# SUMMARY OF DISCUSSIONS

# OF THE

# NINTH MEETING OF THE NAT SYSTEMS PLANNING GROUP

(Paris, 28 May - 6 June 1973)

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# INTRODUCTION

## 1. Convening and conduct of the Meeting

1.1 The Ninth Meeting of the NAT Systems Planning Group was held in the European Office of ICAO from 28 May to 6 June 1973. In addition to normal participation by all Members of the Group and participation on invitation by IANC, IATA and IFALPA, the States Members of the Group had also addressed invitations to attend this Meeting to Denmark, Iceland, Norway and Portugal because of the need to take into account the views of these States on some of the subjects discussed during the Meeting. All those States were present with the exception of Norway, which informed the Group that it was unfortunately unable to participate in the meeting because of other urgent commitments. The Meeting was chaired by Mr J.F. Sapin, Member from France.

1.2 In the morning of 28 May 1973, the Group met in closed session in order to discuss matters of internal interest to the Group only. A further closed meeting was held on 5 June 1973 in order to discuss Agenda Item 7 which was reserved for consideration by Members only. All other Agenda Items were discussed in open meetings with all participants listed on page v.

1.3 For the conduct of its work, the Group decided to create 2 working groups, one dealing primarily with those subjects of the agenda concerning communications, the other with those concerning navigation, separation and ATC procedures. The former Group was chaired by Mr J.H.H. Fraser, from the United Kingdom, and the latter by Mr A.L. Elliott, from Canada.

1.4 Mr P.G. Berger served as secretary of the Meeting, assisted by Mr C. Eigl. Mr F.E. Sperring also participated part-time in the Meeting and acted as advisor to the working group dealing with communication questions. All three are members of the European Office of ICAO in Paris.

2. Status of material developed by the NAT/SPG

2.1 Even though there was no specific reason to raise this subject, the NAT/SPG believed it to be prudent to recall, at this stage, its terms of reference and its constitution. This was done in order to avoid any possible misunderstanding regarding its status in comparison with the recently created European Air Navigation Planning Group (EANPG) whose objectives were similar, as far as the EUR Region was concerned, but whose status differed from that of the NAT/SPG.

2.2 As a consequence, it was recalled that any material prepared by the NAT/SPG is not subject to formal action by ICAO unless such material is adopted by an ICAO Member State and formally presented to ICAO for consideration and action.

AGENDA

Item 1 : Review of the NAT HF air-ground communication system in the light of the August 1972 communication data collection and analysis, and development of proposed resultant action.

Item 2 : Review of the situation regarding the general navigation performance in the NAT Region resulting from the study conducted by Ireland and the Netherlands and assessment of its consequence on the overall navigation situation.

Item 3 : Latest developments regarding the deployment of LORAN A facilities in the NAT Region and their continued use.

Item 4 : Review of the navigational performance of INS equipped aircraft in the NAT Region as presented by the study of the United Kingdom and assessment of its consequences on the NAT ATS route structure.

Item 5 : Review of the situation regarding the development of operating procedures and other measures required to permit commercial SST operations in the NAT Region.

Item 6 : Any other business.

*Item 7 : Arrangements for the next Meeting.

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*Reserved for consideration by Members of the NAT/SPG only.

# LIST OF PARTICIPANTS

Note : Names marked with an asterik are those of Members of the Group.

| State | |
|---|---|
| CANADA | R.F. Brown |
| | *A.L. Elliott |
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| Organization | |
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| IAOPA | H. Koemans (part-time) |

Summary of Agenda Item 1 : Review of the NAT HF air-ground communications system in the light of the August 1972 communications data collection and analysis, and development of proposed resultant action.

Introduction

1.1 The 8th Meeting of the NAT Systems Planning Group (15-21 February 1972) had agreed that a data-collection exercise should be organized for 1972 and that a detailed analysis should be made preferably by an independent agency having no NAT HF communication responsibility (paras 1.17 to 1.22 and 1.48 of the report of NAT/SPG-8 refer).

1.2 The Group noted that this study was carried out during August and one day of September 1972. The United Kingdom had agreed to undertake the data analysis and this was carried out by the Mathematics Department of its Royal Aircraft Establishment Farnborough. Ireland had effected the necessary co-ordination with the participating ground stations and provided advice and assistance throughout the period of the Analysis.

1.3 The UK and Ireland worked closely together on the review, examination and analysis of the data and had prepared a number of Working Papers on this subject.

NAT HF Communications Review 1972

1.4 The Group examined the report of the NAT HF Communications Review 1972 which contains a large number of tables, graphs and other detailed data on various items such as:

a) messages handled by the individual ground stations ;

b) distribution of messages at each station for each hour of operation for each frequency;

c) utilisation of certain frequencies during busy hours in terms of overall time the frequency concerned had been used within successive 15 minute intervals;

d) numbers of messages transmitted per flight;

e) examination of lengthy messages and long delays to messages;

f) forecast of System capacity and dates of anticipated saturation.

1.5 Because of the bulk of this document and the large amount of statistical detail contained in it the Group felt that its complete reproduction as part of this Summary was not justified, however a summary of those items of direct and more immediate interest is given below as useful background information. It should, however, be noted that the summarized information given below should not be used as the basis for further conclusions, as many important details are of necessity omitted. In this respect, the UK Member stated that the complete Review would be published shortly as a separate document and that it could be obtained on request for further detailed study. (The Appendix to this Summary refers). Furthermore, copies would be sent in due course to the participants in this Meeting.

1.6 The Group noted that the Review had generally been conducted along the lines developed at the 8th Meeting of the NAT/SPG, although a limited number of changes of detail was found to be advisable. The six main ground stations within the NAT HF communication system participated in the exercise and full co-operation was received from IATA and IFALPA.

Items of immediate interest

Types of messages

1.7 As regards the proportion of the total communications time taken up by various elements of transmissions the following percentage distribution was found:

| | | |
|---|---|---|
| a) | position reports | 65.1 % |
| b) | SELCAL checks | 7.6 % |
| c) | ATC messages | 6.8 % |
| d) | ground/ground interchanges | 3.0 % |
| e) | frequency change instructions | 2.9 % |
| f) | MET information | 2.7 % |
| g) | Company information | |
| | i) associated with position reports | 1.6 % |
| | ii) not " " " " | 2.1 % |

1.8 As regards SELCAL checks (1.7 b) refers) the Group stressed the need to restrict these to the minimum number necessary to reasonably assure the proper functioning of the system.

1.9 With respect to the ground/ground interchange messages (1.7 d) refers) the Group found that their number appeared to be justified. It suggested, however, that their use should be kept to the absolute minimum.

1.10 With reference to the frequency change instructions (1.7 e) refers) the Group agreed that these were more or less unavoidable as a consequence of frequency changes required sometimes to maintain satisfactory HF contact or, in those cases where aircraft had to be instructed to change to appropriate VHF channels.

1.11 On the subject of MET information (1.7 f) refers) it was found that an average of 8 aircraft per day on the organized track system transmitted such information even though they were not required to do so. In view of the fact that this amounted to not more than 4.5 to 6.5 minutes in frequency occupancy time the Group did not consider it necessary to take any action in this respect.

1.12 Whereas it was found that company information associated with position reports (1.7 g) i) refers) primarily contained information on fuel state or estimated time of arrival at destination, it became evident that company information not associated with position reports (1.7 g) ii) refers) was almost exclusively ground-originated. An examination of this latter category of messages revealed that 10 specific operators which were responsible for only 12 % of the total aircraft movements accounted for 51 % of such ground originated company messages, a number of which appeared to be either unnecessary or unjustified. The Group therefore concluded that States responsible for aeronautical ground stations should draw the operators' attention to cases where the origination of such messages appears to be unreasonable.

Position Reports

1.13 The mean lengths of position reports and elements associated with them were found to be:

| | | |
|---|---|---|
| a) | position report alone | 42.1 seconds |
| b) | addition of MET information - further | 10.5 " |
| c) | " of a SELCAL check - " | 16.8 " |
| d) | " of an ATC message - " | 12.7 " |
| e) | " of a frequency change instruction - " | 4.4 " |
| f) | " of company information - " | 8.9 " |

Delays

1.14 Information obtained from pilots' reports indicated that the mean delays associated with messages were:

a) cockpit delays (assessable for position reports only) 1.06 minutes

b) communications delays (time to contact ground station) 1.02 minutes

From other sources it was determined that the mean delay, from the time at which an aircraft passed a reporting point to the time the ground station had completed reception of the position report, was between three and four minutes. Taking into account the mean length of position reports, these two complementary sets of data are consistent. During busy periods an increase in mean delay to five minutes was occasionally observed.

Comparison of DSB and SSB

1.15 Although not entirely conclusive a number of indications were deduced from the data pointing to the superiority of SSB over DSB operations, in several respects (para.7 of part E of the "North Atlantic HF Communications Review, 1972" refers; see also the Appendix to this Summary).

Frequency congestion

1.16 The Review revealed also that, at present, frequency congestion is only one of a number of factors about equally responsible for message delays. It became, however, apparent that on the busiest frequencies the point had been reached where a further increase in the number of aircraft using them during peak periods would result in an increase of delays due to congestion.

Total message pattern

1.17 When comparing the total message pattern (either by distribution, message length or delays) of the 6 main HF ground stations it was found that any differences could be attributed to the type of flights handled by the stations concerned (either predominantly flights operating on the organized track system or random flights).

HF System Capacity

1.18 A number of interesting facts were found regarding the capacity of a single frequency:

a) by day a maximum of 22 aircraft could be served at any one time or 32 aircraft within a one hour period; 39 position reports could be handled per hour;

b) by night these figures are somewhat lower namely 20 aircraft at any one time or 28 aircraft per hour with a total of 36 position reports.

It should, however, be noted that not all frequencies are equally suitable and that the above figures very much depend on the aircraft position and the time of the day and therefore that network capacity cannot be obtained by simply multiplying by the number of frequencies.

Simultaneous use of frequencies

1.19 With regard to the ability of two or more ground stations to serve aircraft simultaneously on the same frequency it was found that this could increase the capacity of the system by up to 8 % by night and 16 % by day.

Unused Capacity

1.20 The analysis revealed also that there still was approximately 30 % unused capacity in the system even taking into consideration the obvious impracticability of achieving an equal level of loading on all usable frequencies of all Families. In order to realize this additional capacity it would, however, be necessary to amend the present rules applicable to the use of the families and to the methods of allocating aircraft to the various frequencies within the families.

Modes of Transmission

1.21 The study points out also that some attention should be paid to the division of Families for DSB and SSB modes of transmission. It was stated that the concept of 2 DSB Families, 1 mixed DSB/SSB and 1 SSB Family is becoming increasingly inequitable with the increasing number of SSB equipped aircraft.

