NAT SPG/25

SUMMARY OF DISCUSSIONS AND CONCLUSIONS

OF THE

TWENTY-FIFTH MEETING OF THE NAT SYSTEMS PLANNING GROUP

(Paris, 19 - 29 September 1988)

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INTRODUCTION

1. The Twenty-Fifth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 19 to 29 September 1988. The Meeting was chaired by Mr. G. Matthiasson, the Member from Iceland.

2. In addition to IAOPA, IATA and IFALPA, 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. J. Irving 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; and

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

4. Mr. E. Cerasi, Deputy Representative of the European Office of ICAO served as Secretary of the Meeting and was responsible for the preparation of this Report. He was assisted by Messrs. D. Oudin, J. Vanier, RAC/SAR Technical Officers, A. Suban, COM Technical Officer, and B. Barrefors, MET Technical Officer, from the European Office of ICAO.

5. Mr. D. Bartkowski, ICAO Regional Representative, addressed the Group on specific ICAO matters at the opening of the meeting. He explained that the European Office technical support had been augmented and it was now in a more favorable situation to provide the required services to the NAT SPG.

LIST OF CONCLUSIONS

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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 accuracy achieved in the NAT Region during the period 1 March 1987 to 29 February 1988;

b) mathematical-statistical aspects of risk assessment methodology;

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

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

1.1 Navigation performance accuracy achieved in the NAT Region during the period 1 March 1987 to 29 February 1988

1.1.1 The Group completed a scrutiny of observed gross navigation errors in the NAT Region and found that a total of 105(69)* errors were reported during the period under review. 63(27)* of these errors occurred outside the Minimum Navigation Performance Specification Airspace (MNSPA) and were classified as Table 'CHARLIE' errors. Of the remaining 42(42)* errors 17(26)* were not eligible for inclusion in the risk analysis as defined by NAT SPG/17 (and amended by NAT SPG/23) and were classified as table 'BRAVO' errors. A review of these table 'BRAVO' errors is given at paras 1.1.7 to 1.1.10. The remaining 25(15)** errors which form the basis of detailed scrutiny were classified as table 'ALPHA' errors.

1.1.2 A breakdown of the 25(15)* errors is given at Attachment A. The format is in accordance with established procedures and as in previous summaries, the number of errors which can be tolerated by the collision risk models has been shown. As agreed at NAT SPG/23, the 'Zeta' errors have been further broken down to show the error rates of the Random traffic within MNPS airspace.

1.1.3 The Group noted that the improvement in the observed navigation performance in the NAT MNPSA during the 1986-87 monitoring period had not been maintained for the current period. Whilst this was disappointing, the following figures for the last five years set the achieved performance during the period under review in true context.

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* For comparison purposes, corresponding figures for the last monitoring period (1986-87) are shown in brackets.

** One error was deleted from the 1986-87 figures as it was not possible to establish positively that an error had occurred.

Period	Observed Traffic Figures	Total of Gross Errors in NAT Region	Errors outside MNSPA Table 'CHARLIE'	Error in MNPSA		
				Errors not eligible for inclusion in risk analysis	Errors included in risk analysis	Total
				Table 'BRAVO'	Table 'ALPHA'	
1983-84	85333	83	34	19	30	49
1984-85	101837	46	15	5	26	31
1985-86	115784	74	25	14	35	49
1986-87	116494	69	27	26	15	41
1987-88	129458	105	63	17	25	42

It can be seen that the current period was somewhat better than average in terms of Gross Navigation Errors (GNE) in MNPSA (tables 'ALPHA' and 'BRAVO' errors), particularly in the light of the observed traffic figures. Since 1983-84 there has been an increase of 52% in observed traffic whilst the number of MNPSA GNEs has remained relatively constant. The current year however shows a dramatic increase in the number of table 'CHARLIE' (outside MNPSA) errors.

1.1.4 From Attachment 'A', the breakdown of the 25(15)* table ALPHA errors provide two marked differences from the 1986-87 monitoring period:

a) 10(1)* errors (40%) were committed by aircraft which were not approved for MNPS operations. This disturbing statistic is considered at paras 1.3.2 to 1.3.5.

b) The Model 1 'Zeta' error rate for RANDOM traffic is only marginally within the 'ACTION' level of 1.95×10^{-4}. The Model 2 'Zeta' error rate for RANDOM traffic is lower but is still in excess of the 1.3×10^{-4} level required by the MNPS statement. This factor is discussed at para.1.4.2.

The number of table 'ALPHA' errors in the other classifications are almost identical to those shown in the previous period (1986-87).

1.1.5 As indicated above the predominant source of table ALPHA errors was aircraft flying in MNPSA without approval. Thus for the first time for several years "Equipment Control Errors including Waypoint Insertion Errors" did not provide the highest number of GNEs. The frequency of occurrence of this type of error however remains the same. In the current period there were 8(7)* such errors - 32%; 4(3)* were in classification C1 - inadvertent entry of incorrect waypoint data, and 4(4)* were classification C2 - correct entry of incorrect way points. Of these 8 errors 4 were related to route changes which necessitated a reprogramming of waypoint data in-flight. In addition, two errors (1 classification 'B' and 1 classification 'A') involved

erroneous reprogramming of waypoints. Thus there was a total of six errors which emphasize once again the need for extreme vigilance and adherence to flight deck operating procedures when handling amended route clearances. Within the 'C' error classification there were two instances where clearances were corrupted, e.g. "46 at 50" was recorded as 4650N 50W. Although the particular crews expressed surprise at this apparent departure from the standard convention of whole degrees of LATITUDE/LONGITUDE to describe oceanic waypoints, the positions were not specifically queried. The clear lesson must be to question all data which is in any way non-standard.

1.1.6 Of the remaining 6(5)* errors which appeared to have been caused by some failure and/or malfunction of the navigation equipment, 5(4)* aircraft were Omega equipped. The question of Omega GNEs is discussed at paras 1.3.6 to 1.3.8. The other aircraft was equipped with dual INS; during the oceanic crossing the two INSs diverged and the crew elected to follow the wrong set. There were only two instances (both Omega aircraft) where ATC was advised that navigation problems were being experienced.

1.1.7 In reviewing the 17(26)* table 'BRAVO' errors the Group noted the continued variability in the annual total of these errors which had been recorded in previous years. However taken over a five year period (1983-1988) there have been 81 'BRAVO' errors: an annual mean of approximately 16 errors. Thus the current period can be assessed as an average year.

1.1.8 The following table provides a breakdown of the table 'BRAVO' errors into the established error classifications:

Error Classification	Number of Errors
A	6 (4)
B	3 (5)
C1	4 (5)
C2	3 (5)
D	0 (0)
E	0 (0)
F	1 (5)
Unclassified	0 (2)
Total	17 (26)*

1.1.9 In every error classification except one, the current year shows an improvement over the 1986-87 monitoring period. The exception is classification 'A' - non approved users. The 6 offenders (35%) reflects the trend which was apparent from the review of the table 'ALPHA' errors. This issue is discussed at paras 1.3.2 to 1.3.4.

1.1.10 There were 3 instances of errors which were considered to have resulted from some breakdown of the ATC system communications loop. In one, three sections of 3 military high performance jet aircraft were operating along an airspace reservation. There was some confusion over the cleared route of one section and as a result 3 aircraft flew outside the reserved airspace. In another, an aircraft gave a forward estimate for a position which was not on the cleared route. This was not queried by ATC and the aircraft operated to the revised position. It is important to note that whilst these errors were not detected by ATC, there are many instances of ATC intervention to prevent such errors. These are detailed in paras 1.3.14 to 1.3.19.

1.1.11 The number of classification 'C' errors in table 'BRAVO' is similar to that examined in table 'ALPHA'. There were 7 such errors (41%); 4 classification C1 errors which involved 2 inadvertent errors of waypoint insertion and 2 instances of the auto-pilot being left in the heading mode. There were 3 classification C2 errors, 2 in which aircraft put flight plan data into the CDU although cleared on a different route, and one which was an example of an error following a reclearance.

1.1.12 Within the table BRAVO errors there were two instances where aircraft crossed the oceanic entry point with a large track deviation. In each case although the operator accepted responsibility for the error, the role of ATC in allowing the deviation to reach GNE proportions whilst the aircraft was within radar coverage was questioned. The Group felt that ATC should intervene to prevent such errors wherever possible.

1.1.13 The Group then considered the table 'CHARLIE' errors, and expressed concern at the large number of these errors - 63(27)*. 12(5)* of the errors occurred above MNPSA and 51(22)* below MNPSA. In accordance with established procedures only those errors in excess of 50NM (i.e. close to the half separation standard of 60NM) were subjected to the full follow-up action.

1.1.14 Of the 12 errors which occurred above MNPSA, 5 required follow-up action. Two errors involved a failure of the Omega system, one was a waypoint insertion error, one was attributed to the lack of a long range navigation aid and the cause of the final error is, as yet, unresolved.

1.1.15 In view of the large number of errors which occurred below MNPS airspace (51), the Group paid rather more attention to these errors than in previous years. 28 incidents had been subjected to the normal follow-up procedure and of these 11 remain unresolved. A common reaction from Operators who receive the error letters is an expression of indignation:- "we were outside MNPS airspace anyhow". Of the replies received, 6 Operators blamed "inaccurate meteorology", 7 quoted equipment failure (4 LORAN, 2 Doppler, and 1 Omega and Doppler), 1 made basic navigation mistakes, 1 deviated to avoid weather and 2 incidents involved waypoint insertion errors.

1.1.16 Faced with this catalogue of mishaps the Group agreed that greater consideration should be given to the analysis of the achieved navigation performance of aircraft outside MNPSA. This view has been expressed at previous NAT SPG meetings in regard to aircraft above MNPSA because:

a) these aircraft are often equipped with a high level of navigation capability and therefore may be potential users of MNPSA;

b) in the event of an emergency such aircraft may have to descend into MNPSA; and

c) they provide useful data should an extension of the upper limit of the airspace be considered.

Until now it has not been necessary to consider error by aircraft below MNPSA in detail; however the large number of errors call into question the degree to which the navigation equipment of these aircraft meet the requirements of ICAO Annex 2, para 5.1.1: "Aircraft shall be equipped with suitable instruments and with navigation equipment appropriate to the route to be flown"; and of ICAO Annex 6, Part 1, para 7.2.1 which states "An aeroplane shall be provided with navigation equipment which will enable it to proceed:

a) in accordance with its operational flight plan; and

b) in accordance with the requirements of air traffic services;".

These issues are further discussed in para 1.3 under "Methods of improving the observed standard of navigation performance in the NAT Region".

1.1.17 The Group noted that, as in previous years, a survey had been made of flights which had operated through the Reykjavik OCA, within MNPSA, to compare the gross navigation error (Tables ALPHA and BRAVO) rate in that airspace with that experienced in the whole of the MNPSA. As noted in the previous three years there was no significant difference; in fact, this year's figures showed that the error rates were remarkably similar:

REYKJAVIK OCA - 14 errors from 43,564 flights - Rate 1: 3112

Whole MNPSA - 42 errors from 129,458 flights - Rate 1: 3082

The Group however was concerned that a high proportion (78%) of the errors attributed to aircraft or routes through the Reykjavik OCA were made by operators not approved for MNPSA operations.

1.1.18 The Group noted that a core sample of the navigation performance of Eastbound aircraft leaving NAT MNPSA had been completed. The sample consisted of 899 valid tracks on aircraft crossing 10°W between 56N and 61N. The standard deviation of the track keeping accuracy was found to be 2.8NM, this is well within the standard deviation of 6.3NM which is required for MNPS operations (see also para 1.2.12).

1.1.19 With respect to the continued application of ten minutes longitudinal separation in MNPSA, the Group noted that there were no reports of an erosion of this minima in excess of three minutes.

1.1.20 In accordance with agreements reached at NAT SPG/23, the Group reviewed reports of altitude deviations of 300 feet or more from assigned level by aircraft in the NAT Region. There was a total of 8 such reports during the review period. Two proved to be instances of incorrect Mode 'C' data as a result of transponder problems. The remaining 6 involved aircraft which were actually operating at an incorrect flight level, of these only one was in MNPSA. This aircraft had understood that it had been cleared whereas it had been told to "expect a level". Of the remaining 5 incidents, 3 were below MNPSA, one was above and one descended out of MNPSA. The causes established for these deviations were: 3 aircraft flew their flight plan rather than their ATC clearance; one assumed he was cleared to descend and one had to descend without clearance because of an unsafe door indication.

Gross navigation error of 8/7/1987 - Investigation by the Canadian Aviation Safety Board (CASB)

1.1.21 The Group was informed of the results of the detailed investigation carried out by the Canadian Aviation Safety Board (CASB) concerning the near mid-air collision which occurred over the North Atlantic between two flights on 8 July 1987. The incident was investigated by the CASB, in co-operation with the US National Transportation Safety Board (NTSB). One of the aircraft concerned departed its track, crossed the adjacent OTS track and continued to a point approximately 80 NM off course before the crew began to correct back to the assigned course.

1.1.22 While the investigation is ongoing, the CASB issued three interim safety recommendations to Transport Canada aimed at reducing the potential for gross navigation errors. The first recommendation (CASB-87-48) reads as follows:

> "The Department of Transport ensure that all Canadian operators engaged in long range flights dependent upon on-board area navigation systems carry out a prescribed series of pre-taxi and enroute procedural cross-checks to provide redundant protection against gross navigational errors."

The Member from Canada informed the Group that the recommendation has been implemented through an ongoing monitoring process consisting of:

a) audits and base inspections;

b) issuance of operation specifications;

c) annual renewal of MNPSA approvals; and

d) in-flight inspections.

1.1.23 The second recommendation (CASB 87-49) established that:

"The Department of Transport seek international agreement concerning adequate cross-check procedures of area navigation equipment to reduce the possibility of gross navigational errors during long range intercontinental flights, particularly over the North Atlantic."

This recommendation was also brought to the attention of the NAT SPG by its member from Canada with the intent to consider the extent to which the recommended procedures contained in the ICAO NAT Guidance Material (NAT Doc 001, T 13.5N/5) could be strengthened to become mandatory. It was recalled in this respect that new material covering the cross-check procedures was inserted in the MNPS Operations Manual (Fifth Edition - June 1988) under the title "The prevention of deviations from track as a result of waypoint insertion errors". Furthermore, Chapter 11 of the MNPS operations Manual - MNPS Cross-check procedures - was thoroughly reviewed and revised. These actions were taken as an initial response to CASB 87-49. Although no precise decision could be taken by the Group at this stage for collective application, it was agreed that specific provisions concerning protection against gross navigation errors should be afforded a higher status in ICAO provisions. Suggestions were made to the effect of proposing amendments to Annex 2 and/or Annex 6. The Group shared and endorsed the underlying concerns which led to CASB 87-49. Accordingly, the Group requested the Member from Canada to pursue the matter further with a view to seeking the early inclusion of appropriate material in the ICAO provisions.

CONCLUSION 25/1 - NAT MNPS CROSS-CHECK PROCEDURES

That the Member from Canada:

a) seek advice from ICAO concerning the early inclusion of mandatory NAT MNPS cross-check procedures in appropriate ICAO provisions; and

b) take the necessary action within his Administration, upon guidance given in a) above, to present, as soon as possible, a formal proposal to amend the appropriate ICAO provisions.

1.1.24 The third recommendation (CASB 88-03) issued in May 1988 reads as follows:

"The Department of Transport modify Air Traffic Control procedures to ensure that any descrepancies of five minutes or more between pilot and ATC estimates on the North Atlantic be challenged by the controller at once to verify the estimate."

1.1.25 In this respect, the Group was informed of action taken by Canada and the United Kingdom to reinforce their national procedures regarding the requirements for controllers in their respective OACs to check discrepancies between aircraft and ATC estimates. Furthermore it was understood that other NAT Provider States would undertake to review their procedures accordingly.

1.2 Mathematical-statistical aspects of risk assessment methodology

1.2.1 The Group considered a number of papers relating to mathematical issues and carried out the calculation of the NAT/MNPS collision risks using reported occupancy statistics, and the gross error statistics shown in paragraph 1.1 above. In dealing with the subject, the following topics were reviewed:

a) NAT MNPSA occupancy and collision risk estimation.

b) core navigation performance assessment.

c) review of collision risk model parameter values.

d) composite separation and associated contingency risk.

e) extension of MNPS airspace above FL400.

f) MNPS requirements associated with a 15NM lateral separation.

NAT MNPSA Occupancy

1.2.2 The estimation of NAT lateral occupancy in 1987 was based only on traffic samples at 40°W, collected by Canada. In previous years, the estimation was based on an analysis of traffic at 20°W and 40°W; however, due to problems experienced in using data from the Flight Data Processing System (FDPS) at Shanwick OAC, the United Kingdom was unable to provide estimates of occupancy at 20°W.

1.2.3 In the absence of an analysis of the NAT occupancy at 20°W a paper was prepared by the United Kingdom which compared occupancy estimates obtained at 20°W and 40°W in previous years. The objective of this exercise was to ascertain whether any systematic differences existed between the two sets of estimates and if so, the effect this would have on the estimate of collision risk using only the 40°W occupancy figures. Traffic counts for the years 1983-1986 inclusive were found to be similar for the two meridians, the main difference being in random westbound traffic, where a consistently lower count (by about 10%) was apparent in the 40°W sample. For the majority of the years studied, same direction occupancy for westbound aircraft at the two meridians was also similar. However a consistent and fairly large difference (about 20%) was discovered in the Eastbound occupancy, for both random and OTS traffic, the larger values being recorded at 40°W.

1.2.4 The opposite direction occupancy recorded at 20°W over the period 1983-1986 has tended in general to exceed the level recorded at 40°W, although the difference appears to be diminishing with time. Opposite direction occupancy measured at 20°W has declined during the period, possibly reflecting a reduction in the use of OTS tracks for opposite direction traffic. As mentioned in paragraph 1.2.19 below, however, it is not possible to reliably discern trends in this data.

