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SUMMARY OF DISCUSSIONS AND CONCLUSIONS

OF THE

TWELFTH MEETING OF THE NAT SYSTEMS PLANNING GROUP

(Paris, 31 May - 11 June, 1976)

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INTRODUCTION

1. Convening and conduct of the Meeting

1.1 The Twelfth Meeting of the NAT Systems Planning Group (NAT/SPG) was held in the European Office of ICAO from 31 May - 11 June, 1976. In addition to normal participation by all Members of the Group and participation upon invitation by IATA and IFALPA, the Group had also invited Denmark, Iceland, Norway and Portugal to attend this Meeting because of the need to take into account their views on some of the subjects discussed. With the exception of Norway, all those States were present. The Meeting was chaired by Mr. J.G. ten Velden, Member from the Netherlands.

1.2 The Meeting of the Group was conducted throughout as an open Meeting with all participants present as shown on page vii. For some of the Agenda Items, the Group created ad-hoc drafting groups as follows:

a) a drafting group dealing with matters of Items 1 and 4 with Mr. K.R. Mack as Rapporteur;

b) a drafting group dealing with the mathematical aspects of Item 2 with Mr. A.Pool as Rapporteur;

c) a drafting group dealing with operational matters of Item 2 with Mr. R. Fleming as Rapporteur; and

d) a drafting group on Item 7 with Mr.J.P. Perrin as Rapporteur.

1.3 At the opening session, the Group paid tribute to Mr. Hugh Hart who had recently died and who had for years participated in the Group's activities as the Representative of IFALPA.

1.4 Mr. Paul Berger served as Secretary of the Meeting assisted by Mr. C. Eigl. Messrs F.E. Sperring and A. Bruinenberg also participated part-time in the Meeting and acted as advisers with regard to communication and meteorological questions respectively. All four are Members of the European Office of ICAO.

AGENDA

Item 1: Review of the situation with regard to proposals for amendment emanating from previous work of the Group and development of possible consequential action.

Item 2: Development of proposals for minimum navigation performance specifications for application in specified parts of the NAT Region preparatory to the LIM NAT RAN Meeting 1976.

Item 3: Development of measures required to accommodate air traffic in the NAT Region unable to comply with the proposed minimum navigation performance specifications preparatory to the LIM NAT RAN Meeting 1976.

Item 4: Review of the concept of the organized track system in the NAT Region, especially with a view to:

a) provide more flexibility in order to accommodate crossing traffic;

b) facilitate the application of step-climb procedures by aircraft operating in the organized track system;

c) integrate CAR/SAM traffic into the flow of NAT traffic; and

d) prepare a traffic forecast for NAT/CAR/SAM.

Item 5: Review of procedures regarding the promulgation of the organized track system.

Item 6: Possible extension of the use of composite separation, including a review of the problem raised in Recommendation 10/3 of the NAT/V RAN Meeting.

Item 7: Review of the HF air-ground communication situation in the NAT Region including applicable Regional Supplementary Procedures.

Item 8: Review of the procedures, facilities and services used to effect oceanic clearance delivery for NAT flights originating in Europe.

Item 9: Development of measures to permit timely contingency planning in the NAT Region.

Item 10: Work programme until, and arrangements for, the next Meeting.

Item 11: Operational problems of current interest;

a) Review of the lower limit of control areas in the NAT Region;

b) possible adjustments to FIR boundaries in the NAT Region;

c) situation with regard to the ATS inter-area speech circuit between Stavanger and Reykjavik ACCs

d) possible modification to the Shannon HF VOLMET broadcast to include Lyon/Satolas and Marseille airports;

e) application of longitudinal separation in the NAT Region;

f) use of Mount Gabriel SSR for NAT traffic;

g) ferry flights in the NAT Region;

h) relation with the NAT/TFG and timely preparation of NAT traffic forecasts;

i) promulgation of aeronautical information regarding the NAT Region;

j) continued requirement for the provision of a VOR/DME at Akraberg.

LIST OF CONCLUSIONS

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Agenda Item 1: Review of the situation with regard to proposals for amendment emanating from previous work of the Group and development of possible consequential action.

Introduction

1. The development of Regional Supplementary Procedures to cover SST operations in the NAT Region had been the subject of discussion at a number of recent meetings of the NAT/SPG. These discussions culminated in the preparation of a proposal for Regional Supplementary Procedures which was accepted by the Group at its 10th Meeting, and in accordance with a Conclusion of the Group, was subsequently formally proposed to ICAO by the United Kingdom.

2. This proposal was circulated to all States and International Organizations concerned by the European Office of ICAO, on 2 May 1975. In the course of consultation with States on this proposal, it was found that one State (USA) made certain proposals for changes to the amendment as originally submitted. In addition, one International Organization concerned by the proposal (IFALPA) made certain observations.

3. It was therefore necessary to refer the proposal back to the originator, i.e. the United Kingdom, and the latter had undertaken a further consultation with Members of the NAT Systems Planning Group (NAT/SPG).

4. After conclusion of the above described consultative process, the United Kingdom had provided a revised version of the proposal which took account of the observations made on the original proposal. This revised version had then been circulated to all States and International Organizations concerned by the European Office of ICAO on 1 March 1976.

5. Subsequent to this action, the three Oceanic ATS provider States concerned with initial operation of SST aircraft between Europe and North America (Canada, United Kingdom and USA) had conjointly agreed to promulgate routes and procedures for interim use, pending publication of amendments to the NAT Regional Supplementary Procedures (ICAO Doc 7030). To achieve this agreement, further modification of the earlier proposed amendments had been found to be required.

Revision of Proposed Amendment

6. In view of the difficulties which had been experienced, the Group re-examined the requirements in order to develop a final version of the proposal for amendment which would be submitted to the ICAO Limited NAT Regional Air Navigation Meeting to be held during August/September 1976.

7. The need for such amendments in support of SST operations was confirmed and it was agreed that, so far as was possible, such amendment should be drafted in a form which could eventually be recommended for adoption by other ICAO Regions in which SST aircraft would operate, as well as in the NAT Region.

8. Having regard to comments received on earlier proposals and experience since gained with SST operations, the draft proposal in the Appendix A was then developed. In addition to editorial revision it incorporates the following changes in operational procedures, compared with earlier proposals:

a) Lateral Separation: As previous NAT SPG discussions on the establishment of 60NM lateral separation for SST aircraft had clearly been directed towards the oceanic supersonic phase of flight it was agreed to bring the Doc 7030 amendment proposal into line with this objective. It was therefore decided to propose a lateral separation minimum of 60NM at or above FL450.

b) Longitudinal Separation: In view of the change already introduced in the proposed longitudinal separation minimum (from 8 minutes, as proposed by NAT SPG/10, to 10 minutes) it was considered that there was no longer any need for radar confirmation of the required initial minimum of 12 minutes, except in the case of aircraft not crossing the same oceanic entry point. This condition was therefore deleted from the proposal in respect of the longitudinal separation of aircraft crossing the same oceanic entry point. However, the Representative of IFALPA reserved his Federation's position on this point and it was agreed that the requirement would be re-introduced in the proposal if IFALPA was unable to support its deletion. The IFALPA Member undertook to advise the Group of his Federation's view before the proposal was submitted to the LIM NAT RAN Meeting. Where conditions for use of 10 minutes longitudinal separation could not be met, it was agreed that 15 minutes between SST aircraft would be adequate.

c) Vertical Separation: It was agreed that while it remained prudent ... to require a minimum of 4000ft vertical separation for SST aircraft at the levels occupied in supersonic flight, there was no reason to demand this separation for SST aircraft operating at levels which are also used by present subsonic aircraft and for which only 2000ft is required. The Group therefore agreed to propose a minimum vertical separation for SST aircraft of 4000ft above FL450.

d) Procedures for in-flight contingencies - Special procedures for supersonic transport aircraft: In response to constructive suggestions from IFALPA, the Group revised the contingency procedures for supersonic transport aircraft to take account of operations in two-track systems such as had recently been established in the North Atlantic. In such a system it was agreed that the balance of safety was in favour of a direct turn away from the opposite direction track, rather than execution of a manoeuvre which would bring the aircraft temporarily closer. However, it was again emphasized that no contingency procedure could meet every possible combination of circumstances and the material was intended for guidance only. The pilot's judgement must determine the action to be taken in a given situation.

e) En-route absorption of delay: While recognizing the desirability of providing facilities for en-route absorption of delay, the Group noted that no State had yet found it possible to implement procedures to accommodate the technique, though some trials had been conducted. It seemed likely that effective procedures would demand far more sophisticated means of metering the ebb and flow of air traffic in busy areas than were yet available. Inclusion of the concept in Regional Supplementary Procedures would therefore be premature and it was decided to delete it from the present proposal. However, States were urged to develop such procedures as soon as it became feasible.

9. Having developed the revised amendment, the Group agreed that Members should consult with their Administrations at the earliest opportunity and that confirmation of their support for the proposal (or further comment) should be sent to the Secretary (copy to all other Members) so that the proposal could be submitted in time for consideration by the LIM NAT RAN Meeting in August 1976.

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REVISED
PROPOSAL FOR AMENDMENT OF REGIONAL SUPPLEMENTARY PROCEDURES (ATS)
NAT REGION

1. Amend the NAT SUPPs in the section dealing with "Lateral Separation" (para.1.1) as follows:

   i) Change sub-para 1.1.1 1) to read:

      "1) a) 60 nautical miles between SST aircraft operating at or above FL450;

         b) 90 nautical miles between turbojet aircraft operating within the control areas of Gander Oceanic, New York Oceanic, Reykjavik, Santa Maria Oceanic and Søndrestrøm (south of 70N); and

         c) 120 nautical miles between other aircraft."

   ii) Add a new para 1.1.2:

      "1.1.2 Tracks may be established with a spacing of 1° of latitude instead of 60 nautical miles, provided that they shall in no case include a change of latitude in excess of 3° between successive points spaced at intervals of 10° longitude."

2. Amend the NAT SUPPs in the section dealing with "Longitudinal Separation" (para. 1.2) as follows:

   i) Insert new sub-para. 1.2.1. 4) a):

      "4) a) 10 minutes between SST aircraft in supersonic flight provided that:

         i) both aircraft are in level flight at the same Mach number or the aircraft are of the same type and are both operating in cruise climb;

ii) the aircraft concerned have reported over the same entry point into the oceanic controlled airspace with a time interval of at least 12 minutes and follow the same or continuously diverging tracks until another form of separation is established.

Note: An ATC clearance authorizing the commencement of the deceleration/descent phase of the flight of the aircraft concerned may be issued while the above separation minimum is being applied.

This separation mimimum may also be applied between SST aircraft which have not reported over the same entry point into oceanic controlled airspace (but comply with all other provisions) provided their respective entry points, as well as the point from which they either follow the same track or start following continuously diverging tracks, are located within the radar coverage of the controlling ATC unit and it is therefore possible, by radar monitoring, to ensure that the appropriate time interval will exist between the aircraft concerned, at the time they start to follow the same or continuously diverging tracks."

ii) Insert new sub-para 1.2.1. 4) b):

"4) b) 15 minutes between SST aircraft in supersonic flight but not covered by a) above."

iii) Re-number existing sub-paras 1.2.1. 4) a), b) and c) to 1.2.1 4) c), d), and e).

3. Insert new NAT SUPPs dealing with "Vertical Separation" (para 1.5) and re-number existing paragraphs as follows:

"1.5 Vertical Separation

1.5.1 Above FL450, vertical separation between SST aircraft, and between SST aircraft and any other aircraft shall be considered to exist if the flight levels of the two aircraft differ by at least 4000ft.

1.6 ...(Retain text of the present para 1.5)"

4. Amend the NAT SUPPs in the section dealing with "Contents of Clearences" (para 3.4)as follows:

"3.4.1 ..(Retain present text)...

3.4.1.1 When an abbreviated clearance is issued it shall include:

1) cleared track specified by the track code;

2) cleared flight level(s);

3) cleared Mach number (if required);

4) if the aircraft is designated to report meteorological information in flight "SEND MET REPORTS."

3.4.1.2 On receipt of an abbreviated clearance, the pilot shall read back the contents of the clearance message. In addition the pilot of a subsonic aircraft shall read back full details of the track specified by the code letter.

3.4.2 .(Retain present text)...

3.4.3 The ATC approved Mach number shall be included in each clearance given to subsonic turbojet aircraft operating:

1) ....(Retain the present text).

2) ....(Retain the present text).

3) ....(Retain the present text)."

5. Amend the title of section 3.5 to read:

"3.5 Establishment and use of organized tracks for subsonic air traffic

6. Insert new NAT SUPPs dealing with "Establishment and use of organized tracks for SST operations" (para 3.6) and re-number existing paragraphs as follows:

"3.6 Establishment and use of organized tracks for SST operations

3.6.1 Where appropriate, an organized track system may be promulgated for SST operations. When promulgating such an OTS the requirements for position reporting and the applicability of abbreviated position reports shall be included."

Re-number the present paragraphs 3.6 and 3.7 to read 3.7 and 3.8 respectively.

7. Amend the NAT SUPPs in the section dealing with "Contents of position reports" (para 4.3) as follows:

i) Change para 4.3.1 to read:

"4.3.1 Position

4.3.1.1 Except as provided in 4.3.1.2, position shall, for flights outside the ATS route network, be expressed by the latitude and longitude of the point at which the fixed reporting line is crossed. For flights whose tracks are predominantly East or West, latitude shall be expressed in degrees and minutes, longitude in degrees only. For flights whose tracks are predominantly North or South, latitude shall be expressed in degrees only, longitude in degrees and minutes."

ii) Add a new para 4.3.1.2:

"4.3.1.2 Aircraft operating in the organized track system for SST operations may report their positions by reference to the track code with the longitude of the reporting point."

iii) Change para 4.3.2.2 to read:

"4.3.2.2 If the estimated time for the next position last reported to ATC is found to be in error by 3 minutes or more (for supersonic aircraft), or 5 minutes or more (for subsonic aircraft), a revised estimate shall be transmitted to the ATS unit concerned, as soon as possible."

iv) Add a new para 4.3.3:

"4.3.3 Level

4.3.3.1 Aircraft cleared for cruise climb shall report their level to the nearest 100ft.

Note: Levels so reported, eg 554, may not necessarily be flight levels as defined in PANS/OPS Part III, para 1.1.1.1.1"

v) Re-number existing para 4.3.3 to 4.3.4 and amend text to read:

"4.3.4 Abbreviated Reports

4.3.4.1 Except as provided in 4.3.4.2, position reports should contain only the aircraft identification, position, time and flight level."

vi) Add a new para 4.3.4.2:

"4.3.4.2 Abbreviated position reports for SST aircraft shall consist of aircraft identification, position and time only."

8. Amend the NAT SUPPs in the section dealing with "Special procedures for in-flight contingencies" (para 5) as follows:

"5. SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES

5.1 The following procedures are intended for guidance only. Although all possible contingencies cannot be covered, they provide for such cases as inability to maintain assigned level due to weather, aircraft performance, pressurisation failure and problems associated with high level supersonic flight. They are applicable primarily when rapid descent, turn-back or both, are required. The pilot's judgement shall determine the sequence of actions taken, having regard to the specific circumstances.

5.2 General Procedures

The following general procedures apply to both subsonic and supersonic transport aircraft.

5.2.1 If an aircraft is unable to continue flight in accordance with its ATC clearance, a revised clearance shall, whenever possible, be obtained prior to initiating any action, using the radiotelephony distress or urgency signal as appropriate.

5.2.2 If prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time and, in the meantime, the aircraft shall broadcast its position (including the Track Code, if appropriate) and intentions, on frequency 121.5 MHz at suitable intervals until ATC clearance is received.

5.3 Special procedures for subsonic aircraft

5.3.1 Initial action

If unable to comply with the provisions of 5.2.1, the aircraft should leave its assigned track by turning 90° to the right or left whenever this is possible. The direction of the turn should be determined by the position of the aircraft relative to any organized track system, e.g. whether the aircraft is outside, at the edge of, or within the system, whether composite separation is used, the levels allocated to adjacent tracks and, if appropriate, terrain clearance.

5.3.2 Subsequent action

5.3.2.1 An aircraft able to maintain its assigned level should, nevertheless, climb or descend 150m (500ft) while acquiring and maintaining in either direction a track laterally separated by 30NM from its assigned track.

5.3.2.2 An aircraft not able to maintain its assigned level should start its descent while turning to acquire and maintain in either direction a track laterally separated by 30NM from its assigned track. For subsequent level flight, a level should be selected which differs by 150m (500ft) from those normally used.

5.4 Special procedures for supersonic transport aircraft

5.4.1 Turn-back procedures

5.4.1.1 If a supersonic transport aircraft is unable to continue flight to its destination and a reversal of track is necessary, it should:

1) When operating on an outer track of a multi-track system, turn away from the adjacent track;

2) When operating on a random track or on an inner track of a multi-track system, turn either left or right as follows:

   a) if the turn is to be made to the right, the aircraft should attain a position 30NM to the left of the assigned track and then turn to the right onto its reciprocal heading, at the greatest practical rate of turn - if the turn is to be made to the left, the opposite procedure should be applied;

   b) while executing the turn-back, the aircraft should lose height so that it will be at least 6000ft below the level at which turn-back was started by the time the turn-back is completed;

3) In either case, heading should then be adjusted to maintain a lateral displacement of 30NM from the original track in the reverse direction, if possible maintaining the flight level attained on completion of the turn.

5.4.2 Emergency descent

5.4.2.1 A supersonic transport aircraft compelled to make a rapid descent, whether continuing to destination or turning back, should, if its descent will conflict with an organized track system for subsonic air traffic:

1) proceed to a point mid-way between a convenient pair of subsonic tracks, prior to entering that track system;

2) while descending between FL450 and FL280, maintain a track which is parallel with the subsonic tracks;

3) after passing through FL280, proceed in accordance with the relevant provisions for subsonic aircraft (at para. 5.3).

