# SUMMARY OF DISCUSSIONS AND CONCLUSIONS

# OF THE

# TENTH MEETING OF THE NAT SYSTEMS PLANNING GROUP

(Paris, 10 - 20 June 1974)

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# INTRODUCTION

## 1. Convening and conduct of the Meeting

1.1 The Tenth Meeting of the NAT Systems Planning Group was held in the European Office of ICAO from 10 to 20 June 1974. In addition to normal participation by all Members of the Group and participation on invitation by 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, and all those States were present. The Meeting was chaired by Mr. J.F. Sapin, Member from France.

1.2 In the morning of 10 June 1974, the Group met in closed session in order to discuss matters of internal interest to the Group only. All Agenda Items were discussed in open meetings with all participants listed on page iv.

1.3 For the conduct of its work, the Group decided to create three Working Groups as follows:

a) a group dealing with Items 1, 4, 5 and 7, chaired by Mr. R. Howley (Ireland);

b) a group dealing with Item 3, chaired by Mr. M.N. Bagg (United Kingdom); and

c) a group dealing with Item 2, chaired by Mr. E.J. Brambleby (United Kingdom).

Agenda Item 6 was dealt with by the full group.

1.4 Mr. P.G. Berger served as secretary of the Meeting, assisted by Mr. C. Eigl. Messrs. F.E. Sperring and A. Bruinenberg also participated part-time in the Meeting and acted as advisors to the Meeting with respect to communication and meteorological questions respectively. All four are members of the European Office of ICAO in Paris.

# AGENDA

Item 1 : Co-ordination of activities of NAT/TFG with NAT/SPG and review of latest forecast prepared by the NAT/TFG.

Item 2 : Further review of the HF air/ground communication system in the NAT Region in the light of additional surveys of and studies on this subject.

Item 3 : Review of the work achieved by the ad hoc working group on airspace and ATS organization in the Northern part of the NAT Region and development of appropriate proposals for action.

Item 4 : 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.

Item 5 : Review of the concept of the NAT organized track system and the procedures used for its establishment.

Item 6 : Development of proposals for Regional Supplementary Procedures covering SST operations in the NAT Region.

Item 7 : Any other business:

a) Special problems raised with regard to radio communication failure in the NAT Region;

b) Fuel-saving measures in the NAT Region;

c) Proposal to amend the NAT Regional SUPPS regarding in-flight contingencies;

d) Operation of Bushmills CONSOL;

e) Need for Akraberg VOR/DME;

f) Arrangements for the next Meeting.

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Summary of Agenda Item 1 : Co-ordination of activities of NAT/TFG with NAT/SPG and review of latest forecast prepared by the NAT/TFG.

## Introduction

1.1 Since the NAT Traffic Forecasting Group (NAT/TFG) had met in the European Office of ICAO the week preceding the Tenth Meeting of the NAT/SPG in order to prepare the updated NAT traffic forecast for the period from 1974 to 1978, it had been suggested that the opportunity should be seized to have, at the beginning of the Tenth Meeting of the NAT/SPG, a brief joint session in order to discuss problems of common interest and to provide the NAT/TFG with an opportunity to present an initial report to the NAT/SPG on their updated forecast.

1.2 This joint meeting was held on 10 June 1974 in the afternoon, and the discussion covered essentially the following two points:

a) the utility of the work conducted by the NAT/TFG for planning purposes in the NAT Region;

b) an initial appraisal of the latest forecast prepared by the NAT/TFG.

## The utility of the work conducted by the NAT/TFG for planning purposes in the NAT Region

1.3 The NAT/SPG confirmed its previously expressed views that the work conducted by the NAT/TFG constituted an essential tool for its planning activities. In addition, it noted that, especially in view of recent developments in the field of fuel supply, the present composition of the NAT/TFG, i.e. the presence of designated members from Canada, the United Kingdom and the USA who, apart from their responsibilities within the NAT/TFG, performed identical work in their respective national Administrations, ensured that maximum account was being taken in the work related to traffic forecasting in the NAT Region of developments in the major domestic traffic generating areas immediately adjacent to that Region. It was believed that this situation provided maximum assurance of the compatibility of forecasting work undertaken for the NAT Region and for the critical domestic areas adjacent to it.

1.4 It was, therefore, believed that the present arrangements should be maintained, both as regards the mandate and composition of the NAT/TFG and also its relationship with the NAT/SPG.

## Initial appraisal of the latest forecast prepared by the NAT/TFG

1.5 The NAT/TFG had prepared a short summary of the work conducted so far for the preparation of its updated traffic forecast covering the period 1974 to 1978, with a forward projection to 1983.

This summary consisted essentially of tables showing:

a) the estimated aircraft flow on the various traffic axes in 1973;

b) the development of total aircraft movements in the NAT Region from 1974 to 1978; and

c) assumptions regarding SST operations in the NAT Region during the forecasting period.

1.6 With respect to the aircraft flow on the various traffic axes in the NAT Region, the NAT/TFG explained that only estimated figures could be given because the collection period of actual traffic data for the various axes varied considerably, covering in some cases a sample of seven days only, and in others a sample of up to forty-nine days. It was also stated that necessary measures were taken by the NAT/TFG to avoid double counting in the final forecast with regard to traffic figures given for the various axes.

1.7 With regard to the development of the total traffic in the NAT Region from 1974 to 1978, the NAT/TFG presented a table which gave three sets of values constituting the high, medium and low values, depending on a number of assumptions made regarding possible future developments in the field of air transport in the NAT Region. In any case, it was noted that the high value of total movements in the NAT Region for 1974 was some 10 to 12 percent below that of 1973, while the medium and lower values for the same year were appreciably lower. At this point the United Kingdom Member pointed out that comparisons of actual traffic data for the spring of 1973 with that for the same period of 1974 in the Shanwick area suggested that traffic in 1974 was some 15 percent lower than for the corresponding period in 1973, and that it could, therefore, be envisaged that the traffic movements would probably progress slower than indicated by the NAT/TFG based on the high values assumed by them. The Chairman of the NAT/TFG pointed out that the high values given for the period 1974 to 1978 and which show a marked increase of traffic movements over those now experienced as from 1976 were based on the assumption that the charter market on the North Atlantic would develop comparatively unrestrained. If this were not the case, and the medium and low values given by the NAT/TFG were based on this assumption, the medium value for 1978 would then barely be above the actual traffic figures of 1973. The reason for this was that, apart from the effects created by the fuel situation, it was expected that the progressive replacement of present-day turbo-jet aircraft (DC8, B707) by wide-bodied turbo-jet aircraft would make itself felt.

1.8 With regard to the assumption made for SST operations, it was noted that the NAT/TFG had assumed that, in 1976, four SST aircraft would be in commercial service across the North Atlantic with two daily crossings, amounting to 2,900 flights per year, and that, as of 1977, it was assumed that each of the seven or eight aircraft then in service would

effect three daily crossings, amounting to some 8,800 SST flights per year across the North Atlantic by 1978.

1.9 In general, the NAT/TFG stressed, however, the fact that, while the information provided to the NAT/SPG, and that eventually contained in the more complete updated traffic forecast now in the final stages of preparation, was based on the best available sources, both as regards actual traffic data and anticipated developments, they should nevertheless be treated with appropriate caution because of the many imponderables which could influence future air transport development in that Region within the next three to four years. Finally, the NAT/TFG stated that it expected to be able to provide to ICAO the final version of their updated forecast for the period 1974 to 1978 by the end of July 1974.

1.10 The Chairman of the NAT/SPG expressed the appreciation of the NAT/SPG of the work done by the NAT/TFG, and also expressed the hope that the excellent co-operation between the two Groups could be maintained in future.

Summary of Agenda Item 2 : Further review of the HF air-ground communication system in the NAT Region in the light of additional surveys of and studies on this subject.

Amended provisions for the distribution of NAT HF aeromobile message traffic between the NAT frequency families

2.1 It was recalled that NAT/SPG/9 had established a Limited Working Party of NAT States to consider the NAT Frequency Deployment Plan in the light of the loading data computed by the United Kingdom, with a view to presenting, not later than 1 January 1974, a formal proposal for amendment of the current NAT COM SUPPS (see Summary of NAT/SPG/9, para. 1.42 g) ). However, the data analysis had been delayed, and a Sub-Group, in November 1973, had, furthermore, been unable to reach agreement on a proposal. The Working Party therefore presented to NAT/SPG/10 a range of proposals for the Group's consideration.

2.2 Only one of the seven alternative proposals presented led to a substantial equalization of the loading on the four NAT families. It was discarded for three reasons. These were:

a) that it required the implementation of additional Families at a number of stations;

b) that the allocation to the different Families on the NAT routes was somewhat complicated;

c) that the use of NAT Family A in NAT MWARA NA-1 is contrary to ITU Radio Regulations Appendix 27.

2.3 Of the remaining six alternative proposals, all would lead to a heavier loading of Family D than of any one of the other three Families, but it was recognized that this would tend to be self-correcting in the future. Only one of these six alternatives had a simple allocation of the users to the Families when on one or the other of the NAT routes, and the Group chose it - basically for this reason. The proposal is as follows:

| Designated for: | Route | | |
|---|---|---|---|
| | Southern | Central | Northern |
| All SSB-equipped aircraft registered in the hemisphere W of 30°W | A | B | B |
| All SSB-equipped aircraft registered in the hemisphere E of 30°W | A | C | C |
| All DSB-equipped aircraft | A | D | D |

It entails the conversion of Family B from DSB to SSB operation.

2.4 Taking into account the 1973 data collection exercise results, this would currently result in the following (estimated) percentage distribution of HF aeromobile message traffic between the Families:

| | A | B | C | D |
|---|---|---|---|---|
| night | 13 | 18 | 31 | 33 |
| day | 15 | 13 | 32 | 35 |

Whilst with this arrangement 35% of the traffic would currently be carried by Family D, it was pointed out that this would not overload Family D. Moreover, increasing use of VHF by aircraft on the Northern route and on Northerly tracks of the Central route would reduce the HF loading on Family D. In addition, it was to be expected that the continual increase in the proportion of aircraft equipped with SSB would lead to part of the Family D loading passing to Families C and particularly B.

2.5 The Group believed that the above proposal would adequately meet NAT requirements for a period of three to four years from the date of implementation, i.e. until about 1979 if brought into service in Spring 1975.

2.6 The Group agreed that Gander and Shannon should again be empowered to effect co-ordinated offloading of any heavily loaded Family, and it was agreed to include an appropriate paragraph in the proposed new NAT SUPPs (see below).

2.7 As regards the introduction of a fifth NAT Family, the Group agreed that it could not foresee the required date with any degree of accuracy. Forecasts in this respect made at NAT/SPG/9 had been upset by changes in NAT air traffic trends since that time. There was, however, agreement that continuation of the yearly data collection exercise would permit a timely decision on the stage at which a fifth Family - or some of its frequencies - should be introduced.

2.8 As regards the use of 13 MHz channels, the agreement at NAT/SPG/9 (see para. 1.39 of its Report) to keep two only (13328 kHz for SSB/DSB on Families A and D and 13288 kHz for SSB on Families B and C) was endorsed.

2.9 Arising from the foregoing, the followed revised NAT SUPP emerges:

"Procedures for the distribution of the NAT HF aeromobile message traffic of the users on the NAT routes between the various NAT HF Families:

a) All SSB-equipped aircraft registered in the hemisphere West of 30°W should use Family A on the Southern route and Family B on the Central and Northern routes;

b) All SSB-equipped aircraft registered in the hemisphere East of 30°W should use Family A on the Southern route and Family C on the Central and Northern routes;

c) All DSB-equipped aircraft should use Family A on the Southern route and Family D on the Central and Northern routes;

d) In the event of heavy loading of a Family occurring, Shannon and/or Gander may, for the expected duration of the condition, and after co-ordination between themselves, and advice to all other aeronautical stations concerned, offload aircraft of one or more aircraft operators from that Family to another appropriate Family.

Note 1 : SSB-equipped aircraft registered in Australia will use Families designated for aircraft registered East of 30°W.

Note 2 : Southern routes are those which enter the New York or Santa Maria Oceanic FIRs. The Central and Northern routes comprise all others.

Note 3 : Canada and Ireland will reach prior agreement on appropriate local procedures for the proper application of the procedure at d) above."

Interference to NAT HF Aeromobile Service Channels

2.10 In the course of discussion it was reported that heavy interference was being experienced on the 2868 kHz channel of Family D. It was agreed that two actions should be undertaken in parallel: firstly, attempts would be made to clear the interference, and, secondly, the ex-EUR channel 3467 kHz should be monitored with a view to its possible use as a supplementary channel after co-ordination of its clearance through the ITU.

HF aeronautical mobile service from Sondrestrom

2.11 In connection with the provision of service to the new Polar FIR CTA (see Report on Agenda Item 3), the question was raised as to whether there was a need to retain a NAT en-route HF AMS Station at Sondrestrom. Equipment there was currently being replaced, with a completion date in 1975. It was pointed out that cases had arisen where some HF messages sent to Sondrestrom had not been copied by Iceland and vice-versa. It therefore appeared that Reykjavik HF station might not currently have reliable coverage over part of the new Polar CTA. Plans were in hand at Reykjavik to provide improved coverage of the new CTA.

2.12 The Group agreed that it would be necessary for a comprehensive coverage test to be made in order to find the extent of the reliable Reykjavik HF coverage. Until the results of this test were known, no recommendation regarding the future of Sondrestrom HF station could be made. It was agreed that it would be preferable for Reykjavik, which would be the location for the OAC, to act as primary station without reliance on Sondrestrom, since, inter alia, the latter service would have to rely on the ICECAN cable circuit Iceland-Greenland which was sometimes unserviceable. Alternative routings were currently available, but this might not always be the case.

2.13 There was agreement between Denmark and Iceland to conduct a special trial with the possible assistance of Canada and to report back to the next Meeting of the NAT/SPG (see Conclusions below).

Introduction of an 11 MHz channel at Reykjavik

2.14 There was reported to be evidence that there was too large a gap between the 8 MHz and 13 MHz NAT Family channels. The suggestion was made that 11303 kHz, derived from the old EUR Family B, should be implemented as a dual-mode channel at all Northern NAT HF en-route aeronautical stations. This received only limited support. However, the Group agreed to an Icelandic proposal to conduct tests to see if the use of 11303 kHz would help Reykjavik coverage of the new Polar CTA. It was reported that continued use of the frequency by the USSR might cause problems, and the Secretariat agreed to take up this point with the USSR.

SELCAL procedures

2.15 Ireland reported a number of cases where difficulties had been caused by the HF ground station operators having wrong SELCAL code information for aircraft in their areas of concern. Time had been wasted by calling on the wrong code and then in trying to find the correct code. It was proposed that at least such errors, when detected, should be notified to all other NAT HF AMS stations concerned. It was then suggested that, in the same vein, it should be obligatory for aircraft to check SELCAL at the time of first contact with the first station serving the

first oceanic area concerned with the flight. Current PANS (see Annex 10, Volume II, para. 5.2.4.2.3 b) ) were proving inadequate. There was, however, opposition either to establishing an obligation on the part of the pilot or to laying down detailed procedures for use in the HF aeronautical stations. It was finally agreed to introduce tentative procedures which could be tried out pending the next Meeting. These would also lessen the need for SELCAL checks, other than on initial entry into the NAT system. It was agreed that, in fact, repeated SELCAL checks, and the tracing of correct codes in the event of errors, were occupying too much of the ground station operators' time, as well as taking up too much channel time (see Conclusions below).

Use of VHF in the NAT aeromobile service

2.16 It was recalled that earlier NAT/SPG Meetings had called for increased use of VHF (NAT/SPG/4, Agenda Item 3; NAT/SPG/8, para. 1.35; NAT/SPG/9, para. 1.41) and this matter was again raised in relation to the amended proposal for the use of NAT HF Families (see paras. 2.3 and 2.9 above).

2.17 The possible integration into the NAT System of VHF stations at Vagar (Faroe Islands) and Frederikshaab (Greenland) was discussed. The availability of VHF GP coverage at these stations on a twenty-four hour basis, appropriately linked to Reykjavik and Gander, would help reduce the loading on Families B, C and D in the proposed revised scheme for the use of the NAT Families. It was pointed out that the Vagar VHF channel currently was only available during the hours of opening of the Vagar aerodrome (HD) and that the service previously rendered to en-route traffic would be discontinued. Furthermore, the implementation of a speech circuit Iceland - Faroes would cost some US$ 50,000 per annum. It was also observed that some of the current difficulties in the area would be resolved when a Stavanger-Reykjavik via Prestwick speech circuit was implemented in Autumn 1974. The Group finally agreed that, whilst additional VHF coverage appeared desirable in the two cases, the matter should be studied again at the next Meeting in the light of experience then available (see also the Report on Agenda Item 3).

2.18 In relation to para. 1.41 of the Report of NAT/SPG/9, Canada presented to the Meeting a draft map of VHF GP coverage in the Northern NAT area. This was gratefully accepted by the Group with a few minor changes. In support of Conclusion k), para. 1.42 of the Report of NAT/SPG/9 that pilots should be encouraged to make a maximum use of NAT en-route VHF GP channels when within their coverage, it was agreed to be necessary for a map of such coverages to figure in Flight documentation provided to pilots. For this to be possible, the States concerned (Canada, Denmark and Iceland) should include such a map in their AIPs. It was agreed that their AIS Offices should co-ordinate action in this field, using the Canadian map as an example of the type of guidance required.

NAT HF Communications Review 1973

2.19 The Group examined the results of the annual NAT HF data collection for 1973 and noted that:

a) the division of communications load among Families was:

| Family | A | B | C | D | 13 MHz |
|---|---|---|---|---|---|
| Loading | 35.4% | 25.6% | 31.1% | 6.8% | 1.1% |

b) during the 0300-0700 GMT peak period, almost equal loading was experienced on the 2 MHz and 5 MHz frequencies overall, with low usage on 8 MHz. However, in Family C, the 2 MHz frequency took 84% of the family load and 26% of the total load;

c) during the 1400-1800 GMT peak period, the 8 MHz group of frequencies took 63% of the load, twice that on the 5 MHz group. The most heavily loaded frequency was 8 MHz in Family A, with 23% of the total load;

d) the 13 MHz group of frequencies took only 1.1% of the total load;

e) during the period of high utilisation of 2 MHz in Family C, 49 position reports were passed in the course of one hour, with a mean delay of 4 minutes, 5 of the reports having delays of more than 12 minutes. Delays of 20 minutes and 32 minutes (not caused by congestion) also occurred during the peak period. The high proportion of reports containing positional data only, evenly distributed, helped to minimize delays. The previous general tendency for message delays to be lower during periods of high utilisation was again evident;

f) the ratio of DSB to SSB equipped aircraft was approximately 35/65.

Comparison with 1972 data collection

2.20 In general, tendencies noted in 1973 followed patterns established in the 1972 exercise. The main differences were:

a) usage of Family D was less;

b) load on Family C increased;

c) the 8 MHz and 5 MHz frequencies had a slightly less uneven distribution (1400-1800 GMT period);

d) aircraft generated more position reports per flight and the hourly rate also was higher (95 position reports in one hour at Shannon).

The Group realized that undue significance should not be attached to these differences since the data sample was statistically small.

Annual up-dating of the HF review

2.21 The Group approved revised instructions for compilation of the annual return, which will be issued to participating stations (see Appendix to the Report on Item 2) and agreed action as set forth in the Conclusions listed below.

Conclusions

2.22 The Group agreed that:

a) the revised NAT SUPP at para. 2.9 above should be formally submitted to ICAO by Ireland with a view to its becoming effective on the AIRAC date nearest to 1 April 1975;

b) States required in the Plan to operate on Family B should convert their ground equipment to SSB (A3J) operation to meet the date mentioned in a) above;

c) two 13 MHz channels should be shared between the four Families as explained in para. 2.8 above; a formal proposal for amendment to the NAT Plan should be presented by Ireland;

d) States and the Secretariat should make all efforts to clear the interference to NAT use of 2868 KHz;

e) States able to do so usefully should monitor 3467 KHz from time to time with a view to reporting the result to the next Meeting of the Group;

f) Denmark and Iceland should co-operate in a comprehensive trial aimed at ascertaining the Reykjavik HF station coverage of the new Polar CTA and report back to NAT/SPG/11. Canada should participate at the request of one or other of these two States;

g) Iceland should conduct appropriate trials to ascertain the possible utility of 11303 KHz in providing coverage of the Sondrestrom FIR, and the Secretariat should look into the question of continued USSR use of the frequency. Similar trials could also be conducted by Canada from Cambridge Bay;

h) States should invite their airline operators not only to ensure that the SELCAL codes were included in their flight plans, but also to instruct their pilots to announce the code and check it at the time of first contact, either on HF or VHF (GP) on their first entry into the NAT System so as to take up the least HF channel time;

i) States should, to the greatest extent possible, arrange to notify the other NAT HF aeronautical stations concerned in those cases where action such as that mentioned in h) above revealed a discrepancy between the SELCAL code in use by a flight and that notified in advance or contained in a flight plan;

j) the AIS Offices of Canada, Denmark and Iceland should co-ordinate and co-operate in the publication, in their AIPs, of a map or maps showing the VHF GP coverage in the Northern NAT area. On completion of this action, States should invite their aircraft operators to include the information in flight documentation, and to instruct their pilots to make maximum use of such VHF coverage.

k) because of the opportunities offered by improved VHF GP coverage for the off-loading from HF to VHF, the 1974 data collection should include:

   i) information on position reports passed on VHF;

   ii) the ground station assessment of those position reports passed on HF which might have been transmitted on VHF;

   Note : A specimen of the Form which might be used for this purpose is shown in the Appendix to the Report on Item 2 (page 2-13).

l) the best possible estimate of the numbers of DSB and SSB equipped aircraft taking part in the 1974 data collection should be made;

m) the date for the 1974 data collection (data day) will be in either July or August, and the decision on the date will be made early in September. It was noted that certain air traffic statistics were collected by centres on 27 July and 27 August each year, and these dates should be borne in mind when deciding the data collection day. Ireland and the United Kingdom would co-ordinate details of the exercise, including the date, and the United Kingdom will be responsible for the collation of data.

# NAT ANNUAL HF DATA COLLECTION

## INSTRUCTIONS FOR COMPILATION OF ANNUAL RETURN

1. Count POSITION REPORTS only - and only those positions reports where you are the station of read-back.

2. Prepare a table for your particular station, divided into hours for each frequency as shown in the Specimen at page 2-13. The time in the left hand 'hour' column refers to the time of receipt of the REPORT, not the time of the position. Hour 0000-0059 covers the period midnight to 0059, hour 0100-0159 the period 0100 - 0159, etc. You may use either the frequency letters or state the frequency in figures at the top of each column. Complete the table with hourly totals for all frequencies used during the Data Collection day.

3. When this table is complete, the two busiest frequencies should be determined as follows:

a) San Juan, New York, Santa Maria and Reykjavik

Choose the two frequencies which have the highest totals of position reports for the whole 24 hours.

b) Gander, Shannon

Choose the two frequencies which show the heaviest total over a period of two to three hours (e.g. Gander would choose QN and VF; Shannon would choose QN and QL).

If there are more than two heavily loaded frequencies then one SSB and one DSB should be chosen if possible.

Since this is a 'sampling' exercise, if the totals are very nearly equal, making choice difficult, it is not likely to make much difference which two are chosen.

4. All Stations

4.1 As shown in the Specimen at page 2-13, a table can be prepared for each of the two selected frequencies. Go through the hard copy for the two selected frequencies for the whole 24 hours, but remember - for position report messages only, and only where you are the station of read-back. Look at the time of receipt of the report and compare it with the time of the position, the difference being the time of delay. Insert a tick in the relevant place in the table, remembering that the time in the left hand 'hour' column refers to the time of receipt of the report, not the time of the position.

e.g: Position Report received at 14.05
Time of position 13.55

Time difference .10 minutes

Therefore, tick the '10 minute' delay box for the period 1400-1459.

5. If the delay is more than 12 minutes, tick the $>12$ box and note the actual delay in the 'Notes' column. If you receive a report at say 1401 and it refers to a position at 1402, tick the '-1' column. If the delay time difference relates to a domestic fix or to a light low level aircraft, include the tick in the appropriate column, but place an asterisk against the tick. This factor can then be taken into account if necessary in the analysis. If an occasional 'delay' of -2 minutes arises, you can annotate the tick in the '-1' column with, say, a + and note the actual 'delay' in the 'Remarks' column.

6. To obtain the mean delay for each hour, obtain the total delay of all reports for that hour, and divide by the number of reports. An example of this for the period 1400-1459 is shown in the Specimen at page 2-13.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | reports | of | -1 | minute | delay | = | -2 |
| 4 | " | " | 0 | " | " | = | 0 |
| 6 | " | " | 1 | " | " | = | 6 |
| 4 | " | " | 3 | " | " | = | 12 |
| 1 | " | " | 4 | " | " | = | 4 |
| 1 | " | " | 10 | " | " | = | 10 |
| 1 | " | " | 13 | " | " | = | 13 |
| 1 | " | " | 15 | " | " | = | 15 |
| Total reports 20 | | | | | Total delay 58 mins | | |

Mean delay = 58 ÷ 20 = 2.9 mins

7. When the three forms are completed, send them to:

Civil Aviation Authority
(attn. CP 10)
Room 422A
The Adelphi
John Adam Street
LONDON WC2N 6BQ
United Kingdom

Retain the 'hard copy' for the collection day for a period of three months from date of despatch of the forms in case we wish to ask you for any additional information after the returns for the other stations have been examined.

8. If you have any information you wish to pass on (e.g. severe electrical interference distorted the delay results for one of the hours) this can be written on the back of the form. If you have any queries while you are preparing the information, ask Shanwick (Ballygirreen) for advice, using the AFTN address EIAAYF. If they cannot supply the answer immediately, they will be able to contact the United Kingdom CAA Section CP 10, and obtain further advice.

9. The data day will normally be in either July or August each year, and the decision on the date will be made early in September.

(Page 2-12 left blank intentionally)

SPECIMEN

## DISTRIBUTION OF POSITION REPORTS BY TIME AND FREQUENCY

STATION: REYKJAVIK

DATE: 27.7.74

| HOUR | FREQUENCY | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QT | VHF | TY | VHF | VK | VHF | QN | VHF | TT | VHF | VF | VHF | QC | VHF | TR | VHF | VN | VHF | YI | VHF | YD | VHF | VHF GP | TOTALS |
| 0000-0059 | 1 | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 0100-0159 | 2 | - | | | | | | | | | | | | | | | | | | | | | 2 | |
| 0200-0259 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | 4 | |
| 0300-0359 | 4 | 1 | | | | | | | | | | | | | | | | | | | | | 7 | |
| 0400-0459 | 7 | 2 | | | | | | | | | | | | | | | | | | | | | 9 | |
| 0500-0559 | 8 | 2 | | | | | | | | | | | | | | | | | | | | | 10 | |
| 0600-0659 | 5 | 1 | | | | | | | | | | | | | | | | | | | | | 5 | |
| 0700-0759 | 2 | - | | | | | | | | | | | | | | | | | | | | | 3 | |
| 0800-0859 | 1 | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 0900-0959 | - | - | | | | | | | | | | | | | | | | | | | | | - | |
| 1000-1059 | - | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 1100-1159 | - | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 1200-1259 | - | - | | | | | | | | | | | | | | | | | | | | | - | |
| 1300-1359 | - | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 1400-1459 | - | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 1500-1559 | - | - | | | | | | | | | | | | | | | | | | | | | 3 | |
| 1600-1659 | - | - | | | | | | | | | | | | | | | | | | | | | 5 | |
| 1700-1759 | - | - | | | | | | | | | | | | | | | | | | | | | 8 | |
| 1800-1859 | - | - | | | | | | | | | | | | | | | | | | | | | 11 | |
| 1900-1959 | - | - | | | | | | | | | | | | | | | | | | | | | 7 | |
| 2000-2059 | - | - | | | | | | | | | | | | | | | | | | | | | 4 | |
| 2100-2159 | - | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 2200-2259 | 1 | - | | | | | | | | | | | | | | | | | | | | | 1 | |
| 2300-2359 | 1 | - | | | | | | | | | | | | | | | | | | | | | - | |
| TOTAL | 34 | 7 | | | | | | | | | | | | | | | | | | | | | 86 | |

Note 1: In columns headed "VHF", insert the number of position reports received on the associated HF channel while within coverage of the VHF GP channel.

Note 2: In the column headed "VHF GP", insert the number of position reports received on the VHF GP channel.

Note 3: TWO COLUMNS have been entered, as examples of the completed tabulation.

(Page 2-14 left blank intentionally)

SPECIMEN

DATE:

## POSITION REPORT DELAYS

STATION:

FREQUENCY:

Delay times in minutes

| HOUR | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | >12 | Mean delay per hour | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0000-0059 | | | | | | | | | | | | | | | | | |
| 0100-0159 | | | | | | | | | | | | | | | | | |
| 0200-0259 | | | | | | | | | | | | | | | | | |
| 0300-0359 | | | | | | | | | | | | | | | | | |
| 0400-0459 | | | | | | | | | | | | | | | | | |
| 0500-0559 | | | | | | | | | | | | | | | | | |
| 0600-0659 | | | | | | | | | | | | | | | | | |
| 0700-0759 | | | | | | | | | | | | | | | | | |
| 0800-0859 | | | | | | | | | | | | | | | | | |
| 0900-0959 | | | | | | | | | | | | | | | | | |
| 1000-1059 | | | | | | | | | | | | | | | | | |
| 1100-1159 | | | | | | | | | | | | | | | | | |
| 1200-1259 | | | | | | | | | | | | | | | | | |
| 1300-1359 | | | | | | | | | | | | | | | | | |
| 1400-1459 | ✓✓ | ✓✓✓ | ✓✓✓✓ | | ✓✓✓✓ | ✓ | | | | | | ✓* | | | ✓✓ | $\frac{58}{20} = 2.9$ | 13 mins, 15 mins. |
| 1500-1559 | | | | | | | | | | | | | | | | | |
| 1600-1659 | | | | | | | | | | | | | | | | | |
| 1700-1759 | | | | | | | | | | | | | | | | | |
| 1800-1859 | | | | | | | | | | | | | | | | | |
| 1900-1959 | | | | | | | | | | | | | | | | | |
| 2000-2059 | | | | | | | | | | | | | | | | | |
| 2100-2159 | | | | | | | | | | | | | | | | | |
| 2200-2259 | | | | | | | | | | | | | | | | | |
| 2300-2359 | | | | | | | | | | | | | | | | | |
| TOTALS | | | | | | | | | | | | | | | | | |

* Domestic fix or light low level aircraft.