1.2.5 The Group concluded that, given the predominant influence of same direction occupancy on collision risk and the consistently higher overall same direction occupancy figures obtained at 40°W, the use of these estimates alone was likely to provide a more cautious risk estimate than in previous years, when 40°W and 20°W values have been averaged. The Group also felt that the source of differences between the two sets of estimates should be clarified during the period before the next NAT SPG meeting in order to provide reassurance that the process of calculating occupancy is being carried out in a consistent fashion.

1.2.6 The 1987 lateral occupancy estimates at 40W prepared by Canada were reviewed. The data was based on a sample of traffic consisting of twelve days total traffic, taken on the fifteenth day of each month. The estimates of total system occupancy are presented in Table 1 for OTS, random and total occupancy.

TABLE 1

OCCUPANCY ESTIMATES FOR 1987 AT 40°W

	OTS	RANDOM	TOTAL
EASTBOUND	1.047	0.215	0.631
WESTBOUND	0.931	0.133	0.532
TOTAL SAME DIRECTION	0.986	0.179	0.582
OPPOSITE	0.002	0.002	0.002

NAT MNSPA Collision risk estimates for 1987

1.2.7 The "Occupancy Ratios" which indicate the overall level of occupancy in comparison with the values used in the MNPS derivation, are presented in Table 2.

TABLE 2

OCCUPANCY RATIOS - 1987

OTS	RANDOM	TOTAL
1.43	0.31	0.87

1.2.8 Table 3 shows the derivation of zeta error ratios, based on material contained in Attachment A of this Agende Item, used to determine the navigation performance accuracy of the NAT system.

TABLE 3

ZETA ERROR RATIOS

	OTS			RANDOM		
	No. of Errors	Permissible No. of Errors	Zeta Error Ratio	No. of Errors	Permissible No. of errors	Zeta Error Ratio
MODEL 1	1	10.09	0.10	10	6.73	1.486
MODEL 2	0.46	10.09	0.046	7.76	6.73	1.153

1.2.9 The calculation of the NAT MNPSA collision risk ratio, which expresses the level of risk in proportion to the Target Level of Safety (TLS), was conducted for OTS and random traffic separately, as was done for the last three years in accordance with the procedure for evaluation of collision risk developed by the United States. Separate collision risk ratios are calculated to highlight the continuing differences in occupancy and zeta error rates associated with OTS and random traffic. The values obtained were then combined and weighed by traffic count to produce an overall MNPSA risk ratio. These risk ratios are shown in Table 4, based on the occupancy ratios shown in Table 2 and the zeta error ratios shown in Table 3.

1.2.10 The number of aircraft flying within the OTS and in random airspace within the MNPSA must be known in order to weight the OTS and random risks to calculate the average system risk. The OTS traffic extracted from the analysis of navigation performance in the NAT Region for 1 March 1987 to 29 February 1988 is 77,675 aircraft. Since all traffic flying on random routes cannot be picked up in the radar monitoring, the random traffic figure had to be derived. The first step was to subtract the OTS traffic from the total North Atlantic traffic (158,500) as reported by the NAT TFG for 1987 to give 80,825. This figure was adjusted by the factor 0.948 which was derived from the statistics from Canada concerning operations within the Gander OCA (Comparison of random traffic by area 1986/87) to remove random aircraft above and below the MNSPA. The result is an estimate of 76,622 random aircraft, and a total of 154,297 aircraft in the MNPSA.

TABLE 4

CALCULATION OF RISK RATIOS OF THE NAT MNPSA
1987

	1987 TRAFFIC	OCCUPANCY RATIO	x	ZETA RATIO	=	RISK RATIO
OTS	77,675	1.43* (1.31)	x	0.10 (0.11)	=	0.14 (0.14) MODEL 1
	(69,896)		x	0.05 (0.16)	=	0.07 (0.21) MODEL 2
RANDOM	76,622	0.31* (0.34)	x	1.49 (0.66)	=	0.46 (0.22) MODEL 1
	(67,098)		x	1.15 (0.48)	=	0.36 (0.16) MODEL 2
TOTAL MNPSA	154,297					0.30 (0.18) MODEL 1
	(136,994)					0.21 (0.19) MODEL 2

(Numbers in brackets are NAT SPG/24 estimates for 1986)
*NOTE: These figures relate to 40°W occupancy estimates only

1.2.11 The Group concluded that the risk was well within the TLS during 1987, although the risk ratio in the random airspace was up from 1986. This increase was entirely a result of an increase in zeta errors from 4 to 10 (the number of zeta errors in OTS airspace remained constant at 1). Table 5 shows the trend of risk ratios from 1984 to 1987. The general trend over these four years in the reduction of the risk ratio is a result of improved navigational performance as shown in the zeta error rate. During the same time, occupancy ratios have remained in the same range.

TABLE 5

RISK RATIOS 1984-1987

	1984	1985	1986	1987
MODEL 1	0.90	0.78	0.18	0.30
MODEL 2	0.75	0.62	0.19	0.21

Core navigation performance assessment

1.2.12 The Group discussed the latest lateral navigation error core sample analysis, carried out by the CMA during May and June 1988. A study had been conducted similar to that of previous years, wherein the lateral errors of aircraft exiting oceanic airspace at 10°W were recorded. After scrutinising large errors to validate the data, a sample of 899 valid tracks was obtained, which resulted in a mean error of -0.36NM and a standard deviation of 2.8NM. This represents a smaller spread of errors than in previous years and led the Group to consider possible causes for the reduction, since it appears unlikely to reflect simply a statistical fluctuation. One plausible explanation might be the introduction of novel INS technology - utilising ring laser gyros - with better performance in new aircraft types. Another reason for an improving trend in the distribution of cross track errors might be an increase in the use of "triple-mix" INS equipment.

Review of collision risk model parameter values

Suggested changes to the values

1.2.13 Two papers were discussed by the Group which suggested changes to the parameter values applied to the NAT SPG collision risk model. The Group considered the contribution by the United States which reviewed several parameters associated with the lateral collision risk estimation. The paper expanded the assessment made at the last meeting on parameter estimates and reaffirmed the suggestion that the collision risk estimation process would benefit from having a set of parameters consistent with present day circumstances. The paper generally supported the estimates provided by the United Kingdom at last year's meeting. Further, the same direction occupancy for both the OTS and random sub-system was projected for future time periods, 1991 and 1996.

1.2.14 The occupancy projections are based upon an examination of the traffic volume and occupancy data between the years 1982 and 1986 inclusive for which the occupancies were regressed on traffic volume for two sub-systems, the OTS and random operations. Since older NAT/TFG data were used to project the 1991 and 1996 traffic volume for the estimates in the paper, the Group revised those estimates of same direction occupancy using more recent information (1987) extracted from the NAT TFG report. The new parameters were used to predict the maximum large error rate (zeta rate) which would contain the TLS. The paper also presented results of fitting a double-double exponential distribution to the accumulated core and large error samples of data since 1980.

1.2.15 From a review of collision risk parameter values for the North Atlantic, a contribution from the United Kingdom also suggested possible changes based on an analysis presented to the last NAT SPG where the Group had agreed that serious consideration should be given to altering the parameter values in future years. The substance of the changes proposed in the two papers considered by the Group was very similar, and a consensus was reached on proposals for a more realistic set of parameter values. These are shown in Table 6.

TABLE 6

COLLISION RISK MODEL PARAMETERS

PARAMETER	ORIGINAL VALUE	SUGGESTED VALUE
S_y	60NM	60NM
S_x	120NM	120NM
$P_Z(0)$	0.25	0.38
λx	0.033NM	0.033NM
λy	0.033NM	0.029NM
λz	0.0083NM	0.009NM
$\overline{\Delta V}$	13kts	13kts
$\bar{V}$	480kts	480kts
$\overline{\lvert\dot{y}\rvert}$	47kts	80kts
$\overline{\lvert\dot{z}\rvert}$	1.0kts	1.5kts

1.2.16 The rationale for these changes is as follows:

a) Aircraft dimensions (λx, λy, λz). These have been obtained by a process of averaging the dimensions of aircraft observed in traffic samples analysed by the United States and the United Kingdom, according to the frequency with which the aircraft occurred in the sample. The dimensions of aircraft were obtained from published sources where the vertical dimension represents the height of the aircraft with undercarriage retracted.

b) Vertical overlap probability [Pz(o)]. This has been calculated on the basis of data obtained from the EUROCONTROL vertical data collection exercise for the sample of North Atlantic traffic observed at Aberporth, North Wales. The data was fitted with a gaussian-double exponential distribution with the following parameters:

Standard deviation of core (gaussian) distribution = 81.65ft
Standard deviation of tail (exponential distribution = 98.37ft
Mixing parameter (alpha) = 0.139.

Using a vertical aircraft dimension of 54.37 ft (obtained from the process described above) the vertical overlap probability was calculated to be 0.38.

c) Relative lateral velocity ($\overline{|\dot{y}|}$). The suggested value of 80kts was obtained by examining gross error records in the NAT MNPS airspace over a three year period, and averaging the lateral velocity observed. The process required a considerable exercise of judgement, in interpreting the data in accordance with the methodology proposed by the United Kingdom at the last meeting.

d) Relative vertical velocity ($\overline{|\dot{x}|}$). Accurate data on the distribution of vertical velocities of aircraft maintaining constant altitude above FL 290 were obtained by EUROCONTROL for the studies on vertical separation by the Review of the General Concept of Separation Panel (RGCSP) of ICAO. A United Kingdom study estimated the relative vertical velocity between aircraft at the same flight level to be 1.5kts.

Effect of new parameter values on risk estimate

1.2.17 The effect of this new set of parameter values is to increase somewhat the lateral collision risk estimates for NAT MNPSA. Applying the new set of parameter values to the 1987 (Model 1) gross error rates and occupancy values produces the results shown in Table 7:

TABLE 7

MODEL 1 RISK RATIOS USING SUGGESTED NEW PARAMETER VALUES

	OTS RISK RATIO	RANDOM RISK RATIO	TOTAL RISK RATIO
Present parameters	0.14	0.46	0.30
New parameters	0.32	0.99	0.65
Proportional increase	2.26	2.15	2.18

1.2.18 It will be recalled that the risk ratio is an expression of risk as a proportion of the TLS. Absolute values of the collision risk can therefore be obtained by multiplying these values by the TLS, 2×10^{-8} fatal accidents per flight hour. Roughly speaking, the new parameters have increased the risk estimates by slightly more than a factor of 2. Furthermore, the Group recognized that these values need to be adjusted and refined as necessary. When agreement on collision risk values is reached in future the need for two different Models should be reviewed in order to determine whether Model 2 needs to be retained. The Model 2 weights depend directly upon parameter estimates.

Estimates of maximum new Zeta Error Rates to 1995

1.2.19 To examine further the implication of new collision risk model parameter values for the NAT SPG's annual review of NAT traffic navigation performance, the Group estimated the zeta error rate that would need to be met by the population of aircraft to maintain collision risk below the TLS in future years. For this purpose, estimates of future occupancy levels were necessary. These were made for the year 1995 (taken as a reasonable planning horizon for the NAT traffic system in its present form) on the following basis:

a) Same direction occupancy

As mentioned in paragraph 1.2.14, a regression analysis of the relationship between same direction occupancy and traffic count was conducted by the United States for OTS and random traffic separately, using data from the years 1982 to 1986 inclusive. Applying a 60% increase in traffic over 1986 levels (as projected by the 1988 NAT TFG for the year 1995) led to an occupancy estimate of 1.1 for OTS traffic and 0.3 for random traffic.

b) Opposite direction occupancy

After examining historical data on opposite direction occupancy, the Group concluded that a regression approach, as applied to same direction occupancy, would not be reasonable. The reason for this was that there were extremely large fluctuations in opposite direction occupancy (resulting from the very small number of proximate pairs observed). It was therefore decided that, in the absence of any obvious and reliable trend in the data, similar values for opposite direction occupancy should be assumed to those occurring in the past. Values of 0.003 and 0.004 for OTS and random occupancies were assumed for the year 1995 on this basis.

1.2.20 In view of the difficulties involved in occupancy projections, these estimates must be regarded only as illustrative; considerable uncertainty exists in the values quoted - especially in the case of opposite direction occupancy.

1.2.21 Applying these occupancy estimates and the new set of parameter values shown in Table 6 to the collision risk model, led to the maximum zeta error rates shown in Table 8.

TABLE 8

MAXIMUM ZETA ERROR RATES PROJECTED TO 1995

	OTS	RANDOM
MNPS Zeta error rate	1.3×10^{-4}	1.3×10^{-4}
1995 Projected zeta error rate	3.5×10^{-5}	1.2×10^{-4}
acceptable No. of errors at 1995 traffic levels	3	8

1.2.22 It will be observed that the projected zeta error rate for random traffic is only marginally less than the MNPS value; this is a result of the considerably smaller occupancy observed - and predicted in the future - for this part of the system. The OTS projected zeta error rate is a factor of approximately 3.5 below the MNPS value, reflecting the relatively high same direction occupancy observed in the OTS. The 1987 OTS zeta error rate is below the limit projected on the above basis. The 1987 random zeta error rate is, however, in excess of both the present MNPS and projected future zeta error rates.

1.2.23 It was, however, observed by the Group that the permissible zeta error rate for random traffic calculated on this basis might in the course of time be found to be unduly stringent for two reasons:

a) The regression analysis from 1982-86 data seemed conservative when compared with 1987 occupancy data at 40°W. There may be cause to suppose that the regression approach overestimates the increase of occupancy with traffic for the random element of the NAT MNPSA.

b) The process of estimating random same direction occupancy is regarded as intrinsically conservative, since it is based on the disposition of aircraft at a particular meridian (20°W or 40°W) on the assumption that the tracks of aircraft are parallel across the ocean. In practice, the tracks of random aircraft may be expected to diverge, reducing occupancy somewhat. With the use of computerised flight plan data it should be possible in the future to estimate more accurately the random same direction occupancy, and remove this source of conservatism from the risk calculation.

Composite separation and associated contingency risk

Simulation of traffic patterns in a composite separation OTS

1.2.24 The Group considered an analysis of the pattern of demand transposed to a composite situation. The results of this scenario put into evidence the combined effect on the risk of collision of a concentration of traffic towards the central region of the OTS tracks and a 30NM/1000ft composite separation. Using the asumption that traffic would gravitate toward the areas where there exists the greatest observed density today, especially when more (composite) tracks were available, the study relied upon a simulation of traffic movements whereby the observed demand would be reconstituted so as to concentrate it toward the higher density. Base data used in the analysis were observed traffic movements within the NAT Region on OTS tracks.

1.2.25 The Group considered in detail the demand pattern on the OTS. It was found that there was generally a preference toward a central region of the OTS tracks. This does not mean that all operators compete for a single track, rather that even with the natural spread that exists due to flight planning variations and mission differences, there is a higher use of the central tracks in the system. Three demand patterns were observed, two of which were unimodal and one which had two peaks. The unimodal demand pattern dominated the samples of data which were used.

1.2.26 An algorithm was used in the simulation that took the original demand and either dispersed it, resulting in the spreading of traffic somewhat amongst the tracks, or concentrated it so that somewhat more traffic was redistributed toward the area(s) where there was observed higher density. In a strictly rectangular system the concentration assumption resulted in higher risks due to increased occupancy, since proportionately more traffic was allowed to flow into the central region. As traffic was allowed to flow onto the newly introduced composite tracks, this increase in risk was diminished. In many cases, the increase in risk due to the concentration of traffic was not restored to the previous level or below that observed in the system on the sample day until a substantial amount of traffic contributed to the composite tracks.

1.2.27 From the analysis by the United States, it was evident that demand patterns currently exhibited in the system do show a tendency for traffic to operate toward the central region of the OTS tracks. On the basis of the assumptions of concentrated demand, it was shown that increases in risk due to that concentration cannot in all cases be compensated by employing composite tracks unless a sufficient amount of traffic uses those tracks.

1.2.28 The two separate effects considered in the paper - the increased concentration of traffic by more intense "packing" on the central tracks, and the introduction of composite tracks - were discussed. As described above, concentration of the traffic increases the lateral collision risk whereas the introduction of composite tracks reduces it. Discussion focused on whether the introduction of composite tracks could of itself be expected to result in an increase in concentration of traffic, as the paper showed that this might under certain circumstances lead to an increase in overall risk relative to the current system.

1.2.29 Any link between increased concentration of traffic and the introduction of composite tracks depends on the assumption that the existing observed distribution of OTS traffic stems from aircraft competing for the same "preferred" track and, as a result of congestion, a proportion of aircraft having to settle for a sub-optimal track. If this were the case, the introduction of composite tracks could give rise to a greater concentration around the "preferred" track because of the greater capacity available in its vicinity. However, it was suggested in discussion that the distribution of traffic on OTS tracks owed much to the fact that the preferred track for aircraft on different routes would differ, so they would not in fact be competing for the same track. This view was supported by the fact that a high percentage of aircraft (circa 80%) are currently assigned to their requested track and flight level. If this were the prime reason for current variations, then the introduction of composite tracks would be unlikely to lead to any significant increase in the lateral concentration of traffic.

1.2.30 Some members of the Group concluded that the effect of introducing composite tracks using reasonable assumptions about vertical overlap probability, a similar spread of traffic and comparable error rates would always be to reduce collision risk in the system.

Composite separation contingency risk

1.2.31 On the basis of the examination of collision risk in specific phases of flight produced by the United States, the Group considered the risk of collision that could be expected while aircraft were executing in-flight contingency manoeuvres and the additional system risk component due to these events. At the last meeting, it was observed that the analysis of contingency risk conducted by the United Kingdom was incomplete in not accounting for opposite direction contingencies which would be expected if aircraft were to turn around to oppose the general flow. The paper suggested a method of determining the risk during the course of the event for the opposite direction case, using updated parameter estimates consistent with those recommended by NAT SPG/24. Table 9 presents the risk estimates for two systems, a 60NM rectangular system and 30NM/1000ft composite system. The risk shown in Table 9 is that which would be borne by an aircraft and its neighbours during the course of executing an in-flight contingency manoeuvre both for the same and opposite direction case, assuming either a normal drift-down procedure or a rapid descent.