5.4.2.2 The pilot of a supersonic transport aircraft which, during any period of its flight, is likely to operate in the vicinity of an organized track system for subsonic air traffic, shall be in possession of detailed information regarding that system as it is in operation during the period of his flight.

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Summary of Agenda Item 2: Development of proposals for minimum navigation performance specifications for application in specified parts of the NAT Region.

2.1 Introduction

2.1.1 At its 11th Meeting in May 1975, the Group had reached agreement in principle that, in order to make possible a reduction of the lateral separation minima applied between aircraft operating in specified parts of the NAT Region, a new procedure should be developed envisaging that such aircraft meet a Minimum Navigation Performance Specification. Subsequent work conducted by a number of Working Groups of the NAT/SPG resulted in proposals dealing with both the operational and mathematical aspects of the introduction of such a specification and those covering the general aspects were submitted to the 9th AN Conference in April/May 1976 for consideration. After extensive discussion, this Conference agreed to the application, on an interim basis, of the concept developed by the NAT/SPG in the NAT Region pending further study of this matter on a world-wide basis (Recommendations 2/1 and 2/2 of the 9th AN Conference refer).

2.1.2 As a consequence, the Group at this Meeting developed specific proposals for action by the LIM NAT RAN Meeting, to be held in August/September 1976, and these are reflected in Appendix A to the Summary of this Item. These proposals envisage:

a) the application of Minimum Navigation Performance Specifications to aircraft planning to fly within the Organized Track System in the NAT Region;

b) the development of procedures for the evaluation and approval of air navigation systems used by aircraft engaged in NAT operations in order to determine that they are capable of meeting the established Minimum Navigation Performance Specifications;

c) the establishment of a programme for monitoring the actual navigation performance of aircraft engaged in NAT operations to determine that this continues to satisfy the criteria upon which separation minima are based;

d) the introduction of specific amendments to the NAT Regional Supplementary Procedures dealing with separation, Minimum Navigation Performance Specifications and procedures for the Organized Track System resulting from the above; and

e) a programme of implementation of the measures described above.

2.2 Proposed action

2.2.1 The Group agreed that the material in Appendix A to this Summary should be submitted to the LIM NAT RAN Meeting 1976 in order to form basic supporting documentation for the consideration of Agenda Item 1 "Aircraft Navigation Performance and Separation" of that Meeting.

CONCLUSION 12/1 : SUBMISSION OF SUPPORTING DOCUMENTATION TO THE LIM NAT RAN MEETING 1976 REGARDING ITS AGENDA ITEM 1

That the material contained in Appendix A to the Summary of this Item be submitted to the LIM NAT RAN Meeting 1976 as supporting documentation for consideration under Agenda Item 1 of that Meeting.

2.3 A need for continued work in the mathematical analytical field regarding Minimum Navigation Performance Specifications

2.3.1 When considering the mathematical aspects of Minimum Navigation Performance Specifications, the Group noted that the numerical values of the same-direction and opposite-direction occupancies used in the calculations had to be based on realistic values of the traffic density during the period the Minimum Navigation Performance Specifications were to be used. The numerical values used in previous calculations, were amended in the light of the latest forecast of North Atlantic traffic presented by the NAT Traffic Forecasting Group, and the values for traffic density used in the calculations were chosen to be the forecast average traffic density for about 1983, i.e. 400 crossings per day in the NAT Region. In addition, the Group was provided with preliminary results of traffic counts which had been made by the United Kingdom

in 1973 at meridians 20W and 40W and between latitudes 45N and 65N. It was found that the expected occupancy values which could be calculated from this data were appreciably lower than those obtained from traffic counts made in 1967 for the same area. These differences could not be fully explained by the changes in the track structure between the two data collection dates and it was moreover found to be very difficult to predict from such data the numerical traffic values which were likely to occur in the future in an organized track structure based on the use of 60NM lateral separation. It was for this reason that the numerical values finally chosen were more on the cautious side than those which would be obtained when calculated on the basis of the 1973 traffic data collecting exercise carried out by the United Kingdom. It was for this reason that the UK was requested to analyze the 1973 traffic data in more detail and to provide the results of this work to the NAT/SPG, if possible before the LIM NAT RAN Meeting 1976.

2.4 Latest developments regarding the OMEGA Navigation System

2.4.1 In the course of the Meeting, the Group was provided with information by Canada, the UK and by IATA which seemed to indicate that developments regarding the use of the OMEGA Navigation System in the NAT Region were progressing satisfactorily and that it could therefore be confidently expected that navigation of aircraft using this system, would meet the proposed Minimum Navigation Performance Specifications. In fact, it was indicated that, in mid-Atlantic, signals from all eight OMEGA stations were often available to provide valid navigational guidance. The track guidance accuracy derived from OMEGA appears to be of a high order with the great majority of errors being contained within 1-2NM.

2.4.2 Further, trials regarding the OMEGA coverage provided over Greenland are expected to be conducted later this year. Determination of the acceptability of OMEGA for the provision of navigational guidance in the NAT Region is expected to be made before the end of 1976. As to the airborne equipment reliability it was pointed out that this compared very favourably with other airborne equipment and that, from a cost-effectiveness point of view, the provision of OMEGA navigation equipment continued to be very attractive to operators when compared with other comparable equipment.

2.4.3 As to those aspects of the use of OMEGA related to its routine use in the NAT Region by operators conducting flights therein, the Group was informed that:

a) airborne OMEGA receiving equipment was in quantity production and was readily available to operators without any restrictions; and

b) negotiations were underway at the appropriate level within the USA aimed at the development of procedures ensuring the issue of appropriate aeronautical information providing operators with up-to-date information on the operating status of OMEGA ground stations.

2.4.4 The question of ensuring, within appropriate ICAO provisions, that the OMEGA navigation system continues to operate within internationally agreed specifications is covered in para 6.4 of Appendix A to the Summary of this Item.

2.4.5 The Group noted, with appreciation, a report which had been developed by the United Kingdom on the effects of sudden ionospheric disturbances on VLF position fixing accuracy in the North Atlantic which was obviously relevant in this context. The report noted that measurements to date related to a relatively quiet period of sunspot activity. It was decided therefore to attempt to estimate the likely effects of a noisy year in the sunspot cycle by analysis of available monitoring records which cover the recent solar maximum of 1969-1970. The results of the studies were encouraging and the Group felt this matter could be left to further study and it therefore requested the United Kingdom to do so and make the results obtained available to the NAT/SPG in due time.

2.5 User Organizations' positions

2.5.1 Because of the impact action considered under this Agenda Item was expected to have on the way flight operations in the NAT Region would be conducted, the Group felt it advisable to provide the two User Organizations present at this Meeting, IATA and IFALPA, with an opportunity to state their views on the situation as it presented itself at this time in order to make them a matter of record.

2.5.2 With regard to navigational capability and related separation minima as applicable in the NAT Region, the Representative of IFALPA stated that the policy of his Organization, as recently confirmed at their Annual Conference 1976, was that:

"a) In areas such as oceanic areas, in addition to the basic station-referenced aid for national and terminal operations, the navigational requirement may be met by one or other of the following combinations:

i) two independent self-contained sensors and one independent station-referenced aid serving the operational area concerned,

or

ii) two independent station-referenced sensors serving the operational area concerned,

or

iii) three independent INS sensors.

b) When the standard of navigational equipment in a)iii) above is met, IFALPA accepts that lateral separation in the NAT organized track structure may be reduced to 60NM or, in the case of composite separations, to 30NM.

c) No reduction in separation standards can be accepted until such time as a collection and analysis of statistical evidence from aircraft operating at a lower standard of navigational equipment than that specified in a)iii) has demonstrated that safety standards will not be compromised.

d). IFALPA recognizes, however, that navigation equipment other than INS but having a comparable accuracy and reliability specification may soon be available."

2.5.3 In addition the Representative from IFALPA stated that he was unable to accept the value of 120NM as the minimum value for lateral separation used outside the organized track system once the LORAN A stations had been withdrawn from service. This was based on the ground that IFALPA believes that no numerical value for the use of lateral separation in the above described conditions can be mathematically substantiated at this time for use between aircraft not meeting the Minimum Navigation Performance Specifications because their number, as well as their navigation capability, is unknown. Therefore until such time as both of these parametres are known IFALPA would prefer that no numerical value for the minimum lateral separation to be applied between these aircraft be stated and that this be done only after a reassessment of the situation has been made prior to the application of a specific value, work in which IFALPA is prepared to participate. (Para 6.7 and the related Recommendation on page 2-A-10 refer.)

2.5.4 The Representative of IATA expressed the position of his Organization as follows:

"a) Concern was voiced by IATA in respect of several aspects of this meeting. The first of these was not new: IATA has considerable reservations regarding some aspects of the mathematical treatment of collision risk.

b) Secondly, the limitation of Minimum Navigation Performance Specifications to the Organized Track System has seriously affected some of the arguements on which the development of MNPS has been based. However, IATA appr,ciates that this limitation results from decisions taken elsewhere.

c). Thirdly, IATA is concerned at the long lead-time which States are suggesting between the introduction of MNPS and the use of reduced lateral separation. In IATA's opinion it is quite likely that enough data will have been collected prior to 29 December 1977 to enable a decision to be made which would implement reduced separation before October 1978.

d) Since it appears that only a minority of aircraft will rely on OMEGA as a means of meeting the MNPS, IATA feels that user charges levied on all operators might be an unfair burden. Consequently IATA expressed concern regarding the stated necessity to include OMEGA in the Regional Plan in case such inclusion be taken as justification for the levy of user charges on all operators."

Proposal for Action Regarding Aircraft Navigation Performance Specifications

1. Introduction

1.1 During its 11th Meeting (Paris, May 1975) the NAT Systems Planning Group agreed in principle that in order to permit a reduction in the lateral separation between aircraft on the tracks in specified parts of the NAT Region, a new procedure should be developed based on the use of a Minimum Navigation Performance Specification. Subsequent to that Meeting, various Working Groups made extensive studies and finally developed proposals dealing with both the operational and mathematical aspects of the Minimum Navigation Performance Specification. When the 9th Air Navigation Conference was held in April-May 1976, the subject was further discussed, resulting in Recommendations 2/1 and 2/2.

1.2 The Group recognized that the 9th Air Navigation Conference, in its Recommendation 2/1 had requested ICAO to undertake necessary work required to permit the establishment of Minimum Navigation Performance Specifications. It fully supported the intention of this Recommendation, and felt that, in view of developments in the NAT Region, this work should receive priority consideration noting that in Recommendation 2/2, the 9th AN Conference had provided for the possibility of introducing Minimum Navigation Performance Specifications in the NAT Region on an interim basis and limited in application to aircraft operating in the organized track system.

1.3 In view of this situation, the NAT/SPG restricted its proposals for action to the limits of Recommendation 2/2 of the 9th AN Conference, even though it was felt that, should the Group not have been confronted with these limitations, more advantageous solutions could have been developed.

1.4 At the same time the Group realized that, in the North Atlantic, planners were faced with a continuously evolving situation where developments in different fields (number of flights conducted, distribution of traffic on different routes, airborne navigation equipment, fleet utilisation by operators, etc.) can have a significant influence on the overall development of air navigation in the region. As some of these developments cannot as yet be quantified, States and operators concerned are therefore required to keep the overall situation under constant review, in order to make necessary adjustments towards the improvement and extension of the concept developed in this paper. This obviously underlines the need for speediest possible action on Recommendation 2/1 of the 9th AN Conference as indicated above.

2. Basic Principles of the Proposed Action

2.1 During its first meetings (in the period 1966-1968) the NAT/SPG developed a method for assessing the safe separation between aircraft on tracks in the NAT Region. In this method data collected in the NAT Region are used as an input to a mathematical model which expresses the relationship between collision risk and separation. On the basis of other, world-wide, information the NAT/SPG proposed a value of the maximum acceptable collision risk, which is called the target level of safety. By comparing the collision risk calculated for a certain lateral separation with this target level of safety, an indication is provided as to whether this separation can be considered to be sufficiently safe. If it is found that the lateral separation which is being used or proposed for use results in an estimated collision risk which does not meet the target level of safety, the responsible authorities will have to consider either an increase in the separation or other measures in order to avoid compromising safety. On the basis of this procedure, adjustments to the lateral separation in the NAT Organized Track System have been made in the past.

2.2 The Group was also aware that the provision of LORAN A in a large part of the NAT Region would be discontinued at the end of 1977. It was believed that unless steps were taken to improve the overall standard of navigation performance, the withdrawal of LORAN A could well result in increased lateral separation being required. However, studies had shown that the considerable portion of the traffic which was equipped with INS could in fact operate with reduced lateral separation.

2.3 At its 11th Meeting (Paris, May 1975) the NAT/SPG discussed a proposal for the establishment of a Minimum Navigation Performance Specification for aircraft operating in specified parts of the NAT Region. As a result of the expected withdrawal of LORAN A, it was agreed that the specifications should be such that the large majority of aircraft using present generations INS would meet it and that operators now using LORAN A could take the specifications into account when choosing replacement navigation equipment.

3. Description of the Proposals

3.1 It is proposed to establish a Minimum Navigation Performance Specification for all aircraft using the NAT Organized Track System and to establish a monitoring programme in order to verify that the specification is being met. This new specification is designed for an Organized Track System with a planned lateral separation of 60NM with a future capability to apply a 30NM/1000 feet composite separation.

3.2 The rationale and mathematical foundation for the Minimum Navigation Performance Specification is given in Attachment 1. The specification states that the demonstrated navigation performance required of an aircraft wishing to fly in the NAT Organized Track System should be such that:

a) the standard deviation of the lateral track errors shall be less than 6.3NM;

b) the proportion of the total flight time spent by aircraft 30NM or more off track shall be less than 5.3×10^{-4};

c) the proportion of the total flight time spent by aircraft between 50 and 70NM off track shall be less than 13×10^{-5}.

3.3 It is furthermore proposed that operators, and States having jurisdiction over such operators, ensure that aircraft equipped with navigation systems which are unable to meet the performance specification do not plan flights in the NAT Organized Track System.

3.4 Proposals for implementation of the Minimum Navigation Performance Specification and reduced lateral separation appear in para.5.

3.5 The proposed performance specification is designed to ensure operation within a target level of safety in the track system operating environment for a ten-year period from the time of adoption. Towards the end of the period, the performance specification will be re-examined in the light of the operating environment. Furthermore, the collision risk will be periodically re-estimated during that period in order to assess the impact of system performance upon safety.

4. Evaluation programme and operational approval of air navigation systems in relation to specific Minimum Navigation Performance Specifications

4.1 The Group noted that the 9th AN Conference adopted basic guidance material on this subject which emanated from previous work of the NAT/SPG. It felt that the material referred to in Recommendation 2/3 of the 9th AN Conference should be applied in the specific case of the NAT Region. For convenience the appropriate material is reproduced in Attachment 2.

5. Monitoring of navigation performance

5.1 In this respect, the Group also noted that the 9th AN Conference had already adopted basic guidance material on this subject which was originally developed by the NAT/SPG.

5.2 Therefore, using the guidance material referred to in Recommendation 2/3 of the 9th AN Conference, the Group felt it needed amplification to make it suitable for application in the specific environment of the NAT Region. The relevant material is contained in Attachment 3.

5.3 Navigation performance depends on the navigation equipment installed, the operating instructions issued for its use and adherence to those instructions by the crew members involved. However, the Group recalled that these aspects were covered in paras 2.1 and 2.2 of Appendix A to the Report on Item 2 of the 9th AN Conference and it specifically wished to confirm these provisions.

6. Proposed action by the Meeting

6.1 In the light of the above, the NAT/SPG requests the Limited NAT RAN Meeting 1976 to take the following action:

RECOMMENDATION - AMENDMENT TO DOCUMENT 7030

That the Regional Supplementary Procedures in Part I, Rules of the Air and Air Traffic Services and Search and Rescue, as applicable in the NAT Region be amended as follows:

a) Amend para 1 in accordance with the following:

i) "1.1.1 Minimum lateral separation shall be:

1 a) 60 nautical miles between turbojet aircraft which meet the Minimum Navigation Performance Specifications in accordance with para 1.5 below and which operate in the organized track system as established in accordance with para 3.5;

b) 90 nautical miles between aircraft operating:

i) between the United States or Canada and Bermuda;

ii) between the United States, Canada or Bermuda and points in the CAR Region;

iii) between the Iberian Peninsula and the Azores Islands; and

iv) between Iceland and points in Scandinavia and in the United Kingdom;

c) 120 nautical miles between other aircraft.

except that the lower minima in 7.2 of Part III of the PANS-RAC may be applied, or further reduced in accordance with 9 of the same Part, where the conditions specified in the relevant PANS-RAC provisions are met."

ii) "1.4 Composite separation

1.4.1 Between aircraft operating at or above FL290 and within the organized track system as established in accordance with para 3.5, composite separation, consisting of the combination of 30 nautical miles lateral and 300 metres (1000 feet) vertical separation may be applied.

1.4.2 This type of separation may be applied between aircraft operating in the same or opposite directions.

iii) "1.5 Minimum Navigation Performance Specifications

States having jurisdiction over operators intending to conduct flights within the Organized Track System established in accordance with para 3.5 shall ensure that aircraft, used for such operations have demonstrated navigation performance capability such that:

a) the standard deviation of lateral track errors shall be less than 6.3NM;

b) the proportion of the total flight time spent by aircraft 30NM or more off the cleared track shall be less than 5.3×10^{-4};

c) the proportion of the total flight time spent by aircraft between 50 and 70NM off the cleared track shall be less than 13×10^{-5}."