Effects of poor communication conditions

1.22 It was found also that the effects of poor communication conditions varied widely and were difficult to quantify. It appeared, however, that, with the safeguards proposed when assessing capacity, mean message delays should increase by only about 1 minute during periods of poor communications of the severity encountered during the Review.

Annual up-dating of the HF-Review

1.23 Assuming that an annual check of the System utilisation and a "sample" of delays could be made without undue effort on the part of the States concerned, the group agreed to institute an annual data collection day, the exact date of which should be determined by the parties concerned , based on operational considerations.

1.24 The UK CAA was invited and agreed to undertake the task of organizing this exercise and the full support of all ground stations was promised. This data and future revised NAT/TFG traffic forecasts would be applied to the Model by RAE Farnborough to provide revised "saturation forecasts".

Expected saturation of the present HF Communication System

1.25 Furthermore, as a result of calculations based on the specifically developed model and the forecast air traffic figures of the NAT/TFG, it was found that the forecast year of saturation of a 4 Family Network on the basis of present evidence would be 1979. However, it must be clearly understood that this date would depend on a number of variables:

(i) Traffic forecasts, which are revised periodically.

(ii) Increased use by the USAF which, at the time of the data collection exercise, was operating primarily on its own Network.

(iii) Effectiveness of revised methods of allocation of aircraft to Families and frequencies, and to division of Families between SSB and DSB modes of operation.

(iv) Data content of messages (e.g. variation of length of position reports by inclusion of additional information; or reduction of present information, would have a significant effect).

(v) Possible differences in reporting patterns of SST aircraft.

Introduction of a fifth frequency Family

1.26 Depending upon the "lead time" between any decision to introduce a fifth Family (possibly at only a limited number of ground stations) and its coming into operation, it would seem prudent to expand the System one - or preferably two - years before the date of expected saturation, to allow for the variables mentioned above. If a 2 year "lead time" is assumed, for example, sample checks in 1973/74/75 and possibly 1976 would make it possible to confirm the projected trends and permit adequate time for any resulting revision of introductory dates. How closely the System should be permitted to approach saturation was also discussed.

1.27 It was expected that the 5 Family System would have sufficient spare capacity to absorb possible increases in message length which might occur during the "sun spot" maximum years 1979/1980. Even without reduction of message requirement from aircraft, the System should not reach saturation until 1984 on the basis of the extrapolated NAT TFG Mid Forecasts.

1.28 After careful and detailed consideration of the Report on the HF data analysis the Group endorsed the method of the conduct of this review. With the inclusion of certain minor points of clarification the validity of its findings was agreed. The Group felt that the addition of a fifth Family into the System should be initiated some two years before the expected date of saturation. Should the 1975 data collection and analysis - which is expected to be finalized in Autumn 1975 - confirm the year 1979 as the probable saturation date, the implementation of the fifth Family would be needed in 1977. Taking into consideration an inevitable lead time of about two years to allow for a timely ICAO Council decision and subsequent preparatory measures the Group felt that appropriate action by the States concerned should start immediately after the 1975 System check.

1.29 The Group expressed its sincere thanks to all concerned for the enormous amount of effort invested in the conduct of this high-quality exercise. It was agreed that the aims set by NAT/SPG-8 had fully been met and the relevant data and resulting conclusions were taken as the basis for the subsequent discussions relating to ways and means towards the better allocation of traffic to Families and frequencies as well as relating to the mode of operation of the Families.

Distribution of North Atlantic HF Aeromobile message traffic between the NAT Families

1.30 The Group noted that the validity of the conclusions it had reached regarding the probable year of saturation of a four Family Network (see paragraph 1.25 above) depended, inter alia, on the adoption of effective methods for spreading the message load as evenly as possible between the four Families. It therefore gave consideration to a revision of the current NAT COM Supplementary Procedures (SUPPs) to achieve this end.

1.31 It was realized that this would be a relatively complex task. On the one hand, the number of SSB equipped aircraft was higher for countries East of 30°W than for those West of 30°W. At the same time the rates for conversion of DSB to SSB usage would be different in the two cases. An additional complication was the continual movement of the NAT track structure, and the concept of Northerly and Central NAT routes became increasingly difficult to sustain. It was agreed to be important not to load heavily a Family which would need to carry an increasing load. On the contrary, efforts should be made to achieve a procedure aimed at equal loading of the Families towards the time that overall four Family saturation was likely to occur.

1.32 With this in mind the Group considered several proposals aimed at obtaining an equitable distribution of message traffic between Families in an efficient and cost effective manner and, at the same time, providing expansion capability for increased use of SSB. The Group finally agreed that the following arrangement showed promise of achieving the required result:-

"Procedures for the distribution of North Atlantic HF aeromobile message traffic between NAT frequency Families A, B, C and D to cater for SSB and DSB equipped aircraft, and to maintain an equitable loading of the Families.

FAMILY A

All SSB and DSB equipped aircraft irrespective of State of registration flying Southerly NAT routes (i.e. aircraft which, for part of their flight, enter New York or Santa Maria Oceanic areas) should employ Family A.

FAMILY B

All SSB equipped aircraft (other than those flying Southerly NAT routes) registered in States West of longitude 30°W should employ Family B.

FAMILY C

All SSB equipped aircraft (other than those flying Southerly NAT routes) registered in States East of longitude 30°W should employ Family C.

FAMILY D

All DSB equipped aircraft irrespective of State of registration (other than those flying Southerly NAT routes) should employ Family D."

Note : With this proposal, Family A remains a dual mode DSB/SSB Family; Family C and Family D remain exclusive SSB and DSB Families respectively; Family B is converted from an exclusive DSB Family to an exclusive SSB Family.

1.33 The first attempt to analyze the resultant loadings, based on independent statistics provided by Ireland for one day's traffic in 1972, led to the following figures:-

| | | |
|---|---|---|
| Family A | 54 aircraft | (12%) |
| Family B | 78 aircraft | (17%) |
| Family C | 159 aircraft | (35.5%) |
| Family D | 159 aircraft | (35.5%) |

As it was considered that these figures were somewhat incomplete, an attempt was made to assess probable message loading from figures derived from the HF review. Due to the number of assumptions which had to be made, the result could only be regarded as an approximation. It led to the following figures (based on statistics for the dates indicated):-

| | 3rd August 1972 | 15 August 1972 |
|---|---|---|
| Family A | 18.9% | 13.9% |
| Family B | 24.5% | 28.0% |
| Family C | 24.7% | 28.8% |
| Family D | 31.9% | 29.3% |

From these figures the critical family appeared to be Family D, and, other things being equal, such a situation could only be tolerated up to and including 1978 based on "mid" air traffic forecasts.

1.34 These figures were questioned by one Delegation, which pointed out that the SSB fit East of 30°W was twice that West of that longitude. If this were so, since the majority of the SSB load would be carried on Families B and C, it would seem more likely that the 57% load carried jointly by Families B and C would, in fact, be divided into 38% on Family C, and 19% on Family B. This meant that, with the new procedures, Family C would already be overloaded.

1.35 It was pointed out that, since the load division between Families B and C bore a direct relationship to the numbers of aircraft involved, one way of evening up the loads would be to change the concept of a line of demarcation at 30°W, so as to include some European aircraft with those in the American hemisphere. It was, however, observed that, in any case, the growth rate for SSB equipped aircraft registered West of 30°W was likely to be higher, so that the loadings would tend to even up. The Group decided that it could reach no valid conclusion without more relevant data.

1.36 It was finally agreed that the occasion of the 1973 data collection exercise (see paragraph 1.23 above) should be seized in order to get certain additional information which would permit a valid assessment to be made. It was desired to know, for example, with some detail, the States of Registry of the aircraft included in the data collection - whether they were SSB equipped - what routes or tracks they were flying, and so on.

1.37 The data so collected should be utilized to ascertain the effect of the proposal at paragraph 1.32 above. Should it result that there was still a marked imbalance, modifications or variations of this basic proposal, for example the impact of the incorporation of some European States' aircraft with those registered West of 30°W, should be assessed. Alternative plans might, perhaps, be suggested. Following this work, a limited Working Group composed, say, of Canada, Denmark, Iceland, Ireland

Portugal, the United Kingdom, USA and IATA, should convene to agree a proposal for amendment to NAT COM SUPPs. It was envisaged that these could then, following ICAO processing, come into force on about 1 April 1974. The Group noted that NAT/SPG 10 would probably not be held before April 1974, which was too late for the Group as a whole to study the draft proposal in time to permit its introduction prior to Summer 1974.

1.38 The Group considered that any proposal adopted for equalizing the load between the Families could result in a concentration of the traffic at some stations on a limited number of frequencies. Consideration would need to be given by the States concerned, in the interests of economy and the general operational efficiency of the network, to the withdrawal of some Families from these stations. The Group was, however, of the opinion that the withdrawal of guard at any station should be deferred until the limited Working Group referred to in the preceding paragraph had agreed upon new draft NAT COM SUPPs.

Guard on individual frequencies

1.39 In the course of these discussions the Group noted the current low utilization of the 13 and 17 MHz frequencies. It was agreed to be desirable for cost/benefit reasons to eliminate unnecessary frequency watch at stations whilst, at the same time, maintaining the network concept. It was also agreed to be necessary to maintain the frequency assignments in the ICAO Regional Plan for possible later use during periods of maximum sunspot activity even if guard were not currently kept on them. It was eventually decided that, until further notice, guard on 17 MHz could be withdrawn. It was further decided that, in the 13 MHz band, watch could be withdrawn on 13352 kHz with a consequent reutilization of the remaining two channels as follows:

| | | |
|---|---|---|
| 13328 kHz | SSB/DSB | Families A and D |
| 13288 kHz | SSB | Families B* and C |

* Assuming the proposal at paragraph 1.32 is finally adopted. It was noted that ICAO action would be called for in this case.

Airborne equipment performance

1.40 In the course of discussion of a Working Paper presented to the Group on the subject of a comparison between results obtained with SSB emission as compared with those obtained with DSB, it was noted that evidence appeared to point to poorer SSB performance with some types of aircraft as compared with others. The Group agreed that airline operators' attention should be drawn to this point since it could perhaps have a bearing on communication success in poor propagation conditions.

VHF coverage in the North Atlantic

1.41 The Group also discussed in some detail the relief of the HF system loading which could be obtained by an extensive use of VHF general purpose channels, particularly in the northern part of the North Atlantic. The Group noted that full use was not being made of VHF enroute facilities, and that no significant off-loading effect could be observed except in the case of Iceland. The Group consequently agreed that the States concerned (Canada, Denmark, Iceland, Ireland and Norway) should develop and distribute an up-to-date chart indicating the complete VHF GP channel coverage in the northern part of the North Atlantic, with the aim of encouraging its greater use. The Canadian Group Member agreed to co-ordinate this joint project.