Summary of Agenda Item 3 : Review of the work achieved by the ad hoc Working Group on airspace and ATS organization in the Northern part of the NAT Region and development of appropriate proposals for action.

## 3.1 GENERAL

3.1.1 At its Ninth Meeting in June 1973, the NAT/SPG agreed to a request from ICAO to examine the delineation of FIRs in the Northern part of the NAT Region to determine the safest and most efficient organization of the airspace at least cost to its users. To this extent a Working Group was established composed of Canada, Denmark, Iceland, Ireland, Norway, United Kingdom, USA and IATA. The terms of reference and tasks assigned to the Group are contained in Item 6.2 of the Report on NAT/SPG/9.

3.1.2 This Summary is composed of four parts as follows :

a) Introduction
b) Alternative Methods of Providing Air Traffic Services in FIR Reykjavik
c) Alternative Methods of Providing Air Traffic Services in FIR Sondrestrom
d) Conclusions

3.1.3 The Group was unanimous in its views that the airspace organization which best would meet the ICAO requirement would be the establishment of :

a) A Sondrestrom FIR for the provision of Flight Information Service in the lower airspace of the present Sondrestrom FIR. This service would be the responsibility of Denmark ;

b) A new Polar FIR/CTA* for the provision of air traffic control in the present Reykjavik FIR/CTA and the upper airspace covering substantially the present Sondrestrom FIR/CTA with the ACC at Reykjavik.

3.1.4 The plane of division between the upper and the lower airspace of the present Sondrestrom FIR should be determined by consultation between Denmark and Iceland. The upper airspace should include at least those flight levels normally used by international jet traffic. The present plane of division between Gander OCA in the upper airspace and Sondrestrom FIR in the lower airspace over the Southern part of Greenland should be adjusted accordingly, and this should be effected by consultation with Canada at an appropriate stage. Minor boundary changes between the new NAT Polar FIR/CTA and FIR's adjacent to it might also need consideration.

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* Note : The name of this area will be determined by Iceland and Denmark.

3.1.5 The proposed target date for the above changes is 1 July 1975. This can, however, only be met if urgent diplomatic, financial and technical action were taken by the various authorities and organizations concerned.

3.1.6 It was also noted that this report would be submitted to ICAO through the European Office of ICAO and the UK Member stated his willingness to make Mr. Bagg, who had acted as rapporteur of the ad hoc working group, available to participate in further discussions within ICAO if this was believed to be of assistance.

## 3.2 INTRODUCTION

### Conduct of the Investigation

3.2.1 The size of the task and the effort available to undertake it made it necessary to divide the work into three phases. In the first phase an examination was made whether Shanwick (the joint UK/Ireland Oceanic organization) could effectively absorb the Reykjavik OCA, and, if so, what cost variation would result. This work was undertaken by a sub-group composed of UK, Ireland and Iceland. The second phase was intended to be a similar examination regarding OCA Sondrestrom to be served by Canada (Edmonton and/or Gander ACC), and the third phase consisted of a study of the feasibility and cost of a single Northern Centre serving substantially the present Sondrestrom and Reykjavik OCAs subject to necessary boundary revisions. The cost/benefit comparison of these three alternatives were expected to allow a reasonable decision to be made of suitable ATS arrangements for the area in question.

3.2.2 In the course of Phase 1 it was found that the USAF had decided to cease the provision of ATS which it had so far provided in the FIR Sondrestrom, with effect from 30 June 1975. As the provision of service was a responsibility of Denmark, the Working Group offered its assistance to Denmark in determining the most suitable alternative arrangements within the timescale available. This resulted in a change of direction of the work of the Group, and priority was given to this particular task.

3.2.3 Progress had, however, been made with the Reykjavik/Shanwick study by the UK/Ireland/Iceland sub-group. Their way of approach and the high priority given to the overall study enabled Phase 2 and Phase 3 to be examined simultaneously and the timescale of the examination was substantially reduced.

### Area affected by the study

3.2.4 The present FIR structure in the NAT Region is shown in Appendix A. The areas substantially in question were those of the Reykjavik and Sondrestrom FIRs.

Financing of Services

3.2.5 Services provided to international aviation in the Reykjavik and Sondrestrom FIRs are illustrated in Appendices B and C. They are now primarily financed by a Joint Support Programme supported by a number of States whose aircraft currently use the North-Atlantic airspace. The conditions of the Denmark/Iceland Joint Support Agreement are specified in ICAO Docs 7726-JS/563 and 7727-JS/564. Services financed in whole or in part are Navigational Aids, Meteorological Services, Communications (both fixed and mobile) and Air Traffic Control. In the Sondrestrom FIR certain services are at present provided wholly or in part without charge by the USA under the terms of an agreement with Denmark. In the case of Joint Support Services, the recipient State is required to pay 5% of the cost involved and 95% are supported by joint finance arrangements. Certain facilities serving the Sondrestrom FIR are, however, provided without charge by Denmark.

3.2.6 A DEN/ICE Joint Finance Conference (DEN/ICE/2) was held from 27 March to 5 April 1973. It agreed to recommend the institution of user charges for a part of the Denmark and Iceland Joint Financed Services. These charges would apply to civil North Atlantic traffic operating north of 4000N. Details of the suggested programme are contained in ICAO Doc 9056 DEN/ICE/2(1973). These arrangements have not been taken into account because the study was intended to determine how the ATS requirements of the area in question could most effectively be met at the least cost to all concerned irrespective of whether costs are funded from user charges or by joint support. In this context it was, however, noted that the Second DEN/ICE Conference had recommended the examination of the feasibility of establishing a uniform charging system for the North Atlantic as a whole.

3.2.7 It was noted that Canada, Ireland and UK would all require reimbursement of cost increases resulting from acceptance of additional responsibilities previously held by Denmark and Iceland through the Joint Support Programme. It must, therefore, be expected that in general the costs falling on those States which will provide service in the area under consideration would have to be recovered either from aircraft operators or from States under a Joint Financing Agreement. The relative costs established by this study do not take into account any method of cost recovery or in what proportions they might eventually be distributed.

Costs of Services

3.2.8 Cost details for the various alternatives involved Danish Kroner and Icelandic Kronur, Canadian Dollars, and UK and Irish Pounds. It was agreed to generally indicate the costs involved in Pounds Sterling.

3.2.9 Details regarding the costs of the Joint Support Programme can be found in ICAO Working Papers JS-WP/890 DEN/186 dated 28/11/73 and JS-WP/891 ICE/164 dated 27/11/73. These show the 1972 actual costs and the estimated costs for 1974. The 1974 estimates appear to be the most suitable basis for comparison, and they are therefore given below in summary :-

| | ICELAND | | DENMARK | |
|---|---|---|---|---|
| | KRONUR | £ STERLING | KRONER | £ STERLING |
| ATC/COM/MET/NAV | 185,000,000 | 810,000 | 20,000,000 | 1,370,000 |
| CABLE RENTAL | 43,000,000 | 183,000 | 4,000,000 | 270,000 |
| TOTAL | 228,000,000 | 993,000 | 24,000,000 | 1,640,000 |

Note. : The approximate conversion rates are : £1 = 229 Icelandic Kronur = 14.6 Danish Kroner = 2.3 Canadian Dollars.

3.2.10 In this study sophisticated accounting techniques have not been used, and a straightforward comparison of running and capital costs has been made on 1974 values. The results thus obtained do not appear to make additional re-evaluation necessary. It should be noted that not all of the costs involved would be affected by the re-arrangements recommended by the Group and that such costs are therefore not included in the details of the study. Involvement of the various items is as follows :-

a) Navigational Aids : the costs for these would not be affected, and were therefore not taken into account.

b) Meteorological Services : the costs for meteorological reporting services would not be affected. There might, however, be some effect on forecasting requirements which were therefore examined.

c) Communications :

i) the costs for AFTN and ATS speech circuits which include the ICECAN and SCOTICE Cables are likely to be significantly affected, particularly in the case of the Sondrestrom FIR. They were therefore examined in order to determine appropriate variations to be recommended.

ii) the costs for HF and VHF Air/Ground communications would be significantly affected and were therefore examined in detail.

d) Air Traffic Control Services : the costs for the provision of ATC services would be significantly affected and were thus also examined in detail.

3.2.11 The main costs of the Joint Support services likely to vary under the terms of the study were therefore expected to be :-

a) ICELAND

| Estimated for 1974 | KRONUR | £ STERLING |
|---|---|---|
| Air Traffic Control | 50,000,000 | 218,000 |
| Gufunes | 65,000,000 | 284,000 |
| Rjupnahaed | 16,000,000 | 68,000 |
| TOTAL | 131,000,000 | 570,000 |

b) GREENLAND

While no ATC costs arise at present, the following are purely ATS communications costs :

| Estimated for 1974 | KRONER | £ STERLING |
|---|---|---|
| Frederiksdal VHF | 410,000 | 28,000 |
| *Prins Christian Sund | 2,000,000 | 138,000 |
| TOTAL | 2,410,607 | 166,000 |

*Including provision of an NDB the individual costs of which are not at present available.

OVERALL DEN/ICE TOTAL £736,000

3.2.12 In this context it was, however, noted that, in addition to those services provided free of charge by Iceland and Denmark, a number of facilities used for en-route services to international civil aviation in the FIRs Sondrestrom and Reykjavik are at present provided by military funding. It should be borne in mind that the provision of ATC in the FIR Sondrestrom will be an entirely civil responsibility after cessation of the services provided by USAF on 30 June 1975. It must therefore be expected that civil funding of most or all of the civil ATS requirements will eventually be needed. Details of the facilities affected are given in para. 3.4.

Staffing Costs

3.2.13 With regard to the expected costs of staff it was found that these varied depending on the State concerned because of different requirements for number and grading of the ATS personnel involved. This did not constitute significant difficulties, however, because the method of assessment was to :

a) determine the cost of the present services, as presented in the ICAO estimates ;

b) determine the workload at the various ATS units resulting from the provision of ATS in the area in question in accordance with the alternatives examined ;

c) estimate the staffing requirements at the unit concerned, based on staffing practices and gradings at these units ;

d) estimate the expected staffing costs as a result of the staff requirements determined in accordance with c) above. These costs would vary between States involved depending upon the items to be taken into account in the cost assessment. The costs assessed in this study are those expected to arise for the State concerned.

Capital expenditure

3.2.14 Capital expenditure arising from the alternatives examined (e.g. additional HF aerials; extra ATC sectors; extension to existing accommodation, etc.) has been taken into account, whether for a new unit or extension of an existing one.

Efficiency of service

3.2.15 The study of alternative methods for providing services within the area in question revealed a number of advantages and disadvantages, inherent in anyone method, either to the Air Traffic Services or to Aircraft Operators. These could not easily be converted into costs with a reasonable degree of accuracy. It was decided therefore not to try to present a solution in purely financial terms, but to associate with the established cost variations of the examined alternatives a statement of the attendant advantages and/or disadvantages. This should permit a qualitative judgement to be formulated whether the change of effectiveness would justify the reduction of costs.

Allowance for future traffic growth

3.2.16 In order to take into account the future air traffic development in the NAT Region it had originally been intended to use the available NAT Traffic Forecast as prepared by the NAT Traffic Forecasting Group (NAT/TFG). The event of the aviation fuel crisis led to a change of view however and the estimates of staffing and equipment requirements and the resulting costs have been made on the basis of no significant traffic growth in the near future. At the same time it has been ascertained that any of the proposed alternatives would readily permit expansion, or could satisfactorily cope with a significant increase of traffic loading if the need should arise. In the event of an increase in traffic it could be expected that cost variations would be roughly on a proportional basis regarding each unit concerned (e.g. a future increase in traffic necessitating an additional sector at Reykjavik ACC would, in principle, necessitate an additional sector at Shanwick ACC should a transfer of responsibilities be effected from one ACC to the other.) It was, however, realized that this was not necessarily an exact relationship because the basis for the decision to institute a new sector might vary between ATS units as a result of differing organisational or internal considerations.

Use of the term "Shanwick"

3.2.17 The joint UK/Irish Oceanic Organisation, with its communications station at Shannon (Ballygirreen) and the ATC centre at Prestwick, is normally referred to as "Shanwick". In many places in this study it has, however, been necessary to be precise as to whether a reference is to Shannon or to Prestwick. Where necessary therefore these separate names have been used.

Introduction of Aeronautical Satellite Facilities

3.2.18 The effect of a possible introduction of aeronautical satellite facilities has not been considered in detail. The time scale and extent of such facilities are at present too indefinite to form a basis for other than conjecture. It was, however, apparent, even at this stage, that fundamental changes in boundaries and areas of responsibilities might well be appropriate once satellites are operationally used. It is certain that at an appropriate time a far reaching examination of the whole of the NAT Region will become necessary in this context.

## 3.3 COMPARISON OF ALTERNATIVE METHODS OF PROVIDING AIR TRAFFIC SERVICES WITHIN THE FIR REYKJAVIK

Traffic in the Oceanic Area

3.3.1 It was found that the flow of air traffic varies considerably from day to day, particularly as the total numbers of movements are significantly greater on those occasions when the weather situation results in one of the tracks of the NAT Organized Track System (OTS) impinging upon OCA Reykjavik. Total figures of Icelandic traffic are shown in Table 1 below for selected days in 1973. To allow assessment of the combined workload of Shanwick and Reykjavik ACCs the totals have been subdivided into those movements already known to Shanwick and comprising part of their loading (aircraft which transitted part of OCA Shanwick as well as part of OCA Reykjavik, and those aircraft which did not enter OCA Shanwick.

TABLE 1

Shanwick/Iceland Traffic

| | DATE / Direction | 18 JULY 1973 | 27 JULY 1973 | 5 AUGUST 1973 | 4 SEPT. 1973 | 17 SEPT. 1973 |
|---|---|---|---|---|---|---|
| ICELAND TOTAL | E | 54 | 47 | 52 | 39 | 35 |
| | W | 94 | 60 | 153 | 79 | 144 |
| | TOTAL | 148 | 107 | 205 | 118 | 179 |
| ICELAND OCA ONLY | E | 38 | 26 | 37 | 22 | 24 |
| | W | 45 | 27 | 96 | 58 | 77 |
| | TOTAL | 83 | 53 | 133 | 80 | 101 |
| ICELAND SHARED | E | 16 | 21 | 15 | 17 | 11 |
| | W | 49 | 33 | 57 | 21 | 67 |
| | TOTAL | 65 | 54 | 72 | 38 | 78 |
| SHANWICK TOTAL | E | 227 | 233 | 237 | 237 | 212 |
| | W | 246 | 235 | 211 | 206 | 205 |
| | TOTAL | 473 | 468 | 448 | 443 | 417 |
| OVERALL TOTAL | E | 265 | 259 | 274 | 259 | 236 |
| | W | 291 | 262 | 307 | 264 | 282 |
| | TOTAL | 556 | 521 | 581 | 523 | 518 |

ATC workload

3.3.2 In assessing the additional workload which these movements would represent to Shanwick ACC, should the provision of ATS within the FIR Reykjavik be effected by this centre, due account must be taken of the following :-

a) Those aircraft already now affecting OCA Shanwick would represent only a proportion of the increase a completely new additional movement would represent. This proportion would vary depending upon the time the aircraft concerned would remain within the respective OCA, and whether an additional planning effort would be required by Shanwick ACC or not (e.g. a westbound flight from OCA Shanwick to Reykjavik would involve no additional planning effort, whereas a westbound flight from OCA Reykjavik into Shanwick would.)

b) Some movements will represent a greater workload than is normal for a movement within the present Shanwick OCA (e.g. aircraft which would remain in the OCA from 0000 until past 3000W, compared with the today Shanwick 1000W/1500W to 3000W flight path).

c) The traffic flow within the present Reykjavik OCA is primarily of a random nature, whereas the traffic within the present Shanwick OCA is primarily on the OTS. Random flights represent a relatively greater controller workload - both as regards planning and en-route control of the flight - than do flights on the OTS.

d) All Icelandic westbound movements which would require additional Shanwick ACC planning effort, would require their ATC clearances to be delivered through HF air/ground communication channels rather than via the VHF Oceanic Clearance System because they would operate outside of the coverage of the appropriate VHF channels. This again would represent a relatively greater controller workload.

Hourly traffic flow

3.3.3 The traffic data for the 24 hour periods of the sample days in Table 1 has been broken down into hourly intervals. It was found that the peak hourly traffic flow reached 25/26 aircraft per hour on occasions with a mean peak hour rate of over 15. Peak hours occurred at similar times as the present Shanwick peak hours. Full details are contained in Appendix D.

Potential traffic conflict

3.3.4 An illustration of the very varied traffic pattern in the OCA Reykjavik is contained in Appendix E. It is clearly understood that the high number of conflicting tracks do not represent actually conflicting aircraft which are normally vertically or longitudinally separated. Nevertheless such a random traffic pattern can be expected generate a significant number of potential conflictions at the crossing points, or during climb or descent and on the sample day used, a number of such occasions were readily apparent from a study of the movement data. Some further indication of the number of aircraft within the upper and the lower airspace overflying, landing in, or departing from, Iceland is shown in Table 2 below.

TABLE 2

International Traffic within the Reykjavik Domestic CTA

| DATE | FLIGHT LEVEL | OVERFLYING DOMESTIC CTA | LANDING IN ICELAND | DEPARTING FROM ICELAND | TOTAL |
|---|---|---|---|---|---|
| 18 JULY 1973 | 250 & below | 1 | 11 | 11 | 23 |
| | Above 250 | 29 | 16 | 19 | 64 |
| 27 JULY 1973 | 250 & below | 0 | 8 | 9 | 17 |
| | Above 250 | 22 | 15 | 12 | 49 |
| 5 AUG. 1973 | 250 & below | 0 | 13 | 11 | 24 |
| | Above 250 | 57 | 19 | 24 | 100 |
| 4 SEPT. 1973 | 250 & below | 0 | 4 | 4 | 8 |
| | Above 250 | 28 | 21 | 23 | 72 |
| 17 SEPT. 1973 | 250 & below | 0 | 8 | 6 | 14 |
| | Above 250 | 65 | 12 | 15 | 92 |

Facilities available at Reykjavik ACC

3.3.5 The ACC Reykjavik provides for :

a) 3 Oceanic Control Sectors ;
b) 1 Planner/Co-ordinator position ;
c) 2 Domestic ATC Sectors (one for the upper and one for the lower airspace) ;

d) 1 Sector for recovery of military traffic, which is not yet implemented ;

e) HF and VHF communications facilities for oceanic ATS purposes which are communicator operated. Their detailed description is contained in para. 3.3.23 below.

3.3.6 The Domestic Sectors (see para. 3.3.5 c) above) are equipped with :

a) VHF (pilot/controller) air/ground communications : These comprise 6 mountain top facilities, remotely controlled from Reykjavik ACC. When appropriate the domestic sector can extend service to the OCA, and 4 of the VHF facilities are therefore partially supported through Joint Finance.

b) Radar - SSR : The radar displays in Reykjavik ACC use radar data derived from a military equipment located in Keflavik. The cost of remoting to and display at Reykjavik ACC is currently financed by Iceland.

3.3.7 Separation is based upon availability of short range radio navigation aids (VOR, DME and NDB) and radar. The areas of coverage of the VHF air/ground communication channels (pilot/controller) are shown in Appendix F. This appendix also indicates the coverage of the extended range General Purpose VHF communication channels available to the oceanic organization and shows the three ER GP stations which are additional to those used for the Domestic VHF service and which are in different locations. The area of radar coverage is illustrated in Appendix G, and both Appendices F and G indicate the delineation of the Domestic CTA.

Control of Traffic in the Vicinity of Iceland

3.3.8 The small and integrated Reykjavik organization permits a considerable degree of flexibility in the areas within which the respective facilities are used. This permits for instance during periods of low traffic density overflying aircraft to remain on the GP frequency instead of changing to the Domestic CTA frequency. A more important advantage, however, is the possibility to use radar for traffic surveillance in the oceanic environment in order to resolve conflicts of traffic on crossing tracks, to expedite arriving and departing traffic and to facilitate its integration into the flow of overflying traffic. Reduced procedural separation standards can also be applied within coverage of the available short-range radio navigation aids.

3.3.9 Should the responsibility for the Reykjavik OCA be transferred to Shanwick this flexibility would undoubtedly be lost. OCA/Domestic CTA co-ordination procedures would necessitate a strict delineation of areas of responsibility and the pilot/controller VHF air/ground communication service and radar surveillance would have to be confined to the Domestic CTA. Similarly, use of the ER GP VHF channels would be confined to the OCA only. Should domestic CTA facilities be made available at Prestwick some of these disadvantages could possibly be overcome. Although oceanic and domestic operating positions would have to be accommodated in separate operations rooms, the provision of the required co-ordination facilities (e.g. additional telephone circuits, closed circuit TV) would be easier than their provision between the Prestwick and Reykjavik centres.

3.3.10 Although it is technically possible to remote the Reykjavik SSR data to Prestwick, as well as to remotely control VHF air/ground communication facilities, the associated equipment would have to be maintained and serviced in Iceland as at present. Radar digital conversion equipment and radar displays would be needed at Prestwick and appropriate domestic control sectors would have to be established and staffed at Prestwick. At least one circuit would be required for the remoting of radar, two for the remoting of the VHF communications and one direct ATS speech circuit for ATC co-ordination (the ICAO omnibus circuit would be inappropriate for this purpose). This would amount to a total of at least 4 circuits which, at a cost of £38,000 per annum each, would result in annual expenditure of £152,000.

3.3.11 The necessary circuits between Iceland and UK are at present not available, but could be implemented within 2 - 4 years, which would be in any case the minimum time for the provision of the necessary sectors. It is, however, doubtful if space could be made available for this purpose in either the oceanic or the airways operations rooms at Prestwick.

3.3.12 In view of the above the provision of ATC within Reykjavik domestic airspace from Prestwick clearly cannot be recommended. The cost involved would be high, it would take several years to effect the task, and little or no operational benefit would result.

Reykjavik Domestic Control Area

3.3.13 The transfer of responsibility for the provision of ATC within Reykjavik OCA only to Shanwick ACC would therefore necessitate the establishment of a Reykjavik CTA which would remain under the control of Reykjavik ACC. This CTA could either have an upper limit of e.g. FL 250, or could even be of unlimited vertical extent.

3.3.13.1 Should Reykjavik CTA be limited to FL 250 and below the following considerations should be taken into account :

a) All overflying traffic operating above FL 250 would remain on oceanic communication channels. The separation would be based on the current oceanic separation standards and would therefore result in an increase of potential conflict situations. Their resolution would be significantly more difficult because of the absence of radar surveillance.

b) Aircraft departing from, or arriving at, Iceland and requiring to climb into - or descend out of - the main traffic flow above FL 250 would in the light of a) above pose a particular problem. This situation would frequently result in departing aircraft to be restricted to low and uneconomic flight levels, and arriving flights required to hold at high levels until their integration into the domestic airspace below FL 250 could be effected.

c) Utilization of Reykjavik domestic CTA facilities to resolve the above difficulties would require flight data exchange and direct controller to controller co-ordination as well as suitable procedures for the transfer of control of aircraft to Reykjavik ACC for appropriate radar surveillance and for the transfer of control back to Shanwick ACC after resolution of the separation problem between the aircraft concerned. This would often have to be done at times when insufficient time would likely to be available for this purpose. It is also relevant in this context that message interchange between pilot and OAC would be subject to a 3 or 4 minute greater time delay than is the case at present (see para. 3.3.28 below).

d) Proximity of the Sondrestrom FIR boundary to the Reykjavik domestic CTA boundary will pose a number of additional co-ordination problems because it is evident that, should Prestwick assume control within Reykjavik OCA, Canada would take over the responsibility to provide ATS within FIR Sondrestrom. These problems are in detail discussed in para. 3.4. Limiting the availability of the CTA facilities to the lower airspace only would make these co-ordination problems even more difficult.

e) The fact that high performance fighter-interceptor aircraft are stationed at Keflavik results in considerable training activities within the Reykjavik domestic airspace. For this purpose the area is subdivided into 10 military training areas, the allocation of which is largely governed by the requirements of the overflying oceanic traffic. Use of radar has, however, greatly improved the flexibility afforded the controllers in accommodating the frequently conflicting requirements of the civil and military users of the airspace. Safe and adequate control of this military traffic from Shanwick is obviously impracticable.

3.3.13.2 Should Reykjavik CTA be established without upper limit, the following would apply :

a) The data transfer requirement for overflying traffic, the amount of which is indicated in Table 2, is a heavy one because it actually involves a double transfer requirement (on entry to, and on exit from, the CTA). This requirement could, however, be met on a routine basis by the provision of appropriate staff. Similarly, air/ground communication frequency transfer instructions would also have to be passed on a routine basis, and message delay times would appear to be of little importance in this instance.

Note : Departing and arriving aircraft data will require transfer whatever zone configuration will eventually be adopted.

b) Direct pilot/controller VHF air/ground communications, suitable radar surveillance, use of reduced separation standards, reduction of controller to controller co-ordination workload would result from this type of airspace organization although pilots will be required to change frequency from OAC communication facilities to Reykjavik ACC and, after having passed through the CTA back to the appropriate OAC channels. Safe and adequate service in respect of military traffic could also be provided.

Conclusion

3.3.14 In view of the above and bearing in mind that the provision of ATC within an area should be vested in the unit most suitably equipped for its need, noting especially the airways type control service, with radar surveillance and direct pilot/controller communications which would be available ; examining the potential traffic conflicts on the random routes within the area in question and the difficulties which would otherwise arise in their resolution ; taking into account the military activity which cannot be subjected to procedural control, particularly through communicator operated facilities with the resultant message delay ; the Group came to the conclusion that the airspace of the Reykjavik Domestic CTA should remain under the responsibility of Reykjavik ACC. The provision of service should be effected within this area up to an unlimited height.

Faeroe Islands

3.3.15 Approach control service for the Vagar aerodrome on the Faeroe Islands is currently provided by Reykjavik OAC. In view of the relatively low traffic density, a separate ATS direct speech circuit has not been considered justified, and commercial telephone services with priority handling have been satisfactorily employed. The Vagar AFIS unit is thus able to relay appropriate air traffic control messages to aircraft within range of the Vagar VHF ground station. Use can also be made of a

military circuit between Keflavik and a radar station on the Faeroe Islands for the relay of urgent messages between Reykjavik OAC and aircraft as well as the Vagar AFIS. Remote operation of one of the Faeroe VHF channels from Prestwick (provided the airspace between 6100N and 6300N and between 0000 to 1000 W is incorporated into continental airspace), or from Iceland (without any changes to existing boundaries) appears feasible subject to the availability of appropriate circuits. This would provide VHF coverage in an area which, at present, relies upon the availability of HF communications. The cost of line rentals would be in the order of £22.000 per year for operation from Iceland or Prestwick respectively. Other costs of operation (e.g. additional communicators) have not been assessed.

Effect on ATC of Reykjavik OCA Transfer to Shanwick ACC

3.3.16 Should the responsibility for the provision of ATC within Reykjavik OCA be transferred to Shanwick ACC, the co-ordination requirements would change as follows :-

a) The Shanwick/Reykjavik OAC co-ordination requirement would be replaced by Shanwick/Reykjavik CTA co-ordination requirement as described above. The ICAO omnibus speech circuit would probably be less satisfactory for this type of co-ordination.

b) Pre start-up co-ordination will be needed for departures from Iceland.

c) The present internal co-ordination between Reykjavik ACC and Reykjavik OAC would have to be replaced by a formal agreement and a more time consuming procedure.

d) Co-ordination with Shanwick would be required with the respective authorities expected to provide ATS within the upper and the lower airspace of the Sondrestrom FIR (this would be Sondrestrom for the lower airspace and, probably, Edmonton for the upper airspace). The short flying time between the Reykjavik CTA boundary and the Sondrestrom FIR boundary is expected to cause co-ordination difficulties.

e) The elimination of the Shanwick OCA boundary at 6100N would have less effect than might be imagined. Co-ordination procedures between Shanwick and Reykjavik in use at present could be modified and co-ordination requirements for aircraft on the OTS are minimal. 6100N boundary reports are not required West of 1000W for other than the few N/S flights and for pilots the only change would be a slight extension of the area within which the GP VHF channel at Iceland could be used.

f) Co-ordination between the Scottish Domestic ACC and Reykjavik OAC for aircraft crossing 6100N east of 1000W would have to be replaced by Scottish Domestic/Shanwick OAC co-ordination. This would not have a great deal of effect as co-ordination would still have to be done by telephone, but the provision of additional inter-sector co-ordination channels would be easier to accomplish and less expensive should the necessity arise in the future.

g) Stavanger/Reykjavik OAC co-ordination would be replaced by Stavanger/Shanwick OAC co-ordination. The requirement for a facility to interconnect the Stavanger/Prestwick (Domestic) speech line to the ICAO omnibus speech circuit has so far encountered difficulties and has therefore not yet been accomplished. The Stavanger/Reykjavik OAC co-ordination therefore still consists primarily of voice relay by Scottish ATCC personnel.

Note : It is expected that facilities for inter-connection of the two circuits will become available in the autumn of 1974. Use of a commercial telephone link will also become available between Iceland and Stavanger in late 1974.

h) Co-ordination between Shanwick OAC and the military authorities at Keflavik would be difficult as the ICAO omnibus speech circuit would not be available for this purpose. Special co-ordination procedures are at present in use between the US Navy and Reykjavik OAC for military maritime patrol operations.

Prestwick ATC Sector Requirement

3.3.17 The traffic flow data in Tables 1 and 2 and the information on hourly flow rates in Appendix D have been used to assess the probable additional oceanic ATC workload and thus the expected sector and staff requirements at Prestwick.

