Chapter 7

LANGUAGES USED IN AIR TRAFFIC CONTROL

Section 1. INTRODUCTION

1.1 The Interim Report

Chapter 7 of the Interim Report considered two matters: firstly, the Recommendations of the International Civil Aviation Organization (ICAO) as to language to be used in aeronautical telecommunications, and, secondly, language used in air traffic control systems in other countries.

a) Recommendations of ICAO

It will be helpful to repeat what was said in Section 1 of Chapter 7 in the Interim Report:

> "International Standards, Recommended Practices and Procedures for Aeronautical Telecommunications are to be found in Annex 10 to the ICAO Convention. Volume II of Annex 10 deals with Communication Procedures. Attached are portions of the Third Edition of Volume II (July, 1972) that bear generally on the subject of languages to be used.
>
> Two sections of Annex 10 are of particular interest:
>
> > '5.2.1.1.1. RECOMMENDATION. -- In general, the air-ground radiotelephony communications should be conducted in the language normally used by the station on the ground.'
>
> It is accordingly the prerogative of each state to decide what that language shall be.
>
> > '5.2.1.1.2. RECOMMENDATION. -- Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, the English language should be used as such and should be available, on request from any aircraft station unable to comply with 5.2.1.1.1., at all stations on the ground serving designated airports and routes used by international air services.'
>
> These ICAO specifications have the status of 'Recommendations', not of 'Standards'. In ICAO terminology, a 'Standard' is a specification, the uniform application of

which is necessary for the safety or regularity of international air navigation. In the case of a 'Recommendation' its uniform application is desirable in the interest of safety, regularity or efficiency of international air navigation."

b) Language used in air traffic control systems in other countries

Section 2 of Chapter 7 of the Interim Report describes an analysis, dated March, 1977, made by the Commission's consultants to provide a comprehensive background on the air traffic control systems throughout the world with a view to determining the languages used in air traffic control. The study was filed during the first phase of the hearings as Exhibit 164. The way in which the Analysis was done is described in detail in the Interim Report, which should be consulted for that purpose. At that time 133 countries belonged to ICAO. While all were considered by the consultants, information was given in Exhibit 164 concerning 128.

The Analysis showed that air traffic control was then available in 30 different languages throughout the world. There was a total of 83 countries where ATC services were provided in more than one language. It was mentioned that in every case one of those languages was English since service was offered in that language to a greater or lesser degree in each country because of the ICAO recommendation that English should be available for designated airports and routes used by international air services.

The Interim Report pointed out that the data contained in the Analysis would "... be of further assistance to the Commission should it appear desirable to select a country or countries whose experience, examined in detail, may provide information for the work of the Inquiry still to be done."

1.2 Further investigations conducted on behalf of the Commission

The Commissioners asked their consultants to carry out additional studies, some of which concern the situation in other countries. The studies fall into four categories. Firstly, an up-dating of languages available for ATC in ICAO countries, dealt with in Section 2 of this Chapter; secondly, a detailed on-site investigation of ATC systems in seven countries and Eurocontrol, discussed in Section 3; thirdly, an examination of the VFR/IFR mix of aircraft at certain airports, including those of Mexico City and Geneva, considered in Chapter 8, Section 2; and, fourthly, the monitoring of control tower tapes at a number of airports, including those of Mexico City and Geneva, discussed in various chapters of this Report.

In addition to furnishing information of itself relevant to the issues to be decided by the Commission, the studies of the situation in countries and at airports where two languages are used in air traffic control provide real-life data of value in assessing the relative findings of the simulation studies and other matters considered in the BICSS Report.

1.3 Studies made by the Department of Transport

Officials of the Department of Transport visited Mexico, several European countries and Eurocontrol to gather data and background information on bilingual communications. Particular emphasis was placed on areas of communication problems experienced and procedures developed in the countries visited. A detailed report is contained in Chapters 1 and 2 of Working Document 6 of the BICSS Report, and will be discussed in Section 5 of this Chapter.

1.4 Views of CALPA and COPA

In its written argument CALPA refers to the situation in several countries, especially Germany and Switzerland, as well as to material from ICAO and the International Air Transport Association (IATA). There is mention of the experience in other countries in the submission filed by COPA, and in the testimony of its President, Mr. Beach. Reference will be made to these matters in Section 6 of this Chapter.

Section 2. LANGUAGES CURRENTLY AVAILABLE FOR AIR TRAFFIC CONTROL

As mentioned, the consultants have brought up to date both the list of languages available for air traffic control in ICAO countries (Interim Report - Figure D) and the list of ICAO countries showing the language or languages available in such countries (Interim Report - Figure E). The revised lists are to be found as Figures A and B of this Report.

