SUMMARY

OF DISCUSSIONS AND CONCLUSIONS

OF THE TWENTY-SIXTH MEETING

OF THE NAT SYSTEMS PLANNING GROUP

(Paris, 21 May - 1 June 1990)

July 1990

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LIST OF ABBREVIATIONS

AAC	Airline Administrative Correspondence
ACAS	Airborne Collision Avoidance System
ADS	Automatic Dependent Surveillance
AES	Aircraft Earth Station
AMSS	Aeronautical Mobile Satellite Services
AOC	Airline Operational Control
APC	Aeronautical Passenger Communications
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
ETOPS	Extended-range twin-engined aircraft operations
FDPS	Flight Data Processing System
GAATS	Gander Automated Air Traffic System
GES	Ground Earth Station
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICD	Interface Control Document
IFSS	International Flight Service Station
IGA	International General Aviation
INS	Inertial Navigation System
MNPS	Minimum Navigation Performance Specification
MNPSA	Minimum Navigation Performance Specification Airspace
OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
ODAPS	Oceanic Display and Planning System
OLDI	On-Line Date-Interchange
OTS	Organized Track Structure
RGCSP	Review of the General Concept of Separation Panel
SD	Standard Deviation
TLS	Target Level of Safety
VSM	Vertical Separation Minimum

INTRODUCTION

1. The Twenty-Sixth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 21 May to 1 June 1990. 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 Denmark, Norway, Spain and the USSR to attend this meeting. A list of participants is at page 3

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. D. Covell of the United States acted as Rapporteur;

c) a sub-group to consider the mathematical-statistical aspects of separation minima in the NAT Region, of which Dr. D. Harrison 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. Messrs. J. Vanier and D. Oudin, RAC/SAR Technical Officers of the European Office of ICAO served as Secretaries of the meeting and were responsible for the preparation of this report. They were assisted by Messrs. A. Suban and V. Oustinovitch, COM Technical Officers and B. Barrefors, MET Technical Officer, from the European Office of ICAO.

5. Mr. M. Krüll, Deputy ICAO Regional Representative, 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 reaffirmed the Office's strong commitment to provide the required services to the NAT SPG.

6. In his opening remarks, the Chairman welcomed several new Members including Mr. J. O'Farrell (Ireland), Mr. C. Bouman (Netherlands), Mr. J. Valadares (Portugal), Mr. P. Wood (United Kingdom) and Mr. J. Mayrhofer (United States). Because the Group was to discuss comprehensive planning matters that would have a long term effect on its work of the Group, the Chairman emphasized the importance of this particular meeting.

LIST OF CONCLUSIONS

LIST OF PARTICIPANTS

CANADA
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- Earle R. SNOW
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Agenda Item 1: NAT Air Navigation System safety performance review

1.0 Introduction

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

a) the navigation performance achieved in the NAT Region including methods to improve the overall accuracy; and

b) mathematical/statistical aspects of the NAT Minima Navigation Performance Specification (MNPS) in collision risk.

1.1 Navigation performance achieved and methods to improve overall accuracy

1.1.0 The Group considered the following matters relating the navigation performance:

a) the navigation performance accuracy achieved in the NAT Region during the period 1 March 1989 to 28 February 1990;

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 1989 to 28 February 1990*

1.1.1.1 The Group completed a scrutiny of observed gross navigation errors in the NAT Region and found that a total of 76(85)* errors were reported during the period under review. 31(40)* of these errors occurred outside MNPS Airspace (MNPSA) and were classified as Table 'CHARLIE' errors. Of the remaining 45(45)* errors, 21(13)* 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 § 1.1.1.8 to 1.1.1.11. The remaining 24(32)* errors which form the basis of detailed scrutiny were classified as Table 'ALPHA' errors.

1.1.1.2 A breakdown of the 24 errors is given at Attachment 1-A. The format is in accordance with established procedures, as in previous summaries. The numbers of errors which can be tolerated by the collision risk models have been shown.

1.1.1.3 The Group noted a 25% reduction in Table 'ALPHA' errors from the previous year in conjunction with a 2.4% rise in the observed traffic. This, in turn, was offset by the rise in Table 'BRAVO' errors from 13 to 21 which ensured that the figure for all MNPSA (Tables 'ALPHA' and 'BRAVO') remained the same at 45.

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* For comparison purpose, corresponding figures for the last monitoring period (1988-89) are shown in brackets.

1.1.1.4 From Attachment 1-A, the breakdown of the 24(32)* table 'ALPHA' errors shows three main aspects, namely:

i) The number of errors [11(10)*] in classification "A" (aircraft not certified for MNPS operations) remains disturbingly high.

ii) The number of errors [2(10)*] in classification C2 (waypoint insertion error due to the correct entry of incorrect position) shows an encouraging decrease.

iii) The Models 1 (unweighted) and 2 (weighted) error rates for random traffic exceed the rate of 1.3×10^{-4} tolerated by MNPS requirements, and the Model 1 (unweighted) error rate is marginally below the "action required" level of 1.95×10^{-4}.

The number of table 'ALPHA' errors in other classifications are very similar to those shown in the previous monitoring period (1988-1989).

1.1.1.5 As shown, a major cause of table 'ALPHA' errors remains aircraft flying in MNPSA without approval.(Classification 'A'). The Group noted with concern that this was the third year in which this situation existed, as shown in Table 1.

Table 1 - Table ALPHA Classification A Errors

Monitoring Year	Number of Table 'ALPHA' errors	Number of Classification 'A'	Percentage of Table 'ALPHA' errors
1987-88	25	10	40%
1988-89	32	10	31%
1989-90	24	11	46%

1.1.1.6 The Group was pleased to note the reduction to 2(10)* of classification C2 - correct entry of incorrect waypoints, but noted that both involved route changes necessitating a reprogramming of waypoint data in flight. Considering the 4(4)* classification C1 - inadvertent entry of incorrect waypoint data - errors the Group considered that it was possible that adherence to established MNPS cross check procedures may have prevented these errors. The 1 (1)* error classified as an ATC System Loop error involved a reclearance.

1.1.1.7 Of the remaining 6(7)* errors which were caused by some failure and/or malfunction of the navigation equipment, 2(3)* aircraft were Inertial Navigation System (INS) equipped, and 4(3)* were equipped with Omega. The Group noted with concern that of the 6 errors, 4(5)* were given classification 'F' - navigation errors including equipment failure of which notification was not received by ATC. In most cases it appeared that crews were aware of equipment malfunction for some considerable time before the situation became apparent to ATC, and there did not appear to be a reason for not giving a timely notification of navigation problems.

1.1.1.8 In reviewing the 21(13)* table 'BRAVO' errors the Group noted, again a continued variability in the annual total of these errors over the last four years. These totals are shown in Table 2 below.

Table 2 - Table BRAVO Errors

Monitoring Year	Number of Table 'BRAVO' errors
1986-87	26
1987-88	17
1988-89	13
1989-90	21

The average over the four years is just over 19 thus showing that the period under review is only a little worse than an average year.

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

Table 3 - Table BRAVO by Error Classification

Error Classification	Number of Errors
A	7 (3)
B	0 (1)
C1	8 (3)
C2	4 (4)
D	1 (1)
E	0 (0)
F	1 (1)
Unclassified	0 (0)
Total	21 (13)*

1.1.1.10 As with Table 'ALPHA' errors, classification 'A'-non approved users, accounted for a high proportion (33 %) of Table 'BRAVO' errors. Within this total, 6 were International General Aviation (IGA) aircraft and one was operated by an infrequent NAT user. The Group also noted also the high proportion under classification C1 - equipment control error, including inadvertent waypoint insertion. Of the 8 so classified, 4 were equipment control errors, and 4 were waypoint insertion errors. As with those errors classified C1 in Table 'ALPHA', adherence to established cross-check procedures may have prevented some of these errors.

1.1.1.11 The remaining classification of errors in Table 'BRAVO' showed a similar pattern to the previous monitoring year.

1.1.1.12 The Group then considered Table 'CHARLIE' errors, and were pleased to note that the number of errors (31) showed a reduction for the second year running (40 in the monitoring year 1988-1989, and 63 in the monitoring year 1987-1988). Of the 31 errors 2(8)* occurred above MNPSA and 29(32)* below. The trend of previous years remains, in that the majority of Table 'CHARLIE' errors occur below MNPSA. As with previous years, many of the aircraft involved in the errors below MNPSA carried no long range navigation equipment.

1.1.1.13 In accordance with monitoring procedures, follow-up action is taken with any reported error in excess of 50 NM. The Group noted that, both the errors above MNPSA and 22 of those below MNPSA, were in this category. Of the 2 above, one involved the failure of Omega navigation equipment, and no response, as yet, was recorded from the other operator. Of those errors which occurred below MNPSA, and which required follow-up action, 8 involved equipment failure, 5 involved incorrect Dead Reckoning (DR) using forecast winds, 2 were classified as waypoint insertion errors, and 7 are as yet unresolved.

1.1.1.14 The Group noted that a core sample of navigation performance of eastbound aircraft leaving NAT MNPSA had been completed. The sample consisted of 2693 aircraft crossing 10°W between 56°N and 61°N. The Standard Deviation (SD) of the track keeping accuracy was found to be 3.358 NM, which is well within the SD of 6.3 NM required for MNPS operations. The Group also noted details of a core sample of navigation performance of westbound aircraft leaving NAT MNPSA. The sample comprised 969 flights and was observed within the Gander and Trepassey SSR coverage areas. The SD of track keeping accuracy was found to be 1.87 NM. The Group felt that the distance flown by some eastbound aircraft may have had some bearing on the differences between the two SDs recorded (§ 1.2.2.21 also refers).

1.1.1.15 The Group noted that a review had been completed of navigation accuracy of non MNPSA traffic as a follow-up of Conclusion 25/5. The review had considered the accuracy of IGA, Public Transport, and military aircraft both above and below MNPSA, and a comparison had been made with MNPSA results. The Group noted that the 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 outside MNPSA. Nevertheless, the Group felt that the review gave a good picture of the navigation performance in the NAT as a whole. The Group noted the poor performance of IGA aircraft, and endorsed the recommendation that further studies, in the form of core samples, be completed to further evaluate the true picture of non MNPSA navigation accuracy.

CONCLUSION 26/1 - STUDY OF NON-MNPSA NAVIGATION ACCURACY

That States concerned undertake studies in the form of core samples to further evaluate the navigation accuracy of aircraft operating in non-MNPSA.

1.1.1.16 With respect to the continued application of ten minutes longitudinal separation in MNPSA, the Group noted that the Central Monitoring Agency (CMA) had received one report in which 2 aircraft of similar type at the same Mach number, track and level gave 30°W estimates indicating 7 minutes separation. The problem had been resolved by the time the aircraft reached 30°W. The Group noted that the CMA had received a report in which the separation of 2 westbound aircraft of similar type, speed, track and level was reducing. When the separation had reduced to 8 minutes at 40°W the lead aircraft was given a level change.

1.1.1.17 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. Of these, 2 were also the subject of gross navigation error reports. One had descended from FL110 to FL090 due to icing and no explanation had been forthcoming from the other aircraft, against which enforcement action was being taken. In 2 incidents, aircraft had requested higher levels and had been refused. In one incident the pilot claimed that he had received clearance to a higher level, in another one, the pilot climbed to a flight plan level instead of a cleared level and in one case there was confusion by the crew over clearance details. The Group noted that there were no reports in which spurious Mode 'C' readings were recorded. Finally, in view of the establishment of a Vertical Studies Group to plan for the implementation of Reduced Vertical Separation (cf. § 4.3) the Group agreed that the CMA should provide information regarding altitude deviation to the Rapporteur of the Vertical Studies Group on a continuing basis.

1.1.1.18 The Group was informed of the action taken by Canada as a follow-up to NAT SPG/25 Conclusion 25/1 - NAT MNPS cross-check procedures. In reviewing the proposed amendment to the Regional Supplementary Procedures (Doc 7030 - NAT/RAC) put forward by the Member from Canada, the Group agreed that a specific procedure should not be laid down. Instead, there should be a requirement for operators to have cross-check procedures which would be taken into account by the State of Registry when giving an MNPS approval. The Group agreed that this requirement should be reflected in Doc 7030.

CONCLUSION 26/2 - NAT MNPS CROSS-CHECK PROCEDURES

That Canada take the necessary action to have the ICAO Regional Supplementary Procedures (Doc 7030 4-NAT Part 1 - Section 2 MNPS) amended to include the following:

"When granting approval for operations in MNPSA, States of Registry shall ensure that in-flight operating drills include mandatory navigation cross-checking procedures which will identify navigation errors in sufficient time to prevent the aircraft inadvertently deviating from the ATC cleared route. Guidance on procedures are detailed in NAT DOC 001, T 13.5N/5 and NAT MNPS Operations Manual."

1.1.2 *Methods of improving the observed standard of navigation performance*

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

a) the lessons derived from the review of navigation performance reported in § 1.1.1;

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

1.1.2.2 The major concern of the Group was the number of Gross Navigation Errors (GNE) attributed to non-approved operators. During the period under review 18 such errors occurred in MNPSA out of a total of 45 GNEs (40%). The Group agreed that the non approved operators prejudice the integrity of the overall MNPS concept.

1.1.2.3 The Group noted that the results of spot checks of MNPS approvals, together with checks carried out on the compilation of flight plans, indicated that the problem still lay with the General Aviation/Private/ Infrequent NAT user category of operators. The Group considered that spot checks of approval status, and of flight plans by the provider States remained a valid method of addressing the problem, particularly as the automation of data processing developed.

1.1.2.4 In discussing further measures aiming at reducing the number of non-approved flights in the MNPSA, Canada and the United Kingdom accepted a proposal to include a note in the twice daily NAT track message, for a 90 day period from 15 June 1990 to 15 September 1990, to emphasize the need for operators to have approval before planning to fly through MNPSA as follows:

"Operators are reminded that specific MNPS certification to fly within MNPSA (FL275/FL400) is required from their State aviation authority."

When agreeing to this proposal, Canada and the United Kingdom emphasized that the NAT Track message is not meant for this purpose but they had agreed to the proposal because of the safety implications.

1.1.2.5 As in previous years the Group noted the part played by Oceanic Area Control Centres (OACs) in containing the number of GNEs through timely intervention to prevent incorrect routing.

1.1.2.6 Within the period of the monitoring year Gander OAC advised the CMA of a total of 79(55)* occasions when mistakes were noted, and action taken, by ATC to prevent a GNE. The causes for these mistakes may be broken down as follows:

a) 35 instances in which the aircraft stated that it had been so cleared by other ATC units;

b) 27 instances in which no explanation was offered for an incorrect forward estimated position;

c) 4 instances in which the pilot said that the was using Flight Plan routing;

d) 3 instances in which the pilot claimed he had not received a re-route;

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

f) 2 instances when incorrect position reports had been given;

g) 2 instances in which incorrect data had been passed between adjacent ATC units;

h) 1 instance in which the pilot claimed he had been cleared as per flight plan;

i) 1 instance in which the pilot used a route which he had been advised might be available for him, but he had not been cleared on;

j) 1 instance in which the ATC unit stated that an error had been made on their part.

1.1.2.7 In reviewing the report of a scrutiny of the 1988-1989 monitoring year, as carried out at the CMA, the Group endorsed the views expressed that hand written amendments on a computer generated flight plans had lead to confusion. The Group agreed that had provisions existed for recording details of a reclearance there would have been less likelihood of a mistake. The Representative from IFALPA informed the Group that the would bring this matter to the attention of his organization.

1.1.3 *Methods of improving the current monitoring procedures*

1.1.3.1 From the report of the scrutiny group, 8 errors were noted in which a malfunction of Omega Long Range Navigation equipment was a factor. Only 3 of these had been identified as such at the time of reporting by the ATC unit. The result was that only details of these 3 had been passed to the Omega Navigation System Centre of the US Coast Guard in accordance with procedures adopted at NAT SPG/24. The Group noted that, to ensure meaningful assistance from the Omega Navigation System Centre, it is necessary for ATC units to identify aircraft with Omega difficulties at the time of the occurrence.

1.1.3.2 The Group noted that the CMA received no feed-back on the action taken by States of Registry to prevent a repetition of MNPS operations by aircraft which had been identified as having no MNPS approval. It was considered that a more detailed feed-back to CMA would enable a more comprehensive report to be circulated to members, which in turn would enable States to better deal with this problem.

CONCLUSION 26/3 - FEED-BACK BY STATES OF REGISTRY

That States of Registry take appropriate action to ensure that a more detailed feed-back is provided to the CMA to prevent a repetition of MNPS operations by aircraft identified as non-MNPS approved.

1.1.3.3 In further considering the report of the scrutiny of the 1988-1989 monitoring year the Group endorsed the view that the retention of the relevant radiotelephone tape, or a suitable copy, following the report of a GNE in which it is considered a reclearance may have some bearing, could considerably assist any subsequent investigation.

CONCLUSION 26/4 - RETENTION OF RTF TAPES

That NAT provider States take necessary measures to ensure retention of radiotelephone tapes, or suitable copies, following reports of Gross Navigation Errors in which it is considered a re-clearance may have had some bearing in order to assist in subsequent investigation.

1.1.3.4 The Group endorsed the recommendation that the use of the present style of graph used by the CMA and introduced at the beginning of the 1989-1990 monitoring year be adopted.

1.2 Mathematical/statistical aspects of the NAT MNPS collision risk

1.2.0 The Group considered the following matters relating to mathematical issues and NAT MNPS collision risk assessment :

a) review of 1988 collision risk estimation;

b) review of 1989 collision risk estimation;

c) effect of new parameter values on risk estimation;

d) tactical monitoring;

e) fall-back procedures;

f) future target level of safety;

g) reduced vertical separation minima (VSM) and its effect on other collision risk estimates; and

h) future work programme.

1.2.1 *Review of 1988 collision risk estimation*

1.2.1.1 Although the NAT SPG did not meet in 1989, the Group noted that a review of navigational performance had been carried out by the NAT Scrutiny Group and that an assessment of the NAT MNPS lateral collision risk was made, based on 1988 occupancy statistics and GNE rates.

1988 OCCUPANCY

1.2.1.2 Estimation of NAT lateral occupancy for 1988 was based on traffic samples from 40°W only. Data from 20°W was not available due to operational problems; however a paper was presented which estimated same direction occupancy values at 20°W based on the relationship between occupancy levels at 40°W and 20°W as observed in previous years. The resultant occupancy estimates for 1988 are shown in Table 4.

Table 4 - Occupancy Estimates for 1988

	OTS		Random		Total	
Eastbound	1.10	(1.05)	.19	(.22)	.66	(.63)
Westbound	1.08	(.93)	.14	(.13)	.63	(.65)
Total Same	1.09	(.99)	.16	(.18)	.64	(.67)
Total Opposite	.007	(.002)	.003	(.002)	.005	(.002)

(1987 estimates in brackets)

1.2.1.3 The largest percentage increases were found in opposite direction occupancy. This was almost solely due to the results for December when a comparatively large number of opposite direction Organized Track Structure (OTS)/OTS proximate pairs were recorded. These were the result of a trial which enabled the publishing of an eastbound flight level on one track during the day-time track structure. This trial was discontinued in mid-March, 1989.

1.2.1.4 Table 5 shows the trend of occupancy ratios from 1984 to 1988. The occupancy ratios indicate the level of measured occupancy i.e. same direction and opposite direction occupancy, relative to the values assumed in the derivation of the MNPS criteria. The random occupancy ratios show a slight downward trend and are approximately a third of that assumed in the MNPS derivation. OTS occupancy is related to the increase in OTS traffic and may also be due to the greater packing of traffic within particular time periods, flight levels and tracks. The OTS occupancy is seen to be 70% higher than that assumed in the MNPS derivation.