Conclusions

1.42 The Group agreed that:

a) airlines should be advised that SELCAL checks should be restricted to the minimum number necessary to reasonably assure the proper functioning of the system (para 1.8 refers);

b) the exchange of messages between ground stations on any frequencies of the aeronautical mobile service should be kept to the absolute minimum (para 1.9 refers);

c) airlines should be advised to keep the number of company information messages to the necessary minimum and that States responsible for aeronautical ground stations should draw the attention of the airline operators concerned to cases where the origination of such messages appeared to be unreasonable (para 1.12 refers).

d) aeronautical stations should, to the extent practicable, transfer aircraft from 8 MHz to 5 MHz channels so as to even up the message loading between the two frequency orders;

e) an annual data collection day should be instituted, and that the dates should be co-ordinated by the United Kingdom;

f) the United Kingdom should be requested, in connexion with the 1973 data collection, firstly, to secure the additional data indicated in paragraph 1.36 above, and secondly, to assess the relative loadings of the Families that would result either from the proposal at paragraph 1.32 above, or from variations to that proposal as indicated in paragraph 1.37 above, the aim being to arrive at a reasonably even and acceptable distribution of the message traffic load amongst the Families by about the time that the four Families could be expected to reach saturation;

Note The United Kingdom agreed to be responsible for the collation of data, and, in conjunction with RAE Farnborough, for their application to the proposed Family allocation. The U.K. Member stated, however, that the data required would have to be extracted and supplied by provider States, and that there could be no question of this data extraction being undertaken by the U.K. It was agreed that the U.K. CAA, RAE and Ireland would co-ordinate details of the data required.

g) a limited Working Group of the NAT States particularly concerned, especially Canada, Denmark, Iceland, Ireland, Portugal, the United Kingdom and the USA, with the assistance of IATA, should be established, with Ireland acting as Rapporteur State, in order to consider the acceptability of the various proposals in the light of the loading data computed by the United Kingdom, with a view to one or more States presenting a formal proposal to ICAO not later than 1 January 1974 for the most appropriate amendment of NAT COM SUPPs;

h) no principal stations (Prins Christian Sund excepted) should be withdrawn from the NAT HF Mobile Service Plan on any Family pending completion of the limited Working Group study;

Note A formal proposal for deletion of the Prins Christian Sund HF aeronautical station from the NAT Plan was under ICAO processing at the time of the NAT/SPG 9 Meeting.

i) until further notice, guard could be discontinued on the 17 MHz channel and on 13352 kHz, whilst 13288 kHz and 13328 kHz should be used for SSB and SSB/DSB operation respectively;

Note The Families to which 13288 kHz and 13328 kHz will eventually be allotted will depend upon the types of emissions agreed for those Families. At that time a formal amendment to the ICAO Plan would be necessary.

j) airline operators' attention should be drawn to the airborne equipment question explained in paragraph 1.40 above;

k) pilots should be encouraged to make a maximum use of NAT en-route VHF general purpose channels when within coverage.

# APPENDIX TO THE SUMMARY OF AGENDA ITEM 1

## Bibliography

1. The complete "North Atlantic HF Communications Review, 1972" (Document DCP Paper No. 66) conducted in Summer 1972 by the United Kingdom and Ireland in co-operation with the RAE Farnborough can be obtained on request from:

Civil Aviation Authority
(attention CP 10)
Room 422A
The Adelphi
John Adam Street
LONDON WC2N 6BQ

2. Any requests for additional information or enquiries in connexion with the Review should also be made to the same address.

Summary of Agenda Item 2 : Review of the situation regarding the general navigation performance in the NAT Region resulting from the study conducted by Ireland and the Netherlands and assessment of its consequence on the overall navigation situation.

Review of the present situation

2.1 The Group noted that, in accordance with previous decisions, provider States, and particularly Ireland and the United Kingdom, had maintained a continuous monitoring of the navigation performance in the NAT Region. This was particularly important for the period 1971/72 because the NAT/SPG had anticipated that by the end of 1972 growth of traffic would exceed the level on which previous risk-assessments had been based. In fact, it was noted that the number of annual movements had risen from some 85000 in 1967/68 to some 130000 in 1972 and it appeared therefore necessary to undertake a re-evaluation of the situation.

2.2 This work has been undertaken and is discussed in the latter part of this summary. It was, however, also noted that this continuous survey of traffic had revealed a number of very practical problems which had immediate consequences on the operation of the Air Traffic Services in the NAT Region. This concerned primarily a question of gross errors and blunders. The traffic surveys revealed, in fact, that error and blunder distribution amongst operators was not proportional to the percentage of traffic their operations constituted of the overall traffic but that a limited number of operators seemed to be responsible for the bulk of errors and blunders.

2.3 As a consequence, the United Kingdom had, for each reported case, applied the reporting procedure for observed navigational errors, endorsed by Recommendation 10/10 a) of the NAT V RAN Meeting in order to obtain necessary corrective action and improvement. The Group was informed that, while some operators had been very co-operative in following up of individual cases of gross errors or blunders and, as a consequence, had taken corrective measures, others had been less co-operative in this respect. It was therefore hoped that States of registry of the operators concerned and the operators themselves would find it possible to take necessary action as a matter of urgency.

2.4 Some of the errors observed in early 1973 with eastbound flights were of such magnitude and their frequency of occurence was such that the United Kingdom had been forced to increase the lateral separation value between aircraft operating at the same flight level but in opposite directions to 180NM in the area between 10°W and 40°W. While it was not possible to determine the exact causes for these errors with absolute certainty it nevertheless appeared that they were due to three main reasons :

a) continuous undetected deviations from track ;

b) temporary deviations from track with insufficient corrective action ;

c) one time navigation blunders with subsequent corrective action.

In any case, the difficult navigational environment existing under certain conditions between 40°W and 10°W for eastbound flights were thought to have been a contributory factor. In addition, it was noted that the vast majority of these errors occurred with flights approaching the western seaboard of Europe in the early morning hours when radio propagation conditions are particularly difficult.

2.5 It was also noted by the Group that the energetic follow-up action by the United Kingdom on all observed gross errors or blunders during 1972 and especially in early 1973 seemed to have resulted in a considerable improvement of the situation during the last few months so that the overall trend of navigational performance is now once more in line with assumed values. In view of this situation, it was therefore not unreasonable to expect that the increase in lateral separation between aircraft at the same flight level but operating in opposite directions could be eliminated towards the end of 1973 if continued traffic surveys confirm the existing trend.

2.6 A further by-product of the temporary introduction of 180NM lateral separation between opposite direction traffic had been that, while the minority of flights, affected by this measure, had suffered economic penalties because of the increased fuel consumption involved, this might have resulted at the same time in an improvement to the main flow of traffic because more levels closer to the minimum time track had become available for that traffic, thus resulting in a possible overall economy when considered with respect to all participants in the system. The Group therefore agreed to keep this in mind when reviewing in more detail the NAT ATS route structure and future developments regarding the establishment of the organized track system.

Purpose and determination of target levels of safety

2.7 It was recalled that, in order to permit an assessment of the separation values applied in the NAT Region, the second and third meetings of the NAT/SPG had developed the concept of target levels of safety against which risks obtained from mathematical/statistical treatment of actual traffic data could be measured.

2.8 As to the target level of safety itself, it was also recalled that, since its time of development, it had been clearly understood that this could never be more than one of a number of tools utilized by the responsible authorities in the assessment of the overall operational situation in the NAT Region. In no case had it ever been intended that this value by itself or, with any significant preponderence, should constitute the single or major criterion for action in order to determine the values of separation which should be applied in the NAT Region. It was therefore confirmed that target levels of safety should be used with discretion.

2.9 As to the establishment of target levels of safety, the United Kingdom had done a thorough review of the method previously employed by the NAT/SPG and presented the Meeting with the results of this review. However, the complexity of the material presented to the Group prevented it from the determination, in the time available, of new target levels of safety which would be generally acceptable. It was therefore agreed that, for the time being, the band of target levels established at the Second Meeting of the NAT/SPG (i.e. the band between 0.15 to 0.4 fatal aircraft accidents due to loss of lateral separation per 10 million flying hours) should be retained. The Group was reassured in this action by the knowledge that these values represented, at the current rate of accumulation of flying hours in the NAT Region, a probability of between one collision in every 100 years (for the value 0.4) and one in every 260 years (for 0.15). It was, however, agreed that this matter would be again reviewed at the next meeting of the Group.

Calculation of the collision risk on the basis of observed deviations from track

2.10 In a joint working paper, the Netherlands and the United Kingdom presented a calculation of the collision risk for 1976, on the basis of recently collected data. A complete presentation of the data and the method of calculation used is being prepared as a separate report and can be obtained, on request, from the Netherlands (see the Appendix to this Summary).

2.11 The main data used was collected by Shannon radar in the period from 1 October 1971 to 30 September 1972. When comparing the data with that collected at Kilkee in 1967, it is found that the percentage of deviations between 10 and 60 NM has markedly decreased. This seems to indicate that the general standard of navigation has greatly improved since 1967. For deviations larger than 60 NM there is some improvement, but to a much lesser degree. An analysis of these blunder-type errors, which have a great influence on the collision risk, has shown that they are caused by a relatively small group of operators. This seems to indicate that it should be possible to obtain a marked reduction of these errors if appropriate corrective measures are taken by these operators.

2.12 A detailed analysis of the very large deviations, several of which by far exceeded 120 NM, showed that many of these had been caused by a more or less gradual deviation from the track over a relatively long period. It was realized that the model developed at earlier NAT/SPG Meetings does not adequately cater for these cases. A new model was developed which treats these cases in a more realistic way. This model was applied to all flights for which it could be shown that the aircraft had deviated at a steady rate. he model developed by the 2nd Meeting of the NAT/SPG was applied to all other observed deviations.

2.13 The results of the calculations show that the collision risk in 1976, based on the distribution of deviations measured in 1971/72, is :

0.55 fatal aircraft accidents per $10^7$ flying hours if opposite-direction traffic is allowed in the organized track system,

0.38 fatal aircraft accidents per $10^7$ flying hours if opposite-direction traffic is segregated.

These values apply for a system where 120 NM lateral separation is used without composite tracks. For a system using composite tracks (60 NM / 1000 ft) these values should be increased by 0.02 to 0.04.

2.14 It will be seen that the value for the case where opposite-direction traffic is allowed in the organized track system is well outside the range of target levels of safety now being used by the Group, and that the value for the case where opposite-direction traffic is segregated is approximately equal to the lower limit of the accepted target levels of safety (value 0.4).