When the most recent study, Exhibit 355, was made there were 143 countries belonging to ICAO. No data was available to the consultants concerning four of these countries. Of the 139 countries as to which information could be obtained, air traffic services were available in 28 languages, and there was a total of 79 countries where the services were provided in more than one language. The tables do not indicate the extent of use of specific languages.

The revised lists prepared by the consultants are based solely on a review of the Aeronautical Information Publication (AIP) of each of the countries whereas the previous data came from several sources. Exhibit 355 concludes in this way:

> "It should be noted that the AIP is primarily intended for use by international operators and its statements about language available for air-ground communications may not always reflect languages that may be available locally in certain parts of that country or under certain conditions."

It seems to the Commission that the following observation made in the Interim Report is still appropriate:

> "Nor can one learn from the bare statistical data why countries provide air traffic control services in a given language or languages. Historical reasons are no doubt involved in some instances, political considerations in others. Territorial dimensions and geographical location probably come into the picture in some cases. It seems reasonable to assume that economic factors have played a significant role in the choice of language made by a number of the states. The role of an airport may be important - is it dedicated primarily to international flights or does it essentially serve domestic traffic?"

Section 3. DETAILED ON-SITE INVESTIGATION OF SEVERAL AIR TRAFFIC CONTROL SYSTEMS CONDUCTED BY COMMISSION CONSULTANTS

3.1 Introduction

The Commission asked its consultants to recommend a number of countries in different parts of the world where more than one language was available for air traffic control purposes, and which, if examined closely, and on the site, could provide information useful to the Commission. It was decided that such investigations should be conducted in seven countries. In addition, it was felt that an examination ought to be made of the system used by Eurocontrol, an organization providing air traffic services in certain upper airspace in Western Europe.

During the period July 11 to October 6, 1977 groups drawn from the Commission's technical consultants, counsel and administrative staff made the following visits:

Points Visited	Dates
1. Tokyo, Japan	July 11-14, 1977
2. Rio de Janeiro and Sao Paulo, Brazil	August 1-5, 1977
3. Mexico City and Guadalajara, Mexico	August 16-18, 1977
4. Rome, Italy	September 26-27, 1977
5. Geneva, Switzerland	September 28-29, 1977
6. Frankfurt, Germany	September 30, 1977
7. Paris, France	October 3-4, 1977
8. Eurocontrol-Brussels, Belgium and Maastricht, Holland	October 6, 1977

Separate reports summarizing the findings made during each visit were prepared by the consultants and bound together in one document entitled "Detailed On-Site Investigation of Selected ATC Systems", filed as Exhibit 278 during the second phase of the hearings.

3.2 The investigation made by the consultants

It is not practicable to incorporate into this Report all the material contained in Exhibit 278, which should accordingly be consulted if more detailed information is required.

The investigation in each case was carried out in a consistent way. The data sought was broken down into topics. Figure C shows a list of the matters with respect to which inquiry was made in Japan. A similar list or data form was used for the other visits.

Each of the eight reports incorporated into Exhibit 278 begins with a brief introduction giving the facilities visited, the names of the observers and the dates of the visit. Then comes a section described as an "overview". In most instances there follow sections describing area control centres and certain airports and their control towers and other facilities. Each report concludes with a section entitled "Summary of Findings." It will be helpful to describe briefly the subjects dealt with in the various sections.

a) Overview

The section called "Overview" deals with such matters as the history of the country's civil aviation, and the development and current state of its air traffic control services, with particular emphasis on language. Governmental policy concerning language use in aeronautical communications is considered, as is the use itself. The training of air traffic controllers is discussed. The language used in publications required for flying and for air traffic control is examined. Consideration is given to the language policy of a number of national carriers. Attention is paid to any special procedures or practices related to the use or availability of two or more languages, and as to whether any accidents or incidents might have resulted therefrom.

The salient points of the "Overview" section are usually summarized in the "Summary of Findings" and it is unnecessary to discuss them further. In some cases, however, it will be helpful to refer to the contents of the "Overview".

b) Sections describing area control centres, certain airports, their control towers and other facilities

An area control centre (ACC) is responsible for the control of air traffic over a large territory. In most cases the report considers the structure of the airspace, its division into sectors for overflights, arrivals and departures, and the sub-division of sectors into air traffic control positions. The equipment in the centre is described, as is the complement of personnel. Information is provided as to the number and type of aircraft using the airspace, with traffic samples. The language used for air/ground and ground/ground communications is considered.