Table 5 - Occupancy Ratios 1984-1988

	1984	1985	1986	1987	1988
OTS	1.27	1.31	1.31	1.40*	1.70*
Random	0.48	0.46	0.34	0.26*	0.30*
Total	0.94	0.97	0.91	0.83*	1.03*

* Estimated to take account of 20°W

1988 COLLISION RISK ESTIMATION USING THE ORIGINAL PARAMETER VALUES

1.2.1.5 Using the original parameters assumed in the MNPS derivation, the occupancy estimates were combined with GNEs information and NAT traffic counts to obtain the 1988 risk ratios shown in Table 6.

Table 6 - Calculation of Risk Ratios for the NAT MNPSA 1988 Using the Original Parameter Values

	1988 Traffic	Occupancy Ratio			Zeta Ratio			Risk Ratio		
OTS	84454	1.70	(1.43)	x	.365	(.10)	=	.62	(.14)	Model 1
	(77675)				.267	(.46)	=	.45	(.07)	Model 2
Random	79384	.30	(.31)	x	1.231	(1.49)	=	.37	(.46)	Model 1
	(76622)			x	.892	(1.15)	=	.27	(.36)	Model 2
Total	163838						=	.50	(.30)	Model 1
	(136994)						=	.36	(.21)	Model 2

1.2.1.6 The values given for the risk ratio indicate the level of risk associated with OTS or random traffic when compared to the Target Level of Safety of $2x10^{-8}$. It may be concluded from Table 6 that the lateral collision risk, whether OTS, random or total, was within the target level of safety during 1988, although the risk ratio in the OTS airspace was significantly higher than for 1987. This increase was a result of increases in both the occupancy ratio from 1.40 to 1.70 and in the number of zeta errors from 1 to 4.

1.2.1.7 Table 7 shows the trend of risk ratios from 1984 to 1988. During this 5-year period the risk ratios for OTS and random airspace have both fluctuated; 1984 and 1985 show relatively high risk (1985 OTS exceeding the TLS), 1986 and 1987 were years of relatively low risk (due mainly to the small number of OTS GNEs), while 1988 rose again (due to the 4 OTS GNEs).

Table 7 - Risk Ratios 1984-1988

		1984	1985	1986	1987	1988
OTS	(Model 1)	.88	1.21	.14	.14	.62
Random	(Model 1)	.92	.35	.22	.46	.37
Total	(Model 1)	.90	.78	.18	.30	.50
Total	(Model 2)	.75	.62	.19	.21	.36

1988 COLLISION RISK ESTIMATION USING THE PROPOSED PARAMETER VALUES

1.2.1.8 Using the proposed updates to the parameters used in the estimation of lateral collision risk resulted in the following changes to the risk ratios.

Table 8 -
Risk Ratios for the NAT MNPSA 1988 Using
the Proposed Changes to the Original Parameter Values

	Model 1			Model 2		
	OTS	*Random*	*Total*	*OTS*	*Random*	*Total*
Present Parameters	0.62	0.37	0.50	0.45	0.27	0.36
New Parameters	1.37	0.75	1.07	1.00	0.54	0.78
Proportional Increase	2.21	2.03	2.14	2.22	2.00	2.17

1.2.1.9 For both Model 1 and Model 2, use of the proposed parameter values approximately doubles the risk estimates in comparison with the levels estimated using the original parameters. The overall system risk is shown to be approximately equivalent to the TLS, under Model 1. Estimates based on Model 2 show the overall system risk to be within the TLS.

1.2.1.10 Concluding its discussion on the 1988 collision risk estimation, the Group noted the following main points:

a) occupancy for OTS traffic continued to rise in relation to traffic levels and was 70% higher than that assumed in the original MNPS derivation. This has a direct consequence on the number of OTS GNEs which can be tolerated while remaining within the TLS. In 1988, 4 OTS GNEs were observed, if 6 had been observed the TLS would have been exceeded;

b) conversely, random traffic occupancy was shown to be less than that assumed in the original MNPS derivation. This therefore increases the number of tolerable random GNEs; in 1988 up to 24 random GNEs would have been tolerable;

c) using the original parameter values, the risk, whether OTS, random or total, was within the TLS in 1988;

d) the risk ratio in the OTS (0.62) was higher than that in 1987 due to increases in both occupancy and the zeta error rate;

e) the risk ratio in random airspace (0.37) indicated little change from 1987;

f) use of more appropriate parameter values, resulting from changes in the air traffic system and more precise information about the performance of aircraft, leads to an increase in the estimated risk for any given level of occupancy and error rate;

g) keeping the zeta error rate and occupancy constant, new parameters lead to an increase in risk by a factor of approximately 2;

h) use of the new parameters and Model 1 assumptions produced a risk estimate for OTS traffic in excess of the TLS. The 1988 overall level of system safety was slightly above the TLS; and

i) it was also noted that concluding remark (h) could also have been made for 3 out of the last 5 years using the new parameter values. It should therefore not be concluded that collision risk within the system suddenly deteriorated in 1988.

1.2.2 *1989 Collision Risk Estimation*

OCCUPANCY

1.2.2.1 A short presentation of a report by the United Kingdom regarding its database and occupancy programme was made to the Group. The report presents a subset of the Prestwick Flight Data Processing System (FDPS) database received by the United Kingdom Civil Aviation Authority (CAA) Directorate of Operational Research and Analysis on a monthly basis. The database contains information on aircraft movements in Shanwick airspace on selected days of each month. Also included is a brief description of the available statistics from a software package principally designed to estimate North Atlantic occupancy. The paper was presented in order to record the methodology used to calculate occupancy for comparison with a similar software package used in Canada and inform Members as to the statistics now available for general use.

1.2.2.2 The Group agreed that occupancy information at 30°W, now available from the improved databases, should also be used in the overall assessment of NAT lateral occupancy. Papers relevant to NAT lateral occupancy during 1989 were presented by Canada and the United Kingdom.

1.2.2.3 The overall occupancy estimates for 1989 are therefore based on data collected by Gander OAC on aircraft crossing the 40°W and 30°W meridians on the 15th day of each month and averaged over the twelve months of the year, and on data collected by Shanwick OAC on aircraft crossing the 20°W and 30°W meridians, also on the 15th day of each month and averaged over the year. The occupancy estimates are based on the number of proximate pairs formed at the three meridians. With the current separation standards, two aircraft form a proximate pair if they cross the same line of longitude within 15 minutes of each other, whilst flying at the same flight level and separated by 1° of latitude.

1.2.2.4 The occupancy estimates produced by the United Kingdom and Canada at 30°W were averaged and then combined with estimates from 20°W and 40°W to produce the final occupancy estimates. The results are presented in Table 9 with 1988's results given in brackets for comparison. It should be noted that for 1988, occupancy estimation was based on data from 40°W only, due to operational problems with the flight data processing system at Shanwick OAC

Table 9 - Occupancy Estimates for 1989

	OTS		RANDOM		TOTAL	
Eastbound	1.73	(1.10)	0.402	(0.19)	0.814	(0.66)
Westbound	0.827	(1.08)	0.177	(0.14)	0.572	(0.63)
Total same	0.995	(1.09)	0.302	(0.16)	0.697	(0.64)
Total opposite	.004	(.007)	.006	(.003)	.005	(.005)

1.2.2.5 The opposite direction statistics across all sample days for 1989 show a total number of proximate pairs similar to that for 1988 which again shows a large increase compared to previous years. The 1989 increase is almost solely due to the results for March 1989 when a total of 5 proximate OTS/OTS pairs were recorded at 40°W. These resulted from the publication and use of eastbound flight levels during the day-time track system. These results were noted in the 1989 Mathematicians' reports and OACs were subsequently requested not to publish opposite direction levels within the organized track system. Although these are now not published, one normal eastbound flight level is often still available on the northern-most track, with aircraft using them being classed as OTS traffic. However, they have not been used to the same extent and opposite direction occupancy has since fallen to previously observed levels.

1.2.2.6 Table 9 continues to show the ever widening difference between eastbound and westbound OTS occupancy. Eastbound same direction OTS occupancy continues to exceed westbound occupancy by a relatively constant 40%. Similarly, as noted in previous years, occupancy at 40°W continues to exceed that at 20°W based on both the Canadian and the United Kingdom data bases. Overall OTS occupancy is relatively unchanged compared to 1988 results.

1.2.2.7 Of greatest concern in the 1989 occupancy results is the doubling of the overall random occupancy resulting almost totally from the eastbound statistics (eastbound random occupancy in 1988 was 0.19, compared to 0.402 for 1989). On examination, this has been caused by a very large increase in the number of eastbound OTS/random proximate pairs. One possible cause identified by ATC operational advisors is the increase in the number of Extended Range Twin-Engine aircraft Operations (ETOPS) aircraft flying random within the eastbound OTS. Further review of this is required and may bring into question the current method of presenting random and OTS risk estimates as if they related to two separate "blocks" of airspace. This may result in a detailed tabulation of OTS and random traffic used for estimating occupancy.

1.2.2.8 The occupancy ratios, which indicate the level of measured occupancy, i.e. same-direction and opposite-direction occupancy, relative to the values assumed in the derivation of the MNPS criteria, are presented in Table 10. The values used in the MNPS derivation were 0.5 for same-direction occupancy and 0.013 for opposite-direction.

Table 10 - Occupancy Ratios - 1989

	OTS	RANDOM	TOTAL
Eastbound	1.75	0.70	1.27
Westbound	1.26	0.39	0.92
Both directions	1.50	0.56	1.10

1.2.2.9 Table 11 shows the trend of occupancy ratios from 1985 to 1989. The random occupancy ratio shows a large increase compared with previous years but is still well within the value assumed in the MNPS derivation. The OTS occupancy ratio is down from last year but is still above that assumed in the MNPS derivation, as it has been for the whole period 1985-89. Table 11 is shown in graphical form in Figure 1 of Attachment 1-B.

Table 11 - Occupancy Ratios 1985-1989

	1985	1986	1987	1988	1989
OTS	1.31	1.31	1.40*	1.70*	1.50
Random	0.46	0.34	0.26*	0.30*	0.56
Total	0.97	0.91	0.83*	1.03*	1.10

* Estimated to take account of 20°W

1.2.2.10 With the introduction in Canada and the United Kingdom of new software for the calculation of occupancy, and the availability of traffic movement data for alternative purposes on the 4th of each month, the Group requested that occupancy statistics be produced for NAT SPG/27 based on the 4th as well as the 15th of each month. Comparisons would be made at such a time and a decision could be made as to whether the current sample size of 12 days be expanded to 24 days.

1.2.2.11 The Group agreed that in the future, occupancy figures should be obtained for the monitoring year employed by the CMA, 1 March to 28 February, rather than on a calendar year basis.

OBSERVED TRAFFIC COUNTS

1.2.2.12 Prior to examining the zeta error rates for 1989, questions were raised as to the accuracy of the traffic counts used for their calculation. Currently, traffic counts at the actual radar monitoring windows are not possible. The traffic figures are obtained for all aircraft crossing 20°W in Shanwick airspace, and 50°W in Gander airspace.

1.2.2.13 This discrepancy between the locations of recording GNEs and counting traffic may lead to inaccuracies in calculating zeta error rates. The Group was informed that improved counting methods for OTS and random traffic at the radar monitoring windows are currently being installed at Shanwick. Until these data are available it was considered unwise to recommend changes to the current method used by the monitoring agency.

ZETA ERROR RATES

1.2.2.14 To calculate the overall MNPSA risk ratio, the number of zeta errors, together with the tolerable number of errors derived from the MNPS criteria and the corresponding traffic counts, are required. Table 12 shows the derivation of the zeta error ratios.

Table 12 - 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	3	11.24	0.267	10	7.49	1.335
Model 2	2.46	11.24	0.219	8.38	7.49	1.119

1.2.2.15 The number of OTS zeta errors observed during the last monitoring period was well within the level consistent with the MNPS criteria. The number of random errors, however, exceeded the corresponding level by one third.

1.2.2.16 Table 13 shows the trend in zeta error ratios for the past five years using Model 1 only. The OTS and random ratios have decreased and increased respectively between 1988 and 1989, with the net effect that the overall zeta error ratio has remained relatively constant. The trends indicated in Table 13 are well illustrated in Figure 2 at Attachment 1-B.

Table 13 - Zeta Error Ratios 1985-1989 (Model 1)

	1985	1986	1987	1988	1989
OTS	0.92	0.11	0.10	0.37	0.27
Random	0.76	0.66	1.49	1.23	1.34
Total	0.86	0.33	0.65	0.71	0.70

1989 COLLISION RISK ESTIMATION USING ORIGINAL PARAMETER VALUES

1.2.2.17 In order to calculate the average system risk, the OTS and random risks are weighted by the numbers of OTS and random aircraft flying within the MNPSA. Since not all of the traffic flying on random routes is picked up by radar monitoring at the window, the total number of random aircraft has to be derived. The total number of OTS aircraft recorded, as supplied by the Scrutiny group, was 86,491. The total 1989 NAT traffic movements, as estimated by the NAT TFG, was between 193,500 and 190,600. For the purposes of this calculation the mid-point of this range - 192,050 - was taken as the total number of movements. Therefore, the total number of random aircraft operating in the NAT Region was estimated as 105,559. This figure includes aircraft operating above and below MNPSA and must therefore be adjusted accordingly. The number of such aircraft has been estimated as 7,917, derived from Canadian operating statistics; this gives an estimate of 97,642 random aircraft within MNPSA.

1.2.2.18 Table 14 shows the calculation of the 1989 risk ratios. OTS and random risk ratios are obtained from a direct multiplication of the occupancy and zeta ratios. The total risk ratio is a weighted average of the OTS and random traffic counts.

Table 14 - Calculation of Risk Ratios for the NAT MNPSA 1989

	1989 Traffic	Occupancy Ratio		x	Zeta Ratio		=	Risk Ratio		
OTS	86491	1.50	(1.70)	x	.267	(.365)	=	.40	(.62)	Model 1
	(84454)				.219	(.267)	=	.33	(.45)	Model 2
Random	97642	0.56	(0.30)	x	1.335	(1.231)	=	.75	(.37)	Model 1
	(79384)				1.119	(0.892)	=	.63	(.27)	Model 2
Total	184133						=	.59	(.50)	Model 1
	(163838)						=	.49	(.36)	Model 2

1.2.2.19 A risk ratio of less than 1 indicates that the estimated risk is within the TLS. A ratio of greater than one indicates that the TLS is being exceeded. For 1989 it can be seen that for OTS, random and total traffic the risk was within the TLS. Whilst the total risk is virtually the same as for 1988, OTS risk has decreased whilst random risk has increased, due mainly to the increase in random occupancy.

1.2.2.20 Table 15 gives the Model 1 risk ratios for the period 1985 to 1989. The table indicates that there was a large increase in the random risk ratio in 1989. This is due to the higher occupancy observed in random airspace for 1989. Figure 3, at Attachment 1-B, illustrates the trends indicated in Table 12 showing both the fluctuating risk estimates between OTS and random traffic and the general upward trend in overall risk since 1986.

Table 15 - Risk Ratios 1985-1989

		1985	1986	1987	1988	1989
OTS	(Model 1)	1.21	0.14	0.14	0.62	0.40
Random	(Model 1)	0.35	0.22	0.46	0.37	0.75
Total	(Model 1)	0.78	0.18	0.30	0.50	0.59
Total	(Model 2)	0.62	0.19	0.21	0.36	0.49

LATERAL NAVIGATION PERFORMANCE

1.2.2.21 The Group reviewed two contributions presented by Canada and the United Kingdom. The latest lateral navigation error core sample analysis carried out by the CMA took place during June 1989. The lateral errors of aircraft exiting oceanic airspace at 10°W were recorded in similar fashion to previous studies. A sample of 2693 valid tracks was obtained, approximately three times the magnitude of previous studies, which resulted in a mean error of -0.411 NM and an SD of 3.358 NM. Within the sample 24 aircraft tracks were observed to be 13 NM or more off track and were individually reviewed.

1.2.2.22 Canada presented lateral navigation error core sample statistics for westbound aircraft obtained from the Gander and Trepassey radar sites during April and May 1989. A total sample size of 969 valid tracks was obtained, resulting in a standard deviation of 1.87 NM. No errors of 8 NM or more were observed.

1.2.2.23 The Group welcomed the fact that both samples continue to indicate that the core navigational performance is well within the standard deviation of 6.3 NM required for NAT MNPS operations, but noted the large difference between the two sample statistics. Several factors may contribute to this disparity; length of the aircraft flight prior to being sampled, (longer flight times for eastbound traffic prior to being observed), the location of the sampling sites and the nature of the aircraft profiles when observed.

1.2.2.24 The Group reviewed a report on studies undertaken by the United States to re-evaluate the parameters of the double double exponential (dde) density function used in the collision risk model. The report showed that the empirical data gathered over the last 10 years was "better" than that assumed by the current dde function. The shape of the empirical distribution was shown to be a function of the large number of way-point errors and the lateral window. Work into possible improved fits to this distribution is to be continued by the United States, although this is to be reviewed in the context of the introduction of new technology.

1.2.2.25 Concluding its discussion on the 1989 collision risk estimation, the Group noted the following main points:

a) with the development of new databases and software, occupancy is now calculated at 20°W, 30°W and 40°W to improve the accuracy of the occupancy estimate. In addition, results for the 4th day of each month may be added to the current sample, expanding the occupancy assessment to 24 days per year;

b) the Group proposed for the sake of consistency that occupancy results be produced to match the same examination period as that used by the CMA - 1 March to 28 February;

c) eastbound OTS same direction occupancy continues to exceed westbound occupancy by over 40%. Similarly, as noted in previous years, occupancy at 40°W continues to exceed that at 20°W;

d) same and opposite direction OTS occupancy is relatively unchanged when compared to 1988 and can be seen from the occupancy ratio to be 50% higher than that assumed in the original MNPS derivation;

e) of greatest concern in the 1989 occupancy statistics is the doubling of the eastbound random occupancy from 0.19 in 1988 to 0.40 in 1989;

f) the risk ratio for OTS traffic (0.40) was lower than in 1988 due to small decreases in both occupancy and GNEs;

g) the risk ratio for random traffic (0.75) was more than double that in 1988 due to increases in both the number of GNEs and, primarily, occupancy; and

h) using the original parameter values, lateral collision risk, whether OTS, random or total, was within the TLS in 1989.

1.2.3 *The effect of new parameter values on risk estimation*

PROPOSED CHANGES TO THE PARAMETER VALUES

1.2.3.1 In the derivation of the MNPS criteria, parameters relating to the aircraft populations physical and kinematic properties and to the system occupancy were assumed. Information amassed since the MNPS derivation indicates that some of the original assumed parameters are no longer applicable to the present day and enables updated values to be produced. Continued use of the original parameters is therefore likely to result in a misleading evaluation of lateral collision risk. The derivation of the proposed parameter estimates has been presented in several papers and previous mathematicians' working group reports. Table 16 presents the original and proposed parameters for comparison.

Table 16 - Collision Risk Model Parameter Values

Parameter	Original Value	Proposed Value
Sy	60 NM	60 NM
Sx	120 NM	120 NM
$Pz^{(0)}$	0.25	0.39
λx	0.033 NM	0.033 NM
λy	0.033 NM	0.029 NM
λz	0.0085 NM	0.009 NM
$\lvert \overline{\Delta v} \rvert$	13 kts	13 kts
$\lvert \bar{v} \rvert$	480 kts	480 kts
$\lvert \bar{y} \rvert$	47 kts	80 kts
$\lvert \bar{z} \rvert$	1.0 kts	1.5 kts

1.2.3.2 The Group noted that the proposed parameter values will continue to be under review as the system operations and make-up changes. Examples of likely changes in the relatively short term are the aircraft dimension parameters due to the introduction of ETOPS aircraft, and the lateral relative velocity $\lvert \bar{y} \rvert$ which is principally based upon way-point insertion errors and may change following the introduction of new technology such as Automatic Dependent Surveillance (ADS).

1.2.3.3 The Group accepted the improved accuracy of the revised parameter values, but recognised that before they can be used consistently in risk analysis it will be necessary to take into account other related changes to risk evaluation criteria (cf. § 1.2.3.10).