2.15 It is thought that the models used in these calculations should provide reasonably realistic values for the collision risk when used with appropriate deviation data. It must be realized that the data used in the present calculation is not quite representative of the traffic situation in 1976. The reasons for this are :

a) There is reason to believe that the magnitude of the deviations in the region near Shannon is somewhat larger than in other parts of the NAT region.

b) It seems likely that the number of large deviations which mainly determines the value of the collision risks occurring in 1976 will be less than in 1971/72, because of the expected increase in navigation performance. This point should, however, not be over-stressed as the improvement in this respect between 1967 and 1971 has been much less than was expected in so far as the LORAN A/Doppler equipped aircraft were concerned. It is for this reason that particular emphasis is placed on the nature of the navigation fit in future planning.

2.16 It seemed of interest to investigate whether lateral separation could be reduced if only INS equipped aircraft would fly in the track system. The observations since January 1972 showed only 1 deviation larger than 20NM in about 18000 flights. This data was insufficient to establish the shape of the tails of the distribution of the deviations. In order to obtain at least an impression of what can be realized, a calculation was made of the collision risk with the use of 60NM lateral separation using the following assumptions :

a) only the model developed at the second Meeting of the NAT/SPG was used ;

b) the tail shape is the same as found in the 1971/72 Shannon data ;

c) the shape of the central part ("core") of the distribution of the deviations is as measured for INS equipped aircraft at Shannon in October 1972.

Under these conditions, it is possible to calculate what will be the relation between the number of deviations observed beyond the half value of lateral separation, the total number of flights observed and the collision risk. The results are shown in the figure below. It will be seen that the collision risk will be below the less severe target level of safety (0.4 fatal aircraft accidents per 10 million flying hours) if no deviations are observed beyond the half-separation in 15000 flights or if 4 deviations beyond the half-separation are observed in 40000 flights.

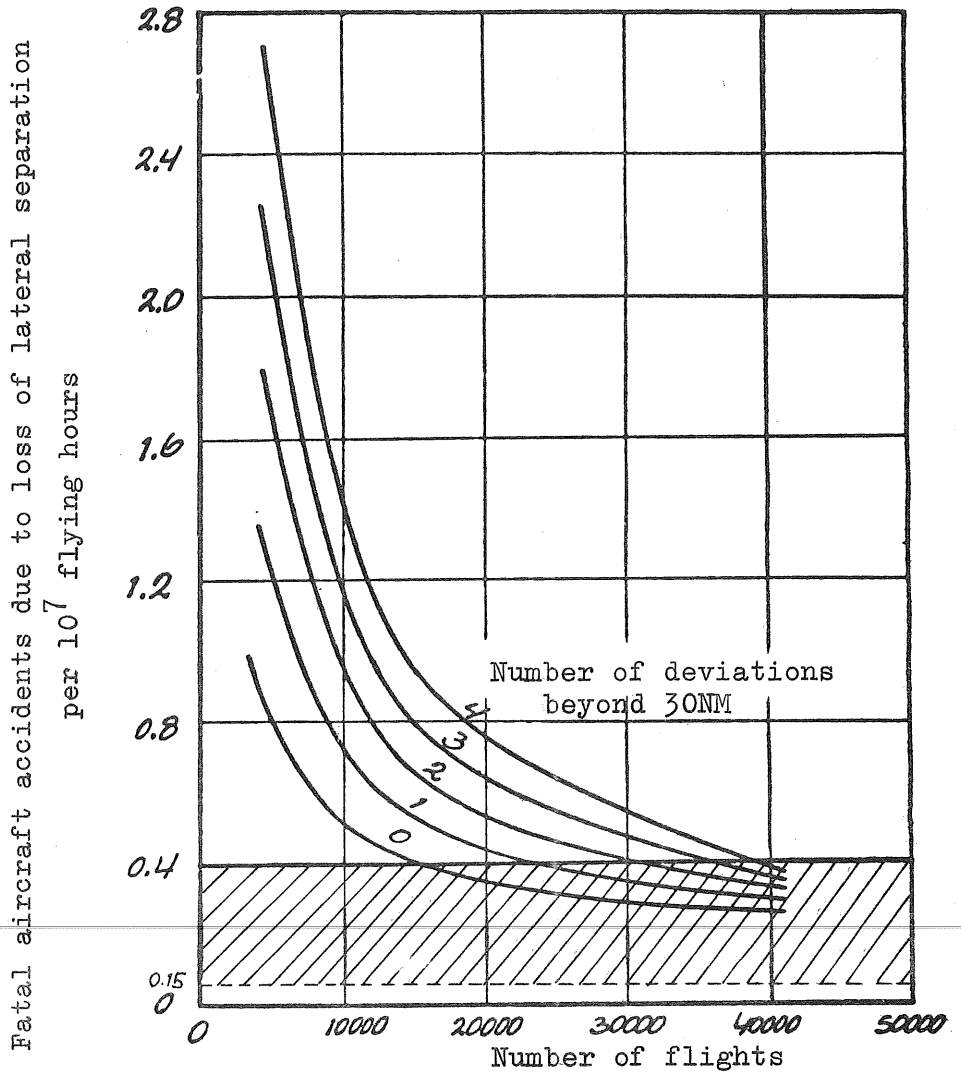


Figure 1. The relation between collision risk, number of deviations beyond 30NM and the number of flights for INS equipped aircraft flying at a 60NM separation standard.

Possible future developments with respect to navigation and separation in the NAT Region

2.17 While considerable improvements in the overall navigation performance by aircraft in the NAT Region have been noted, especially as regards INS equipped aircraft, it was nevertheless believed that despite any efforts made with respect to training of aircrews, standardization of navigation techniques and other suitable measures significant progress in the improvements of navigation permitting the reduction of, especially lateral separation can only be achiefed if :

a) effective measures are taken to reduce the occurrence of gross errors and blunders to an acceptable low level consistent with the inevitable fallacies of human nature (a point which has not been reached yet) and,

b) minimum navigation performance specifications are agreed and generally applied.

From indications it would appear that the latter is primarily a question of the provision of suitable navigation equipment to all aircraft. In this respect, reference should be made to the discussions contained in the Summary of Agenda Item 4 regarding the performance of INS equipped aircraft and also to the Summary of Agenda Item 3 dealing with the future disposition of LORAN A as a means of navigation in the NAT Region.

2.18 With respect to the latter aspect, it was believed that, in view of the situation described in the Summary of Agenda Item 3, it may well be that, due to the force of circumstances resulting therefrom, the agreed withdrawal date of LORAN A might coincide with the introduction of further reductions in lateral separation. Values quoted in this respect were 60NM lateral separation between aircraft at the same flight level and 30NM in the case of composite separation. It was, however, also pointed out that any such reductions were closely linked with the ability of provider States in the transition area to overcome transition problems between the domestic and the oceanic route structure.

2.19 From the preceding, it was evident that any development in this field depended significantly on the availability of representative data on the actual navigation performance of air traffic in the NAT Region and the Group therefore hoped that all States concerned, and especially Canada, Ireland and the United Kingdom would continue to monitor the navigation performance on a continuing basis. Furthermore, it was hoped that those establishments so far involved in the processing and analyzing of such data would be able to continue this work.

Conclusions

2.20 The Group :

a) noted with appreciation the work done by ATC units providing services in the NAT Region, especially as regards the supplementary task of collecting data on the navigation performance of aircraft and that done by other establishments involved in the navigation and separation problems of the NAT Region over the last few years ;

b) noted with satisfaction the corrective action taken by some of those operators having had cases of poor navigation performance in the past ;

c) requested those operators not yet having taken adequate corrective measures to do so as a matter of urgency and invited the States of registry concerned to ensure that this is being done ;

d) approved the action taken by the United Kingdom in March 1973 to increase temporarily the lateral separation value between aircraft operating in opposite directions at the same flight level from 120NM to 180NM ;

e) hoped that the action listed under b) above and that requested under c) above would permit the unrestricted application of 120NM lateral separation between aircraft at the same flight level, regardless of direction of flight by the end of 1973 ;

f) expected that operators and States of registry concerned would continue their efforts to ensure maintenance of the present general level of navigation performance so that no further increases to the present separation values would be required in the future ;

g) agreed that any possible beneficial results on the overall traffic flow obtained with an increased separation between the main flow of air traffic and a minority flow in the opposite direction resulting from the action listed under d) above should be further studied by Canada and the United Kingdom;

h) requested that Ireland and the United Kingdom continue their studies on the relationship between the occurrence of gross errors and specific periods of the day or specific traffic situations in order to permit determination of appropriate corrective measures ;

i) agreed that the current band of target levels of safety from en-route collision, i.e. 0.4 fatal aircraft accidents per 10 million en-route flying hours as the lower target level of safety and 0.15 fatal aircraft accidents per 10 million en-route flying hours as the upper target level should be retained for the time being ;

j) agreed that, under no circumstances the values in i) above should be considered as absolute and as such serve in isolation for the purpose of exercising operational judgement ;

Note. These values should only be considered as one of the essential tools required to formulate decisions regarding action required in the specific NAT environment with the proviso that, should the observed trend in performance show a significant decrease below the lower target level (0.4) States concerned should provide for closer monitoring of the situation in order to effect necessary improvements or, if this fails, a change in the separation values applied if the trend continues below the acceptable level for a significant period of time. On the other hand, should the observed trend approach the upper target level (0.15) consistently this could indicate the availability of an option to reduce the separation values concerned.

k) confirmed its views that any possible reduction in the separation values applied depended primarily on the specification of an agreed navigation performance by all aircraft operating in the NAT Region ;

l) expressed the hope that the retro-fit or provision of improved navigation equipment on board aircraft which might be necessitated by the withdrawal of LORAN A as a means of navigation in the NAT Region could imply that reductions in lateral separation, preferably to the next logical set of values of 60NM between aircraft at the same flight level and 30NM in the case of composite separation, could be applied as of the agreed date of LORAN A withdrawal provided that transition problems between oceanic and domestic ATS route structures can be satisfactorily resolved by the same date ;

m) requested that all States concerned and particularly Canada, Ireland and the United Kingdom continue to monitor the navigation performance of aircraft operating in the NAT Region in order to collect adequate data for continued analysis of the situation ;

n) requested States concerned to continue making available the services of those of their establishments having so far been involved in the study of navigation and separation problems in the NAT Region.

Appendix to Item 2

## APPENDIX TO THE SUMMARY OF AGENDA ITEM 2

### Bibliography

1. The detailed report on the calculations of safety risks based on observed lateral deviations from track is published under the following reference :

NLR Technical Report 73057,

Results of calculations for monitoring the safety of lateral separation in the NAT Main Area for 1976.

2. It can be obtained on request from :

Rijksluchtvaartdienst
(Attention Mr. J.G. ten Velden)
Plesmanweg 1 - 6
THE HAGUE
Netherlands

3. Any requests for additional information or enquiries should be addressed to :

National Aerospace Laboratories NLR
(Attention Mr. A. Pool)
Sloterweg 145
AMSTERDAM W
Netherlands

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Summary of Agenda Item 3: Latest developments regarding the deployment of LORAN A facilities in the NAT Region and their continued use.