TABLE 9

ESTIMATES OF THE RISK OF COLLISION
DURING AN IN-FLIGHT CONTINGENCY MANOEUVRE IN OTS AIRSPACE

	COMPOSITE SYSTEM		RECTANGULAR SYSTEM	
	OPPOSITE DIRECTION	SAME DIRECTION	OPPOSITE DIRECTION	SAME DIRECTION
Drift-down Descent	8.27×10^{-6}	1.41×10^{-7}	5.51×10^{-8}	2.33×10^{-9}
Rapid Descent	1.49×10^{-6}	5.67×10^{-8}	9.94×10^{-9}	8.76×10^{-10}

1.2.32 Having produced the "per-event" risk figures, the United States assessment presented an overall system risk contribution due to in-flight contingencies in the OTS. These values were revised by the Group and represented the long-term system contribution that would be additive to other risk components. Table 10 presents the values as revised, for both rectangular and composite systems.

TABLE 10

LONG-TERM SYSTEM AVERAGE CONTRIBUTION
DUE TO THE EXECUTION OF IN-FLIGHT CONTINGENCY MANOEUVRES

	COMPOSITE	RECTANGULAR
Drift-Down Descent	6.92×10^{-10}	4.72×10^{-12}
Rapid Descent	1.27×10^{-10}	8.90×10^{-13}

1.2.33 The Group generally accepted that operational judgement and expert opinion would be required in order to determine whether it would be advisable either to use the long-term average which incorporates the frequency of occurrence of these events, or to protect for the risk that is imparted during the course of the event, in planning for future systems. The conclusion of the Group was that the inclusion of opposite direction contingency procedures did not substantially affect the previous estimation of long term average contingency collision risk. This showed that contingencies added a small additional contribution of less than one percent of the current TLS to the overall collision risk in a composite system (para 4.3 also refers).

Possible extension of MNPS above FL400

1.2.34 The Group considered the mathematical/statistical aspects of a possible reduction in lateral separation above FL400 by means of raising the upper limit of the MNPSA, in connection with its discussion under Agenda Item 2 (Expanded application of MNPS separation minima, paras 2.1.1.1 to 2.1.1.3). Statistical data were made available describing the rate of large navigational errors in the North Atlantic based upon historical information using the accumulated large error tables (Table A, Table B and Table C) from 1980 to March 1988. Estimates of the rate of occurrence of large navigation errors were made for OTS and random traffic, and for user categories of commercial, military and general aviation (business jets). It was observed that the rate of errors was lower for the OTS compared to the random sub-system and that the commercial aircraft generally performed better than military aircraft and that both commercial and military aircraft performed better than the general aviation category. The latter relationship was preserved across the OTS and random sub-systems (para 2.1.1.3 also refers).

Possible MNPS requirements for a future 15NM separation environment

1.2.35 While accepting that the current NAT TLS and MNPS criteria would remain valid as long as the NAT system remains in its present state, the Group reviewed some preliminary material presented by the Member from the United Kingdom which calculated the possible effect on MNPS criteria which might result from a rectangular system with 15NM separation in a future NAT ATS system environment using Automatic Dependent Surveillance (ADS) and satellite navigation system environment. Parameter values peculiar to a system with 15NM lateral separation were discussed and in particular the value of $|\dot{Y}|$ - the relative lateral speed of aircraft.

1.2.36 The analysis provided was based on a very stringent target level of safety, one order of magnitude lower than the existing TLS, in keeping with the results of discussions held by the RGCSP in the context of vertical separation. This change in the TLS would result in a major reduction in permissible eta and zeta error rates to levels in the order of 1.1×10^{-5} and 5.5×10^{-6} respectively. The existing MNPS permissible error rates are 5.3×10^{-4} (eta) and 1.3×10^{-4} (zeta).

1.2.37 The Group noted that such strict limits on eta and zeta error rates would present difficulties in developing appropriate monitoring criteria in that several years traffic would be required in order to count sufficient errors to provide meaningful data; the absence of errors, or the occurrence of only a small number of errors over several years, might not demonstrate with any confidence that the target level of safety was being met.

1.3 Methods of improving the observed standard of navigation performance in the NAT Region

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

a) the lessons derived from the review of navigation performance reported in paragraph 1.1; and

b) salient points emerging from the discussion.

1.3.2 A major concern of the Group at this meeting was the number of gross navigation errors attributed to non-approved operators. During the review period 16 such errors occurred in MNPSA out of a total of 42 GNEs (38%). The Group also noted that over the period 1983 to 1988, 23% of all recorded NAT MNPS GNEs were caused by non-approved users. In practice, these errors occur as a result of inadequate aircraft navigation capability, poor crew training and procedures, and a general lack of awareness of the system requirements. The non-approved operators clearly prejudice the integrity of the MNPS concept and the overall system safety.

1.3.3 The Group noted that spot-checks of MNPS approvals, together with an analysis of the 'non-approved' offenders, indicated that the problem was almost entirely contained within the General Aviation/Private/Infrequent NAT user category of operator, (approximately 6% of all MNPS operations) on routes through the Reykjavik OCA.

1.3.4 The Group recognized that all attempts to inform this user category of MNPS requirements, by means of wide-spread publicity in the form of guidance material, NAT Operations Manual, aviation magazines, information circulars and notices on MNPS charts, had failed to eradicate the problem of the presence of non-approved aircraft in the NAT MNPSA. In order to provide for a more direct approach to potential offenders, the Group considered two methods by which a tactical monitoring of MNPSA approval status might be achieved:

a) Pre-flight Monitoring

All ICAO flight plans submitted for flights in MNPSA could be scrutinised and those plans without an 'X' in Field 10 queried with the originator. Ideally this would be done pre-flight, but in those cases where this was not possible the relevant flight could be subjected to the in-flight monitoring procedure.

b) In-flight Monitoring

When "selected" operators request oceanic clearance for MNPSA they could be asked to "Confirm you have State Approval for flight in MNPS airspace". A tentative procedure is set out below:

i) the selection of operators to be queried would be dictated by the workload involved:

- All major carriers/frequent users/military aircraft would be excluded; this would leave a figure of around 6.4% to be interrogated. Based on a scrutiny of all Westbound Flights entering MNPSA during the busy period 1 July 1988 to 7 July 1988 inclusive; this would require questioning some 18 flights per day.

  Alternatively -

- Only the General Aviation/Private operators should be questioned. A ready means of identifying such a sample might be to check only those aircraft using the tail number (i.e. N-1234 or GABCD) as their callsign. A scrutiny of the sample referred to above shows that of 1935 Westbound Aircraft, 57 operated with their tail-number as the callsign and of these, 41 were requesting MNPS levels (i.e some 6 aircraft would need to be questioned per day).

ii) It would be important to ensure that these procedures be afforded maximum publicity so that intending MNPSA users were aware that tactical monitoring was to be introduced. Such publicity should include advice that, unless operators can give positive confirmation of State approval, an MNPS clearance will not be issued; a rerouting above or below MNPSA may be offered. Additionally, operators should be advised that the CMA would initiate follow-up action to confirm the "YES" replies with the appropriate State of Registry.

iii) Military aircraft need not be questioned. A Military Pilot having been authorised by his Unit for a particular flight would invariably answer "YES". Any such problems involving military flights in the NAT MNPSA can only be resolved by correspondence with State authorities concerned.

iv) Standard R/T phraseology should be developed by the relevant OACs.

1.3.5 The need for some form of tactical monitoring was accepted by the Group; however members from the Provider States, whilst indicating a willingness to explore the pre-flight verification of flight plans, could not make any commitment to the principles of in-flight monitoring on both operational and legal grounds.

CONCLUSION 25/2 - TACTICAL MONITORING OF MNPSA APPROVALS

That Provider States in the NAT Region endeavour to introduce additional procedures designed to achieve tactical monitoring of the approval status of operators in MNPS airspace (MNSPA) in order to reduce the number of non-approved operators in MNSPA. Such procedures, effected at the pre-flight and/or in-flight stage, should be implemented to the extent possible, initially on a trial basis.

1.3.6 The Group then considered the report on the standard of navigation performance of Omega equipped aircraft and the effectiveness of the additional procedures for investigating Omega related errors which were introduced at NAT SPG/24. Of the total number of 42 GNEs in the NAT MNPSA between 1 March 1987 and 29 February 1988, 7(17%) were attributed to some problems with, or failure of, the Omega Navigation System. Of the 25 table 'ALPHA' errors, 5(20%) were attributed to Omega problems and whilst this reflects an improvement over the 33% of table ALPHA errors in 1986-87, it remains high in relation to the estimated 11% of all traffic which are equipped with Omega.

1.3.7 The Group noted that in the opinion of the Omega Navigation System Centre (ONSC) of the US Coastguard, Omega errors in NAT MNPSA are largely due to equipment installation, maintenance and operator training problems. It was also the view of the ONSC that the Omega error reporting procedure should be continued as it was proving to be of value.

1.3.8 The Group therefore recommended that:

a) The Omega reporting procedure as detailed in NAT SPG, Conclusion 24/1, should be retained;

b) OACs should be encouraged to apply the procedure whenever possible; and

c) States should be reminded of the need to pay particular attention to the installation and maintenance procedures of operators seeking MNPS approval for Omega equipped aircraft. Additionally, such operators should be required to develop comprehensive crew training procedures in order to obtain optimum value from Omega.

CONCLUSION 25/3 - MNPSA APPROVAL OF OMEGA EQUIPPED AIRCRAFT

That the European Office of ICAO should remind States of the need to pay particular attention to the antenna installation, maintenance and crew training procedures of operators seeking MNPSA approval for Omega equipped aircraft.

1.3.9 The Group then considered how the observed navigation performance outside MNPSA might be improved following the poor standard achieved during the review period. Cognisant of the fact that the Required Navigation Performance Capability (RNPC) concept is being developed for global application by the ICAO RGCSP, the Group accepted that it will become necessary to establish a required level of navigation performance for the NAT Region outside of MNPSA. The Group then agreed that, wherever possible, studies should be undertaken to evaluate the current navigation performance achieved by non-MNPS traffic, in order to determine whether the present standard is acceptable and to develop a required standard for the future.

1.3.10 The navigation performance capability of aircraft operating above MNPSA was discussed at length. These aircraft are permitted to climb through MNPSA to reach cruising levels and, should they experience any in-flight emergency or operating difficulties, they may require to descend and operate at MNPS levels. In widening the debate it was decided to include a consideration of two options relating to the expanded application of MNPS separation minima into the airspace above FL400, the present MNPS ceiling. One option provided was to apply MNPS lateral separation (60NM) between MNPS approved aircraft above the MNPS ceiling whilst retaining the existing 120NM lateral separation between MNPS and non-MNPS traffic, as well as between non-MNPS traffic. The other option was to expand MNPSA up to FL420/FL440/or FL460. The Group discussed this matter in detail under Agenda Item 2 (cf. para 2.1.1.3).

1.3.11 In examining navigation errors outside MNPSA, the Group noted that 4 errors were attributed to LORAN failure. Some doubt existed as to whether these were all 'failures' as the problems may have been due to operations outside ground-wave coverage. The use of LORAN as a NAT long-range aid was discussed and it was agreed that a better coverage diagram was required in the ICAO NAT Guidance Material - NAT Doc 001, T 13.5N/5, together with more detailed guidance on NAT routes for which LORAN was suitable. The member from the United States provided the draft text of their guidance on the approval of LORAN 'C' for NAT MNPS operations and this, together with a new coverage diagram, will form the basis of an amendment to the ICAO NAT Guidance Material. This will be submitted to the European Office of ICAO by the United Kingdom.

1.3.12 The Group then considered a suggestion to employ a lateral separation standard in MNPSA which was slightly more than 1° latitude (e.g. 67 NM). The anticipated benefit from such a standard was derived from the fact that the most common navigation error in MNPSA is a 1° waypoint insertion error which places the offending aircraft on an adjacent track. Much debate centred on whether such a separation standard, with its more complex latitude values (5607N; 5714N; etc. instead of 5600N, 5700N, etc.), would increase or reduce waypoint errors. The proposition was rejected when it was pointed out that such a separation standard would be impractical to apply by oceanic controllers. It would also require the realignment of the Oceanic and Domestic entry/exit points. Such reorganization could not be justified particularly as ADS was seen to be the answer to the virtual elimination of waypoint errors.

1.3.13 Following its decision at NAT SPG/24 to require aircraft to carry 2 Flight Management Systems (FMS) in addition to 2 Inertial Reference Systems (IRS) for a full MNPS approval, the Group considered whether 1 FMS (+ 2 IRS) would be acceptable for operation on "Special Routes" along lines of longitude. The suggestion being that in the event of the FMS failure the pilot could assess his position relative to track by reference to the longitude counters of the IRS. Such a route (routes) could be established along 12°W and/or 16°W longitude between United Kingdom/Ireland and the Canary Islands as contingency routes for use in the event of ATC industrial disputes. The proposal was seen to be a further weakening of the MNPS concept, providing yet another level of navigation capability e.g. given that the FMS failed there would be no automatic track guidance to the auto-pilot. It was agreed that the member from the United Kingdom would circulate full details of the proposal to all concerned for further consideration.

1.3.14 As in previous years, the Group noted the part played by the OACs in containing the number of gross navigation errors through timely intervention to prevent incorrect routeings.

1.3.15 Within the period of the monitoring year, Gander OAC advised the Central Monitoring Agency (CMA) of a total of 78 occasions when mistakes were noted and action taken by ATC to prevent a gross navigation error. The causes for these mistakes may be broken down as follows:

a) 27 instances in which the aircraft stated that it had been so cleared;

b) 14 instances in which no explanation was apparent for an incorrect forward estimate;

c) 11 instances in which the data passed between control centres proved to be incorrect. These instances included cases in which computer displays were incorrect as well as periods of "computer down";

d) 9 instances in which the aircraft used the route shown on its flight plan instead of its clearance;

e) 6 instances in which an incorrect readback of clearance was not identified, or claimed by the aircraft not to have been identified by ATC;

f) 5 instances in which the aircraft admitted a mistake had been made, although not identifying the type of mistake;

g) 4 instances in which the aircraft used incorrect oceanic track information;

h) 1 instance in which the aircraft claimed that it had not received a second re-clearance;

i) 1 instance in which the aircraft used a combination of the original and the reissued clearance.

1.3.16 A scrutiny of the category of aircraft involved in the incidents noted at para 1.3.15 above, together with consideration of the national language of the operator showed the following results:

OPERATOR/ BRREAKDOWN	AIR CARRIER	GA	MILITARY
No. of incidents	52	11	15
% of incidents	67%	14%	19%
National Language - English - Non-English	 29 23	 9 2	 14 1

1.3.17 The Table shows that all categories of users are prone to this type of incident. It is unusual perhaps in that major air carriers do not compare favourably with other users. A previously expressed view that ATC Loop Errors may be the result of misunderstandings due to language difficulties is not supported by the English/Non-English speaking breakdown.

1.3.18 During July 1988, Shanwick OAC controllers were required to note occasions on which aircraft position reports were queried. The frequency of these queries varied between 6 and 22 per day, totalling 400 during the month. This total covers all queries concerning position co-ordinates, estimates or routeings. It is not possible to assess how many of these queries would have presented GNEs.

1.3.19 These incidents highlight the value of the vigilance displayed by the OACs in safeguarding the navigation performance of aircraft operating in the NAT Region.

1.4 Methods of improving the current monitoring procedures

1.4.1 The Group considered a series of spot-checks carried out by Canada, Iceland, the United Kingdom, and the United States to determine the MNPS approval status of selected operators and also to evaluate the correct insertion of the letter X (denoting MNPS approval) in Item 10 of the ICAO flight plan by MNPS users. It was shown that operators intending to operate in MNPSA fail to enter the appropriate 'X' between 3 to 7% of occasions. There were also a few instances of the letter 'X' being entered although the flight was not planned for operations in MNPSA. Spot checks continue to identify flights operating within NAT MNPSA without the approval of their State of Registry. The response from States of Registry in following up queries on approvals and/or in cases where the letter X has been excluded is generally good although in some cases a considerable delay is incurred. The Group agreed that, if after all means had been explored, no response to a query requesting confirmation of approval had been received, it would be assumed that no approval had been issued. It is believed that these checks constitute a useful means of hightening the awareness of States and of the confirmed/potential offenders of the MNPS requirements. The Group recommended that similar spot-checks on MNPS approvals continue to be conducted on a random basis by NAT Provider States.

1.4.2 It was noted that throughout the period under review the zeta error rate for Random Traffic remained at a level close to the 1.95 X 10^{-4} 'Action' line. On several occasions during the year the CMA had drawn attention to the fact that although the Random error rate was high the occupancy level within Random airspace was considerably lower than that experienced on the OTS, the basis of the collision risk calculations. By applying the actual 'Random' Occupancy level calculated at NAT SPG/24 (para 1.2.8 of the NAT SPG/24 Report refers) of 0.34 compared to the assumed level of unity, the collision risk in Random airspace was shown to be well within acceptable limits. The Group, whilst appreciating this approach, recommended that, if possible, steps should be taken to include the actual occupancy levels in the calculation of the Random error rates/risk so that such explanations become unnecessary.

1.4.3 The Group was advised that in the monitoring period which commenced on 1 March 1988 a particular airline had experienced three gross navigation errors within a period of three months. In accordance with established procedures the CMA had written to the State of Registry of the particular company requesting confirmation that the company was still considered capable of meeting the MNPS requirements.

1.4.4 The Group expressed its appreciation of an offer from Portugal to consider providing additional radar monitoring of the navigation performance of aircraft entering/exiting the NAT airspace. The scope and details of the monitoring were agreed between Portugal and the United Kingdom and will be established, initially, on a trial basis.

1.4.5 Following an assessment of the implications of the offer by Canada to extend the monitoring window along the southern limits of the Gander/Moncton FIR boundary (NAT SPG/24 - Report, para 1.4.3 refers), the Group agreed that such monitoring would provide valuable information on the navigation performance of a sub-set of MNPS aircraft which could not be obtained elsewhere. The Group expressed its appreciation of this additional work undertaken by Canada.