1989 COLLISION RISK ESTIMATION USING THE PROPOSED PARAMETER VALUES

1.2.3.4 Applying the new proposed set of parameter values to the 1989 GNE rates and occupancy values produces the results shown in Table 17.

Table 17 - Risk Ratios for New Parameter Values

	Model 1			Model 2		
	OTS	*Random*	*Total*	*OTS*	*Random*	*Total*
Present Parameters	0.40	0.75	0.59	0.33	0.63	0.49
New Parameters	0.94	1.61	1.30	0.77	1.35	1.08
Proportional Increase	2.35	2.15	2.20	2.33	2.14	2.20

1.2.3.5 It can be seen that the effect of the new parameters and latest occupancy figures is to more than double the risk estimates produced using the original parameters. As the risk ratio is expressed as a proportion of the TLS, the random risk, using Model 1, exceeds the TLS of 2×10^{-8} by 61 % ie a risk of approximately 3.22×10^{-8}. The overall system risk is shown to exceed the TLS, under both Model 1 and Model 2.

1.2.3.6 The risk ratios for OTS and random traffic differ from those produced for 1988. In 1988 the estimated OTS risk exceeded the TLS, in 1989 random risk exceeded the TLS, illustrating the sensitivity of the estimates to changes in the number of GNE's and occupancy.

1.2.3.7 An alternative way of expressing these results is to calculate the zeta error rate that was required to be met by the population of aircraft to have maintained collision risk below the TLS. Table 15 shows the zeta error rates for OTS and random traffic, using both the original assumed parameter values and the new proposed parameter values, together with the 1989 occupancy and traffic levels.

1.2.3.8 Using the original parameter values together with 1989 occupancy estimates, Table 18 also shows that only 7 OTS GNEs could have been tolerated before the TLS would have been exceeded. Similarly due to the lower occupancy experienced by random traffic up to 13 GNEs could have been tolerated.

1.2.3.9 Of greater significance, however, is the number of GNEs which can be tolerated when the proposed new collision risk parameter values are used. Here, due to the high same direction occupancy in the OTS, the upper limit on the number of GNEs for the 1989 traffic loading was 3 (3 were observed). For random traffic as the occupancy is lower, the upper limit on the number of GNEs was 6 (10 were observed).

Table 18 - Model 1 Zeta Error Rate Requirements

	Using Original Parameter Values		**Using New Parameter Values**	
	OTS	*Random*	*OTS*	*Random*
MNPS Zeta Error Rate	1.3×10^{-4}	1.3×10^{-4}	1.3×10^{-4}	1.3×10^{-4}
1989 limit on the Zeta Error rate	0.86×10^{-4}	2.29×10^{-4}	0.37×10^{-4}	1.08×10^{-4}
No. of Tolerable errors in 1989	7 (7.44)	13 (13.20)	3 (3.20)	6 (6.23)
No. of observed Zeta Errors in 1989 (Model 2 in brackets)	3 (2.46)	10 (8.38)	3 (2.46)	10 (8.38)

THE INTRODUCTION OF NEW PARAMETER VALUES AND RELATED DEVELOPMENTS

1.2.3.10 A paper presented by the United Kingdom summarized the proposed new parameter values and explained that they are the result of improved and updated knowledge about the aircraft population and are therefore more appropriate for current traffic than the original assumptions. In addition to the changes in the values of fixed parameters, the values taken by the occupancy parameters - which vary from year to year according to observation - are found to be consistently different from those originally assumed in order to derive the MNPS criteria. The effects of changing the parameter values are evident in various aspects of safety assessment using the collision risk model. These effects must be given due consideration before the new parameter values are adopted. The aspects identified were:

a) the classification and weighting of GNE's (Model 1/Model 2);

b) the confidence with which risk is estimated, relating to the sampling period and the use of warning lines;

c) possible changes to MNPS criteria; and

d) the TLS and its division for the three dimensions.

In addition, the need for reviewing the parameter values from time to time in the light of technological changes was identified.

1.2.3.11 The Group recognized the importance of these considerations. In particular, with respect to (a), the Group accepted the need for a single model only to be adopted. It was accepted that, if the purpose of analyzing errors is to estimate the time spent in overlap, then the most accurate method of doing this should be adopted - bearing in mind the limitations of data collection. More work is needed on the principles of error classification and the averaging/weighting process as well as the consequences to the limits used in declaring the system to be in conformance or not before it is possible to determine whether an approach along the lines of Model 2 (with weights revised in line with parameter changes) is the correct one.

1.2.3.12 The Group noted the relationship of GNE behaviour to the origins of the Collision Risk Model (CRM): in particular the derivation of the frequency of occurrence of lateral overlap and its bearing on the average relative lateral velocity. The point was raised that estimates of certain parameters, such as the average relative lateral velocity, may not conform to the intent of the CRM. The Group agreed that there was a need to review this matter in the work programme, and that this might also be relevant to the consideration of appropriate weights to be used for the various classifications of GNE.

1.2.3.13 The question of mathematical confidence in risk estimates will become more critical if the new parameters are adopted because it is likely that a smaller number of zeta errors would be tolerable according to the straight forward comparison with TLS. The Group agreed that it would be necessary to consider using a longer sampling period, for example in the form of a moving average over several years, in order to increase confidence. It will also be necessary to review the warning line concept.

1.2.3.14 The Group considered that, on the adoption of the revised parameter values, the existing MNPS criteria would not be consistent with the model. New eta and zeta error criteria are required in order to act as guides to navigation performance in terms of GNEs. Suitable rates could be derived from the model using estimated 1995 occupancy, and could be applied as revised MNPS criteria for MNPSA. It was recognized that it may also become necessary to specify a maximum SD smaller than the current MNPS values of 6.3 NM, in order to obtain consistency. Such a value could be derived with reference to new Eta/Zeta criteria and actual navigation performance. The Group agreed that further work was required to develop possible future MNPS criteria.

1.2.3.15 The Group debated the possible alteration of the overall TLS applied to total collision risk, and agreed that the philosophy underlying the choice of TLS, and its alteration, was a legitimate area for further work. In addition, the proposed modification to the probability of vertical overlap (due to improved height-keeping) illustrates the interaction between risks in the three dimensions: changes which reduce the risk in one dimension may increase it in another. This raises the question of the selection of a TLS and how it should be applied.

1.2.3.16 Changes in technology will necessitate a continuing review of the model parameters and estimation methods, for example ADS may produce a marked reduction in the number of zeta errors, and perhaps, as a result, the significance of eta errors would be increased. Also, the Group agreed that some operational changes - such as the increase in ETOPS - would imply further changes to parameter values.

1.2.3.17 Concluding its discussion on the introduction of new parameter values the Group noted the following:

i) review of the lateral CRM parameter values indicates that the currently used values do not fully represent the existing environment. However, before new parameter values may be accepted by the NAT SPG it will be necessary to take into account other related changes;

ii) risk estimates for random traffic are shown to be in excess of the TLS for 1989. The overall level of system safety has reached the upper bound set by the TLS, and the trend over the last 4 years shows the risk to be increasing;

iii) unless action is taken to limit the number of GNEs or the currently increasing occupancy it is felt that collision risk estimates will continue to climb; and

iv) to assist in the decision making process and to improve the confidence with which risk estimates are expressed, the Group set out a programme of work for the mathematicians to be reported on by NAT SPG/27 (cf. § 1.2.8).

1.2.4 *Tactical Monitoring*

1.2.4.1 The Group noted that tactical verification of MNPS compliance was introduced by Canada, Iceland and the United Kingdom during 1990. Because the Group has always recognized the need for and likely benefits of such monitoring, it was now in a position to carry out an assessment of the benefits of tactical monitoring, albeit with a small sample.

1.2.4.2 The Group also noted that in 1989, 5 of the 11 eta errors attributed to non-approved users were also observed as zeta errors and that altogether 13 zeta errors (50-70NM) were observed in 1989. To illustrate the beneficial effect of the removal of these errors on the lateral collision risk estimates for 1989, reflecting the assumption that non-approved users could be excluded from MNPSA, the following table has been produced:

Table 19 -
1989 Risk Ratios with the Removal of all Zeta Errors due to non-approved MNPS Operators

	Model 1			**Model 2**		
	OTS	*Random*	*Total*	*OTS*	*Random*	*Total*
Present Parameters	0.27	0.45	0.37	0.20	0.33	0.27
New Parameters	0.63	0.96	0.80	0.46	0.70	0.59

1.2.4.3 Table 19 shows that, whether using the original or proposed parameter values and/or Model 1 or Model 2, the lateral collision risk would not have exceeded the TLS.

1.2.4.4 With the above in mind, the Group noted the results of the Tactical Monitoring of MNPS approval status of operators entering MNPSA since its implementation. The Group noted that the exercise had only been running for a short time, and considered that it was too early to form a meaningful assessment from the results available to date. The Group did however feel that the exercise was beginning to have effect in that some operators already realised that merely the submission of a flight plan did not constitute NAT MNPS approval. The Group noted the slight difference in the format of the monitoring process and recommended that all provider States undertake or continue tactical monitoring of operators entering MNPSA. In so doing the Group felt that meaningful assessments of the results could then be made. The Group further agreed that the tactical monitoring process should be carried out throughout the NAT Region and that it should embrace the proviso that, in the event that the pilot, or the aircraft operator, is unable to provide confirmation of approval, then the aircraft will be issued on oceanic clearance outside MNPSA (below FL275 or above FL400). The Group noted that Canada already excludes non-approved MNPS aircraft from MNPSA, that Iceland will follow suit and that other States are actively pursuing this matter. Keeping in mind the potential effects on the overall safety of the system, the Group concluded:

CONCLUSION 26/5 - TACTICAL MONITORING OF MNPSA

That all NAT Provider States implement tactical monitoring of MNPSA as soon as possible using the following two-phased approach:

a) confirmation of the MNPS approval status of aircraft be requested; and

b) aircraft that cannot provide MNPS approval be cleared to operate outside MNPSA.

1.2.5 *Fall-back Procedures*

1.2.5.1 An input from the United States concerning fall back procedures indicated the options which could be implemented if the collision risk value exceeds the TLS. In choosing the appropriate action, it would be important to identify the factor(s) causing the increase in risk. If increased numbers of GNEs are seen as the problem, it will be necessary to determine any common cause and take remedial action. If such remedial action cannot be taken or if occupancy is regarded as the main cause of the problem, then other options can be recommended. The first of these is flow management, which could be used to reduce occupancy. A second possibility might be an increase in longitudinal separation, although recent simulation studies in the United Kingdom have concluded that this would not significantly decrease the occupancy or, therefore, the risk. Finally, a change in separation standards might be implemented, in particular an increase in the lateral separation standard or the introduction of composite separation. While increases in lateral separation might actually increase occupancy, it is believed that this effect would be more than offset by the reduction in lateral overlap probability.

1.2.5.2 The Group recognized the importance of identifying the cause(s) of increased risk. It was emphasized that if an increase in risk could be ascribed to specific navigational problems, possibly in a small sub-population of North Atlantic aircraft, then it should be possible to take action reducing this factor and hence pre-empt the need for a change in separation standards.

1.2.5.3 From a contribution by the United Kingdom, it was noted that the upward trend in risk estimates over the last 4 years necessitates consideration of fall-back procedures. Three possibilities were offered:

a) 120 NM/2000 ft rectangular separation;

b) 60 NM/2000 ft composite separation; or

c) 60 NM/1000 ft composite separation.

Because the usual occupancy estimates relate to adjacent 60 NM - separated tracks only, it was necessary to apply a different methodology to these three scenarios, taking into account occupancies and error rates at 120 NM, 180 NM, etc. This revised methodology was applied to all three scenarios above and for purposes of comparison to the current 60 NM/2000 ft rectangular separation.

1.2.5.4 The United Kingdom presentation emphasized that in applying the revised methodology to the various potential fall-back procedures, it has been necessary to make several assumptions. In particular, it is difficult to know what the distribution of GNEs at 120 NM, 180 NM, etc, is. Also, the effect of such scenarios on occupancy is uncertain. Because of the difficulties in assessing the number of OTS/random pairs and the random occupancy, the risk calculations have been performed for OTS traffic only. Finally, the interaction between these fall-back procedures and the traffic orientation scheme is unknown and has not been allowed for in the calculations.

1.2.5.5 Bearing in mind these limitations, the risk calculations for the three scenarios show that each of them would offer a reduction in risk compared with that estimated for the current system. The greatest reduction is offered by option (c), although the Group recognized that the implementation of this scenario (60 NM/1000 ft composite) would present some operational problems, at least in the short term. IATA considered that of the three options, (c) might be preferable from the operators' point of view in that it preserved the current track density. The Group considered it important to point out that these three options are not the only possible fall-back procedures. Whatever fall-back procedure is proposed, it will be necessary to consider the effect the change in separation standard will have on error types and frequencies; this would be particularly important if a lateral separation standard were to be chosen which was not equivalent to a whole number of degrees of latitude.

1.2.5.6 In summary, the Group concluded that so far as risk assessment is concerned each of the three fall-back procedures described in the United Kingdom proposal is viable, offering different but in all cases substantial reductions in risk. The Group noted that it would be necessary to consider the matter of an appropriate fall-back procedure bearing in mind questions of operational acceptability. The Group further noted that:

a) options other than those presented are available; and

b) before implementing any fall-back procedure, NAT SPG should identify the cause(s) of any increase in risk. It may be that remedial action - possibly addressed to a sub-population of North Atlantic traffic - would reduce the risk and remove the need to consider increasing the separation standards.

1.2.6 *A Future Target Level of Safety*

1.2.6.1 The Group reviewed a presentation by the Member from the United States, concerning the application of a TLS in the NAT Region. The presentation made clear the necessity of using a TLS in order that performance criteria can be derived. In this way it is possible to determine whether the level of system safety is acceptable.

1.2.6.2 Any review of the TLS must include consideration of several separate but related questions. For example:

i) Should the TLS be determined in terms of collisions per flight hour, or the expected number of collisions over a fixed period of time, or some other criterion or should a combination of criteria be used?

ii) Should the timescale for which a TLS is reviewed, and the TLS value itself, be determined according to safety goals or technological capability?

1.2.6.3 It should be borne in mind that TLS's for different types of collision risk may be developed at different times and even according to different principles; for this reason the TLS values may appear inconsistent. In particular, the Review of the General Concept of Separation Panel (RGCSP) review of vertical separation might give rise to this situation when comparing vertical and lateral separation in the NAT Region. For this reason, it is now necessary to conduct a review of the principles involved.

1.2.6.4 The NAT SPG's mathematicians will consider these questions and present the options to NAT SPG/27. A final decision will be a matter of policy and should be taken at that time.

1.2.7 *Reduced Vertical Separation Minimum and its effects on other collision risk estimates*

1.2.7.1 The Group discussed the possible future introduction of a reduced VSM and its effect on collision risk in the NAT Region. The implementation of a reduced VSM as stated in the draft Guidance Material for implementation of a 300 m (1000 ft) vertical separation minimum above FL290 requires the improvement in height-keeping performance of some aircraft through the application of a Minimum Altimetry System Performance Specification (MASPS). Such an improvement will increase the vertical overlap probability required for the assessment of lateral and longitudinal risk, which should be evaluated. Improved height-keeping performance will increase the assumed values for Pz(0) (used in both the current lateral and longitudinal analysis) and reduce Pz(1000) used in composite analysis. There should, however, be a beneficial effect on occupancy levels which, it is believed, would more than off-set such increases. The Group agreed that assessments should be made of the possible effects of a reduced VSM on the lateral and longitudinal collision risk.

1.2.7.2 In concluding its discussion on this matter, the Group noted that an assessment should be made of the possible effects of a reduced vertical separation minimum on the lateral and longitudinal collision risk.

1.2.8 *Future work programme by the mathematicians*

1.2.8.1 Having identified a significant number of areas of work which need to be addressed by the mathematicians over the coming year, the Group agreed to the following work programme:

a) Introduction of the new parameter values:

   i) Revised MNPS criteria;

   ii) Review the confidence with which risk estimates are expressed, including the use of longer sampling periods and warning/action limits;

   iii) Classification and weighting of GNEs;

   iv) Use of the current TLS; and

   v) The numerical value of the relative lateral velocity as used in the CRM.

b) Review of the TLS and the principles on which it is determined;

c) The effects on lateral and longitudinal collision risk of the implementation of a reduced VSM;

d) Assess the effects on occupancy of procedures intended to re-distribute traffic loadings onto the NAT;

e) Alternative Fall-Back procedures; and

f) Monitor the SICAS Panel activities in assessing the potential effects of Airborne Collision Avoidance System (ACAS) on collision risk.

ATTACHMENT A TO THE REPORT ON AGENDA ITEM 1

		ERROR					
		50 - 70 NM (ZETA ERRORS)					
CLASSIFICATION (See Note 1)	*30 NM ETA ERRORS*	*TOTAL MNPS TRAFFIC*		*OTS TRAFFIC*		*RANDOM TRAFFIC*	
		Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
A	11(10)*	5.00	5.00	1.00	1.00	4.00	4.00
B	1 (1)*	0	0	0	0	0	0
C1	4 (4)*	3.00	1.38	0	0	3.00	1.38
C2	2(10)*	1.00	0.46	1.00	0.46	0	0
D	2 (1)*	1.00	1.00	0	0	1.00	1.00
E	0 (1)*	0	0	0	0	0	0
F	4 (5)*	3.00	3.00	1.00	1.00	2.00	2.00
Not Classified	0 (0)*	0	0	0	0	0	0
Total	24	13.00	10.84	3.00	2.46	10.00	8.38
Total in last period	32	13.00	9.44	4.00	2.92	9.00	6.52
Observed traffic		144151		86491		57660	
Last monitoring period		140757		84454		56303	
Number of Errors within MNPSA tolerated by the CRM	76.40 (5.3×10^{-4})	18.74 (1.3×10^{-4})		11.24 (1.3×10^{-4})		7.49 (1.3×10^{-4})	
Number of Errors, tolerated by the CRM before action based on operational judgement is required	114.60 (7.95×10^{-4})	28.11 (1.95×10^{-4})		16.86 (1.95×10^{-4})		11.24 (1.95×10^{-4})	

( )* Previous years figures for each error classification.