Description of the existing situation

3.1 At its Eighth Meeting, the Group had already noted that the situation with regard to the provision of LORAN A chains was undergoing certain developments caused mainly by the evolution in the field of requirements for navigation guidance to military aircraft. In fact, up to now, all LORAN A chains had served both a military and a civil purpose and their installation and maintenance had, in the past, been assured nearly exclusively from military funds.

3.2 The cessation of the requirement for navigational guidance by the military will entail withdrawal of funding and other support provided by them (maintenance, personnel, etc.) for the operation of these chains with the consequence that, should they still be required for civil purposes, their support would have to be assured henceforth from civil sources. The question is therefore to determine whether such a civil requirement still exists and if so for how long.

3.3 Studies conducted by the United Kingdom seemed to indicate that the situation, on the part of the civil operators in the NAT Region , was not uniform. A considerable number of operators had already indicated that, after 1974, (the date at which military support for LORAN A chains will be withdrawn) they had no further requirement for navigational guidance provided by this aid. There remained, however, some 400 aircraft which might have a continued requirement for LORAN A guidance well beyond the year 1974.

3.4 Based on the above general situation, the detailed situation, with regard to individual LORAN A chains, was found to be:

a) Since the US military requirement for LORAN A chains will cease definitely by 31 December 1974 throughout the world, any chain operated for the military will be discontinued as soon as the specific requirement for its operation has ended. In addition, support provided by the US for Chains not operated for the military will be withdrawn accordingly. There are, however, arrangements made that, even in those cases where the military requirement for the operation of a specific chain ceases before 30 June 1974, financial support for its operation will be maintained until that date.

Note. Some LORAN A Chains, serving also other than aviation purposes, may be retained in operation beyond the end of 1974 and studies aimed at the combined use of LORAN A/LORAN C navigational guidance may change the above situation.

b) As to Chains on the eastern side of the North Atlantic military support for their operation is expected to be withdrawn on 1 April 1974 when the military requirement for their operation ends. As of that date any chain required for purely civil purposes will have to be supported from civil sources only.

c) There is general agreement that, whenever civil support is required for the operation of chains maintained in operation after the withdrawal of military support, this should be recovered, within the permissible quotas, through user charges imposed on all operators conducting flights within the area, regardless of whether they use these Chains or not.

d) Maintenance costs for the operation of individual Chains vary considerably depending on their geographic location and other relevant factors. In addition, based on information provided by France and the U.K., it must be expected that, by about 1977, most of the ground equipment of those chains, located on the eastern side of the North Atlantic, will have come to the end of its useful service life and will require replacement. The resultant costs would, as of that date, have to be added to the user charges.

3.5 With respect to d) above, it was noted that studies, conducted by the United Kingdom, seemed to indicate that, by 1977, the overall number of aircraft still relying on LORAN A navigational guidance would have diminished from 400 to a maximum of 250 and, more likely to 160 aircraft, considering the withdrawal from service of aircraft before that date.

3.6 Under these conditions, it appeared possible that the costs in user charges to all operators involved in keeping LORAN A Station in operation beyond, say some time in 1977, would considerably exceed the cost required to retro-fit all those aircraft relying on LORAN A navigation with other suitable navigation equipment. It was, however, recognized that retro-fit questions could not only be considered from the pure equipment cost point of view but that this question was rather more complex.

3.7 The above considerations are relevant only to those chains now included in the ICAO Plan for the NAT Region. It was, however, noted that one operator indicated a continued requirement for the operation of 2 LORAN A chains (1LO and 1L1), which had never formed part of the Regional Plan, until some time in the middle of 1975. Since it was found that the States of registry of the operator in question were also those responsible for the operation of these chains after 1 April 1974, the Group agreed that this matter should be resolved directly between these States and the operator concerned.

Alternative navigation aids or systems to replace LORAN A

3.8 The Group fully realized that, apart from the question of funding of LORAN A chains, their future disposition also raised the problem of their replacement as a means of navigation in case of withdrawal. In this respect, it was noted that, with the introduction of new types of aircraft into NAT operations new and more sophisticated navigation equipment was coming into more widespread use. From information available to the Group, it appeared that by 1977/78 aircraft operating in the North Atlantic and relying on LORAN A navigation might only constitute 20 to 25% of the total number of aircraft engaged in such operation and that by 1979/80 this was likely to fall to less than 10%.

3.9 As to the navigational accuracy obtained from other navigation aids or systems, it was evident that this had to be at least equal to that obtained now with the use of LORAN A if the whole concept of separation applied in the NAT Region was to be maintained at the present level. As a consequence, the Group considered a number of alternative navigation means and came to the following conclusions :

3.9.1 The provision of dual or triple INS on board modern aircraft has already been found to be a more than adequate substitute for LORAN A/Doppler aids (for a more detailed review of the performance of INS, see the summaries of Agenda Items 2 and 4). It was, however, realized that retro-fit of such equipment (which is comparatively expensive) in aircraft whose useful service life would not extend appreciably beyond an agreed date for the withdrawal of LORAN A, might not be justified from a cost/benefit point of view.

3.9.2 A combination of LORAN C and Doppler was not found to be a suitable substitute for the entire area for two reasons. One is that, at latitudes below 55°N and to the east of 40°W, no reliable LORAN C coverage exists. The second reason is that some trials conducted with LORAN C have shown that the use of LORAN C requires a rather high degree of navigational skill and might, for this reason, result in the need for an additional specialized crew member with all the resultant consequences.

3.9.3 A possibility of combining a single INS installation with the existing single or dual Doppler with computer equipment has not yet been tried in actual operating practice. It would appear that this might provide an acceptable substitute for the LORAN A Doppler equipment, especially in the case of those aircraft having a comparatively small service life left. It would also appear that operational trials to support the studies would not need to be very protracted.

3.9.4 As to the use of OMEGA, it appeared that, from the information so far available, this might be an improved substitute for LORAN A. However, so far only limited operational trials in airline operations have been conducted with this system and may, at a larger scale and in the specific NAT environment, not be possible before some time in 1974/75 when an adequate number of OMEGA transmitters have been put into operation. In addition, there was also a likelihood that the use of OMEGA might still require support by at least one single INS in order to ensure navigational guidance during potential periods of ambiguity/signal outage of OMEGA transmissions. Finally, the question of user charges for this aid has not yet been resolved and remains therefore open.

3.10 In any case, the Group was adamant in its views that whenever LORAN A chains were withdrawn from service, either in toto or partially, operators must not revert to, for example, astro-navigation as a means to up-date Doppler data or to the use of Doppler equipment alone because of the unacceptable effects this may have on the question of accuracy of navigation and thus on that of the separation minima used in the NAT Region.

3.11 In this context, the Group was also informed that there was a growing tendency to effect delivery flights across the North Atlantic with aircraft whose navigation equipment was completely inadequate for the conduct of such flights with the result that large navigational errors were committed. It was therefore felt that this practice should not be tolerated by the States of registry concerned because of the inherent safety risk and that it might even be useful to take collective action at the level of ICAO against such practices.

3.12 A further point of general interest, which became apparent during the discussions on this as well as some other items of the agenda, was the fact that the Group had no possibility to address itself to or obtain the views from the non-scheduled commercial operators which, over the last few years, had appeared in growing numbers in the NAT Region. It was noted that similar concerns had recently been expressed by the European Air Navigation Planning Group for its area of concern and the Group therefore wished to associate itself with the views expressed by that body on this subject.

3.13 Discussion of this subject revealed a problem which, even though it had its origin in the problem of the LORAN A coverage, involved much broader aspect. The subjects raised in paras 3.11 and 3.12 above also appear to be relevant. This concerns the possibility of establishing, in general terms minimum aircraft navigation performance specifications as a pre-requisite for the conduct of operations in the NAT Region. The Group believed that the time was fast approaching where it will be no longer possible to adjust ATC procedures and, more specifically, separation minima to cater for the worst performer, thus depriving ATC from providing the best possible flow of air traffic and wasting ATC capacity as well as imposing operational and economic penalties on those users capable of appreciably better performance. It was believed that this subject needed, at the earliest possible time, consideration on a formal basis within ICAO with the aim of obtaining an appropriate regional air navigation agreement and it was felt that a procedure similar to that used by the USA, prior to the establishment of government rules and regulations (i.e. the proposed rule making procedure) could be used to this end.

3.14 In any event, because of the many factors involved in this question and also because of the comparative complexity of the overall problem, the Group felt that this needed further detailed study before it would be possible to arrive at firm proposals for action. It therefore agreed to create an ad hoc working group which should pursue work on this subject between now and the 10th meeting with the aim of enabling the Group, at that time, to come to definite conclusions. The terms of reference of this Group should be :

a) To review the need for the continued operation of LORAN A chains in the NAT Region and the determination of a suitable target date for their definite withdrawal.

b) To determine the optimum grouping of LORAN A stations during the intermediate period with the aim to reduce, to the practical minimum the number of individual LORAN A stations required to be kept in operation.

Note. Any proposals regarding re-grouping of individual LORAN A station should also cover the requirement for the publication of revised LORAN A coverage charts suitable for airline operational use.

c) To establish the financial implications resulting from action under a) and b) for States and operators under a practical overall cost/benefit aspect.

Conclusions

3.15 With respect to the future disposition of LORAN A as a means of navigation in the NAT Region, the Group agreed that:

a) An early decision as to the future disposition of LORAN A chains is required. Such decision should take account of the following:

i) the need to ensure the provision of funding and maintenance of LORAN A chains until their agreed withdrawal date;

ii) the need to allow adequate time for retro-fit by operators of those aircraft at present using LORAN A navigation equipment;

iii) the need to permit confirmation by operational trials of the navigational adequacy of any alternative navigation system chosen as a substitute for LORAN A.

b) In view of the present situation there was a strong possibility that the large majority of LORAN A chains now operated in the NAT Region may not be available as of 1977 and that action in this field should therefore be adjusted time-wise to that date.

Note. As action, planned by the US in this field, may also affect Regions other than the NAT Region, the Group expected that States concerned would use the occasion of the forthcoming PAC/SEA RAN Meeting of ICAO to review the situation in this area.

c) An ad hoc working group, composed of representatives from Canada, France, Portugal, the United Kingdom, the USA, IATA and IFALPA, should be created in order to:

i) review the need for the continued operation of LORAN A chains in the NAT Region and determine a suitable target date for their definite withdrawal;

ii) determine the optimum grouping of LORAN A stations during the intermediate period with the aim of reducing to the practical minimum the number of individual LORAN A stations required to be kept in operation;

iii) establish the financial implications resulting from action under a) and b) for States and operators under a practical overall cost/benefit aspect,

and that its findings should be presented to the 10th Meeting of the NAT/SPG so as to permit the latter to come to firm conclusions regarding the future disposition of LORAN A chains in the NAT Region.