Timely receipt of oceanic clearances

1.4.6 Pursuant to its discussions at the last meeting (NAT SPG/24, para 1.3.5 refers), the Group dealt with the question of aircraft arriving at the oceanic boundary without having received an oceanic clearance. It was recalled that Provider States had been requested to ensure that adequate co-ordination arrangements between domestic and oceanic ACCs are provided to prevent such situations. Information provided by Canada showed that the lack of timely receipt of oceanic clearances was not a recurrent factor within Gander OAC. However, those occurrences could be attributed to various circumstances such as: controller workload, clearance delivery frequency congestion, interphone congestion or failure of the aircraft to make timely contact with the ATC unit.

1.4.7 Recognizing that a common failsafe procedure for the timely issuance of oceanic clearances cannot be achieved easily, the Group agreed that all NAT Provider States, in conjonction with adjacent domestic ACCs, should agree and publish procedures relating to both the timely issue of oceanic clearances and the action to be taken should an aircraft arrive at the oceanic boundary without a valid oceanic clearance.

CONCLUSION 25/4 - TIMELY RECEIPT OF OCEANIC CLEARANCE

That Provider States in the NAT Region:

a) establish required co-ordination procedures between domestic and oceanic ACCs to issue clearances sufficiently early prior to the aircraft crossing the oceanic boundary;

b) publish in appropriate aeronautical information publications the requirement for pilots to obtain a valid oceanic clearance or alternative instructions prior to crossing the oceanic boundary; and

c) publish in appropriate aeronautical information publications relevant procedures to be followed by pilots when the aircraft reaches the oceanic boundary without an oceanic clearance.

Attachment A to
Summary on Item 1

CLASSIFICATION (See Note 1)	30 NM ETA ERRORS	ERROR					
		50 - 70 NM (ZETA ERRORS)					
		TOTAL MNPS TRAFFIC		OTS TRAFFIC		RANDOM TRAFFIC	
		Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
A	10 (1)*	1	1.00	0	0	1	1.00
B	1 (3)*	0	0	0	0	0	0
C1	4 (3)*	3	1.38	1	0.46	2	0.92
C2	4 (4)*	4	1.84	0	0	4	1.84
D	1 (0)*	0	0	0	0	0	0
E	1 (1)*	1	2.00	0	0	1	2.00
F	4 (4)*	2	2.00	0	0	2	2.00
Not Classified	0 (0)*	0	0	0	0	0	0
Total	25	11	8.22	1	0.46	10	7.76
Total in last period	16	5	4.38	1	1.46	4	2.92
Observed traffic		129458		77675		51783	
Last monitoring period		116494		69896		46598	
Permissible number of errors within MNPS Airspace	68.61 (5.3×10^{-4})	16.83 (1.3×10^{-4})		10.09 (1.3×10^{-4})		6.73 (1.3×10^{-4})	
Permissible number of errors before action based on operational judgement is required	102.91 (7.95×10^{-4})	25.24 (1.95×10^{-4})		15.14 (1.95×10^{-4})		10.09 (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

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 the airspace users by ATC.

2.1 Air Traffic Services Operations

2.1.0 The Group dealt with the following matters regarding NAT air traffic services operations:

a) application and refinement of separation standards;

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

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

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

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

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

2.1.1 Application and refinement of separation standards

Expanded application of MNPS separation minima

2.1.1.1 As a follow-up to NAT SPG Conclusion 24/4, the Members from Canada and the United States presented the results of their studies concerning the expanded application of MNPS separation minima. Two options were considered:

i) amending the NAT SUPPs (Doc 7030) so as to permit the application of reduced lateral separation minima between MNPS certified aircraft while operating exclusively above the MNPSA; or

ii) raising the upper limit of the MNPSA.

2.1.1.2 In the ensuing discussion, it was pointed out that aircraft can already operate above MNPSA with the reduced separation standards, provided the aircraft concerned have passed through MNPSA. It was also mentioned that undue penalties could be imposed on non-certified aircraft that currently use the airspace above MNPSA if the upper limit is raised. It was also argued that the first option might well be feasible given that the controlling authority could identify Approved/Non-approved Operators. Within the present environment such identification would, of necessity, rely on the integrity in the use of the letter 'X' in Item 10 of the filed flight plan, as well as the establishment of a method of displaying this information to the controller. However, regular spot checks already carried out on the use of the letter 'X' raised serious doubts as to its operational value. This situation could be improved if a system of monitoring, as proposed in paragraph 1.3.4, were to be used, and if it would be possible to modify existing software to extract and display data from Item 10. Also, in order to provide monitoring of aircraft navigation accuracy within the environment of the expanded use of MNPS separation criteria, it would be necessary to obtain traffic counts for Approved/ Non-approved Operators above FL400 together with regular core samples of the track keeping accuracy of the aircraft population. Some members raised doubts concerning the number of aircraft that would be affected by any changes and whether operators would in fact be penalized, bearing in mind the availability of the special routes.

2.1.1.3 A statistical analysis of available data for the airspace that exists above the current MNPSA (FL 410 - FL 450) showed that the composition of that sub-population is different from that which occurs within the MNPSA and that the error rates for the user categories are generally larger than their counterparts in the current MNPSA. Because of the small amount of traffic in this area, compared to the entire MNPSA, the overall effect would not appreciably change the rate of larger errors, especially if the sub-population were to exhibit the same error rates as observed in the random area today (para 1.2.34 refers). As a consequence of the foregoing considerations together with the unease expressed concerning the poor performance of non-MNPS traffic, the Group could not reach a consensus on the merits of one or other of the options until further studies had been completed. It was agreed that the matter should be reviewed by the next NAT SPG meeting with the objective of reaching a decision.

CONCLUSION 25/5 - ACTION BY THE CENTRAL MONITORING AGENCY (CMA)

That the CMA should undertake studies to determine the navigation accuracy of non-MNPS traffic above and below MNPS airspace. Such studies could also provide data on Flight Level utilisation and establish the frequency and causes of all Gross Navigation Errors above FL 400 in the NAT Region.

Application of reduced separation minima in the Gander Oceanic Control Area

2.1.1.4 The Member from Canada informed the Group that helicopter operations from the East coast of Canada to a position approximately 200NM East of the Western boundary of the Gander OCA have increased substantially. The Group was also informed that these aircraft operate up to FL100 and that they are equipped with normal short range navigation equipment as well as LORAN C or OMEGA/VLF. The oil rigs to which these helicopters operate are equipped with an NDB and efficient ATC communications are provided via HF. It was then explained that the application of 120NM lateral and 30 minutes longitudinal separation does not lend itself to the provision of efficient ATC service and that operators were being unduly penalized.

2.1.1.5 With the above in mind, the Member from Canada explained that reduced separation could be applied taking into account the accuracy of the navigation systems used provided this accuracy is in conformance with the ICAO guidance material on area navigation (Circular 111-AN/83) and meets the specifications contained in FAA advisory circular AC 90 - 45A. Accordingly, protected airspace of $\pm$ 10NM each side of the RNAV route could provide sufficient protected airspace to meet the 95% containment requirement for enroute operations with navigation equipment that meets the above-mentioned specifications. Furthermore, this reduced separation would only be used between helicopters that would meet Transport Canada's certification requirements.

2.1.1.6 The Group endorsed in principle the proposal and noted that Canada would seek ICAO approval for the application of reduced separation in the area concerned, taking into account the necessity of clearly specifying the separation standards that would be used, the certification process and the route structure.

Longitudinal separation between MNPS certified aircraft

2.1.1.7 As a follow-up to NAT SPG/24, the Member from Canada presented the results of the study carried out concerning the application of the provisions of paragraph 7.2.2 of the NAT Regional SUPPS (Doc 7030). The problems stem from the fact that the angle between many of the diverging polar track pairs is rather narrow. This, combined with the fact that "significant points" are often spaced at short distances along track because of meridian convergence near the Pole, makes the requirement to achieve at least 60NM lateral separation at or before the next significant point extremely difficult to satisfy. In order to ensure continuing separation under the present application of the rule, controllers are obliged to either reroute aircraft or else provide vertical separation between aircraft which diverge on adjacent tracks with minimum longitudinal separation at the common point. Neither option is desirable from the user's point of view because of the time and fuel penalties.

2.1.1.8 In considering the distances between some potentially significant points in the more southerly latitudes of MNPS airspace, it becomes clear that the distance (and therefore the flying time) to "the next significant point" is far from a fixed value. That being the case, the angle of divergence between any two tracks may also vary widely. Therefore, it has been suggested that it would facilitate more efficient and consistent application of separation if the requirement to achieve 60NM lateral separation could also be described either in terms of time or miles to fly instead of only the "next significant point".

2.1.1.9 In view of the need to cater for these specific situations, the Group developed a proposal for amendment to ICAO Doc 7030/4-NAT as contained in Attachment A to the Summary on this Agenda Item.

CONCLUSION 25/6 - AMENDMENT TO NAT REGIONAL SUPPS

That:

a) the NAT Regional SUPPS regarding procedures for operations wholly or partly in MNPS airspace (subsonic aircraft) in the NAT Region (Doc 7030/4-NAT, Part 1, para 7.2.2) be amended in accordance with the material contained in Attachment A to the Summary on Agenda Item 2;

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

c) the Member from Canada take the necessary steps to amend "The Practical Application of Criteria for separation of aircraft in the NAT Region".

Application of separation standards over Southern Greenland

2.1.1.10 The Member from Canada informed the Group that in accordance with the NAT SUPPS (Doc 7030), the availability of navaids in Southern Greenland permitted the application of the separation minima specified in the PANS-RAC (Doc 4444). The application of these separation minima would improve the provision of ATS to the users of this airspace. However, in order to ensure Gander OAC is continuously aware of the availability of these NDBs, an agreement will be reached with Denmark. The Representative from Denmark agreed with the proposed action. The Group supported this position and noted that the procedures to be used over Southern Greenland would be published in the relevant AIPs.

Longitudinal separation during a level change

2.1.1.11 The Member from the United Kingdom brought to the attention of the Group a potential problem that could arise in the application of NAT/RAC SUPPS, paragraph 7.2.2.1. 2). It has been found that, when one aircraft at FL350 M086 followed by another at FL310 M080 and the 5 minutes required at the common point exists in accordance with the "sliding scale", and then the aircraft at FL310 climbed to FL350, the separation at the next common point was reduced to 3 minutes. This erosion of separation was caused by significant wind differences between FL310 and FL350 and the delay in issuing the clearance after the aircraft had passed the preceding significant point.

2.1.1.12 The Group recognized this matter was of concern, however, more in depth analysis was required as it normally only arose when using automated systems. It was agreed that the Provider States would co-ordinate amongst themselves and, if the need arose, the United Kingdom would submit an amendment proposal to the NAT/RAC SUPPS. In the meantime, a software patch that restricts the use of the SUPPS provisions in question has been incorporated in the FDPS at Shanwick OAC in order to prevent a re-occurrence of the situation.

2.1.2 Review of domestic/oceanic interface problems and transition problems adjacent to NAT MNPS airspace

Communications failure-transition from oceanic to domestic airspace

2.1.2.1 A problem caused by communications failure could occur when an aircraft is rerouted and the landfall at ocean exit differs from that contained in the flight plan and confusion could be created in the crew's mind by uncertainty over which communications failure procedure should be used. The Group agreed that the potential for uncertainty did exist, however the need for common procedures was not clear. Nevertheless, it did agree that when reviewing the MNPS Operations Manual the above should be kept in mind, and that applicable procedures should be promulgated in all AIPs. In this respect, it was noted that Canada had already published such information in its AIP.

CONCLUSION 25/7 - COMMUNICATIONS FAILURE DURING TRANSITION FROM OCEANIC TO DOMESTIC AIRSPACE

That States concerned publish in their respective AIP's the procedures to be followed in the event of a communication's failure with an aircraft that is re-routed and the landfall at oceanic exit differs from the flight plan.

Shannon Oceanic Transition Area (SOTA)

2.1.2.2 In accordance with NAT SPG Conclusion 24/5 c), the Group was informed of the following developments concerning SOTA:

a) the basic features such as boundaries of airspace to be delegated to Shannon ACC, link routes, ATC procedures to be applied, separation standards and data exchange arrangements are agreed subject to the exchange of appropriate Letters of Agreement between Shannon/Brest; Shannon/London and Shannon/Shanwick;

b) the provision of the necessary communications, data exchange lines and associated links, as well as the training of the required ATS staff is currently under way;

c) the requirement to provide a UHF communication channel had been reviewed and was no longer felt to be justified;

d) the facilities required to support the SOTA arrangement have been costed. In this context discussions will shortly be arranged with IATA regarding the costs involved and the associated recovery method to be used; and

e) due to some slippages and the time required for adjustments to certain link routes and their promulgation, coupled with the development of a software interface with the Shanwick FDPS, it is now expected that the SOTA will become operational towards the end of 1989.

Problems associated with the differences between Oceanic and Domestic separation standards

2.1.2.3 The Group recalled that the substantial differences between domestic and oceanic longitudinal and lateral separation is one of the interface problems between domestic and oceanic operations. With respect to the interface between United States domestic airspace and the New York Oceanic Area, the Member from the United States informed the Group that when the major flow is eastbound,the domestic controller, because of the restricted size of the airspace in which to work, must establish the required oceanic separation in the limited airspace available. Additionally, when aircraft request a higher altitude for the oceanic crossing, the distance is insufficient to permit the aircraft reaching the altitude by the entry point. The transitional problems adjacent to NAT MNPSA are similar to the domestic/oceanic disparities as well as with airspace not identified as MNPS.

2.1.2.4 It was realised that a substantial reduction in oceanic separation standards may only be obtainable through the introduction of Automatic Dependent Surveillance (ADS) and/or improved navigational capabilities which may also offer some relief in solving the Oceanic/Domestic interface problems.

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

Use of ship borne military radar in oceanic CTAs

2.1.3.1 The Group examined the possibility of using ship borne military radars for the purpose of separating from general air traffic military aircraft that were proceeding from their bases to the operational area. During this examination, it was clearly understood that such separation would be limited to the horizontal plane and would never involve military aircraft carrying out high speed or operational manoeuvres; stationary temporary airspace reservations would still be required for those purposes. A further consideration was the competence of the military air traffic controllers who would provide the service. It was considered that the total volume of airspace reserved for the military use could be significantly reduced to the benefit of civil users.

2.1.3.2 Whereas there was general support for the concept of improving airspace utilization, several issues were raised that gave concern to the Group. One important matter that would need to be addressed was the legal aspects of the responsibility for the provision of air traffic services in airspace over the high seas. There was also the problem of agreements with all military agencies that may be involved as well as the requirement to meet international civil aviation standards. Because of these unresolved issues, the Group agreed that the subject was not mature enough to pursue at this time. Nevertheless, they were of the opinion that the Member from the United Kingdom should continue to explore this matter and to keep the NAT SPG informed of any progress.

Extension of the application of the Datum Line Technique

2.1.3.3 In response to a query from IATA concerning the application of the Datum Line Technique South of the OTS, the Members from Canada and the United Kingdom advised that trials are planned to commence in the last quarter of 1988.

Improvements to the Air Traffic Services in the Western Atlantic Route System (WATRS)

2.1.3.4 The Member from the United States informed the Group of the latest developments in the WATRS area, particularly the National Airspace Review's recommendation that the FIRs comprising the area be consolidated. The Group noted that WATRS is currently comprised of portions of Miami, New York and San Juan OACs. The mandatory reporting by aircraft and the required inter-facility coordination are based on the three centres' boundaries which leads to communications congestion (fixed and mobile). The consolidation of all non-radar oceanic airspace at New York centre should lead to improved traffic management, a reduction in delays, more balanced traffic, less reroutes, more optimum altitude assignments and a reduction in communications congestion. Finally, the reduction in the necessary coordination should reduce human errors. The Group took note of the problems that could arise if differing SUPPS for two ICAO regions (CAR and NAT) would have to be applied by one ATS unit (para 2.1.4 refers).

2.1.4 Airspace organisation in the Miami, New York and San Juan Oceanic Control Areas

2.1.4.1 At its 24th Meeting, the Group had been presented with an update by the Member from the United States on the proposal to reorganize air traffic services in the Western Atlantic Route System (WATRS) (para 2.1.3.4 also refers).

2.1.4.2 At this meeting, the Group was presented with the following status report on implementation of the proposal:

a) Phase I of WATRS began on November 19, 1987. New York Centre implemented a traffic management programme which selects the entry point into WATRS based on departure point and destination. One of the primary objectives is to minimize the crossing of flight paths. As in a track environment, this gives ATC the ability to optimize altitude allocation usage which is based on major flow periods. Also, an additional route was added to accommodate the traffic requirements to the Western Caribbean; it is laterally separated from the Eastern Caribbean routes. Originally, both routes entered New York OCA at the same point (CHAMP Intersection) and converged on the northern flow. Phase I has been operational since 19 November 1987 and has been very successful.

b) Phase II of WATRS (Reduction of longitudinal separation to ten (10) minutes using mach number technique (MNT) in lieu of the current fifteen (15) minutes) should be implemented in the early part of 1989. A proposal was submitted to ICAO in August 1988 to amend the applicable NAT and CAR SUPPS (Doc 7030).

c) Phase III of WATRS (Redesignation of WATRS airspace to MNPS) is still under review by the administration.

d) Phase IV of WATRS (Harmonization of CAR and NAT procedures) has been put into motion. New York oceanic is acquiring all the non radar portions of Miami and San Juan centers.

2.1.4.3 With respect to Phase III above, the Member from the United States informed the Group that alternate ways of increasing system capacity in the WATRS Area are currently under review. A decision by the United States to propose the expansion of MNPSA to include the WATRS Area will not be taken until a review of those studies is completed by his Administration.