3.3.18 After making due allowance for a proportion of the load to be absorbed by existing sectors during quiet periods, it can be estimated that the following sector requirements would arise :

- Planning — 1 Sector, 6 - 8 hours per day

- En-route ATC — 1 Sector, 24 hours
  1 Sector, 6 - 8 hours per day

The requirement for air traffic controllers for this sector, including data handling, extraction and transfer, will result in an overall staff cost increase of £150,000 - £185,000 per annum. The capital cost of the introduction of three sectors would require a total of approximately £7,500.

3.3.19 The present cost of ATC Joint Support staff at Reykjavik is £218,000 per annum. However, Iceland has indicated that in the event of withdrawal of oceanic ATC support they would find it necessary to request support for the Domestic CTA facilities required for international civil aviation. Alternatively, they would have to introduce user charges for the use of these facilities. The estimated overall cost of providing services to international air traffic within the Reykjavik Domestic CTA is £158,000 per annum.

Automation of Prestwick OACC

3.3.20 Automation of the OAC at Prestwick is planned to be introduced by 1978. A requirement to incorporate the present Reykjavik OCA would not introduce new principles but several points would require closer and more detailed study before the practicability of accepting the additional task could be decided upon. It is expected that the necessary increases in storage capacity and Met Grid capacity could be effected. While the number of en-route sectors proposed might permit the Iceland sector(s) to be accommodated physically, the very high proportion of random traffic in the Reykjavik OCA, and the expectation that conflict probe for such traffic would have to be limited to prediction only would require close study of sector capacity. It is thought that an additional planning sector which had been allowed for, but was not intended to be instituted until required by increased traffic, would have to be installed at the outset.

3.3.21 Provision for manual reversion, particularly of the planning function, during the period until full stand-by facilities were provided, is foreseen as an area of difficulty. The feasibility of the operation had been predicated on the Shanwick OAC sector requirements only. The addition of the Iceland sectors within the space available in the present operations room would require detailed evaluation, but its acceptability is doubtful.

3.3.22 While therefore it is probable that the incorporation of Reykjavik OCA could be included in the automation requirement it would probably be necessary to defer such action until after the change-over has been effected to the existing sectors or, alternatively, consider the construction of a new operations room. It would also result in an earlier requirement to extend or replace the proposed system than would otherwise have been necessary.

Aeronautical Communications (Oceanic)

3.3.23 The communications requirements of the Reykjavik OCA are at present met as follows :-

a) VHF : Three extended range VHF stations for oceanic purposes are maintained at Gagnheidi, Hafell and Thorbjorn. All are remotely operated from the PTT receiving station at Gufunes. These stations are additional to those used for direct pilot/controller air/ground VHF communication purposes. Their locations and area of coverage are illustrated in Appendix F.

b) HF : Three NAT HF "Facilities" are provided at Iceland, with a transmitting station at Rjupnahaed and receivers at Gufunes. The VHF and HF facilities are both communicator operated. Relay to the ATCC is by teleprinter with outgoing messages from ATC to the aircraft being passed to the communicator by telephone. Staffing of the communication channels is varied and depends on traffic loading.

c) AFTN : Teleprinter network facilities are available through SCOTICE and ICECAN as shown in Appendices H and J. Gufunes also acts as the relay station for the Met reporting network.

d) Additional use is made of the VHF air/ground communication channels available to the Domestic CTA sectors. In the event of transfer of responsibility this advantage would definitely be lost to traffic within the OCA.

Alternatives for provision of service

3.3.24 If the ATC service is to be provided from Prestwick several alternative methods of meeting the communication requirements of the area need examination. These would depend upon, whether a) the HF or VHF services (or both) would continue at Iceland as at present, with AFTN/Telephone relay of messages to and from Prestwick ATCC ; b) HF and/or VHF would be remotely controlled from Shanwick ; or c) one or both would be closed down in Iceland.

VHF service (oceanic)

3.3.25 With regard to the oceanic VHF air/ground communication service the following two alternatives were considered :

a) Withdrawal : This was not studied in detail. The VHF service has been gradually extended because of its superiority over the HF service, and it would be a retrograde step to lose its benefits. It would appear practicable to continue the provision of the oceanic VHF service in case of transfer of responsibility to Prestwick ATCC, and depending upon the method adopted the cost of such provision need not be excessive although delay times would increase. The principle of continuation or withdrawal of the VHF service therefore became irrelevant to the present study, as it could be continued, or be withdrawn irrespective of location of the ATCC and the same principles which led to its installation would still apply.

b) Remote operation of VHF from Shanwick : Technical feasibility of remote control of these stations from Prestwick or Ballygirreen in Ireland is not in question. Operation on a multicarrier basis would permit all 3 stations to be operated by means of a single circuit. This method has certain disadvantages although a number of similar systems are operated satisfactorily in other areas. The lower capacity of such a network compared with that of 3 separate stations is of lesser consequence with present traffic density. However westbound aircraft wishing to make a position report at 3000W could be out of VHF coverage before making their report if there should be any significant reporting delay. It might therefore be necessary to consider the use of two separate circuits - one for Thorbjorn and one for Hafell and Gagnheidi - if this problem is found to be sufficiently serious. Availability of more than one circuit between Iceland and Shanwick is doubtful at present, but one circuit could probably be implemented without undue delay.

3.3.26 The cost of circuits for remote VHF operation is in the region of £38,000 per annum per circuit, and the VHF stations would still have to be provided and staffed/maintained at the same cost as before. Communicators would still be required to operate the service at either Prestwick or Shannon. At Shannon this requirement might be met by existing staff at quiet periods, but additional staff would be needed at busier periods. The rental cost of the necessary wire circuit from Iceland through the UK cable termination to Shannon (£38,000 plus £7,000, totalling £45,000 per circuit per annum) would offset any possible overall staff saving.

3.3.27 Prestwick OAC does not operate direct pilot/controller VHF air/ground communication equipment, nor would it wish to do so in this instance. If the VHF termination were to be at Prestwick, therefore, it would be necessary to provide communicators for this purpose at least to the same scale as at Iceland, in addition to cable rental costs annually of £38,000 per circuit. The question of communicator provision at Prestwick would require closer study within the UK. Procedures for the relay of messages from en-route aircraft to operating companies are not at present operative at Prestwick ATCC and would require to be instituted.

3.3.28 The concept of remote operation of VHF air/ground communication is therefore considered impractical. The continued operation of VHF at Iceland is feasible however, with relay of incoming messages from aircraft to Prestwick ATCC by AFTN. Outgoing messages from ATC to aircraft would be passed to Iceland either by telephone or through the AFTN. This system is on the general lines of the Ballygirreen/Prestwick arrangement but is not strictly comparable to it. Because of manual formatting and handling in Iceland delay in reception by ATC of messages from aircraft would increase. In broad terms, and on the basis of general experience of manually operated centres, it is expected than an additional delay in the order of 3 to 4 minutes would arise for messages from aircraft to reach the controller and would of course also display a similar delay in a pilot receiving a reply to a clearance request. The number of VHF messages which would have required to be relayed to ATC during certain days of the 1972 NAT data collection exercise was up to 21 per hour.

3.3.29 It is believed to be unsatisfactory that the data transfer between an ACC and one of its prime communication stations relies on a submarine cable although it is realized that alternative routings on NAT cables can be made available in the event of cable outage. These re-arrangements take some time to arrange however. During cable outages the VHF communicator could transfer aircraft to HF but unless Shannon intercepts messages or is able to work the aircraft directly there will be no ATC/aircraft contact. An alternative AFTN routing is provided between Ballygirreen and Prestwick to cover this contingency. Serviceability of the Iceland/London AFTN circuits has been found to be 98.3% - 99.7%, with interruptions of service occurring due to both cable and equipment failures. During the year 1973/74 the following failures were recorded :

a) Speech circuit
22 failures with a total time of unserviceability of 18 hrs 27 min. The longest individual outage lasted 3 hrs 10 min. and the shortest 7 min.

b) AFTN (2 channels)
86 failures with a total time of unserviceability of 137 hrs 22 min., 46 of them having been greater than 15 min. The remaining 40 failures were greater than 1 hour. However, both circuits were rarely failed at the same time.

HF services

3.3.30 Remote operation by Shannon of the large numbers of HF transmitters and receivers at Iceland is completely unfeasible. The two only available choices are :

a) To continue to operate them as at present with messages being passed to Prestwick OAC via the AFTN as described above for the VHF service, or

b) Complete close down of the Iceland HF stations and covering the requirement from the Shannon transmitters/receivers.

3.3.31 The continuation of the HF service in Iceland as described in para. 3.3.30 a) above is technically feasible. It would probably operate with acceptable efficiency but the additional message delays would be approximately the same as those expected for the VHF service (see para. 3.3.28 above). There would be no saving in the cost of communications facilities or communicators. Minor expenditure would be necessary to engineer an extension of the SCOTICE speech circuit to incorporate Gufunes. (This would meet a similar requirement for the VHF service.) During busy periods up to 20 messages per hour would have to be passed via the AFTN to Prestwick. As in the case of VHF messages the manual formatting and handling at Iceland would introduce additional delays of 3 - 4 minutes in reception by ATC. This would give an overall message delay of 5 - 6 min., and a time interval between an aircraft

crossing a reporting point and reception of the report at Prestwick of 8 - 9 minutes. If delays of this order are thought to be excessive it would be necessary to consider automation of Gufunes. The comment on the use of a single cable for data transmission applies as for VHF (para. 3.3.29 refers).

3.3.32 Should the HF stations in Iceland be closed, however, (para. 3.3.30 b)), it would be necessary for Shannon to be able to provide communication service to substantially the whole of the present Reykjavik OCA. Extraction of further information from the data available from the 1972 NAT HF communications study indicated that a significant number of Iceland (TFW) "read-backs" were not acknowledged by any other station. The relevant data is contained in Table 3 below :

TABLE 3

| DATE | POSITION * | MESSAGES "READ-BACK" BY TFW | | OTHER STATIONS RECEIVING | | | | |
|---|---|---|---|---|---|---|---|---|
| | | TOTAL | RECEIVED BY TFW ONLY | VFG | EIP | SFJ | LIB | WSY |
| 3 AUG. 1972 | N | 11 | 10 | 1 | | | | 1 |
| | S | 30 | 26 | 2 | 1 | | 1 | 1 |
| | U | 35 | 31 | 1 | 2 | 1 | | |
| | TOTAL | 76 | 67 | 4 | 3 | 1 | 1 | 1 |
| 15 AUG. 1972 | N | 25 | 15 | | 1 | 8 | 5 | |
| | S | 56 | 40 | 3 | 11 | | 3 | |
| | U | 43 | 34 | | 2 | 2 | 5 | |
| | TOTAL | 124 | 89 | 3 | 14 | 10 | 13 | |
| 24 AUG. 1972 | N | 27 | 17 | | 1 | 5 | 5 | |
| | S | 27 | 13 | 2 | 12 | | 1 | |
| | U | 63 | 49 | 2 | 9 | | 1 | |
| | TOTAL | 117 | 79 | 4 | 22 | 5 | 7 | |

* POSITION N = 6500N and further North
S = South of 6500N
U = Unknown

VFG - Gander
EIP - Shannon
SFJ - Sondrestrom
LIB - Bodo
WSY - New York

3.3.33 Trials were therefore instituted between Ballygirreen and Reykjavik to determine the extent of Shanwick/Reykjavik HF coverage overlap in the area between 5700N and 7000N and the results are reflected in Table 4 below :

TABLE 4

| LATITUDE | | 27-7-73 | 27-8-73 | 4-9-73 |
|---|---|---|---|---|
| 5700N - 6200N | Reykjavik "Read back" | 17 | 70 | 75 |
| | Shanwick "intercept" | 12 | 33 | 35 |
| | Shanwick "Read back" | 59 | 124 | 92 |
| | Reykjavik "intercept" | 45 | 71 | 62 |
| 6200N - 7000N | Reykjavik "Read back" | 33 | 38 | 41 |
| | Shanwick "intercept" | 15 | 2 | 17 |
| | Shanwick "Read back" | 8 | 1 | 12 |
| | Reykjavik "intercept" | 4 | 1 | 11 |

3.3.34 These results indicate deficiencies in Shanwick coverage particularly in the areas north of Iceland. Some of the deficiencies in coverage revealed by these exercises might possibly be, at least partially, eradicated by use of directional aerial systems and/or higher powered equipment. However, as the aerial systems at Shannon have also to serve the predominantly east/west main traffic flow, the scope for introduction of antennae specifically directional to the north is limited and would have to be additional to existing aerials. If this were effected the present method of combining watch on the OAC VHF channel with that on the Family D channels would be no longer practicable. An additional communicator position would have to be provided and manned.

3.3.35 Total cost of a revised aerial system would be in the order of £10,000 to £12,000 : higher powered transmitters approximately £20,000 ; additional communications position £3,000 ; 6 additional communicators would be required to man this position, at £5,000 per man - totalling £30,000 annually. It is therefore not believed that the deficiencies in HF coverage can be overcome by extending the area of responsibility of existing HF stations. Cost savings at Iceland resulting from HF withdrawal would be £69,000 (staff) and £26,000 (services) per annum. The residual book value of the HF equipment on a 10 year amortization basis would be £47,000, but its capital value as a realisable asset will be considerably less and is difficult to quantify.

3.3.36 A further important aspect is the overall performance of the NAT HF communications system. A protracted period of tape recording and analysis would be needed to provide adequate details of station coverage under various conditions and therefore enable a detailed determination to be made of all aspects of station interdependence. Table 4 does give some indication of this aspect in normal conditions, but care must be taken not to draw too many inferences from it as it relates only to a small sample for restricted periods.

3.3.37 During periods of poor propagation a station at one location can often intercept messages which aircraft are unable to send to their normal control station. The receiving station sends them via the AFTN and a safe and efficient ATC/communications service results, e.g. during the night of 28 February 1974, in poor communication conditions, Gufunes copied 15 reports from aircraft between 5100N and 5400N which Shannon had not copied. It is a qualitative judgement whether cost savings of the order indicated above are commensurate with the reduction of overall system coverage and effectiveness which would result from the withdrawal of the Reykjavik HF facilities. It should be noted that the station at Gufunes is in any case required for AFTN/ Met transmission/reception purposes and removal of either or both HF/VHF services would not result in its complete closure for aviation purposes.

Aeronautical fixed services

Speech circuits

3.3.38 It is not thought that any saving will be possible on the ICAO speech circuits (illustrated in Appendices H and J). The Iceland/Gander circuit is a component part of the omnibus Shanwick/Gander circuit, and would still be required for this purpose and for Shanwick/Sondrestrom speech purposes even if no longer required for Reykjavik/Gander liaison. Trials are in progress of a data interchange system between Gander and Prestwick on the direct Gander/Prestwick circuit. If these are successful it might be possible to examine the feasibility of relinquishing the Gander/Prins Christian Sund segment of the omnibus circuit, but manual fall back requirements associated with a single processor configuration make this by no means certain. Minor additions would be required to the speech circuit terminations (e.g. extension to Gufunes and/or RCC) but these would not be significant.

AFTN

3.3.39 In the event of transfer of responsibility for Reykjavik OCA to Shanwick the AFTN loading will increase, although the actual amount of additional traffic will depend upon the communications configuration chosen. The traffic will consist of flight plans not previously addressed to Prestwick, and relay of VHF and/or HF messages received in Iceland and relayed to Prestwick. In the event of Reykjavik HF closure relay of messages to ATC and aircraft operators (and vice versa) would be from Ballygirreen instead of from Reykjavik and this would represent a further variation.

3.3.40 Estimates of AFTN loading changes can only be approximate, but during busy periods are expected to be of the proportions shown below. They may be exceeded at times, and they may occur at the same time as the existing Shanwick peaks :

| | Iceland HF continued | Iceland HF withdrawn |
|---|---|---|
| Flight plans | | |
| Croydon - Prestwick circuit | 80 - 100 per day | |
| Croydon load increase | 35 - 40 per day | |
| Croydon - Scot/Ice | 35 - 40 per day | |
| Aeromobile messages | | |
| Croydon - Prestwick circuit | 30 per hour | 30 per hour |
| Shannon - Croydon circuit | - | 15 per hour |
| Croydon - Scot/Ice | 15 per hour | 15 per hour |
| Croydon load increase | 15 per hour | 15 per hour |

Note : Croydon is the UK Civil Aviation Communications Centre.

3.3.41 Examination of the AFTN capacity and present peak loading indicates that the additional load could be accommodated on both SCOTICE and the domestic AFTN without requiring additional circuits.

Meteorological services

3.3.42 The existing UK Met Service would be able to provide an adequate service for Prestwick ATCC purposes in the combined area at negligible or no additional cost. Similarly the provision of service to Reykjavik OAC has little or no effect on the forecasting requirement of the Met Services at Iceland. The Reykjavik forecasting office requirement for other than OAC purposes is not, of course, within the province of the NAT/SPG and has therefore not been considered.

SAR facilities

3.3.43 While provision of SAR facilities would not be affected by the proposed change, the arrangement by which the ATCC concerned activates this service required examination. The UK northern RCC (Edinburgh) is normally alerted in case of a SAR requirement in the northern part of the Shanwick area. In case of extension of Shanwick into the Reykjavik OCA, either this could continue, or arrangements be made for Shanwick to alert the Reykjavik RCC directly, whichever is determined as most suitable by the appropriate authorities. In case of the latter it might however be necessary to use Reykjavik ACC as intermediary, or arrange for a Scot/Ice telephone extension to the RCC. Edinburgh RCC has alternative communications available with Iceland which do not rely upon the SCOTICE cable.

3.3.44 It should be noted in this context that the Reykjavik SRR extends beyond the present FIR boundaries into the Gander FIR east of the Southern tip of Greenland, as it was considered that a more efficient service could be rendered in that part of the area by the Reykjavik RCC.

Automation of message handling at Gufunes

3.3.45 In the above, reference was made to the manual formatting and handling of messages at Gufunes. The NAT/SPG was not able to examine the cost/benefit relation of a possible automation of the message system. The subject might merit attention by the appropriate authorities.

Summary of Conclusions

3.3.46 Based on the assumption that the responsibility for FIR Reykjavik should be transferred to Shanwick ACC the NAT/SPG came to the following conclusions and identified the following changes to existing requirements or new arising requirements :

A. ATC services

a) The establishment of a Reykjavik CTA would be required with the responsibility to provide ATC by Reykjavik ACC. The boundaries would be approximately those of the present Domestic CTA, and the vertical extent of the new Reykjavik CTA would be unlimited.

b) As a consequence of a) however the area within which direct pilot/controller VHF air/ground communications and radar surveillance would be available would be significantly restricted.

c) ATC co-ordination procedures would, in general, be more complicated and less satisfactory than at present, although in some instances a slight improvement could be expected.

d) Oceanic ATC clearances for departing traffic from Iceland would have to be co-ordinated before start-up of the aircraft concerned.

e) Elimination of the Shanwick OCA boundary at 6100N would have little effect on position reporting procedures. A slight extension of the area within which the GP VHF frequency could be used, would result.

f) Transfer of responsibility probably could not take place for some years to come, due to the restricted space available in the Prestwick OAC operations room, resulting from the introduction of automation.

g) Aircraft transitting the Reykjavik CTA would always be required to change communications frequencies at the entry and exit points of this area.

B. Communications (AMS)

a) VHF service would continue to be provided from Iceland, with message relay by AFTN to Prestwick. The average message delay would be increased by 3 - 4 minutes.

b) HF service, if continued at Reykjavik : The cost of the service would continue without reduction. The average message delay would be increased by 3 - 4 minutes due to the necessary AFTN relay to Prestwick. The HF coverage would remain unchanged.

c) HF service, if terminated at Reykjavik : The remaining Ballygirreen coverage would be inadequate. In order to effect some improvement new aerials, new equipment and a new communication position would be required. A significant degradation of HF system coverage during poor communications conditions must be expected resulting from a significant loss of HF coverage in parts of the Northern part of the NAT Region which can not be supplemented by any other coverage.

C. Communications (AFS)

a) No savings could be expected on ICAO speech circuits. A number of minor additional extensions would be required.

b) The ICAO omnibus speech circuit would not be entirely satisfactory for co-ordination between Shanwick OAC and Reykjavik ACC.

c) It is expected that the AFTN could accept the additional message load resulting from any of the alternatives considered.

d) The introduction of an automated message system at Gufunes might merit attention.

D. Meteorological services

There are no significant changes expected with regard to the meteorological services.

E. Search and rescue organization

The SAR Organization in the area in question is not expected to be significantly affected. Revised co-ordination procedures might however become necessary. Minor expenditure on ICAO omnibus speech circuit might also become necessary.

3.3.47 Cost variations :

| Annual costs | Savings | Additional expenditure |
|---|---|---|
| ATC services (OAC) | £218,000(Reykjavik) | £150,000 to £185,000(Prestwick) |
| ATC services (Domestic CTA) | - | £158,000(Reykjavik) |
| Communications | *£ 95,000(Iceland) | *£ 30,000(Shannon) |
| Total | £313,000 | £338,000 to £373,000 |
| **Capital costs** | **Expenditure** | |
| ATC sectors (Prestwick) | £ 7,500 | |
| **HF sector ( (Shannon) | £ 3,000 | |
| **Aerials (Shannon) | £10,000 to £12,000 | |
| **Equipment (Shannon) | £20,000 | |
| Total | £40,500 to £42,500 | |

* Capital recovery
Communications equipment at Iceland - Residual Book Value £47,000
Actual capital value however not determined.

** Not applicable if HF service retained at Iceland.

## 3.4 ALTERNATIVE METHODS OF PROVIDING SERVICE IN THE PRESENT SONDRESTROM FIR

### Introduction

3.4.1 Although the responsibility of USAF for the provision of ATC service within the FIR Sondrestrom will cease on 30 June 1975, the communications circuits provided by them will continue to be available for civil use without charge for the time being. The circuits are provided under the terms of a Danish/USA agreement, and on the basis of past history it can be expected that reasonable notice of any future change in the status of these facilities can be expected. There is no indication at present that such action is imminent. Nevertheless, the USA representative on the Group indicated that the US would welcome a definite statement as to the period of time for which the continued use of military facilities was thought to be necessary, as their provision cannot be an undetermined commitment to civil aviation.

3.4.2 In the light of the above, it could be expected that the replacement of USAF controllers by civil controllers would provide continuance of service and the only question arising would be the resulting additional civil staff costs and the increase in the cost of the HF service should the civil authorities assume provision of ATS within the FIR Sondrestrom.

3.4.3 The Danish Civil Aviation Authorities do not have sufficient staff available for this additional ATC commitment, however. Providing civil ATC staff for the Sondrestrom ACC, is considered to be extremely difficult because of the remoteness of the site and the inhospitable nature of the environment. Overall cost would be exceedingly high, while staff wastage would be a continuing problem. Denmark cannot provide controllers from their available staff and the recruitment of suitable personnel, and their training to adequate standards - even if this were possible - would in any event not allow the provision of an ATC service in the area for a significant period of at least some years after the USAF would have withdrawn.

3.4.4 Provision of a Flight Information Service might, however, be possible by increasing and training the civil communications staff at Sondrestrom.

3.4.5 It was therefore decided to conduct the study on the basis that a control service could not be provided from Sondrestrom, but that a Flight Information Service could be made available within part or the whole of the FIR. The following additional points would, however, have to be taken into account :

a) The immediate steps taken to provide a service commencing on 1 July 1975 should not inhibit progression to any longer term re-organization which might be desirable.

b) Provision and maintenance of facilities in Greenland are both expensive and difficult and while making at present best possible use of available military circuits and facilities, the costs which would result in the event that full use of commercial circuits would have to be made should therefore be borne in mind.

Traffic in the upper airspace

3.4.6 The traffic pattern in the FIR Sondrestrom is illustrated in Appendix E although a number of additional flights took place, for which data for the sample day was not available.

3.4.7 Movement data of air traffic within the FIR Sondrestrom during March 1974 showed daily totals of civil international traffic conducted above FL 250 of between 29 and 64 movements. Edmonton ACC traffic data showed a daily peak of 45 movements between FIRs Edmonton and Sondrestrom during the period September to December 1973. Relating these to the summer months results in daily totals of some 60 movements. Military traffic has not been taken into account in the above figures.

3.4.8 The overall picture of daily movements likely to require ATC service in the upper airspace of FIR Sondrestrom is therefore expected to amount to about 75 - 80 aircraft per day during the summer, of which up to about 60 could be expected to enter or leave FIR Edmonton. The remainder would either be landing in or departing from Greenland or would be entering or leaving the OCA Gander. However, information available from Sondrestrom on overall number of movements indicates that on individual days in summer, the totals might be considerably higher.

Facilities available in Greenland (See Appendix K)

Denmark

3.4.9 Family "D" HF facilities for area use are operated from the Sondrestrom communications centre. Annual costs amount to £150,000 but as of 1 June 1976 an increase to £205,000 must be expected as a result of the withdrawal of US maintenance support. 30% of the cost is provisionally allocated to domestic services. In addition, the following VHF GP stations for area use are available :

a) Sondrestrom and Qaqatoqaq (siting difficulties necessitate two stations for all round coverage).

b) Kulusuk (remoted to Sondrestrom by a USAF supporter link).

c) Dundas (limited availability only). Family "D" HF is also available from Dundas.

3.4.10 The present share of the maintenance costs of the facilities described in a) and b) above which is supported by Denmark, amounts to £2,000 per annum. Maintenance costs for c) are £82,000 per year. None of the above costs are charged to Joint Support. However, a proportion of the operational costs of the VHF GP stations at Frederiksdal and Prins Christian Sund is charged to Joint Support.

Commercial circuits

3.4.11 Circuits between Sondrestrom and Frederiksdal are available at an annual rental charge of £41,000 (speech) and £20,000 (telegraph). Denmark rents one telegraph circuit at present for its own use. The available ICECAN speech circuits between Frederiksdal and either Gander or Iceland amount to annual rental costs of £28,000 each.

Note : Telegraph circuit costs are, as a rule, approximately half those of a comparable speech circuit.

USAF circuits

3.4.12 The available speech circuits provided by the USAF include links between Gander, Goose, Edmonton, Moncton, Reykjavik and Anchorage. The existing circuits interconnect Reykjavik and Goose and provide access to the AFTN. As of 1 July 1975 however the provision of the AFS system (i.e. AFTN and speech circuits) associated with the Sondrestrom HF station will become the responsibility of Denmark. The USAF will endeavour to continue to provide the necessary circuits for the time being but is interested in having a definite date for the termination of these requirements established at the earliest possible time. (See also para. 3.5.15.) Annual Danish staffing costs are expected to be £135,000.

Airspace organization

3.4.13 In view of the type of aircraft operations conducted in the lower airspace, and the associated services to be provided for them, it was noted that the provision of ATC services by an ACC located outside Greenland could only be effected within the upper airspace of the FIR Sondrestrom. The establishment of the plane of division between the upper and lower airspace is discussed below (para. 3.5.9 e) refers).

Provision of ATC service in the upper airspace

3.4.14 It was found that the costs for the provision of Flight Information Service by Denmark would be in the order of £150,000, based, however, on the assumption of maximum use being made of the available military circuits for communications with adjacent ACCs and access to the AFTN. It was agreed in this context that the provision of ATC service would by far be preferable especially by civil operators using the area,

subject, however, to the acceptability of costs involved. The military users of the airspace would be able to agree to this, provided that special areas would remain available for them whenever needed. It should also be noted that ATC service is already provided within the adjacent FIRs within which the main NAT traffic flows occur (Edmonton, Moncton, Gander, Reykjavik). Although AMS communications may be difficult in parts of the area at certain times, an air traffic control service could still be provided, resulting in a higher degree of service available than FIS. Alerting service could better be effected and Search and Rescue Services could be activated at an earlier stage by an ACC than by a unit providing only Flight Information Service, especially in the event of loss of radio communications. It was, therefore, decided that the study would be based on the assumption of the provision of ATC service to at least en-route international jet traffic.

Common Boundary of FIRs Bodo and Sondrestrom with FIR Dixon (USSR)

3.4.15 In determining the delineation of the area within which ATC service should actually be provided, the Group examined:

a) the possible extension of FIR Bodo; and

b) the gap which still existed between 3000E and 4000E between the FIRs Bodo and Sondrestrom in the West and the FIR Dixon in the East.

3.4.16 With regard to a) above, it was noted that Norway would prefer not to extend the Bodo Oceanic FIR, either Northwards or Westwards, and this mainly because of a number of difficulties which were experienced in the past when the FIR Bodo extended to the pole. It was in fact because of these difficulties that the present delineation of the North-Eastern boundary of FIR Sondrestrom had been introduced.

4.3.17 With respect to the gap in FIR-coverage mentioned in 3.4.15 b) above, Norway is at present negotiating with the USSR regarding the establishment of a common boundary between FIRs Bodo Oceanic and Dixon. It was therefore believed inappropriate to consider the Eastern boundary of FIR Sondrestrom until the question of the new Eastern boundary of the Bodo Oceanic FIR had been resolved. It is suggested, therefore, that as soon as the common boundary between FIRs Bodo and Dixon has been established, the delineation of the common boundary between FIRs Sondrestrom and Dixon should be examined. It would be preferable, but not essential, for ATS purposes that the Eastern boundaries of FIRs Bodo and Sondrestrom be established along a common longitude.

3.4.18 The possibility of establishing the Southern part of the Bodo Oceanic FIR as controlled airspace was also considered. Norway is aware of the requirement that controlled airspace should be provided in the upper airspace of at least part of the areas affected by NAT traffic, and is currently studying this question.