Note: In accordance with para 3.5, an Organized Track System may be promulgated in the NAT Region between 30°N and 65°N and between FL280 and FL390 inclusive.

iv) Re-number the existing para 1.5 as 1.6.

b) Amend para 3.5 as follows:

"3.5 Establishment and use of organized tracks

3.5.1 When necessary in order to permit the optimum use of the airspace, the area control centres serving Gander, New York, Santa Maria and Shanwick Oceanic control areas may, subject to coordination with each other and, when appropriate, with Reykjavik area control centre, establish an organized track system. The following procedures shall then be applied;

3.5.1.1 Operators conducting scheduled or non-scheduled flight operations within Gander Oceanic, New York Oceanic, Shanwick Oceanic and Santa Maria (north of 30°North)Oceanic control areas shall provide information to the area control centres concerned regarding the tracks likely to be requested by turbojet aircraft during peak traffic periods. Such information shall be provided as far in advance of the anticipated peak periods as practicable and as specified in appropriate aeronautical information publications.

3.5.1.2 Based on the above information an Organized Track System may be established. The location of the organized tracks will depend on traffic demand and other relevant factors but at no time will they extend North of 65°N, South of 30°N or above FL390 or below FL280. The related organized track messages will be disseminated to operators by Shanwick Oceanic area control centre for the predominant Westbound flow of air traffic and by Gander Oceanic area control centre for the predominant Eastbound flow of air traffic. These messages hsall be disseminated at least three hours in advance of each anticipated peak traffic period. Any subsequent change made to the track system shall be notified to the operators as soon as possible.

3.5.2 Aircraft may be cleared to join the outer track of the organized track system at points other than the normal entry points in the oceanic control areas provided required minimum longitudinal or vertical separation will exist between such aircraft and others operating along this track. The clearance shall, however, provide that joining shall be effected via a track extending between the point of joining and a point which, at 10 degrees of longitude from the joining point, is laterally not less than 60NM distant from the track in question.

3.5.3 Aircraft flying along the outer track of the organized track system may be cleared to leave the system provided that the lateral separation from all other aircraft in the system continuously increases or another form of separation is established.

3.5.4 Aircraft changing tracks within the organized track system or which are crossing the organized track system shall be cleared to do so only if they are provided with minimum longitudinal, lateral or vertical separation with respect to other aircraft.

3.5.5 Aircraft operating in the organized track system may be cleared to change levels on the same track.

Note: The provisions in paras 3.5.2 to 3.5.5 apply also in those cases when composite separation is used in the organized track system."

6.2 With regard to the above Recommendation, the Group noted that some of its aspects had a bearing on the proposal for amendment of the NAT Regional Supplementary Procedures contained in the Summary of Item 1 and that this may require consequential action in due time.

RECOMMENDATION - DISPOSITION OF GUIDANCE MATERIAL REGARDING MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS

That the material contained in Attachments 1, 2, and 3 to this paper be retained as guidance material for use in the NAT Region.

6.3 As a consequence of the amendments proposed to the NAT Regional Supplementary Procedures, and especially those concerning the introduction of a Minimum Navigation Performance Specification, it will be essential to amend the NAT Regional Plan so that it contains provisions regarding coverage in that Region by OMEGA ground stations.

6.4 It should be noted that this proposal presupposes eventual action by ICAO to include, in relevant world-wide documents such as Annex 10, material regarding the OMEGA navigation system.

6.5 In the light of these circumstances, the Group felt that, in order to achieve the objective stated in para 6.3 above, the best course of action would be to amend the basic operational requirements and criteria for regional planning as applicable in the NAT Region.

RECOMMENDATION - AMENDMENT OF THE STATEMENT OF BASIC OPERATIONAL REQUIREMENTS AND PLANNING CRITERIA FOR THE NAT REGION

That under the heading "Navigation" the following paragraph be included, in a suitable location in the basic operational requirements and planning criteria for the NAT Region:

"X. In order to ensure that aircraft, relying on navigational guidance derived from the OMEGA navigation system, can meet the Minimum Navigation Performance Specifications established for the NAT Region, it will be essential to provide for continuous and reliable coverage within the NAT Region by the OMEGA navigation system. This will have to include the availability of up-to-date status information of all OMEGA ground stations used to provide such coverage."

6.6 In view of the many factors affecting the implementation of the changes proposed above, the Group found it necessary to develop specific proposals for the phasing of implementation. These proposals envisage that:

a) the provisions regarding Minimum Navigation Performance Specifications for aircraft operating within the Organized Track System in the NAT Region as specified in the new paragraph 1.5 on page 2-A-5 above, should become applicable when the LORAN A stations in the eastern part of the NAT Region are withdrawn from service;

b) the provisions regarding the use of 60NM lateral separation between aircraft operating on adjacent tracks within the Organized Track System should become applicable some 9 months after the date specified in a) above, in order to provide for a sufficiently long monitoring period of the actual navigation performance of aircraft in the NAT Region after the withdrawal of LORAN A stations;

c) the provision regarding the use of composite separation as proposed in para 1.4 on page 2-A-5 should only become applicable after Provider States and operators concerned have reached agreement on a mutually acceptable application date.

6.7 In addition, the Group felt that it would be essential to undertake further work following the LIM NAT RAN Meeting 1976, in order to ensure that the implementation of these provisions could be effected without any degradation in the levels of safety currently afforded within the Region and in a manner ensuring the highest possible economic efficiency of operations. It was believed that such work would have to be based on close monitoring of the situation as it developed after the LIM NAT RAN Meeting 1976. To this extent it was believed best if a Meeting of the NAT/SPG were held in late 1977 to review the situation within the Region as it was likely to exist after 29 December 1977 when the LORAN A stations would be withdrawn, in order to determine:

a) in the light of detailed information then available on the number of aircraft likely to be unable to meet the Minimum Navigation Performance Specifications, the specific values of lateral separation which will be required to be applied to such aircraft in order to ensure an acceptable level of safety; and

b) the manner of application of the agreed lateral separation values.

RECOMMENDATION - PHASED IMPLEMENTATION OF THE REVISED NAT REGIONAL SUPPLEMENTARY PROCEDURES

That:

a) the proposed NAT Regional SUPPs regarding adherance of aircraft operating in the Organized Track System to Minimum Navigation Performance Specifications should become applicable as of 29 December 1977;

b) the provisions regarding the use of 60NM lateral separation between aircraft operating on adjacent tracks in the Organized Track System should become applicable on 5 October 1978, unless another date was agreed in due time between States and Operators concerned; and

c) the revised provisions regarding the use of composite separation within the Organized Track System should become applicable at some time after 5 October 1978 as agreed between States and Operators concerned and notified in due time to ICAO.

RECOMMENDATION - FURTHER WORK OF THE NAT/SPG

That:

a) The NAT/SPG be requested to plan a Meeting in late 1977 in order to:

i) review the situation likely to exist within the Region regarding the navigation capability of aircraft after the withdrawal of the LORAN A stations;

ii) determine the likely number of aircraft which, at that time, are unable to comply with the Minimum Navigation Performance Specifications as applicable in the NAT Region;

iii) in the light of the above, determine the values of lateral separation required to be applied between such aircraft to ensure a continued acceptable level of safety;

iv) develop procedures for the application of the values agreed under iii) above;

b) in order to assist the NAT/SPG in the task outlined above, States having operators conducting flights in the NAT Region be invited to inform ICAO by mid-October 1977 regarding the numbers of aircraft of such operators which on 29 December 1977:

i) can be expected to comply with the Minimum Navigation Performance Specification as applicable in the NAT Region;

ii) are unable to comply with those specifications.

Note: The information under ii) above should, if at all possible, be supplemented by an indication if and when compliance by these aircraft is likely to be achieved.

ANALYTICAL DEVELOPMENT OF A MINIMUM NAVIGATION PERFORMANCE SPECIFICATION

1. Introduction

1.1 The purpose of this Attachment is to delineate the rationale and mathematical foundation for the minimum navigation performance specification applicable in the North Atlantic Region proposed in this paper. Presented herein are a statement of the assumptions involved and a derivation of the numerical values used in the specification. The minimum navigation performance specification is established to provide a mechanism to assure that the risk of aircraft collision due to loss of lateral separation will be maintained at a satisfactory level, as defined by the Target Level of Safety (TLS). The navigation performance specification achieves this objective by:

a) providing guidelines for new system design and procurement;

b) establishing criteria for acceptable navigation performance as measured through a lateral deviation monitoring programme; and

c) providing a basis for taking remedial actions in the event that the navigation performance of some aircraft is found, through monitoring, not to meet the specification.

1.2 The performance specification is designed to assure acceptable lateral collision risk in the organized track system environment for a ten-year period from the time of adoption. Before the end of that period, the performance specification will be re-examined in the light of possible changes in the operating environment and equipment technology during that time.

2. Collision Risk Formula

2.1 It is assumed that the collision rate is related to the lateral overlap probability by the NAT/SPG collision risk formula which relates lateral navigation performance to the risk of collision due to

loss of lateral separation. The formula agreed upon by the NAT SPG to represent the lateral collision risk is:

$$N_{ay} = 10^7 \, P_y(S_y) \, P_z(0) \, \frac{\lambda_x}{S_x} \left\{ E_y(\text{same}) \left(\frac{\overline{|\Delta V|}}{2\lambda_x} + \frac{\overline{|\dot{y}|}}{2\lambda_y} + \frac{\overline{|\dot{z}|}}{2\lambda_z} \right) + E_y(\text{opp}) \left(\frac{2\overline{|V|}}{2\lambda_x} + \frac{\overline{|\dot{y}|}}{2\lambda_y} + \frac{\overline{|\dot{z}|}}{2\lambda_z} \right) \right\} \quad (1)$$

2.2 The parameters used in this equation are defined below and the values used are:

$S_y = 60\text{NM}$ = the lateral separation standard

$P_y(S_y)$ = the probability of lateral overlap of aircraft nominally flying on laterally adjacent paths (the value of this parameter is calculated below)

$P_z(0)$ = 0.25 = the probability of vertical overlap of aircraft nominally flying at the same flight level

λ_x = 0.033 NM (=200ft) = the average length of an aircraft

λ_y = 0.033 NM (=200ft) = the average wing span of an aircraft

λ_z = 0.0085NM(=50ft) = the average vertical dimension of an aircraft

S_x = 120NM = a parameter used in the calculation of the E_y values

E_y (same)	= 0.5	=	the average number of same-direction aircraft flying on laterally adjacent tracks at the same flight level within segments of length 2 S_x centred on the typical aircraft
E_y(opposite)	= 0.013	=	the average number of opposite direction aircraft flying on adjacent tracks at the same flight level within segments of length 2 S_x centred on the typical aircraft.
$\overline{\lvert\Delta V\rvert}$	= 13 Kt	=	the average relative along-track speed of two aircraft flying at the same flight level in the same direction
$\overline{\lvert V\rvert}$	= 480Kt	=	the average ground speed of an aircraft
$\overline{\lvert\dot{y}\rvert}$	= 47Kt	=	the average relative cross-track speed between aircraft which have lost 60NM of separation
$\overline{\lvert\dot{z}\rvert}$	= 1Kt	=	the average relative vertical speed of aircraft flying at the same flight level

All the values given above, except those for E_y(same) and E_y (opposite), have been used in all recent calculations of the NAT SPG and are regarded as the best estimates of the operating environment. The values of E_y(same) and E_y(opposite) have been estimated on the basis of the most recent North Atlantic Traffic forecasts and on traffic counts made in the North Atlantic in 1973. Total average traffic flow = 400 flights per day (NAT/TFG baseline forecast for 1982), of which 350 will cross 20°W or 40°W between 45°N and 65°N. This number (flights between 45°N and 65°N) is needed because it was used in traffic packing studies which used ATC records and computer simulations to derive values of E_y (same) and E_y(opposite).

2.3 Dropping the subscript y from the separation standard, the lateral overlap probability is related to the overlap integral by the defining relation

$$P_y(S) = 2\lambda_y C(S) \qquad (2)$$

so that the overlap integral is given in terms of the lateral deviation distribution f(Y) by:

$$C(S) = \int_{-\infty}^{\infty} f(Y)\, f(Y+S)\, dY \qquad (3)$$

Here, f(Y) is the probability density function of lateral deviations from course.

2.4 The objective of the minimum navigation performance specification can now be stated in terms of the NAT SPG collision risk formula:

> The level of navigation performance in the North Atlantic Organized Track System shall be such that the risk of collision due to loss of lateral separation does not exceed 0.2 fatal aircraft accidents in 10^7 flying hours.

2.5 Using the values of the collision risk formula parameters given above and $N_{ay}=0.2$, this objective implies that the maximum allowable level of C(S) is $4.26 \times 10^{-6} NM^{-1}$. In the estimation of collision risk from observed lateral deviation data the estimation of C(S) is the crucial point of the procedure. Likewise, in the establishment of a navigation performance specification, the primary concern is to ensure via the specification that C(S) will not exceed the maximum allowable value indicated above.

2.6 In the next section, general characteristics of the lateral deviation distribution, f(Y), inferred from data collected to date in the North Atlantic are discussed in terms of the consequent properties of C(S). This discussion leads to the calculation of parameters used in formulating a minimum navigation performance specification for the North Atlantic Organized Track System.

3. Derivation of the Numerical Values

3.1 The specification has been developed based on a set of assumptions concerning the distribution of lateral deviations which reasonably reflect characteristics observed in data collections to date and which can be expected to hold true in the future. Specifically, the probability density function of lateral deviation is assumed to be:

a) symmetric with zero mean;

b) unimodal;

c) most heavily weighted in the inner (core) region; and

d) slowly varying and small in magnitude in the outer (tail) region.

3.2 As a consequence of these properties, a simple approximation for C(S) can be developed. Assumptions c) and d) are restated in a different manner, assuming the existence of a positive number $K<S/2$:

$$\int_{|Y| \geq K} f(Y)\, dY \ll 1$$

$$\left| \frac{f^{(m)}(Y)}{f(Y)} \right| \ll \frac{1}{K^m} \qquad \text{(for } |Y|>K \text{ and for all positive integers m)} \qquad (5)$$

3.3 The first relation indicates that the bulk of the distribution is contained within the core region, while the second relation expresses the fact that for $|Y|>K$, and in particular for $Y \approx S$, $f(Y)$ is smooth and slowly varying on intervals as wide as the core region. For instance, if $f(Y)$ in the vicinity of $Y=S$ has the parametric form $f(Y)=Ae^{-Y/2}$, then the inequality (4) becomes $\frac{1}{\lambda^m} \ll \frac{1}{K^m}$ for all positive integers m, or simply $\lambda \gg K$.

3.4 The justification of the assumption that for a distribution of lateral deviations from track, a value of K can be chosen such that the inequalities (4) and (5) hold, is essentially empirical. It has been consistently observed in data collection programs that the vast majority of aircraft stay within a narrow interval about the center line Y=0 while the few remaining aircraft execute larger deviations with a frequency which falls off slowly with respect to magnitude of deviation. Roughly speaking, these two groups can be distinguished as "normal operations" and "blunders".

3.5 When use is made of the four assumptions mentioned above, eq. (3) can be more conveniently written as:

$$C(S) = 2\int_{\cdot}^{S/2} f(Y)f(S-Y)\,dY \qquad (6)$$

$$= 2\int_{-K}^{K} f(Y)\,f(S-Y)\,dY + 2\int_{K}^{S/2} f(Y)\,f(S-Y)\,dY + 2\int_{-\infty}^{-K} f(Y)\,f(S-Y)\,dY$$

Denote the first term on the right hand side of the equation above by $C_1(S)$. It is the only term which depends on $f(Y)$ for $|Y|<K$, so it is interpreted as the "core-tail interaction."

3.6 The factor $f(S-Y)$ is expanded in a Taylor series about $Y=0$ (i.e., about $S-Y=S$):

$$f(S-Y)=f(S) - Yf'(S) + \frac{Y^2}{2} f''(S) + \ldots + \frac{(-Y)^m}{m} f^{(m)}(S) + \ldots \qquad (7)$$

Direct substitution into the formula for $C_1(S)$ gives:

$$C_1(S)=2\sum_{m=0}^{\infty} \frac{1}{m!} f^{(m)}(S) \int_{-K}^{K} (-Y)^m f(Y)dY$$

$$\leq 2\sum_{m=0}^{\infty} \frac{1}{m!} f^{(m)}(S)\; K^m \int_{-K}^{K} f(Y)\,dY$$

$$=2\left\{f(S) + \sum_{m=1}^{\infty} \frac{K^m}{m!} f^{(m)}(S)\right\}\int_{-K}^{K} f(Y)\,dY \qquad (8)$$

The inequality follows from replacing $(-Y)^m$ by K^m in the integrand, since $(-Y)^m < K^m$ for $-K<Y<K$. Noting that $\int_{-K}^{K} f(Y)\,dY \approx 1$, and applying the inequality (5), all but the leading term in eq. (8) are negligible and

$$C_1(S) \approx 2f(S) \qquad (9)$$

3.7 As a result of the small magnitude and slow variation of the density function in the tail region, the other terms in eq. (6) are negligible by comparison with $C_1(S)$ and so

$$C(S) \approx 2\,f(S) \qquad (10)$$

3.8 The quantity 2f (S) is a measurable function of the navigation performance of the aircraft. It is equal to the probability that the absolute value of the lateral deviation lies within a certain region about the separation standard S, divided by the width of that region. The approximate equation (10) relates this quantity to C(S), for which a maximum allowable value of 4.26×10^{-6} per NM has been derived above. If the region about S is taken as 50 to 70NM, the requirement on the navigation performance can be expressed as:

> the proportion of the total flight time spent at lateral deviations from track between 50 and 70NM shall be less than 13×10^{-5}.