Note It was noted that the USA was prepared to take necessary action to organize the work of this Group.

3.16 As regards the wider aspects of the navigation situation related to the possible withdrawal of LORAN A, the Group agreed that:

a) States of registry confronted with the need to authorize operations in the NAT environment by their operators based on new or alternative navigation aids or systems should ensure that such systems are subjected to performance evaluations regarding their accuracy, reliability and use ensuring that they are comparable with those of INS now in use in the Region.

Note Such evaluation should be conducted under normal airline operations and should cover an adequate period of time to allow the assessment of possible seasonal performance variations.

b) At the earliest possible time, action should be initiated with the aim of obtaining regional air navigation agreement on minimum navigation performance specification concerning aircraft engaged in operations in the NAT Region so as to permit optimum use of the airspace for all users. Such minimum performance specification should subsequently serve as the basis for granting operating licences for NAT operation to individual operators by their respective States of registry.

c) States concerned should take, as an immediate measure, all necessary action to ensure that delivery and similar one-time flights, conducted in the NAT Region, are only authorized provided the aircraft concerned are capable of a navigation performance which is commensurate with the level of navigational accuracy upon which separation for the type of flight intended is based.

d) All parties concerned be encouraged to ensure that the common interest of non-scheduled operators will be represented in suitable form on all those occasions where questions of interest to them are discussed.

Summary of Agenda Item 4 : Review of the navigational performance of INS equipped aircraft in the NAT Region as presented by the study of the United Kingdom and assessment of its consequences on the NAT ATS route structure.

Surveys conducted of the navigation performance of INS equipped aircraft

4.1 The Group had before it two surveys conducted by Canada and the United Kingdom respectively, related to the navigation performance of INS equipped aircraft. The survey of Canada had been conducted in August 1971 and covered 1116 pairs of INS and non INS equipped aircraft. The UK survey covered some 5000 flights by INS equipped aircraft in the NAT Region during the period from April to July 1971 which, taking into account the provision of either triple or at least dual INS installations onboard the aircraft concerned, amounted to some 15 400 individual systems flights in the NAT Region and some 125 000 hours of system operation.

Survey by Canada with regard to longitudinal separation

4.2 The survey conducted by Canada suggested that maintenance of longitudinal separation between pairs of B 747 aircraft was better that that between pairs of other aircraft and it appeared that this was at least partially due to the fact that all B 747 aircraft were equipped with INS.

4.3 In addition, and unrelated to the fact whether aircraft were equipped with INS or not, it was found that with the exception of 23 pairs of aircraft, all others had a minimum of 15 minutes longitudinal separation when leaving the NAT Region. Investigation of the 23 cases revealed that only 3 of them had less than 10 minutes longitudinal separation (e.g. 9, 8 and 6 minutes respectively) while the others had still at least 10 minutes separation. However, this apparent loss of longitudinal separation might have been due to inaccurate clock setting onboard the aircraft concerned which might introduce significant errors in position reporting. In fact, in one case the clock error was 16 minutes and, because it went undetected, led eventually to an airmiss incident involving that aircraft over the United Kingdom. There was therefore some doubt as to the validity of the above findings and it was agreed that this issue should be the subject for further investigation.

4.4 Further factors leading to changes in longitudinal separation during flight in the NAT Region might include :

a) relaxation on the part of some pilots in adhering to the assigned Mach number in accordance with the regional supplementary procedures,

b) the type of instrumentation used to indicate Mach numbers,

c) the performance characteristics of certain large aircraft which make small velocity adjustments difficult.

4.5 In a paper presented by IANC, it had been pointed out that the type of Machmeter used in B 747 aircraft might be a reason for the difference in performance observed in comparison with other aircraft. There are two factors which could contribute to the better performance of these aircraft :

a) The digital presentation of Mach numbers makes small changes easier to detect than on "clock-type" instruments.

b) Modern air data computers are believed to provide a more accurate indication of Mach numbers than other sources.

4.6 With regard to the general subject of instrumentation, the Group also noted that the repeated requests made to ICAO at the Sixth Air Navigation Conference and at the NAT V RAN Meeting to take action, in order to develop specifications for the calibration and maintenance of Machmeters, had not yet produced any results. It was therefore hoped that now that this question had gained a significant importance in the assessment of accuracy of navigation, ICAO would find it possible to take action at the earliest possible time. As to the performance characteristics, the Group agreed that this matter required further study and should be reviewed at its next meeting.

Survey by the United Kingdom

4.7 The survey conducted by the United Kingdom indicated that in 95% of all cases the radial error rate of INS was of the order of 2.1 NM/hr or less. If it was to be assumed that 75% of this error affected the lateral component, this would result in an across-track error of 10 NM or less in 95% of all occasions, taking into account an exposure time of $5\frac{1}{2}$ hrs between the time aircraft were leaving the North American airports and arriving over European landfall points. For flights in the opposite direction, this value can be expected to be even better. (The detailed report on the survey conducted by the United Kingdom is available on request. For details see Appendix to the Summary of this Item.)

4.8 Even greater significance should, however, be attributed to the situation regarding the occurrence of gross errors with INS equipped aircraft (i.e. deviations from track in excess of 30 NM). From April 1971 to March 1972 a total of 124 gross errors were observed by Shannon SSR and Ulster radar on eastbound flights. During that period approximately 25% of the total air traffic in the NAT Region was INS equipped. Out of the 124 gross errors observed, 115 were committed by aircraft not equipped with INS and only 9 concerned INS equipped aircraft. During the period from April 1972 to March 1973 the figures were 54 gross errors and of these 53 were committed by non-INS equipped aircraft. In this latter case, the percentage of INS equipped aircraft had risen to 35% of the total traffic.

4.9 Out of 10 gross errors committed by INS equipped aircraft and listed above, only one can be attributed to malfunctioning of the equipment while the 9 others were due to human error. In addition, the sharp decrease from 9 errors in the period 1971/72 to one during the period 1972/73 seems to indicate that the large majority of the errors committed in 1971/72 was due to inexperience and would have to be attributed to the "learning curve" usually associated with the introduction of radically new equipment.

4.10 As to system reliability, the UK study indicated that, in the average a mean time between failures (MTBF) of 1500 hrs per individual INS installation was achieved and more current figures appear to indicate that an MTBF of 1700 to 2000 hrs is more realistic.

4.11 As to the operating techniques, it appeared evident that, apart from the elimination of the effects of the "learning curve" mentioned above, it will be essential to develop standard operating procedures for the use of this equipment which are as error-proof as possible. In this respect, it was understood that IATA was already engaged in work on this subject and intended to produce a manual on good operating techniques concerning the use of INS.

4.12 As to the cost of INS equipment, it was pointed out that, while this appear to be considerable when looked at in isolation, it should nevertheless be borne in mind that the provision of a triple INS installation in a modern aircraft used for NAT operations will generally not exceed 1 - 2% of the total cost of the aircraft in question.

4.13 Because of the apparent superior performance of INS equipped aircraft, it appeared that, subject to confirmation by the continuation of the data collection carried out during the Summer 1973 in order to provide an adequate sample, it might be feasible to reduce lateral separation between INS equipped aircraft in the NAT Region at some later date. However, since it is expected that within the next 1 or 2 years the number of INS equipped aircraft will only constitute some 50 to 60% of the total number of aircraft operating in the NAT Region, this would require segregation between them and aircraft using other means of navigation. Experience suggests that such a method would be very difficult to apply by ATC due to problems both in the transition area between oceanic and domestic airspace and in the oceanic airspace itself.

4.14 In any case, the Group noted that the question of accuracy of navigation and the resultant separation minima applied, had a significant effect on the airspace capacity and, as had already been mentioned in the Summary of Agenda Item 3, will have effects on the traffic management in the NAT Region as traffic increases. It will therefore be inevitable that, sooner or later, the airspace capacity must be increased in order to permit accommodation of all traffic demands under optimum conditions and it appeared to the Group that INS was definitely one of the means of achieving this end.

Conclusions

4.15 The Group agreed that :

a) as a measure of urgency, operators engaged in NAT operations as well as ATC units, providing services in this region, should ensure that accurate time is used both in the air and on the ground at all times ;

b) operators, engaged in NAT operations, should ensure that aircrews adhere to the assigned Mach number in accordance with the regional SUPPs ;

c) ICAO should, once more, be requested through appropriate channels to initiate earliest possible action on the development of specifications for the performance, calibration and maintenance of Machmeters ;

d) in addition to normal monitoring of traffic, surveys along the lines undertaken by Canada, Ireland and the United Kingdom, should be carried out during the Summer of 1973 and should cover approximately one week special sampling both for eastbound and westbound traffic ;

e) based on additional data, provided in accordance with d) above, the subject of lateral separation be retained for consideration at the tenth meeting of the NAT/SPG with the aim of developing proposals by the Group, or subsequently by States for consideration at the forthcoming LIM NAT RAN Meeting, regarding those changes to lateral separation which appear to be feasible ;

f) in view of the anticipated difficulties in accommodating, to the optimum extent possible, traffic demands in the NAT Region, States and operators should bear in mind that any new navigation system considered for use in the NAT Region should have performance characteristics in terms of accuracy and reliability which are comparable to those so far demonstrated by INS.

Appendix to Item 4

## APPENDIX TO THE SUMMARY OF AGENDA ITEM 4

### Bibliography

1. The complete "Evaluation of Inertial Navigation Systems, North Atlantic Region" (Document DCP Paper N° 65) conducted in 1971/72 by the United Kingdom in co-operation with selected IATA Carriers can be obtained on request from :

Civil Aviation Authority
(attention CP9)
Room 423
The Adelphi
John Adam Street
LONDON WC2N 6BQ

2. Any requests for additional information or enquiries in connexion with this document should be addressed to the above address.

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Summary of Agenda Item 5 : Review of the situation regarding the development of operating procedures and other measures required to permit commercial SST operations in the NAT Region.

5.1 Under this item, the United Kingdom had presented four working papers dealing with :

a) ATS procedures and practices applicable to SST operations within the NAT Region ;

b) planning principles for SST operations ;

c) longitudinal separation applied between SST flights ;

d) lateral spacing of tracks in the NAT Region used by SST aircraft.

5.2 These papers had been submitted primarily for further study by the Group until its next meeting when the subject of SST operations was intended to be dealt with in detail. It was therefore agreed not to review these papers at this meeting but to retain them as supporting documentation for NAT/SPG-10.

Conclusion

5.3 The Group agreed that :

a) the subject of SST operations should be retained as an item for consideration at its 10th meeting, in preparation for the LIM NAT RAN Meeting 1974 ;

b) the four working papers submitted to this Meeting by the United Kingdom on the subject of SST operations should be retained as supporting documentation for its next meeting and that Members should be invited to use them in their preparation for discussion of this subject at the next meeting.