An international airport is usually described, and frequently another, smaller airport. The configuration of runways is shown. If relevant, the operational capacity of the airport is given. Aircraft movements are provided, with detail as to traffic pattern and type of aircraft. The mix, if any, of VFR and IFR traffic is dealt with. Air traffic control facilities located at the airport are described. The operation of the control tower is examined, and, where it exists, an IFR room or like facility. Consideration is given to responsibility for airspace, the positions required for control and, in some instances, to the segregation of traffic. Equipment and personnel are described. An examination is made of the languages used for air traffic control purposes.

c) Summary of Findings

At the end of the report of each on-site investigation contained in Exhibit 278 is to be found a section which sets out a summary of the findings. In each case the findings are summarized under the following headings:

i) Language Use. First, the appropriate Aeronautical Information Publication (AIP) communications section is examined for references to languages available for air traffic control purposes. Then follows, in most cases, a brief historical review. Finally, a summary is given as to language use in various phases of air traffic control.

ii) Special Procedures. The meaning to be given to this heading is best described in the words of the consultants, taken from Exhibit 278:

> "By special procedures, we refer to written instructions to controllers or pilots contained in manuals or other official air traffic control documents, which instructions have been designed to insure that controllers or pilots will follow certain procedures because of the fact that the ATC system is bilingual rather than unilingual, for example, special separation minima or requirements for exchange of 'Traffic'."

iii) Special Practices. In words taken from Exhibit 278, the expression is defined by the consultants in this way:

> "By special practices, we mean procedures which have evolved as a result of experience in a bilingual ATC environment, which practices have been adopted by either pilots or controllers because of a special need arising out of the fact that the ATC system is bilingual rather than unilingual but which have not been officially recognized as special written procedures as referred to above."

iv) VFR/IFR mix. This refers to the mixing and sequencing of VFR traffic with aircraft on an IFR flight plan as they enter the final approach area of a major airport.

v) Incidents/Accidents.

vi) Publications.

vii) Lexicon.

viii) Radio/Telephone Licenses. This section of the Summary of Findings essentially deals with language requirements, if any, for pilots' licenses. Since this subject is considered at some length in Section 3 of Chapter 8 of this Report, reference will be made in that section to the findings concerning radio/telephone licenses contained in Exhibit 278.

3.3 Tokyo, Japan

a) Facilities visited

i) Tokyo Area Control Centre (ACC). The Tokyo ACC is responsible for approximately 70% of Japan's airspace, is staffed with a complement of 350 personnel, and handles an average of 1,100 aircraft per day.

ii) Tokyo International Airport, Control Tower and Approach Control. Tokyo International Airport is one of the world's busiest inter-continental airports. Indeed, because of its high activity and limited facilities, the airport had imposed operational capacity limits. When the investigation was made daily traffic averaged 471 flights, of which about 140 (made by 33 international carriers) were international, 300 were domestic, 20 were non-scheduled and 10 were not categorized. Ninety-six per cent of the flights were IFR, of which 86% were jets, predominately of the heavy variety.

iii) Chofu Airport Control Tower. Chofu is a small, single-runway general aviation airport located about ten nautical miles west of Tokyo. When visited, it had 110 aircraft and accommodated only VFR traffic. During the period 1972 to 1976 annual traffic was in the range of 40,000 flights.

b) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The Japanese Aeronautical Information Publication (AIP) Communications Section, Page 0-2 provides,

> 'Language for use in the aeronautical mobile service should be either Japanese or English in principle, while in the mobile service by U.S. Forces, Japan the use of English is normally required.'

The use of English started with the takeover of the air traffic control system by the U.S. Air Force following World War II. It has continued to be available because of the ICAO recommendation and because of problems inherent to the Japanese language which make it difficult to achieve the clarity and conciseness needed for ATC. We observed that in practice, English is the preferred language in air traffic control and its use is encouraged although we were told that Japanese is used to meet some unusual circumstances. English usage was observed as follows:

- Enroute Control - almost exclusively

- Approach Control - almost exclusively

- Tokyo International Airport

  --Air Control - almost exclusively
  --Ground Control - almost exclusively except Japanese used to communicate with tractor drivers towing aircraft
  --Clearance Delivery - almost exclusively

- Chofu Airport - 96 percent

- Inter and Intra Facility Coordination - English and Japanese are both used; we observed a predominance of Japanese.

Special Procedures

There are no special procedures because of bilingual air traffic control.

Special Practices

There are no special practices because of bilingual air traffic control.