Use of Aeronautical Mobile Service Facilities

4.3.19 The AMS facilities which would be a prerequisite for the provision of area control service were examined. These facilities are common to all possible configurations and they therefore do not affect comparative costings. The situation regarding the different facilities is as follows:

a) Dundas HF and VHF : This station is available on request, subject to three hours notice through Sondrestrom Radio;

b) Sondrestrom/Qaqatoqaq VHF : This station is to be retained without change;

c) Kulusuk VHF : This station is to be retained at present. If military support for it should be withdrawn, the cost of the civil maintenance of a relay link over the ice-cap would be prohibitive. An alternative remote operation could be provided via a projected commercial communications link along the East coast of Greenland and then via the available commercial link to Sondrestrom. The East coast link will not be available until 1978 at the earliest, and the cost of the required circuits is unknown at present. The Frederiksdal-Sondrestrom link covering a similar distance to that from Kulusuk to Frederiksdal costs £41,000 annually, and the total cost of remote operation of Kulusuk VHF via such a link might therefore well be in the region of £80,000 per year. However, HF service would be available in case of the withdrawal of the Kulusuk VHF station and an alignment of the FIR boundary does not depend upon its availability. If it should be found that the operation of Kulusuk VHF depended exclusively on civil support, its retention can therefore be considered on its merits at that time;

d) Frederikshab VHF (proposed) : A station at Frederikshab would close a gap in the present VHF coverage. Its viability can be considered by the appropriate bodies when its cost, including the necessary circuits for its remote operation, is known. Its availability might make a minor adjustment of the FIR boundary necessary, but this does not affect the Study itself.

e) Sondrestrom HF Service : In considering its retention or withdrawal, the following factors were taken into account:

i) The Gander HF station is unable to provide service in the area at present covered by the Sondrestrom HF station;

ii) In normal conditions, the Reykjavik HF station can provide coverage in the greater part of the FIR Sondrestrom. However, the full extent of the coverage is not determined and is known to be deficient in the North;

iii) The Canadian stations at Frobisher (64N69W), Cambridge Bay (69N105W), and Resolute (75N95W) all operate on Family 'D' and might provide some coverage in parts of the FIR Sondrestrom;

iv) New HF equipment and aerials are being installed at Sondrestrom. Re-equipment costs will therefore not arise again for some years and improved coverage and performance can be expected;

v) A lengthy simultaneous recording exercise - and subsequent analysis - would be required to determine the overall coverage from other stations with any degree of certainty. Even so the known communications difficulties in Northern areas during periods of adverse propagation conditions would make the occurrence of significant gaps in coverage probable in the absence of Sondrestrom HF;

vi) HF and VHF equipment at Sondrestrom is maintained by the same personnel and the withdrawal of Family 'D' would therefore result only in a staff reduction of one maintenance technician.

3.4.20 In view of the above, it was agreed that planning must continue on the basis of retention of Sondrestrom HF. It is believed, however, that at a later date the controlling authority for the area and the Provider State (Denmark) together with the operators can reconsider withdrawal of the service if alternative coverage proves to be acceptable and adequate.

3.4.21 Remote operation of the Sondrestrom/Qaqatoqaq, and Kulusuk VHF stations from the Control Centre's communication position was only briefly examined. The considerations involved are very similar to those which were considered in para. 3.3 for the Reykjavik VHF to be remoted to Prestwick. The cost of circuits for remote operation would have to be added to the cost of communications personnel at the new location, and the VHF stations would still have to be provided and maintained in their existing locations. In the case of remote operation from Reykjavik or Gander, annual rental costs would be approximately £70,000 per circuit, and from Edmonton considerably more.

3.4.22 A possible future conversion of Family 'D' to SSB mode of operation has no effect on the Study. Sondrestrom, Reykjavik and all the Canadian stations can change to SSB at negligible expense. Bodo will be in a similar position in about one year, following re-equipment.

Alternatives for Provision of Service

3.4.23 Formal agreement will be needed between Denmark and the State(s) who will be responsible for the provision of ATS over Greenland. While Denmark has no objection to the principle of the responsibility being divided between two States, it would prefer however to avoid the need for two formal agreements and would thus prefer the task to be provided by a single authority. The present provision of a control service over the Southern area of Greenland by Gander is unaffected by this consideration - the preference relates to the service over the remainder of the area. Both Canada (Gander or Edmonton ACCs) and Iceland (Reykjavik ACC) are fully acceptable to Denmark.

3.4.24 A lateral or a longitudinal division of the area of responsibility between, e.g. Edmonton and Reykjavik ACCs would have repercussions on the FIR structure resulting in co-ordination requirements between two separate ATS units. The principle of a single unit executing control within FIR Sondrestrom was accepted as the basis for the study.

3.4.25 The study was therefore conducted on the basis that the control service over the Sondrestrom FIR should be provided by Canada (either by Gander or Edmonton ACCs) or by Iceland (from Reykjavik ACC). Examination is made at a later stage. However, the question of whether the introduction of divided responsibility would be more beneficial was also briefly examined (para. 3.4.46). The variation resulting if Shanwick should assume responsibility for the Reykjavik OCA is discussed in paras. 3.4.41 to 3.4.45.

ATC Sector and Staff Requirements

Service provided by Canada

3.4.26 The following two ACCs in Canada would be suitably located for the provision of ATS within FIR Sondrestrom because of the actual orientation of the main traffic flows and the available communication facilities:

a) Gander Oceanic ACC
b) Edmonton ACC

3.4.27 The traffic flow across the contiguous boundary between Canadian airspace and Greenland is primarily oriented in an East/West direction and within Canadian airspace controlled by Edmonton ACC. Only a small proportion of the traffic operates in a North/South direction. A co-ordination requirement between Edmonton and Gander does not exist and there are, therefore, no facilities provided for this purpose.

3.4.28 The extension of the Gander OCA to also cover the FIR Sondrestrom would, however, require the introduction of co-ordination facilities between Edmonton and Gander ACCs. Control of FIR Sondrestrom from Edmonton ACC, possibly in conjunction with minor realignments of

FIR boundaries, would reduce the need for such co-ordination to a minimum, but would nevertheless introduce a new co-ordination requirement with Reykjavik ACC. In either case, an additional co-ordination requirement would arise with Bodo OAC.

3.4.29 Staff requirement at either Gander or Edmonton ACC would be identical as a consequence of the need for an additional ATC sector on a 24 hour basis. Staffing costs would amount to £57,000 per annum. Capital costs for the introduction of one additional sector were considered to be minimal and have therefore not been included.

Service provided by Reykjavik ACC

3.4.30 The provision of service by Reykjavik ACC would result in a new co-ordination requirement with Edmonton ACC and an upgrading of the co-ordination requirement with Gander and Bodo ACCs. Additional staff would be required at Reykjavik for the manning of one additional 24 hour sector, at a total cost of £40,000 per annum. Capital costs would be minimal and have therefore not been included.

Aeronautical Fixed Services Requirements

3.4.31 The speech circuit requirements have been considered in view of an eventual use of commercial circuits. In practically all cases military circuits are at present available for at least part of the requirement and cost of the resultant combined commercial/military service has been assessed in detail.

AFTN

3.4.32 Should the services be provided by either Gander or Edmonton ACCs, Canada would have to provide for a connection to the Halifax Computer Port, which would amount to costs of £35,000 per annum. These could, for the time being, be reduced to £13,000 by the use of existing military circuits.

3.4.33 The provision of ATC by Reykjavik would require access to the ICAO AFTN link at Frederiksdal. The resulting costs would be £20,000 per annum. A military circuit is now available between Sondrestrom and Reykjavik.

ATS Direct Speech Circuits

3.4.34 In the opinion of Canada, the additional load on the ICAO speech circuits resulting from the new co-ordination and data transfer requirements which would arise in the event of withdrawal of existing military circuits should necessitate the introduction of an additional circuit between Gander, Frederiksdal and Reykjavik, for use in conjunction with the Edmonton/Gander circuit which would also have to be provided. The Edmonton/Gander connection would either serve as a direct Gander/Edmonton speech circuit, or as part of the Edmonton circuit to Reykjavik.

Availability of military circuits through Greenland could allow the overall Centre/Centre speech circuit requirement to be reduced to the civil provision of initially the Gander/Edmonton link. This would, however, still require costs of £37,000 per annum. A full Edmonton/Reykjavik connection based on commercial circuits would amount in costs in the order of £87,000 per annum.

3.4.35 The above was accepted as a basis for comparative planning as the requirement would be a constant factor in any of the three alternatives under consideration. However, by the time an entirely commercial circuit between Edmonton and Reykjavik will have to be implemented because of the potential withdrawal of military facilities, loading characteristics might have changed - particularly if the Gander/Shanwick automated data exchange is in operation - on the ICAO direct speech circuits, and judicious re-arrangement of co-ordination procedures might be necessary in order to permit transfer of a significant portion of the loading from the omnibus circuit to the direct Gander/Prestwick link. This would perhaps avoid the need for the further Gander/Frederiksdal/Reykjavik link, and would also be a common factor for all alternatives.

Speech Circuits to ACC Sondrestrom

3.4.36 Canada : The method of control used by Edmonton ACC would require all communications between Edmonton and Sondrestrom ACCs - including the passing of routine position reports - to be effected by telephone on a circuit separate from that used for ATC co-ordination. On the other hand, Gander would act as air-ground relay through the Halifax Computer Port, and the speech requirement between Gander and Sondrestrom could be met by the improved ICAO omnibus circuit to Frederiksdal, and thence to Sondrestrom through commercial circuits. Costs are expected to be £87,000 and £41,000 respectively, and alternative military circuits are available for part of the requirement.

3.4.37 Reykjavik : As in the case of Gander, the Reykjavik direct speech requirement would be met by the ICAO omnibus connection to Frederiksdal, thence through a commercial connection to Sondrestrom. Position reports could be passed on the AFTN connection through Frederiksdal. A military circuit is available for direct speech communications between Sondrestrom and Reykjavik.

3.4.38 Overall Cost Comparison

| Additional requirements | Edmonton ACC | | Gander ACC | | Reykjavik ACC | |
|---|---|---|---|---|---|---|
| | CC* | C/M** | CC* | C/M** | CC* | C/M** |
| AFTN | £35,000 | £13,000 | £35,000 | £13,000 | £20,000 | - |
| Speech circuits (inter-area) | 87,000 | 37,000 | 87,000 | 37,000 | 87,000 | 37,000 |
| Speech circuits to Sondrestrom ACC | 87,000 | 22,000 | 41,000 | 11,000 | 41,000 | - |
| ATC Staff | 57,000 | | 57,000 | | 40,000 | |
| TOTAL ANNUAL COSTS | £266,000 | £129,000 | £220,000 | £118,000 | £188,000 | £77,000 |

* Commercial circuit.

** Combination of commercial circuits in combination with available military circuits.

Operational Considerations

Aircraft Operations

3.4.39 Whatever configuration is eventually adopted, it is not expected that significant changes will arise with regard to position reporting by aircraft. With the integrated HF and VHF-GP system used in the NAT Region and with adequate inter-area co-ordination facilities, reports should not normally be required when passing OAC boundaries. The only change would be the station to which individual position reports or ATC clearance requests will be addressed.

Co-ordinated Requirements

3.4.40 The following factors in the field of co-ordination must be taken into account when considering each of the three possible alternatives:

a) Edmonton ACC providing ATC within FIR Sondrestrom:

i) No other co-ordination possibility than AFTN exists with Bodo ACC;

ii) The co-ordination requirement with Reykjavik ACC will replace the existing one with Sondrestrom ACC but it will be a heavier commitment;

iii) The majority of traffic conflicts occur in the Eastern part of the FIR Sondrestrom and this shortly after entry or immediately before exit;

iv) The need for co-ordination with Gander ACC is expected to be minimal, but a number of flights will remain within FIR Sondrestrom for a short time only, transitting between Reykjavik and Gander OCAs;

v) Although Edmonton will have to rely upon Sondrestrom to relay AMS messages, the Canadian HF stations will, to some extent, supplement the existing coverage. However, messages received by another NAT communications station and not copied by a station in the Edmonton area will suffer significant delay in reaching Edmonton ACC;

vi) Sondrestrom airport is located near the Western boundary of that area within which FIS only will be provided in the lower airspace. However, it is expected that, in practice, the small amount of traffic using Sondrestrom airport will not cause a significant complication;

vii) At present and whenever necessary, Sondrestrom ACC obtains assistance from Reykjavik ACC for resolution of traffic separation problems arising near the Eastern FIR boundary which is done by early adjustment of flight path, or by descent of traffic landing at Sondrestrom to a level below that of overflying traffic, by means of VOR/DME or radar separation. Similarly, departures from Sondrestrom East-bound can be climbed through overflying traffic as soon as they are within the Reykjavik radar coverage. There is a certain amount of traffic, however, between Iceland and the East or South coast of Greenland which at present operates at comparatively low levels but which, following the expected re-equipment with jet aircraft, will occupy higher flight levels. While Edmonton will be able to obtain assistance with regard to arrivals at and departures from Sondrestrom airport, direct co-ordination between Reykjavik ACC and Sondrestrom FIC will be required with reference to traffic operating between Iceland and East and South Greenland and, after the introduction of jet aircraft on these routes, difficult co-ordination problems will arise between Sondrestrom, Edmonton and Reykjavik.

b) Gander ACC providing ATC within FIR Sondrestrom:

i) No other co-ordination possibility than AFTN exists with Bodo ACC;

ii) A greater co-ordination loading will occur with Iceland, and a new co-ordination requirement will result with Edmonton ACC;

iii The proximity of Sondrestrom airport to the Western FIR boundary of the revised OCA Gander is not likely to cause undue complication due to the low traffic density;

iv) The majority of conflicting flight paths are near the Eastern boundary of the FIR Sondrestrom and traffic problems will therefore occur immediately after entry or just before exit of the aircraft concerned;

v) Gander ACC will have to rely almost entirely on Sondrestrom for the relay of communications for flights operating within the present FIR Sondrestrom. However, messages received by other NAT stations than Sondrestrom will have to be relayed rapidly to Gander ACC;

vi) The entire airspace above the Sondrestrom FIR would be incorporated in one single UIR;

vii) The same co-ordination problem mentioned in para. 3.4.40 a) vii) above would exist.

c) Reykjavik ACC providing ATC within FIR Sondrestrom:

i) Co-ordination with Bodo is at present effected by AFTN. It is expected, however, that direct co-ordination will be possible by relay through Stavanger later in 1974 when the interconnection of the Prestwick-Reykjavik and Prestwick-Stavanger speech circuits becomes available at Prestwick;

ii) In general co-ordination with Edmonton ACC and co-ordination (slightly increased in load) with Gander ACC will replace the existing co-ordination with Sondrestrom ACC;

iii) Practically all conflicting flight paths occur well within the FIR Reykjavik and can therefore be resolved by internal co-ordination within the domestic organization;

iv) Mutual and complementary coverage by the respective HF stations exists within the area in question;

v) The provision of service can readily be arranged by direct co-ordination between Sondrestrom and Reykjavik both for traffic landing at or departing from Sondrestrom, or for flights between Iceland and East and South Greenland. The Co-ordination would be relatively simple on all occasions.

Variations of the above considerations if Shanwick ACC were to provide ATC within OCA Reykjavik

Co-ordination requirements

3.4.41 Should ATC within OCA Reykjavik be provided by Shanwick ACC, the following variations with regard to the various factors listed in para. 3.3.40 above would occur:

a) Edmonton ACC providing ATC within FIR Sondrestrom:

i) The considerations in para. 3.3.40 a) above would still be generally valid. However, the co-ordination requirement for traffic arriving at or departing from Sondrestrom airport (para. 3.4.40 a) vii)) would become a more complex one between Edmonton, Shanwick and Reykjavik domestic ACCs. This would prove to be very difficult on occasions and unless procedures for direct co-ordination between Edmonton and Reykjavik could be devised, the service would become more restricted or require significantly greater co-ordination time, which would considerably increase the workload.

ii) With regard to traffic between Iceland and East and South Greenland, this would result in triangular co-ordination between FIC Sondrestrom, ACC Shanwick and Reykjavik Domestic ACC for the lower airspace and after the introduction of jet aircraft would also involve Edmonton ACC for the upper airspace. Unless procedures for direct co-ordination between Reykjavik and Sondrestrom could be devised the co-ordination requirement will become unacceptably complex and would probably lead to severe flight level restrictions on traffic.

b) Gander ACC providing ATC within FIR Sondrestrom:

A common boundary between Shanwick and Gander OCAs would exist North of 4500N and extent to the Bodo FIR boundary. The overall co-ordination load would remain the same as described in para. 3.4.40 b) however. The co-ordination problem discussed in para. 3.4.41 a) ii) above would apply equally to Gander as it would to Edmonton.

Communications considerations

3.4.42 Should the Reykjavik HF services be withdrawn, there would be a need to rely upon the Sondrestrom HF coverage in those areas where the improved Shannon HF coverage might remain inadequate. The delay of such messages received in Prestwick would be at least that discussed in relation to manual formatting and handling at Gufunes. To pass ATC instructions to aircraft would necessitate direct speech contact between Prestwick and the Sondrestrom Communications Centre, or would at least require relay through Sondrestrom FIC or Gander and Edmonton ACCs and would involve significant delays.

Co-ordination facilities

3.4.43 The overall co-ordination commitment would therefore be at least as great as for any of the alternatives concerned in para. 3.4.40 above. The additional co-ordination problems, however, discussed in para. 3.4.41 and 3.4.42 might well put into question the adequacy of a single circuit between Prestwick and Reykjavik. The additional speech circuit between Gander, Frederiksdal and Reykjavik will become necessary (as discussed in para. 3.4.34 above) should the revised inter-centre co-ordination procedures not be able to transfer sufficient loading from the omnibus circuit to the direct Gander/Prestwick circuit. Should the direct Gander/Prestwick circuit be so loaded, however, that this transfer is not possible, it is not likely that this circuit will be able to take the significantly increased Prestwick/Gander (or Prestwick/Edmonton) traffic loading either.

3.4.44 The Sondrestrom/Prestwick speech requirement must also be considered in conjunction with the Gander (or Edmonton) to Sondrestrom load and - if authorized - the direct Reykjavik Domestic ACC co-ordination with the Centre responsible for FIR Sondrestrom as discussed in para. 3.4.41. There is still, however, a further factor to be taken into account: as explained in para. 3.3, the United Kingdom would be unable to accept responsibility for Reykjavik OCA for some years, until automation re-equipment had been effected. By this time, it could be expected that automated data transfer with Gander would have reduced by a significant amount the load on the two ICAO speech circuits. It is likely therefore that the provision of the second circuit between Gander, Frederiksdal and Reykjavik would then no longer be required for any configuration.

3.4.45 It is evident that, in the circumstances outlined above, the forecast of message loading in the next few years is open to conjecture. In comparison with the other alternatives considered, it is probable that the overall speech circuit requirement will be the same whether the Reykjavik OCA is controlled by Reykjavik or Shanwick ACCs, although there might be a requirement for an additional Prestwick/Reykjavik speech circuit (at an annual cost of £38,000.

Variations resulting from a divided responsibility to provide ATC within FIR Sondrestrom

3.4.46 A brief examination was made to determine whether significant operational benefit would result from dividing the responsibility over the present FIR Sondrestrom between Reykjavik and Edmonton ACC. It was found that no overall significant operational benefit would be obtained from such a division and that no savings in speech or teletype circuit requirements would result. The overall staffing requirement of the two centres would increase by an annual amount of £20,000. Such an action can, therefore, not be recommended. A division between Reykjavik and Gander ACCs would result in an impractical long and narrow area between FIRs Reykjavik and Edmonton and cannot offer any practical benefits.

Meteorology

3.4.47 It is not expected that extension of Reykjavik's responsibility into Sondrestrom FIR will lead to any requirement for additional meteorological facilities at the Keflavik Meteorological Office.

SAR facilities

3.4.48 While SAR facilities will not be affected by the proposed changes, alerting procedures will need to be agreed between the Sondrestrom FIC and Reykjavik ACC.

## 3.5 CONCLUSIONS

Overall consideration of the Northern part of the NAT Region

3.5.1 It is now possible to examine the Northern part of the NAT Region as a whole, and to combine the considerations of para. 3.3 with those of para. 3.4.

Operational

3.5.2 There are no overwhelming operational considerations which would make one arrangement either essential or unavoidable. However, there is a definite balance in favour of the continuation of the Reykjavik OACC, and also, as Denmark is unable to provide an appropriate service, in favour of Reykjavik becoming responsible for the provision of ATC in the upper airspace of FIR Sondrestrom.

3.5.3 One further point which must also be taken into account is the possible introductory date of any of the changes:

a) Iceland:

Provided that early agreement could be reached with ICAO on financial reimbursement, Iceland could be ready to take over control of OCA Sondrestrom on 1 July 1975. This would represent the final arrangement of the Northern NAT airspace, and no interim scheme would be necessary;

b) Canada (Edmonton or Gander ACCs):

For budgetary reasons, it is unlikely that Canada could accept control of OCA Sondrestrom until 1 January 1976. Unless Reykjavik OACC was to continue in operation, there would be an interim phase until Shanwick extended its authority over the Reykjavik OCA;

c) United Kingdom:

It is not expected that the extension of the authority of Shanwick over OCA Reykjavik could be accepted before approximately 1978. Even if an earlier date could be arranged, it would be some time after 1 January 1976, and an interim phase would therefore be unavoidable.

Financial

3.5.4 Transfer of responsibility for OCA Reykjavik to Shanwick ACC would result in an overal cost increase per annum of £25,000 - £60,000 and additional capital expenditure of £40,500 - £42,500.

3.5.5 Of the three alternatives available for the provision of ATC within FIR Sondrestrom, the respective annual total costs are:

| Edmonton ACC | | Gander ACC | | Reykjavik ACC | |
|---|---|---|---|---|---|
| CC* | C/M** | CC* | C/M** | CC* | C/M** |
| £266,000 | £129,000 | £220,000 | £118,000 | £188,000 | £77,000 |

The annual financial benefit in favour of Reykjavik ACC is therefore:

| | CC* | C/M** |
|---|---|---|
| Over Edmonton ACC | £78,000 | £52,000 |
| Over Gander ACC | £32,000 | £41,000 |

* Use of commercial communication circuits.
** Use of commercial communication circuits in combination with available military circuits.

Note: There is a possibility that a direct connection between Edmonton and Reykjavik ACCs can be arranged by means of inter-connection of military circuits at Sondrestrom. Reykjavik ACC taking over control of FIR Sondrestrom does not introduce an Edmonton/Gander co-ordination requirement and the cost of an Edmonton/Gander circuit would thereby be avoided initially. Edmonton ACC taking over control of FIR Sondrestrom might be similarly affected, if FIR boundary revisions can avoid the need for co-ordination between Edmonton/Gander. This point has not been taken into account in the financial comparisons.

3.5.6 When the financial benefit of keeping FIR/CTA Reykjavik in operation, instead of integrating it in the FIR/CTA Shanwick, is compared with the financial benefit of Reykjavik ACC providing ATC within a combined FIR/CTA Reykjavik/Sondrestrom, the result is:

| | CC* | C/M** |
|---|---|---|
| Over Edmonton ACC | £103,000 - 138,000 | £77,000 - 112,000 |
| Over Gander ACC | £57,000 - 92,000 | £66,000 - 101,000 |

3.5.7 Should it, in fact, prove possible for Shanwick to accept responsibility for OCA Reykjavik at a date significantly earlier than 1978, a further financial aspect would arise. Prestwick is at present not connected to military circuitry through Greenland. Consequently, the following commercial circuit requirements would be unavoidable, even if USAF military facilities were still available.

| Commercial circuit requirement between: | Service | Annual Costs | Remarks |
|---|---|---|---|
| Frederiksdal - Sondrestrom | Speech | £41,000 | Essential |
| Frederiksdal - Sondrestrom | Teletype | £20,000 | Desirable |
| Edmonton - Gander | Speech | £37,000 | Essential (see Note) |

Note: This requirement could not be avoided by either arrangement in para. 3.5.5 above.

3.5.8 While there is no overwhelming financial benefit from any of the alternatives available, the balance is definitely in favour of the arrangement that:

a) Reykjavik ACC should continue to provide ATC within the FIR/CTA Reykjavik; and

b) the responsibility of ACC Reykjavik should be extended to the provision of ATC within FIR/CTA Sondrestrom.

Action recommended

Establishment of a new Polar FIR/CTA

3.5.9 The NAT/SPG agreed, without dissent, that the airspace organization in the Northern part of the NAT Region which would provide the safest and most efficient organization at the least cost to its users would comprise the following:

a) the establishment of a new Polar FIR/CTA* serving aircraft operating within:

i) the present Reykjavik FIR/CTA; and

ii) the upper airspace within substantially the lateral limits of the present Sondrestrom FIR;

b) the Area Control Centre for the new Polar FIR/CTA should be Reykjavik OAC;

c) the retention of an FIR Sondrestrom for the provision of Flight Information Service within the lower airspace of the present FIR Sondrestrom;

d) FIS within the lower airspace of the present FIR Sondrestrom should be provided by Denmark;

e) the plane of division between the lower and the upper airspace over Greenland should be determined by the States responsible for the provision of the respective services within the area in question and should be established so as to at least ensure ATC to all international commercial operations by turbo-jet aircraft.

3.5.10 Communications facilities required for the Polar FIR/CTA, in addition to the present facilities in Iceland, are:

a) HF - Sondrestrom has to be retained.

Note: The service might, however, be withdrawn later if alternative coverage proves to be acceptable and adequate.

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* Note: The name of the area will be determined by Iceland and Denmark.

b) VHF - Sondrestrom/Qaqatoqaq and Kulusuk have to be retained.

Note: Dundas is not included. The requirement for Kulusuk can be reconsidered in the event of withdrawal of military support. Introduction of Frederikshab can be considered when appropriate.

c) AFTN requirements should be met initially by military circuits.

d) ICAO requirements for speech circuits should be met, initially, by military facilities with the possible exception of a new circuit between Edmonton and Gander.

e) Availability of a VHF station on the Faeroes by either Prestwick or Reykjavik requires consideration.

Revisions of FIR boundaries

3.5.11 The following revisions of the delineations of FIR boundaries are required:

a) A realignment of the Eastern boundary of the new Polar FIR/CTA North of 8200N should be considered after agreement has been reached between Norway and the USSR on a common boundary between the Eastern boundary of the FIR Bodo and the Western boundary of the FIR Dixon.

Note: It is preferable, but not essential, that the Sondrestrom and the Bodo FIR boundaries should be aligned with the Dixon FIR boundary along a common degree of longitude.

b) Further minor boundary revisions should be considered as necessary in the light of operational considerations.

Note: The present FIR boundaries have been acceptable for a number of years, particularly since improvements in co-ordination procedures between the ACCs concerned have eliminated the need for the transmission of FIR boundary estimates via the HF system.

c) If the Faroes VHF channels are remoted to Prestwick, a revision of the new Polar FIR (present Reykjavik FIR) boundary between 6100N and 6300N from 0000 longitude to 1000W will be desirable. If these channels are, however, remoted to Reykjavik, a revision of the Eastern FIR boundary at 0000 longitude might have to be considered.

d) If the VHF station at Frederikshab becomes available, a revision of the Northern boundary of the Gander OCA should be examined.

Immediate action required

3.5.12 If the required target date of 1 July 1975 for the introduction of the new Polar FIR/CTA is to be met, the following urgent action will be required:

a) Diplomatic

Agreement between Denmark and Iceland to authorize the provision of air traffic control service by Reykjavik OACC over Greenland;

b) Financial

Approval of additional Finance expenditure of £40,000 per annum for the provision of staff at Iceland to meet the new commitment;

Note: A speech circuit between Edmonton and Gander might have to be provided by Canada at an annual expenditure of £37,000.

c) Technical

Arrangements have to be made for inter-connection of military circuits for ICAO purposes. If the establishment of a Reykjavik/Edmonton link is possible by this means, no additional civil circuitry will be required initially. Otherwise arrangements will be necessary for an Edmonton/Gander circuit to interface with a military Reykjavik/Gander link.

Additional notes

Sondrestrom HF/AFTN Facilities

3.5.13 Denmark indicated that it would wish the recovery of the cost of operation of the Sondrestrom HF/AFTN service (see paras. 3.4.9 and 3.4.12) to be considered as soon as possible. The cost allocated to the provision of service in the upper airspace is approximately £280,000 per annum. The Danish Government will be taking action to request Joint Support Funding.

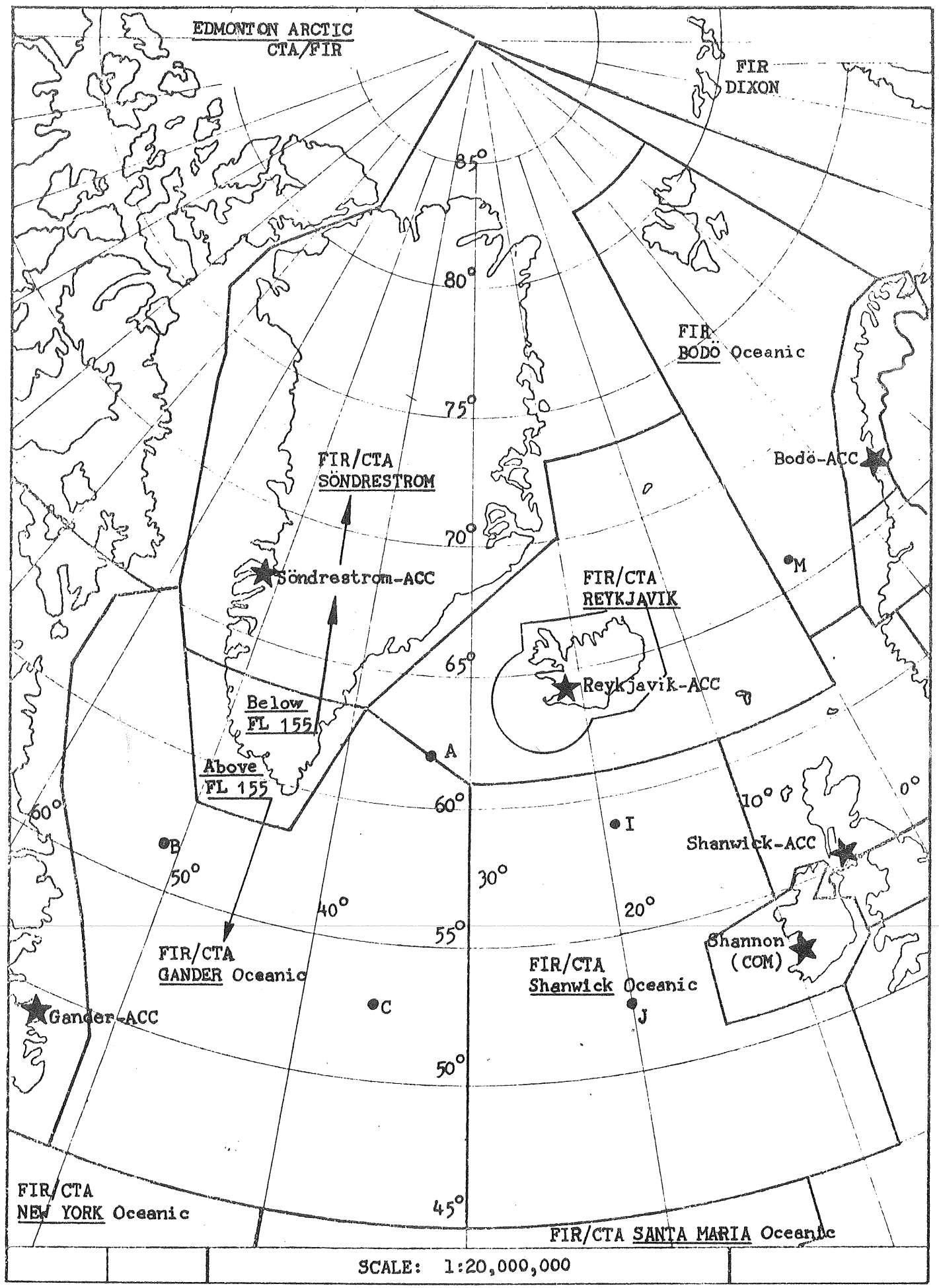
3.5.14 Use of Sondrestrom HF facilities is common to all alternatives. It is suggested that it be determined as soon as possible whether the HF coverage available from Iceland (Gufunes) and other existing communications stations permits Sondrestrom HF to be dispensed with. If this

is the case, it would then be feasible to consider whether remote operation of the Sondrestrom GP VHF channels from Reykjavik (Gufunes) would, in this particular instance, result in significant cost saving.