3.9 The value of f(S) determined from the relationship given by eq. (10) can be used as a specification of navigation performance. However, a specification in terms of density function alone, both as a guide to manufacturers of navigation systems and as a standard for the measurement of acceptable performance in the track system, would be difficult to implement, since a very large number of lateral deviation measurements is required to demonstrate a navigation system's compliance with the small value of f(S). An alternative specification, employing not only f(S) but also the standard deviation of nominal navigation performance and the probability of lateral deviations at least as large as half separation, can be developed, but a parametric form for the distribution of lateral deviations has to be assumed. The advantage of this specification is that navigation parameters which are more readily adaptable to design goals and performance measurements form a part of the specification, while the restriction on f(S) is maintained. Taking into account the shapes of distributions observed in the past, in which distinct "core" and "tail" regions have often been encountered, the double-double exponential (DDE) function has been chosen to characterize the distribution of lateral deviations from course. This distribution is a weighted sum of two double exponential distributions and has the form:

$$f(Y) = \frac{(1-\alpha)}{2\lambda_1} e^{-|Y|/\lambda_1} + \frac{\alpha}{2\lambda_2} e^{-|Y|/\lambda_2} \quad (0<\lambda_1<\lambda_2<\infty;\ 0\leq\alpha\leq 1) \qquad (11)$$

where λ_1 and λ_2 can be thought of as the scale parameters of the core and tails, respectively, in the sense of the "normal operation" and "blunder" interpretation cited previously, with α indicating the relative weight of the tails.

3.10 The standard deviation σ of this distribution is given by:

$$\sigma^2 = 2\left\{(1-\alpha)\lambda_1^2 + \alpha\lambda_2^2\right\} \qquad (12)$$

and the probability of deviation by at least half standard is:

$$\eta = \text{Prob}\,(|Y| > S/2) = (1-\alpha)e^{-S/2\lambda_1} + \alpha e^{-S/2\lambda_2} \qquad (13)$$

The overlap integral is

$$C(S) = \left[\frac{1-\alpha}{2\lambda_1}\right]^2 (S+\lambda_1)e^{-S/\lambda_1} + \left[\frac{\alpha}{2\lambda_2}\right]^2 (S+\lambda_2)e^{-S/\lambda_2}$$

$$+ \frac{\alpha(1-\alpha)}{2}\left[\frac{1}{\lambda_2 - \lambda_1}\left(e^{-S/\lambda_2} - e^{-S/\lambda_1}\right)\right.$$

$$\left. + \frac{1}{\lambda_1 + \lambda_2}\left(e^{-S/\lambda_1} + e^{-S/\lambda_2}\right)\right] \qquad (14)$$

3.11 Combinations of the values of λ_1, λ_2, and α which exactly provide the required value of $C(S)$ (4.26×10^{-6}) are tabulated in the attached table. The bottom element of each dual number entry is the value of η (denoted by "ETA") corresponding to the specific set of values λ_1, λ_2 and α. The star signs indicate that at the given value of λ_1, λ_2 and α exist, given the definition of the DDE function, such that the required value of $C(S)$ can be achieved.

3.12 From this table it is apparent that:

i) a value of λ_1 less than 6NM is required for achieving the required value of $C(S)$ and,

ii) the value of η is never less than 5.3×10^{-4}.

Choosing a maximum value of 4.5NM for $_1$ would imply a maximum value of $4.5\sqrt{2} = 6.3$NM for the standard deviation of the "core" above. It is seen from eq. (12) that the standard deviation of the entire distribution is certainly not less than that of the core.

3.13 The lower bound of 5.3×10^{-4} for the values of η in the table implies that if η is specified not to exceed this value, C(S) (and hence the collision risk) will also not exceed the permitted maximum.

3.14 In summary, combining the results of both the analyses carried out above, the specification is:

a) the standard deviation of the lateral track errors shall be less than 6.3NM;

b) the proportion of the total flight time spent by aircraft 30NM or more off track shall be less than 5.3×10^{-4};

c) the proportion of the total flight time spent by aircraft between 50 and 70NM off track shall be less than 13×10^{-5}.

TABLE 1

COMBINATIONS OF LAMDA 1, LAMDA 2, AND ALPHA WHICH GIVE THE TARGET LEVEL OF C(I)

C(I) = 0.00000645280220000
SEPARATION STANDARD = 60. N.M.

LAMDA 1 (N.M.)

LAMDA 2 (N.M.)		1.	2.	3.	4.	5.	6.
7.	ALPHA =	0.186714	0.180122	0.167741	0.142653	0.052586	********
	ETA =	0.002570	0.002479	0.002347	0.002438	0.003072	********
8.	ALPHA =	0.084147	0.080993	0.075466	0.064634	0.023293	********
	ETA =	0.001979	0.001905	0.001817	0.002037	0.002969	********
9.	ALPHA =	0.043389	0.041935	0.039447	0.034369	0.012490	********
	ETA =	0.001548	0.001496	0.001451	0.001760	0.002893	********
10.	ALPHA =	0.025303	0.024580	0.023354	0.020673	0.007615	********
	ETA =	0.001260	0.001224	0.001207	0.001571	0.002839	********
11.	ALPHA =	0.016300	0.015906	0.015239	0.013663	0.005097	********
	ETA =	0.001066	0.001041	0.001041	0.001439	0.002799	********
12.	ALPHA =	0.011349	0.011116	0.010721	0.009709	0.003660	********
	ETA =	0.000932	0.000913	0.000925	0.001345	0.002770	********
13.	ALPHA =	0.008397	0.008249	0.007998	0.007300	0.002776	********
	ETA =	0.000835	0.000821	0.000841	0.001275	0.002748	********
14.	ALPHA =	0.006517	0.006418	0.006249	0.005738	0.002197	********
	ETA =	0.000765	0.000753	0.000778	0.001223	0.002731	********
15.	ALPHA =	0.005254	0.005185	0.005065	0.004675	0.001800	********
	ETA =	0.000711	0.000702	0.000731	0.001183	0.002718	********
16.	ALPHA =	0.004369	0.004318	0.004231	0.003920	0.001517	********
	ETA =	0.000670	0.000663	0.000694	0.001152	0.002708	********
17.	ALPHA =	0.003726	0.003688	0.003621	0.003367	0.001308	********
	ETA =	0.000638	0.000632	0.000665	0.001128	0.002699	********
18.	ALPHA =	0.003245	0.003215	0.003163	0.002949	0.001149	********
	ETA =	0.000613	0.000608	0.000643	0.001108	0.002693	********
19.	ALPHA =	0.002875	0.002852	0.002810	0.002626	0.001026	********
	ETA =	0.000593	0.000588	0.000625	0.001093	0.002688	********
20.	ALPHA =	0.002586	0.002566	0.002533	0.002371	0.000929	********
	ETA =	0.000577	0.000573	0.000610	0.001081	0.002684	********
21.	ALPHA =	0.002354	0.002338	0.002310	0.002167	0.000851	********
	ETA =	0.000564	0.000561	0.000599	0.001071	0.002680	********
22.	ALPHA =	0.002167	0.002153	0.002130	0.002000	0.000787	********
	ETA =	0.000554	0.000551	0.000590	0.001064	0.002678	********
23.	ALPHA =	0.002012	0.002001	0.001981	0.001863	0.000734	********
	ETA =	0.000546	0.000543	0.000583	0.001058	0.002676	********
24.	ALPHA =	0.001884	0.001874	0.001857	0.001748	0.000689	********
	ETA =	0.000540	0.000537	0.000577	0.001053	0.002675	********

25.	ALPHA =	0.001776	0.001767	0.001752	0.001651	0.000652	********
	ETA =	0.000535	0.000533	0.000573	0.001050	0.002674	********
26.	ALPHA =	0.001684	0.001677	0.001663	0.001569	0.000620	********
	ETA =	0.000531	0.000529	0.000570	0.001047	0.002673	********
27.	ALPHA =	0.001606	0.001599	0.001587	0.001499	0.000593	********
	ETA =	0.000529	0.000527	0.000568	0.001046	0.002672	********
28.	ALPHA =	0.001539	0.001533	0.001522	0.001438	0.000569	********
	ETA =	0.000527	0.000525	0.000567	0.001045	0.002672	********
29.	ALPHA =	0.001480	0.001475	0.001465	0.001385	0.000549	********
	ETA =	0.000526	0.000525	0.000566	0.001045	0.002672	********
30.	ALPHA =	0.001429	0.001425	0.001416	0.001339	0.000531	********
	ETA =	0.000526	0.000524	0.000566	0.001045	0.002673	********
31.	ALPHA =	0.001385	0.001380	0.001372	0.001299	0.000515	********
	ETA =	0.000526	0.000525	0.000567	0.001046	0.002673	********
32.	ALPHA =	0.001346	0.001342	0.001334	0.001263	0.000502	********
	ETA =	0.000527	0.000526	0.000568	0.001047	0.002674	********
33.	ALPHA =	0.001311	0.001308	0.001301	0.001232	0.000489	********
	ETA =	0.000528	0.000527	0.000569	0.001049	0.002675	********
34.	ALPHA =	0.001281	0.001277	0.001271	0.001204	0.000479	********
	ETA =	0.000530	0.000529	0.000571	0.001051	0.002676	********
35.	ALPHA =	0.001254	0.001250	0.001245	0.001180	0.000469	********
	ETA =	0.000532	0.000531	0.000574	0.001053	0.002677	********
36.	ALPHA =	0.001229	0.001227	0.001221	0.001158	0.000460	********
	ETA =	0.000534	0.000533	0.000576	0.001056	0.002678	********
37.	ALPHA =	0.001208	0.001205	0.001200	0.001138	0.000453	********
	ETA =	0.000537	0.000536	0.000579	0.001058	0.002679	********
38.	ALPHA =	0.001189	0.001186	0.001182	0.001121	0.000446	********
	ETA =	0.000540	0.000539	0.000582	0.001061	0.002680	********
39.	ALPHA =	0.001172	0.001169	0.001165	0.001105	0.000440	********
	ETA =	0.000543	0.000542	0.000585	0.001065	0.002682	********
40.	ALPHA =	0.001157	0.001154	0.001150	0.001091	0.000435	********
	ETA =	0.000546	0.000546	0.000589	0.001068	0.002683	********
41.	ALPHA =	0.001143	0.001141	0.001137	0.001079	0.000430	********
	ETA =	0.000550	0.000549	0.000592	0.001072	0.002684	********
42.	ALPHA =	0.001131	0.001129	0.001125	0.001068	0.000426	********
	ETA =	0.000554	0.000553	0.000596	0.001075	0.002686	********
43.	ALPHA =	0.001120	0.001118	0.001114	0.001058	0.000422	********
	ETA =	0.000557	0.000557	0.000600	0.001079	0.002688	********

Extract from Appendix A of the Report on Item 2 of the 9th AN Conference

"2.3 Evaluation Programme and Operational Approval

2.3.1 In most cases, operators will be able to select for installation equipment for which performance capability has already been established to the satisfaction of a State of Registry, and the primary concern will therefore be in establishing that the end product of performance of the system is of the highest order. Where, however, a completely new system is proposed for use or major changes have been made in the technology of an existing system, an evaluation will be necessary to establish the quality of performance before authorization for use as a primary system.

2.3.2 Where such an evaluation is required, normal navigational performance must be assured by the carriage of a system having current approval in addition to the new system being evaluated.

Any evaluation programme must provide data on sufficient flights to demonstrate to the satisfaction of the appropriate authority:-

(a) The accuracy and reliability required to establish compliance with the appropriate Navigation Performance Specification.

(b) The adequacy of operational procedures.

(c) The adequacy of maintenance arrangements.

(d) The adequacy of operations and maintenance training programmes.

The amount of flying required to complete an evaluation will vary with the type of installation, the experience of the manufacturer or other operators with the equipment and the results which have been obtained.

2.3.3 The process of operational approval of a new system, after its Airworthiness Certification, will generally consist of the following phases:

(a) Manufacturers' trials and trials on board the aircraft in the regional environment concerned, with the basic navigational requirement being met by an existing approved system. Previous valid evaluation programme data may be used.

(b) Confirmatory flights by the Flight Standards Organization of the State of Registry, after establishing that the overall standards of accuracy and reliability appear acceptable, to establish that adequate operating drills/procedures and training facilities have been established leading to conditional approval for use in the environment.

(c) Operational use in the environment but with close monitoring to ensure that the initially approved level of performance is being maintained.

2.3.4 In the event that the performance of a system falls significantly below the requirement during this latter period, the State of Registry will need to consider whether remedial action in terms of improvement to the equipment or flight-deck drills is possible, or whether the aircraft may need to be temporarily excluded from the system. This latter consideration is of significant importance as the only alternative may be to increase the separation values currently applied, thus creating a considerable economic burden for other operators."

Monitoring of navigation performance

1. General provisions

1.1 Extract from Appendix A to the Report on Item 2 of the 9th AN Conference

"3.2 Monitoring Procedures

3.2.1 To assure compliance with any minimum navigation performance specifications, States may need to establish procedures for :

a) the systematic or periodic monitoring of the actually achieved navigation performance and ;

b) the notification of pilots-in-command, operators and States of Registry of any gross deviations from assigned track.

Close cooperation between operating crews, operators, and flight standards authorities will be required to ensure that unsatisfactory performance is properly brought to notice and corrected. Incident reporting procedures of a nature which encourages cooperation by the crew members involved are an essential contribution to safe operations.

3.2.2 In the event of a significant deterioration in navigation performance, whether as the product of random excursions by individual operators or identifiably as the result of an obviously low level of performance by a particular type of equipment system, corrective action will be required. The authority providing air traffic control in an environment where minimum navigation performance specifications apply must accept responsibility in such cases, for advising user States and operators of action being taken to correct the situation. In the absence of agreement with the concerned State(s) of Registry to exclude the offending aircraft from the system, it may be necessary to apply a temporary increase in separation whilst taking appropriate action to resolve the problem."

2. Specific supplementary provisions for use in the NAT Region

2.1 The Minimum Navigation Performance Specification will define tolerances for the occurence of deviations from cleared track.

2.2 A method for monitoring lateral deviations from track will have to be established in areas in which the observed lateral deviations can be regarded as representative of the lateral deviations in the completed Organized Track System. This monitoring should preferably be done on a continuous basis.

2.3 Regular checks should be made to determine whether the lateral deviations observed via the monitoring programme are within the tolerances set by the specification. These checks should be made periodically (e.g. every six months) and whenever the number of large errors is higher than usual. Such checks should be made

i) on all available data, in order to determine the overall safety of the track system ; and

ii) on the data concerning specific navigation systems or specific operators, if it is suspected that they may no longer meet the specification.

It is proposed that the appropriate authority of the State which collects these data will investigate the causes for each large deviation in cooperation with the operator and, where appropriate, with the authorities of the State having jurisdiction over the operator of the aircraft. Such a procedure is already applied by the UK and Ireland in relation to the observations of Shannon Radar, and to a more limited extent, by Canada based on observations by Gander Radar.

2.4 If it is found that the specified tolerances regarding the frequency of large lateral deviations are exceeded, a more detailed investigation must be made. It should be borne in mind that there are at least two general classes of error which can result in large lateral deviations. One of these concerns a progressive deviation from track because of navigational inaccuracy, and the other covers cases where the aircraft flies to or along a track adjacent to its intended track as the result of some operational error. The second type, though extremely dangerous, cannot be prevented by increasing the lateral separation but must be eliminated b improvements to operating procedures.

2.5 If there is an indication that the tolerances are exceeded by a large amount, rapid response to the causes of the problem may be necessary. In such a case, the States responsible for ATC in the NAT Region should take prompt action, after consultation with at least the major affected users. An example where such prompt action may be necessary could be a serious disturbance of the coverage of station-referenced systems, for instance due to unserviceability of ground stations or to very severe ionospheric disturbances. Such action must be possible even when the number of large deviations in the limited area in which the navigation performance is monitored is not excessive, if there is reason to believe that large errors might occur elsewhere in the track structure.

2.6 When the exceedance of the tolerances is not very great or when the observed performance merely shows a trend toward degradation, it will be more useful to have a detailed investigation made, for instance by the NAT SPG. This may take several months, but it must be kept in mind that the target level of safety is equivalent to expecting about one collision every 150 years and that a small increase in the statistical probability of collision during a six (or twelve) month period is acceptable. Such an investigation may show that the causes for the large deviations can be eliminated by improved procedures. Such procedures must then be proposed and be brought to the attention of the operators and/or controllers through the appropriate channels. A close observation of the results of the actions will then be necessary. If the causes cannot be eliminated quickly the States of registry of the aircraft should temporarily exclude offending aircraft types or operators from the Organized Track System. Only in extreme cases should an increase in lateral separation be chosen as a solution.

3. Some practical aspects related to the execution of performance monitoring in the NAT Region

3.1 Since 1967, observations of lateral deviations have been made by several radar stations near the boundaries of the Oceanic Area, for instance, Shannon, Ulster, Brest and Gander. Of these stations, only Shannon and Ulster have made almost continuous observations. In all later collision risk calculations, only the data from Shannon have been used and the calculations were based upon the distribution of lateral deviations measured by Shannon Radar. However, because of its limited coverage the data obtained from Shannon Radar was therefore used with certain reservations. Moreover, it was realized that with the increasing use of INS-equipped aircraft, the local effects of LORAN A coverage became relatively less important for the overall collision risk.

3.2 It seems likely that, at least initially, the data for the new monitoring procedure will be mainly collected by those controllers using Shannon and Mount Gabriel Radars on the Eastern side, and those controllers using Gander Radar on the Western side of the Atlantic. The assumption will be that the distribution of lateral deviations obtained using these radars will be representative of the deviations throughout the Organized Track System i.e., that the relative amount of time spent in the OTS outside each value of the lateral deviation will be the same as the proportion of measurements outside that lateral deviation observed near the Eastern and Western boundaries of the Oceanic Area. It is relevant to look at the consequences of this assumption more closely :

a) For INS-equipped aircraft, it is known that the normal navigation errors tend to increase with the time elapsed since the last alignment or updating of the INS equipment. As far as blunder-type errors are concerned, there seems to be no reason to suppose that the occurrence of this type of error near the Eastern and Western boundaries will not be representative of the whole Oceanic Area. Taking these two aspects into account, the collision risk calculated on the basis of these data will probably be higher than if data for the whole ocean were available. This over-estimation may be appreciable if adjacent tracks are used by opposite-direction traffic, but will be small for tracks used for same-direction traffic. As the traffic over the North Atlantic is predominantly unidirectional, it would seem that the above-mentioned assumption would only have a small effect on the calculated collision risk.

b) For aircraft navigating on station-referenced navigation aids with sufficient coverage throughout the Organized Track System, it seems likely that the lateral deviations will be independent of the time flown. For these cases the above-mentioned assumption seems correct.

c) For aircraft using station-referenced navigation aids with insufficient coverage outside the area where the measurements are made, a calculation of the collision risk based only on measurements in that area would provide too low a value of the collision risk. Special care may have to be taken with temporary effects on this coverage, such as those caused by station outages.