Note 1: The letters in the Classification Column mean:

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

Figure 1: **North Atlantic MNPS Airspace**
Same-Direction Lateral Occupancy

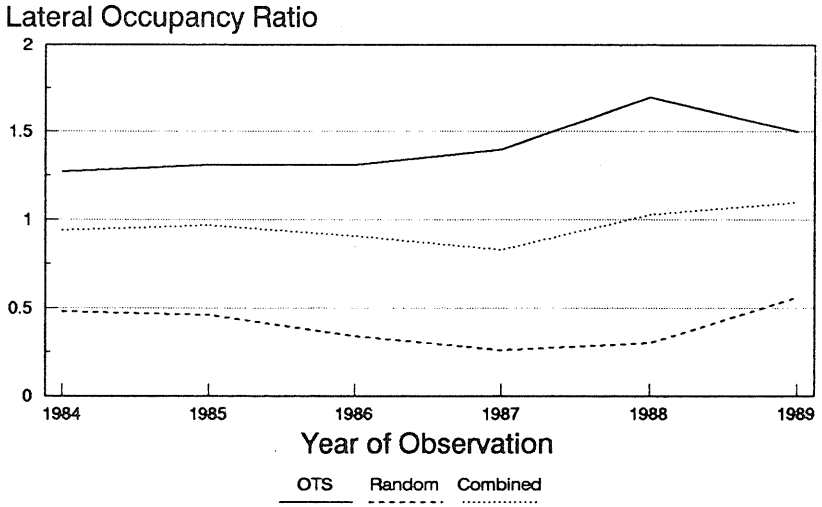


Figure 2: **North Atlantic MNPS Airspace**
Zeta Errors

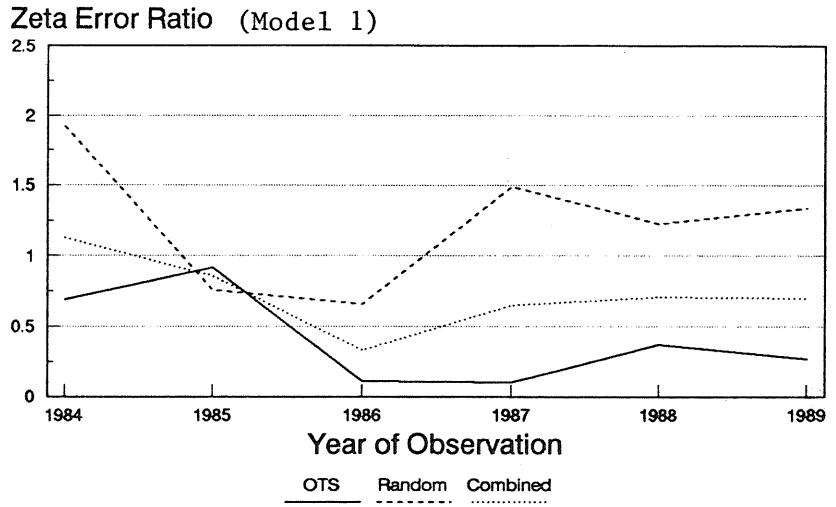
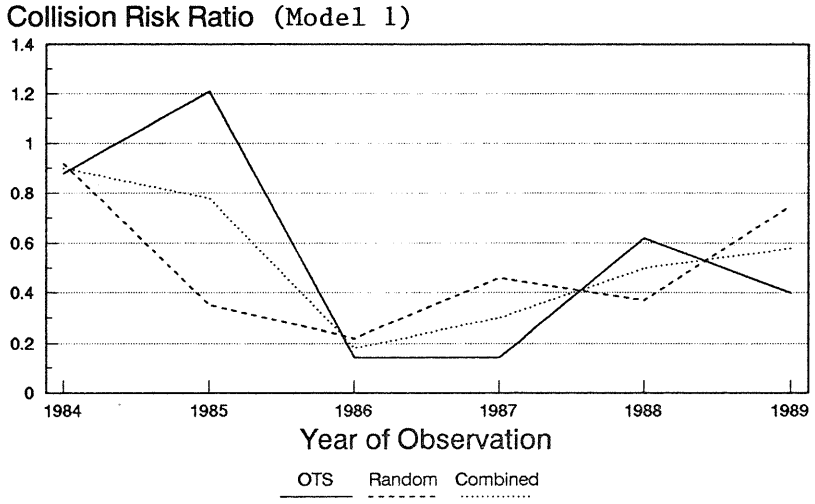


Figure 3: **North Atlantic MNPS Airspace**
Lateral Collision Risk



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; and

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

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) review of domestic/oceanic interface and transition problems adjacent to NAT MNPSA;

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;

e) airspace organization in the Miami, New York and San Juan Oceanic Control Areas;

f) ATS operational contingency planning in the NAT Region;

g) contingency measures in the NAT Region; and

h) interpretation of separation minima in an automated environment.

2.1.1 *Application and refinement of separation standards*

EXPANDED APPLICATION OF MNPS SEPARATION MINIMA

2.1.1.1 Further to previous discussions at NAT SPG/24 and NAT SPG/25, the Group considered proposals made by the Members from Canada and the United States to allow expanded application of MNPS separation minima (60NM lateral separation) to certified aircraft operating wholly above the MNPSA. It was recalled that the separation minima currently applied between MNPS certified aircraft within the MNPSA has resulted in increased operational efficiency for both air traffic services and airspace users. These separation minima also applied to certified aircraft which operate to/from MNPSA thus affording the same operational advantages beyond the delimitation of MNPSA. However, this is not possible for certified aircraft which transit the North Atlantic wholly above or below MNPSA.

2.1.1.2 The proposal to extend the application of reduced separation minima to those certified aircraft which operate wholly above the lateral limits of MNPSA (above FL400) was rejected by the Group on the grounds that it would dilute the integrity of the MNPSA. The option of raising the upper vertical limit of the MNPSA had already been presented earlier as an alternative to achieve the application of reduced separation minima; the Group considered that such action could be restrictive to IGA operators at this time.

2.1.1.3 It was however agreed that the present procedure allowing MNPS separations between MNPS approved aircraft immediately above and below MNPSA could be safely extended. These procedures would not require a change in the current delimitation of the MNPSA nor would they require a modification to access regulations. The only remaining operational concern would be to ensure that ATC had access to appropriate information on an aircraft's MNPS approval status.

2.1.1.4 In view of the above, the Group agreed that the most appropriate course of action was to allow the application of reduced lateral separation minima between MNPS certified aircraft whilst operating above or below MNPSA - providing they were cleared and in fact operated for part of their flight within it. This would be achieved through an amendment to the Regional Supplementary Procedures (Doc 7030 - NAT/RAC). It was also agreed that provision should be made to provide instantaneous information to ATC concerning the certification status of aircraft (display of 'X' in item 10 of the flight plan or any other means to provide this information). The Representative from IFALPA expressed concern that this proposal might dilute the safety of the MNPSA.

CONCLUSION 26/6 - AMENDMENT TO NAT REGIONAL SUPPS CONCERNING MNPS CERTIFICATION

That:

a) the NAT Regional SUPPS regarding separation of aircraft (lateral separation) in the NAT Region (Doc 7030/4 - NAT, Part I, § 7.1.1 2) c) be amended to read:

"c) operate for part of their flight within the MNPS airspace but are cleared to operate above or below such airspace for a portion of their flight."; and

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

CONCLUSION 26/7 - PRESENTATION OF INFORMATION ON MNPS CERTIFICATION TO ATC

That States take necessary action to ensure that information regarding the MNPS approval status of aircraft is immediately available to the appropriate air traffic controllers.

REDUCTION OF LONGITUDINAL SEPARATION IN THE WESTERN ATLANTIC ROUTE SYSTEM (WATRS)

2.1.1.5 The Group was informed by its Member from the United States of the latest developments concerning the WATRS area, particularly the application of a reduced longitudinal separation of 10 minutes using the Mach number technique in lieu of 15 minutes. This measure was approved in February 1990 and implemented in April 1990, resulting in increased capacity. The Group also noted the United States plans vis-à-vis the San Juan and Miami non-radar oceanic Control Area/Flight Information Region (CTA/FIRs).

2.1.2 *Domestic/oceanic interface problems and transition adjacent to NAT MNPSA*

SHANNON OCEANIC TRANSITION AREA (SOTA)

2.1.2.1 Further to discussions on this subject at the last two meetings, the Group was presented with latest developments by its Member from Ireland concerning the planned implementation of the SOTA. It was recalled that the introduction of SOTA will allow for the provision of radar control service by Shannon ATC in part of the Shanwick Oceanic Control Area (OCA). A number of steps had been taken by the three administrations concerned to develop and sign letters of agreement as well as to set up detailed procedures for a phased implementation of this proposal. The Group noted that the scheduled date for implementation of SOTA is 10 January 1991. This will be followed by a review of its operation in mid-1991 and the introduction of any adjustments during winter 1991-92.

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

SPECIAL ROUTES IN THE NAT MNPSA

2.1.3.1 The Group examined contributions from Denmark, United Kingdom, IFALPA and IATA concerning the provisions and operational use of additional special routes in the NAT MNPSA. The use of such routes is outlined in the Guidance and Information Material concerning Air Navigation in the NAT Region (NAT Doc 001, T 13.5N/5) Part 1, § 5 and 6.

2.1.3.2 Four short routes (essentially domestic routes to be used by aircraft carrying one set of long range and one set of short range navigation fit) between Greenland/Canada/Iceland were agreed to for inclusion in NAT Doc 001 as follows:

a) between Greenland and Canada:

- SF NDB, 67N 060W, UZ NDB. Distance 390 NM.
- KU NDB, 6600N 060W, VN NDB. Distance 284NM.
- KU NDB, 64N 060W, 6400N 063W, YFB VOR. Distance 434 NM; and

b) between Iceland and Greenland:

- RE NDB, 6930N 02240W, CP NDB. Distance 289 NM.

2.1.3.3 The United Kingdom proposal for two special contingency routes between United Kingdom and Ireland and the Canary Islands, for use by aircraft equipped with double IRS and single FMS, was rejected. In reaching this decision the Group confirmed the views expressed at NAT SPG/25 that system redundancy, in terms of both automatic track guidance to the auto-pilot, and a continuous indication to the pilot of position relative to track, was necessary for operations on these routes. Double FMS is therefore required. The view was also expressed that the United Kingdom proposal was a potential dilution of the MNPS concept and that it could create an unnecessarily high workload on a two-man flight crew in the event of a failure of the single FMS.

2.1.3.4 The Group was aware that the inclusion of additional special routes would increase the possibility of misinterpretation of the requirements for their use by operators not familiar with the NAT Region. Consequently the Group agreed that a detailed re-assessment of these requirements, as set out in NAT Doc 001, was necessary. In order to carry out this task, a sub-group was established; its findings showed the need for a major revision and update of the Guidance Material with cross references to the MNPS Operations Manual and future IGA Manual. The Group therefore decided that work during NAT SPG/26 would be limited to preparing a list of contents. The subject of updating the NAT Guidance and Information Material for the NAT Region is further discussed under Agenda Item 5.2.

2.1.3.5 The Group was presented with details of trials being undertaken by the United Kingdom concerning rearrangements of ATS routes within the United Kingdom airspace affecting North Atlantic traffic transiting to/from the domestic/oceanic interfaces (Scottish, Shannon and London). It was reported that a working group had been formed by the United Kingdom, in consultation with Ireland, including user representatives to study a solution to the current problem of acute shortfalls in United Kingdom ATC capacity. Changing weather patterns in the NAT result in daily variations in the distribution of NAT traffic in its transit of United Kingdom domestic airspace. This causes difficulties for the United Kingdom in the tactical management of its ATC resources.

2.1.3.6 In view of the above, the United Kingdom introduced a route orientation scheme wherein various combinations of oceanic entry/exit points, originating areas, destination areas and domestic routes are defined. It was agreed to introduce a trial on 3 May 1990 to be run until 20 September 1990. Traffic affected was westbound traffic departing from, or eastbound traffic to: London FIR, Denmark (westbound only), the Benelux States, the Federal Republic of Germany, France, Switzerland and Italy. The times of operation are presently those of the normal operating periods of the OTS. The trial is to be kept under constant review and monitored by the working group.

2.1.3.7 The intention was that the scheme should reduce the potential for ground delays for flights to/from/within/through United Kingdom airspace, (including NAT, european and domestic traffic) albeit at the expense of increased flight time and fuel costs for NAT traffic. The Representative from IATA stated that there was no clear indication yet of the predicted improvements to the system. However, airlines were already in a position to identify extra costs attributable to these measures and, the delay situation for some traffic flows has shown a deterioration since the introduction of the scheme. It was acknowledged that it was difficult to determine appropriate benchmarks for comparison of benefits or disadvantages to providers or users. A suggestion had been made that the provision of flight plan information 24 hours in advance should allow pre-planning of resource management and thus address the problems of unforeseen sector overloads.

2.1.3.8 Other aspects of the traffic orientation scheme were considered by the mathematicians' sub-group since it would affect occupancy levels (cf. § 1.2.5.4). Recognizing that further work was required on this matter, the United Kingdom was examining occupancy levels for several days during the application of the scheme in addition to the normal method of assessing one day per month. The results of these studies will be forwarded to NAT SPG Members if significant changes are observed. The Group also noted that a simulation was being carried out by the United Kingdom to assess the effect of the scheme on the system efficiency and changes in aircraft fuel burn.

RE-SECTORISATION OF REYKJAVIK AREA CONTROL CENTRE

2.1.3.9 The Group was informed that Iceland had taken a number of measures aimed at the re-sectorisation of the Reykjavik CTA into four geographical sectors two of which were being provided with SSR coverage. SSR data was now available from the radar stations at Keflavik, Hornafjördur and the Faroe Islands thus providing radar coverage in the south-eastern part of the Reykjavik CTA/FIR from Norway and Scotland across Iceland up to 30°W. Experience gained with the re-sectorisation so far indicated that better efficiency in air traffic handling and increased capacity had been achieved.

EUROPE-CARIBBEAN TRACK SYSTEM

2.1.3.10 A proposal was tabled by the United States concerning the introduction of an organized track structure to be used by air traffic operating between Europe and the Caribbean and vice versa. Although this traffic operated in the past mostly on random tracks, instances occurred where its complexity was such that service provided might not be the optimum. This also applied to the two fixed ATS routes R99 and G61 which, in addition to not representing the optimum alignment available to most operators, was often unfeasible for use by ETOPS aircraft. Furthermore, the takeover of responsibility by New York OAC of the San Juan non-radar oceanic airspace had highlighted a need to re-evaluate the use of airspace by the EUR/CAR traffic and to propose a more efficient route structure.

2.1.3.11 Several views were expressed advocating the advantages of a flexible route system in lieu of a fixed route structure. The Representative of IATA in particular could see more merits in a random track system and put into question the degree of constraints this proposed organized track structure placed on operational handling of traffic in view of the low density involved. The Member from Portugal reported that simulations carried out with sample traffic models on procedural and automated environments involving current traffic volumes against double density had shown a decisive advantage in providing a tactical random routes service. The Members from Canada and the United Kingdom expressed concern with respect to limitations that the proposed system would place on the random south traffic associated with the main east/west traffic flows. It was recognized that more detailed information was required concerning the impact of the proposal. In view of the above, the Member from the United States agreed to reconsider the project, taking into account all comments expressed by the NAT SPG.

2.1.4 *Extended-range twin-engined aircraft operations in the NAT Region*

2.1.4.1 The Group was informed that a survey had been carried out recently showing that ETOPS counted for 12.5% of the total NAT population in 1989. Forecasts for 1990 quoted 27%, a large number of which are not operating under the 60 or 90 minutes rule. It was reported that some operational ATC problems had emerged due to different operating parameters (e.g. lower Mach-number, applying in particular to the Airbus series), which have an impact on longitudinal separation. Having already identified this particular aspect of ETOPS operations, the Group confirmed the need to closely monitor the situation in order to be able to react to this problem should it become an operational constraint.

2.1.5 *Airspace organization in the Miami, New York and San Juan OCAs*

WATRS IMPLEMENTATION UPDATE

2.1.5.1 Further to previous meetings where the Member from the United States had presented proposals concerning the re-organized air traffic services in the WATRS area, updated information was made available with regard to the implementation status of the program. It was recalled that the first phase of WATRS began on 19 November 1987. A traffic management programme was implemented in the New York OAC making provisions for a selection of entry points into WATRS based on departure point and destination. The second phase was implemented in April 1990 when a reduction of longitudinal separation to 10 minutes was introduced (§ 2.1.1.5 also refers). The third phase (inclusion of WATRS within MNPSA) was under consideration. A fourth phase, which foresaw a realignment of CTA/FIR boundaries, has partly taken place when, in October 1989, the New York OAC became the delegated authority for air traffic control in non-radar areas of San Juan CTA/FIR. A further step would be taken towards the end of 1990 with the transfer of responsibility of the Miami CTA/FIR non-radar oceanic airspace to the New York OAC.

COMPOSITE SEPARATION IN WATRS

2.1.5.2 The Group recalled that the application of composite separation in WATRS had been considered by the Federal Aviation Administration (FAA) two years ago. However, this project had not been pursued in view of the workload involved by ATC. At the request of airspace users, the FAA planned to re-examine the application of composite separation in WATRS. This review was expected to begin in early summer 1990. The Member from the United States indicated that the review would take into account additional factors such as the effect of crossing traffic between Florida and Europe and vice versa. A progress report on the review would be provided by the United States at the next NAT SPG meeting.

2.1.6 *ATS operational contingency planning*

IN-FLIGHT CONTINGENCIES IN GANDER AND SHANWICK OCAS (1989)

2.1.6.1 As at previous meetings Canada and the United Kingdom reported contingencies which occurred in the Gander and Shanwick airspaces in 1989. The total number of contingencies were 73 and 31 respectively. The Group noted the details of recorded contingencies within both these OCAs and agreed that it was essential that such information be available when considering future plans for the NAT Region. Although it was recognized that collection of data might be difficult for all provider States, the Group agreed that all NAT provider States report details of contingencies within their area of responsibility to NAT SPG/27.

IN-FLIGHT DIVERGENCES FROM CLEARED TRACK DUE TO SEVERE WEATHER

2.1.6.2 The Group was presented with a proposal by IATA concerning action to be taken by aircraft in the event that they may have to divert from cleared track because of severe weather. In this connection, it was suggested that pilots above FL290 climb 500 ft if diverting left of track or descent 500 ft if diverting to the right. Furthermore, pilots should broadcast their intentions on 121.5. The Member from the United States then informed the Group that they were carrying out research on this procedure in the Pacific Region where these types of situation are more common than in the NAT Region. The Group agreed that it was too early to include any guidance in the relevant documents at this time; however, in view of the research being carried out by the United States, it also agreed to review this matter at their next meeting on the basis of information to be presented by the United States.

DISRUPTION OF HF COMMUNICATIONS DUE TO SOLAR FLARE

2.1.6.3 A case for contingency procedures was presented by IATA in relation to severe disturbances caused by solar flares during 1989 resulting in disruption of HF communications for periods of several hours. Noting that more problems may be encountered in 1990 than in 1989, the Group recognized that such occurrences needed specific treatment; in this connection, it was noted that some measures already existed to cater for increased separation minima in the event of HF communications disruption. Although procedures for communication failure in the NAT Region are published in the NAT MNPS Operations Manual, these are specifically aimed at failures affecting single aircraft. It was considered that the use of relay techniques using VHF communications, when available, as well as blind broadcasts would be the best alternatives in these circumstances. The Group therefore recommended that 131.8 should be used for such purposes in accordance with the advice from its COM sub-group (§ 2.2.33 refers).

2.1.7 *Contingency measures in the NAT Region*

2.1.7.1 NAT SPG Members were provided with an input from the United States suggesting specific measures aimed at ensuring continuity in traffic handling capability in the NAT Region when disruption of services occur.

2.1.7.2 The Group recognized the uncertainty embedded in the conditions surrounding implementation of contingency measures for application in the event of disruption of air traffic services. Aware that Assembly Resolution A 23-12 and the related guidelines for contingency measures approved by Council on 27 June 1984 committed States to prepare contingency plans, NAT SPG Members agreed that such matters should be dealt with in close co-ordination between NAT Provider States, taking account of requirements of adjacent States, with the assistance of ICAO as necessary. As a first step, the NAT SPG requested OAC managers to develop an operational framework which would ensure that high seas airspace remains open to international air traffic and report to NAT SPG/27 through their national administrations.

2.1.8 *Interpretation of separation minima in an automated environment*

2.1.8.1. The Group noted the requirement for close co-ordination among the NAT Provider States with respect to the interpretation and application of separation minima for software adaptation in NAT OACs. To this end, the Members requested that administrations, which currently employ automated processing or are about to do so, make their application descriptions available for review at the 1990 meeting of NAT chiefs, and subsequently through respective Members to NAT SPG/27.

2.2 Communications operations

GENERAL

2.2.0 The Group dealt with the following matters related to communications operations:

a) fixed services; and

b) mobile services.

2.2.1 *Aeronautical Fixed Services (AFS)*

AFS CIRCUITS IN THE NORTHERN PART OF THE NAT REGION

2.2.1.1 The Group noted that:

a) action has been taken as required with respect to additional AFS circuit requirements identified at its last meeting (NAT SPG/25, page 42, § 2.2.2 and 2.2.3 refer);

b) no new circuit requirements were identified; and

c) a new circuit configuration for the northern part of the NAT Region was developed by the ninth Informal NAT AFTN/AFS meeting (Paris, 15-18 May 1990).