Use of military facilities

3.5.15 The arrangements recommended above take the greatest possible account of the availability of military facilities initially. They will also permit change-over to commercial facilities when the need arises, without modification of areas of responsibility. The USAF will endeavour to continue to provide the necessary circuits for the time being but is interested in having a definite date for the termination of these requirements established at the earliest possible time. An undetermined requirement is no longer practicable.

MAP OF THE PRESENT SITUATION IN THE AREA IN QUESTION

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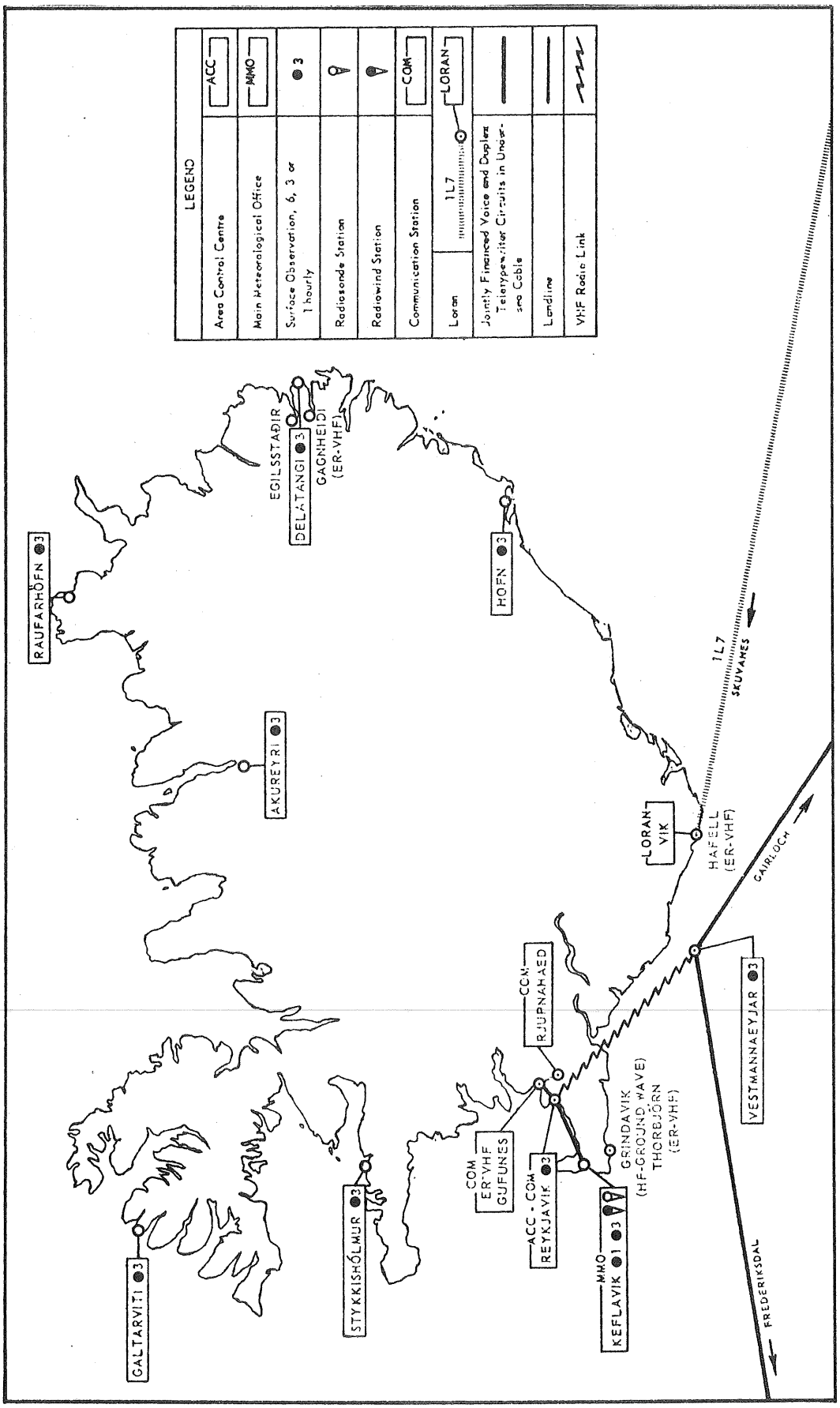
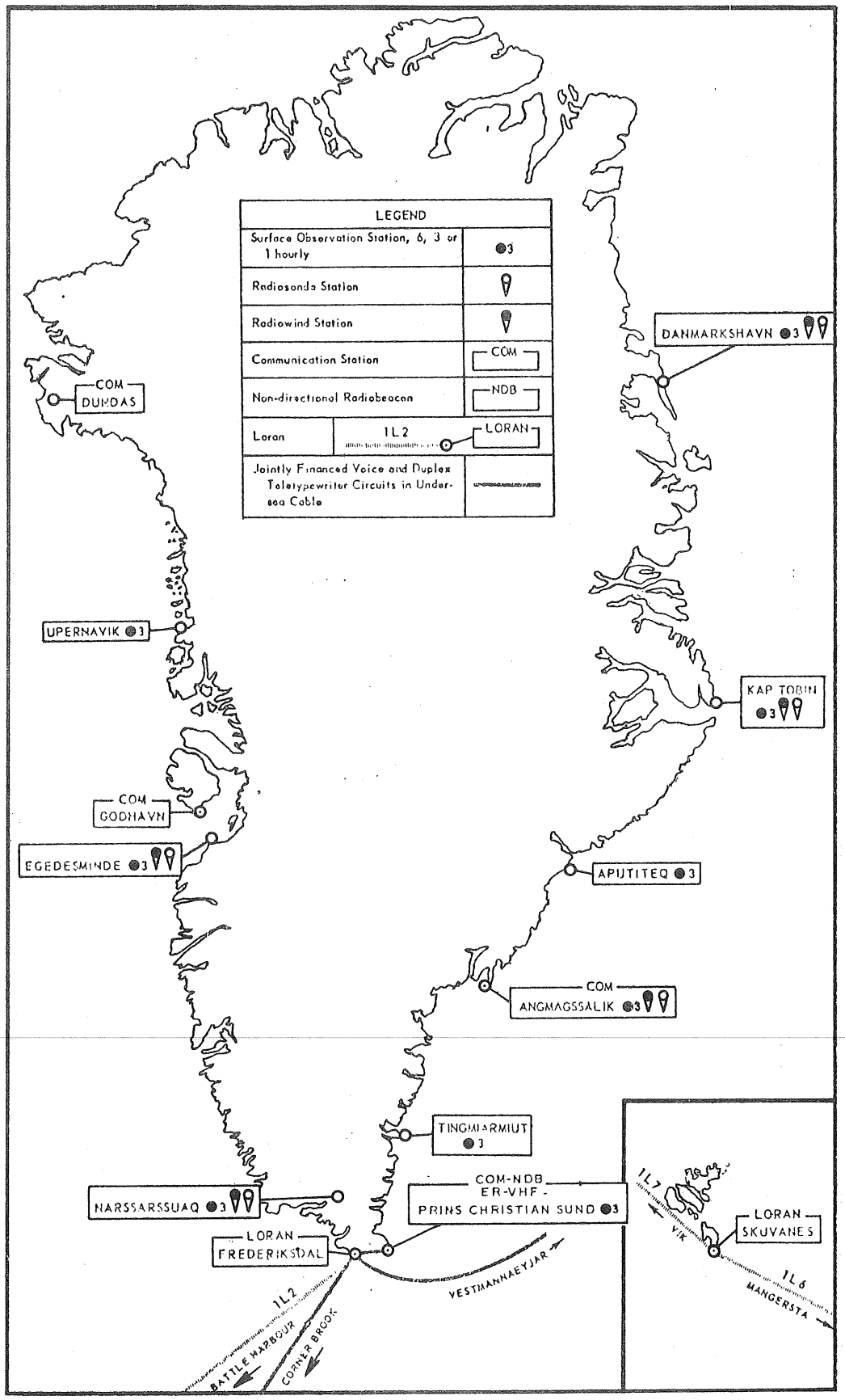
# PRESENT AVAILABLE JOINT SUPPORT FACILITIES IN ICELAND



# PRESENT AVAILABLE JOINT SUPPORT FACILITIES IN GREENLAND



# HOURLY FLOW RATES OF TRAFFIC WITHIN THE PRESENT REYKJAVIK F I R AT 2000W OBSERVED AT SELECTED DAYS IN 1973

| PERIOD \ DATE | JULY 18 1973 | JULY 27 1973 | AUG 5 1973 | SEPT 4 1973 | SEPT 17 1973 | MEAN RATE |
|---|---|---|---|---|---|---|
| 0000 - 0100 | 3 | 6 | 1 | 2 | 0 | 2.4 |
| - 0200 | 2 | 1 | 8 | 3 | 0 | 2.8 |
| - 0300 | 5 | 2 | 8 | 3 | 0 | 3.6 |
| - 0400 | 2 | 6 | 7 | 3 | 3 | 4.2 |
| - 0500 | 5 | 4 | 0 | 3 | 4 | 3.2 |
| - 0600 | 3 | 3 | 0 | 1 | 1 | 1.6 |
| - 0700 | 8 | 4 | 3 | 0 | 5 | 4.0 |
| - 0800 | 2 | 1 | 7 | 1 | 1 | 2.4 |
| - 0900 | 6 | 7 | 6 | 3 | 2 | 4.8 |
| - 1000 | 9 | 2 | 5 | 6 | 4 | 5.2 |
| - 1100 | 8 | 5 | 4 | 7 | 3 | 5.4 |
| - 1200 | 3 | 4 | 3 | 6 | 10 | 5.2 |
| - 1300 | 2 | 6 | 8 | 5 | 13 | 6.8 |
| - 1400 | 9 | 8 | 20 | 11 | 27 | 15.0 |
| - 1500 | 15 | 4 | 25 | 9 | 21 | 14.8 |
| - 1600 | 14 | 10 | 26 | 10 | 17 | 15.4 |
| - 1700 | 12 | 8 | 19 | 16 | 21 | 15.2 |
| - 1800 | 10 | 3 | 16 | 3 | 15 | 9.4 |
| - 1900 | 11 | 7 | 13 | 9 | 16 | 11.2 |
| - 2000 | 4 | 5 | 10 | 4 | 8 | 6.2 |
| - 2100 | 6 | 5 | 6 | 3 | 1 | 4.2 |
| - 2200 | 4 | 2 | 4 | 6 | 4 | 4.0 |
| - 2300 | 2 | 3 | 5 | 1 | 2 | 2.6 |
| - 2400 | 3 | 1 | 2 | 3 | 1 | 2.0 |
| | 143 | 107 | 205 | 118 | 179 | |

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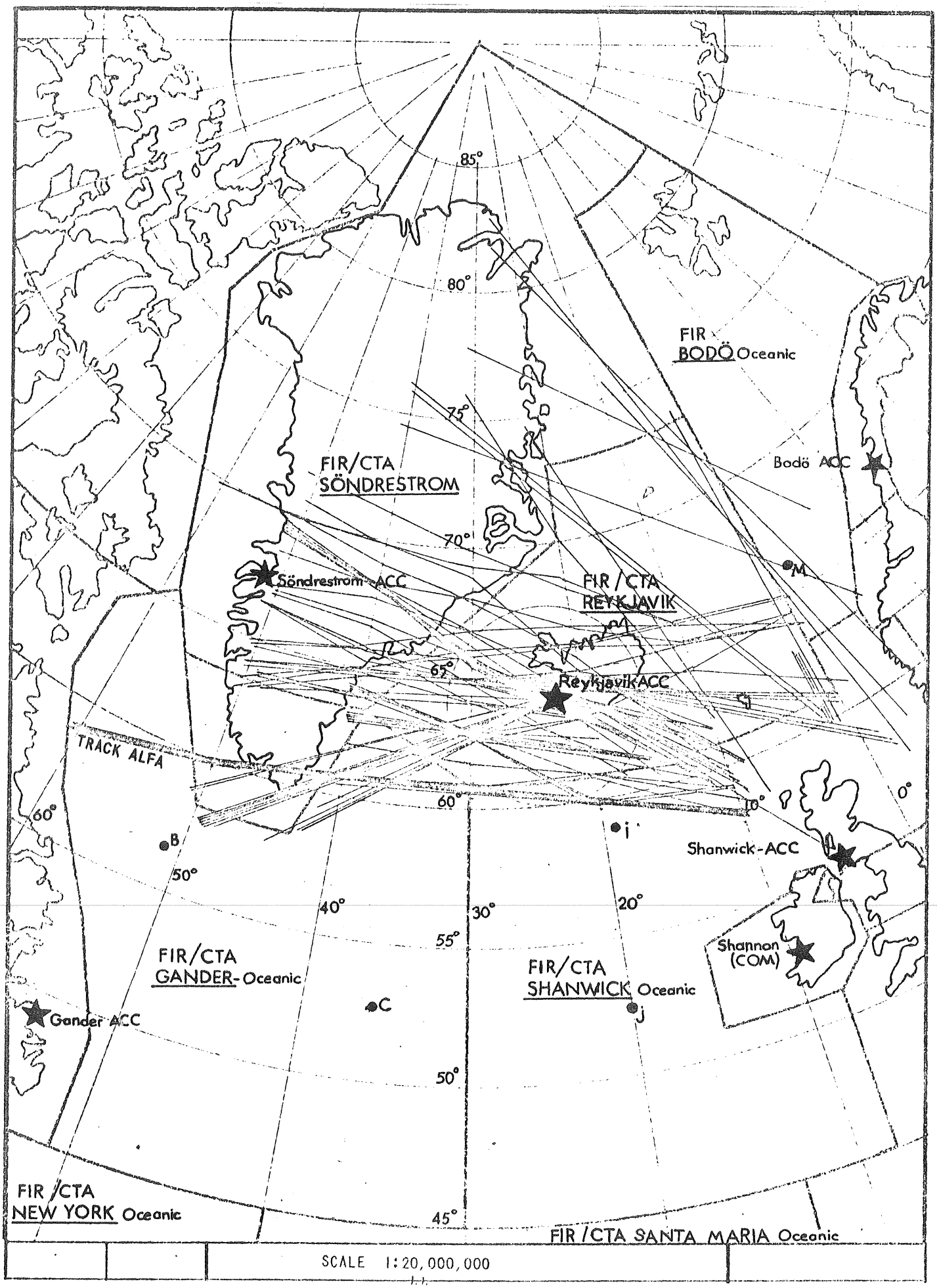
ROUTES FLOWN WITHIN THE REYKJAVIK FIR ON 12 JULY 1973

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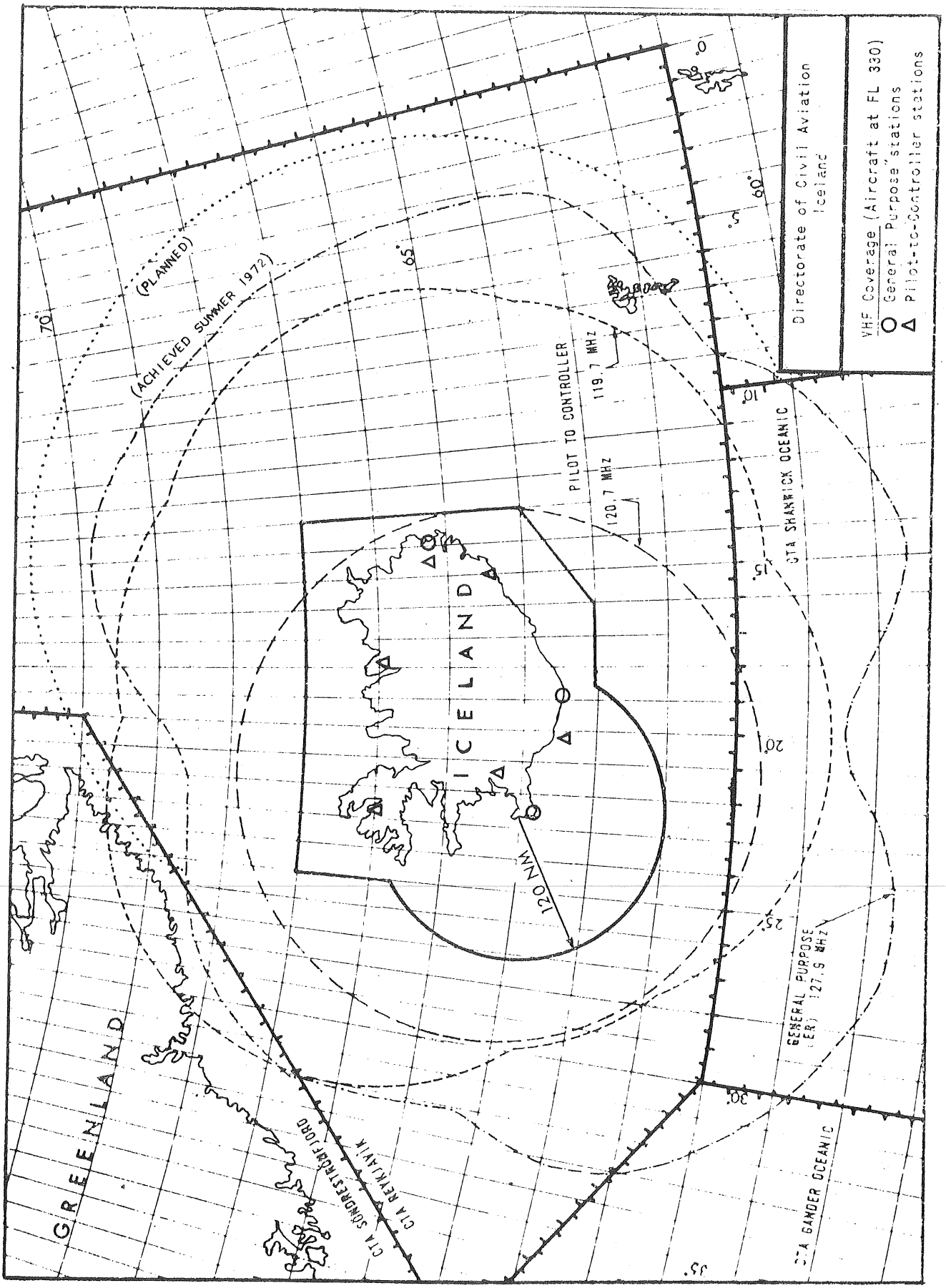
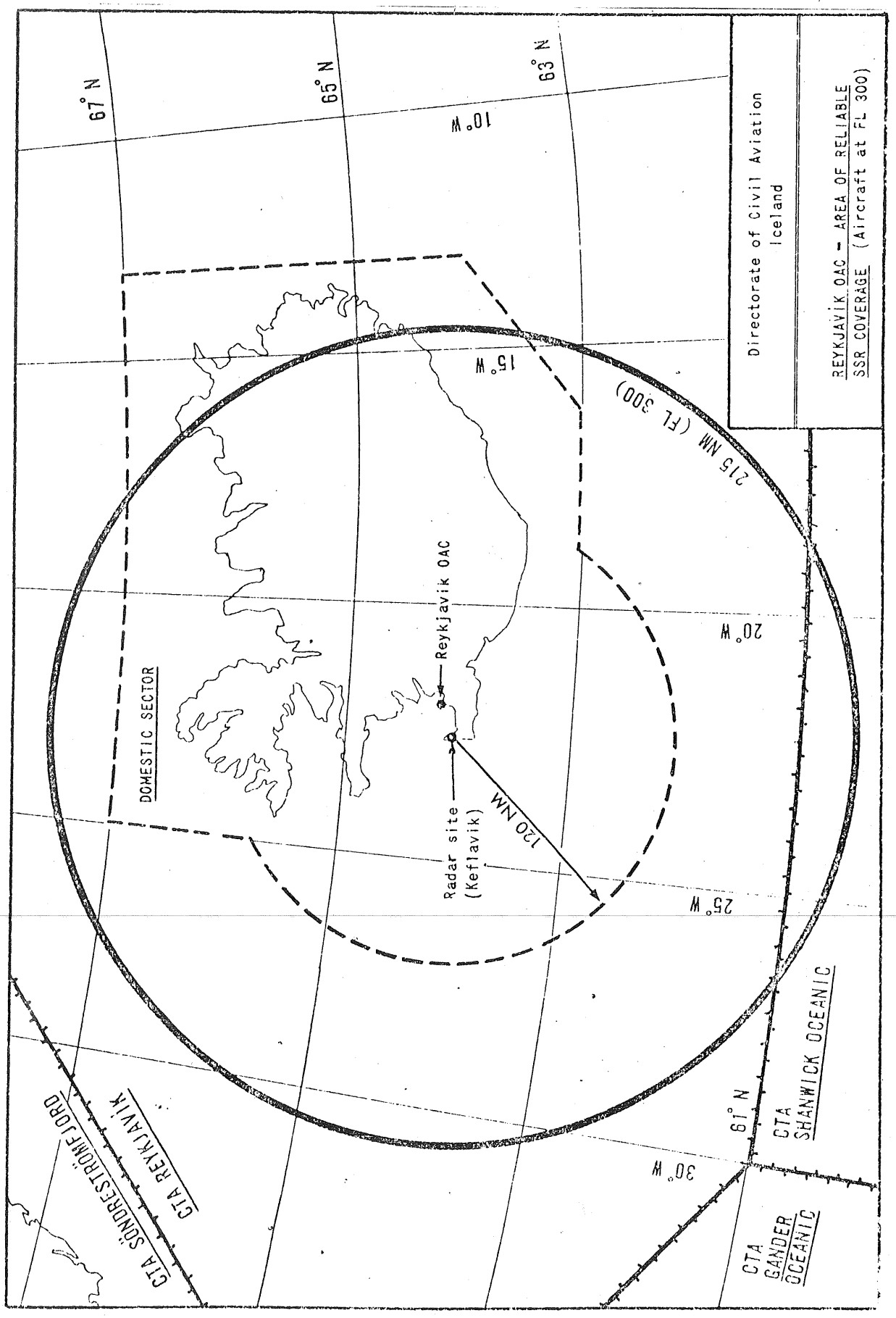
Appendix F to Item 3

# DELINEATION OF THE REYKJAVIK DOMESTIC CTA AND VHF COVERAGE PROVIDED BY VHF STATIONS IN ICELAND

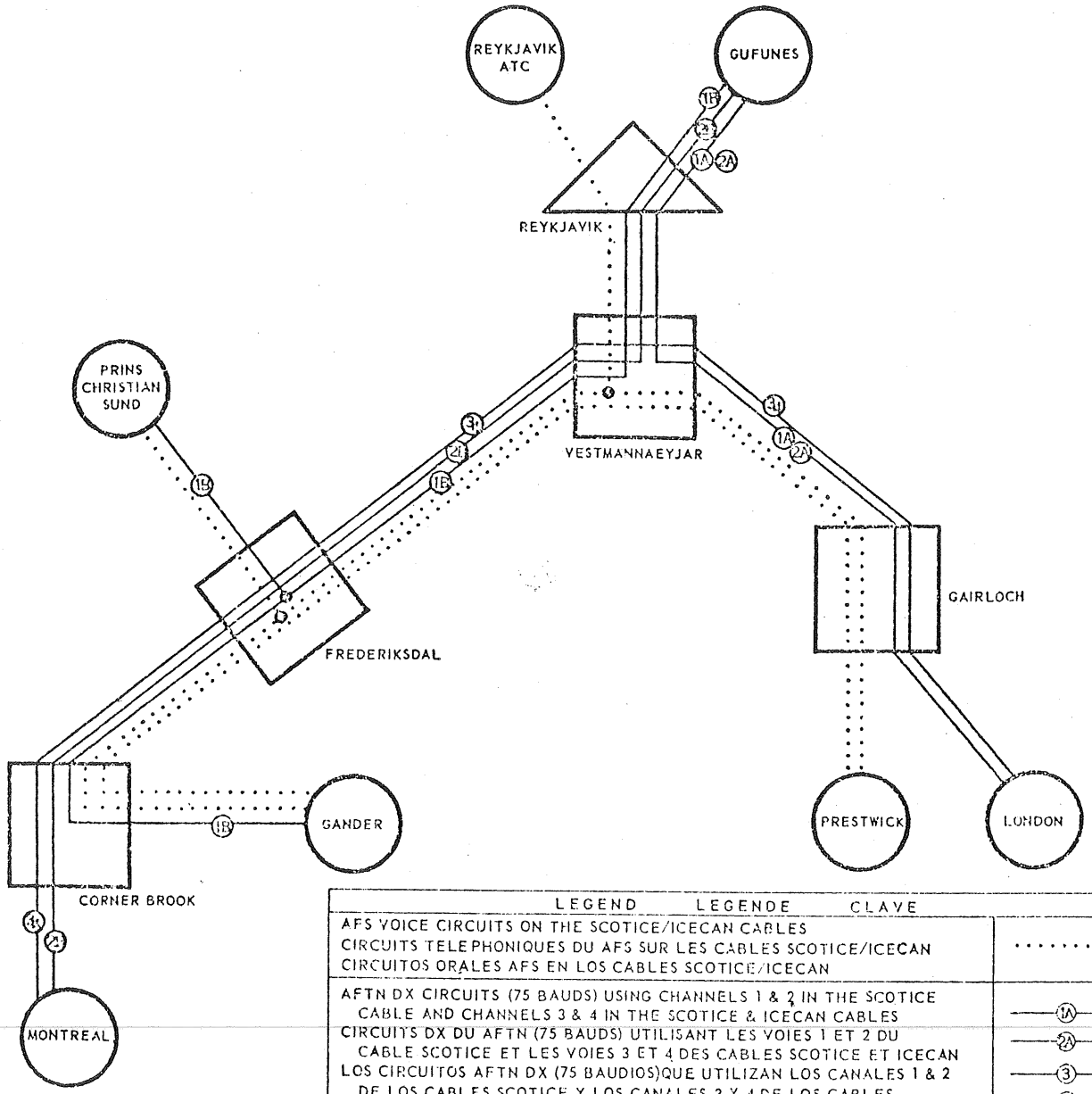


# DELINEATION OF THE REYKJAVIK DOMESTIC CTA AND COVERAGE PROVIDED BY THE SSR AT KEFLAVIK



# PRESENT AERONAUTICAL FIXED SERVICES NETWORK

Note : This network would have to be amended as shown in appendix J



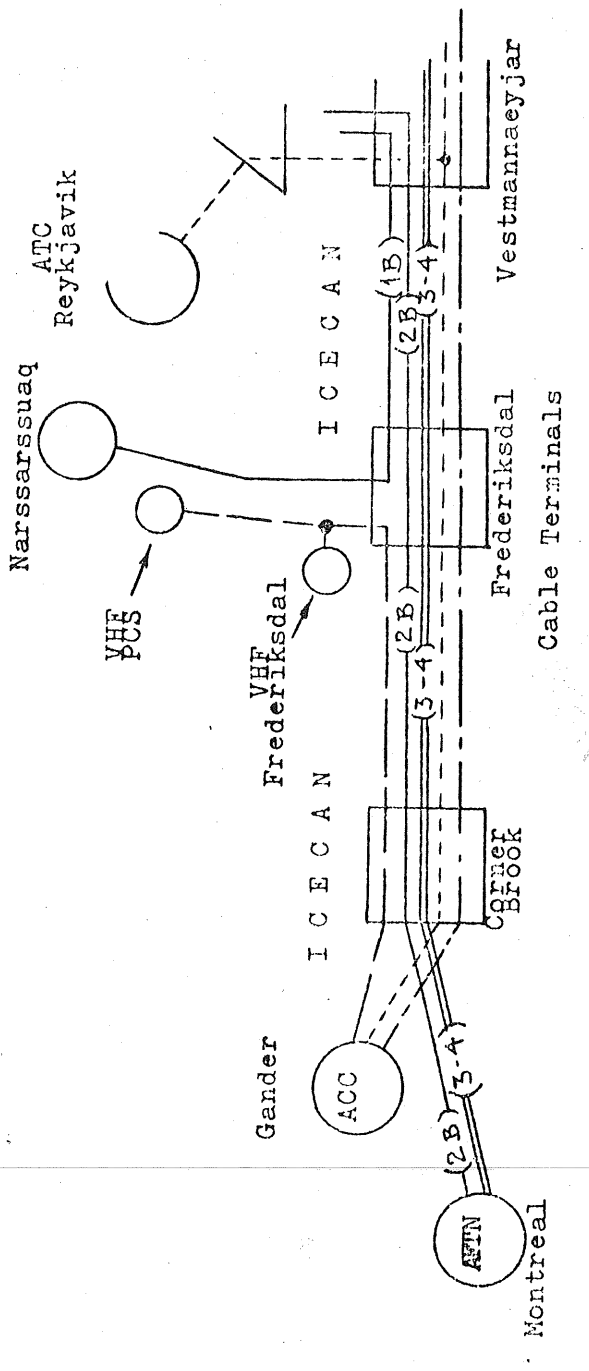

| LEGEND LEGENDE CLAVE | |
|---|---|
| AFS VOICE CIRCUITS ON THE SCOTICE/ICECAN CABLES<br>CIRCUITS TELEPHONIQUES DU AFS SUR LES CABLES SCOTICE/ICECAN<br>CIRCUITOS ORALES AFS EN LOS CABLES SCOTICE/ICECAN | ..... |
| AFTN DX CIRCUITS (75 BAUDS) USING CHANNELS 1 & 2 IN THE SCOTICE CABLE AND CHANNELS 3 & 4 IN THE SCOTICE & ICECAN CABLES<br>CIRCUITS DX DU AFTN (75 BAUDS) UTILISANT LES VOIES 1 ET 2 DU CABLE SCOTICE ET LES VOIES 3 ET 4 DES CABLES SCOTICE ET ICECAN<br>LOS CIRCUITOS AFTN DX (75 BAUDIOS)QUE UTILIZAN LOS CANALES 1 & 2 DE LOS CABLES SCOTICE Y LOS CANALES 3 Y 4 DE LOS CABLES SCOTICE E ICECAN | 1A<br>2A<br>3<br>4 |
| AFTN/AFS SX OMNIBUS CIRCUIT USING CHANNEL 1 OF THE ICECAN CABLE (50 BAUDS)<br>CIRCUIT OMNIBUS SX AFTN/AFS UTILISANT LA VOIE 1 DU CABLE ICECAN (50 BAUDS)<br>EL CIRCUITO OMNIBUS AFTN/AFS SX UTILIZA EL CANAL 1 DEL CABLE ICECAN (50 BAUDIOS) | 1B |
| AFTN DX CIRCUIT USING CHANNEL 2 OF THE ICECAN CABLE (75 BAUDS)<br>CIRCUIT DX DU AFTN UTILISANT LA VOIE 2 DU CABLE ICECAN (75 BAUDS)<br>EL CIRCUITO AFTN DX UTILIZA EL CANAL 2 DEL CABLE ICECAN (75 BAUDIOS) | 2B |
| AERONAUTICAL AND/OR AFTN CENTRE<br>CENTRE AERONAUTIQUE ET/OU AFTN<br>CENTRO AERONAUTICO Y/O AFTN | MONTREAL |
| CABLE TERMINAL<br>TETE DE CABLE<br>TERMINAL DEL CABLE | GAIRLOCH |
| PTT CENTRE<br>CENTRE PTT<br>CENTRO PTT | |