Summary of Agenda Item 3: Development of measures required to accommodate air traffic in the NAT Region unable to comply with the proposed Minimum Navigation Performance Specifications.

3.1 Ever since the question of the introduction of the concept of Minimum Navigation Performance Specifications in the NAT Region has been discussed within the NAT/SPG, the problem of accommodating those aircraft operating in the NAT Region but being unable to meet the specifications had been reviewed. One of the difficulties in planning for this type of traffic has been, and to a certain extent still is, the amount of traffic involved by the time the provisions regarding Minimum Navigation Performance Specifications become applicable, as well as their distribution throughout the Region at any given time.

3.2 Although at this Meeting it was not possible to obtain reliable information on the above, it was apparent that, should the number of aircraft unable to meet the Minimum Navigation Performance Specifications but wishing to operate in those areas normally occupied by the Organized Track System exceed 10-15 %, it would be impracticable to handle the traffic in a segregated manner. However, it was believed that at the time of implementation of Minimum Navigation Performance Specifications the number of non-complying aircraft would represent less than 5 % and should rapidly decrease thereafter.

3.3 As to the segregation of this traffic from that conforming with the Minimum Navigation Performance Specifications, the major Provider States, after exploration of every feasible possibility, have come to the firm conclusion that only a vertical segregation was within the means of air traffic control between "conforming" traffic in the Organized Track System and "non-conforming" air traffic intending to operate within the lateral limits of the Organized Track System.

3.4 As to the vertical segregation applied within the lateral limits of the Organized Track System, the Group noted that, in order to cater for crossing traffic, as mentioned in the Summary of Item 4, the highest flightlevel which might be available for non-conforming aircraft operating underneath the OTS could be FL270. The lowest level available above the OTS for non-conforming aircraft could be FL410.

3.5 Regarding the lateral separation to be applied between "conforming" and "non-conforming" aircraft operating outside the lateral or vertical limits of the organized track structure, this could be a minimum of 120NM, however, depending on the number of aircraft involved and their navigation capability, this value will require further study (para. 6.7 on page 2-A-9 and the associated Recommendation on 2-A-10 refer).

CONCLUSION 12/2 - MEASURES TO ACCOMMODATE AIRCRAFT UNABLE TO COMPLY WITH MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS

That, when operating within the lateral limits of the Organized Track System aircraft, unable to comply with the Minimum Navigation Performance Specifications be segregated vertically from traffic operating in the Organized Track System.

Summary of Agenda Item 4: Review of the concept of the organized track system in the NAT Region

4.1 Introduction

4.1.1 When reviewing this Item, the Group agreed that this should be done under the following four main headings:

a) measures to accommodate crossing traffic;

b) use of the step-climb procedures by aircraft operating in the Organized Track System;

c) integration of CAR/SAM traffic into the overall flow of NAT traffic; and

d) preparation of a traffic forecast covering CAR/SAM traffic operating in the NAT Region.

4.2 Measures to accommodate crossing traffic

4.2.1 The question of accommodating flights in the NAT Region which are conducted along tracks which do not follow the major East-West flow of traffic has presented problems ever since traffic densities in the NAT Region reached proportions where conflicts between individual operations became frequent because of the sheer number of aircraft present at any time in the Region. Major efforts to overcome, or at least reduce, these problems were made at the 7th Meeting of the NAT/SPG. However, it was now noted that, mainly because of the increase of traffic to and from the CAR and SAM Regions, this question was again receiving major attention.

4.2.2 As it had already been found in the past that there was no readily applicable solution available and that any procedure, developed to resolve this problem, invariably entailed a process of give and take between traffic operating on the major East-West axes in the Region and that operating on crossing tracks, the Group once more came to the conclusion that the only possible way of improving the situation could be found in carefully weighing the relative advantages and disadvantages for each of the two conflicting traffic flows and choosing that solution which constituted the best possible compromise.

4.2.3 This raised, however, immediately the question of statistical data in order to determine:

a) the number of aircraft involved at any given time;

b) the period of time involved when the problem of crossing traffic was most acute;

c) the relative effects on the two conflicting flows of traffic in terms of "restrictions" and/or "operational penalties."

Reference to the NAT Traffic Forecast showed that the manner of presentation of actual traffic as well as that of forecast developments did not permit the Group to obtain a clear indication of the size of the problem as well as the effects of a chosen solution. It was therefore felt that, apart from introducing a number of measures which were expected to provide at least partial relief to this problem, it would be necessary to have a much clearer appreciation of the size of all relevant factors before a more lasting solution could be developed. It was, however, noted that despite the overall reduction in NAT operations which had followed the fuel crisis in October 1973, traffic densities during peak hours in the NAT Region were only 2% below the highest ones which had been recorded in the Summer of 1973.

4.2.4 The Group agreed that the only way to obtain a clear indication of the existing situation would be to organize a data collection on actual air traffic during a representative period which would indicate to what extent the ATC system, in operation in that part of the NAT Region where this crossing problem arose, was able to meet the intentions of operators and to what extent ATC was obliged, for air traffic control reasons, to modify the intentions of operators and to what degree. It therefore developed a data collection form, shown in Appendix A to the Summary of this Item, and requested Canada, Portugal, the United Kingdom and the USA to conduct, from 15 to 21 July 1976, a data collection exercise in their respective oceanic control centres, using this form, and to process this data so that it could be made available to the LIM NAT RAN Meeting 1976.

CONCLUSION 12/3 : DATA COLLECTION ON ACTUAL TRAFFIC IN THE NAT REGION

That:

a) Canada, Portugal, the United Kingdom and the USA undertake a data collection on actual air traffic in the area of their oceanic control centres for the period from 15-21 July 1976, using the form contained in Appendix A to the Summary of this Item;

b) upon completion of the data collection exercise, the collected data be exchanged between the four States for comparison and resolution of any discrepencies;

c) this data be made available to the LIM NAT RAN Meeting 1976 as supporting documentation under Agenda Item 2 of that Meeting; and

d) the complete flight data used during the data collection exercise be retained by the four States for further, more detailed analysis after the LIM NAT RAN Meeting 1976, and for use in the course of continued work on the question of accommocating crossing traffic in the Nat Region.

4.2.5 As to immediate relief measures, the suggestion was made that OACs concerned should look into the possibility of reducing the number of tracks of the OTS whenever their retention was no longer justified by the demand made for their utilization, thus reducing the overall width of the airspace encompassed by the OTS and, at the same time, the time which crossing traffic would have to spend at uneconomical flight levels. As the application of this measure depended to a very large degree on the situation as it presented itself at a given time, the Group felt that it was not possible to make this a standing requirement but that it rather had to rely on the intelligent application of this procedure in the light of circumstances by the OACs concerned.

4.2.6 With regard to the longer-range developments, the Group felt that apart from developing specific procedural arrangements for application by air traffic control in the "executive control phase", it might also be useful to pursue air traffic management aspects such as voluntary schedule coordination by, and between operators to avoid the creation of excessive demand on the ATC system during peak periods, possible traffic orientation schemes limiting the too wide-range in day-to-day flight planning for identical flight operations, the provision of advance basic flight data to OACs so as to permit them to better anticipate traffic developments ahead of their occurence, etc.. As this was, however, expected to have some effect on the manner in which flight operations were planned by NAT operators, it was felt that this required much more detailed and careful study before it would be possible to arrive at any specific conclusion.

CONCLUSION 12/4 : CONTINUED WORK ON THE PROBLEMS POSED BY CROSSING TRAFFIC IN THE NAT REGION

That:

a) States and operators concerned continue their studies of the problems posed by traffic in the NAT Region crossing the main East-West flow of air traffic in that Region, taking into account all relevant factors, including those offered by the application of air traffic management and measures recently adopted by the 9th AN Conference;

b) the results of such studies be made available to the NAT/SPG as soon as possible so that the Group may continue its work on this subject on a Region-wide basis.

4.3 Use of the step-climb procedures by aircraft operating in the OTS

4.3.1 The Group had before it a proposal by IATA which was aimed at the introduction, on a much more extended scale than was now the case, of procedures permitting aircraft engaged in NAT operations to use the step-climb method in order to save fuel. Discussion within the Group revealed that a systematic application of the step-climb procedure whereby, at specific points along the NAT tracks, aircraft would be permitted to execute a step-climb to the next suitable level would be impractiable because they would pose to ATC more problems than it could be expected to cope with. In addition, it was also realized that, depending on circumstances, at least some of the flights involved in such a procedure may, for one reason or another, not be prepared to leave their assigned level because this could in fact be detrimental to the economic operation of their flight.

4.3.2 In view of this situation, the Group agreed that the only feasible way for extending the step-climb procedure was to leave its application to individual flights by specific arrangement between the pilot of the flight concerned and the responsible OAC, as was now the case. But, in order to permit OACs to better anticipate pilots' intentions, pilots should be requested to inform OACs, on initial contact, of their wishes, based on aircraft performance.

4.3.3 The Group therefore developed a NOTAM on this subject (Appendix B to the Summary of this Item refers) and requested Provider States concerned to publish this at the commonly agreed date of 15 July 1976 for application on 12 August 1976.

CONCLUSION 12/5 : EXTENDED USE OF THE STEP-CLIMB PROCEDURE IN THE NAT REGION

That:

a) Provider States in the NAT Region take necessary measures to ensure that controllers concerned with NAT operations offer the possibility of a step-climb to NAT flights whenever this is feasible in the light of circumstances; and

b) in preparation of this, Provider States publish the NOTAM contained in Appendix B to the Summary of this Item on 15 July for application on 12 August 1976.

4.4 Integration of CAR/SAM traffic into the overall flow of NAT traffic

4.4.1 Much of what has been said regarding the inability, at this time, to appreciate the size of the problem of crossing traffic also applied to that created by the need to integrate, into the general flow of NAT traffic, those operations destined for, or originating in, the CAR and SAM Regions. It was therefore felt that, before any serious work could be undertaken on this subject, it would be essential to have reliable data available as to its size and the locations and times where and when it occurred most acutely.

4.4.2 The Group noted that the USA was already involved in studies on this subject which affects mainly traffic in the New York Oceanic control area and that it can be expected that the results of these studies will be brought before the NAT/SPG in due time. In addition, it was noted that the USA intended to make proposals to the forthcoming CAR/SAM RAN Meeting on this subject covering those aspects of the problems affecting the airspace and ATC organization in these two Regions.

CONCLUSION 12/6 : STUDY OF THE INTEGRATION OF CAR/SAM TRAFFIC INTO THE GENERAL FLOW OF NAT TRAFFIC

That the USA make available to the NAT/SPG in due time, the results of their studies now in progress on the problem of integrating air traffic destined for, or originating in, the CAR and SAM Regions with the general flow of air traffic in the NAT Region.

4.5 Preparation of a traffic forecast covering CAR/SAM traffic operating in the NAT Region

4.5.1 The Group noted a request resulting from the last Meeting of the Chief Controllers of NAT OACs to the effect that more detailed traffic statistics and forecasts be provided regarding air traffic originating in, or destined for, the CAR/SAM Regions.

4.5.2 The Group noted this request and agreed that this, together with the remarks regarding present NAT traffic forecasting and its utility for air navigation planning as recorded in paragraph 4.2.3 above, be held over for consideration under its Agenda Item 11 as part of the overall method and presentation of NAT traffic forecasting (para 11.2.8 refers).

Appendix A

Survey of ability of OACs to meet planned or requested routes and/or flightlevels for NAT operations

Explanation of the table:

Column 1: Self-explanatory

Column 2: Insert the total number of flight operations on and off the Organized Track System during the day and in the direction indicated.

Column 3:
a) Insert, in the direction indicated, the number of those flights which have been cleared as requested in the flight plan or on RTF by the pilot; and

b) insert, in the lower half of the box, its percentage related to the total number of flights indicated in Column 2.

Column 4:
a) Insert, in the direction indicated, the number of those flights which have been cleared within a tolerance of ± 60NM of the requested track and/or ± 2000ft of the requested FL; and

b) insert, in the lower half of the box, its percentage related to the total number of flights indicated in Column 2.

Column 5:
a) Insert, in the direction indicated, and separately for flights operating in the Organized Track System and those operating outside the OTS, the number of those flights which have been cleared outside a tolerance of ± 60NM of the requested track and/or ± 2000ft of the requested FL; and

b) insert, in the lower half of the box, its percentage related to the total number of flights indicated in Column 2.

Note: The full historical flight data for flights entered in column 5 should be kept for future reference.

Column 6: Self-explanatory.

(page 4-A-2 left blank intentionally)

Reporting OAC _____

Survey of Ability of OACs to Meet Planned or Requested Routes and/or Flightlevels for NAT Operations

Date : .... July 1976

Survey Period: 15-21 July 1976

Direction of flight	Total number of flights	Cleared as requested	Cleared within tolerance	Cleared outside tolerance	Remarks
1	2	3	4	5	6
Eastbound	On OTS:			On OTS:	
	Off OTS:			Off OTS:	
	100%	%	%	Total %	
Westbound	On OTS:			On OTS:	
	Off OTS:			Off OTS:	
	100%	%	%	Total %	
Total East & West bound	On OTS:			On OTS:	
	Off OTS:			Off OTS:	
	100%	%	%	Total %	

Draft NOTAM

"Fuel Conservation

1. Pilots and air traffic controllers are already making great efforts to enable oceanic flights to conserve fuel by making step-climbs. In order to simplify the negotiation of such climbs and to reduce message traffic, the following procedure should be adopted throughout the NAT Region, on a trial basis:

a) On first radio contact with the relevant ACC at each Oceanic Control Area boundary, the pilot should indicate, at the end of his position report, the highest flight level he is prepared to accept and the position or time at which such higher flight level would be acceptable.

EXAMPLE: "PA 101 5100N 30W 0436 FL330 EST 5000N 40W 0521 WILL ACCEPT FL 350 AT 40W."

2. Full pilot co-operation with this procedure will enable controllers to plan step-climbs more efficiently, not only for the aircraft making the report but also for other aircraft seeking to operate at higher levels in the interests of fuel economy."

Summary of Agenda Item 5: Review of procedures regarding the promulgation of the organized track system.

Introduction

5.1 Under this Item the Group dealt with two specific aspects regarding the promulgation of the organized track system:

a) a new format for the NAT OTS message; and

b) the use of updated MET information in the planning of Westbound flights in the NAT Region.

New format for the NAT OTS message

5.2 At its 11th Meeting, the NAT SPG had dealt with the format of the NAT OTS message promulgating the organized track system in use at a given time. At that time, in specifying the format of the message, major emphasis had been placed on the fact that the chosen format should, to the maximum extent possible, assist operators and pilots in avoiding errors when transposing track information from the OTS message onto flight plans and into automated navigation systems. In addition it had been agreed at the time that two notes should be added, one for an introductory period, the other for repetition at specified intervals, in order to alert operators and pilots to the need for careful handling of data contained in the OTS message (CONCLUSION 11/8 in NAT/SPG Summary 11 refers).

5.3 At this Meeting, the Canadian Member presented the Group with a proposal for a revised format of the NAT OTS message which had been developed in the light of practical experience gained in the meantime. This new arrangement of the OTS message provides for the grouping, in one separate block within the text of the message, of the oceanic track, flight levels used on that track and domestic routings on either side of the North Atlantic to be used for access to, and exit from the track in question. It was believed that such an arrangement would improve the presentation of information because:

a) all data relating to a given Oceanic track, including access to and exit from it, are displayed in a single block;

b) the flight levels shown immediately below the description of the NAT track make it clear that they refer only to that specific track; and

c) the complete information on each individual track is clearly separated from that concerning other tracks, thus reducing the possibility of erroneous insertion of way-points of adjacent tracks into automated navigation equipment.

5.4 The Group agreed that the proposed new format of the OTS message constituted a considerable improvement in presentation over that used so far, and therefore adopted it for earliest possible use. It further noted that, with this new format the Note, developed at the 11th Meeting and relating to the need for double spacing between the description of NAT tracks, would now become superfluous because of the greatly reduced likelihood of errors. However, it also agreed that as of the date of the use of the new format, the Note requesting operators and flight crews to exercise care when transposing way-point coordinates from the OTS message onto flight plans or into automated navigation equipment should be re-run for three months from the date of application of the new format (CONCLUSION 11/8 c) refers). A sample of the new OTS message format is attached in Appendix A to the Summary of this Item.

5.5 As to the coordinated introduction of the new OTS message format, it was agreed that this should be done on the AIRAC date of 9 September 1976, and that this should be announced by NOTAM Class II on the AIRAC date of 12 August 1976.

CONCLUSION 12/7 - NEW OTS MESSAGE FORMAT

That:

a) States concerned should implement, on the commonly agreed AIRAC date of 9 September 1976 the new format of the OTS message as shown in Appendix A to the Summary of this Item;

b) for three months following its implementation, the new OTS message should be supplemented with the Note as shown in CONCLUSION 11/8 sub-paragraph c);

c) the provisions in CONCLUSION 11/8 sub-paragraph d) be cancelled.

Use of updated MET information in the planning of Westbound flights in the NAT Region

5.6 At its 11th Meeting, the Group, when dealing with fuel conservation measures, had indicated that the provision of more up-to-date MET information, both for the planning of the organized track system and for planning of individual flights by operators, could assist in the economy of aviation fuel. The measures agreed upon at that time are reflected in CONCLUSION 11/17 and also in paragraph 7.2.7 of NAT/SPG Summary 10.