EFFICIENCY OF ATS SPEECH CIRCUITS

2.2.1.2 Portugal provided the Group with information relating to the efficiency of ATS speech circuits with particular reference to those between New York and Santa Maria. It was noted that difficulties were encountered because of interruptions and circuit abnormalities. In this context, the Member from Portugal mentioned the requirement for co-operation between Portugal and the concerned States with respect to the identification and rectification of problems being experienced with these circuits.

2.2.2 *Mobile Services*

REVIEW OF THE HF AND GP VHF COMMUNICATIONS IN THE NAT REGION

2.2.2.1 The Group reviewed the collated results of the 1989 NAT HF data collection carried out in accordance with Conclusion 25/8 of its 25th Meeting. The arrangements for the data collection had been the same as for previous years, i.e. data related to three days where the alignment of the OTS was Southabout, Northabout and Central; the dates selected were 14, 19 and 23 July 1989 respectively.

2.2.2.2 A comparison of the number of HF position reports with those of 1984 showed an increase of approximately 50 %. With regard to GP/VHF, an increase of approximately 30 % in the number of position reports was noted. It was also noted that on 14 and 19 July 1989 the Remote Control Outlet (RCO), frequency 127.1 MHz, located in southern Greenland, was unserviceable.

2.2.2.3 The distribution of HF messages for each 24-hour period indicated overloading at times on families NAT-A, NAT-B, NAT-C and NAT-D. With regard to the distribution of message loading by frequencies for each 24-hour period, the highest percentages were noted on 4/5 MHz and 8 MHz (24.8% and 51.6% on 19 July and 26.3% and 49.0% on 23 July, respectively).

2.2.2.4 The Group noted that studies of the peak hour loading on individual frequencies showed one frequency to carry 101 messages in one hour. Further analysis produced average loading figures of between 45 and 72 messages per hour between 1100 and 1800 hrs on each of the 8 MHz band frequencies on all three days. The mean overall delay* on HF position reports was 2.83 minutes (the 1984 figure was 3.02 minutes).

* *Delay* is the time period which has elapsed between the moment an aircraft passes over a reporting point and the moment the air-ground radio station has *completed* reception of the corresponding position report, *mean delay* is obtained by dividing the total delay by the number of messages.

2.2.2.5 The results of a similar exercise, to examine delays at the Gander International Flight Service Station (IFSS)** during the peak summer season traffic for the years 1986-1989, were presented by Canada enabling the meeting to compare results for 1989 with those of previous years and to see the trends and significant changes. Also, statistical material regarding other Canadian flight service stations (namely Churchill, Cambridge Bay and Iqaluit), which provide communications to international aircraft, was also provided to the Group.

2.2.2.6 A document showing the increase in air-ground traffic experienced by Santa Maria aeronautical station in the last three years (1987-1989), similar to that for Canadian IFSS, was also presented to the meeting. The results showed a similar increase of traffic loading on the frequencies concerned. The Members from Iceland, Ireland and the United States indicated that they also had similar increases in traffic and frequency congestion problems.

2.2.2.7 The Group was aware that the HF network in the north and central parts of the NAT Region was presently operating up to full capacity with periods of overload. Furthermore, traffic was increasing at a rate significantly in excess of published forecasts and satellite communications were not likely to have a significant impact on the NAT HF network until the late 1990s. Therefore, if a critical overload of the system is to be avoided, action is needed to expand the capacity of the present system. The statistical data presented to the Group showed that the traffic loading on HF and VHF had increased significantly and provided evidence to support the action, needed to relieve the problems of frequency congestion, which is further elaborated on in § 2.2.2.12 below.

NEXT HF AND GP/VHF DATA COLLECTION

2.2.2.8 The opinion was expressed by some Members that more frequent HF data collections were required but, after discussing this matter at length, the Group recommended retaining the present 4-year period.

CONCLUSION 26/8 - HF AND GP/VHF DATA COLLECTION

That:

a) a three-day NAT HF and GP/VHF data collection be conducted in 1993; and

b) users of the information provide NAT SPG/27 with details of their specific requirements.

Note: NAT SPG may advance the date for the next data collection at its 27th meeting in light of developing traffic conditions.

** Network stations are also known as International Flight Service Stations, Aeronautical Radio or Aeradio Stations depending on the State providing the service.

HARMFUL INTERFERENCE TO NAT HF OPERATIONS

2.2.2.9 Information from member States, collated by the United Kingdom, regarding reports of harmful interference on HF showed that the problem has continued. It was noted that in the majority of cases the source had been traced to East European States. Information provided to the meeting showed that there was no appreciable change in the occurrence of harmful interference during the period under review.

2.2.2.10 In some cases, where the source of interference could not be identified, official reports were sent to the International Telecommunications Union (ITU) according to the arrangements made by the ITU. Informal contact between the EUR Frequency Co-ordinating Body (FCB) members had been made and had proved to be effective in some cases.

2.2.2.11 After considering in detail the requirements for presenting information regarding harmful interference, the Group agreed on a common format as shown in Attachment 2-A.

CONCLUSION 26/9 - HARMFUL HF INTERFERENCE

That NAT States continue to gather information on harmful HF interference in the region and present it to future NAT SPG meetings in the agreed format.

Note: States should continue to use the existing procedures to resolve specific problems.

ADDITIONAL HF FAMILIES

2.2.2.12 The Group studied input submitted by Canada and the United States respectively supporting the view that the four NAT HF families are no longer adequate to efficiently service the NAT air-ground communications system. Unacceptable delays in the handling of air traffic safety messages could be expected if relief is not promptly provided.

2.2.2.13 To add the needed air-ground communications capacity, the United States proposed implementation of the NAT-E HF family at New York and had invited the Portuguese Administration to consider implementing the same HF family at Santa Maria hence establishing the NAT-E HF network in the south-central part of the NAT Region. The NAT-B family would then be decommissioned concurrently at New York and Santa Maria.

2.2.2.14 The Group noted that the NAT SPG Task Force had endorsed the United States' proposal to proceed with the necessary planning and that NAT-E family would be introduced at Santa Maria and New York OACs on 28 June 1990 and that the United States will submit a proposal for amendment to the NAT/NAM/PAC Air Navigation Plan (Doc 8755).

2.2.2.15 The Group noted that the HF channel 11336 kHz had been implemented at Gander and Shanwick in 1989 and had provided a temporary improvement. However, to provide the necessary additional capacity in the north-central part of the NAT Region, Canada and Ireland proposed the implementation of NAT-F family at Gander and Shanwick. This family of frequencies has been approved for use in the NAT Region. In addition, provision should be made for increases in polar traffic by the establishment of an additional family (NAT-G) and frequencies identified for use within that family.

2.2.2.16 The Group noted that the implementation of NAT-E and NAT-F families would utilize all frequencies listed for NAT use in the ITU Radio Regulations, Appendix 27 AER 2 developed by the 1978 Aeronautical World Administrative Radio Conference (WARC) on the Aeronautical Mobile (R) Service [AM(R)S]. It is now necessary to seek authorization for the use of the necessary additional frequencies to meet the expanded requirements in the NAT Region which will continue to exist until aeronautical satellite systems impact significantly on HF communications.

2.2.2.17 Because of the urgency of the matter and in advance of any decisions to be met by the 1992 ITU World Administrative Radio Conference for Mobile Services (WARC-MOB), the Group recommended that a review of unused assigned frequencies be undertaken to determine if certain frequencies can be re-assigned for the use in the NAT Region. In this context, the Group noted, for example, that the additional family of frequencies reserved for HF VOLMET was presently not being utilized.

2.2.2.18 Finally, having noted the actions taken by the United States and Portugal to implement NAT-E family HF frequencies as well as the implementation of frequency 11336 MHz by Canada and Ireland, the Group recognized that further capacity was still required.

CONCLUSION 26/10 - IMPLEMENTATION OF HF FAMILIES

That:

a) **Canada and Ireland take appropriate action within their Administrations to implement NAT-F family at Gander and Shanwick as soon as possible; and**

b) **Canada take appropriate action so that NAT-G family frequencies be authorized and assigned for use in the northern part of the NAT Region.**

EXTENDED VHF FACILITY

2.2.2.19 The Group discussed a proposal by Iceland that, in order to improve reliable communications in the northern part of the NAT Region, the possibility of installing a VHF facility on the east coast of Greenland, remotely controlled from Reykjavik, should be investigated. If such an installation was available, it would be a valuable addition to the existing VHF coverage in the area. This was particularly important during the present high sunspot activity which causes disruption to HF communications. It would also help to relieve traffic congestion on HF NAT-D family.

CONCLUSION 26/11 - GREENLAND EAST COAST VHF FACILITY

That Iceland investigate the possibility of installing a VHF facility on the east coast of Greenland to be remotely controlled from Reykjavik.

IMPROVEMENTS TO REYKJAVIK AIR-GROUND OPERATIONS

2.2.2.20 The Group was provided with a detailed description of various steps that had been taken by Iceland Aeradio to improve the air-ground operations. Amongst these were:

a) computer comparison of Position (POS) messages in order to suppress duplicates prior to delivery to the OAC;

b) automatic formatting of POS messages by computer; and

c) automatic splitting into separate messages [(POS and Request Clearance (RCL)] of air-ground messages which contain both POS and an RCL.

2.2.2.21 A new computerized air-ground system is to be installed at Iceland Aeradio in the summer of 1990. It will further assist air-ground radio operators in their work, reduce message delivery times, and be able to meet the requirements of the present ATC system and the planned FDPS. The improvements provided by the new system would be:

a) automatic detection of message errors and checking of values of reasonableness;

b) improved automatic addressing of messages, based upon aircraft route and present position;

c) rapid on-line access to flight plans, previously received messages, reference data and weather information;

d) reduction of in-station delay;

e) queuing and colour-coding of messages for transmission according to priority based on message type;

f) warnings of high priority messages and delayed messages awaiting transmission;

g) warning of overdue position reports; and

h) SELCAL equipment access from the workstation keyboard.

POSITION REPORTING

2.2.2.22 The Group was informed that during the design and testing of the new air-ground system at Reykjavik, difficulties relating to the processing of air-ground messages by computer were highlighted. For example, problems occur even when messages from aircraft contain correct and valid information, but the formats, as transmitted, are not in accordance with those agreed and widely published for the NAT Region. It was considered that variations in the position reporting may be attributed to misinterpretation of flight documentation by pilots.

2.2.2.23 With the above in mind, the Group was presented with the following list of problems that frequently occur:

a) positions specified by the use of words such as FIR and BNDRY instead of geographical coordinates or recognized reporting points;

b) latitude and/or longitude indicated with decimal positions, either with or without a decimal point, eg 77495N 6823.7W;

c) position reports with only one co-ordinate;

d) aircraft on polar tracks not repeating the track name for the second or third position;

e) position 3 (next subsequent position) omitted;

f) aircraft call-sign containing more than 7 characters;

g) clearance requests embedded in position reports rather than placed at the end; and

h) times given in other than four figure groups.

2.2.2.24 Having noted the foregoing, the Group reached the following conclusion:

CONCLUSION 26/12 - FOLLOW-UP OF AMENDMENTS TO ICAO PROVISIONS CONCERNING MESSAGE FORMAT

That:

a) the course of action to amend ICAO Doc 4444 and Doc 7030 agreed at NAT SPG/25 and outlined in § 5.2.5 of the report of that meeting be expedited; and

b) airspace user representatives be requested to bring the list of problems to the attention of their members and to reiterate the requirement to adhere to the agreed formats published in the relevant AIP's/NOTAM.

HF VOLMET BROADCASTS

2.2.2.25 The Member from Ireland informed the Group that, in view of the growth of NAT traffic during 1990 and to enable existing resources to meet the operational requirements of peak season activity in 1990, it intended to curtail the operation of the Shannon HF VOLMET broadcast during the months of June, July and August 1990. Curtailment would take the form of a suspension of broadcast services between the hours of 1100 and 1700 UTC in each daily cycle. This period coincides with the established patterns of the maximum westbound and minimum eastbound activity on NAT routes when the Shannon VOLMET service is least utilized of by pilots. Weather information would be available on request during this period. It was planned to introduce this measure from 1 June 1990 until 1700 on 31 August 1990. Appropriate NOTAM action has been taken.

AUTOMATION OF SHANNON HF VOLMET

2.2.2.26 The Group noted that the Shannon HF VOLMET service is operated in accordance with the HF VOLMET broadcast plan outlined in Table ATS-2 NAT/NAM/PAC ANP (ICAO DOC 8755). Routine meteorological reports for thirty-two, and forecasts for twenty international aerodromes, at various locations in Europe, are disseminated. SIGMET information is also included, as appropriate, in broadcast schedules. Currently, the Shannon VOLMET is operated manually from the Shannon Aeronautical Communications Centre, Ballygirreen, Ireland.

2.2.2.27 The Group was informed that the Irish Administration intended to automate the Shannon HF VOLMET. The system would provide a high quality voice output delivered at a speed of 90 words per minute. It would be capable of selecting, verifying, decoding and processing METAR, TAF and SIGMET reports and would also automatically interrogate international MET data banks to obtain missing data. The automated Shannon HF VOLMET was planned to be operational in March 1991 and should provide users in the NAT Region with a reliable and consistent service.

2.2.2.28 In this context, the Representative for IFALPA stated that, particularly with regard to ETOPS, there was a requirement for a larger number of NAT aerodromes to be included in the Shannon VOLMET broadcast. While it was recognized that, at present, it would not be possible to accommodate more data, the Group was advised that the European Office of ICAO was investigating whether the current reservation of the last five minutes in each half-hour cycle for other purposes than this broadcast was still applicable. If not, Ireland would be so advised and an increase in cycle time, and consequently in the capacity of the broadcast, could be achieved.

SELCAL EXPANSION

2.2.2.29 It was recalled that in the late 1970's it had been determined that all assignable SELCAL codes (2970 total) were approaching saturation. Action taken by ICAO in 1981 to relieve the problem by expanding the number of SELCAL tones from twelve to sixteen was accepted by States starting from 1 September 1985.

2.2.2.30 To date, more than 2,530 new SELCAL codes have been assigned by Aeronautical Radio, Inc. (ARINC), the ICAO-designated international registrar of SELCAL codes. These are discrete single user codes and will remain unshared for many years. As new SELCAL units, capable of using 16-tones, are placed in service, the assignment of multiple users to a common code from the 12-tone allotment will be reduced. This, in turn, will significantly reduce the false SELCAL triggering caused by the heavily shared assignments of the 12-tone codes.

2.2.2.31 Over the past five years, the SELCAL Registrar had widely disseminated information concerning the availability of the new codes, the new equipment and the advantages of using them. Users requesting SELCAL codes were now invited to determine if they can use the new codes. This was to ensure their maximum use, thus minimizing the number of shared 12-tone code assignments.

2.2.2.32 The Group noted that in some parts of the world some States had not yet installed ground station SELCAL equipment capable of transmitting SELCAL codes containing the P, Q, R and S tones. Consequently, aircraft operating in those areas were still limited to the use of the old shared codes selected from the original 12-tones. However, all of the aeronautical stations serving the NAT Region were now equipped with the new 16-tone ground station SELCAL tone sending equipment.

SOLAR FLARE CONSTRAINTS

2.2.2.33 The Group noted that sunspot activity, expected to be at the maximum of an 11 year cycle this year (1990), had caused an abnormally high number of incidents of HF radio blackout conditions during the 1989 peak traffic season. This aspect was taken into consideration by the NAT States during the final selection of optimum data collection dates. However, it was not possible to assess how many aircraft calls went unheard as a result of poor propagation.

2.2.2.34 Procedures for communication failures in the NAT Region are published in the AIPs and in the NAT MNPSA Operational Manual. These are, for the most part, aimed at failures affecting single aircraft. The use of blind broadcast techniques was considered, using a VHF frequency designated for this purpose. After considerable discussion the Group could not agree to the introduction of 123.45 MHz as a new common frequency but considered that 131.8 MHz should be used for relay and broadcast purposes (§ 2.1.6.3 also refers). It was noted that as a last resort 121.5 MHz can be used for position reporting.

2.3 Assessment of the performance of the NAT Air Navigation System and the services provided to airspace users

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 1988 and 1989. The statistics used in compiling the information were based on 50°W data collections with the exception of random traffic. That information was 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 significantly when compared to the preceding year: +12.7% for 1988 vs 1987 and +10.1% for 1989 vs 1988. Taking into account a decrease of low level traffic respectively -12.2% and -2.2%, the total operations for Gander OAC had increased by +11.9% for 1988 vs 1987 and +9.8% for 1989 vs 1988. 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. Figures presented by Canada, in accordance with the categories agreed to at NAT SPG/24, showed that 77% of OTS and 72,5% of random traffic was cleared on the requested track at requested or higher flight level: category A. The figures produced by the United Kingdom, for the same category, showed 75.9% for the OTS and 65.7% for random tracks.

2.3.3 The Member from Iceland informed the Group that because of the re-sectorisation undertaken in Reykjavik OAC in early 1989, it had not been possible to compare requested flight levels with cleared flight levels. It was also suggested that, since the traffic had already been adjusted by another OAC, it would be more meaningful to compare requests for en-route re-clearance against actual ones to assess the performance of the system.

2.3.4 An overview of the air traffic situation within the WATRS area under the jurisdiction of the New York OAC was presented to the meeting. Traffic volume in 1989 had increased by +9% compared to 1988. From the total amount of traffic, which operates mainly northbound/southbound, 83% were cleared on their requested route at their requested flight levels.

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.

ATTACHMENT A TO THE REPORT ON AGENDA ITEM 2

HF INTERFERENCE REPORT

Start Date/Time	Stop Date/Time	Frequency Interfered With	Class of Emission and Frequency	Signal Strength	Source of Inter-ference	Action Taken	Remarks

Agenda Item 3: Technological Developments of interest in the NAT Region

3.0 Introduction

3.0.1 Under this item the Group considered the following subjects:

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

b) developments in navigation 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 latest enhancements and developments to the Icelandic Automated Data Transfer (ADT) system and plans regarding the developments of an automated FDPS. A uni-directional ADT had been established from Shanwick to Reykjavik; it would be bi-directional once the FDPS is installed in Reykjavik. The ADT provides benefits to the Shanwick/Reykjavik traffic by reducing controller workload as well as by offering the capability of automated strip printing.

3.1.2 The Group recalled that the Icelandic plans for the implementation of an automated FDPS stipulate the following three major project phases:

a) development of a baseline FDPS;

b) addition of situation displays; and

c) development of ADS and other advanced ATC techniques.

It was noted that the contract for the first phase had been awarded in late 1989 and that work on the basic system was expected to require two to three years. The second system development phase was expected to follow immediately after completion of the current project.

3.1.3 As regards the radar data processing system, the Group was informed that SSR data from the air defense radar in the Faroe Islands had been available to the CAA of Iceland for almost a year using the troposcatter link. The availability of this data had proved to be an effective and reliable tool, in support of the basic procedural ATC system, used to reduce aircraft separation. The SSR data from new air defence radars in Iceland were expected to be available in late 1991 or early 1992 and their integration was being investigated.

3.1.4 In the course of the discussions, it was pointed out that reductions in the military presence in Greenland and Iceland could possibly lead to the withdrawal of some radar facilities and communications links, e.g. the troposcatter link. The Representative from Denmark informed the Group that the radar station in Kulusuk on the East Coast of Greenland will be closed in August 1991 and that military presence in Sondre Stromfjord will cease at the end of 1992. It was recalled that a number of ATS communications circuits are presently provided by United States Air Force, free of costs to the users, (Report from LIM NAT RAN Meeting 1976, Recommendation 3/4 refers) and that this situation is now going to change. The Member from Iceland informed the Group that no changes to the availability of military radars in Iceland were foreseen and that the understanding with the military as regards the Faroe island link is that warning would be given before changes to the availability of present services were made. In this context, the NAT SPG recalled that the LIM NAT RAN Meeting (1976) had noted that a number of recommended COM circuits and facilities in the NAT Region were currently supported by links provided free of charge or at reduced cost and that the action to be taken by ICAO if and when the conditions regarding the provision of those links were changed would be reviewed at that time in the light of all relevant factors.