2.1.5 Extended-range twin-engined operations (ETOPS) in the NAT Region

2.1.5.1 The Member from the United States informed the Group of the latest action the Federal Aviation Administration (FAA) had taken in regards to ETOPS. He mentioned that the FAA had distributed a draft revision of its Advisory Circular, (AC 120-42), Extended Range Operations (ETOPS), to the aviation industry on July 29 1988. This draft incorporates the type design, maintenance, and operations programs necessary for aircraft certification and operational approval of extended range (ER) operations up to 180 minutes. The basic criteria had been discussed previously in meetings with manufacturers, operators, pilot groups and international governmental authorities. Following the distribution of the draft to these groups, a series of meetings have been arranged to discuss issues on which they disagree.

2.1.5.2 The Member from the United States mentioned that the international authorities and the FAA are in basic agreement on the criteria for 180-minute operations and plan to continue to discuss unresolved issues. The FAA does not see any obstacles which would change the plan to publish the revised AC by January 15, 1989.

2.1.5.3 As a follow on to this presentation, the Group discussed the application of the 120 minute limit, which can go up to 138 minutes when the 15% proviso is considered, in the NAT Region. The diversion envelope of ETOPS aircraft would be increased, therefore more of these types of operations will enter the core OTS. Because of the different operating parameters, (e.g. lower mach number), some operational ATC problems may arise, particularly in respect of longitudinal separation. The Group agreed that the situation should be closely monitored in order to be able to react to this problem should it arise.

2.1.5.4 Another issue that was raised by the Group concerning ETOPS was the actual operational problems associated with re-routes issued by ATC. In many cases, ATC is not aware of the inability of ETOPS aircraft to be re-routed as the new routing may take the aircraft outside its diversion envelope.The obvious solution seemed to be that ATC should be provided with advance notification of any particular limitation concerning such operations. It was agreed that States concerned would take the necessary steps to make this requirement known to ETOPS operators by the most appropriate means.

2.1.5.5 The Group was informed by the Secretariat of recent considerations of the ICAO Air Navigation Commission (114-5, 114-6) in respect of ETOPS and in particular of reported shortcomings in the availability of actual and forecast weather data in the North Atlantic airspace for such operations. It had been reported to the Commission that problems were encountered in practice in obtaining the required weather information both before and during flight.

2.1.5.6 With respect to the provision of information to ETOPS in flight, the Group recalled that it had discussed this matter at its previous meeting in the context of HF VOLMET broadcasts and had concluded that the situation was satisfactory until new requirements materialise (paras 2.2.27 and 2.2.28 also refer).

2.1.5.7 The Group undertook to monitor ETOPS in the NAT Region in its routine work noting also that the Secretariat would attempt to obtain further information of any reported shortcomings.

2.1.6 ATS operational contingency planning in the NAT Region

2.1.6.1 When reviewing this subject, the Member from the United Kingdom informed the Group that his Administration is actively considering contingency Planning at this time. The Group agreed that the NAT SPG/24 decisions on this matter still held good and that this point should remain on the work programme.

2.2 Communications Operations

2.2.1 The discussions on this item were separated into a) fixed services and b) mobile services.

Fixed Services

AFS/AFTN circuits in the Northern part of the NAT Region

2.2.2 The meeting was presented with implementation information concerning the AFS and AFTN circuit requirements as provided by Canada, Denmark, Iceland and the United Kingdom under the DEN/ICE Joint Financing Agreement. The information was derived from the report of the 7th Informal NAT AFS/AFTN meeting (May 1987). It was noted that these circuits were now provided by satellite or transatlantic cable. It was confirmed that the SCOTICE and ICECAN cables were abandoned in December 1987 as planned. In the case of Iceland, communications were now via satellite only.

2.2.3 It was recalled that at the NAT SPG/24 meeting the following additional circuit requirements were agreed:

a) voice communication between Gander OAC and Søndrestrøm FIC;

b) data link between Reykjavik OAC and Gander OAC;

c) data link between Reykjavik OAC and Shanwick OAC.

It was stated that the circuit referred to in c) has now become operational and was working satisfactorily. The circuit in a) had been working using the military troposcatter link between Reykjavik and Søndrestrøm. Following failure of this link, this circuit ceased to operate in the Summer of 1988. It is now planned to have this link (Reykjavik-Søndrestrøm) implemented via satellite. The circuit referred to in b) was under consideration. It was also recalled that, at the appropriate time, the States concerned with these circuits would present formal amendment proposals to include them in the NAT Air Navigation Plan.

Inter-centre data communications

2.2.4 On-line data interchange via satellite was introduced between Shanwick and Reykjavik in June 1988. The United Kingdom is investigating with Iceland the possibility of an HF back-up facility using modern techniques to allow speech and data transfer to cover outages of the satellite link. Shanwick is now "on-line" with Ballygirreen, Gander, Reykjavik, Scottish Airways and Shannon. These links reduce the telephone workload between centres para 3.1.15 also refers).

Mobile Services

Review of the HF and GP VHF communications in the NAT Region

2.2.5 It was recalled that, at the NAT SPG/24 meeting, it was decided to have the customary NAT HF and GP VHF data collection exercise in 1989. It was also noted that individual States continued to monitor frequency utilization to ensure efficient management of the communication facilities.

2.2.6 The results of such an exercise with regard to Gander IFSS covering the peak traffic months of May, June, July and August for the years 1984 to 1987, were presented to the meeting. The purpose of the exercise was to compare the results for 1987 with those of previous years and to see whether there were any significant changes or trends. The conclusion from the results of that exercise showed that there was an increase in the amount of traffic handled by Gander IFSS during the period covered.

2.2.7 Statistical information, broadly similar to that for Gander IFSS but relating to Iceland Aeradio covering 1987 and previous years was also presented to the meeting. Here again the results showed a steady increase of traffic load on the frequencies, 52% in total compared with 1983 traffic (57% on GP VHF and 46% on HF).

2.2.8 The Members from Ireland, Portugal and the United States stated that they also had an increase in traffic during the 1983-1987 period, with a continuing upward trend in 1988.

2.2.9 Referring to its previous Conclusion 24/8, which had called for a data collection exercise to be conducted in 1989, the Group once again considered whether it was worthwhile to continue having such exercises in the future noting that they involved considerable effort and expense. The general opinion was that these exercises should continue (although not as frequently as in the past) since they were the main means of assessing whether particular frequencies and the system as a whole were becoming overloaded. It had already been shown from statistical data presented earlier that the traffic loading on the HF and VHF frequencies had increased significantly and therefore such an exercise would assist in any anticipatory action that might be needed to alleviate problems on frequency congestion that may arise. IATA considered that these exercises should be held as frequently as before. It also was of the opinion that "peak hour delay" for position reports should be derived in addition to "mean delay"*. The Group had discussed this matter at length, but considering the effort and expense and the value of the results that would be obtained, decided to have only "mean delay". The Group decided to have a data collection exercise in 1989 with similar arrangements as in previous years. It was also agreed to include information on reports of harmful interference to NAT frequencies since this problem still existed as indicated elsewhere in this report.

CONCLUSION 25/8 - NAT HF AND VHF DATA COLLECTION IN 1989

That:

a) a three-day NAT HF and GP VHF data collection be conducted in 1989 with the same arrangements as agreed for 1986; the data should be related to three days when the alignment of the Organised Track System was Northabout, Central and Southabout;

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* 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.

b) Ireland will co-ordinate the data collection and, in consultation with other participating States, select suitable dates for the exercise. The information is to be conveyed to all participants in September 1989;

c) States concerned will retain data from Bodø, Cambridge Bay, Churchill, Gander, Iqaluit, New York, Reykjavik, San Juan, Santa Maria and Shannon on all air-ground messages for July, August and September 1989 until the dates have been selected;

d) in addition to the normal breakdown of position report messages (those read back only), the data collection should also include total message traffic, broken down by time, frequency and mean delay;

e) the data should include information on the nature and extent of any harmful interference to NAT frequencies during the period from 1 June to 31 October 1989;

f) States concerned should send the results of the exercise to the United Kingdom by the end of November 1989 to the following address:

Civil Aviation Authority C (G) 2
Room T 806
CAA House
45-59, Kingsway
LONDON WC2B 6TE

g) the United Kingdom will collate the results and send the final report to the European Office of ICAO by the end of January 1990, for distribution to NAT SPG members and COM experts concerned.

Congestion on 127.900 MHz

2.2.10 The Group noted that severe congestion existed on 127.900 MHz; statistics presented also indicated an increase of traffic on HF and VHF frequencies. It was also noted that the introduction of ETOPS had increased the load on 127.900 MHz. In fact, this frequency had been carrying too much traffic in the past and, in addition, there was cross-talk interference due to use of the same frequency by Shannon and Iceland Aeradios. With particular reference to the GP VHF on 127.900 MHz, it was recalled that the Group at its last meeting had identified a likely requirement for an additional GP VHF channel for use in the Reykjavik OCA. The Group agreed that a requirement for an additional GP VHF channel was now evident and that it should be provided to relieve this situation. In order to eliminate all possibilities of mutual interference, frequencies other than 127.900 MHz should be sought for the new and existing channels operated by Iceland. Therefore, the meeting made the following conclusion:

CONCLUSION 25/9 - ADDITIONAL GP VHF CHANNEL IN REYKJAVIK OCA

That:

a) an additional GP VHF channel for use in Reykjavik OCA be provided by Iceland;

b) the frequencies used for the additional and existing GP VHF channels operated by Iceland be other than 127.900 MHz; and

c) the Member from Iceland take the necessary action with his Administration to process the required changes to the ICAO NAT Air Navigation Plan.

Harmful interference to NAT HF operations

2.2.11 Information provided to the meeting showed that harmful interference to HF frequencies has continued although the situation had not deteriorated. In cases where the source could be identified and the interference was prolonged, action was taken directly with the appropriate authorities to remedy the situation. When this did not prove effective, formal reports were sent to the International Telecommunications Union (ITU) according to established procedures. It was stated that informal contact between the EUR Frequency Co-ordinating Body (FCB) members concerned in specific incidences had proved to be quite effective in the past. It was agreed that this subject should continue to be monitored in the future and the results reported to the Group.

Similarity of aircraft callsigns

2.2.12 At the NAT SPG/24 meeting it was reported that Gander was experiencing, rather frequently, cases where aircraft with similar callsigns were operating simultaneously within the same airspace. It was confirmed that this situation had continued and was reported at other centres as well. In the case of Gander, the solution adopted was to contact the aircraft operators concerned to resolve this potentially dangerous situation. This procedure has worked well and a marked decrease has been noted in the number of aircraft operating with similar callsigns in the Gander OCA during 1987. The Group was in agreement that that procedure appeared to be the best approach to resolve such situations and it should continue to be applied.

Transition from HF to satellite communications in the NAT Region

2.2.13 The Group was in agreement with the FANS Committee that HF communications would be replaced by satellite communications commencing in the 1990s. It was envisaged that there would be a long transition phase involving consideration of several complex factors. Some of the questions that have to be taken into account are the level of back-up HF communications necessary during the transition phase, the back-up HF communications that would remain in a satellite environment, the necessity of maintaining the integrity of the present system until full satellite implementation. In view of these factors the Group was of the strong opinion that the whole question should be studied as a matter of priority with a view to drawing up a plan for the orderly and economic transition from the existing HF communications system to a satellite system. It was considered that the NAT SPG Task Force should address this particular issue (see para 4.2).

NAT GP VHF coverage charts

2.2.14 At the NAT SPG/24 meeting it was suggested that gaps existed in the GP VHF coverage in Northern areas where present charts showed continuous communications coverage at 30,000 feet. It was also suggested that a minimum altitude coverage chart be developed to depict the lowest altitude at which pilots could expect continuous VHF coverage. With regard to the Northern VHF coverage at 30,000 feet, it appeared that the VHF coverage limits shown in the Canadian AIP were reasonably accurate for Canada's GP VHF facilities in Southern Greenland, Gander and Goose Bay. Based on this and other comments by the Group, it was felt that the consolidated coverage map presented to the NAT SPG/24 meeting for FL 300 was considered reasonably accurate with regard to these facilities. Therefore no changes are required to the present charts. With regard to defining a minimum level where continuous coverage was assured, it was considered that FL 300 is the minimum coverage level.

Status of implementation of the expanded SELCAL facility

2.2.15 It was recalled that the original SELCAL system used 12 tones (denoted by letters A through M except I) which provided 2970 usable codes that could be assigned to aircraft. In the late seventies it became obvious that there was a shortage of SELCAL codes that could be assigned even with multiple users of the same code. Through action within ICAO (effective 1 September 1985), the tones were increased to 16 by the addition of P,Q,R,S which expanded the available codes to 10920. To date, in excess of 1300 new SELCAL codes have been assigned from the new tone allocation. The 12-tone airborne equipment cannot accept the new codes and thus this situation restricts the assignment of codes to aircraft with such equipment. Some models of the old 12-tone equipment can be converted to accept the new codes, otherwise new equipment has to be procured.

2.2.16 The Registrar (ARINC) had, over the past four years, widely disseminated information on the availability of the new codes, new equipment, and the advantages of using them. As additional users come on stream, they are requested to determine if they can use the new codes. This is done to maximize the use of the new codes, thus minimizing the number of shared assignments on the 12-tone codes.

2.2.17 When acquiring an aircraft equipped with SELCAL, the purchaser or lessee of the aircraft must apply for a new SELCAL code. This will enable the Registrar to assign a SELCAL code which is compatible for use in the area in which the aircraft will be operated. It was noted that some aircraft operators mistakenly assume that a SELCAL code is transfered to the purchaser or lessee.

2.2.18 It was noted that all of the aeronautical stations serving the NAT Region have now been equipped with the new 16-tone ground station SELCAL tone transmitting equipment.

2.2.19 It was recalled that deficiencies noted in the operation of the SELCAL system should be brought to the notice of the Registrar using the AFTN address KDCAXAAG.

HF phone patch facilities

2.2.20 It was recalled that in the past there had been qualified support within the Group for the implementation of phone patch facilities on NAT HF frequencies. However, it was said that these facilities were not widely available and it was suggested that they should be provided for emergency use to establish direct pilot/controller communications.

2.2.21 In the discussion, the Group became aware that HF phone patching has, in the past, been tried at New York, San Juan, Santa Maria, Reykjavik and Gander. It continues to be available at New York, San Juan and Santa Maria.

2.2.22 It was the opinion of IATA that in emergency conditions the ideal situation was direct pilot to controller communications. However, in the specific case of the NAT Region it was accepted that the current communications arrangements were adequate. It was agreed that Portugal and the United States would publish in their respective AIPs, information on the availability of the phone patch facility at New York, San Juan and Santa Maria.

HF VOLMET Broadcasts

2.2.23 The Member from Ireland advised the Group that problems encountered in the past with the Shannon HF VOLMET broadcast had been resolved and that service reliability this year was virtually 100%. Specifications for the new automated HF VOLMET broadcast system were finalized; tender action was imminent and the system was expected to be in operational service by early in 1990. The Group noted that the new system would employ a speech collator rather than a voice synthesiser.

2.2.24 With regard to the New York HF VOLMET, the Group noted that the broadcast content was not consistent with the related requirements specified in the NAT Regional Air Navigation Plan. The Member from the United States indicated awareness of the problem and that the matter was being followed-up within his Administration in order to rectify the situation.

2.2.25 The Group was informed by the Secretariat of a request received from Luxembourg for the inclusion of METARs and TAFs for Luxembourg in the Shannon HF VOLMET broadcast. The Irish Administration had indicated that the present occupancy of the broadcast precluded the addition of Luxembourg aerodrome and had suggested that the matter be considered by the NAT SPG. In discussions on this matter, it was noted that the inclusion of Luxembourg information in the Shannon HF VOLMET could only be achieved at the expense of removing some other aerodrome from the broadcast. The Group felt that, in view of current operational requirements, such action could not be justified and agreed that no changes should be made to the Shannon HF VOLMET broadcast.

2.2.26 The Group then had an exchange of views of the overall question of HF VOLMET broadcast contents. From time to time proposals were brought forward for the inclusion of certain aerodromes to facilitate various airline operations. More recently, the ICAO Air Navigation Commission referred to reported shortcomings in the availability of actual and present weather data for ETOPS operations over the North Atlantic (para 2.1.5.5 and 2.1.5.6 refer).

2.2.27 The existing HF VOLMET broadcasts were considered to be satisfactorily meeting current operational requirements, and hence the Group was unwilling to embark on an overall review of the broadcast contents unless supporting evidence should indicate to the contrary. The Group was however quite prepared to review the situation whenever consolidated new requirements and especially those of the operators were placed before it.

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

2.3.1 In accordance with NAT SPG Conclusion 24/11, the Members from Canada, Iceland, Portugal, the United Kingdom and the United States presented reports on their collections of statistical data regarding operations in their oceanic ACCs. Data collected were in conformance with the specifications for the provision of statistical data by OACs to the NAT SPG, as spelled out in Attachment A to Agenda Item 2 of the NAT SPG/24-Report.

2.3.2 In the Gander OAC, it was noted that there was a substantial increase in high level traffic during 1987 (10.9%) and a corresponding increase in low level traffic (9%). There was a slight decrease in the percentage of random traffic (2.4%) compared to 1986. The effect of the datum line technique is reflected in a greater percentage of random traffic north of the OTS than in any other area. The number of tracks published on a daily basis increased slightly over 1986: eastbound 5.6 versus 5.3 and westbound 7.1 versus 6.5. The eastbound traffic was frequently able to enter the oceanic area at optimum flight levels, due in part to the flight time from departure airports and radar coverage in the oceanic boundary area, resulting in fewer step climb requests, when compared to westbound traffic. It was noted that 82% of aircraft were cleared on their requested track at or above flight planned altitude. The Member from Canada indicated that for July/August 1988, an increase of 17% over the same period last year has been observed.

2.3.3 In Reykjavik OAC, it was noted that the total number of oceanic operations assessed was 3350 during 1987, of which 81.01% were cleared on requested track and level. No instances were experienced when an aircraft was cleared on a different track and at one or more flight levels below the one requested. The division of the assessed traffic was 2.95% on OTS Routes, 11.94% on Polar Routes and 85.11% on Random Tracks. Data on enroute step-climbs indicate that 40% of the total traffic received at least one step-climb clearance, 13% two step-climb clearances and 2% three such clearances in addition to the entry clearance. The Member from Iceland also reported an overall increase of some 17% in traffic by the end of August 1988 over the same period last year.