5.7 With regard to sub-paragraph a) of CONCLUSION 11/17 wherein Canada was requested to make efforts to reduce the present delay of three hours in the provision to Gander OAC of the PROG Chart on which the determination of the OTS is based, the Member from Canada informed the Group that it had unfortunately not yet been possible to achieve any progress, and this for a number of technical as well as administrative reasons. However, efforts were continuing to obtain the desired result. The Group noted this statement and expressed the hope that early improvements could be made because of the benefits which were expected to be derived from the resolution of this difficulty.

5.8 At the 10th Meeting of the NAT/SPG, the United Kingdom had agreed to undertake limited trials with one daily flight of a selected operator which would be provided with latest actual MET information until very shortly before takeoff in order to establish whether the provision of such information effectively resulted in noticeable fuel economy (paragraph 7.2.8 in NAT/SPG Summary 10 refers). The UK now informed the Meeting that arrangements had been made to provide such information not only to one selected operator, but also to the OAC Shanwick and that this information was being used both in the determination of the organized track structure by the OAC and in flight planning by the operator. Experience to date seemed to indicate that such information was useful, however, it was not possible to quantify its usefulness in specific terms. The United Kingdom Member indicated however that:

a) the trials would be continued both with Shanwick OAC and with the operator in question; and

b) other operators were free to join in these trials provided they were prepared to make arrangements for their access to the BRACKNELL computer stored MET data.

APPENDIX A

DAY TRACK

FF ADDRESS
DATE TIME CYQXZQ
NAT-TRACKS FLS 310/370 INCLUSIVE SEPT 031000 TO 032100
PART ONE OF TWO PARTS

A 58/10 59/20 59/30 58/40 57/50 CAPLIN CYYR
WEST LVLS 310 330 350
EAST LVLS 370
EUR RTS WEST 3
EUR RTS EAST BEN
NAR NA63 NA18 NA90 NA95

B 56/10 57/20 57/30 56/40 55/50 SCAD CYCA
WEST LVLS 310 330 350 370
EAST LVLS NIL
EUR RTS WEST 3
EUR RTS EAST NIL
NAR NA61 NA89

C 55/10 55/20 55/30 54/40 52/50 CYAY
WEST LVLS 310 330 350 370
EAST LVLS NIL
EUR RTS WEST 3
EUR RTS EAST NIL
NAR NA59 NA88

D 54/15 54/20 54/30 53/40 51/50 CYSG
WEST LVLS 320 340 360
EAST LVLS NIL
EUR RTS WEST 3 VIA EGL
EUR RTS EAST NIL
NAR NA58 NA86

E 53/15 53/20 53/30 52/40 50/50 CYQX
LVLS WEST 310 330 350 370
LVLS EAST NIL
EUR RTS WEST 3 VIA SNN
EUR RTS EAST NIL

F 52/15 52/20 52/30 51/40 49/50 CYRZ
LVLS WEST 320 340 360
LVLS EAST NIL
EUR RTS WEST 3 VIA CRK
EUR RTS EAST NIL
NAR NA54 NA83

END OF PART ONE OF TWO PARTS

FF ADDRESS
DATE TIME CYQXZQ
NAT TRACKS FLS 310/370 INCLUSIVE SEPT 031000 TO 032100
PART TWO OF TWO PARTS

G 50/08 50/20 50/30 49/40 48/50 CYYT
LVLS WEST NIL
LVLS EAST 310 330 350 370
EUR RTS WEST NIL
EUR RTS EAST LND
NAR NA5 NA29 NA30

H 48/08 48/20 48/30 47/40 46/50 CYSA
LVLS WEST 330 350
LVLS EAST 370
EUR RTS WEST QPR
EUR RTS EAST QPR
NAR NA51 NA2 NA80 NA25 NA26

J 4418/13 46/20 47/40 46/50 CYSA
LVLS WEST 310
LVLS EAST NIL
EUR RTS WEST STG
EUR RTS EAST NIL
NAR NA51 NA80

K 4003/15 41/20 43/30 43/40 43/50 42/60 PIKE CODDS
LVLS WEST 310 350
LVLS EAST 330 370
EUR RTS WEST CP
EUR RTS EAST CP
NAR NA50 NA1

NOTE SHANWICK WILL ISSUE CLEARANCE ON TRACK J

NIGHT TRACK

FF ADDRESS
DATE TIME CYQXZQ
NAT TRACKS FLS 310/370 INCLUSIVE SEPT 022300 TO 030800

U CYAY 53/50 54/40 55/30 55/20 55/10 BEL
EAST LVLS 330 370
WEST LVLS 310 350
NAR NA15 NA42 NA60 NA88

V CYSG 51/50 53/40 54/30 54/20 54/15 EGL
EAST LVLS 320 340 360
WEST LVLS NIL
NAR NA14 NA39 NA40

W CYQX 50/50 52/40 53/30 53/20 53/15 SNN
EAST LVLS 310 330 350 370
WEST LVLS NIL
NAR NA13 NA36

X CYRZ 49/50 51/40 52/30 52/20 52/15 CRK
EAST LVLS 320 340 360
WEST LVLS NIL
NAR NA9 NA33 NA34

Y CYYT 48/50 50/40 51/30 51/20 50/08 LND
EAST LVLS 310 330 350 370
WEST LVLS NIL
NAR NA5 NA29 NA30

Z CYSA 46/50 48/40 49/30 49/20 48/08 QPR
EAST LVLS 330 350 370
WEST LVLS NIL
NAR NA2 NA25 NA26

Summary of Agenda Item 6: Possible extension of the use of composite separation, including a review of the problem raised in Recommendation 10/3 of the NAT V RAN Meeting

6.1 When reviewing the subject of composite separation, the Group took advantage of this discussion to obtain confirmation from Canada that the problem of vertical separation, having been made the subject of Recommendation 10/3 of the NAT V RAN Meeting, had been resolved a number of years ago and that therefore this Recommendation was no longer relevant.

6.2 The fact that this matter had been raised in the Group was primarily due to the continued lack of publication of an AIP by Canada in accordance with the provisions of ANNEX 15, which made it difficult for those not intimately familiar with the air navigation situation in Canada to obtain valid up-to-date information on the status of air navigation services and facilities and procedures used in that State.

6.3 It was therefore hoped that, in due time, Canada would find it possible to adjust their aeronautical information publications more closely with the provisions of ANNEX 15 than was now the case.

6.4 As to the application of composite separation itself, Canada informed the Group that they were at present engaged in studies aimed at the provision of one or more additional composite tracks through Labrador and the Group was informed that the target date for the provision of these tracks is November 1976, provided coordination with operators as to the use of these tracks, which will be started in Autumn, can be completed in time.

6.5 The UK Member indicated that now that Stornoway Radar had become operational, the provision of such additional composite tracks in the Northern part of the Organized Track System was not expected to cause any difficulties to Shanwick OAC.

6.6 As to the provision of a composite track in the Southern part of the Organized Track System extending from the exit of the NAT Region over Newfoundland to an entry point into the Canadian ATS route network, which was requested by the UK Member, the Member from Canada pointed out that this was causing certain difficulties because of transition problems in areas where inadequate radar coverage existed. He was therefore not able to give any indication when the implementation of such a composite track would be possible.

6.7 Following this more detailed discussion of the provision of specific composite tracks, the Group reviewed the more general problem whether, as stated in Recommendation 10/5 of the NAT V RAN Meeting, radar coverage in the transition area between areas where normal procedural or radar separation was applied and areas where composite separation was applied, is indispensable. Discussion revealed that views on this question were not unanimous and seemed to depend very largely on existing local conditions. For instance, the Member from Ireland felt that, as far as the transition area West of Shannon was concerned, radar coverage was an essential pre-requisite in order to permit the orderly integration of Eastbound NAT flights into the continental ATS route network of Europe. On the other hand, it was noted that, on the western edge of the North Atlantic conditions might be quite different and therefore allow the application of different procedures not presupposing the existence of radar coverage in each and every case.

6.8 In any case, since the provisions in Recommendation 10/5 of the NAT V RAN Meeting had been, at the time, formulated primarily on the insistance of IFALPA, the Group believed it useful if, prior to the LIM NAT RAN Meeting (1976), IFALPA were to review its policy in this respect in the light of latest developments so that, when this matter was being discussed at that Meeting, a clear position could be expected from IFALPA on this matter.

6.9 This was even more desirable because the Group was unanimous in its views that, should a reduction in lateral separation between aircraft operating on the OTS be accepted by the LIM NAT RAN Meeting (Summary of Item 2 refers) it was not intended to discard the concept of composite separation within the OTS, even though it may not be used during the initial period when the new reduced lateral separation between aircraft operating on the OTS will become applicable.

6.10 A further point made with respect to traffic operating outside the OTS, was that consideration should also be given to the extension of the concept of composite separation to that traffic because it was believed that this could materially assist in relieving the problems mentioned in the Summary of Agenda Item 4.

6.11 As it was realized that most of the parties present at this Meeting, and especially IFALPA, had had insufficient time to review this matter in detail and arrive at definite conclusions, it was agreed that this should be brought forward for discussion under Agenda Item 1c) of the LIM NAT RAN Meeting (1976). However, in order to permit States concerned to prepare adequately for these discussions, IFALPA, as one of the main parties interested in this matter, was requested to inform the Group as early as possible and in any case prior to the LIM NAT RAN Meeting with regard to the following questions:

a) Was IFALPA prepared to accept the use of composite separation between aircraft operating outside the OTS?

b) Was IFALPA maintaining its unconditional requirement for the provision of radar coverage in areas of transition between composite separation and normal procedural or radar separation in the continental areas on either side of the Atlantic?

Note: The reply to this latter question should cover both the case of the present composite separation and that of the new one, should lateral separation within the OTS be reduced.

6.12 The Group noted that, depending on the action taken with respect to the proposals made under Item 2 and those made under this Item by the LIM NAT RAN Meeting, the provisions in ICAO Doc 7030 would require extensive revision. In this context the Group once more wished to record its dissatisfaction with the present lay-out of this document which made it extremely difficult for use and confusing, especially to those not being obliged to work continuously with this complicated document. It therefore hoped that the occasion of the revision of this document by the LIM NAT RAN Meeting could also be seized to modify its presentation to make it easier to use. One way, which the Group felt would go a long way to meeting this objective, could be to present the Regional SUPPs applicable in one Region in a consolidated, self-contined section.

Summary of Agenda Item 7: Review of the HF air-ground communication situation in the NAT Region including applicable Regional Supplementary Procedures

Consideration of the results of the 1975 annual NAT HF data collection

7.1 The Group reviewed the analysis, presented by the United Kingdom, of the data collected in the course of the 1975 exercise. The dates selected by Ireland following coordination had been 1 August, 3 August and 24 August 1975 for the Central, Southern and Northern positions of the OTS respectively. The Group wished to express its appreciation to the States concerned, and particularly to the United Kingdom which had performed the collation work.

7.2 The Group noted that the proportion of SSB equipped aircraft had increased from 69 to 76%. In a year when the growth in NAT traffic had been effectively nil, this had resulted in a slightly larger loading on Family B than would otherwise have been the case.

7.3 It was appreciated that the data collection exercise had taken place at almost sunspot minimum conditions, so that only the lower frequency orders were useable by night. The main 24 hour loading had, however, been shared between the 5 and 8 MHz orders.

7.4 It was noted that, overall, Families A and C had again carried the heavier load, Families B and D remaining relatively lightly loaded. Under peak load conditions by day, Family C was clearly the most loaded. As was to be expected, VHF carried almost one third of the position reports, due to VHF coverage available to Northerly tracks, and to aircraft using VHF in the Gander Oceanic area.

7.5 As a supplement to the report it was noted that, at Shannon, throughout the eight months up to and including May 1976, more than 40% of the traffic appeared on Family C, and heavy loading was often experienced on the 2 and 8 MHz orders of that Family by night and day respectively. It was established, however, that the offloading procedures had been little employed, and might have remedied the situation.

7.6 The numbers of "American" aircraft on Family C and of "European" aircraft on Family B were so small as to be negligible.

7.7 The Group noted that the load on Family C would be partly relieved when SSB could be used on Family D, a move advocated by IATA. It was further noted that A3/A3H/A3J operation would be feasible on Family D since it was relatively lightly loaded. However Ireland, Iceland and Norway could well need some time to re-equip their ground stations, within say 2-3 years.

7.8 The Group observed that the data collection showed that there was still no clear need for a Fifth Family in the next three or four years. Further, any temporary heavy loading on one Family could be taken care of by the new offloading procedures. It was agreed that, in order to keep the trends under close review, it would be necessary to hold a further data collection in 1976, the arrangements being unchanged from 1975. The United Kingdom kindly offered once more to collate the results, whilst Ireland would coordinate the exercise.

HF coverage from Iceland in the Søndrestrøm FIR

7.9 The Group reviewed a report by Iceland on the trials made in the first four months of 1976 regarding HF coverage from the Iceland HF station in those parts of the Sondrestrom FIR above FL195 where no VHF coverage was available and expressed its appreciation to those States which had participated in these trials. The report showed that 89% of all HF contacts made during the trial period were established with Reykjavik; 5% were made with Søndrestrøm, 3% with stations in Canada and another 3% with Bodø and other stations.

7.10 In view of this situation, it appeared to the Group that the HF communication station at Søndrestrøm could be withdrawn from the air navigation plan without any reduction to the efficiency of the service. This appeared even more feasible in view of the fact that Iceland informed the Group that improved antennas were being installed at the Iceland HF communication station and could be expected to be fully operational by the end of 1976.

7.11 However, since there was still some time available between now and the beginning of the Limited NAT RAN Meeting (1976), the Group agreed that the trials should be continued until then and that information on these trials should be made available to that Meeting. Should it then be found that the tendency of developments in the use of HF communication stations as indicated in paragraph 7.9 above is confirmed during this additional period, the Group proposes that the HF communication station in Søndrestrøm should be withdrawn.

Consideration of the Conclusions of NAT/SPG 11

7.12 The Group reviewed action on the Conclusions of NAT/SPG 11. In this connexion it was agreed that the trial use of 11303 kHz for A3/A3H/A3J use at Reykjavik, Søndrestrøm and Northern Canadian stations should continue, and that Bodø could usefully implement the same frequency.

SELCAL

7.13 The Group noted that several stations had experienced certain SELCAL problems, SELCAL success dropping at Shannon by up to 23% when going from DSB to SSB operation. It was understood that Ireland was studying technical solutions to this problem and would propose them at a suitable time.

Met reporting

7.14 The Group was informed that MET reporting caused some problems at aeronautical stations when appropriate procedures were not complied with. In one case, time was only sent in minutes past the hour (2 numerics) when Section 3 of the AIREP was sent. The current procedures needed 4 numerics in such a case. In another case Section 3 of the AIREP was being sent as a separate message, subsequent to and separate from the position report message (Section 1 of the AIREP). The Group agreed that the attention of operators should be drawn to the need to conform with AIREP procedures if problems to aeronautical stations and to MET services were to be avoided. REC.10/2 of the Ninth Air Navigation Conference was also relevant in this context.

CONCLUSION 12/8 -ACTION ON NAT HF AIR-GROUND COMMUNICATION MATTERS

That:

a) a three day data collection exercise should be conducted in 1976 with the same arrangements as in 1975, noting that:

i) Ireland will coordinate the exercise and select the dates;

ii) United Kingdom will collate the results;

iii) Canada and Ireland will assess the SSB/DSB mix, as before by retrospective check.

b) the States concerned should plan to permit A3/A3H/A3J use of Family D within 2-3 years, bearing in mind that this will not only help to improve communications assurance in the difficult communication environment to be found on polar routes, but also help to equalize the loading on the four Families of frequencies;

c) the same States should study the time and cost required to permit the change referred to in b), with a view to the LIM NAT RAN Meeting (1976) taking a decision regarding possible earlier implementation;

d) the trials of HF coverage from Iceland in the Søndrestrøm FIR should continue until the beginning of the LIM NAT RAN Meeting 1976, and that States concerned should make available the results of these trials to that Meeting in a form similar to that chosen by Iceland for the first month so as to permit that Meeting to take a definite decision as to the further disposition of the Søndrestrøm HF communication station;

e) the trials of A3/A3H/A3J use of 11303 kHz for polar flights on Family D should continue at least until the end of 1976;

f) the LIM NAT RAN Meeting (1976) should consider the addition of 11303 kHz at Bodø; and

g) the attention of aircraft operating agencies should be drawn, as and when appropriate, to the need to conform to the AIREP procedures (c.f. Doc 4444-PANS RAC-Appendix 1).

Summary of Agenda Item 8: Review of the procedures, facilities and services used to effect oceanic clearance delivery for NAT flights originating in Europe

8.1 The Group recalled that the question of delivery of oceanic clearances to NAT flights originating in Europe at a time when they were still operating within the continental route network, had been reviewed repeatedly by the Group. It also noted that on one occasion thought had been given to the possibility of elevating the procedures developed for this purpose between UK air traffic services and operators using this oceanic clearance delivery method to the status of Regional Supplementary Procedures. It had, at the time, been agreed that, because of the experimental nature of this means and its evolutionary development, it would be better not to do so in order to avoid unnecessary formal action whenever it was found that, due to developments, the procedures needed modification and/or improvement.

8.2 It was now stated by the UK that this situation still persisted and that, while as a longer-range project the development of Regional Supplementary Procedures covering this aspect of NAT operations was still believed to be desirable, they preferred at this time to continue existing arrangements as concluded between the UK authorities and operators concerned. One point which was particularly important in this respect was that the provision of the oceanic clearance delivery system should in no case result in a situation whereby aircraft, departing from aerodromes located so close to the Eastern boundary of the NAT Region that they could not use this system for negotiating their oceanic clearance, were being deprived of a fair share of the more advantageous tracks and flight levels provided in the organized track system.