3.1.5 The Member from Canada reported on recent developments of the Gander Automated Air Traffic System (GAATS). New software, that permits automated comparison of Air Ground Communication System (AGCS) transmitted oceanic clearances with the current flight record, was undergoing site testing. In addition, this new software release permits the system to optionally access, via the Canadian Atmospheric Environment Service (AES), in Montreal, forecast upper-air data from either the United States National Weather Service, Bracknell or the AES itself. Furthermore, new hardware to replace all existing GAATS equipment had been purchased and was now undergoing assembly in the Technical Systems Centre in Ottawa. The system would then be tested in conjunction with newly re-hosted GAATS software. This version of software, whose change would be totally transparent to the user, was expected to be implemented along with the new hardware at the end of the summer traffic period. The following additional improvements can be expected from this system enhancement:

a) the capability for system acceptance of position reports from the AFTN, ADS and other sources;

b) dynamic conflict prediction for all active flights within the system;

c) conformance checking of all flights;

d) sectorisation and message routing capability;

e) data-links to radar processing systems; Air Movement Information Service, Automatic Data Interchange System; and

f) implementation of sector printers.

3.1.6 With regard to the Gander Automated Message Processing System (GAMPS), the Group was informed that it is currently undergoing site acceptance testing with commissioning scheduled for June 1990. Also, the Gander IBM Replacement Terminal (GIRT), the IFSS access to the AFTN, was now being enhanced to provide message editing capabilities.

3.1.7 The Member from the United States gave a progress report on the implementation of the Oceanic Display and Planning System (ODAPS). It was noted that the ODAPS would provide the baseline ATC automation for the New York CTA/FIR. In doing so it would support all the ATC functions which were currently being performed manually as well as providing the United States' end-user node to the NAT communications network. In this function, ODAPS would support On-Line Data-Interchange (OLDI) between New York OAC and Lisbon and Gander OACs. Also, it would provide for automation support for message generation, checking and processing.

3.1.8 As regards the implementation of the ODAPS, the Group was informed that a configuration, which did not include conflict probe, became operational in the Oakland CTA/FIR in January 1990 and that initial controller reaction to the system was positive. The next step in the operational testing and deployment of the system would be to develop ODAPS adaptation data, specific to the New York CTA/FIR, in order to implement ODAPS, with conflict probe capability, in New York OAC in mid 1991. In conjunction with this effort, the development and testing of several system enhancements was continuing.

3.1.9 The Member from Portugal informed the Group that the plans for the implementation of their new automated Oceanic Control System (SATL) were on schedule as mentioned at NAT SPG/25. The implementation date remains the end of 1992. The OAC at Santa Maria was scheduled to be moved to Lisboa at the end of 1991 or the beginning of 1992. Also, the programme to update the Azores TMA was proceeding as planned.

3.1.10 The Member from the United Kingdom updated the Group on recent activities concerning the FDPS at Shanwick. In particular, it was mentioned that, in the light of the previously experienced difficulties, the software quality control measures in place now exceed international standards for safety critical systems. Furthermore, work was on-going with the objective of fragmenting the system in order to enable gradual degradation rather than catastrophic failure. Finally, the prototyping of the Man Machine Interface (MMI) had been finished.

3.1.11 The Group was then informed of problems which had been encountered because of lead-in times concerning the notification of airspace changes involving automated ATC systems. It was pointed out that, although the AIRAC notification period of six weeks is normally followed, this does not leave sufficient time to prepare and test changes to data processing systems, especially where conflict detection and resolution or other safety critical elements are affected.

3.1.12 With the above in mind, it was agreed that the increasing use of data processing in ATC systems had created a new problem because of the requirements to test the new software. Provided that an OAC is warned of a specific forthcoming change and given advance warning of the planned dates of official notification and implementation, the necessary software can be prepared and tested, then held in readiness until an official promulgation of the change is made.

CONCLUSION 26/13 - NOTIFICATION OF CHANGES AFFECTING SOFTWARE

That NAT Provider States, intending to make changes which may necessitate revision of software in Oceanic ACCs give adequate notice as follows:

a) changes be promulgated in accordance with AIRAC procedures; and

b) concerned OACs be informed 12 weeks in advance of the proposed changes and of the planned implementation dates.

3.2 Developments in navigation systems

3.2.1 The Group was informed of the latest developments in respect of Global Navigation Satellite Systems (GNSS) and in particular of the Global Positioning System (GPS). It was noted that GPS would be available virtually free of charge to civil aviation at the end of the 1990s. It should, at that time, provide a horizontal accuracy of 100 meters 95% of the time. As regards health monitoring, the Group noted that GPS integrity had not been proven for civil aviation. However, it was informed that the following methods were being investigated to provide the necessary integrity:

a) a GPS Integrity Channel (GIC) - a network of independent ground stations that monitor the status of each satellite; then, a master station broadcasts the information to the users; and/or

b) a Receiver Autonomous Integrity Monitor (RAIM) - additional information is used in the receiver to detect and isolate satellites that are performing outside prescribed tolerance limits.

The Member from the United States informed the Group that the FAA had been funded for the development of some ground integrity monitoring. The Group would be kept abreast of these developments.

3.2.2 In the ensuing discussion the observer from Inmarsat informed the Group that they were exploring three options for health monitoring. Furthermore, whatever option is chosen and providing that independent health monitoring is considered necessary, it will be included on the third generation satellites scheduled to be launched in 1995. As regards the continuous availability of GPS, the Group was informed that this issue should not cause any concern to civil aviation and that no opinion could be offered on whether there might be any future change to the policy regarding free of charge availability to civil users.

3.2.3 The Group was also informed that the development of minimum operation performance standards for airborne GPS user equipment was in progress and that the system was being evaluated for civil aviation implementation both as a supplemental and as a sole means source of radionavigation. It was likely that, starting in 1993, the initial civil aviation use of GPS would be as a supplemental system in oceanic airspace to be used in combination with INS. The improved navigation performance derived therefrom could have a major impact on separation standards in the NAT - particularly when GPS position is combined with the ADS function.

3.2.4 As regards recent developments, it was noted that the United States was currently launching operational GPS satellites and, as of 1 April, had seven in orbit. Also, the United States and the Union of Soviet Socialist Republics were jointly investigating airborne user equipment that would receive and use signals from both GPS and Global Orbiting Navigation Satellite System (GLONASS) for navigation and integrity monitoring. Finally, it was mentioned that an Airport Datum Monument (ADAM) Survey Program had been initiated to establish geodetic control monuments at airports with non-precision instrument approach procedures.

3.3 Data-link developments: Satellite, Mode S and VHF

GENERAL

3.3.1 As a follow-up to NAT SPG/25 Conclusion 25/10 - Identification of VHF data-link capability in ICAO flight plans - the Group was informed by the Member from Canada of the following:

a) ICAO recognizes that the availability of an air/ground data-link may need to be reflected in a uniform manner in the flight plan and that use of a single letter in Item 10 rather than a description in Item 18 of the flight plan would facilitate automatic processing of this information; and

b) to reserve one of the current, non-allocated letters for the purpose, would require an amendment to the Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services (PANS-RAC, Doc. 4444). It was the ICAO Secretariat's intention to bring this matter to the attention of the Air Navigation Commission for review and eventual inclusion in Amendment 4 to the PANS-RAC for applicability in late 1993, the next programmed date for an amendment to the PANS-RAC.

SATELLITE DATA-LINK

3.3.2 The Group noted the information submitted by Inmarsat in relation to the current status of their Aeronautical Services programme and the initial phase of their implementation plan. It also noted the target dates and other relevant data presented in accordance with the FANS II format for the Global Co-ordinated Plan for Transition for Future Communications Navigation and Surveillance (CNS) Services and Research and Development (R&D) activities related to Aeronautical Mobile Satellite Services (AMSS) and GNSS. The Group was also informed that some airlines had commenced pre-operational trials using pre-production type Aircraft Earth Station (AES) equipment.

3.3.3 It was pointed out that the initial implementation of the data-link would not be fully compatible with Inmarsat's System Definition Manual (SDM). However, full SDM-compliant packet-data mode was the stated objective of all service providers and equipment manufacturers. In other words, although the interim capabilities would eventually converge to full compliance with the SDM, it was necessary, initially, for Ground Earth Stations (GESs) to offer service only to those AESs for which they could support the given implementation level. While the need to continue the definition of the global system capability requirements was fully recognized, regional system requirements were considered of equal importance. Therefore, it is important to keep in mind that the initial implementation activities of the AMSS are likely to start in a defined area, such as the NAT Region, and that the availability of specific operational requirements and existing environment, such as available inter-networking capabilities, may greatly increase the pace of the technological advancements needed to improve the efficiency of Air Traffic Services.

3.3.4 Through its Member from the United States, the Group was informed that many of the air carriers throughout the world had implemented the ACARS/AIRCOM VHF data-link service for Airline Operational Control (AOC) and Airline Administrative Correspondence (AAC) and that this data-link capability had become an essential service for efficient airline operations. Several of these carriers were anxious to extend this capability to the oceanic regions and they had, therefore, ordered satellite avionics for their new long-range aircraft such as the B747-400, the MD-11 and the A-330/340. ARINC and SITA* had formed a joint venture in order to provide satellite services for these carriers throughout the world and early data service would commence in mid-1990. It was expected that this service will grow rapidly as more aircraft are satellite equipped and that a voice capability would be added in early 1991 when high gain aircraft antennae become available.

3.3.5 Initially, this system relies upon Inmarsat satellites, accessed through twelve GESs located throughout the world. Other regional mobile satellites may be incorporated, provided their operators commit themselves to fully compatible operations. The planned network is based on the following concepts:

a) most air traffic communications via satellite will use digital data-links;

b) all satellite communications are integrated by the terrestrial network;

c) the single, integrated system maintains priority for safety-related communications; and

d) the system will provide continuous communications with aircraft throughout the world.

3.3.6 Because this service would be available in early 1991 it could provide a potential means for States to implement satellite services to support ADS and other satellite data-link applications at an early date. The system architecture chosen provides access to multiple GESs in each ocean region and, therefore, protects the system from sun outages and other GES failures and could therefore provide the reliability needed for air traffic services.

3.3.7 Satellite-based services would be supported through a common set of aircraft avionics. The standards for these avionics were currently being specified in the Airlines Electronic Engineering Committee (AEEC) Characteristic 741, Radio Technical Commission for Aeronautics (RTCA) SC-165, and by ICAO in its AMSS Panel deliberations. The most efficient means to route satellite communications is to employ the intelligence of the terrestrial network, not the satellite. Under this systems approach, discrete ground facilities are not necessary for each individual FIR. An aircraft will remain logged on to a single GES as long as it is in view of the satellite and the GES is available. If separate satellite and GES resources were set aside for each FIR, the capacity of the Inmarsat satellite system would soon be exhausted. Under the ARINC/SITA approach, all facilities would be available in common and, with the strict enforcement of priorities, capacity would always be there for Air Traffic Services Communications (ATSC). ATCC between one aircraft and the ATC facility would be routed automatically using the Aeronautical Telecommunications Network (ATN).

* 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.

3.3.8 The benefits of this approach are:

a) maximum availability of communications;

b) optimum use of system resources; and

c) transparency of facilities to the user.

According to ARINC/SITA, the redundancy in satellite ground stations and their existing terrestrial facilities should ensure the highest system availability practicable. Indeed, they claim that such a global system approach is the only way to meet the ICAO FANS availability objective of 99.99%, and that no single Inmarsat Signatory or regional satellite system could provide as high a level of system availability and redundancy as the ARINC and SITA system.

3.3.9 The integrated system would maintain the priority of safety communications as directed by Annex 10 to the Convention on International Civil Aviation. The entire resources of the system would be available for safety communications, such as air traffic control messages, upon demand of the flight crew or the air traffic control service. Because the system must handle distress, air traffic, operational, administrative, and passenger communications, ARINC and SITA recognized and would enforce sixteen levels of priorities and would pre-empt whatever traffic necessary to accommodate safety related communications. It follows that the system must shed lower priority connections to handle safety related messages.

3.3.10 For aircraft and administrations that choose to utilize the ARINC/SITA networks, the ATS data would be routed by the ARINC/SITA networks directly to the cognizant ATS authority in whose FIR the aircraft is operating. The location of the aircraft, as provided by the ADS communications, would be used to route ATCC messages. AOC messages would be routed to the aircraft operating agency. Voice messages would automatically be switched to the appropriate voice communications center controlling that FIR. Aeronautical Passenger Communications (APC) would be identified and handed to the terrestrial telephone network at the earth station or other appropriate gateway.

3.3.11 In the ensuing discussions to the presentation of the ARINC/SITA system, the Group expressed concern in regards to the reliability of the data as well as the apparent lack of redundancy built into the system to provide data when part of the system fails. In particular, it was mentioned that because the driving forces behind the system were essentially non-safety related items - AAC and APC as well as AOC - there appeared to be insufficient work being carried out in connection with satellite redundancy. Also, the importance of rapid intervention communications, whether voice or data, was stressed when considering reductions in separation or the implementation of a more tactical ATC environment.

3.3.12 In response to the concerns expressed above, the Group was informed that two operational satellites plus one spare would be in orbit. Furthermore, eight GESs would be available to route data. It was also pointed out that the high reliability of modern satellites has been well established. The Group therefore accepted that the likelihood of a catastrophic failure of the space segments or of the GESs was considered to be very small indeed, but that it nevertheless needed to be quantified. In this context, the Group noted that their was a continuing need for HF communications in the foreseeable future.

3.3.13 The Group expressed its appreciation to the Member from the United States for the presentation of a complex technical issue and also requested him, on behalf of the NAT SPG, to convey the appreciation of the Meeting to ARINC and SITA for the quality of the presentation which they made to support the above.

MODE S

3.3.14 The Group was then provided with a brief summary of the United States Air Transport Industry's standards development processes, of the status of avionics characteristics to support data-link systems as well as a description of the work in process to develop the ATN. It was agreed that these tasks were important on-going activities in relation to the implementation of the future NAT ATS Concept. Therefore, the Group agreed that the NAT SPG Task Force should be kept informed of these developments in order to take them into account when developing an implementation plan.

3.3.15 The Group agreed that Mode-S SSR is of interest in the oceanic system for two main reasons. First, it would be desirable to have a high degree of commonality in the data-link services so that any transition is transparent to the aircraft. Secondly, the Mode-S transponder will be interrogated directly by the ACAS in order to provide collision avoidance information. Furthermore, some areas of the NAT Region may install Mode-S SSR for surveillance purposes.

3.3.16 With the above in mind, the Group was informed that the recent definition of an ATN and its relationship to the VHF, Mode-S and satellite data-links would play an important role in the routeing of ADS messages within the region by providing two important services to ATS:

a) routing of ADS position messages based on the end user address; and

b) permit both the aircraft and the controller to use any communications means available - Mode-S, VHF or satellite - without needing to make a selection.

VHF DATA-LINKS

3.3.17 The Member from Canada provided the Group with an up-date on the current status of the VHF data-link used for delivery of oceanic clearances by Gander OAC. The loopback, from the aircraft, of the oceanic clearance message issued by Gander was installed and implemented in GAATS in November 1989. The purpose of the loopback was to permit GAATS to perform a character by character check of the transmitted message against the aircraft response in order to provide the clearance delivery officer with a verification that the clearance had been accurately received. This could reduce the subsequent VHF Direct Controller Pilot Communication (DCPC) voice contact to a verbal validation of the clearance sequence number. Several airlines had expressed interest in participating in the pre-clearance program but had not yet signed the necessary letter of agreement.

3.3.18 In other data-link related activities going on in Canada, it was noted that work was continuing on the dissemination of a hard copy Airport Terminal Information Service (ATIS) Message in conjunction with the voice broadcast. Also, work on an interface to the AFTN from the Canadian National Flight Data Processing System (NFDPS) was progressing well and a means of delivering hard-copy domestic pre-clearances directly to the cockpit, or to the gate in the case of non data-link equipped aircraft, would be available in a test mode by mid-summer 1990.

3.3.19 The Group was then informed that proof of concept trials for the first phase of the delivery of oceanic clearances by Shanwick OAC were coming to an end. This trial, which was being carried out with SITA, had uncovered some operational problems. In particular, it had been shown that voice can be faster than the data-link. Nevertheless, it appears that benefits to air traffic controllers, assistants and flight crews can be expected. The United Kingdom would provide further information to NAT SPG/27.

3.3.20 The Member from Portugal informed the Group that trials for oceanic clearance delivery at Santa Maria were progressing. It was intended to extend the trials to include departure clearances from Lisboa airport using Lisboa ACC facilities.

3.3.21 The Member from the Unites States apprised the Group of developments concerning pre-departure clearances by data-link at Dallas/Fort Worth and Chicago/O'Hare airports. These trials were also proceeding well and it was expected that the service would be extended.

3.3.22 Finally, in the ensuing discussion, it was mentioned that the development of VHF data-links was, like satellites, being driven by AOC, AAC and APC and that no common standards for ATS applications existed as yet. In this context, a note of caution was expressed concerning the possibility that a variety of different systems could be developed.

3.4 Automatic Dependent Surveillance

3.4.1 The Member from Canada conveyed to the Group the latest information concerning ADS developments in Canada. He pointed out that pre-operational trials with the following three-fold objectives were being carried out:

a) familiarize air traffic controllers and pilots with the concept of ADS in a pseudo-operational environment;

b) develop a methodology to identify potential operational problems and to evaluate solutions, prior to building an operational system;

c) answer questions regarding:

i) types of air/ground messages needed;
ii) message acknowledgement levels;
iii) size and performance requirements;
iv) controller and pilot interfaces;
v) evaluation of candidate situation displays; and
vi) system accuracy and radar correlation.

3.4.2 To carry out these trials, it had been decided to use a PC system, based on the Northern Airspace Control System (NACS), as a foundation for this development. NACS already has the following capabilities:

a) in operational use;

b) access to NFDPS for flight plan data;

c) acquires, and uses, upper level winds;

d) provides calculated estimates at fixes and coordinates;

e) accepts manually entered position reports;

f) displays active traffic on a multi-colour situation display; and

g) detects and advises of potential conflicts among several aircraft using Canadian Minimum Navigation Performance Specification (CMNPS) separation minima (note CMNPS equates to NAT MNPS).

3.4.3 As the trials progress, and satellite communications become available, the range could be extended using a satellite emulation of ACARS data-link. This should provide sufficient throughput for the period of the trials and have no impact on existing airborne applications as the satellite would be accessible through the Air Canada Data Network (ACDN). The switch-over to and from VHF would be transparent to the user; another small step, low risk approach to the ultimate goal of operational ADS.

3.4.4 The Group was then informed that the results of these trials should provide the necessary data to define performance requirements and to design the system.

3.4.5 The Member from the United States informed the Group that ADS would be the second major upgrade to the United States oceanic ATC system after ODAPS. ADS would be implemented as a modification to the ODAPS baseline and would use existing commercial satellites to provide data-link and, in the future, digital voice for backup and emergency communications between the aircraft and the air traffic controller. The first step of this program would be to provide fixed rate automatic position reporting. Plans and specifications for this step were complete and development would begin as soon as a contract can be finalized. Engineering trials of the system were beginning in the spring of 1990 in the Pacific.

3.4.6 In order to foster the development of ADS, end to end integration meetings between the FAA, the users and manufacturers were held. These meetings were aimed at examining all the components of the ADS system from the pilot to the air traffic controller. Subjects covered in these meetings included the function of each component, the data that flows in/out of each component, and the physical interfaces.

3.4.7 In the same context, the FAA had sponsored a series of experiments which will test the end-to-end system design. These experiments involved the civil aviation authorities, airlines, avionics manufacturers, satellite service providers and terrestrial network providers. The objective of the experiments was to operate the system in an experimental configuration in order to identify any shortcomings in the system design. The agreements necessary to conduct these experiments in the Pacific have been reached and the tests should begin in 1990.