AIS 72/33

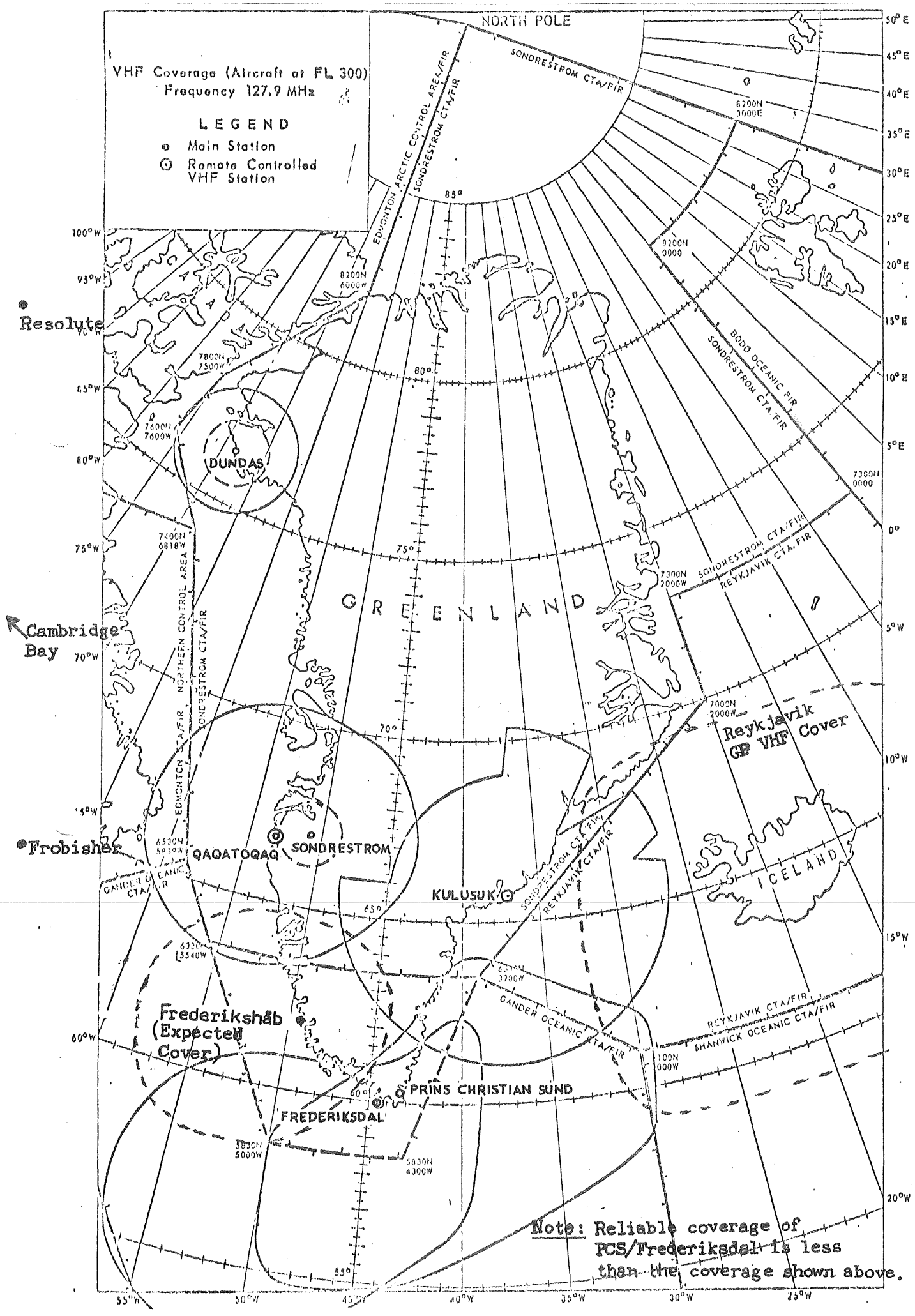
REVISED AERONAUTICAL FIXED SERVICES NETWORK

PROPOSED REVISED CIRCUIT ARRANGEMENTS ON THE ICECAN CABLE SYSTEM

REVISION PROPOSEE DES DISPOSITIONS INTERESSANT LES CIRCUITS DU CABLE ICECAN



# VHF COVERAGE BY STATIONS LOCATED IN GREENLAND AND ICELAND DURING DAYTIME ON 16 JANUARY 1974



Summary of Agenda Item 4 : 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.

## 4.1 Introduction

4.1.1 Under this item, the Group reviewed four specific subjects as follows:

a) the situation and proposed action in order to resolve the LORAN A situation in the NAT Region;

b) developments with regard to the implementation and use of OMEGA;

c) proposed action with regard to the development of minimum navigation performance specifications;

d) amendments to the procedure for the recording and publication of radar-observed deviations from track by aircraft operating in the NAT Region.

## 4.2 The situation and proposed action in order to resolve the LORAN A situation in the NAT Region

4.2.1 At its Eighth Meeting held in February 1972, the NAT/SPG had already noted that the situation with regard to the provision of LORAN A chains in the NAT Region was undergoing certain developments because requirements for their continued use had either diminished or, in some cases, completely disappeared. The Ninth Meeting of the NAT/SPG, held in June 1973, therefore agreed to undertake a detailed study of the situation in order to make proposals for specific action with respect to:

a) the future disposition of the LORAN A chains in the NAT Region;

b) consequential action required in order to find suitable substitutes for navigational guidance so far provided by these chains, should they be withdrawn.

As it was found that the situation regarding the future disposition of LORAN A chains was not exclusively restricted to the NAT Region but also affected the PAC Region, it was realized, at that time, that it was probably not possible to treat this subject in the NAT Region in isolation. This assumption was subsequently confirmed at the ICAO Asia/PAC RAN Meeting held in September 1973, where an appropriate

recommendation for the review of the LORAN A situation on a world-wide basis was formulated so as to ensure co-ordination of world-wide action on this subject (Recommendation 16/2 of the Asia/PAC RAN Meeting refers).

4.2.2 In view of this situation, the ICAO Council has now decided that a meeting dealing with this subject should be held in November 1974 and that this meeting should review the LORAN A situation both in the NAT and in the PAC Regions, the two regions primarily affected. It was also expected that the NAT/SPG would make a contribution to this meeting by stating its views on possible future action with regard to the NAT Region.

4.2.3 The work undertaken by an ad hoc Working Group of the NAT/SPG, established at its Ninth Meeting, to make a more detailed study of the situation and of certain developments having occurred since the Ninth Meeting has now led to a situation enabling the NAT/SPG to arrive at a number of specific proposals for action in the NAT Region, and these are described below in more detail.

Present and expected situation with regard to the need for LORAN A derived navigational guidance

4.2.4 Further studies conducted by the Working Group established at the Ninth Meeting of the NAT/SPG, and also by some of the Provider States on a national basis, have confirmed that there were, at present, some 200 aircraft used in international civil air transport operations which were likely to be engaged in NAT operations between Europe and North America and relying, for the conduct of such operations, on LORAN A derived navigational guidance. It was also found that planning by the operators concerned seemed to indicate that a number of aircraft still relying on LORAN A as one of the major sources for navigation in the NAT Region would only fall below appreciable numbers by the latter part of 1977, when it might be likely that they would constitute fewer than 10 percent of the total aircraft operating in the NAT Region. It was, therefore, agreed that a reasonable date for the withdrawal of LORAN A chains in the NAT Region should specify some time towards the end of 1977 and not before. In this respect, it was fully realized that the above statement was based exclusively on considerations regarding the situation in the NAT Region and did not take account of questions such as fleet utilization by operators operating on a world-wide scale, and other factors having an influence on the world-wide position.

Operation of LORAN A stations in the NAT Region

4.2.5 It was noted that, ever since LORAN A had been introduced as a means of navigation in the NAT Region, the aeronautical service provided for this purpose had served not only civil requirements but had also been largely used by the military. As a consequence, the provision of LORAN A chains had been a mixed responsibility, some stations being supported exclusively by civil funds, others by national military funds, and still others by funding provided through international military agreement. In considering this situation, the Group agreed

that it would not take into account certain LORAN A stations which, in the past, had served exclusive military purposes and whose disposition was, therefore, either a purely national military responsibility of the States in whose territory the respective stations were located or of international military agreement if the stations concerned had functioned under those terms. The Group therefore concentrated its review primarily on those stations at present contained in the Regional Plan of Navigation Aids in the NAT Region, and this regardless of the terms under which the respective stations were funded. A listing of these stations and a chart showing their location is contained in Appendix A.

Civil Aviation Funded LORAN A Stations

4.2.6 The Group noted that, with the exception of the station located at Porspoder in France, the funding of all civil aviation funded LORAN A stations providing services in the NAT Region was assured until the end of 1977. (For the future dispositions of the Porspoder station, see paras. 4.2.8 to 4.2.11 below.)

National and Military Funded Stations

4.2.7 With regard to LORAN A stations included in the NAT Regional Plan, funded either by other national funds or by international military agreement, the Group noted that the funding of stations funded from national sources appeared also to be assured up to the end of 1977. However, with respect to those stations funded by international military agreement, the situation was not yet clear, since a decision on this subject in the appropriate military forum was still pending. The stations concerned were:

a) Sandur in Iceland and Kutdlek and Orssuiagssuaq in Greenland forming rates 1L4 and 1L5 respectively; and

b) Sagres Point in Portugal, Porto Santo in Madeira, and Santa Maria and Flores in the Azores, forming rates 1S5, 1S6 and 1S7 respectively.

Rationalization of the existing LORAN A stations

4.2.8 The Working Group, established at the Ninth Meeting of the NAT/SPG, had found that, as regards the rationalization of the existing LORAN A stations, there appeared to be only one possibility. This concerned the elimination of LORAN A station Porspoder in France from the chain formed by East Blockhouse in the United Kingdom, Porspoder in France, and El Ferrol in Spain, now providing rates 1S3 and 1S4 and providing a new single rate based on the stations East Blockhouse and El Ferrol only.

4.2.9 Trials conducted by the United Kingdom in collaboration with those operators using LORAN A for navigational guidance in the

area covered by rates 1S3 and 1S4 indicated that the elimination of Porspoder and subsequent rearrangement into a single rate provided by stations East Blockhouse and El Ferrol would not result in any reduction of the area of LORAN A coverage as compared with the present configuration, and, apart from the removal of one of the available sets of LORAN A position lines in the South Eastern part of the NAT Region, would not have any significant detrimental effects on the navigational accuracy or track checking capability in that area.

4.2.10 Complementary to the above, the Group also noted that, at present, the funding for the continued operation of LORAN A station Porspoder was only assured up to and including June 1975 at the latest, and that the general state of the equipment at Porspoder was such that, if continued operation until the end of 1977 was required, a complete replacement of the entire transmitting equipment and the antenna array would be necessary with the associated considerable investment cost over and above the normal current operating costs. It was, therefore, felt that this was one further point which advocated in favour of the withdrawal of the station from service.

4.2.11 As to the consequences of the withdrawal of the Porspoder station, the Group noted that this would require substantial improvements to the equipment (rubidium standards, etc.) of the two remaining stations at East Blockhouse and El Ferrol, the possible provision of a communications link between the two stations to ensure possibilities for the maintenance of synchronization between them, and obviously the availability of new LORAN A navigation charts showing the revised hyperbolic pattern. As it was not possible, at this time, to resolve all those problems, especially in view of the fact that one of the States concerned with this rearrangement, Spain, was not present at the Meeting, it was agreed that this matter should be left to earliest possible co-ordinated action between the interested parties, i.e. France, Spain, the United Kingdom and the USA. It was considered, however, that such action could be completed within the next four to five months and it was, therefore, felt that States should try and meet a target date in December 1974 for the definite withdrawal of Porspoder and, if this was not possible, a date which in any case should not be later than some time in June 1975.

4.2.12 Further trials conducted with the aim to assess the effects of the elimination of rate 1S5 provided by the LORAN A station in Sagres Point in Portugal and Porto Santo in Madeira were not conclusive because of diverging views on the effects which the elimination of this rate could have on the navigational situation in the present area of coverage of that rate.

4.2.13 It was, therefore, agreed that the rearrangement regarding the present rates 1S3 and 1S4 described in para. 4.2.9 above should be undertaken on the assumption that rate 1S5 would continue in operation until the agreed date for the general withdrawal of LORAN A coverage in the NAT Region.

Contingency plan in case of premature withdrawal of LORAN A facilities

4.2.14 Even though the Group was unanimous in its views that ways and means would have to be found to maintain LORAN A facilities serving international civil purposes in the NAT Region in operation until at least some time towards the end of 1977, it nevertheless felt that it would be prudent to review the various possibilities which existed for the preparation of a contingency plan in case those stations listed in para. 4.2.7 above were withdrawn prior to the end of 1977.

4.2.15 Having regard to the location of the LORAN A stations whose continued operation is at present not yet confirmed, it is evident that their withdrawal would also render those civil aviation funded stations to the East or West of the NAT Region useless, because their continued operation would not, by themselves, provide adequate navigational guidance. It would, therefore, have to be expected that, if the military funded stations providing rates 1L4, 1L5, 1S5, 1S6 and 1S7 were withdrawn, this would create a situation where aircraft relying on Doppler navigation supplemented by LORAN A would find themselves with significantly reduced navigational guidance between about 20°W and 45°W in the NAT Region. While position lines might be obtainable from other remaining LORAN A rates, these would not be adequate to ensure sufficiently precise fixing in order to update the Doppler navigation system mentioned above for as much as three hours of flight time by turbo-jet aircraft in the affected area. It would, therefore, have to be expected that both the usual lateral deviations and the occurrence of large lateral errors in navigation would increase to a point where the present standards of lateral separation applied in the NAT Region would no longer be safe. In addition, it was not believed that alternate means of navigation, such as astro-navigation, etc. could compensate for this lack in Doppler cum LORAN A navigational guidance and thus maintain the present standard of navigational accuracy.

4.2.16 A recent review of the aircraft operating regularly in the NAT Region has indicated that, at this time, 60 percent of these aircraft are equipped with INS while approximately 40 percent are still using Doppler navigation combined with LORAN A. While it is recognized that the INS-equipped aircraft would not be affected by the withdrawal of LORAN A, it was nevertheless believed unacceptable to either:

a) penalize only the Doppler/LORAN A-equipped aircraft exclusively, assuming that this was operationally feasible;

or

b) impose the operational penalties resulting from withdrawal of LORAN A on all aircraft operating within the system.

It was, therefore, felt that, in the case of withdrawal of LORAN A, even if any contingency plan afforded a certain degree of preferential treatment to those aircraft not depending on Doppler/LORAN A navigation, their complete escape from any resultant consequences could not be avoided, especially in view of the fact that complete segregation of the two types of traffic could hardly be achieved.

4.2.17 In the light of the above, three possibilities for a contingency plan were considered:

a) vertical segregation between INS-equipped aircraft and other traffic;

b) a revised, generally applicable system for the organization of the flow of traffic where INS-equipped and other traffic was mixed indiscriminately;

c) a lateral segregation between INS-equipped aircraft and other traffic.

4.2.18 Vertical segregation of traffic into INS-equipped aircraft and other traffic envisaged that:

a) INS aircraft would operate on FL 330 and above, with 60 NM laterial separation between adjacent tracks and 15 minutes longitudinal separation. An alternative could also envisage that the 60 NM lateral separation be supplemented by 1,000 feet vertical separation between adjacent tracks;

b) between FL 270 and FL 310, a mixture of INS-equipped and other aircraft would be accepted, however, with a proviso that 180 NM lateral separation would be provided between adjacent tracks or 120 NM lateral combined with 1,000 feet vertical separation, and 20 minutes longitudinal separation in order to account for the possible reduction in longitudinal accuracy of non-INS-equipped aircraft;

c) at FL 260 and below only non-INS-equipped aircraft, including turbo-prop aircraft would be accomodated with a lateral separation of 180 NM between adjacent tracks and 30 minutes longitudinal separation.

4.2.19 While this proposal appeared to be very attractive regarding East-bound flights, it was noted that it would have severe shortcomings for its application to West-bound flights, because INS-equipped aircraft required in accordance with para. 4.2.18 a) to operate at higher flight levels are frequently not able to reach those levels prior to entry into the NAT Region because of the comparatively short distance between their departure aerodrome and NAT entry points.

4.2.20 Another system (para. 4.2.17 b) refers) envisaged that the present composite separation of 60 NM and 1,000 feet would be abolished and would be replaced by a composite separation of 120 NM lateral combined with 1,000 feet vertical separation in the Central and Northern part of the NAT Region. In the remainder of the Region, 180 NM lateral separation would be applied throughout.

4.2.21 Investigations conducted by the United Kingdom have shown that the application of this system would extend the width of the organized track system as compared to the present system by 120 to 180 NM with the resultant increase in mileage required to be flown by aircraft finding themselves operating on the peripheral tracks of the system.

4.2.22 A laterally segregated system, as mentioned in para. 4.2.17 c) above, would be based on the use of 60 NM lateral separation combined with 1,000 feet vertical separation between tracks used exclusively by INS-equipped aircraft, while non-INS-equipped aircraft in the organized track system would operate on tracks separated by 120 NM lateral separation combined with 1,000 feet vertical separation. Any aircraft operating outside the organized track system would be provided with 180 NM lateral separation.

4.2.23 The application of this system was expected to result in only a slight extension of the overall width of the organized track system but there were a number of operational constraints which would lead to severe economic consequences for operators.

4.2.24 In any case, the Group was unanimous in its views that any of the systems chosen, or any other possible alternatives, would invariably result in a considerable complication of the task of the ATC services, both as regards the establishment of the organized track system and the handling of individual flights operating within, adjacent to or outside of such a system.

Estimated additional costs for the application of a contingency plan

4.2.25 The United Kingdom member presented to the Group calculations which had been done in order to assess the possible additional costs to operators now relying on Doppler/LORAN A navigation in the NAT Region, resulting from the premature withdrawal of LORAN A stations in the NAT Region. As an example, these calculations indicated that non-INS-equipped aircraft would, after withdrawal of the LORAN A facilities and application of the contingency system described in para. 4.2.17 c) above, complete an average of 200 to 250 air NM more per flight on each North Atlantic crossing. Similar values might also occur in the other systems. When adding this figure to the normal sector times, and fuel burn-off of a typical NAT operation with an aircraft of the type B707, and estimating

that non-INS-equipped aircraft would, in mid-1975, still constitute approximately 30 percent of the total aircraft operating across the North Atlantic, this would result in some US$ 17 million additional costs per annum to the operators concerned in fuel costs alone.

4.2.26 If one adds to this the additional time costs resulting from the additional mileage flown, i.e. some US$ 7.5 million per annum, it was expected that the total additional annual costs to operators operating non-INS-equipped aircraft in the NAT Region would, after the withdrawal of LORAN A facilities, amount to some US$ 25 million, i.e. twelve to fifteen times the cost required to keep the LORAN A stations in question in operation for one year.

4.2.27 It was noted that the above figures were rather conservative estimates and that, should the case arise, the actual costs could be appreciably higher.

Conclusions

4.2.28 In the light of the above, the Group:

a) agreed that ICAO should be informed of the Group's view that the date for the withdrawal of LORAN A facilities in the NAT Region should be specified as being 29 December 1977;

Note : It was noted that IATA reserved its position with respect to this date until such time as it had had an opportunity to establish a world-wide position on this subject amongst its Member airlines, and that this was likely to be done before the Special NAT/PAC (LORAN A) RAN Meeting 1974;

b) expressed the sincere hope that all States and Agencies concerned would, as a matter of urgency, ensure the continued operation of those LORAN A stations providing rates 1L4, 1L5, 1S5, 1S6 and 1S7 until the end of 1977. In addition, it stressed that a decision to this end must be reached well prior to the Special NAT/PAC (LORAN A) RAN Meeting 1974, and, if possible, before 31 July 1974;

Note : If, contrary to expectations, the decision were unfavourable, and funding based on international military agreement ceased at the end of 1974, it would be essential for action to be taken as follows:

The States directly concerned should, at as early a date as possible co-ordinate measures for the continued operation of the stations concerned after 1 January 1975, in the expectation that the Special Meeting, based on their joint proposals, would agree a scheme for international financial support of the operation of the stations after that date:

i) until 29 December 1977; or

ii) in any case, at least until the date by which an agreed contingency plan could be put into operation.

c) requested France, Spain, the United Kingdom and the USA to enter into earliest possible negotiations in order to reach agreement on any necessary action required to permit withdrawal of LORAN A station Porspoder in France, and the establishment of a new LORAN A rate provided by the stations East Blockhouse and El Ferrol. This action should cover:

i) necessary technical modifications to the two remaining LORAN A stations to permit their satisfactory operation, including, in particular, the time pulse synchronization systems;

ii) possible provision of an adequate communications link between the two remaining stations;

iii) production of revised LORAN A coverage charts based on the new rate;

iv) publication of appropriate aeronautical information publications announcing the intended action.

Note : It was noted that the target date for the completion of this action should, by all possible means, be arranged so that Porspoder station can be permanently withdrawn on 5 December 1974 or, if this is not possible, at any suitable AIRAC date thereafter but in any case not later than 19 June 1975.

d) invited Canada and the United Kingdom to pursue, in collaboration with other Provider States and the operators concerned, preparations regarding the application of a contingency plan, in order to cater for the unlikely event that certain military-funded LORAN A stations would be withdrawn from service before the end of 1977.

4.3 Developments with regard to the implementation and use of OMEGA

4.3.1 Further to the information provided to the Group at its Ninth Meeting in 1973 on the installation and test programme of OMEGA, the Group was informed that testing of this new navigation aid was continuing with promising results. It was also noted that, apart from test aircraft in the USA, an aircraft in the United Kingdom had recently been equipped with OMEGA airborne equipment and an airline was engaged in service trials of that system. In this respect, the United Kingdom member of the Group expressed the hope that all those involved in the evaluation of OMEGA would arrange for a free exchange of results obtained so as to ensure that each of the parties concerned was aware of the others' experience.

4.3.2 With regard to the implementation of OMEGA ground stations, it was noted that both the stations at Hawaii and Japan were expected to go into operation by the third quarter of 1974 and that it was then expected to have complete OMEGA coverage throughout the Northern hemisphere. With regard to airborne OMEGA equipment, developments on the production of low priced equipment were progressing satisfactorily. However, the expected withdrawal of LORAN A stations by the end of 1977 will add to the need for the availability of suitable OMEGA airborne equipment before that date as one possible replacement for LORAN A.

4.3.3 With regard to the testing of OMEGA under actual conditions, the Group stated that it was primarily interested in obtaining valid information on:

a) performance of airborne equipment in routine commercial operations;

b) the performance of OMEGA at latitudes above 60°N;

c) the effects of ionospheric disturbances on OMEGA propogation characteristics and its influence on the continued and reliable provision of OMEGA-derived navigation information to the pilot.

4.3.4 It was also noted that the question regarding user charges for use of this aid, which had already been raised at the Ninth Meeting of the Group, still remained unresolved.

Conclusions

4.3.5 In the light of the above, the Group did not draw any firm conclusions with regard to this subject other than to request States to be kept currently informed of any results achieved with the evaluation of the OMEGA navigation system.

4.4 Proposed action with regard to the development of minimum navigation performance specifications

4.4.1 Under this item, the United Kingdom provided the Group with information on planned amendments to the U.K. legislative procedures regarding the carriage of a flight navigator and/or the carriage of navigation equipment appropriate to the area wherein the flight operations are intended to be conducted. This was closely related to discussions held at the Ninth Meeting of the Group, and which resulted in two conclusions:

a) that States of registry ensure that operators authorized by them to conduct NAT operations carried adequate operational equipment to do so;

b) that action should be taken to develop, at the earliest possible time, an appropriate Regional Air Navigation agreement establishing minimum navigation performance specifications for aircraft intending to operate in the NAT Region;

Note : Para. 3.16 a) and b) of NAT/SPG/9 Summary refers.

As it was now possible that some time in the latter part of 1975, the Ninth Air Navigation Conference of ICAO would be held containing, in its Agenda, an item which would be appropriate to this problem, the Group felt that arrangements should be made to have a further detailed discussion of this subject at its next Meeting in order to determine whether a contribution could be prepared by the NAT/SPG for submission to this Conference.

4.4.2 It was therefore agreed to retain a suitable item for inclusion in the Agenda of the next Meeting of the NAT/SPG and members of the Group were invited to prepare appropriate supporting documentation on this subject at the earliest possible time for circulation prior to the next NAT/SPG.

Conclusion

4.4.3 The Group agreed that:

a) an item dealing with the development of minimum navigation performance specifications should be retained for inclusion in the Agenda of the next Meeting of the NAT/SPG;

b) members should prepare, to the extent possible, supporting documentation on the subject mentioned under a) above, for circulation prior to the next Meeting of the NAT/SPG so that a decision can be taken at that Meeting as to whether a contribution should be made to the Ninth AN Conference on this subject and, if so, in what form.

4.5 Amendments to the Procedure for the recording and notification of radar-observed deviations from track by aircraft operating in the NAT Region

4.5.1 Under this item the Group was presented with a proposal by IATA which envisaged that, in addition to the existing procedures for the recording, notification and publication of radar-observed deviations from track by aircraft operating in the NAT Region, the procedures should be extended as follows:

a) that pilots of aircraft observed on radar to be 20 or more miles off track be advised immediately by the Air Traffic Controller concerned on the appropriate air-ground communication channel;

b) that each Administration collecting information on radar-observed deviations provide operators concerned, at monthly intervals, with a list of those of their flights which had been observed to be between 20 and 29 NM off track.

4.5.2 With regard to the latter provision, it was specified that this was in no way intended to replace the present procedures whereby observed errors of 30 NM or more were brought to the attention of the operator concerned within twenty-four hours of the time the incident occurred.

Conclusion

4.5.3 After considerable discussion, which mainly centred around the increased workload which the above provisions could cause to the Air Traffic Control services, it was agreed that, whenever possible, pilots of aircraft who were found to be offtrack as observed on radar, by 20 NM or more, would be informed immediately by the Air Traffic Controller concerned on the appropriate air-ground communication channel.

4.5.4 In addition, States concerned agreed that, as far as this was practicable, they would provide operators with monthly lists of radar-observed deviations of 20 NM or more of their aircraft, on the understanding that the immediate notification procedure in respect of deviations of 30 NM or more would remain in force and would take priority if, because of workload considerations, both procedures could not be applied on a continuing basis.