8.3 In view of this situation, the Group agreed not to take any action on this matter.

Summary of Agenda Item 9: Development of measures to permit timely contingency planning in the NAT Region

9.1 This Item had been placed on the Agenda of the NAT/SPG because it had been noted that within the last two to three years the navigation system in the NAT Region had been threatened repeatedly by industrial action on the part of ground personnel of different Provider States. Whenever such situations had arisen it had been noted that coordination of possible relief action had been effected at different levels and to varying degrees. Because of this the questions were posed:

a) whether it would be feasible to determine in a uniform manner, the level of coordination and the parties concerned; and

b) whether it would be advisable to develop specific preparatory measures for a number of envisagable contingencies, such as the temporary withdrawal of a control facility, or the loss of an essential part of the air navigation system.

9.2 After some discussion, it was, however, found that in the past, occasions where such contingency planning was required had varied not only in scope but, in some cases had also involved certain non-technical and outright political aspects so that no common denominator as to the level of coordination or the extent of planning could be detected.

9.3 In view of this situation the Group felt that it would not be worthwhile to pursue this matter on the understanding that, should a further need for contingency planning arise, States would use their best judgement in determining the necessary level of coordination as well as its extent.

Summary of Agenda Item 10: Work programme until and arrangements for, the next Meeting.

10.1 Work programme until the next Meeting

10.1.1 With regard to supporting documentation required to be submitted to the LIM NAT RAN Meeting 1976 as a result of this Meeting, and more especially that on Agenda Item 1 of the LIM NAT RAN Meeting, the Group noted that this would be prepared by the ICAO Secretariat based on the Report of this Meeting, unless otherwise indicated therein.

10.1.2 It was, however, noted that in addition to the action required in accordance with the above, the Group had, in the course of this Meeting requested a number of its Members to undertake work on related subjects for review by the NAT/SPG in the course of its future activities as follows:

a) The United Kingdom to continue studies on the effects of sudden ionospheric disturbances on VLF position fixing accuracy (para 2.4.5 refers);

b) Canada, Portugal, UK and USA to undertake a data collection on actual air traffic (Conclusion 12/3 refers);

c) all States and operators concerned continue studies of crossing problems in the NAT Region (Conclusion 12/4 refers);

d) the USA to make available studies on the problem of integrating CAR/SAM traffic into the general flow of traffic in the NAT Region (Conclusion 12/6 refers);

e) UK and Ireland to develop a survey method and conduct a survey based on it regarding longitudinal separation in the NAT Region (Conclusion 12/9 refers);

f) Canada, Portugal, UK and USA to prepare proposals for the collection and presentation of actual traffic data in the entire NAT Region to serve as basis for future traffic forecasts (Conclusion 12/11 refers); and

10.2 Arrangements for the next Meeting

10.2.1 In view of the forthcoming LIM NAT RAN Meeting 1976 and action proposed in the Summary of Agenda Item 2 for consideration by that Meeting, the Group agreed that there would exist a definite requirement for a Meeting of the NAT SPG by late 1977 on the understanding that this Meeting would be devoted primarily to the assessment of the navigation system likely to exist in the NAT Region after the withdrawal of the LORAN A systems on 29 December 1977.

10.2.2 However, since it was not possible to envisage at this stage, with any degree of certainty, developments likely to occur at the LIM NAT RAN Meeting 1976, the Group felt that it would be prudent to envisage the possibility of holding a further Meeting much earlier in 1977, or possibly in late 1976, should this be required as a consequence of developments at the LIM NAT RAN Meeting 1976.

10.2.3 In order to prepare for this eventuality, the Group agreed that it would be useful to envisage an ad-hoc Meeting of those of its Members present at the LIM NAT RAN Meeting 1976 towards the end of that Meeting or immediately thereafter in order to reach agreement on the future work programme of the Group in the light of the results achieved by the LIM NAT RAN Meeting 1976.

10.2.4 As to possible subjects for discussion at an eventual meeting sometime between the end of the LIM NAT RAN Meeting and that planned for late 1977, the Group felt that this would, by necessity, have to be left open.

10.2.5 In any case, and based on experience once more gained at this Meeting, it stressed again the need for the earliest possible provision of supporting documentation in preparation of meetings of the Group so as to permit all Members to effect necessary coordination within their administrations prior to arrival at the meeting itself.

10.3 Supplementary action

10.3.1 The Group hoped that, as has been the case in the past, ICAO would find it possible to provide it with adequate secretariat and other assistance to the extent required to conduct its future work. It was believed that this was particularly essential over the next 2 to 3 years when significant changes were likely to be introduced in the NAT Region requiring close monitoring of developments and possibly development of ad-hoc measures required at comparatively short notice.

Summary of Agenda Item 11: Operational problems of current interest

11. Introduction

11.1.1 Under this Item, the Group reviewed a number of operational matters of current interest which had accumulated since the last Meeting of the Group or which required follow-up.

11.1.2 These matters were:

a) Review of the lower limit of control areas in the NAT Region;

b) possible adjustments to FIR boundaries in the NAT Region;

c) situation with regard to the ATS inter-area speech circuit between Stavanger and Reykjavik ACCs;

d) possible modification to the Shannon HF VOLMET broadcast to include Lyon/Satolas and Marseille airports;

e) application of longitudinal separation in the NAT Region;

f) use of Mount Gabriel SSR for NAT traffic;

g) ferry flights in the NAT Region;

h) relation with the NAT/TRG and timely preparation of NAT traffic forecasts;

i) promulgation of aeronautical information regarding the NAT Region;

j) continued requirement for the provision of a VOR/DME at Akraberg.

11.2 Review of specific matters

11.2.1 Review of the lower limit of control areas in the NAT Region

11.2.1.1 When discussing the subject of the lower limit of control areas in the NAT Region, it became immediately apparent that this was closely related to the problems concerning ferry flights across the North Atlantic. The Group therefore discussed the two subjects together and the results are recorded in paragraph 11.2.7 below.

11.2.2 Possible adjustments to FIR boundaries in the NAT Region

11.2.2.1 The Group noted a proposal by Canada for the re-alignment of the FIR boundary between the Gander FIR/OCA and the Edmonton FIR so that the responsibility for the airspace north of 6500N would be transferred from Gander to Edmonton ACC. Since, in view of the alignment of the traffic flow in the area in question, this change would result in a reduction in coordination requirements between the two ACCs and since this modification did not affect the alignment of the boundaries of other FIRs/OCAs, it was agreed that Canada would formally present this proposal to the LIM NAT RAN Meeting for adoption.

11.2.2.2 In this context, the question was raised whether the workload involved for both State administrations and ICAO in originating and processing proposals for amendment to the ICAO Air Navigation Plan could not be reviewed. While it was believed perfectly justified that a formal proposal was required in all those cases where modifications of substance, affecting more than one State and the structure of services provided to the users of the airspace were involved, it was felt that, provided mutual agreement has been reached on the intended modification, changes to the alignment of FIR boundaries affecting FIRs of one State only, or even two States, could be subject to a simple notification to ICAO for the correction of the relevant Regional Plan Publication.

11.2.2.3 It was, however, realized that, while such a procedure might well work in the NAT Region, it might create significant difficulties in other parts of the world. The Group therefore did not pursue this discussion and it was agreed that this subject should be raised at a suitable opportunity in the appropriate forum of ICAO.

11.2.3 Situation with regard to the ATS inter-area speech circuit between Stavanger and Reykjavik ACCs

11.2.3.1 The question of the situation with regard to the ATS inter-area speech circuit between Stavanger and Reykjavik ACCs was raised once more because there had been no developments since the last time this matter was reviewed by the Group. The Member from the UK explained that a connexion via Prestwick has proved technically impracticable but repeated that, subject to workload, the staff of Scottish ACC were prepared to continue to perform the relay functions until such time as a more satisfactory solution could be found. In addition, he pointed out that this matter would be kept in mind should a more satisfactory technical solution become feasible.

11.2.3.2 The Group expressed its appreciation of the cooperation shown by Scottish ACC in this matter and confirmed once more that the provision of a definite solution was a matter to be resolved between Iceland and Norway. It was, however, realized that, because of the costs involved in the technical provisions of such a communication link, the two States might wish to keep the cost-effectiveness aspect of such an installation under close review.

11.2.3.3 In this context, the Group briefly reviewed a proposal by IATA aimed at the extension to the North of the Scottish FIR so that there would no longer exist a common boundary between Stavanger and Reykjavik FIRs. This would then eliminate the requirement for a speech circuit between Stavanger and Reykjavik ACCs. The UK Member was unable to agree to this specific proposal but agreed to study this matter further and advise the Group of the results in due time.

11.2.4 Possible modification to the Shannon HF VOLMET broadcast to include Lyon/Satolas and Marseille airports

11.2.4.1 The Group was informed by IATA that some of its Member airlines had indicated a need for the inclusion in the Shannon HF VOLMET broadcast of MET information on Lyon/Satolas and Marseille airports. This requirement had arisen because a national HF VOLMET broadcast by France providing such information had recently been withdrawn.

11.2.4.2 After a brief discussion, the Group considered that there was insufficient justification for the inclusion of MET information about Marseille airport in the Shannon VOLMET broadcast.

11.2.4.3 As to the inclusion of Lyon/Satolas, the Group did not agree to the suggestion made by IATA to include this aerodrome in the Shannon HF VOLMET broadcast in place of Birmingham, but accepted a proposal made by the MET expert of the Paris Office of ICAO to the extent that Lyon/Satolas should be included in the group of airports in which the two airports in the Paris area were included and this in lieu of Athens, and that Athens aerodrome should be shifted to the next group and that, in that group, Barcelona should be cancelled without replacement. Such a rearrangement would have the advantage that MET information on aerodromes in France would be grouped in a single group and it would also eliminate the present anomaly whereby MET information on Athens airport was given in a group primarily devoted to aerodromes in France and in the Iberian Peninsula.

11.2.4.4 The Group proposed to IATA that it should bring the above to the attention of the Limited NAT RAN Meeting 1976, for resolution by presenting a Working Paper to that Meeting outlining the action described above.

11.2.5 Application of longitudinal separation in the NAT Region

11.2.5.1 The Group discussed a proposal by IATA aimed at a reduction of the longitudinal separation minima in those parts of the NAT Region where the Minimum Navigation Performance Specifications would apply. This reduction would provide for the use of 15 minutes longitudinal separation in circumstances which at present call for the application of 20 minutes and of 10 minutes in conditions at present requiring 15 minutes. After a brief discussion the Group noted that the most important factors affecting longitudinal separation were the accuracy of the position reports and the reliability of the transmission of all position reports to the OAC. These factors have improved since the present longitudinal separation minima were introduced by the Special NAT RAN Meeting (1965), especially due to the use of more modern airborne navigation equipment, stricter rules for ensuring accurate clocktimes on board the aircraft and the use of SSB for HF R/T communications. It therefore seemed to be opportune to investigate the possibilities of reducing this separation.

11.2.5.2 The Group briefly considered the effect of a reduction in longitudinal separation on the required values of the tolerances of the Minimum Navigation Performance Specifications proposed in respect of lateral separation. It was found that the required standard deviation would hardly be affected but that the tolerances at the half-separation and at the full separation would probably have to become more stringent, but that this would depend on the extent to which the distribution of the flights over the different tracks and flight levels would be changed. This was difficult to predict at the present time. It was realized, however, that an eventual implementation of a reduction in longitudinal separation should only be made some time after the implementation of the Minimum Navigation Performance Specifications, in order to avoid confronting air traffic controllers with the need to apply a reduction of lateral and longitudinal separation at the same time. If it were found that the aircraft would remain well within the Specifications, the reduction in longitudinal separation might well be effected without a change in the tolerances of the Specification.

11.2.5.3 It was agreed that careful studies should be made to assess the safety of a reduction in longitudinal separation. Some of these studies could be based on the comparison of ETAs made by the flight crew at about 10° longitude before landfall and the ATAs established by radar.

11.2.5.4 It was believed useful if this survey and the related data collection and analysis could be made simultaneously with the monitoring of lateral track keeping of NAT flights (the Summary of Item 2 refers). Necessary arrangements for this data collection, which would be based on observations by Shannon Radar, should be developed by the United Kingdom, in cooperation with Ireland.

11.2.5.5 Finally, it was agreed that the subject should be brought informatively to the attention of the LIM NAT RAN Meeting so that States were aware of the fact that work on this question was being undertaken. IATA agreed that, pending the outcome of their preparatory meeting for the LIM NAT RAN Meeting, they would undertake to present a short Working Paper on this subject to that Meeting.

CONCLUSION 12/9 -APPLICATION OF LONGITUDINAL SEPARATION IN THE NAT REGION

That:

a) States and International Organizations pursue studies aimed at a possible reduction of longitudinal separation in those parts of the NAT Region where aircraft are required to meet Minimum Navigation Performance Specifications;

b) as a first step a data collection be organized by the UK and Ireland on the along-track navigation accuracy of flights in the Organized Track Structures;

c) the NAT/SPG review the results of this survey in order to decide on further action in the light of its results; and

d) IATA prepare a brief Working Paper on this subject for presentation to the LIM NAT RAN Meeting 1976.

11.2.6 Use of Mount Gabriel SSR for NAT traffic

11.2.6.1 The Group was informed by its Member from the UK that SSR and VHF air-ground communication equipment had been installed on Mount Gabriel on the South-Western tip of Ireland which was operated from London ACC and that this facility was expected to become fully operational by August 1976. This results in a considerable extension of both the SSR and VHF area of coverage south of Ireland permitting London ACC to provide air traffic control in the area covered.

11.2.6.2 In order to take full advantage of the improved services it has therefore been agreed between Ireland and the UK that the responsibility for the provision of air traffic services within that part of the Shanwick Oceanic Control Area located within SSR and VHF coverage from Mount Gabriel should be delegated to London ACC on a trial basis. It was further noted that the arrangements regarding this delegation of responsibility would be published by a NOTAM Class II in accordance with the AIRAC system.

11.2.6.3 Finally, the Group noted that no limit has been placed on the duration of the trial period but that definite measures regarding a final solution as to the airspace organization would be taken in the light of practical operating experience and after due co-ordination between all parties concerned.

11.2.7 Ferry flights in the NAT Region

11.2.7.1 Early in the discussions on problems encountered with IGA operators and, more specifically, ferry flights in the North Atlantic, the Group realized that this was closely related to the question of the lower limit of control areas in the NAT Region. It therefore agreed to review these two subjects together (see para 11.2.1 above).

11.2.7.2 The Group was informed by its Member from the United Kingdom that the United Kingdom is becoming increasingly concerned about the operations of General Aviation ferry flights on direct routes between North American and Europe. There were recurring difficulties with these operations because of inadequate communications and/or navigation equipment.

11.2.7.3 It was noted that, although these flights were small in number, the problems that resulted from their inability to comply with normal communication and navigational performance standards have had a significant impact in general, by:

a) increasing ATC workload;

b) causing congestion on HF communication channels;

c) misuse of the international distress frequency 121.5MHz as a routine communications channel; and

d) the alerting of the Search and Rescue Services in the absence of position reports, causing, inter alia, serious complaints from marine communications users.

This situation caused the UK considerable additional costs in view of the fact that Search and Rescue operations had to be carried out in accordance with ICAO provisions although actual emergencies were, fortunately, extremely rare. These costs were reflected in user charges levied on all operators.

11.2.7.4 Representations to the operators concerned have not resulted in any significant improvement in the situation. Attempts to persuade the operators concerned to use routes via Greenland and Iceland have so far met only with limited success.

11.2.7.5 In view of the above situation, the Group reviewed the following two basic possibilities to resolve this problem:

a) raising the lower limit of oceanic controlled airspace from FL55 to, perhaps, FL170; and

b) re-enforcing of current regulations by the application of a minimum communication and navigation equipment requirement to all general aviation aircraft operating on direct North Atlantic routes.

11.2.7.6 As regards a) above, the intent was that these flights would operate in uncontrolled airspace and would therefore no longer be required to report position. In addition, alerting action by ATC would only be initiated on the receipt of a specific emergency call from an aircraft operating in that airspace, or if the aircraft failed to arrive at its destination within the prescribed limits of its ETA as stated in its flight plan. It was understood that such a proposal had some support from IGA interests.

11.2.7.7 In the ensuing discussion doubt was expressed whether the raising of the lower limit of the oceanic controlled airspace really constituted a remedy. It was feared that most flights would request flight information service and would still misuse the emergency frequency for the required position reporting. The only difference would be that such flights would no longer be subject to the provision of air traffic control. A proposal to establish a VHF air-to-air reporting channel to accommodate relay traffic, thus eliminating the mis-use of 121.5MHz, was not supported because of workload considerations in the cockpit or relaying aircraft and in ACCs.

11.2.7.8 With respect to the possibility mentioned in paragraph 11.2.7.5 b) above, it was felt that there would continue to be great difficulty in enforcing the regulations. However, it was agreed that general aviation aircraft should be strongly encouraged to use the routes via Greenland and Iceland and that details of such routes should be published by States concerned, as soon as possible.

11.2.7.9 Because of the legal, procedural and operational aspects involved in this matter, the Group felt that more time was required in order to conduct a thorough study of this complex problem. It therefore agreed that this subject should be retained on the work programme of the NAT/SPG and should again be discussed at its next Meeting.

11.2.7.10 As regards the mis-use of the international distress frequency 121.5MHz for the relay of ATS messages by under-equipped aircraft in the North Atlantic, the Group agreed that this matter should be raised at the LIM NAT RAN Meeting.

CONCLUSION 12/10 -GENERAL AVIATION FERRY FLIGHTS IN THE NAT REGION

That:

a) States and International Organizations concerned study the problems created by General Aviation ferry flights in the NAT Region;

b) the current mis-use of the international distress frequency 121.5 MHz for the relay of ATS messages by inadequately equipped aircraft operating across the North Atlantic be brought to the attention of the LIM NAT RAN Meeting (1976) for consideration; and

c) States concerned publish, as soon as possible, in their aeronautical information publications the alignment of routes to be used by aircraft not sufficiently equipped for a direct crossing of the North Atlantic, as well as a list of the necessary survival equipment to be carried on board such flights.

11.2.7.11 While on the subject of non-commercial operations in the NAT Region, the Group noted a statement by its Member from the USA that his administration was currently involved in studying the aspects of free balloon flights in the North Atlantic and was developing measures to avoid the disruption of North Atlantic traffic because of such balloon flights. He also stated that he would inform the Group in due time of any results of these studies.