3.4.8 In the ensuing discussion, concern was expressed regarding the possible duplication of effort in the ADS R&D effort. To this end, the Group considered that States, in conjunction with industry, should carry out trials on the basis of bilaterally agreed memoranda of understanding (MOU) to meet internationally agreed objectives in order to concentrate research efforts. The Group also agreed that States should keep the NAT SPG Task Force informed of the results of their trials in order to enable the Task Force to develop the NAT Region ADS requirements and inform the ICAO ADS Panel accordingly. Finally, the Group agreed that Atlantic trials should be carried out.

CONCLUSION 26/14 - RESULTS OF ADS TRIALS

That:

a) States apprise the NAT SPG Task Force of the results of ADS trials being carried out; and

b) the NAT SPG Task Force develop NAT ADS requirements to be submitted to the ADS Panel.

3.5 Other Technological Developments of interest in the NAT Region

3.5.1 The Member from the United States presented to the Group information concerning the development of their Dynamic Ocean Track System (DOTS). In particular, it was noted that DOTS provides automation for producing Flexible Track Systems (FTS) and for flowing air traffic over these or other existing track systems. Furthermore, a successful R&D phase had been completed and plans were being formulated to provide the New York, Oakland, and Anchorage OACs with an operational capability. To this end, prototype systems had been installed in Oakland and New York.

3.5.2 As regards implementation of DOTS, it was noted that a formal agreement between Japan and the United States had been signed which allows for joint testing of DOTS functions in the Pacific Region and of the FTS between Honolulu and Tokyo. An agreement between Australia and the United States had also been signed for track testing to Australia and New Zealand.

3.5.3 The Group reviewed a theoretical analysis of ACAS performance in oceanic airspace which showed how the existence of ACAS, which would be installed in the near future in a large percentage of the aircraft population operating in the NAT Region, may enable the detection of proximate aircraft in such an environment. The Group agreed that it should take steps necessary to gain a full appreciation of the effects of ACAS and the likely consequences for the NAT Region. To this end, the Member from the United States agreed to provide additional information to the next NAT SPG meeting.

3.5.4 The Group recognized that ACAS is likely to provide considerable safety benefits in the NAT environment but considered that it should not be taken into account when determining separation standards as ACAS is a "safety net" and not a tool for separation assurance. It was therefore agreed that States who participate in the SICASP should inform their Panel members that the effects of ACAS in oceanic airspace should also be evaluated. It was agreed that the NAT SPG mathematicians should monitor the SICASP efforts and request guidance on or interpretation of any oceanic results. The possible use of these results, in assessing system risk, can then be reviewed [cf. § 1.2.8 (f)].

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 Navigation Plans;

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

d) 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 The Group was informed that the NAT Traffic Forecasting Group (NAT TFG) had met in Paris from 26 April to 4 May 1990 and had produced the 1990-95 forecasts which had been made available to the Meeting. It was noted that specific problems had been identified by the forecasters.

4.1.2 In reviewing these problems, the Group noted that the New York OAC information had been provided as flight progress strips for all the oceanic traffic. This had required a major manual sorting exercise. The Group was informed that the NAT TFG requirements for New York OAC were lists of north/south traffic in the WATRS area and of east/west traffic on a city-pair basis. In response to the above, the Member from the United States mentioned that they were endeavouring to automate their data collection and that they would attempt to provide the data to the NAT TFG collator on a diskette.

4.1.3 It was also mentioned that data, which had been produced by IATA, was no longer available and it was felt, by the NAT TFG, that this had had a detrimental effect on their results. The representative from IATA indicated that this information was no longer prepared as there was no requirement for it within the airline community. It was further mentioned that an analysis of the ABC and/or OAG would be possible; however, this analysis would not include charters and it would have to be externally funded.

4.1.4 As regards the NAT TFG's request to have its membership enlarged, the Group did not see any benefit therein and therefore agreed that there was no need to change the existing structure.

4.1.5 Finally, the Group also noted that the NAT TFG would prefer to receive data from States on diskette and that their next meeting is scheduled to be held in Paris from 10 to 19 June 1991.

4.2 Development of medium and long term NAT 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) implementation planning;

c) development of an Interface Control Document; and

d) FANS

REPORTS OF THE NAT SPG TASK FORCE

4.2.2 The Rapporteur of the NAT SPG Task Force informed the Group that it had met three times since NAT SPG/25. He then gave the Group an overview of the work which had been carried out by the Task Force. He expressed appreciation to administrations, user organizations and ICAO for the resources allocated to the work of the Task Force and in particular to the Member from Portugal for his rapporteurship of its first two meetings. The Group noted the three reports and took action on them as indicated in the following paragraphs.

4.2.3 Firstly, the Group turned its attention to the Future North Atlantic Air Traffic Services System Concept Description which had been prepared by the Task Force in response to the first five items on its work programme. The Task Force was congratulated for the outstanding work that had been done in preparing the Concept Description. After noting that all NAT Provider States, as well as IATA and IFALPA, had endorsed the Concept Document, the Group agreed that the first five items of the work programme had been completed, and that the Concept Document should be published by ICAO on behalf of the NAT SPG.

CONCLUSION 26/15 - FUTURE NORTH ATLANTIC AIR TRAFFIC SERVICES CONCEPT DESCRIPTION (Concept Document)

That:

a) States in the NAT Region use the Concept Document as the basis for the development of the future ATS system; and

b) ICAO be invited to publish, on behalf of the NAT SPG, the Concept Document.

4.2.4 The Group then considered other points identified by the Task Force for which NAT SPG guidance was deemed necessary. With regard to Air Traffic Flow Management (ATFM), the Task Force had identified a requirement for the NAT SPG to take up oceanic ATFM planning in conjunction with those bodies responsible for continental ATFM. In response to this requirement and notwithstanding the long-term ATFM requirements identified in the Concept Document, the Group agreed that it should add to its work programme the requirement for oceanic ATFM planning.

4.2.5 In connection with GESs, the Group noted that the Task Force had identified two options for GES service provision which are as follows:

a) State administrations select the service providers; or

b) users select the service providers subject to the approval of the ATS authorities. This will involve multiple gateways into the OACs and the selected service providers would provide all four AMSS functions (ATSC, AOC, AAC, APC).

While appreciating that the Task Force had brought this matter to their attention, the Group agreed that it was too early to make a final decision. However, it did agree that the Task Force should continue to look into the matter in the light of the work being carried out in the FANS/II Committee and to include a proposal in the implementation part of the Concept Document.

IMPLEMENTATION PLANNING

4.2.6 In view of the strong resemblance of the Asian part of USSR airspace to the NAT Region, the Representative from the USSR presented to the Group a brief outline of the implementation strategy for its future ATS system. The main objective of this strategy was to establish transition stages from the existing ATS system to the future one taking into account the following:

a) the evolutionary process of the transition;

b) the requirement for ATS system capacity to exceed air traffic demand;

c) increasing the level of flight safety;

d) the development of future techniques and technology bearing in mind expected implementation dates; and

e) expected level of funding for system development.

4.2.7 The strategy listed the milestones for the aviation administration, the science establishments, industry and aircraft operators affected by the implementation of the ATS system. In this manner, the strategy serves as the connecting link between the conception of the future system and the specific plans for trials, testing and implementation of the particular system elements and the system as a whole.

4.2.8 Following the above presentation, the Group then considered how the Task Force should tackle the last item on its work program - the development of a general implementation plan for the phased and orderly implementation of the various elements of the concept to ensure regional coherence. In this context, the Group noted that the Terms of Reference given to the Task Force did not clearly and precisely indicate the level or degree of planning expected from the Task Force.

4.2.9 The Group noted that, in order to assist the NAT SPG to pave the way ahead, the Task Force had asked the United Kingdom to coordinate the development of a suitable common methodology to collect data necessary for the development of an implementation plan. This methodology would then provide the NAT SPG with a basis on which it could provide guidance to the Task Force. Following an examination of the work carried out by the United Kingdom in this respect, it was agreed that the format which had been presented to the Group should indeed form the basis of the implementation plan.

4.2.10 Looking at implementation planning in general, the Group noted that an implementation plan is usually very detailed requiring the consideration of many factors and a relatively precise listing of actions and milestones. Therefore, it cannot cover a large timespan because its accuracy will progressively degrade with the enlargement of the timeframe considered. Having in mind that the NAT implementation plan must look 20/25 years down the road, it is clear that it would not be possible to develop a detailed plan for that time frame. Therefore, it was agreed that there was a need for an overall implementation strategy that would complement the implementation plan itself and provide the basis for the very detailed part of the plan. The Group agreed on a three-phased implementation strategy which would include the general implementation plan agreed to above as the basis for the first phase.

4.2.11 The Group then considered working methods for the Task Force to carry out its work in the limited time available. It was noted that the concept of forming small working parties to carry out specific tasks to specific deadlines had worked very well for the Task Force when developing the Concept Document. It therefore agreed to the suggestion that two sub-groups of the Task Force be created to deal with specific jobs assigned to them by the Task Force.

CONCLUSION 26/16 - IMPLEMENTATION PLANNING FOR THE FUTURE NAT ATS SYSTEM CONCEPT DESCRIPTION

That the NAT SPG Task Force (created pursuant to NAT SPG Conclusion 25/11):

a) carry out item F) of its work programme in accordance with the directives specified in Attachment 4-A to the Summary of discussions of Agenda Item 4; and

b) present the results of its work to NAT SPG/27.

4.2.12 When discussing the timing and the venue of the next meeting of the Task Force, the Group agreed that sufficient time should be given to the sub-groups to advance their work. As regards the venue, the Group noted with appreciation Denmark's offer to host the meeting. With the above in mind, the Group agreed that the next Task Force meeting be held in Copenhagen from 21 to 25 January 1991. In this context, the Group also noted that a final meeting of the Task Force will be held in Ottawa in the spring of 1991 at which time the implementation plan will be finalized.

INTERFACE CONTROL DOCUMENT (ICD)

4.2.13 The Group recalled that On-Line Data-Interchange (OLDI) in the NAT Region is not a new subject as Canada and the United Kingdom have had OLDI since 1971. There is also a link between Iceland and the United Kingdom. However, these two links, with their associated ICDs, are different thus creating unnecessary problems and highlighting the need for a common ICD.

4.2.14 The Group was informed that the Task Force had recognized the importance of OLDI at an early stage in its work and had created a technical sub-group to examine this matter in greater detail. At its third meeting, the Task Force had reviewed a proposal for a common ICD for the NAT Region developed by the United Kingdom in response to an earlier recommendation by the Task Force. In order to expedite the work, the Task Force had agreed that its members would review the United Kingdom's proposals and provide comments and input material in order that a comprehensive proposal be submitted to NAT SPG/26.

4.2.15 Following a thorough review of the above referred proposal and after assurances that the comments of all States had been incorporated into the draft common ICD, the Group accepted it as the basis on which the NAT ICD would be built. During the discussions, strong emphasis was put on the need to take into account the interfaces on both sides of the Atlantic and that it was therefore important that ICAO documentation should be used as much as possible in the building process.

4.2.16 The Group then examined how the work in this important area should be carried out. Referring to the success of establishing small working parties to carry out specific tasks, the Group agreed that an OLDI working group should be established within the frame of the NAT SPG. The Group also recognized that it would be necessary to ensure that the document, once operational, is administered in a safe, efficient and effective way. The Group therefore agreed that this task should be undertaken centrally and that the European Office of ICAO would be best suited to do it.

CONCLUSION 26/17 - COMMON NAT INTERFACE CONTROL DOCUMENT

That:

a) a working group, comprising one Member each from Canada, Iceland, Ireland, Portugal, United Kingdom (Rapporteur) and the United States be established:

i) to develop a common NAT ICD on the basis of the proposal agreed to in § 4.2.15 above;

ii) to introduce the common ICD into operational service;

iii) to monitor the ICD once operational;

iv) to recommend any required future changes to the ICD to the NAT SPG; and

v) to progress those changes, when adopted, into operational service

b) the European Office of ICAO be invited to administer the document when operational; and

c) other concerned States or international organizations be consulted when necessary in order to ensure harmonization at the interfaces.

4.2.17 With the above in mind, the Group agreed that matters related to the development and management of the ICD should be added to the NAT SPG work programme.

FANS ACTIVITIES

4.2.18 The Group noted that the Special Committee for the monitoring and co-ordination of development and transition planning for the future air navigation system, commonly known as FANS II, had been established by Council to carry on from the FANS Committee. It was further noted that the work being done by FANS II would have an impact on planning activities in the NAT Region. With this in mind, it was agreed that the results of the first meeting of FANS II should be taken into account by the Task Force and that the Concept Document, as endorsed by the NAT Provider States, should be sent to the FANS II/1 meeting.

4.3 Possible introduction of reduced vertical separation above FL290 in the NAT Region

4.3.1 The Group noted that the RGCSP had concluded that the application of 1000 ft separation above FL 290 was technically feasible and that the Air Navigation Commission (ANC) had endorsed this conclusion. The ANC had also agreed that the RGCSP should produce Guidance Material to assist States and regional planning bodies to implement the reduced VSM. The Group noted the draft Guidance Material, including the appendix, and it also noted that any comments should be forwarded to the RGCSP in order that they may be taken into account when the Guidance Material is finalized in November 1990.

4.3.2 The Group noted that, in view of the major benefits which the implementation of a 1000 ft VSM in the NAT MNPSA could offer in terms of increased capacity and cost savings, the Task Force had identified the pressing need to produce an implementation strategy. With this in mind, the Group agreed that this particular task should be dealt with expeditiously. In order to carry out this objective, it was agreed that a Vertical Studies Group (NAT VSG) be established outside the frame of the Task Force.

4.3.3 In developing the terms of reference for the NAT VSG, the Group accepted the timescales and outline strategy envisaged for Milestone No. 4 (page 4-A-2 refers) of the draft implementation plan of the Future NAT ATS System Concept which foresaw NAT SPG/27 (May 1991) and the proposed NAT/RAN Meeting (Autumn 1992) as key dates in the progression toward a target implementation date of 1996. It was therefore considered essential that the report of the VSG be made available to NAT SPG/27 to avoid any delay to this schedule. In this context, the Group agreed to the list of issues to be addressed by the NAT VSG which is at Attachment 4-B.

4.3.4 The Group recognized that the major obstacle to be overcome, prior to implementing the reduced VSM, was the resolution of the interfaces between the EUR/NAT/NAM Regions. In order to assist the NAT VSG with this problem, the Group agreed that EUR and NAM States adjoining the NAT Region be invited to undertake studies in this regard and to provide the NAT VSG with any information that they may have, or already have, in connection with this matter.

CONCLUSION 26/18 - NORTH ATLANTIC VERTICAL STUDIES GROUP

That:

a) a NAT VSG, comprising members from Canada, United Kingdom (Rapporteur), United States, USSR, IATA and IFALPA be established with the following terms of reference:

i) to consider all aspects of the implementation of a 1000ft Vertical Separation Minimum between FL290 and FL410 in the whole or part of the NAT MNPSA;

ii) to develop a detailed implementation strategy based on the RGCSP document "Guidance Material for the Implementation of a 300 M (1000)ft VSM above FL290" and on the Future NAT ATS System Concept Description. This strategy should identify all operational and technical measures necessary to progress the reduced VSM concept;

iii) to re-examine the operational requirement and timescale for, and the benefits and penalties of, the implementation of a 1000ft VSM in the whole or part of the NAT MNPSA;

iv) to submit a report to NAT SPG/27.

b) all Provider States with airspace adjoining the NAT MNPS airspace initiate, as a matter of priority, studies necessary to resolve the interface problem and to report their findings to NAT VSG (through the ICAO European Office) by 1 September 1990; and

c) the European Office of ICAO provide necessary Secretariat support to the Vertical Studies Group.

4.3.5 The Group then noted with appreciation the offer from the Member from the United States to host the first meeting of the NAT VSG provisionally scheduled from 23 September to 2 October 1990 at either the FAA Technical Centre, Atlantic City or the FAA HQ Washington.

4.4 Preparation for the NAT Regional Air Navigation Meeting

4.4.1. The Group recalled that the last NAT RAN Meeting, which had been a limited RAN Meeting, had been held in 1976. In this context, preparation for another LIM NAT RAN Meeting has been on the Work Programme of the NAT SPG for several years. However, for various reasons, no decision had been taken regarding the dates, scope, structure, etc of such a meeting until NAT SPG/25 had agreed that a RAN meeting be convened in 1991/92.

4.4.2 In past discussions within the Group, it had been agreed that activities related to planning in the NAT Region must be sufficiently mature before starting the final preparations for a RAN meeting. In particular, it had been recognized that the FANS Committee had to complete its work. The Group noted that the ANC was presently making preparations for a world-wide air navigation conference, scheduled for September 1991, which would deal with the results of the FANS Committee. Bearing in mind the time required to process the output of the air navigation conference, the Group agreed that a LIM NAT RAN meeting could be scheduled for the 4th quarter of 1992. In this context, the Group noted other on-going activities related to the convening of such a meeting.

4.4.3 The Group then examined a proposed agenda and structure for the LIM NAT RAN meeting and agreed that the traditional procedure would not appear to be the most efficient method to organize a meeting which would primarily address the implementation of the future NAT ATS Concept.

4.4.4 The Group therefore agreed that an agenda should be prepared on the basis of the most efficient way to handle the implementation aspects of the Concept within the ten working day period agreed for the meeting and that the structure of the meeting should be determined accordingly. Finally, the Group agreed that the table of aircraft operations does not appear to be the most appropriate planning tool in view of the availability of the NAT TFG long range traffic forecasts.

CONCLUSION 26/19 - LIMITED NAT REGIONAL AIR NAVIGATION MEETING

That:

a) ICAO be invited to convene a Limited (COM/MET/RAC) Regional Air Navigation Meeting in the fourth quarter of 1992;

b) the LIM NAT RAN carry out its work in ten working days;

c) the NAT TFG forecasts be used in lieu of the Table of Aircraft Operations; and

d) the Secretariat be invited to prepare, for NAT SPG/27, a draft agenda based on the implementation of the Future ATS Concept Description taking into account other Air Navigation Planning matters that would have to be addressed and to propose a structure which would support the agenda in order to obtain the maximum efficiency from the time available.

ATTACHMENT A TO THE REPORT ON AGENDA ITEM 4

IMPLEMENTATION PLANNING DIRECTIVES FOR THE NAT SPG TASK FORCE

1. To develop an implementation strategy for the future NAT ATS concept consisting of three overlapping phases during the time-frame 1990 to 2010/15 namely:

Phase 1 - Time-frame 1990 to 2000
- Improvement of the overall efficiency and capacity of the ATS system by promoting inter alia the harmonization of the NAT automated ATC systems
- Preparation for the implementation of phase 2 (e.g. test, trials, research, SARPS, etc)

Phase 2 - Time-frame 1995 to 2005
- Progressive implementation of satellite technology for communications, navigation and surveillance, co-existing with current systems (e.g. HF voice).
- Integration of NAT ATC systems so that boundaries are transparent to airspace users.
- Preparation for the implementation of phase 3

Phase 3 - Time-frame 2000 to 2010/15
- Full implementation of the concept and progressive withdrawal of the current systems (e.g. HF facilities).

2. To develop an implementation plan which enables the national administrations and aircraft operators to develop their plans so as to meet the conditions and pre-requisites laid down in the future NAT Air Traffic Services system concept description and which takes account of the need to harmonize with plans currently being developed by the regions which interface with the NAT Region.

3. To concentrate initially on developing a plan for Phase I, and then, at the direction of NAT SPG, to progressively extend the planning process to Phases II and III.