# NAT REGION - LORAN A NAVIGATION FACILITIES

## OPERATING AND FINANCING ARRANGEMENTS

1. Stations contained in the ICAO NAT Air Navigation Plan (Doc. 8755/6)

| | Station | Rate/ PRR | Operated by | Financed by |
|---|---|---|---|---|
| 1. | Hobe Sound | 3L1 | US Coast Guard | US Coast Guard |
| 2. | Folly Is. | 3H6 | " | " |
| 3. | Cape Hatteras | 3H4 | " | " |
| 4. | Nantucket* | 3H5 | " | " |
| 5. | Sandy Hook | | " | " |
| 4. | Nantucket* | 1H3 | " | " |
| 6. | Baccaro | 1H2 | Canada (DOT) | Canada (DOT) |
| 7. | Deming | 1H1 | " | " |
| 8. | Port-aux-Basques | | " | " |
| 9. | Bonavista | 1L3 | " | " |
| 10. | Battle Harbour | 1L2 | " | " |
| 11. | Narsak | | Denmark (Lighthouse service) | Danish JF agreement |
| 12. | Kutdlek | 1L5 | " | Intl. military funding agreement |
| 13. | Orssuiagssuaq | 1L4 | " | " |
| 14. | Sandur | | Iceland (PT + T) | " |
| 15. | Vik | 1L7 | " | Icelandic JF agreemt. |
| 16. | Skuvanes | 1L6 | Denmark (Lighthouse service) | Danish JF agreement |
| 17. | Mangersta | | UK (CAA) | UK (CAA) |
| 18. | East Blockhouse | 1S3 | UK (MOD) | UK (CAA) |
| 19. | Porspoder | 1S4 | France (Navy) | France (SGAC) |
| 20. | El Ferrol | | US Coast Guard (for Spain) | US-Spanish funding agreement |

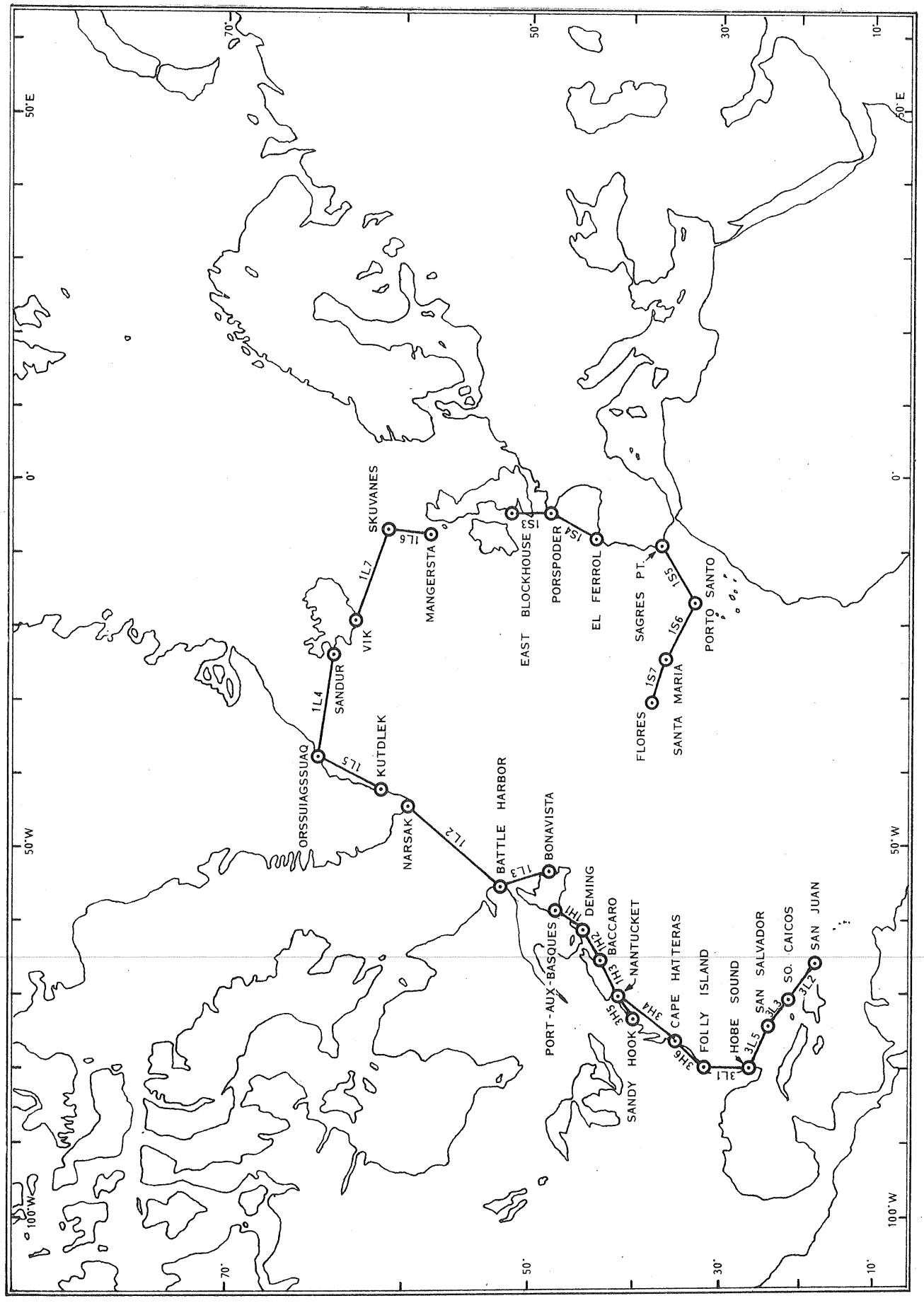
* Nantucket linked with Baccaro, Sandy Hook and Cape Hatteras.

| | Station | Rate/ PRR | Operated by | Financed by |
|---|---|---|---|---|
| 21. | Sagres Pt. | 1S5 | Portugal (Navy) | Intl. military funding agreement |
| 22. | Porto Santo | | " | " |
| 23. | Santa Maria | 1S6 | " | " |
| 24. | Flores | 1S7 | " | " |

2. Rates not contained in the ICAO NAT Air Navigation Plan but used by civil aviation

| | Station | Rate/ PRR | Operated by | Financed by |
|---|---|---|---|---|
| 1. | Hobe Sound | 3L5 | US Coast Guard | US Coast Guard |
| 2. | San Salvador | | " | " |
| 3. | South Caicos | 3L3 | " | " |
| 4. | San Juan | 3L2 | " | " |

Location of LORAN A facilities in the NAT Region at present included in the NAT Regional Plan



Summary of Agenda Item 5 : Review of the concept of the NAT organized track system and the procedures used for its establishment.

## 5.1 Review of the present system

5.1.1 As expected at the Ninth Meeting of the NAT/SPG in June 1973, the United Kingdom, based on continued monitoring of air traffic operating in the organized track system, had informed other interested States and International Organizations that the general level of navigational performance had, by December 1973, improved to a point where it was possible to revert to normal lateral separation between opposite-direction flights at the same flight level. The United Kingdom member now presented the Group with data confirming the validity of this position and the Group seized this opportunity to express its appreciation to operators for the effort made by them in order to improve their navigation performance.

5.1.2 At the same time, the Group was presented with material from its members from the Netherlands, which contained a review and analysis of latest actual performance data provided by Ireland and the United Kingdom with respect to air traffic operating in the Shannon area.

5.1.3 When reviewing this material, it was noted that there was a clearly discernable trend towards a continuous decrease of both the total number of lateral deviations from track by 20 NM or more, and of the comparatively rare cases of deviation from track of 60 NM or more. It was also noted that the number of large errors had decreased at a much slower rate than the smaller errors and that it was unlikely that, regardless of the navigation environment available and the procedures applied, such large errors could ever be completely avoided.

5.1.4 In any case, the Group was confident that the present separations would remain safe until at least 1977, provided that the present navigation performance was maintained. It was also noted that in a track system in which navigation was based on INS or on systems with comparable performance and reliability, appreciable reductions in lateral separation could be feasible.

## 5.2 Revised concept of the organized track system

5.2.1 Based on discussions at the NAT V RAN Meeting, held in 1970, the Canadian member, in 1972, had suggested that, based on material submitted by members, it might be useful for the NAT/SPG to take a look at the concept underlying the NAT organized track system, in order to see whether any improvement could be made, by developing, for example, a semi-fixed track system. As there had been no opportunity to review this subject in any detail at the Ninth Meeting of the NAT/SPG in 1973, because of other, more pressing, requirements, the subject had been retained for this Meeting of the Group. As none of

the members had been in a position to prepare any supporting material on this subject, and because of developments created by the fuel situation (see item 7.2 below) which have resulted both in a slow-down or an outright reduction of traffic growth, and an increased sensitivity by operators to fuel consumption, the Group felt that there was, at this time, comparatively little use in pursuing this subject, especially in view of the fact that the organized track system appeared to function fairly satisfactorily.

Conclusion

5.2.2 The Group felt that there was little use in pursuing this subject at this time, and therefore agreed that it should be removed from the work programme until such time as one of its members wished to bring it forward again, based on appropriate supporting documentation.

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Summary of Agenda Item 6 : Development of proposals for Regional Supplementary Procedures covering SST operations in the NAT Region.

## 6.1 Introduction

6.1.1 When considering this item, the Group took into account material which had been prepared at its Fifth Meeting in 1968 and which had subsequently been reviewed and adopted by the NAT V RAN Meeting 1970, as well as work which had been done in the meantime by the SST Panel. In addition, it had before it supporting documentation, provided primarily by the United Kingdom member, which dealt with various aspects of SST operations and the development of Regional Supplementary Procedures.

6.1.2 In conducting its review of this item, the Group agreed that this should be done under the following main headings:

a) general considerations relating to the development and presentation of Regional Supplementary Procedures covering SST operations in the NAT Region;

b) specific proposals for SST SUPPS in the NAT Region;

c) additional material relevant to the conduct and handling of SST operations in the NAT Region.

## 6.2 General considerations relating to NAT Regional SUPPS

### Need for and concept of NAT Regional SUPPS

6.2.1 The Group was of the opinion that, in order to cover Provider States adequately when providing services to SST operations in the NAT Region, it would be essential to have adequate Regional Supplementary Procedures included in Doc. 7030 for this purpose from the beginning of commercial SST operations in that Region. In addition, this was also believed essential in order to ensure that SST operations would be conducted from the start in accordance with a common concept and uniform procedures.

6.2.2 It was, however, realized that the substance of Regional SUPPS developed at this time for SST operations would, by necessity, be of a provisional nature at the start, and that only practical experience gathered with such operations could either confirm the procedures developed or indicate the need for their amendment. In any case, the Group, when proposing procedures, and especially those affecting the status of SST operations, made rather a conservative approach at this time in order to avoid any possible risk to such flights in their initial stages. This applied particularly in the case of the separation minima adopted for the aircraft (see also paras. 6.3.4 and 6.3.8 below).

6.2.3 In any case, it was expected that Provider States concerned with the provision of services to SST aircraft would closely monitor their performance in order to obtain adequate performance data and detect, at the earliest possible time, any needs for changes of the procedures applied with respect to them, including the possibility of their improvement.

Presentation of NAT SST SUPPS in Doc. 7030

6.2.4 On previous occasions, the Group had commented on the fact that, especially as far as NAT Regional SUPPS were concerned, the presentation chosen by ICAO in Doc. 7030, i.e. the presentation of SUPPS applicable in each Region but treating the same subject, was not relevant to their direct application by either ground services or operators. So far this situation had been accepted because changes to the NAT SUPPS were comparatively few and spaced at long intervals, but the national procedures developed by the Provider States had largely absorbed them, thus reducing Doc. 7030 to a status where it was primarily used by planners and not by executive personnel. The fact that it was now intended to create new SUPPS catering for aircraft with significantly different operating characteristics when compared with those of aircraft now in service, and resultant new operational requirements, handling procedures by ATC, etc. made it, however, appear desirable to reopen discussion on this subject and to propose that serious consideration be given by ICAO to presenting Regional Supplementary Procedures in such a manner that those applicable in one particular Region be presented in a consolidated form for that Region only, and that, in the case of the NAT Region, this presentation be separated into:

a) generally applicable SUPPS;
b) those applicable to subsonic aircraft;
c) those applicable to SST aircraft.

Conclusions

6.2.5 The Group requested that ICAO give serious consideration to the rearrangement of ICAO Doc. 7030 in such a manner that Regional Supplementary Procedures applicable in one Region be presented in a consolidated form for that Region alone, and that, for the NAT Region, such a consolidated presentation be sub-divided into:

a) one generally applicable to all aircraft;

b) one concerning additional SUPPS for subsonic aircraft;

c) one concerning additional SUPPS applicable to SST aircraft.

## 6.3 Specific proposals for NAT SST SUPPS

### General

6.3.1 In presenting the NAT SUPPS covering SST operations, the Group followed the sequence of presentation now shown in Document 7030, on the understanding that, in accordance with the views expressed in para. 6.2.4 above, this did not imply approval of the present form of Document 7030.

6.3.2 It was expected that, once the Regional SUPPS were incorporated in Document 7030, the ICAO Secretariat would take necessary measures to ensure their correct placing in the document, including paragraph numbering and necessary cross references, based on the decision regarding the future presentation of Document 7030 in general.

### Lateral separation

6.3.3 Based on data regarding the navigation equipment expected to be available in the commercial SST aircraft, and performance data regarding such equipment as to accuracy and reliability (much of which has already previously been considered either by the ICAO SST Panel or by other groups concerned with SST operations), the Group noted that, if the target level of safety now used for the determination of lateral separation standards for subsonic aircraft in the NAT Region was applied, a mean lateral separation of 30 NM would be adequate if 20,000 SST operations per year were conducted in the NAT Region. As indicated in the summary of Agenda Item 1, the NAT Traffic Forecasting Group envisaged, however, that only some 8,800 SST flights per year would be conducted in the NAT Region by 1978. However, applying the approach mentioned in para. 6.2.2 above with regard to the development of new SUPPS for SST aircraft, the Group agreed that a minimum lateral separation of 60 NM should be applied between such aircraft.

### Conclusion

6.3.4 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Lateral separation

X.1 Minimum lateral separation between SST aircraft shall be 60 NM.

X.2 Tracks established in the NAT Region for SST aircraft and spaced by 1° of latitude shall, in no case, provide for a change of latitude in excess of 3° between successive points spaced at intervals of 10° of longitude."

Longitudinal separation

6.3.5 When considering this subject, the Group had also access to information and data which had already been reviewed by other bodies. In addition, latest data concerning the performance of INS-equipped aircraft had also been incorporated in the documentation presented for consideration of the question of longitudinal separation. From this data, it became apparent that, because of the limited time that aircraft were operating outside radar coverage between entry into and exit from the NAT Region, it would not only be possible to reduce the general longitudinal separation minima, applicable between SST aircraft, but also to obtain further reductions with respect to two SST aircraft being separated longitudinally and following the same or continuously diverging tracks. In addition, it was noted that, in this particular case, and because of the initially expected small variations in operational performance between SST aircraft in supersonic flight, it would be possible to determine the minimum longitudinal separation for the exit point from the NAT Region and determine the conditions required at entry in order to ensure that the "exit minimum" was never infringed.

6.3.6 Calculations made by France and the United Kingdom based on SST flights so far conducted shows that it would be possible to specify, for the above-mentioned case, a minimum longitudinal separation, at exit from the NAT Region, of 5 minutes, provided the two aircraft concerned were spaced at a ten-minute interval upon entry into the NAT Region over the same entry point. The Group also considered a French proposal to apply reduced longitudinal separation between two SST aircraft on the same track based on the increased accuracy of their forward estimates due to shorter time exposure and reduced wind effect. However, it was felt that further study within the Group and experience would be required before a definite method based on this concept might be proposed for use within the Region.

6.3.7 Once more, conscious of the need for caution and taking into account that those not directly concerned with SST operations had not yet had sufficient opportunity to convince themselves of the validity, under all operating conditions, of the data forming the basis of the above proposal, the Group, after considerable discussion and noting the need to provide a compromise with the views expressed by IFALPA, had agreed that at this time the minimum longitudinal separation between successive aircraft operating along the same track should be 8 minutes, and that, in order to ensure this separation at exit from the NAT Region, the spacing of the aircraft in question at entry should not be less than 12 minutes.

Conclusion

6.3.8 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Longitudinal separation

X.1 Minimum longitudinal separation between SST aircraft in supersonic flight shall be:

a) 15 minutes, except as indicated in b) below;

b) 8 minutes, provided that:

i) both aircraft are in level flight at the same Mach number or are conforming to the same cruise-climb parameter;

ii) the aircraft concerned have reported over the same entry point into the oceanic controlled airspace with a time interval of at least 12 minutes confirmed by radar observation, and follow the same or continuously diverging tracks.

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

Vertical separation

6.3.9 No new material having become available since the subject of vertical separation was first discussed within the NAT/SPG in 1968, the Group agreed that the assumptions made at this time and confirmed by the NAT V RAN Meeting in 1970 were still valid. It therefore agreed that vertical separation shall be considered to exist between two SST aircraft if they are operating at levels which differ by at least 4,000 feet.

Conclusion

6.3.10 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Vertical separation

X.1 Vertical separation between SST aircraft in supersonic flight shall be considered to exist if the flight levels of the two aircraft, as reported by the pilots concerned or as indicated by SSR Mode C derived information, differ by at least 4,000 feet."

Flight plans and clearances

6.3.11 The Group agreed that, in addition to existing provisions regarding the contents of flight plans applicable to all flights in the NAT Region, the following additional provisions regarding flight plans for SST flights should be included in the NAT Regional SUPPS in the appropriate form:

a) information regarding the type of aircraft;

b) supplementary information regarding the speed;

c) information regarding the flight level used;

d) information on the route of flight;

e) other information.

6.3.12 With respect to a) above, the Group noted that no aircraft type designator was yet included in ICAO Doc. 8643 for uniform use in flight plans and by ATC. It was, therefore, agreed that, with respect to "Concorde", earliest possible action should be taken by either France or the United Kingdom in order to have an appropriate designator inserted in ICAO Doc. 8643.

Conclusion

6.3.13 The Group requested that either France or the United Kingdom take necessary action with ICAO to have an approved designator for the "Concorde" SST aircraft included in ICAO Doc. 8643.

Speed

6.3.14 With regard to 6.3.11 b) above, the Group agreed that, in addition to the cruising speed, information should be also provided under item 15 of the flight plan form on the mean speed achieved during acceleration, and that this speed should be indicated in the form of a mach number. In addition, information should be provided on the cruising speed used during subsonic flight.

Flight level

6.3.15 With regard to the inclusion of flight levels under item 15 of the flight plan form, it was agreed that, for that operation where the aircraft was in cruise-climb, the maximum flight level expected to be reached at the end of each significant portion of the flight should be indicated, and that flight level indications in the flight plan related to the cruise-climb portion of the flight should be followed by the suffix 'C', e.g. "F520C". This should be supplemented by the indication "cruise-climb" in item 18 of the flight plan to indicate clearly that the aircraft intends to fly the cruise-climb technique.

Route of flight

6.3.16 As to the description of the route of flight, it was agreed that, if the flight follows an organized track, especially for SST aircraft in the NAT Region, it would be sufficient if, under item 15 of the flight plan form, reference was made to the designator of such a route (for details regarding the designation of such routes, see para. 6.3.28 below). As to the description of the route for other flights, it was agreed that, where existing provisions were not suitable, this should, at least initially, be left to arrangements between the operators and the ATC units concerned, on the understanding that the descriptions of the route under item 15 of the flight plan form would have to be so as to permit ATC units concerned to clearly identify the route intended to be flown.

6.3.17 In addition, information would have to be provided on the intended acceleration point and on the desired point where deceleration was intended to be commenced. This latter information was considered to be of particular significance since the clearance provided to the flight in question would have to specify this point as the clearance limit for the supersonic phase of flight so that, in case of radio communication failure prior to reaching that point, SST aircraft could resume operation in accordance with their filed flight plan from that point onward.

Other information

6.3.18 For West-bound flights departing from Europe, it was agreed that, under item 18 of the flight plan form, the estimated time at 1500W should be shown because this would serve ACCs in arranging for longitudinal separation between successive SST aircraft during the cruise-climb phase of their flight.

6.3.19 It was also agreed that, under item 18 of the flight plan form, the take-off weight of the aircraft should be included in order to permit ACCs to calculate the expected accelerate/climb profile of the flight in question.

Stored flight plans

6.3.20 Finally, the Group agreed that SST flight operations, and especially those conducted within the organized track system for SST aircraft, were particularly suitable for application of the use of stored flight plans and that the ATC unit concerned with the control of such flights, in conjunction with the operators concerned, should develop necessary procedures for the early application of such stored flight plans to NAT SST operations.

Conclusion

6.3.21 The Group refrained from formulating specific Regional Supplementary Procedures regarding the concept of flight plans concerning SST flights, because it was aware that action was pending to review the flight plan form in general within ICAO. It expected, however, that the above requirements would be taken into account in the work undertaken by ICAO and that appropriate texts, covering the content expressed in paras. 6.3.14 to 6.3.19 above would be developed.

6.3.22 With regard to the use of stored flight plans for SST operations, the Group requested Canada, the United Kingdom and the USA to pursue this subject further in direct contact with the operators concerned with SST operations, based on the guidance material contained in Attachment K to Annex 2 of the PANS-RAC.

Contents of clearances

6.3.23 In view of the conclusions reached with regard to the content of flight plans for SST flights, the Group agreed that a new NAT SUPPS regarding the contents of clearances is required.

Conclusion

6.3.24 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Contents of clearances

X.1 Existing para. 3.4.1 in Part 1 of Doc. 7030)

X.1.1 Existing para. 3.4.1.1 in Part 1 of Doc. 7030)

X.1.2 When an abbreviated clearance is issued for an SST flight, it shall include:

i) the cleared track specified by code letters;

ii) cleared flight levels at start and end of cruise-climb;

Note : The clearance limit with regard to cleared flight levels will normally be the planned deceleration point.

iii) cleared Mach number;

iv) time and position of expected acceleration clearance;

v) the phrase "SEND MET REPORTS" for designated aircraft.

Note : Initially it is expected that all SST aircraft will be required to send MET reports because of their limited number."

Establishment and use of organized track for SST aircraft

6.3.25 Work undertaken within the NAT/SPG from 1968 onwards and subsequent studies conducted in the SST Panel and in other bodies have all led to the conclusion that, because of the flight levels used by SST aircraft while in the cruise-climb phase, meteorological conditions had a minimal effect on their alignment. It had, therefore, been agreed that an organized track system for SST aircraft could be based largely on approximate great circle routes in the NAT Region connecting the major terminals in Europe and North America of SST flights, with

the proviso that the routing in the transition area between oceanic and continental airspace would, to a large extent, determine the alignment of the organized track system in the NAT Region. It was also agreed that, because of the above consideration, such an organized track system need not be subject to frequent changes as was the case with that established for subsonic flights. As a consequence, the Group agreed that initially an organized track system providing for one East-bound and one West-bound and possibly one track used in both directions should be established. The present arrangement of such an organized track system for SST aircraft is shown in Appendix A. It was also noted that the likely designation of the two one-way tracks may be "SM" for the Northern and "SN" for the Southern track.

6.3.26 As it had been previously recognized that the major problem regarding access from the continental airspace to this organized track system was located on the European side, and, in order to illustrate the interdependence between the organized track system and routing in the transition area in Europe, the Group felt it useful to include the present plan for these routings in the report, on the understanding that detailed studies regarding the track layout were still continued, and that this scheme, shown in Appendix B to this Summary, was therefore subject to minor adjustments.

6.3.27 In this respect it was also noted that provision of Air Traffic Control in that part of the oceanic controlled airspace between 0800W and 1500W and between 4850N and 5100N and from specified flight levels upwards may be delegated to London ACC in order to take advantage of the radar coverage provided in that centre. A permanent adjustment to the airspace organization resulting from such delegation would, however, only be made once adequate practical experience had been acquired, and decisions regarding such changes could be based thereon.

Conclusion

6.3.28 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

Following the present para. 3.5.1 in Doc. 7030, insert a new paragraph as follows:

"X.1 Organized track system for SST aircraft

X.1.1 A separate track system will be used for SST traffic. Changes to this system are not expected to be frequent and they will, therefore, be announced by appropriate NOTAMs by the ACCs concerned. The designation of the tracks provided in the system will be made in a manner similar to that used for the organized track system for subsonic air traffic but the designators will carry the prefix "S" indicating that the track in question is reserved for use by SST aircraft.

Note: The letter S will not be used to designate a track in the organized track system for subsonic traffic."

Position reporting

6.3.29 When considering the question of position reporting by SST aircraft, the Group felt that the present provisions concerning position reporting on routes not defined by designated reporting points left sufficient latitude to ATCs to make appropriate arrangements for flights operating along such routes. For flights operating predominantly in an East/West direction, and it was expected that these would constitute the vast majority during the initial period of operation of SST aircraft in the NAT Region, it was however found that procedures different from those now specified for subsonic NAT flights were required, mostly to take account of the higher cruising speeds, thus adjusting the interval between position reports approximately to those now achieved by subsonic aircraft.

6.3.30 In addition, it was believed that, because of the improved navigation capabilities of SST aircraft and the higher probability that actual times over specified points would closely correspond to estimated times previously given, it was felt that the contents of position reports could also be limited.

Conclusion

6.3.31 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Time or place of position reports

X.1 When operating on predominantly East/West tracks, position reports shall be made by SST aircraft over the oceanic entry and exit points, and at 3000W and 5000W. Abbreviated position reports shall be made at 2000W and at 4000W.

Y. Contents of position reports

Y.1 Position

Y.1.1 Aircraft operating on a track of the organized track system for SST aircraft may report their positions with reference to the track code letter together with the longitude of the reporting point, e.g. "SM40".

Y.2 Flight level

Y.2.1 The flight level at specific reporting points shall be reported to the nearest 100 feet. Unless specially requested by the ATS, estimated levels at future points shall not be included in the position report. In abbreviated position reports, the flight level shall be omitted.

Y.3 Next position and time over

Y.3.1 If the estimated time for the next position, as last reported to ATC, is found to be in error by 3 minutes or more, a revised estimated time shall be transmitted to the ATS unit concerned as soon as possible.

Z. Abbreviated position reports

Z.1 Abbreviated position reports shall consist of the aircraft identification, position and time only."

Special procedures for in-flight contingencies

Turn back procedures

6.3.32 When considering the turn back procedures for SST aircraft, the Group underlined that the general provisions now contained in Doc. 7030, i.e. to broadcast the pilot's intentions and to obtain, as soon as possible, an ATC clearance, should also apply to SST aircraft.

6.3.33 In addition, it was noted that the turn back procedure provided for SST aircraft might, to a certain extent, be influenced by that now newly proposed for subsonic aircraft (see para. 7. below). In any case, taking into account the lateral separation proposed for SST aircraft, and the turning radius required for SST aircraft at cruising speeds or only slightly less, it was believed necessary to develop a special procedure for them.

Conclusion

6.3.34 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Special procedures for in-flight contingencies of SST aircraft

X.1 Turn back procedures

X.1.1 If an SST aircraft is unable to continue flight to its destination, and a reversal of track is necessary, it should initiate a turn, either to the left or to the right, in accordance with the following provisions:

a) if the turn is to be made to the right, the aircraft shall attain a position 30 NM to the left of the assigned track and then turn to the right on to its reciprocal track, at the greatest practical rate of turn;

Note : In case of a turn to the left, the opposite procedure should be applied.

b) while executing the turn back, the aircraft should lose height so that it will be at least 4,000 feet below the level at which turn back was started, by the time the turn back is completed;

c) the aircraft should then follow a track which is parallel and 30 NM laterally displaced from its original track, while maintaining the flight level attained in accordance with the above."

Emergency descent

6.3.35 The Group came to the conclusion that, in the light of further studies conducted since the NAT V RAN Meeting, the procedure specified at that time for the initial emergency descent was no longer applicable (NAT V Recommendation 10/27 refers). On the other hand, it was noted that the proposals put before the Group for a rapid descent procedure for subsonic aircraft (see para. 7.3.3 below) were also not suitable for application by SST aircraft. However, the provisions introduced there, namely that a rapid descent procedure could be combined with a turn back procedure appear also to apply to SST aircraft.

Conclusion

6.3.36 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Emergency descent

X.1 The operating characteristics of SST aircraft during rapid descent preclude compliance with the turning requirements and time restrictions for execution of the rapid descent procedure specified for subsonic aircraft. Therefore, if a SST aircraft is compelled to make a rapid descent, whether continuing to destination or turning back, it should, if this descent conflicts with the subsonic organized track system:

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

b) while descending between FL 450 and FL 280 maintain a track which is in general alignment with these tracks;

c) after passing through FL 280 proceed in accordance with the provisions relating to the rapid descent of subsonic aircraft.

X.2 It is essential that the pilot of an SST aircraft which, during any period of its flight, is likely to operate within the vicinity of the subsonic organized track system, shall be in possession of detailed information regarding that system as it is in operation during the period of his flight."

Solar cosmic radiation

6.3.37 The Group noted that, especially within the SST Panel, considerable work on this subject had been going on, which had led to new findings. As a consequence, the Group felt that the procedures developed in 1968 and subsequently adopted by the NAT V RAN Meeting (NAT V Recommendation 10/27 refers) was no longer valid and should be replaced.

6.3.38 It was also noted that, since the effect of radiation on human beings was accumulative, it was frequently difficult to decide whether to limit descent and maintain high speeds was more favourable when compared with a comparatively large descent with resultant reduction in air speed because of the respective exposure times involved. It was, therefore, felt that, at this stage, guidance to pilots could only be provided regarding the initial action to be taken in case of cosmic radiation, and that subsequent action depended to a large extent on the actual circumstances in which radiation was encountered. In any case, it was noted that ATCs would provide all possible assistance to aircraft finding themselves confronted with this hazard.

Conclusion

6.3.39 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Procedures in case of excessive solar cosmic radiation

X.1 The following action shall be taken by the pilot of an SST aircraft in the event of receiving an indication of high solar cosmic radiation level:

a) whenever there is an indication of a radiation dose rate of 10 m rems/hour, the appropriate ATS unit shall be informed;

b) whenever there is an indication of a radiation dose rate of 50 m rems/hour, the appropriate ATS unit shall be informed and, if the pilot wishes to descend, a descent clearance shall be requested;

c) if the dose rate continues to increase beyond 50 m rems/hour and descent clearance has not been received,

the pilot should follow the emergency descent procedure specified in para. .... above, descending to FL 440 in the case of West-bound traffic, or to FL 460 in the case of East-bound traffic.

X.2 Subsequent action to be taken by the pilot in order to reduce the effects of solar cosmic radiation shall be taken in accordance with circumstances as they exist at the time of the incident and, if at all possible, after having received appropriate clearance to do so from the ATC unit concerned."

Linear holding

6.3.40 The Group noted that the greatly reduced speed of SST aircraft on lower levels offer the possibility to absorb expected delays en-route rather than while holding at destination. It could, therefore, be of considerable advantage, especially as regards the conservation of fuel. It was, however, realized that the application of such a procedure presupposed the development of specific local procedures within the ATC unit possibly concerned with the application of this procedure, which would have to take account of all relevant local factors.

Conclusion

6.3.41 The Group agreed that the following Regional SUPPS applicable in the NAT Region for SST aircraft should be adopted:

"X. Linear holding

X.1 The pilot of a SST aircraft in supersonic flight wishing to effect an early descent in order to absorb part of the expected landing delay by a reduction of his en-route speed should add the phrase "for linear holding" to his request for a descent clearance.