2.3.4 The Member from Portugal informed the Group that so far in 1988, the high level (i.e. above FL275) traffic has increased by 12%. He also pointed out that July/August were the peak periods and that traffic from the EUR to the CAR/SAM region had increased with the consequent increase in complexity due to crossing tracks.

2.3.5 The Member from United Kingdom explained that data for 1987 was not available. However an analysis of available data for 1988 has shown that 73.9% of aircraft have been cleared on their requested track at or above their flight planned altitude.

2.3.6 In the NAT airspace under the responsibility of the FAA, it was noted that traffic demand is, in general, morning peak hours southbound and late afternoon peak hours northbound. This flow is affected by additional traffic on an east/west axis. Opposite direction traffic and crossing traffic is ever present throughout the major demand periods. Total systems demand for both the northbound and southbound periods has been identified as between 97 and 123 aircraft. Of this total, 74% of the flights were cleared on their requested route at their requested flight levels. The remaining flights were either off-loaded to alternate routes and/or assigned flight levels between 2,000 and 4,000 feet lower than requested. In the WATRS area preferred routing is applied with regard to point of departure and destination. This effectively balances the demand into three flows with the major flow directed to San Juan and two alternate flows directed to destinations, east and west of San Juan.

2.3.7 In the discussion that followed, the question of the usefulness of this kind of data collection was raised by IATA. The Members of the Group were all of the opinion that the information was extremely useful. It was considered that further refinements could possibly be made to the procedures that were agreed to at NAT SPG/24. Nevertheless, the Group confirmed NAT SPG Conclusion 24/11 and agreed that no changes to the data collection method were required at this time.

Attachment A
to Summary on Item 2

PROPOSAL FOR AMENDMENT TO THE (ATS) NAT REGIONAL SUPPLEMENTARY PROCEDURES

a) Originated by : Canada

b) Proposed Amendment : (See Regional Supplementary Procedures, Doc 7030/4-NAT Part 1, Rules of the Air, Air Traffic Services and Search and Rescue as modified by Amendment 170 dated 25.03.88).

Amend as follows the SUPPs applicable to the North Atlantic Region NAT contained in paragraph 7.2.2 "Operations wholly or partly in MNPS airspace (subsonic aircraft)".

Replace the text of paragraph 7.2.2.1 1) a) iii) to read as follows:

"at least 60NM lateral separation will be achieved at or before the next significant point (normally ten degrees of longitude along track(s)) or within 90 minutes of the time the second aircraft passes the common point or within 600NM of the common point whichever is estimated to occur first; or"

d) Originators reasons for amendment: : The paragraph in question states in part, that, with the use of Mach number technique (MNT), ten minutes longitudinal separation may continue to be applied between aircraft which "have reported over a common point and follow the same other form of separation is provided and at least 10 minutes longitudinal separation exists at the point where the tracks diverge, at least 5 minutes longitudinal separation will exist where the 60NM lateral separation is achieved, and at least 60NM lateral separation will be achieved at or before the next significant point (normally ten degrees of longitude along track(s))..."

The angle between many of the diverging polar track pairs is rather narrow. This, combined with the fact that "significant points" are often spaced at short distances along tracks because of meridian convergence near the pole, makes the requirement to achieve at least 60NM lateral separation at or before the next significant point extremely difficult to satisfy. In order to ensure continuing separation under the present application of the rule, controllers are obliged to either re-route aircraft or else provide vertical separation between aircraft which diverge on adjacent tracks with minimum longitudinal separation at the common point. Neither option is desirable from the User's point of view because of the time and fuel penalties.

It has been therefore suggested that it would facilitate more efficient and consistent application of separation if the requirement to achieve 60NM lateral separation could also be described either in terms of time or miles to fly instead of only the "next significant point".

Agenda Item 3: Technological developments of interest to 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 (e.g. Global Positioning System);

c) data link developments;

d) Automatic Dependent Surveillance (ADS); 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 improvements being made by Portugal to the Santa Maria Oceanic ATS System and of development plans for the projected new Oceanic Flight Data Processing and Visualization System (SATL). The Santa Maria OAC and Aeronautical Communications station have been co-located in a single OPS room. New AFTN receivers have been installed, as well as new consoles and improved telephone terminals at ATC working positions. Message transit between communications and control positions is being partially automated by using a network of micro-computers; automatic strip printing, using an independent micro-computer, is due to be introduced by the end of this year.

3.1.2 It is intended to transfer the present OAC from Santa Maria to Lisbon during 1990 retaining the current manual operation. The centre will be accommodated in an existing building, and the Lisbon Aeronautical Communications Station reactivated.

3.1.3 Operational and functional specifications for the new Oceanic System (SATL) are near finalization. A series of fast-time and real-time simulations are planned in the system development programme. Implementation of SATL is scheduled for 1992 and it is planned to extend the Lisbon domestic ACC building to house the new Oceanic Centre. Further phases of development of SATL are geared towards future CNS systems and the use of ADS.

3.1.4 The Member from Iceland updated the Group on recent activities to further develop the automation systems for Reykjavik ACC, within the frame of the long term plan reported to the previous meeting of the NAT SPG. Data from the radar site situated on the South-east coast of Iceland has been integrated into the radar data processing system of the ACC. This provides valuable radar coverage in an area of relatively heavy oceanic traffic to the South-east of Iceland where tracks frequently cross. The capability of the radar display system has been improved in that the controller may now select the radar source to be used (as opposed to a dedicated display for each individual radar), and facilities are provided for storing and replaying radar track and plot data.

3.1.5 A project has been approved by the Government of Iceland for the replacement in 1990 of two existing military radar stations and the establishment of two new long-range radars in Northern Iceland. Radar data from the new stations will be made available for use by Reykjavik ACC, thus providing continuous radar coverage over Iceland and in an area extending up to 200NM from the coastline. In addition, approval has been obtained for use of SSR data from the Faroe Islands radar station, and tests are underway to verify the reliability of existing tropo-scatter links for the transmission of the data to Reykjavik ACC.

3.1.6 The project plan for the Reykjavik ACC Flight Data Processing System (FDPS) foresees three development phases: Baseline System, Situation Displays, ADS and other advanced techniques. The Baseline system, which is currently at contract negotiation stage with implementation planned for 1992, will have all the facilities required for automatic processing of flight plans, flight data messages including position reports and data link messages from adjacent centres, as well as suitably equipped controller work stations. Conflict probe and limited conflict resolution will be an essential feature of the Baseline System. The second development phase involves the use of graphic air traffic situation displays and replacement of flight progress strips by electronic data displays.

3.1.7 The Member from Canada reported on recent developments concerning the Gander Automated Air Traffic System (GAATS). New software has been introduced to incorporate the assignment of North American Routes; printing of flight progress strips for low level traffic is scheduled to be implemented later this year. In addition, GRIB code conversion has been installed in GAATS to accommodate weather forecast data issued by Suitland and Bracknell.

3.1.8 In order to minimise delays in message handling and in responding to pilots requests, an automated message distribution system (GAMPS) will be installed in Gander OAC/IFSS in the period 1988/1989. The GAMPS comprises two sub-systems which will be inter-connected to permit exchange of common data. One sub-system will distribute flight management messages to the appropriate ATC sector(s) which at present is carried out manually. The second sub-system will provide a measure of automation to IFSS specialists by replacing existing AFTN input devices with terminals permitting on-screen editing prior to onward transmission of messages. A "billing" function will also be incorporated to facilitate the associated accounting tasks.

3.1.9 As far as further improvements to GAATS are concerned, it is intended to expand the conflict checking process. The system will also be enhanced to permit evaluation of ADS applications. A data link to the Canadian Automated Air Traffic System (CAATS) is also planned. At about the mid 1990's, the CAATS will replace GAATS. The Group noted that until such time, the GAATS (including enhancements) will remain operational to provide the required service in the OCA.

3.1.10 An account of progress on the development and implementation of the United States Oceanic Display and Planning System (ODAPS) was given to the Group. ODAPS factory acceptance tests have been completed and user acceptance tests are in progress to evaluate the operational aspects of the system.

Detailed test scenarios have been developed, executed and analysed with the participation of oceanic controllers. Further operational evaluation is planned in the Autumn of 1988 prior to field demonstration and implementation. It is anticipated that ODAPS will be operational in Oakland Centre in the Summer of 1989 and New York Centre in the Autumn of 1989.

3.1.11 In the course of the presentation of ODAPS, the Member from the United States brought into focus the need to develop oceanic ATC automation systems in a compatible and timely manner. Referring to recommendations made by the ICAO Council Special Committee on Future Air Navigation Systems (FANS) with regard to harmonisation of the capabilities of ATC systems, there is a need for the NAT SPG to address the matter to ensure that there is a compatible interface between ATC systems and that users are provided with compatible service throughout the NAT Region. The Group discussed this subject in detail under Agenda Item 4 (para 4.2.5 refers).

3.1.12 The Member from the United Kingdom apprised the Group of the Shanwick OAC FDPS strategic plan. In broad terms, the plan covers the development path for FDPS hardware and software in the short, medium and long term. It also lays down a comprehensive programme for the introduction of additional features and facilities in response to the changing requirements of ATC, adjacent centres, traffic growth and advanced techniques such as ADS. The strategic plan recognises the need for smooth transition from FDPS I to FDPS II, the need to continuously meet ATC requirements and actively involve staff at all stages of development. In particular, it allows for the evolution of the current FDPS I to FDPS II by specifying each step as a small, easily managed risk-free package in order to ensure that a fully operational FDPS is maintained at all times.

3.1.13 Alluding to problems that had been encountered with implementation of the present Shanwick FDPS, the Representative of IATA pointed to the general lessons to be drawn from this experience in the planning, design and implementation of new systems. Typical factors that ought to be addressed in project programmes should include modularity in design, duplication of vital hardware components, back-up facilities, phased implementation with prior on-line parallel running. The Group was supportive of the points made by IATA and felt sure that those concerned were taking account of such considerations.

3.1.14 While on this matter, the Member from the United Kingdom pointed out that the Shanwick FDPS had been run in parallel prior to implementation but this did not bring out the problems that arose later. An improved manual reversion (MR) system was now available in Shanwick OAC and serves as back-up in the event of system outage. The MR system is operated regularly to ensure controller familiarity. Since the FDPS is based on dual processors running in parallel, any changes in software to accommodate new procedures are rigorously checked at total system level to ensure that no faults are introduced. Hence, system modifications are restricted to two periods in the year for implementation - Spring and Autumn. The advent of FDPS II with distributed processing will greatly improve system reliability and the ability to incorporate modifications more rapidly.

3.1.15 Concerning current developments at Shanwick OAC, the Group was given a briefing regarding on-line data interchange (OLDI) communications links that have been established with adjacent centres (para 2.2.4 also refers). OLDI benefits not only the centres concerned but also operators because rapid automatic interchange of data reduces workload and allows the system to handle more traffic. Experience demonstrates that in the implementation of such direct links it is essential that the formal procedures (e.g. formats, protocols, etc.) are covered by an agreed Interface Control Document (ICD) and that ATC operational procedures in existing Letters of Agreement are amended.

3.2 Developments in navigation systems (e.g. Global Positioning System)

3.2.1 On the basis of information provided by the Member from the United States, the Group noted that the Global Positioning System (GPS) composed of 21 satellites (plus 3 operational spares) is expected to be fully operational in the early 1990's. Development of minimum performance standards is in progress and the system is being evaluated as a supplemental or sole means of navigation. It was noted that GPS navigation data is referenced to the geodetic reference system WGS-84 which has been recommended to ICAO by the FANS Committee for adoption as a standard for international civil aviation. Attention was also drawn to more detailed technical data concerning GPS as well as the GLONASS satellite navigation system of the USSR which is contained in the Report of the Fourth Meeting of the FANS Committee (FANS/4 - Agenda Item 3, Appendix B refers).

3.2.2 In ensuing comment, it was recalled that the integrity aspects of satellite systems had been discussed at some length by the FANS Committee which considered that on-board integrity monitoring would be the most preferable method to ensure that the time delay in detection of satellite system degradation would be minimal. The Group noted also that interoperability of different satellite systems and common airborne avionics is the subject of ongoing studies and discussions.

3.3 Data link developments

3.3.1 The Member from Canada provided the Group with a detailed description of the system being used on a trial basis in conjunction with Air Canada for evaluation of oceanic clearance delivery via an air/ground VHF data link. Some three years ago, Air Canada approached Transport Canada with a view to experimenting with the transmission of an oceanic clearance message over their Air Ground Communications System (AGCS). A small quantity of additional hardware was installed at the Gander OAC and Transport Canada and Air Canada carried out some software modifications to their respective systems. The link commenced operation in the summer of 1985 on test with Air Canada B767 aircraft, and has worked well since. The system operates as described below.

3.3.2 When a flight entering the OCA between BANCS and PRAWN is approaching the point at which the oceanic clearance is normally given, the Oceanic Planner assigns the route and altitude to the flight. When the planner has determined a conflict free clearance he executes a GAATS command called "Assign Route". Under normal circumstances the clearance resides in the system until the flight calls the Gander clearance delivery controller, or the clearance is issued through an adjacent centre. In cases of data link equipped flights, however, the notation "Data Link Equipped" is placed in Item 18 of the filed flight plan. When the planner executes "Assign Route" on such an annotated flight, the clearance is automatically routed from GAATS to the Air Canada communications network and transmitted over a VHF link to the aircraft where it is printed on a small printer on the flight deck. The pilot contacts Gander clearance delivery as usual but, already having his clearance, only a routine readback is necessary. The related message transmitted to the aircraft is also echoed on a printer in the OAC and may be subsequently used for verification purposes.

3.3.3 A number of improvements to the link have been proposed. Principal amongst these is a method of enabling the pilot, having received the clearance over the link, to echo it back to GAATS. This response could then be compared against what GAATS had originally sent and could take the place of the air/ground readback. If two sets of data did not match exactly, a warning could be passed both to the pilot and the controller and they could revert to voice communications to resolve the discrepancy. A preliminary test has recently been conducted in this area. A message, manually entered on the flight deck, was successfully routed to a printer in the Gander Control Centre. A further refinement of the procedure would be possible when the onboard data link terminal is connected directly to the Flight Management System.

3.3.4 While this procedure is still only in a test mode it is seen as offering considerable benefits and several airlines have shown an interest in joining in the test. Additionally, a number of operational advantages appear to accrue to ATC, principally in a reduction of voice communications and in increased integrity of data. Reduction in intra-centre and inter-centre co-ordination arising out of clearance delivery transactions would contribute to productivity not only in Gander but also in adjacent ACCs.

3.3.5 The Member of the United Kingdom gave the Group details of a trial programme for data linking of oceanic clearance messages from Shanwick OAC. Following meetings between interested parties earlier this year it was agreed that the trial would use the VHF ACARS system and the SITA communications network. The United Kingdom undertook to conduct the trial with the basic premises that it would not prejudice the evaluation of other data link systems under evaluation and that the impact on current ground based procedures and flight data processing systems would be kept to a minimum. The impact on the Shanwick FDPS will be minimised by carrying out all additional processing functions in a front-end processor dedicated to the data link task.

3.3.6 The Group noted that the trial would take place in three distinct phases:

a) The uplinking of the oceanic clearance message from Shanwick OAC to westbound flights;

b) The downlink acknowledgement of the clearance message from the cockpit to Shanwick OAC; and

c) The downlink clearance request from the aircraft to Shanwick OAC.

Progression to subsequent phases will only take place on successful completion of the preceding one. Due to the ready co-operation between the participating parties, steady progress has been made and it is hoped to start operational trials of the first phase in January 1989.

3.3.7 It is intended that the Oceanic Clearance Message (OCM) delivered to the cockpit hardcopy printer will be in the form of an ATS message with data fields as defined in ICAO Doc 4444 plus a plain language version suitable for voice readback. Throughout the trial, voice readback of all data link messages will be maintained to confirm the integrity of the system and all parties have indicated their concern that nothing should be done which might jeopardise existing well established procedures.

3.3.8 Airlines participating in the trial and currently using ACARS for individual company requirements will be constrained to comply with precise message protocols which are currently being defined. The intention is that the trial will be open to all airlines prepared to comply with a Memorandum of Understanding (MOU). Basically this will require a participant to be a SITA AIRCOM service user, to use the defined message formats and to supply Shanwick OAC with their respective participating aircraft registrations and associated SELCAL codes. The Group noted that the United Kingdom intends to promulgate details of the trial by NOTAM as soon as the definition of all parameters has been finalised.

3.3.9 In the ensuing discussion, the Group was informed that currently there are in the order of 2000 aircraft in the United States equipped for ACARS. Also, a growing number of airlines (including some European carriers) have announced intentions to equip aircraft in their fleet to avail of the VHF data link service.

3.3.10 Addressing a proposal presented by the Member from Canada, the Group considered the subject of identification of VHF data link capability in the flight plan. Currently data link equipped flights are identified by using the notation "Data Link Equipped" in Item 18 of the filed ICAO Flight Plan. This method of identifying data link equipped flights will no longer be satisfactory when the anticipated expansion of the scheme occurs in the near future. The development of a system for oceanic clearance delivery by the United Kingdom , similar to that used by Canada, made it desirable that the method of identifying data link equipped flights be common to both systems and to any others subsequently introduced. The chance of non-delivery of a clearance because the identifying data was omitted from Item 18 of the flight plan or missed by the recipient is too high in an expanded system. In addition, Item 18 can potentially contain too much plain language to make automated parsing foolproof.

3.3.11 There was considerable support in the Group for making use of a discrete letter in Item 10 (Equipment) of the ICAO Flight Plan for denoting VHF data link capability. Besides being the appropriate place in the flight plan, this field type can also be easily processed in automated systems. It was noted, in this context, that several non-allocated letters (B, G, J, K, Q) were available for use. Refraining from indicating a preference for one or the other letter, the Group agreed to request ICAO to allocate a discrete letter for use in Item 10 of the Flight Plan to denote VHF data link capability.