4. To use the milestones, adapted and expanded as required, which are listed below as a basis for identifying the operational and technical measures required for the coherent development of individual States' and aircraft operators' plans towards the evolution of the existing Air Traffic Services System and the achievement of Phase III:

MILESTONES	
No.	**DESCRIPTION**
1.	Oceanic entry clearance delivered and verified via data link (VHF Mode "S" or satellite).
2.	Direct Pilot/Controller satellite communications - Routine by data and non-routine by voice - in all of the region South of 75 degrees North.
3.	On line data interchange between OACS/FICS in the NAT Region.
4.	Vertical separation above FL 290 becomes a minimum of 1000 ft for subsonic aircraft in MNPSA.
5.	Navigation System(s) meet RNPC3.
6.	Full automatic surveillance capability within MNPSA South of 75 degrees North.
7.	Lateral separation reduced to 30 NM within MNPSA South of 75 degrees North.
8.	Longitudinal separation reduced to 5 minutes within MNPSA South of 75 degrees North.
9.	Navigation system(s) Meet RNPC1.
10.	Lateral separation reduced to 15 NM within MNPSA South of 75 degrees North.
11.	No further requirement for OTS - All flights follow random tracks in MNPSA South of 75 degrees North.
12.	Totally "free flow" system - each aircraft selects and flies its individually optimised flight path.

5. To provide commonly agreed concrete objectives and lines of action, together with associated programmes and relevant time-scales, as a basis for the achievement of the degree of compatibility and harmonization consistent with the efficient provision of air traffic services within the airspace of the NAT and at its interfaces.

6. To progress its work programme through two sub-groups:

6.1 A technical sub-group will address those aspects associated with milestones 1 to 6 except 4 listed above.

6.2 An ATM sub-group will address those aspects associated with milestones 7 and 8, taking account of the relevant aspects of milestones 1 to 6. It will also be responsible for concurrently developing a description of the ATM scenarios intended to be associated with Phase I, II and III.

6.3 These two groups must co-ordinate their activities taking into account the relevant work within NAT SPG. They must also take account of the need to draw on and harmonize with the planning methodology developed in other regions. This co-ordination will be carried out through the rapporteur who will also coordinate the activities of the NAT Vertical Studies Group with respect to milestone 4.

6.4 These groups will be required to report their progress to the Task Force in January of February 1991 with a view to presenting the completed plan for Phase I to NAT SPG/27.

7. The Members of each sub-group will be as follows:

7.1 The Technical sub-group

- Canada - Rapporteur
- Denmark
- Iceland
- Ireland
- Portugal
- United Kingdom
- USA
- IATA
- IFALPA

7.2 The ATM sub-group

- Iceland (Rapporteur)
- Canada
- Denmark
- Ireland
- Portugal
- United Kingdom
- USA
- IATA
- IFALPA

ATTACHMENT B TO THE REPORT ON AGENDA ITEM 4

ISSUES TO BE ADDRESSED BY THE NAT VSG

1. The following issues will need to be addressed by the NAT VSG, prior to and during the first meeting in late September 1990.

(I) Statistical/Mathematical Studies

a) Confirmation of the RGCSP CRM parameters (applicable to operations in the NAT Region).

b) Assessment of risk in the NAT Region employing current and future traffic levels and the present and expected height keeping performance of NAT aircraft.

c) Recommendation of TLS

d) Monitoring Requirements (See Section III).

e) Risk associated with in-flight contingencies in the reduced VSM.

(II) Operational Studies

a) Interface problems

b) Real-time simulation specification

c) Definition of the reduced VSM airspace

d) In-flight contingencies in the reduced VSM airspace.

(III) Independent Monitoring of Aircraft Height Keeping Performance

a) Monitoring Criteria

b) Amount/Type of data required/possible

c) Traffic Flow patterns for optimum siting of Height Monitoring Units (HMUs)

d) Number/siting of HMUs

e) Specification of HMUs

f) Use of SSR Mode "C" data

(IV) Development of Aircraft Approval Process

a) Aircraft Altimetry Systems

b) Maintenance Procedures

c) Operating Drills

d) Granting/Recording/Checking of approvals

(V) Re-examination of Benefits/Penalties of the reduced VSM

Agenda Item 5: General matters

5.0 Introduction

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

a) formation flying in the NAT Region;

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

c) updating of the NAT Guidance and Information material and the NAT MNPSA Operations Manual; and

d) new airspace classification.

5.1 Formation flying in the NAT Region

5.1.1 It was recalled that the subject of formation flying in the NAT Region, which had given rise to extensive discussions during previous meetings, had resulted in a decision by the ANC, in early 1987, to include this matter in the Technical Work Programme of the Organization. The object of this new task (Formation flights by civil aircraft in controlled airspace) was to determine whether ICAO provisions permitted formation flying by civil aircraft in controlled airspace under IFR and whether military type aircraft, bearing a civil registration in such operations, should be considered to be civil aircraft. Action by the ANC was expected to result in an amendment to Annex 2.

5.1.2 The Group was then informed that the ANC had carried out a preliminary review on this matter and had agreed that the proposed amendment to Annex 2 be transmitted to States and interested international organizations for comment. The Group would be kept abreast of developments.

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

5.2.1 The Group was given a status report on the two inter-related proposals for the amendment of the PANS RAC (Doc 4444) and the NAT Regional Supplementary Procedures contained in Doc 7030 concerning position reporting (Conclusion 26/12 also refers). The Group was also apprised of other amendment proposals to Air Navigation Plans which could have a bearing on the NAT Regional Air Navigation Plan.

5.2.2 As a follow-up to a proposal submitted by the Member from the United States at NAT SPG/25 concerning an amendment to the NAT SUPPS in respect of in-flight procedures, the Group examined the suggested text for this amendment. Although unable to agree on the specific wording at this time, the Group did agree that a draft amendment based on the United States/United Kingdom proposal be circulated to the NAT SPG Members by the European Office of ICAO in order to obtain an agreement on the proposed wording. Subsequent to that, the United States would, on behalf of the NAT SPG, submit an amendment proposal to Doc 7030

5.2.3 While considering the NAT SUPPS, the Group noted that NAT RAC-14 § 8.1.1.1 could be misleading in that it only referred to Mode A which might imply an exclusion of Mode C. As this was not the intent of this paragraph, the Group agreed that Doc 7030 should be amended accordingly. Canada was therefore requested to submit an amendment proposal to Doc 7030 in order to change the following text:

"8.1.1 Operation of transponders

8.1.1.1 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 thirty minutes after entry into NAT airspace."

to read as follows:

"8.1.1 Operation of transponders

8.1.1.1 Unless otherwise directed by ATC, pilots of aircraft equipped with SSR flying in NAT flight information regions shall retain the last assigned code for a period of thirty minutes after entry into NAT airspace."

5.3 Updating of the NAT Guidance and Information Material and the NAT MNPS Operations Manual

5.3.1 As a result of discussions concerning the clarity of the NAT Guidance Material, the Group agreed that substantial work was needed to make it a more user-friendly document. In view of the eventual publication of the IGA Manual and the presence of the MNPSA Operations Manual, both of which are non-amendable , the Group agreed that the main role of the Guidance Material is to link these two Manuals to respective State's AIPs. Therefore, the Guidance Material must continue to be produced as an amendable document.

5.3.2 With the above in mind, the Group agreed that a new edition of the Guidance Material should be prepared and that user input was essential in its preparation in order to obtain a useful product. Keeping in mind the need to keep costs down, the Group agreed that the new edition should be jointly drafted by the United Kingdom and IATA with the participation of IAOPA and IFALPA when needed. It also agreed that the document should be prepared in the frame of the table of contents which is at Attachment 5-A to Agenda Item 5. Finally, the Group agreed that a draft of this new edition should be presented to NAT SPG/27 (§ 2.1.3.4 also refers).

5.3.3 In the meantime, the Group agreed that ICAO be requested to prepare an amendment to the 5th edition of the Guidance Material which would encompass those items that have been identified in the course of the meeting as requiring clarification or inclusion in the document. These changes included, inter alia, the addition of special routes from Iceland via Greenland to Canada, clarification of MNPSA certification requirements, as well as other issues. This amendment should be prepared as soon as possible, preferably by the end of July 1990.

5.3.4 The Group then noted with satisfaction the progress being made by the FAA in the development of Federal Aviation Regulations (FARs) regarding general aviation flights within the NAT Region. The Group also took note of the work being carried out by the FAA in developing an Advisory Circular (AC) pertaining to the use of LORAN C in the NAT Region. The Group felt that work in these areas could only benefit NAT users. The Member from the United States also informed the Group that, in the context of the above work, new LORAN C coverage diagrams will be produced and that they should be available to NAT SPG/27 for eventual inclusion in the Guidance Material.

5.4 New airspace classification

5.4.1 The Group was apprised of the amendments to Annexes 2 and 11 in which new airspace classifications were defined. The Group was informed that these new classifications would come into effect in November 1991. Having noted the information provided, the Group provisionally agreed that all high seas airspace at and above FL55 should be Class A and that all airspace below FL55 should be Class G. It was also recognized that the TMAs and sovereign airspace may require different classifications. The Group agreed that, in the light of the information presented, this question should be reviewed at NAT SPG/27 in order to reach agreement on any outstanding issues to ensure a harmonious implementation of the new airspace classifications in November 1991.

ATTACHMENT A TO THE REPORT ON AGENDA ITEM 4

GUIDANCE AND INFORMATION MATERIAL CONCERNING AIR NAVIGATION IN THE NORTH ATLANTIC (NAT) REGION

Foreword/Introduction - Combine

- Historical Background
- Purpose of the document

Part 1 *The NAT Region*

- Characteristics of Airspace
- Characteristics of Traffic
- Provider States
- Operating Requirements
- Derivation of MNPS Concept
- SOTA

Part 2 *MNPS Airspace*

- Purpose - concept (what is it?)
- Definition of Airspace
- FIRs
- Routes
- Special Routes
- Special Provisions
- MNPS Operations Manual

Part 3 *MNPS Approval Process*

- State Responsibility
- Principle of Approval "Package"
- Aircraft Navigation Capability/Equipment
- Navigation Aids
- Airworthiness Aspects
    - Initial Certification
    - Maintenance Procedures
    - Continuance of Approval
- Flight Crew Training/Operating Procedures
- Emergency Drills
- IGA Approvals
- Ferry Operations/Infrequent Operators
- Record of all Approvals

Part 4 *Monitoring of Navigation Performance*

- Requirement for Monitoring
- How effected
- Detail of Monitoring Process

Part 5 *Operations Outside MNPS Airspace*

Part 6 *ATC Procedures*

- Flight Plans/Clearances
- WX Reporting Procedures
- Flow Characteristics
- OTS Broadcasts and Signal
- Establishment of OTS
- Datum Line
- Airspace Reservations
- Mach Number Technique
- Formation Flying
- Routes to . . . from OTS
- Addresses - Rocket/Missile Firing
- In-flight Contingency Procedures

Part 7 *In-flight Operating Procedures*

Part 8 *Navigation*

- LORAN C Coverage
- OMEGA
- Pilot Qualification

Part 9 *Communications*

- Message Format
- VHF/HF
- Air/Air
- Air/Ground
- Coverage Diagrams (if required)
- HF Frequencies
- VHF Routes to FL290
- Shanwick Requirements

Part 10 *Future Plans*

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;

c) election of Chairman; and

d) NAT SPG membership.

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, 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; and

   c) vertical performance.

2. 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.

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

4. 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;

   e) airspace organization in the Miami, New York and San Juan Oceanic Control Areas; and

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

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 in the NAT Region.

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. Automatic dependent surveillance.

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

PART IV - PLANNING

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

2. Development of medium and long-term NAT Air Navigation Plans (Task Force, Monitoring FANS activities and related ICAO work).
3. Introduction of reduced vertical separation above FL290 in the NAT Region (VSG, RGCSP)

4. Possible introduction of reduced horizontal separation above FL400.

5. Development of a Common Interface Control Document (OLDI).

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

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 MNPSA Operations Manual and the Manual on International General Aviation.

6.1.2 When discussing the work program, the Group expressed concern over the amount of resources that would be required to carry out all the tasks which had been identified. In the ensuing discussions, it was recognized that access to sufficient resources, both financial and human, to carry out the work could be a problem. Nevertheless, because the penalties for not proceeding in accordance with the identified time scales would probably exceed the cost of any extra resources, the Group agreed that no priorities should be allocated to the various tasks and that they should all be progressed in accordance with the plan to the best of each State's ability to do so.

6.2 Dates for the next meeting

6.2.1 In view of the work that would need to be carried out before the Limited NAT RAN Meeting planned for 1992, the Group agreed that NAT SPG meetings must be held once a year. Noting that the Task Force and other working groups require sufficient time to carry out their tasks as well as the necessity to hold the meeting in the spring (before the Air Navigation Conference), the Group agreed that its next meeting should be held in Paris from 13 to 24 May 1991.

6.2.2 The Group recalled that the NAT TFG had scheduled its meeting in mid-June 1991 and that the informal NAT AFTN/AFS meeting was scheduled for mid-May 1991. In view of the usefulness of the NAT TFG long range forecast, which will be reviewed at the next meeting of the NAT TFG, the Group was of the opinion that it would be better for the NAT TFG to meet before NAT SPG/27. In the same vein, the Group was also of the opinion that the Informal AFTN/AFS meeting should be held after NAT SPG/27 so that any specific communications requirements identified by the NAT SPG can be taken into account by the AFTN/AFS meeting. In view of the above and bearing in mind the difficulties of finding appropriate meeting dates for the NAT SPG itself, the Group agreed that Members should encourage participants from their Administrations, in the above meetings, to consider the possibility of re-scheduling their meetings.

6.3 Election of Chairman and organizational matters for next meeting

6.3.1 The Group unanimously re-elected Mr. G. Matthiasson from Iceland as its Chairman. In so doing the Group expressed their appreciation for the outstanding manner in which he conducted the meeting.

6.3.2 In order to improve the efficiency of the meeting, the Group agreed that it would be useful to name the rapporteur of the three sub-groups in advance of the next meeting. In this way, it is felt that portions of the work done during the first week of the meeting could be started in advance. This should expedite the preparation of the intermediate reports and allow the sub-groups more time to carry out other tasks assigned to them in the course of the meeting. The Group therefore agreed that the United Kingdom would be the rapporteur for the mathematicians and the scrutiny groups and that Denmark would act as rapporteur for the Communications group.

6.3.3 Finally, the Group expressed its appreciation to the European Office of ICAO for all the support it provided to the Meeting. In this context, the Group had felt that, because of the 18 months since the last meeting compounded with the complexity of the subject matter, a great deal of effort had been required by the Group itself and ICAO in order to complete the Agenda in the allotted time.

6.4 NAT SPG Membership

6.4.1 The Group reviewed a request from Denmark to become a Member of the NAT SPG. In view of the fact that Denmark is the only major provider State which is not a Member of the NAT SPG, the Group unanimously agreed to accept Denmark's request and called upon the Secretariat to undertake the necessary co-ordination to formalize the matter.

6.4.2 The Group learned with regret the Mr. D. MacKeigan, the Member from Canada, would be leaving. It expressed its appreciation for the outstanding contributions of Mr. MacKeigan to the functioning and work of the NAT SPG. The Group was then informed that Mr. J. Butt would be his replacement. In the same context, the Group took this opportunity to express its belated but very sincere appreciation to Mr. Roger Croxford, the previous long standing Member from the United Kingdom, who had been promoted to a new position within his Administration and therefore had to leave the Group. The Meeting wished him well in his new tasks.

6.4.3 The Group then considered Inmarsat's request to become an Observer in the NAT SPG. Having noted that the Council had given the Group full discretion in this regard, the Group agreed that Inmarsat should be invited to participate in the work of the Task Force and that the Chairman may invite Inmarsat to NAT SPG meetings to discuss matters of direct concern to them .

Agenda Item 7: Any other business

7.1 Safety of IGA in the NAT Region

7.1.1 The Group noted the report of a special meeting on the safety of International General Aviation operations in the NAT Region held in Reykjavik in May 1989. It acknowledged the results achieved in reviewing this type of operations and the determination to take appropriate measures to ensure the continued safe operation of such flights. The Group was grateful to the Administration of Iceland for having undertaken to host this meeting.

7.1.2 Previous NAT SPG meetings had agreed that the question of IGA flights in the NAT Region deserved specific attention in order to provide pilots with the necessary information needed to carry out safe operations. As a result, the United States had offered to develop a document, similar to the MNPSA Operations Manual, which will contain guidance for oceanic crossing in the NAT Region by IGA flights. The second draft of this document was tabled for consideration and commenting the Group.

7.1.3 Expressing a unanimous appreciation for the work carried out by the United States, the Group agreed on the urgency of publishing the document taking into account all available inputs. It was further agreed that the United States would produce and maintain sufficient copies of the NAT IGA Operations Manual in the English language and that ICAO would take care of the other language versions. The Group agreed that, in view of the safety aspects of this document, ICAO be requested to put a high priority on the translation of the document in order to ensure its availability before winter 1990. States concerned should provide their comments on the draft document to the United States by 30 June 1990 for compilation by 30 July before circulation to NAT SPG Members for final comment. The agreed publication date was 15 October 1990. It was also agreed that the maintenance of the IGA manual should be put in Part V of the NAT SPG work programme.

7.1.4 The Group noted that Canada, Denmark and Iceland had held an informal meeting to identify where common requirements existed with respect to IGA operations and their relationship with Annex 6, Part 2. The Group also noted that, when at variance with ICAO provisions, States concerned would follow the notification of differences procedure as required.

7.1.5 The Group was informed by the Member from the United States that the FAA is addressing the issue of authorization and navigation equipment requirements for ICA and that it is drafting an Advance Notice of Proposed Rulemaking which is expected to be published in the September/ October timeframe and which will ask the public to respond to many questions pertaining to this issue. Following that, the FAA expects to publish a Notice of Proposed Rulemaking and a proposed Advisory Circular on the subject.

7.2 Runway conditions format

7.2.1 The meeting considered a proposal by Iceland to include in Regional Supplementary Procedures (Doc 7030/4 - NAT/MET) and the NAT/NAM/PAC ANP (Doc 8765) provisions for the dissemination over the MOTNE of runway conditions at Keflavik and Reykjavik. The information would be contained in an 8-figure code group inserted after the respective routine Meteorological Reports (METAR), in accordance with existing procedures in the EUR Region, promulgated in the EUR ANP (Doc 7754, Part III - AOP, § 4.8).

7.2.2 The meeting recognized that caution would have to be exercised concerning the addition of non-standard figure groups to METAR messages. While the distribution over the MOTNE would not pose any difficulties, States outside the MOTNE area could encounter problems in their electronic data processing systems if the procedure were to apply to METAR messages disseminated over the AFTN. Iceland would therefore transmit the METARs for the two aerodromes in two different formats, one including the runway information group, to be sent to the London AFTN/MOTNE exchange centre, and the other, without the extra group, for general dissemination.

7.2.3 Bearing in mind that the introduction of data link communications in the near future would very likely involve packages of information of different origin, the meeting felt that the current provisions in Annex 3, § 4.12 concerning supplementary information will be too restrictive as to the kind of information that may be included. Since the forthcoming COM/MET/OPS Divisional Meeting would review the aeronautical meteorological codes, this would present an opportunity to at least initiate consideration of the inclusion of information on runway conditions in METAR messages. Iceland offered to raise the matter at the Divisional Meeting.

CONCLUSION 26/20 - DISSEMINATION OF INFORMATION ON RUNWAY CONDITIONS WITH METAR MESSAGES

That Iceland:

a) raise the question of proposals concerning provisions for the inclusion of certain non-meteorological operational information in meteorological messages at the COM/MET/OPS Divisional Meeting.

b) submit a proposal for amendment of the EUR and NAT NAM/PAC ANPs (Docs 7754 and 8755, respectively) to include a requirement for measuring and reporting of runway state information in respect of Keflavik and Reykjavik; and

c) submit a proposal for amendment of Regional Supplementary Procedures (Doc 7030) for the dissemination of this information over the MOTNE.

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