11.2.7.12 Finally, the UK Member informed the Group of a device which had been developed in the UK which could be used in determining which airfield could be reached by an aircraft in emergency in the shortest flight time. It was believed advantageous if this relatively simple device were available at OACs/ACCs, RCCs and on board SAR aircraft since it would provide air traffic controllers, SAR coordinators and flight crews with information allowing a quick decision as to what diversion airfield could, in all probability, be reached in a minimum of time and with a minimum of fuel. The Group agreed that the description of this device should be retained in its Report on this Meeting and this is contained in Appendix A to the Summary of this Item.

11.2.8 Relation with the NAT/TFG and timely preparation of NAT traffic forecasts

11.2.8.1 In the presence of the Chairman of the NAT Traffic Forecasting Group (NAT/TFG) Mr. M. Ellis and his ATC advisor, Mr. K. Brown, both from the United Kingdom, who happened to be present in the European Office of ICAO for other reasons, the Group reviewed the NAT Traffic Forecasts for the period 1975 to 1979, containing a forward projection to 1984, as it had recently been presented by the NAT/TFG. The Group noted that the comparatively long delay in presenting this Forecast had been mainly due to the fact that both Canada and the USA had replaced their previous Members of the NAT/TFG with the resultant need for familiarization with this task for their replacements.

11.2.8.2 As to the Forecast itself, the Group noted that in view of the problems mentioned in the Summary of Item 4 (i.e. crossing and joining traffic in relation to the main flow) the format of the forecast was no longer suitable to permit an appreciation of the problems likely to be caused to the air navigation services, be it from the air traffic control point of view or for other air navigation aspects. In fact, the relation of traffic flows to only nine traffic axes across the North Atlantic, as is now done, was not providing more than a very superficial picture of the traffic pattern and this was believed to be insufficient for present and expected future conditions.

11.2.8.3 It was therefore felt that both the provision of data to the NAT/TFG as well as the processing and presentation of this data in the form of a forecast required profound modifications in order to render the forecasts as useful as possible. In addition, it was believed that, in the forecast, more emphasis should be placed on the presentation, in a comprehensive manner and for the entire NAT Region, of the last observed actual situation as it could be reconstructed from data provided by OACs while the forecasting itself could possibly be limited to a simplified extrapolation process based on that data rather than basing it on complex and complicated economic sociological models as had been done in the past. (In this context it was pointed out that one possible data source, which could be used, could be the monthly traffic statistics on the North Atlantic published in specialized aviation publications.)

11.2.8.4 The Group believed that this was even more feasible because some of the OACs concerned already produced studies on the actual traffic situation in their control areas which went into considerable detail as to the distribution of traffic onto specific tracks and flight levels and as to its distribution in time. The disadvantage of these studies was however that their format and lay-out varied from OAC to OAC and that they therefore did not permit the preparation of a consolidated picture of the traffic situation in the entire NAT Region.

11.2.8.5 It was therefore agreed that:

a) the provision of a traffic forecast covering the entire NAT Region was a continuing requirement provided such a forecast contained data in a form suitable for air navigation planning;

b) in order to assist the NAT/TFG in the development of a new format of the traffic forecast and requisite procedures for its development to meet the objective in a) above, a Working Party consisting of qualified representatives from Canada, Portugal, the UK and the USA should review this question and prepare appropriate proposals;

c) both Canada and the USA review their representation in the NAT/TFG with a view to ensuring that adequate operational expertise is available to that Group.

CONCLUSION 12/11 - DEVELOPMENT OF A NEW FORMAT FOR THE NAT TRAFFIC FORECAST

That:

a) the Limited NAT RAN Meeting (1976) be requested to confirm the continued requirement for the provision of traffic forecasts, at yearly intervals, in a format permitting their use for air navigation planning in the NAT Region as a whole;

b) on the understanding that the LIM NAT RAN Meeting will act as requested in a) above, Canada, Portugal, the UK and the USA prepare jointly proposals for the collection and presentation of actual traffic data covering the entire NAT Region;

c) Canada, the UK and the USA continue to provide members to the NAT/TFG, on the understanding that the composition of the Group should ensure that adequate operational expertise is available to it;

d) after approval of the proposals developed in accordance with b) above by the NAT/SPG, the NAT/TFG prepare a new NAT Traffic Forecast at yearly intervals, if possible beginning with 1977.

11.2.8.6 In order to assist in achieving the objective in d) of CONCLUSION 12/11 above, the Group agreed that OACs concerned should retain the complete traffic data collected during the period from 15 to 21 July 1976 in accordance with CONCLUSION 12/3, because it was believed that this could already serve as a basis for preparation of the first new forecast.

11.2.9 Promulgation of aeronautical information regarding the NAT Region

11.2.9.1 The Group was informed by IATA that a number of States, responsible for the promulgation of aeronautical information regarding the NAT Region, did not in all cases adhere to the agreed AIRAC dates. This had caused significant difficulties to the operators in up-dating pilots' documentation and flight planning computers. In a recent case, one State had published major changes to SIDs and STARs and to NAT gateways at such short notice that IATA had been required to formally request that State to postpone the implementation of these changes in order to permit operators concerned to modify their documentation.

11.2.9.2 Since this matter had an influence on air safety, it was agreed that States concerned should, once more, be requested to adhere to the maximum extent possible, to the agreed minimum advance notice required by the AIRAC system when issuing aeronautical information on major changes to their air navigation system.

CONCLUSION 12/12 - USE OF THE AIRAC SYSTEM

That States responsible for the promulgation of aeronautical information regarding the NAT Region should adhere to the minimum advance notice required by the AIRAC system in order to permit operators to up-date their own documentation.

11.2.9.3 While on the subject of the AIRAC system the Group noted that the dates established by the Council of ICAO for the applicability of amendments to Annexes and PANS, in most cases, did not coincide with the established AIRAC cycles. This was frequently the cause of inconvenience amd it was believed that it would be advantageous if these dates could, as far as possible, be determined in taking account of the published AIRAC dates. The Group therefore wished to invite ICAO, in determining publication and applicability dates of amendments to Annexes and PANS, to select dates which agreed with AIRAC dates as published in the AIS Manual.

CONCLUSION 12/13 -PUBLICATION AND APPLICABILITY DATES OF AMENDMENTS TO ICAO ANNEXES AND PANS

That ICAO should, whenever possible, select publication and applicability dates of amendments to Annexes and PANS which correspond with AIRAC dates as published in the AIS Manual (Doc 8126-AN/872/2).

11.2.10 Continued requirement for the provision of a VOR/DME at Akraberg

11.2.10.1 The Group was informed that the Special North Atlantic Panel, charged with the review of all air navigation facilities and services in the NAT Region, had posed the question whether there was a continued operational requirement for the provision of a VOR/DME at Akraberg in the Faroe Islands. The Group was also informed that initial studies made by Denmark had indicated that annual operating costs for such a facility in this location would amount to some $220,000.

11.2.10.2 As this matter had already been discussed by the Group on previous occasions, the Group felt that it was in a position to express its views on the subject, and, after a brief review of all relevant factors, came to the conclusion that the retention of the requirement for this facility was no longer justified in the light of developments in navigation capabilities by operators likely to make use of this facility.

CONCLUSION 12/14 - ELIMINATION OF THE REQUIREMENT FOR THE PROVISION OF A VOR/DME FACILITY AT AKRABERG

That ICAO be informed of the views of the NAT/SPG that the retention of the requirement for a VOR/DME facility at Akraberg was no longer justified.

Appendix A

A METHOD FOR DETERMINING WHICH DIVERSION AIRFIELD CAN BE REACHED IN THE SHORTEST FLIGHT TIME

1. Introduction

1.1 Following an aircraft accident, in which a light aircraft ditched whilst trying to divert in a strong headwind, the UK CAA received a proposal to evaluate a method which enables SAR or ATS units to advise an aircraft which of a number of possible diversion airfields can be reached in the least time (and therefore with the least fuel).

1.2 In order to make this decision the controller needs to know the wind velocity, the position of the aircraft and its true air speed. In its simplest form the device employed will only show which diversion airfield is nearest in terms of flight time. It will not indicate the actual time required to reach the airport nor can it guarantee that the chosen airfield will be reached.

2. Description

2.1 The method uses a series of transparent templates, each showing a set of circles which represent lines of equal flight time i.e. equal air range from the aircraft position. A line on the templates is defined by the fraction W/T (Wind speed _ True air speed) and in the CAA model increments of 0.1 have been used, to given templates from 0.1 to 1.0. It will be seen that the degree of eccentricity of the range circle varies as the fraction increases.

3. Application

3.1 The templates should only be used with constant scale charts. They could be kept near the appropriate wallchart, with a simple table showing the fraction to be selected for given values of Wind Speed and True Air Speed.

3.2 The templates may be of value whenever a light aircraft is in difficulties caused by high winds or air turbulence but when the aircraft position is shown on a radar screen. In such situations the controller is able to offer advice on the best direction to fly, assuming that his knowledge of the relative speeds were accurate. Alternatively the navigator of an SAR aircraft may be able to offer similar advice.

3.3 More sophisticated versions of this device can be made giving more data, which would be appropriate to the flight planning and fuel handling of individual aircraft types.

Note: The basic type of templates described in para 6 may be copied without restriction. However, the flight planning/fuel management version is subject to patent action by its originator with a view to commercial exploitation.

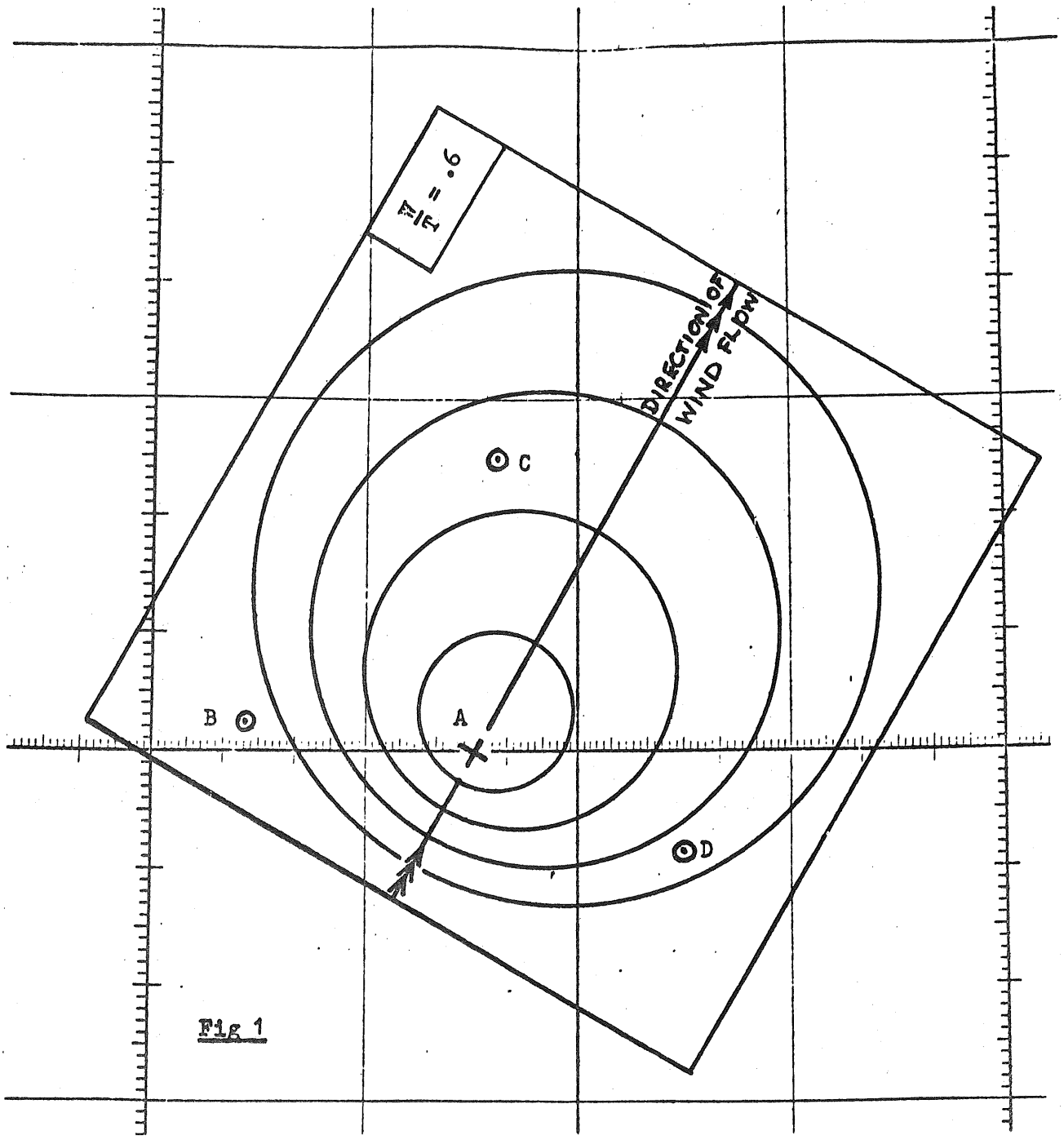

Fig 1

4. Method of use

4.1 In the example illustrated in Fig 1 the aircraft in difficulties at position A has a TAS of 100 Knots. Wind direction and speed is 210/60 Kt. The template required is therefore W/T=0.6 (i.e. 60 (i.e. 60 Knots). It is placed on the map with the centre line pointing
100 Knots

in the direction from 210° towards 030°. (The scale of the map is immaterial provided the circles are large enough to contain the diversion airfields). Inspection of the range circles shows that flight to airfield C required the least time followed by D and B in ascending order, and that B will take approximately twice as long as C, although it is geographically nearer to the aircraft position.

5. Construction of templates

5.1 A square of transparent material is cut for each template, the size depending upon the area of interest and the scale of the chart to be used.

5.2 A centreline is drawn, indicating the wind direction. At its midpoint X, draw the largest circle and note the radiou. Multiply the radius by the fraction allocated to the template and measure the resulting distance from the centre of the circle, along the centreline, towards the direction from which the wind blows (Fig 2). This marks the aircraft position (A in Fig 2).

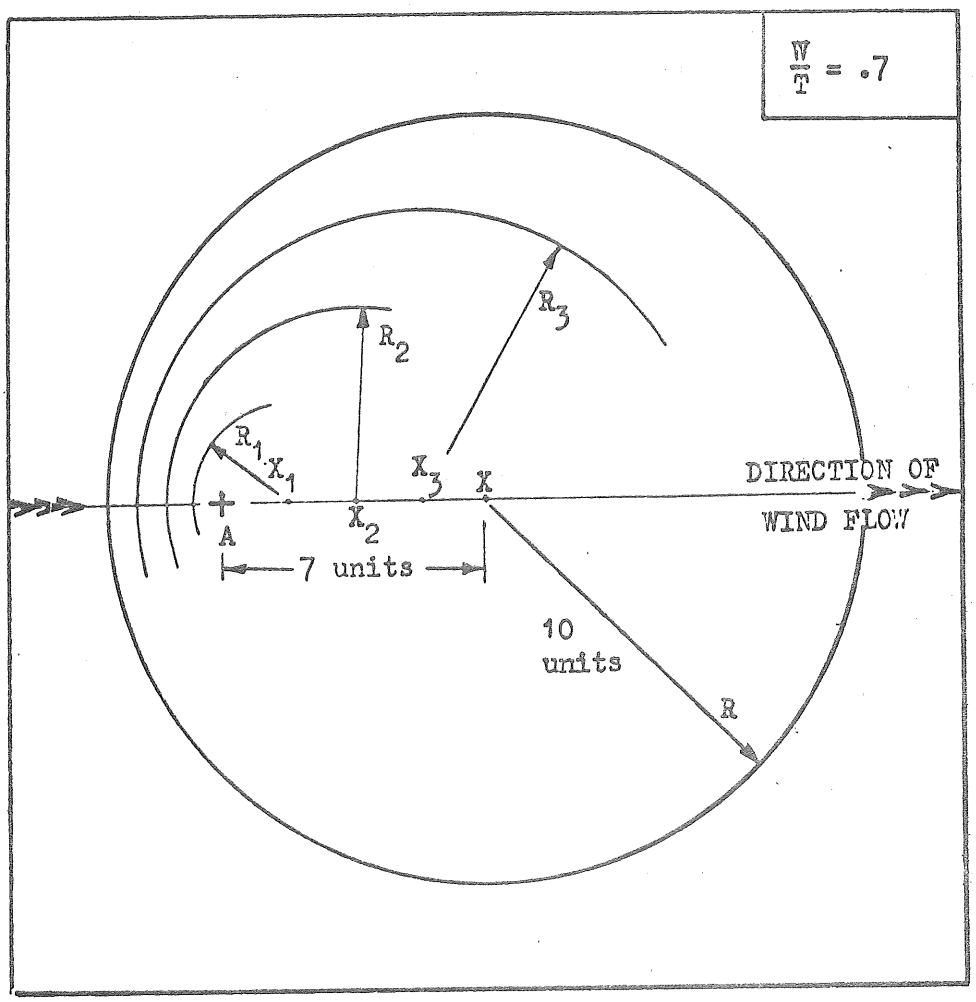

Fig 2

5.3 As many further range circles as desired can be constructed. The sole criterion is that each distance A-X_2 (X_2= centre of new circle) when divided by its appropriate radius (X_2 - R_2) shall preserve the allocated template fraction

5.4 Therefore if 4 circles are required, divide the distance A-X into 4 and the largest radius also into 4 segments. Thus in Fig 2, X_1 would lie at 1.75 units from A and would be the centre of a circle of radius 2.5 units, X_2 would be $3\frac{1}{2}$ units from A with radius 5 units and so on. On completion the centres of circles should be deleted.

5.5 As the wind fraction increases the circles will move so that at W/T=1 the upwind edges of all circles will coincide where they are cut by the centreline.

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