CONCLUSION 25/10 - IDENTIFICATION OF VHF DATA LINK CAPABILITY IN ICAO FLIGHT PLAN

That:

a) ICAO be requested to allocate a suitable letter for use in Item 10 of the Flight Plan to denote carriage of VHF data link equipment; and

b) the member of Canada take appropriate action within his Administration to present this request to ICAO.

3.3.12 While on the subject of data link applications, the Member from the United States presented to the Group a comprehensive paper which reviewed the application potential of aeronautical mobile data link communications for oceanic air traffic services and, to an extent, aeronautical mobile safety communications in general. The review focussed on data link via satellite communications means and traced actitivities from the late sixties right through to the emergence of the FANS Committee concepts. The systematic approach to general data link development was described with particular reference to the use of the Open System Interconnection (OSI) model for satellite communications and SSR Mode S data link. The data packet technique used in satellite communications systems was outlined. A summary account was also given of present data link related development activities around the world.

3.3.13 Factors affecting the development of data link for oceanic areas were highlighted and it was underlined that a satellite data link service could satisfy the airline requirements for operational control and administrative communications, as well as supporting air traffic services such as ADS, direct pilot/controller communications and improved weather data gathering. In conclusion it was pointed out that these improvements can increase system safety, provide substantially more functional capability, pave the way for reduced separation minima and yield significant system operational cost savings.

3.3.14 The Group expressed its appreciation to the Member from the United States for the excellence of the review, which exposed a complex technical subject in simple and understandable terms.

3.4 Automatic dependent surveillance

3.4.1 In discussing this topic, the Group had before it the ADS programme initiated by the United States as a complement to the Oceanic Display and Planning System (ODAPS). The development and implementation of this ADS project is proceeding in two steps. The first step consists of frequent (every five minutes) automatic position reporting, whereby each ADS report is compared to cleared flight plan to determine if the position is within acceptable conformance limits. Position reports that fall within the prescribed limits are processed and the system automatically updated. In the event of an out-of-conformance situation, or if no ADS report is received, the system generates appropriate warning messages on the controller displays. The second step includes two-way pilot/controller data link communications which is expected to improve the reliability and response time for message delivery and acknowledgement. The message types being considered for application include ATC clearances, flight plan discrepancies, weather advisories and emergency situation notification.

3.4.2 The programme calls for a demonstration of live ADS by February 1989. To this end, a work station is being set up in the FAA Technical Center and a Federal Express DC-10 will be equipped with prototype satellite communications equipment. An operational readiness demonstration of ADS Step 1 is scheduled for February 1990 and for Step 2 in July 1993.

3.4.3 The Member from the United States indicated that the ADS programme was in line with the FANS Committee's concept and that co-operation with other States would be welcomed. He added that it was foreseen that about 60 aircraft should be equipped to avail of ADS service by the time it becomes operational.

3.4.4 The Member from the United Kingdom spoke of work being carried out by his Administration in co-operation with Spain and the EUROCONTROL Agency within the framework of tests being conducted by the European Space Agency (ESA), with the objective of evaluating the functional application of ADS and controller display aspects.

3.4.5 The Group noted that such activities will soon permit valuable data to be obtained on experience with ADS applications in a real-time environment. It was pointed out that, in view of the rapid developments in this area, the work of the ICAO Air Navigation Study Group on ADS should proceed with all due haste.

3.5 Other technological developments of relevance to the NAT Region

3.5.1 The Group noted information provided concerning the United States Traffic Alert and Collision Avoidance System (TCAS) Program together with a brief description of the system. Regulations are being implemented to require carriage of TCAS I and TCAS II equipment, as appropriate, by various categories of aircraft and type of operation. It was observed that this development was only of marginal interest to NAT operations at this juncture.

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) further efforts towards the introduction of 30NM/1000ft composite separation in the NAT MNPS airspace and its implications in the oceanic/domestic interface areas;

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

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

4.1.1 In dealing with this subject, the Group considered air navigation systems planning aspects in relation with air traffic projections for the period 1988 to 1993 as prepared by the NAT Traffic Forecasting Group (NAT TFG) during its last Meeting (ICAO Headquarters, Montreal, 24 April to 1 May 1987)

4.1.2 In reviewing the forecasts, the NAT SPG found that, in some instances, there were significant differences with data produced by individual States. This aspect together with the need to identify any future significant growth of opposite direction traffic seemed to justify careful reconsideration of the option, raised at NAT SPG/24, to leave an interval of two years between successive forecasts. On the contrary, it would now seem essential that data obtained from the NAT TFG be regularly available on a yearly basis in order to provide a timely warning of changes in the pattern and growth of traffic in the NAT Region, particularly in the context of the planning work of the Task Force established by the Group (Conclusion 25/11 - refers).

4.2 Development of medium and long-term NAT Air Navigation Plans

4.2.1 When embarking on its discussion of medium and long-term planning, the Group was acutely aware of the accelerating pace of developments. The ICAO FANS Committee had completed its work on the future communications, navigation and surveillance (CNS) concept and the implementation work was now beginning. Progress reported to the Group at this meeting indicated a quickening of systems developments in NAT Provider States (Summary on Agenda Item 3 refers).

4.2.2 The Member from Portugal, in a comprehensive presentation, set the scene for the discussion of planning for the future NAT ATS System. He recalled that at the NAT SPG/23 Meeting the subject of medium and long-term planning had been extensively discussed. Although some improvements to the present system were considered, it was recognized that it would be necessarsy to initiate planning for a transition period to enable the FANS space-based concepts to be incorporated at the appropriate stage. A tentative development scenario for the NAT ATS System had also been drawn up. The matter of medium and long term NAT Air Navigation Plans was taken up again at NAT SPG/24, but not pursued in depth because it was felt that conceptual work on a medium and long term plan, specifically directed to the NAT Region, could only usefully be done once the FANS Committee had completed its task. Taking into account the evolution of worldwide activities since NAT SPG/24 and the progress of ATC systems plans in several NAT Provider States, it was appropriate that NAT SPG should now give due consideration to the need to initiate medium and long term planning for the NAT ATS System as a matter of priority.

4.2.3 Now that the FANS has completed its conceptual work, and after the ICAO Council has taken action on the recommendations of FANS/4, there will still remain a lot of consequential work to be done before the implementation of the concepts or parts thereof can take place, such as studies, tests, trials and development of SARPS and procedures. Notwithstanding the importance of the worldwide activity, it seems unrealistic to assume that the implementation of the concept will occur at the same time or at the same pace everywhere in the world. Therefore, regional planning groups, in those Regions where the need for early planning is felt necessary, should initiate parallel action in order to ensure from the outset a gradual and co-ordinated transition to the FANS future concept. An example cited was the European Region, where the EANPG has already started this planning work by the establishment of a special working group with the task to develop a concept for the Future European ATS System (FEATS).

4.2.4 Referring to development plans for NAT ATS Systems, it was pointed out that several Provider States in the NAT Region are known to be replacing or upgrading their ATC facilities. Plans are already under way, and in the medium term all NAT OACs will be using automation. If future costly interfaces between ATC centres and unnecessary replacement of hardware and/or software are to be avoided, development plans of States should cater for reasonably easy expansion to future concepts and for compatibility with neighbouring centres. However, there was a lack of clear long term objectives for the NAT ATS System as a whole and of agreed transition plans.

4.2.5 One of the main objectives for the NAT ATS System in the long term should be, through the introduction of the concepts developed by FANS, to achieve a harmonized system throughout the entire Region, where boundaries between the various Provider States systems are transparent from the users point of view. To achieve this goal it is essential that States in the Region join their efforts to develop a common ATS System Concept for the NAT Region. Orderly and gradual transition from the present system to the future concept will also call for agreed plans and lead times. This will constitute the necessary framework within which individual national plans may be developed in a co-ordinated and cost/effective manner.

4.2.6 The Member from Portugal underscored that the development of a future ATS System concept for the NAT Region is certainly the responsibility of the NAT SPG. However, by its composition, usually heavy workload, wide variety of subjects and low frequency of meetings, the full NAT SPG is probably not the most appropriate forum to directly undertake the work involved. It therefore seemed to him that a special working group of the NAT SPG should be established for that purpose.

4.2.7 The Member from the United States recalled that on several occasions during this meeting he had emphasized the need for the NAT SPG to focus on future developments (cf. para 3.1.11). Several of the NAT Provider States are pursuing early implementation of improved oceanic air traffic services using automation and ADS. As advanced technology in communications, navigation and surveillance is implemented, it will be essential to make certain that work progresses in a compatible manner to ensure harmonized system development. He completely endorsed the views expressed by the Member from Portugal and would support the establishment of a task force of the NAT SPG.

4.2.8 The Member from Ireland also concurred and stressed the need to address the impact of satellite communications on the existing HF communications infrastructure. Considering that Satellite L-Band communications are expected to replace HF in the 1990s and given that the satellite communication system will impact greatly on Provider States, he believed that a plan for the orderly and economic transition from the existing HF communications system to a satellite communications system should be undertaken as as matter of priority (see also para 2.2.13).

4.2.9 Turning to the outcome of the FANS Committee work, the Member from the United Kingdom outlined the implications for the NAT Region of the global CNS concept. The FANS envisaged that initial application of satellite-based aeronautical CNS would be over ocean and undeveloped continental airspace and that several NAT Provider States are undertaking studies, tests and trials on implementation of the concept. The results to date have demonstrated that the FANS concepts are practicable and that system improvements such as reliable air/ground communications, improved navigation accuracy, more frequent up-date of aircraft position information and detection/ elimination of waypoint insertion errors through the application of satellite-based Automatic Dependent Surveillance, are all likely to be achievable within the next decade.

4.2.10 In the context of the work of the FANS Committee, the United Kingdom had carried out an appraisal of future system development in the NAT Region. The study reviewed how the system is expected to develop in future years in terms of traffic increases, ATS facilities, the manner of air traffic control in the Region and potential enhancements to CNS facilities through the implementation of satellite-based systems. Qualitative and quantitative assessments were made of the economic benefits of such developments to the operators. The Member from the United Kingdom advised that the study had also been made with the NAT SPG in mind to support the future system planning work of the Group.

4.2.11 He recalled the previous work of the Group on developing tentative timescales for long-term systems improvements. It would now seem that the time was ripe to consider firmer implementation timescales, otherwise Provider States would be unwilling to allocate the necessary funds for system improvements. An overall long-term strategy for air traffic services development in the NAT Region is required and this, to be sure, would ultimately need the endorsement of a NAT Regional Meeting.

4.2.12 There was overwhelming support in the Group for the need to draw up a long-term concept for the NAT system. Important decisions had to be taken soon by Provider States and airspace users alike. Events were moving ahead rapidly and the Group was emphatic that there should be no delay at regional planning level in pursuing the work required. The Group was conscious that the FANS Committee had recommended to Council that a new Committee be formed to advise ICAO on the overall monitoring, co-ordination of development and transition planning to ensure that implementation of the future CNS system takes place on a co-ordinated global basis in a cost-effective manner. The Group was adamant that it would keep closely in line with the FANS concept and that there would be no question of duplication of work. As a planning group in a relatively advanced region, where satellite-based CNS would probably find early application, the Group was confident that its work could form a valuable input into future FANS activity.

4.2.13 Turning to the method of carrying out the work on the future concept, the Group concluded that the most effective solution would be to establish a Task Force for the purpose. There was however lively debate over the time required to complete the task, allied to the timing of the next NAT SPG meeting, as well as the possible date for a NAT Regional Air Navigation meeting. Having regard to the fact that the basic principles for the future NAT system were already available from the FANS Committee results, it was believed that a period of some 2 1/2 years should suffice.

4.2.14 With regard to the next meeting of the NAT SPG, the Group was anxious to resume its normal Spring cycle. Hence, in order to allow the Task Force time to advance its work and to make a report, the Group agreed that the next NAT SPG meeting should be held in April 1990 and thereafter in the springtime of successive years (see also para 6.2).

4.2.15 Given these arrangements, the Group felt assured that the future NAT System concept would be available for submission to a NAT RAN meeting if it were held towards the end of 1991 or early 1992 (cf. para 5.4 below).

4.2.16 In discussing the composition of the Task Force, the Group considered that it should be kept as small as possible though, obviously, participation of experts from NAT Provider States and airspace user organizations would be essential. It was also remarked that participation could vary somewhat according to the subjects under discussion and the need for suitable expertise in the issues concerned.

CONCLUSION 25/11 - ESTABLISHMENT OF A NAT SPG TASK FORCE

That:

1. A NAT SPG Task Force be established with the following terms of reference and work programme:

   a) to develop a detailed concept for the future Air Traffic Services System for the whole of the NAT Region taking due account of the communications, navigation and surveillance systems concept developed by the FANS Committee and the results of related consequential work as well as of the principles at Attachment A to the Summary on Item 4;

   b) the work shall be conducted in accordance with the work programme at Attachment B to the Summary on Item 4;

   c) the period planned for should extend from the early 1990s to 2010/2015;

2. the composition of the Task Force be: Canada, Denmark, France, Iceland, Ireland, Portugal, United Kingdom, United States, IAOPA, IATA, IFALPA;

3. the Rapporteur of the Task Force be Mr. P. Rosa (Portugal); and

4. the European Office of ICAO provide the necessary Secretariat support to the Task Force.

4.2.17 In closing its discussion on this subject, the Group expressed its appreciation to the Member from Portugal for the valuable contribution that he had prepared, and for his kind offer to host the first meeting of the Task Force in Lisbon from 3 to 7 April 1989. Contributions for that Meeting should be made available before the end of February 1989.

4.3 Further efforts towards the introduction of 30NM/1000ft composite separation in the NAT MNPS airspace and its implications in the oceanic/domestic interface areas

4.3.1 Further to discussions at a number of previous meetings, the Group once more examined the prospects of applying composite separation based on 30NM lateral, combined with 1000ft vertical separation within the Organized Track System (OTS). In this context, the Group had before it papers prepared by its Members from Canada, the United Kingdom and the United States dealing with the number of contingencies in Gander and Shanwick OCAs and the mathematical/statistical aspects of this question. Since the mathematical/statistical and risk aspects had been dealt with under Agenda Item 1 (see paragraph 1.2.31), the Group turned to safety and operational aspects.

4.3.2 The Members from Canada and the United Kingdom indicated that the number of contingencies resulting in a change of altitude remained approximatly the same in 1987 as in 1986 and that the major cause of these contingencies was engine shut-down.

4.3.3 In the ensuing discussion, the Member from the United Kingdom informed the Group that because of the problems of congestion in continental European airspace, an application of 30NM/1000ft composite separation could not be envisaged in the foreseeable future in view of its implication in the NAT/Continental interface areas. Furthermore, it was the consensus of the meeting that very little economic benefit could be derived from the application of 30NM/1000ft composite separation. Another consideration was the time required for refresher training of air traffic controllers in the application of any form of composite separation, as well as the time required to adjust the software in the automated systems.

4.3.4 With this in mind, the Group then reviewed the fall-back measures developed at its Special Co-ordination Meeting (1980) to cover the case if navigation performance in NAT MNPS airspace deteriorated to the point that the Target Level of Safety (TLS) was eroded thus requiring intervention by the Provider States. It was recalled that 120NM lateral separation could be re-applied with immediate effect at any time should this situation arise. A subsequent introduction of 60NM/1000ft composite separation would require some time to be effected because of required software changes and ATC training. Because of the penalties that would be imposed on the users in the event that the TLS was eroded and the 120NM lateral separation had to be applied, the Member from the United Kingdom informed the Group that his Administration was prepared to carry out an analysis to study whether an increase in longitudinal separation could be used instead, thus reducing the occupancy with the consequent improvement of the TLS.

4.3.5 The Group supported the proposal by the Member from the United Kingdom and agreed that the fall-back procedures should be reviewed at the next NAT SPG meeting in the light of the results of the proposed analysis. In the meantime, every effort should be made to ensure that the 60NM/1000ft software is functional in case it is ever required.

4.3.6 The Group then examined the continued requirement to collect and report to the NAT SPG all the contingencies arising in Gander and Shanwick OACs. It was agreed that the information was useful and that all NAT Provider States should collect data on all contingencies in NAT airspace and present it in the format used by Canada and the United Kingdom.

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

4.4.1 With regard to the reduction of vertical separation above FL290 to 1000ft, the Group reviewed the situation on the basis of a contribution by its Member from the United Kingdom. It was recalled that the subject was being handled by the RCGS Panel in the context of its overall analysis of separation standards. A vast amount of work has been carried out by the Panel and extensive surveys conducted in Canada, Japan, the United States, USSR and Europe have indicated that there were no major difference in the results despite the fact that various methodologies have been used for both data collection and analysis. The Group noted that a new TLS had been developed to assess the safety aspect of reduced vertical separation to be used for a target period of the turn of the century.

4.4.2 From the data collection it would appear that, subject to specific conditions, height keeping performance of the recent fleet of aircraft operating in the NAT Region, when associated with the proposed TLS and the relevant traffic occupancy value, could support a vertical separation of 1000ft above FL290 in the NAT Region; keeping in mind that a major contribution to the problem associated with reducing vertical separation in high density continental airspace was the extent of opposite direction occupancy, which in the case of the NAT Region, was virtually zero. An improvement in the NAT Region in the overall height keeping performance of aircraft could be expected with the introduction of new altimetry system specifications.

4.4.3 It could therefore be anticipated that the RGCS Panel would recommend a reduction in vertical separation along the lines described above, provided a number of additional conditions were met. Some of these would cover a requirement for a segregation of IFR/VFR traffic, special provisions for high performance military aircraft, some form of monitoring of aircraft height keeping performance, specific certification and maintenance requirements for altimetry systems.

4.4.4 In view of these developments, the Group shared the opinion that, once the results of the RGCS Panel are known and action has been taken by ICAO on the report of the RGCSP/6 (early 1989), relevant action could be envisaged for inclusion of provisions allowing the use of 1000ft vertical separation in the NAT Region. In this context, it was emphasized that such course of action would be conditional on satisfactory resolution of all interface problems that would arise between NAT and continental environments.