Summary of Agenda Item 6 : Any other business.

6.1 Need for the continued operation of Bushmills CONSOL

6.1.1 The Member of the United Kingdom requested the views of the Group on whether there was still a need to maintain Bushmills CONSOL in operation. The reason for this was that the Bushmills facility was rather old, required special maintenance and, according to information available to the United Kingdom, appeared to have lost considerably in operational significance. In addition, it could be expected that, if Bushmills CONSOL had to be kept in operation, its operating costs would, in future, have to be recuperated through user charges.

6.1.2 When considering this question, the Meeting noted that the NAT V RAN Meeting, in 1970, had retained 3 CONSOL Stations in the NAT Regional Plan, i.e. Bushmills Lugo and Varhaug because of "the reported substantial usage of CONSOL by flight crews engaged in international commercial transport operations and their usefulness in support of international general aviation operations."

6.1.3 The Group took advantage of the presence of a representative from IAOPA in the Paris Office in order to obtain his views on the continued requirement of Bushmills CONSOL for international general aviation purposes. The IAOPA representative confirmed that such a requirement still existed. He was, however, not in a position to give detailed information as to its extent.

6.1.4 As to the use made of this facility by international commercial transport operations, the representative from IATA stated that repeated surveys conducted amongst its member airlines, on the need for the 3 CONSOL Stations in the NAT Region had shown clearly that, as far as IATA was concerned, no such requirements existed.

6.1.5 The representatives from IANC and IFALPA stated, however, that the Bushmills CONSOL constituted a useful back-up for navigation in all those cases where navigation based on LORAN A was no longer possible, either because of equipment failure or because of LORAN A propagation conditions. The feeling of both IANC and IFALPA was that, as long as navigation was based on guidance derived from LORAN A, the Bushmills CONSOL should be retained in operation.

6.1.6 The U.K. Member stated that, because of its radiation pattern and the resulting difficulties in obtaining reliable position information from Bushmills CONSOL and also taking into account the rather infrequent use of this facility by aircrews, which could result in a decreasing skill in the use of CONSOL, it appeared that, in some cases, its use had been the cause of larger than normal navigational errors because aircrews had placed too much reliance in this facility.

6.1.7 It was also stated that there seemed to have been cases where aircraft had departed from aerodromes on the North American continent with inoperative Loran A equipment and had subsequently based their entire navigation in the NAT Region on the use of Bushmills CONSOL combined with the use of Doppler. It was pointed out that, because of the inherent inaccuracy of this type of navigation such practices could not be tolerated and that operators should therefore stop using this method of navigation.

6.1.8 Finally, the Group concluded that, in principle the U.K. should be requested to maintain Bushmills CONSOL in operation until such time as the Loran A chains for which it served as back-up were withdrawn unless conclusive evidence could be produced in the meantime that the retention of this facility was no longer justified.

Conclusions

6.1.9 The Group agreed that :

a) Bushmills CONSOL should be maintained in operation until such time as the related Loran A chains were withdrawn unless it could be proven at an earlier date that the retention of this facility was no longer justified.

b) Because of certain inherent safety risks, it was totally unacceptable for any type of flight by jet-engined aircraft to be planned in the organized track structure at or above FL290 on the basis of using CONSOL (even if in combination with Doppler), and that all operators should be so advised.

6.2 Airspace and ATS organization in the northern part of the NAT Region

6.2.1 The Group noted that the Second Conference on 1956 Danish and Icelandic Joint Financing Agreements had requested the NAT/SPG to conduct a study of the FIR structure in the North Atlantic (Recommendation 9 of this Conference refers). As a consequence, the Group had already invited Denmark, Iceland and Norway to participate in its Meeting because it was believed that, apart from the interest of those States represented by Members in the NAT/SPG, their interests were also involved.

6.2.2 After having reviewed the request, contained in Recommendation 9 of the Second DEN/ICE Conference, the Group agreed to accept this task and to deal with it as speedily as its other urgent commitments permitted. As a first step, it agreed to make a rapid survey of the situation in order to :

a) list those problems which were at present causing operational and/or technical difficulties ;

b) determine the most suitable approach for the conduct of the required study ;

c) list those subjects which required particular attention and review ;

d) initiate any preparatory work which could be undertaken as of now to further the study ;

e) determine a realistic time-scale for the progress of future work consistent with the possibilities of the Group itself and participants in the study.

6.2.3 In the initial discussion within the Group, it became immediately apparent that, any review of the airspace and ATS organization in the northern part of the NAT Region, could, under no circumstances, be confined to a review of the FIR Reykjavik exclusively and would therefore by necessity have to include the adjacent FIRs as well. This fact was underlined by a statement by the representative of Denmark who pointed out that there was a strong likelihood that the present arrangements regarding the FIR Sondrestrom would change within the next few years.

6.2.4 With regard to the list of problems mentioned in paragraph 6.2.2 a) above, the Meeting noted the following :

a) Canada had informed the European Office of ICAO some time ago that problems were encountered at the Edmonton ACC with flights entering the Arctic CTA from the east without prior notification or without adequate transfer of control from the adjacent ACC. It was suspected that part of this was partially due to communication difficulties during periods of bad radio propagation, but there was also the likelihood that errors or omissions were made in the addressing of the respective flight movement messages.

b) IATA stated that flights engaged in operations through that part of the NAT Region, and particularly in the area between 61°N and 65°N, were frequently provided with ATC clearances which covered only that part of the flight conducted within the control area of the ACC issuing the clearance.

c) IATA also reported that certain difficulties were being encountered in obtaining the application of 20 minutes longitudinal separation between aircraft engaged in Polar flights to Anchorage.

d) It was noted that there existed certain problems concerning the relationship between the organized track structure and the southern boundary of the Reykjavik FIR.

e) It was further noted that the long standing problem of the ATS inter-area communications link between Reykjavik ACC and Stavanger ACC was still not resolved and that co-ordination of air traffic between Reykjavik ACC and Bodo Oceanic FIC also caused certain difficulties.

f) It was also believed useful to review, in this context, the pattern of random routes over and in the vicinity of Iceland which, at one time, had given rise to considerable problems to Reykjavik ACC.

g) For completeness sake, the Group was informed of a problem which had come to light in the course of the EUM VI RAN Meeting where it had been found that there existed a gap in FIR coverage extending from the North pole in the direction of the boundary between Norway and the USSR, which may require a change to the eastern boundary of the Sondrestrom and Bodo oceanic FIRs.

6.2.5 As to the best possible approach for the conduct of the required study, the Group agreed that this could best be done by an ad hoc working group, specially charged with this subject. It therefore agreed to establish such a group with the following membership :

Canada, Denmark, Iceland, Ireland, Norway, United Kingdom, United States of America and IATA.

It further agreed that the terms of reference of this Group should be :

a) to conduct a study of the airspace and ATS organization in the northern part of the NAT Region in order to determine, on the basis of operational considerations, the safest and most efficient organization of the airspace in the area at the least cost to its users ;

b) to give due consideration to the associated requirements for aeronautical fixed and mobile communications to the extent that these perform supporting functions for the air traffic services.

6.2.6 The Group also agreed that, in conducting this study, the working group should be guided by the following principles which had been developed by the special NAT RAN Meeting 1965 :

a) the airspace should be divided into the practical minimum number of FIR's ;

b) the division of the airspace should take account of the different types of traffic operating at various levels ;

c) the organization of the airspace and the deployment of air traffic service units should permit efficient civil/ military co-ordination ;

d) boundaries between oceanic and continental FIR's should be defined so as to minimize difficulties in the transition of aircraft between these two types of airspace.

In addition, the Group agreed that the supplementary principles, contained in the Appendix to this Summary, should be applied.

6.2.7 In order to facilitate, to the maximum extent possible, commencement of work by this working group, the NAT/SPG nominated Mr M.N. Bagg, from the United Kingdom, as its rapporteur with the understanding that the Group should use any suitable method to further its work including bilateral contacts, correspondence and preparation of supporting documentation on specific subjects by appropriately qualified Members. It was also noted that Denmark and Iceland were prepared to host meetings of the Group when these became necessary.

6.2.8 As to the subjects which require particular attention in the course of the study, the following were noted :

a) The traffic situation in the northern part of the NAT Region. This should include :

i) domestic traffic in Greenland and Iceland by scheduled commercial services, general aviation and military flights ;

ii) international operations in the area under consideration subdivided into air traffic operating in that part of the NAT track system of concern to the area under review and "random" civil and military traffic in the area in question ;

iii) the inter-relation between traffic listed under i) and ii) above.

b) ATS services and facilities subdivided into area control service and flight information service, approach control services and special services provided for search and rescue.

c) Aeronautical fixed services.

Note. It should be determined whether the existing fixed service facilities are adequate for any proposed revision or whether additions or changes would be necessary.

d) Aeronautical HF mobile services.

Note. Account should be taken of the existing coverage in relation to the existing and anticipated HF air-ground communication requirements.

e) Aeronautical VHF mobile services.

Note. Account should be taken of the existing coverage and the possibility of remote operation of VHF ground facilities at existing or new locations, both for pilot-controller and general purpose communications.

f) Actual costs of facilities now operated in the area in question and estimated costs for changed or additional services and facilities.

6.2.9 With regard to the initiation of preparatory work for the conduct of the study, mentioned in paragraph 6.2.2 d) above, the Group felt that from the list of problems contained in paragraph 6.2.4 and the list of subjects for special study contained in paragraph 6.2.8, it was fairly evident which States and/or organizations could do preparatory work on specific subjects. The Group therefore refrained from assigning specific tasks at this time to individual Members of the ad hoc working group, trusting that work would be initiated as required and feasible. However, in order to give an indication of the time available for such work, the Group noted that a first meeting of the ad hoc working group could be expected to be convened some time in Autumn of this year.

6.2.10 As to the time-scale for the completion of this study, the Group felt that it would be highly optimistic to expect any tangible results in time for submission to the LIM NAT RAN Meeting planned for late 1974. This was partly due to the fact that States concerned could make only limited resources in personnel and effort available for this work because of other pressing requirements and also because it was felt that in view of the now existing situation, which was reasonably satisfactory, it was unjustified to assign top priority to this subject.

Conclusions

6.2.11 The Group agreed that :

a) the request, addressed to it by the Second Conference on 1956 Danish and Icelandic Joint Financing Agreements, to review the airspace and ATS organization in the Northern part of the NAT Region should be included in its work programme ;

b) a special ad hoc working group should be created to undertake this study with the composition and the terms of reference as shown in para. 6.2.5 above ;

c) the ad hoc working group should report on progress achieved in its study to the NAT/SPG at its 10th meeting, so that an appropriate submission on the results so far obtained can be prepared for the LIM NAT RAN Meeting.