X.2 If such a descent clearance can be issued by the ATC unit concerned, it should inform its adjacent ATC unit subsequently concerned with that flight, of the original and revised estimates of the flight concerned, advising that the revised estimates are "due to linear holding".

X.3 The above arrangement shall only be applied when special procedures relating to linear holding have been promulgated by the responsible authority in respect of the airport of destination of the flight in question."

Radio communications failure

6.3.42 The Group briefly considered the question of radio communications failure procedures for SST aircraft, and came to the conclusion that, while operating in the NAT Region, there was no need for special procedures other than those now prescribed for general use.

Future action with regard to the NAT Regional SUPPS for SST aircraft

6.3.43 The Group agreed that the drafting group created for the review of the present in-flight contingencies (see para. 7.3.5 below) should also make a detailed review of the proposed NAT SUPPS for SST aircraft, as far as this was necessary, and that NAT/SPG members should subsequently be informed of the results of this review.

Formal submission of the proposed NAT SUPPS to ICAO

6.3.44 The Group noted a statement by the member from the United Kingdom that the United Kingdom was prepared, after consultation with ICAO Headquarters on the most appropriate form for the submission of the proposed NAT Regional Supplementary Procedures, to present them to ICAO for formal adoption in accordance with established procedure.

6.4 Additional material relevant to the conduct and handling of SST operations in the NAT Region

6.4.1 Under this item, the Group felt that it would be necessary to cover the following three subjects:

a) general information on the operating characteristics and more especially operating limitations of SST aircraft;

b) issuing of clearances to SST aircraft;

c) inter-centre co-ordination of SST flights.

6.4.2 With respect to a) above, the Group noted that the SST Panel had already prepared some material regarding the operating characteristics of SST aircraft having an influence on the manner in which such aircraft were handled by ACCs and that such material had been published in ICAO Circular 109-AN/82. It hoped that work in this field would continue and that States concerned would take necessary measures to make all relevant material available to their Air Traffic Controllers concerned with the handling of SST flights in an appropriate form.

6.4.3 As concerns the issue of clearances to SST aircraft (para. 6.4.1 b) above refers), it was believed that the only new element introduced in this respect was the need to cover cruise-climb in an appropriate form. In order to avoid a multiplicity of phraseology covering this provision, it was agreed that the clearance for SST aircraft should normally be phrased as follows:

"(aircraft identification) cleared to (destination) via NAT track (code letter or designation as appropriate) to cruise-climb from FL... to FL... to (deceleration point).

6.4.4 With respect to co-ordination between oceanic ACCs and the ACCs providing service in the continental airspace adjacent to the NAT Region, this depends very much on the routing procedures developed for SST flights in the transition area and has, therefore, to be left to local arrangements. In any case, there exists, however, the need for earliest possible exchange of flight data because of the increased speed of the aircraft and thus the accelerated manner in which they are likely to pass through successive areas of responsibility of adjacent ATC units.

Conclusion

6.4.5 The Group agreed that:

a) Provider States concerned with the handling of SST flights arrange that appropriate information regarding the operating characteristics of SST aircraft be made available to those Air Traffic Controllers likely to be required to handle such aircraft, in due time, prior to the commencement of commercial SST operations, and that such material be kept current;

b) whenever possible, the phraseology shown in para. 6.4.3 above be used by Air Traffic Controllers in issuing clearances to SST aircraft;

c) Provider States, in collaboration with other affected States, prepare necessary co-ordination procedures required over and above those already agreed in order to ensure that SST flights are handled in the most efficient manner by those ATS units concerned with their operation.

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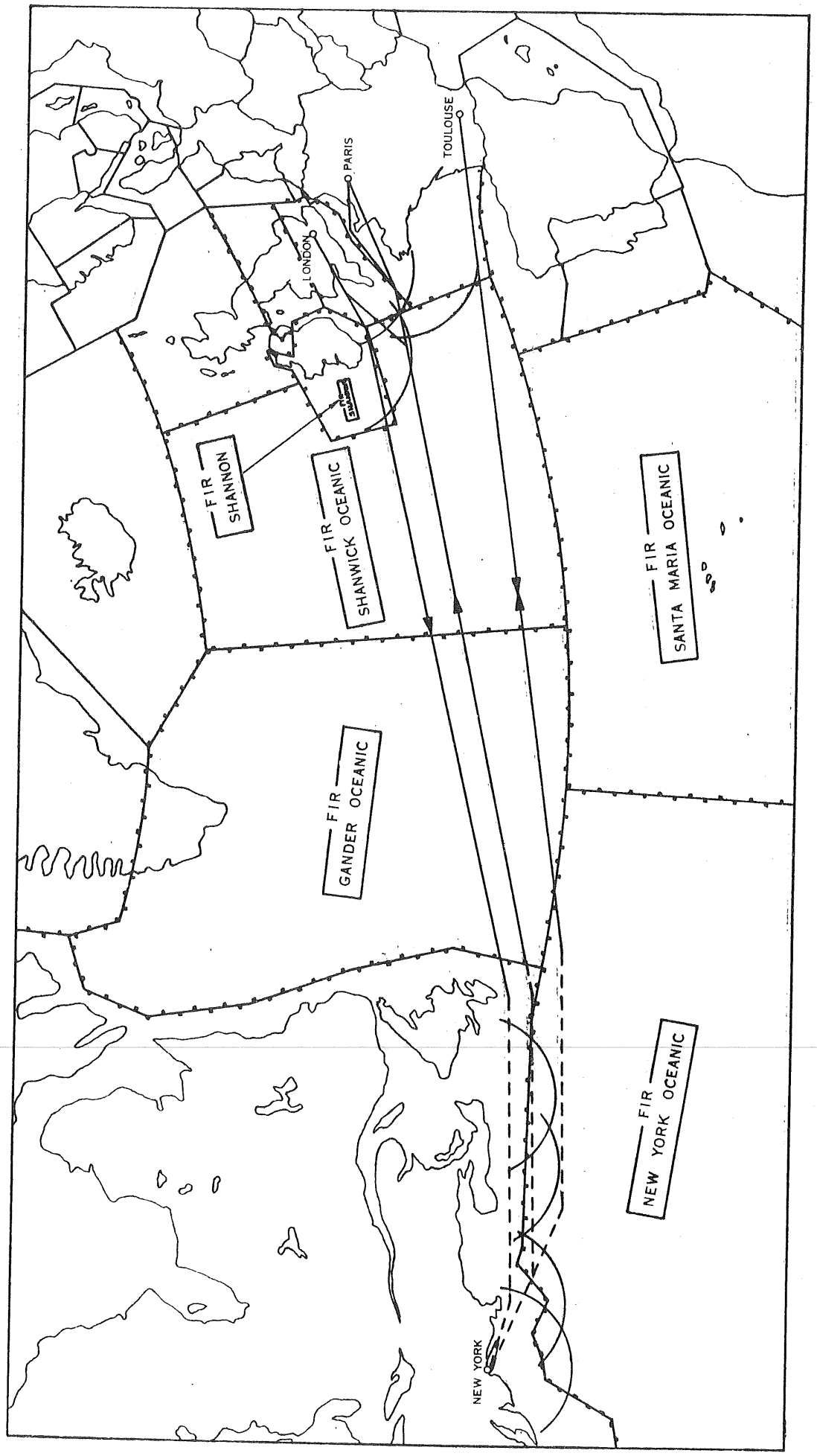
NAT ORGANIZED TRACK SYSTEM FOR SST AIRCRAFT AS AT JUNE 1974

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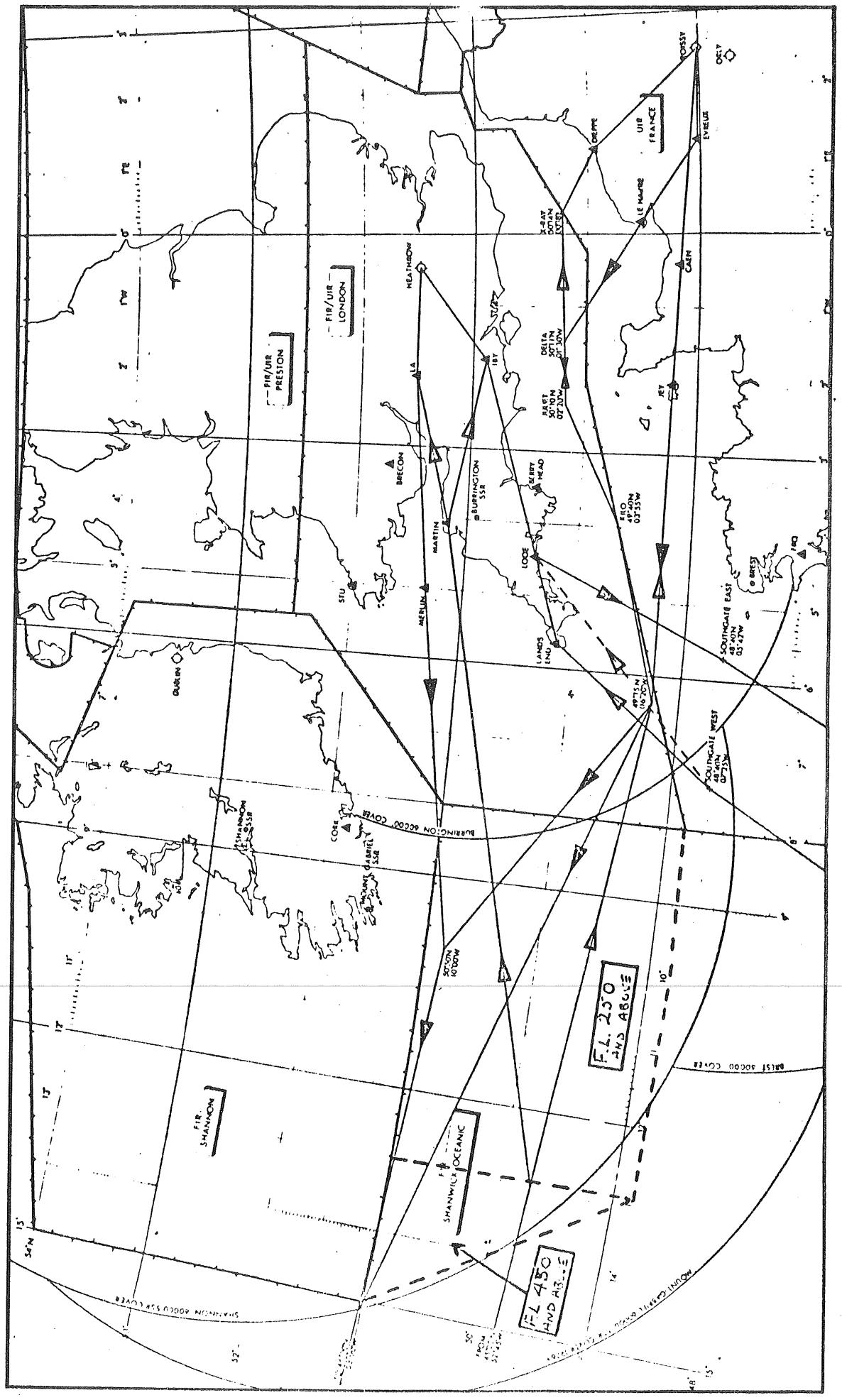
ROUTINGS OF SST AIRCRAFT IN EUROPEAN TRANSITION AREA AS AT JUNE 1974



Summary of Agenda Item 7 : Any other business.

7.1 Radio communication failure in the NAT Region

7.1.1 IATA informed the Group of a problem which had been encountered when determining the possible action a pilot should take in case he encountered radio communication failure in the NAT Region. This concerned the case when an aircraft, having indicated in its flight plan a specific route, was subsequently cleared onto a different track and thus to a different exit point from the NAT Region. The oceanic clearance, even though naming the aerodrome of destination, did not generally contain details regarding the routing within the continental airspace after leaving the NAT Region. The pilot, therefore, was faced with the question of whether to proceed to the exit point specified in his flight plan upon leaving the NAT Region, or whether to continue his flight in the continental airspace from the exit point to which he was cleared, following the most likely routing.

7.1.2 When reviewing this question, the Group noted that on both sides of the North Atlantic, arrangements were in force which required that an aircraft operating along the main traffic axes in continental airspace adjacent to the NAT Region follow specific routings to the main traffic generating points. In the case of the US and Canada, most aircraft were required to follow the NAR routes which were associated with the organized track system in force in the NAT Region. On the European side, some administrations published, on a permanent basis, the routes to be followed between designated traffic generating areas. It was, therefore, considered that the best solution would be that States concerned, when publishing such routings, should indicate that it was expected that a pilot having encountered radio communication failure in the NAT Region, and finding himself operating on a track different from that indicated in his flight plan, would continue flight in the continental airspace from the exit points along such published routings either to destination, providing the routing extended that far, or to the point along his route of flight where the desired routing joined the route originally stated in the filed flight plan, unless the pilot decided to take other permissible action in accordance with the radio communication failure procedure. From there on, the aircraft would proceed in accordance with its filed flight plan to its destination.

7.1.3 It was noted that, at present, only about 10 percent of flights operating in the NAT Region were cleared on routes different from those filed in the flight plan, and it was also noted that in those areas where the difference between the cleared and the filed track could present problems, there was generally adequate radar coverage - either by primary and/or secondary radar - available, and that this could be used as an additional safeguard to ensure the safe conduct of flights affected by radio communication failure.

Conclusion

7.1.4 The Group agreed that:

a) Canada, Ireland, Portugal, the United Kingdom and the US should extend the provisions in their aeronautical information publications regarding the routing of air traffic, so that they required an aircraft, having experienced communication failure and having been cleared on to a track in the NAT Region different from that filed in its flight plan, to proceed along published routings from the exit point of the NAT Region to:

i) its destination, if the routing covered the entire remainder of the flight to destination;

ii) the point where the published routing joins the route filed in the flight plan, and then proceed along the original route specified in the filed flight plan to destination, unless the pilot elects to take other permissible action in accordance with the radio communication failure procedure;

b) the States mentioned in a) above should notify the European Office of ICAO once action had been taken in accordance with a) above so that all interested States and International Organizations can be notified accordingly.

7.2 Measures intended to assist in fuel conservation

7.2.1 The Group noted that the Secretary General of ICAO had addressed to it a Recommendation formulated by the Directors-General of Civil Aviation of the European Civil Aviation Conference (ECAC) requesting, inter alia, that all possible measures be taken in order to assist operators in the saving of aviation fuel. In addition, the Group was presented with a paper by IATA which contained a number of practical proposals to achieve this same end.

7.2.2 Based on this material, the Group considered the following three possibilities for the conservation of aviation fuel:

a) provision of step-climbs;

b) clearance of specific flights via more direct routes to enable them to join the organized track system within the oceanic CTA;

c) improved use of meteorological information for the establishment of the organized track system and for the conduct of individual flights therein.

7.2.3 With regard to the authorization of step-climbs for aircraft within the NAT Region, it was noted that these were already approved by ACCs whenever overall traffic conditions so permitted. IATA requested, however, that States concerned should investigate the possibility of ensuring that operators could base their flight planning on the assurance that step-climbs would be authorized, thus permitting the flight in question to carry less fuel. After a detailed review of the consequences involved in the latter procedures, it was unanimously agreed by those States providing air traffic control services within the NAT Region and in the transition areas adjacent thereto, that this was not feasible under present circumstances. It was, however, agreed that States concerned would, once more, impress upon their ATC services the need to give maximum assistance to operators in the measures to save fuel by issuing appropriate ATC clearances whenever conditions so permitted.

7.2.4 With regard to 7.2.2 b) above, i.e. clearing aircraft via more direct routes into the NAT Region to join the organized track system, it was noted that this concerned mostly flights desiring to enter the NAT Region at points located South of Nantes and North of Santiago. When reviewing the proposal to clear these flights on the most direct track from the point on leaving European continental airspace West-bound until joining the organized track on which they had planned, it was agreed that this was a desirable objective. However, it was also noted that this might lead to difficulties in maintaining the optimum flow of air traffic on the track concerned, and possibly on adjacent tracks, and could, therefore, result in a certain waste of overall traffic handling capacity. It was pointed out that, in any case, each of the cases in question would have to be judged on its own merits, and in the light of the traffic and tracks existing at the time, because of the many variables involved.

7.2.5 It was, therefore, once more agreed that while this question should be brought to the attention of the ATC services concerned, it was not possible to undertake any commitments in principle on this subject by the States concerned.

7.2.6 With regard to the question of improved use of MET information for the establishment of the organized track system and the planning of individual flights within that system, the Meeting noted that, at present, conditions were such that the MET forecasts upon which the establishment of the organized track system was based were frequently at least fifteen hours old, and, in some cases, more. In addition it was noted that actual MET information provided by flights while operating in the NAT Region frequently was not used so as either to permit succeeding flights to take advantage of this information or to permit operators to take it into account in the planning of subsequent flights.

7.2.7 After a very detailed and exhaustive discussion of this question, which not only covered a review of the procedures now in force regarding the provision of MET information by designated flights

but also the organizational arrangement of the various MET services involved and the equipment used to assist in the preparation of the organized track system and computer-derived flight plans, the Meeting agreed that the following points deserved further consideration:

a) the review by States adjacent to the NAT Region of the arrangements existing within their meteorological services for the collection and use of MET data required to establish forecasts for the NAT Region;

b) the review by States adjacent to the NAT Region of the arrangements between their ATC services and their meteorological services for the collection and use of in-flight MET data provided by designated flights in order to update forecasts and/or to provide more recent MET information to operators and other interested agencies;

c) the review of the exchange means and methods for MET data affecting forecasts for the NAT Region between those meteorological services required to provide MET briefings to North Atlantic flights;

d) the review by airlines, as applicable, of internal procedures to take the MET part of AIREPs into account in their flight planning;

e) the review of possibilities to reduce the elapsed time between the provision of MET data required for the establishment of the organized track system and the time when the resultant system is to be put into operation;

f) determination of the minimum time required between the publication of the organized track system and the time operators are able to base their computer programmes for the preparation of flight plans on such a track system;

g) the review of the possibility that States providing ATC in the NAT Region could notify operators when it is observed that the actual MET situation on the organized track system deviates materially from the forecasts on which the track system and flight planning was based.

7.2.8 With respect to g) above, the Meeting noted that the United Kingdom was prepared to conduct limited trials with one daily flight of a selected operator which would be provided with latest actual MET information until very shortly before take-off, in order to establish whether the provision of such information effectively resulted in appreciable fuel economy. It was expected that the result of these trials would be made available to the next Meeting of the NAT/SPG.

7.2.9 Finally, the Group agreed that the review of one or of all subjects listed in para. 7.2.7 above would have to ensure that any revised procedures would not result in an unacceptable workload to the air traffic control services concerned, nor overload the communications channels.

Conclusion

7.2.10 The Group agreed that:

a) the points listed under para. 7.2.7 a), b) and g) above should be reviewed by the States directly concerned, i.e. Canada, Portugal, the United Kingdom and the US, and that they should inform the NAT/SPG of their findings in due time;

b) the Meeting agreed that the subject mentioned under para. 7.2.7 c) and e) above should be reviewed by all States concerned in direct consultation with each other and that, if necessary, they should agree on the convening of an informal meeting under the aegis of ICAO if so desired and especially with respect to the subject mentioned under para. 7.2.7 c) above;

c) operators should take necessary measures to adopt appropriate procedures regarding the subject mentioned in para. 7.2.7 d) and f) above, and to inform the NAT/SPG of their findings with respect to the results of their studies undertaken in accordance with para. 7.2.7 f) above;

d) the Meeting agreed that the United Kingdom should provide the Group with the results of the trials conducted in accordance with para. 7.2.8 above as soon as these became available.

## 7.3 Revised Regional SUPPs for in-flight contingencies

7.3.1 At the Ninth Meeting of the NAT/SPG, IFALPA had requested the Group to review a proposal for amendment of the Regional Supplementary Procedures concerning in-flight contingencies applicable in the NAT Region and contained in para. 5 of Part I of Doc.7030. At that time, the Group had suggested that IFALPA submit their proposal directly to ICAO for formal processing (para. 6.3 of NAT/SPG/9 Summary refers).

7.3.2 For a number of reasons IFALPA had not been able to take this suggested course of action, and it therefore presented, at this Meeting, a revised version of their previous proposal, as adopted by its recent Annual Conference, for review.

7.3.3 The proposals by IFALPA envisaged the establishment of revised procedures concerning aircraft compelled to turn back, depending on whether they were operating within the organized track system, on the edges of that system, or in an area where or at times when no such system was in existence. In addition, IFALPA proposed a new procedure for aircraft compelled to effect a rapid descent, including the possibility either to continue flight to destination or turn back, depending on circumstances.

7.3.4 After a detailed review, the Group agreed in principle with the substance of the proposals of IFALPA. However, it noted that the text as submitted would require a further review before it was suitable for formal presentation as a proposal for amendment to the NAT Regional SUPPs. As a consequence, it was agreed to establish a drafting group composed of one representative each from the United Kingdom, IATA and IFALPA who should meet on 16 and 17 July 1974 in the European Office of ICAO in order to prepare a new version of the proposals of IFALPA. It was also agreed that this draft would subsequently be circulated to the members of the NAT/SPG for review and comment and, if found acceptable, it should then be formally submitted to ICAO for further processing, in accordance with established procedure. It was understood that the United Kingdom would take it upon itself to submit the agreed text to ICAO.

Conclusion

7.3.5 The Meeting agreed that:

a) the NAT Regional Supplementary Procedures concerning in-flight contingencies should be amended, based on proposals submitted by IFALPA;

b) a drafting group composed of the United Kingdom, IATA and IFALPA should be convened on 16 and 17 July 1974 in the European Office of ICAO in order to develop an appropriate proposal in accordance with a) above for review, comment and eventual adoption by members of the NAT/SPG;

c) once the procedure in accordance with b) above has been completed, the final proposal should be formally submitted to ICAO for processing in accordance with established procedure.

Note : It was noted that the United Kingdom was prepared to undertake this task.

7.4 Continued operation of Bushmills CONSOL

7.4.1 At the Ninth Meeting of the NAT/SPG, the Group had considered the need for the continued operation of Bushmills CONSOL and had reluctantly agreed to propose that it should be maintained in operation until it could be proven that its retention was no longer justified or until such time as the related LORAN A rates were withdrawn (para. 6.1 of NAT/SPG/9 Summary refers).

7.4.2 The Meeting was now informed by the United Kingdom that the officer responsible for the operation of this station was about to retire, that efforts made by the United Kingdom administration to find a replacement had so far not been successful, and that there was little prospect that this would change because of the remoteness of the site and other social conditions.

7.4.3 It was noted also that, even at the Ninth Meeting, the case made for the continued operation of Bushmills CONSOL had not been very convincing.

Conclusion

7.4.4 The Group agreed that, because of the circumstances regarding the management of Bushmills CONSOL, and taking into account the fact that its use to international air navigation had already been considered as being marginal, there was no further need for the continued operation of this facility.

7.4.5 It was noted that, as a consequence of the above, the United Kingdom would, in due time, submit an appropriate proposal for amendment of the EUR and NAT Regional Plans.

7.5 Need to retain the VOR/DME Akraberg in the NAT Regional Plan

7.5.1 The Danish representative took the opportunity of this Meeting to enquire whether the requirement for the provision of a VOR/DME at Akraberg still corresponded to an operational need. In the exchange of views on this subject, it was noted that, while the original requirement having motivated the provision of this facility may have disappeared because the operators in question are now equipped with INS, there still remain sufficient other needs supporting the retention, and early implementation, of this facility. This applied particularly to flight operations between Iceland and the European continent, where it was unlikely that operators engaged in these operations, and now using LORAN A for navigational purposes, would change to other, possibly more expensive, forms of navigation, apart from VOR/DME. In addition, it was pointed out that even for navigation based on INS, the VOR/DME Akraberg could constitute a useful cross-check possibility. Finally, it was noted that flight operations conducted in the vicinity of that aid in conjunction with oil prospecting and exploitation may also make the provision of this aid useful.

Conclusion

7.5.2 As a consequence of the above, the Group was of the opinion that the VOR/DME at Akraberg should be retained in the Plan and that its implementation should be actively pursued by Denmark.

7.6 Arrangements for the next Meeting of the Group

Time, Duration and Site of the next Meeting

7.6.1 After having reviewed the various factors having an influence on the schedule of the next Meeting of the NAT/SPG such as the general meeting programme of ICAO, the anticipated commitments of the European Office of ICAO during the period in question, and the need to plan the next Meeting of the NAT/SPG so as to be of optimum use, as a contributory element, to subsequent ICAO Meetings dealing with NAT matters, the Group agreed that the most suitable date for the next Meeting of the NAT/SPG would be some time early in May 1975.

7.6.2 Even though it was not possible to be specific as to the exact dates of such a Meeting, it was nevertheless agreed that 5 May 1975 should be tentatively retained as the opening date of the Meeting, and that its duration should again be eleven calendar days. In addition, it was agreed that this Meeting should, once more, be held in the European Office of ICAO.

Items for discussion

7.6.3 The Group agreed that the following points should be retained for consideration at the next Meeting:

a) Development of minimum navigation performance specifications for aircraft intending to operate in the NAT Region;

Note: It was also expected that, under this item, consideration should be given to the possible development of supporting documentation for the Ninth Air Navigation Conference of ICAO to be held in the latter part of 1975. See also para. 4.4.3 b) above.

b) Review of the navigation situation in the NAT Region with particular reference to the situation regarding LORAN A and OMEGA.

Note: This review should, inter alia, serve to consider necessary follow-up action resulting from the decision taken at the Special NAT/PAC (LORAN A) RAN Meeting 1974.

c) Review of the situation with regard to the reorganization of the airspace in the Northern part of the NAT Region;

Note: It is intended to review the situation in view of progress made with respect to the implementation of the proposals contained in the Summary of Agenda Item 3.

d) Review of the situation with regard to SST operations in the NAT Region;

Note: It is intended to review the situation in the light of further developments with respect to the introduction of commercial operations by SST aircraft in the NAT Region.

e) Review of the HF air-ground communications situation in the NAT Region.

Participation

7.6.4 The Group agreed that, in the light of the points retained for consideration, the next Meeting should once more be attended by Denmark, Iceland, Norway, Portugal, IATA and IFALPA.

7.6.5 Since it has been noted that no replies have been received from IANC to the invitation to attend this Meeting, the Chairman was requested to contact that Organization and to determine whether IANC was still interested in participating in future Meetings of the NAT/SPG. If that was the case, an invitation to attend the next Meeting should be addressed to IANC in due time.

7.6.6 The Group also noted that the European Air Navigation Planning Group (EANPG) had established contact with two Organizations representing the interests of non-scheduled operators, and that one of them (IACA) had participated in the last Meeting of the EANPG. Since the question of representation of non-scheduled user interests was also important for the NAT Region, the Group agreed that its Chairman should establish contact with IACA and ACCA, inquiring whether:

a) these organizations were interested in the Meetings of the NAT/SPG;

b) they could reach agreement amongst themselves for common representation of their interests by a jointly designated representative conversant with oceanic operations.

Depending on the replies received to this, the Chairman should eventually extend an invitation to these Organizations to participate in the next Meeting of the Group.

Conclusion

7.6.7 The Group agreed that:

a) its next Meeting should be held in early May 1975 in the European Office of ICAO for a duration of eleven calendar days, the exact dates to be determined by the Chairman in consultation with the Secretary, taking into account that the tentative date for the opening session of the Meeting would be 5 May 1975;

b) the Agenda of that Meeting should cover the following main items;

i) Development of minimum navigation performance specifications for aircraft intending to operate in the NAT Region;

ii) Review of the navigation situation in the NAT Region with particular reference to the situation regarding LORAN A and OMEGA;

iii) Review of the situation with regard to the reorganization of the airspace in the Northern part of the NAT Region;

iv) Review of the situation with regard to SST operations in the NAT Region;

v) Review of the HF air-ground communications situation in the NAT Region.

c) the following States and International Organizations should be invited to participate in the next Meeting:

Denmark, Iceland, Norway, Portugal, IATA, IFALPA

d) the following International Organizations should be contacted by the Chairman regarding their future participation by qualified representatives in Meetings of the NAT/SPG:

IANC, IACA and ACCA

and should be invited to the next Meeting provided that the consultations with these Organizations by the Chairman of the Group indicated that this was useful.

Request to ICAO

7.6.8 The Group hoped that, as had 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.

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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

| Name/ Nom | State/ Etat | Address/ Adresse | Remarks/ Observations |
|---|---|---|---|
| Mr. A.L. Elliott | CANADA | Ministry of Transport<br>CATS<br>OTTAWA, Ontario<br>K1A ON8<br>Tel: 995-6533 Ottawa | |
| Mr. J.F. Sapin | FRANCE | Direction de la Navigation Aérienne<br>3 Avenue de Friedland<br>75008 PARIS<br>Tel: 359.72.90 | Chairman/ Président |
| Mr. T. O'Dalaigh | IRELAND | Department of Posts and Telegraphs<br>Radio Division<br>Leitrim House<br>The Castle<br>DUBLIN 2<br>Tel: 48888, Ext. 346 or 774836 (direct) | |
| Mr. J.G. ten Velden | KINGDOM OF THE NETHERLANDS | Chief, Operations ATS<br>Department of ATC and Telecommunications<br>1-6 Plesmanweg<br>THE HAGUE<br>Tel: (070) 74.74.74 | |
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| Mr. Van V. Schulze | UNITED STATES OF America | North Atlantic Systems Planning Officer<br>A1A-102, FAA<br>Office of International Aviation Affairs<br>WASHINGTON, D.C. 20591<br>Tel: (202) 426.3158 | |

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4/7/74

# SUMMARY OF THE TENTH MEETING OF THE NAT/SPG

## CORRIGENDUM

Corrections should be made to the Summary of Discussions and Conclusions of the Tenth Meeting of the NAT/SPG as follows:

| | | |
|---|---|---|
| 1. | Page 2-9, para. 4.1, first line: | Replace page reference number "2-13" by "2-15". |
| 2. | Page 2-10, para. 6, last line: | Replace page reference number "2-13" by "2-15". |
| 3. | Page 4-6, para. 4.2.18, sub-para. a), second line: | Change the word "laterial" to read "lateral". |

Note : Minor typing errors not distorting the sense of the text have not been included in this Corrigendum.

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