4.4.5 The Group agreed that the Task Force set up pursuant to Conclusion 25/11 should take account in its future work of the outcome of the RGCSP/6 meeting as approved by ICAO.

Attachment A to
Summary on Item 4

BASIC PRINCIPLES FOR THE DEVELOPMENT AND OPERATION OF A FUTURE NAT ATS SYSTEM

1. General principles

1.1 The future NAT ATS System should provide for improved regularity and efficiency of air traffic with same or higher level of safety as that of the present system.

1.2 The future NAT ATS System should be developed on a system basis and in balance with other parts of the overall air navigation infrastructure. The required changes should be introduced in an evolutionary manner.

1.3 The concept should be adaptable to the particular requirements in the various parts of the NAT Region and there should be no disparity in the level of service to a degree which is detrimental to the expeditious flow of air traffic. The system must also be compatible at the interfaces with the ATS Systems in adjacent Regions.

1.4 All proposals, including transition from HF to satellite communication, should be considered in the light of the likely financial implications for users and providers and due regard should be given to possible alternative solutions and operational cost/benefit considerations.

1.5 Orderly transition from the present system to the future concept, including adequate lead times, is of primary importance. However, the concept should allow for flexibility in implementation under the guidance of the NAT SPG and changes in user requirements.

1.6 The concept developed should be described in sufficient detail to provide the necessary guidance for detailed work in relation to planning for and implementation of facilities and services in the NAT Region.

1.7 The future NAT ATS System should take into account the need to achieve maximum economy of flight operations and the need for compatibility between the airborne and ground systems. It should also permit the optimum exploitation of the capabilities of advanced airborne equipment.

1.8 All foreseeable civil and military requirements, should be taken into account when system capacity is defined.

1.9 Due account should be taken of new technology foreseeable in the air navigation field in the time-scale under consideration.

2. Specific principles

2.1 ATS System Capacity/Efficiency

The aim of the future ATS System should be to satisfy the demand of all users of the airspace. It must be recognized, however, that it may not be practicable in the design of the system to provide for excessive peak levels of air traffic demand, although the system must be capable of accommodating normal traffic peaks and be easily expandable to meet anticipated future growth.

2.2 Management functions of the system

The basic functions of the ATS System will be performed by the ground organization having in mind the responsibilities of the pilot in command.

2.3 Level of Automation and Associated Human Factors

Further advancement of automation or computer assistance will be indispensable for the future development of the system. That development shall be carefully balanced with the need to retain the required level of operational flexibility and the associated changes in the tasks and rôle of the human element, controller and pilot, in particular in relation to the responsibilities carried out for traffic monitoring and, more importantly, decision-making.

2.4 Responsibility for Navigation

The responsibility for aircraft navigation rests with the pilot.

2.5 Compatibility in Data Exchanges

The data exchanges required within the future system should be based on international standards and procedures available or to be developed.

Attachment B to
Summry on Item 4

WORK PROGRAMME FOR THE DEVELOPMENT OF A FUTURE NAT ATS SYSTEM CONCEPT

1. The NAT SPG Task Force should:

a) Identify the future requirements to be fulfilled by the ATS System, taking account of existing system shortcomings, unfulfilled needs and the anticipated evolution of air traffic demand;

b) Consider the means (airborne and ground based) expected to be available to satisfy the future requirements taking account of the FANS Committee's concept for future CNS Systems, the results of related consequential work and other applicable technological developments;

c) Examine relevant future ATS System concepts developed by States and consider whether any of these or parts thereof could be appropriate for application in the NAT Region;

d) Develop a selection of the most appropriate concepts, evaluate their impact on different environments and quantify, where possible, their relative costs and benefits;

e) Propose the framework of a future ATS system concept for the NAT Region on the basis of the agreed principles and taking account of all the above; and

f) Develop a general plan for the phased and orderly implementation of the various elements of the proposed concept to ensure regional harmonization.

2. The Task Force is expected to commence and advance its work expeditiously, with full support of the ICAO Secretariat, with a view to reporting to the 26th Meeting of the NAT SPG.

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 NAT Regional Supplementary Procedures and the NAT Regional Air Navigation Plan;

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

d) need for and timing of the next NAT Regional Air Navigation Meeting; and

e) summary of radar observed deviations in the NAT Region.

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 discussion during previous meetings of the Group had resulted in a decision by the Air Navigation Commission 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 Commission was expected to result in amendments to Annexes 2 and 11.

5.1.2 The Group was aware that the task had not been granted high priority in view of specific circumstances prevailing at that time within ICAO. However, considering that only rare occurences of such events had been noticed, particularly within the Shanwick OCA during the period 1987/88, the Group was satisfied that the action taken so far was responsive to its concerns.

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

5.2.1 The Group was given a status report on the amendments to ICAO provisions which had been originated by the NAT SPG. Two inter-related proposals for the amendment of PANS RAC (Doc 4444) and the NAT Regional SUPPS (Doc 7030), which had been outstanding for a long period, were the subject of prolonged discussion. The Group noted once again that some confusion and difficulty resulted from amendments to ICAO material, in respect of the NAT Region, being handled by two separate ICAO Offices

5.2.2 The Group reviewed the history of the attempts which had been ongoing since 1980 to amend either Doc 4444 and/or Doc 7030 concerning fixed format messages of Position Reports in use in the NAT Region. The content of these messages is identical to the AIREP format shown at Appendix 1 of PANS RAC (Amendment 2 - October 1987), but it uses the prefix POSITION rather than AIREP or AIREP SPECIAL as indicated in the PANS RAC. NOTAMS or AIPs of the NAT Provider States currently promulgate these differences.

5.2.3 Discussions indicated that Amendment 2 to the PANS RAC had introduced a further difference between the phraseology used in the NAT Region and the one used for AIREP. The amendment to the PANS/RAC describes the ensuing significant point, after the position being estimated by the words "FOLLOWING POINT" in AIREP format; however the word "NEXT" is used in the NAT format. Unfortunately, the AIREP format retains the terminology "NEXT POSITION" for the position being estimated. These differences caused some confusion in the NAT Region when the new PANS RAC phraseology was utilized by some users because pilots, communicators and air traffic controllers are accustomed to the existing phraseology used in the NAT Region.

5.2.4 The Group had no wish to consider any change to the position reporting format in use in the NAT Region because communications data processing was designed to accommodate this format. Based on Secretariat advice, it seemed that the best solution would be to secure an amendment to PANS RAC which would permit regional variations in air reporting procedures, pending the updating of the AIREP format for the purposes of compatibility and use in automatic processing, provided there could be assurance that the NAT procedures fulfil the requirements and provisions of the ICAO documentation, particularly in respect of special air reports. The members from NAT Provider States expressed, in the strongest terms, their assurances that procedures for processing all messages with a meteorological content ensured that they were directed expeditiously to the appropriate meteorological office and that those with a significant meteorological report were rapidly addressed to other flights which might be affected.

5.2.5 With this assurance, the Group anticipated that the Secretariat would proceed in due course with a proposal to amend PANS RAC which would allow regional variations to the air reporting procedures. Accordingly, the original proposal for amendment to PANS RAC, Doc 4444, which was the subject of NAT SPG/24 Conclusion 24/9, would not be pursued. However, it was agreed that the United Kingdom would proceed in due course, after Doc 4444 has been amended, with a proposal for amendment to NAT SUPPS (Doc 7030) based on the original proposal (Serial No. EUR-8 87/1 - NAT RAC/22) suitably amended to take into account the phraseology used in the NAT Region.

5.2.6 In the meanwhile, it was agreed that NOTAMs, AIPs and AICs should be reviewed and appropriate amendments made to take account not only of the suspension of the prefixes AIREP and AIREP SPECIAL in the NAT Region, but also of the use of the terminology 'ESTIMATE' and 'NEXT' for giving positions to which the flight is proceeding. The amendments will make it clear that the application of this terminology is unique to the NAT Region.

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

5.3.1 The Group noted that, since the last meeting, the 5th Editions of the Guidance and Information Material concerning Air Navigation in the North Atlantic (NAT) Region (T 13.5N/5) and the North Atlantic MNPS Airspace Operations Manual had been distributed to States, international organizations and other individual users.

5.3.2 A proposal was put forward by the Member from the United States aimed at improving the special procedures for in-flight contingencies, both in the Regional Supplementary Procedures (Doc 7030) and in the NAT MNPS Airspace Operations Manual. The Group agreed that members would review the matter by correspondence and provide input to the originator for further consideration.

5.3.3 The Representative from IATA raised a number of specific issues in which material contained in the NAT Guidance Material was not equally reflected in the NAT MNPS Airspace Operations Manual. In the case of the latter, information concerning a special route via 61N 10W for use by aircraft not equipped with HF was lacking. Also, reference to communications failure as well as the use of the letter "X" on the flight plan were considered to be insufficient.

5.3.4 Considering that the loose-leaf format of the NAT Guidance Material allows easier processing of amendments than the NAT MNPS Airspace Operations Manual, the Group agreed that an opportunity should be taken to introduce changes to the former document without delay. It would be possible to envisage an amendment concerning LORAN 'C', the lowest level with continuous VHF coverage along the Blue Spruce routes and provisions for flights operating via 61N 10W.

5.3.5 With respect to the NAT MNPS Airspace Operations Manual, the Member from the United Kingdom agreed to clarify further with Iceland the procedures currently applied by users operating in the interface area between the Shanwick/Scottish FIR and Reykjavik CTA, in co-ordination with IATA, in order to progress the matter further, as appropriate.

5.4 Need for and timing of the next NAT Regional Air Navigation (RAN) Meeting

5.4.1 The Group was cognisant of the fact that, for a number of years, it had discussed the need for a Limited NAT RAN meeting without however coming to any firm position. At the last meeting of the NAT SPG, in view of the developments taking place in the FANS Committee, it was felt that it would be premature to express any views on the matter.

5.4.2 Since the FANS Committee has completed its conceptual work on the future global air navigation system, the situation has changed significantly. Activity on the part of regional bodies should now commence in planning the implementation of the new technology as a follow-up of the FANS recommendations as soon as these have received the approval of the Council of ICAO.

5.4.3 In the light of the discussions at this meeting, the Group agreed on the need to develop a detailed concept for the future Air Traffic System in the NAT Region (para 4.2 refers). That the matter had a certain urgency was fully recognized in view of the rapidity of the developments taking place, and the need to ensure that the NAT System evolves in a harmonized and compatible manner in the new technological environment.

5.4.4 To this end, the Group realized that the future concept for the NAT Region would ultimately require the endorsement of a RAN meeting. Having regard to the working arrangements to complete this task over the next 2 1/2 years, the Group considered that the last quarter of 1991 or the first quarter of 1992 would appear to be an appropriate time to hold a NAT RAN meeting.

5.4.5 With regard to the scope of the RAN meeting, the Group was of the opinion that the main subject that would need consideration would be the future concept for the NAT Region, i.e. the elements of the FANS concept comprising communications, navigation and surveillance For this reason, the duration of the RAN meeting could probably be limited to 10 working days.

5.5 Summary of radar-observed deviations in the NAT Region

5.5.1 The Group recalled its agreement reached at the last meeting that data contained in the summary of radar-observed deviations in the NAT Region was no longer required in view of the increasing role played by the Central Monitoring Agency (CMA) in following-up observed gross navigational errors (GNE). It was noted that the CMA has been collecting and circulating data regarding navigation performance in the NAT Region since 1980.

5.5.2 The Group was informed that all NAT Provider and User States had been consulted regarding the discontinuation of 6-monthly summaries of radar-observed deviations and that no State or international organization voiced any opposition to the proposed action.

5.5.3 With the above in mind the Group unanimously agreed that the present role played by the CMA in the collection, analysis and dessimination of information on GNEs constituted a satisfactory response to the intent of the LIM NAT RAN (1976) Recommendation 1.2/3 b).

CONCLUSION 25/12 - SIX-MONTHLY SUMMARIES OF RADAR-OBSERVED DEVIATIONS

That the six-monthly summaries of radar-observed deviations from track in the NAT Region, prepared by the European Office of ICAO, be discontinued and that LIM NAT RAN (1976) Recommendation 1.2/3 b) requires no further action.

Agenda Item 6: Updating of the work programme of the NAT SPG

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. Target level of safety factors:

   a) Lateral performance;

   b) Longitudinal performance;

   c) Vertical performance;

   d) Occupancy; and

   e) Others.

2. ATC System Loop Errors.

3. Preparatory work for a basic review of the risk model, the target level of safety and possibly the MNPS values.

4. Contingency (fall back) procedures in the event of erosion of the TLS, including the possible reversion to composite type separation.

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:

   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.

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 VI - 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. Possible introduction of reduced vertical separation above FL290 in the NAT Region.

4. Possible introduction of reduced lateral separation above FL400.

5. Preparation for the NAT Regional Air Navigation RAN Meeting (1991/92).

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 and the NAT MNPS Operations Manual.

6.2 Arrangements for the next meeting

6.2.1 In view of the necessity to give the Task Force (para 4.2 refers) sufficient time to advance its work as well as the fact that NAT SPG meetings are traditionally held in Spring, the Group agreed that the next meeting should be held in April 1990. However, one concern raised was that the navigation/occupancy situation in the NAT Region would not be reviewed by the NAT SPG for more than 12 months. The Member from the United Kingdom informed the Group that the normal annual review of the navigation errors would be carried out by the CMA. In the event that this review could not be agreed to by correspondence, it was agreed that the Scrutiny Group could be convened and the results of such a meeting would be distributed to Members of the NAT SPG and to international organizations concerned.

Agenda Item 7: Any other business

7.0 Introduction

7.0.1 Under this agenda item, the Group discussed the following four subjects:

a) safety of international general aviation flights in the NAT Region;

b) effects of military airspace reservations in the NAT Region;

c) USSR accession to the 1956 Danish and Icelandic Joint Financing Agreements; and

d) format of meteorological charts included in flight documentation for long-haul flights;

7.1 Safety of international general aviation flights in the NAT Region

7.1.1 The Member from Iceland recalled to the Group that the question of the safety of International General Aviation (IGA) in the NAT Region, and particularly the extra burden imposed on Search and Rescue (SAR) facilities, had been the subject of previous discussions. It was also recalled that remedial measures had been developed and improvements had subsequently been noticed. However, experience over the last two years has shown that the situation was again deteriorating and that some further action was necessary.

7.1.2 The Group was informed that in Reykjavik OCA, IGA traffic totalled only 4% of all international traffic, yet it accounted for almost all of SAR missions. After examining a sample of incidents, the Group agreed that many of the incidents, some of which were fatal, would appear to be the result of either poor or inadequate flight planning. The Representative from Denmark advised the Group that a similar situation exists in Søndrestrøm FIR.

7.1.3 The Member from Canada stated that, with the exception of known and qualified ferry pilots, all other pilots of single-engined aircraft intending to cross the NAT were required to undergo an examination. However, he pointed out that only 2% of these aircraft were Canadian registered, that approximately 90% were from the United States while the balance were of other registries. It was also stressed that, without the concerted effort of all the States of Registry of aircraft crossing the NAT, it would be difficult to enforce any air regulations that may be put in place.

7.1.4 The Group agreed that action was required to resolve these problems but recognized the difficulties involved. Consequently, the Group was of the opinion that a special meeting of the States and airspace user organizations concerned would seem to be the most effective way of tackling the issue.

CONCLUSION 25/13 - SPECIAL MEETING ON THE SAFETY OF INTERNATIONAL GENERAL AVIATION (IGA) OPERATIONS IN THE NAT REGION

That:

a) Iceland be invited to convene in Reykjavik, as soon as possible, a special meeting of States - Canada, Denmark, France, Iceland, Ireland, Portugal, United Kingdom, United States and airspace user organizations concerned to review the situation with regard to the safety of IGA operations in the NAT Region and to determine, as required, appropriate measures to assure the continued safe operation of such flights; and

b) the Member from Iceland make the necessary arrangements with his Administration for the convening of the meeting and to inform the NAT SPG of the outcome.

7.2 Effects of military airspace reservations in the NAT Region

7.2.1 IATA recalled that the effects of military airspace reservations in the NAT Region used to be regularly discussed by the NAT SPG some years ago. This subject is no longer addressed in the absence of specific evidence of adverse impact on the NAT traffic. However, when the existence of such airspace reservations were published by NOTAM, it was not obvious to operators that a non-optimum OTS may have been established as a result. IATA pointed out that military airspace reservations had been discussed by the Centre Chiefs Meeting (held early September 1988) and would be further discussed at the forthcoming 9th Annual NAT Airspace Reservations Co-ordination Committee Meeting.

7.2.2 In the ensuing discussion the Member from Canada made it clear that in a situation of competing demands from both the military and civil operators, the interests of the whole aviation community were always safeguarded. At times, the existence of military airspace reservations may have an impact on the OTS; however, it was felt that this has only a limited effect on civil aviation traffic. The Group noted that Provider States ensured that both user categories were satisfied to the maximum extent possible.

7.3 USSR accession to the Danish and Icelandic Joint Financing Agreements

7.3.1 The Group was informed by the Representative from the USSR of the accession of his State to the Protocol for the amendment of the 1956 Agreement on the joint financing on certain air navigation services in Greenland and the Faroe Islands and the Protocol for the amendment of the 1956 Agreement on joint financing of certain air navigation services in Iceland. Both Agreements will come into force in the USSR as from 1 January 1989.

7.4 Format of meteorological charts included in flight documentation for long-haul flights

7.4.1 The Member from France informed the Group of a project to produce World Area Forecast System (WAFS) charts included in flight documentation for long-haul flights in A4 format. It was recalled that under the relevant provision of Annex 3, the format to be used should be either A3 or A4 size paper, the choice depending on the route length and the amount of detail required. Sufficient clarity could now be achieved in the smaller format through the use of higher performance equipment for the reproduction of meteorological information. The Group noted that France would be discussing the matter further with users of its charts and also intended to raise the subject in the Meteorological Advisory Group of the EANPG (METAG).

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