6.3 Regional supplementary procedures regarding in-flight contingencies

6.3.1 IFALPA requested the Group to review a proposal for amendment of the special procedures for in-flight contingencies, applicable in the NAT Region and contained in paragraph 5 of Part 1 of Doc 7030. The proposed changes envisaged that :

a) in paragraph 5.1, the procedure which now provides for a turn, if possible to the right, should give liberty to the pilot to make this turn to the left or to the right as he sees fit. Instead of requiring the aircraft to descend and regain its assigned track in the opposite direction at a level 1000 feet or, below FL290 500 feet below its last assigned level the proposal by IFALPA provided for the possibility to climb or descend by, in any case, only 500 feet and maintaining a track in the opposite direction parallel but 30NM to the left or right of the original track ;

b) in paragraph 5.2, the procedure for rapid descent should be changed to permit the aircraft to alter its course by at least 45° to the left or to the right until established on a special track 30NM distant and parallel to its original track.

6.3.2 Since the Members of the Group and other participants in the Meeting had not had sufficient time to consider the implications of these changes on the safety of operation and it was not possible to determine these with any degree of confidence during the Meeting, the Group was unable to come to any firm conclusion on this subject. In addition, it was also felt that the proposed changes had operational implications which would have to be considered in more detail.

6.3.3 In view of this situation and since any proposal for amendment of the Regional SUPPs was, in any case, subject to formal action by ICAO, it was suggested that IFALPA should submit their proposal through formal channels to ICAO directly so that it would be processed in accordance with established procedures. This course of action was also proposed in order to save time in processing since IFALPA had indicated that in their view the matter was rather pressing.

Conclusions

6.3.4 The Group :

a) agreed that, at least for the time being, no action will be taken by it with regard to the proposal by IFALPA for a change to the special in-flight contingency procedures applicable in the NAT Region and contained in Doc 7030 ;

b) suggested to IFALPA that, if they maintain their proposal that it should be submitted formally to ICAO in the usual manner for processing in accordance with established procedure.

6.4 Revision of the Regional SUPPs regarding lateral separation

6.4.1 IFALPA stated that the present provisions contained in Doc 7030 regarding the application of a minimum of 90NM lateral separation could be misleading because this minimun was not applied. They therefore suggested that Doc 7030 should be changed accordingly and that, for flights operating within the NAT organized track structure, the specification of distance should be replaced by degrees of latitude.

6.4.2 For a number of reasons, including some related to the practical application of lateral separation by ATC, the proposal was rejected by the Group and it was agreed that no action should be taken on this subject.

Conclusion

6.4.3 The Group agreed that no action should be taken to initiate formal action for an amendment of the NAT SUPPs relating to lateral separation.

6.5 Oceanic clearance delivery procedure applied by the United Kingdom

6.5.1 The UK Member informed the Group that the procedure for the delivery of oceanic clearances to aircraft adopted by the United Kingdom in co-operation with a limited number of operators was found to be satisfactory. He also informed the Group that, at least, two operators had recently requested to be authorized to participate in the procedure. In view of the fact that previously agreement had been reached between the UK and IATA that the total number of operators, participating in this procedure, should not exceed six he wished to obtain the views of IATA on whether this restriction still applied. IATA stated that this restriction was no longer valid and that the UK was free to apply the procedure to additional experienced operators.

6.6 Co-ordination difficulties regarding flights operating through the Edmonton Arctic CTA

6.6.1 Further to the statement contained in paragraph 6.2.4 a), the Secretary of the Group informed the Meeting that, based on the letter received from Canada and pointing out certain difficulties, which were experienced with the co-ordination of flights operating through the Edmonton Arctic CTA, the European Office of ICAO would approach States and operators concerned separately in order to obtain an improvement of the present unsatisfactory situation.

6.7 Reliability of the NAT Traffic Forecasts

6.7.1 The Group was informed that the latest traffic forecasts prepared by the NAT Traffic Forecasting Group had to be based on actual traffic data of 1971 because full data on actual traffic in 1972 had not yet been available to the Group at the time of the preparation of the forecasts. It was therefore possible that some of the figures given in the forecasts did not take sufficient account of the decrease in the rate of traffic growth observed during 1972 and were therefore possibly too high.

6.7.2 The Group noted this information and suggested that a statement to this effect should be included, in appropriate terms, by the European Office of ICAO in its letter of transmittal announcing the despatch of the latest NAT traffic forecasts to all NAT States and International Organizations.

6.7.3 In this respect, the Group also noted that the NAT/TFG seriously considered the possibility to postpone the preparation of the yearly up-dated traffic forecasts until a time when full information on the actual traffic of the preceeding year had been made available to it.

6.8 Future planning for the NAT Region

6.8.1 With respect to the recent decision taken by ICAO to suspend participation by Portugal in the activities of this Organization, the Group noted the following statement by the representative from Portugal :

> "The Portuguse delegation wishes it to be noted that, in the view of his government, the ensurance of the safety of air transport users constitutes an unrelinquishable responsibility of each State. Portugal shall therefore continue under any circumstances to co-operate with ICAO, or directly with other States concerned, in order to develop an adequate air navigation system in that part of the NAT Region where it provides services and facilities for use by international civil aviation."

6.8.2 The Group, taking exclusively account of operational and technical aspects, felt that the position of Portugal, as a Provider State in the NAT Region, was such that any planning conducted in that Region without the presence of Portugal would give rise to serious difficulties and could therefore not be done in a satisfactory manner. It therefore hoped that ways and means would be found rapidly to restore a situation permitting an operationally satisfactory conduct of planning activities for the NAT Region at all appropriate levels.

## APPENDIX TO THE SUMMARY OF AGENDA ITEM 6

### Supplementary principles to be considered, as appropriate, in the study on the airspace and ATS organization in the Northern part of the NAT Region

The following principles were agreed at the Special NAT Meeting in 1965 for application in addition to the basic principles listed in paragraph 6.2.6 of this Summary. They should be taken into account as appropriate in the study on the airspace and ATS organization in the Northern part of the NAT Region.

1) The FIR boundaries should be established within effective cover of direct pilot/controller VHF voice communications.

2) The boundaries should be established within effective cover of any radar facility available to the ACC providing Air Traffic Services to continental or domestic traffic.

3) The boundaries should be established within effective cover of continental short-range radio navigation aids.

4) The boundaries should be established at a sufficient distance from the coast to permit aircraft to reach the assigned oceanic cruising level within continental airspace so as to be in cruising flight on entry into the oceanic airspace.

5) FIR boundaries should be delineated with due regard to the main flow of traffic.

6) Adequate air/ground communication facilities for the provision of air traffic services throughout its FIR must be available to each oceanic FIC/ACC.

7) Area control centres serving oceanic FIR's contiguous with major North Atlantic traffic generating areas should have air/ground communication facilities for contact with ocean bound traffic well before entry into the oceanic FIR.

*Summary of Agenda Item 7: Arrangements for the next Meeting.

Date of next Meeting

7.1 Since, according to latest information, the next LIM NAT RAN Meeting was planned to be held in late 1974 the Group agreed that its next meeting should be planned for sometime in Spring 1974 taking due account of the planned date of the 8th Air Navigation Conference and certain meeting commitments of the European Office of ICAO. It was further agreed that the exact date should be established in due time in consultations between the Chairman and the Secretary of the Group.

7.2 In this context the Group also wished to stress the need to maintain the present planned date for the LIM NAT RAN Meeting, not only because of the need to make appropriate provisions for SST operations in the NAT Region but also because of other subjects requiring early formal consideration within ICAO (the LORAN A issue, the question of navigational accuracy and separation, the airspace organization in the Northern part of the NAT Region).

Agenda

7.3 As to the points to be considered at the next meeting of the NAT/SPG these were mainly determined by the fact that this meeting would be preparatory to the LIM NAT RAN Meeting and should primarily be devoted to the development of appropriate supporting documentation.

7.4 As a consequence it was agreed to retain the following items for the Agenda:

a) development of proposals for Regional Supplementary Procedures covering SST operations in the NAT Region;

b) development of proposals regarding action required in the field of navigation in the NAT Region including the LORAN A situation, developments in the field of INS and OMEGA and minimum navigation performance specifications;

c) review of the work achieved by the ad hoc working group on the airspace and ATS organization in the Northern part of the NAT Region and development, if possible, of appropriate proposals for action;

* This Item was considered by the Members of the Group only

d) review of the concept of the NAT organized track structure and the procedures used for its establishment;

e) further review of the HF air/ground communication situation in the NAT Region in the light of further surveys of and studies on this subject.

Site and duration of the Meeting

7.5 The Group agreed that, in principle its next Meeting should be held in the European Office of ICAO with a duration of approximately 10 days.

Participation

7.6 The Group agreed that, in view of the Items retained for consideration at its next meeting, the following States and International Organizations should be invited to participate therein:

Denmark, Iceland, Norway, Portugal, IANC, IATA and IFALPA.

7.7 In addition the Group agreed that, should it be found that, at the time of convening its next meeting, a reasonably representative organization, representing the interests of non-scheduled operators, had emerged, its invitation to the next meeting of the Group should be the subject of timely consultation amongst the Members.

Conclusions

7.8 The Group agreed that:

a) its next meeting should be held some time in Spring 1974, the exact date to be determined by the Chairman in consultation with the Secretary;

b) the Agenda should cover the following main Items:

i) development of proposals for Regional Supplementary Procedures covering SST operations in the NAT Region;

ii) development of proposals regarding action required in the field of navigation in the NAT Region including the LORAN A situation, developments in the field of INS and OMEGA and minimum navigation performance specifications;

iii) review of the work achieved by the ad hoc working group on the airspace and ATS organization in the Northern part of the NAT Region and development, if possible of appropriate proposals for action;

iv) review of the concept of the NAT organized track structure and the procedures used for its establishment;

v) further review of the HF air/ground communication situation in the NAT Region in the light of further surveys and of studies on this subject.

c) in principle the meeting should be held at the European Office of ICAO;

d) the following States and International Organizations should be invited to participate in the meeting:

Denmark, Iceland, Norway, Portugal, IANC, IATA and IFALPA

and that, if feasible, the invitation to an Organization representing non scheduled commercial operators operating in the NAT Region should be made the subject of timely consultation amongst the Members.

Request to ICAO

7.9 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 so as to permit it to continue its work.

## LIST OF NAMES AND ADDRESSES OF THE MEMBERS OF THE NORTH ATLANTIC SYSTEMS PLANNING GROUP/

## LISTE DES NOMS ET ADRESSES DES MEMBRES DU GROUPE DE PLANIFICATIONS COORDONNEES ATLANTIQUE NORD

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| Mr A. White | UNITED KINGDOM | National Air Traffic Service<br>The Adelphi<br>John Adam Street<br>LONDON W.C.2<br>Tel. (01) 836.1207<br>Ext. 1393 | |
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