VFR/IFR Mix

Tokyo International Airport only allows VFR general aviation to operate if they have prior approval; consequently little VFR general aviation traffic exists and the VFR/IFR mix is almost non-existent.

Incidents/Accidents

No incidents or accidents could be recalled by JCAB officials that occurred due to bilingual air traffic control. Written records of accidents and incidents are kept by the Authorities.

Publications

Most aeronautical publications that a pilot would use or refer to such as the AIP are in English and Japanese, while the Japanese manual of operations for air traffic controllers is in Japanese. Class I NOTAMS are in English only, but Class II are in both English and Japanese.

Lexicon

A Japanese-English lexicon is contained in the Japanese manual of operations for air traffic controllers."

3.4 Rio de Janeiro and Sao Paulo, Brazil

a) Facilities visited

i) Brazilia Area Control Centre. The Brazilia ACC is located on the edge of the Brazilia Airport. In 1976, using seven upper and nine lower sections of control, the Centre handled about 1,440 aircraft movements a day in airspace that included Rio and Sao Paulo.

ii) Galeao International Airport, Control Tower and Approach Control. At Galeao Airport, near Rio de Janeiro, a new control tower and approach control system were to be commissioned in late August, 1977, shortly after the visit that was made on behalf of the Commission. A new runway was also being built to provide for increased capacity. In 1976 the airport handled 97,518 movements. The records of a busy day examined by the consultants showed 278 operations, of which only 11 were VFR. All were jet aircraft except for 20 turboprops and three piston engine aircraft.

iii) Sao Paulo Airport, Control Tower and Approach Control. Sao Paulo Congonhas Airport is a busy "downtown" airport, located in a well developed area with either residential or commercial development surrounding it. In 1976 the airport handled 111,390 movements, of which 93% were IFR, largely of the 727 or DC-9 class, but with a goodly number of general aviation, including business jets and some military aircraft. While the airport itself serves mainly domestic traffic, Approach Control handles traffic for both Sao Paulo and nearby Campinas Airport which does have a good bit of international traffic.

iv) Santos Dumont Control Tower. Santos Dumont is the original main airport for Rio de Janeiro, but has been outgrown since it is located on the harbour and cannot be expanded. It serves as a general aviation and local airline type airport. In 1976 there were 59,938 aircraft movements at Santos Dumont, of which 26% were VFR.

b) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

No specific reference to available language is contained in the Brazilian AIP.

Air Traffic Control was started on a systematic basis in 1946 with Portuguese as the basic language. In 1949, the system became bilingual and offered English control to meet ICAO requirements. We observed the following language usages:

- Brazilia Area Control Center - 90 percent Portuguese and 10 percent English
- Galeao Control Tower - 91 percent Portuguese and nine percent English
- Galeao Approach Control - 93 percent Portuguese and seven percent English
- Sao Paulo Control Tower - almost exclusively Portuguese
- Sao Paulo Approach Control - almost exclusively Portuguese
- Santos Dumont Control Tower - almost exclusively Portuguese

Special Procedures

There are no special procedures which have been adopted by Brazilian ATC because of the fact that multilingual control is offered.

Special Practices

There are no special practices used in Brazil because of bilingual air traffic control.

VFR/IFR Mix

Galeao International Airport accommodates predominantly IFR air carrier traffic. From tower records of a recent busy day, there were 278 movements of which only 11 were VFR. Most of the VFR general aviation aircraft operations take place at Santos Dumont Airport where facilities are provided and traffic is lighter. There is no real VFR/IFR mix at Galeao Airport.

Incidents/Accidents

We were informed that there were no incidents or accidents which may be attributed to the use of one or more languages in ATC. A system for the reporting of incidents is available to pilots at major airports. A U.S. Navy DC-6 and a Real Aerovias DC-3 collided in mid-air over Rio de Janeiro in 1960 with language implications which were discussed in the Commission of Inquiry 23 June 1977 Interim Report. The official investigation report may be found in Exhibit 168.

Publications

All ATC publications are available in Portuguese. The following publications are also in English:

- AIP
- Flight Plan Forms
- Class I NOTAM (if time permits)
- Class II NOTAM
- Legends and explanatory material on terminal area manuals, instrument departure manuals, instrument approach manuals and radio navigation charts.

Lexicon

The ATC Lexicon is a Portuguese translation of the ICAO Lexicon."

3.5 Mexico City and Guadalajara, Mexico

a) Facilities visited

i) Mexico City International Airport Control Tower and Approach Control. Mexico City International Airport is the busiest airport in Mexico and, indeed, one of the world's busiest intercontinental airports. In 1976 the airport handled 213,653 aircraft movements. On an average day there are approximately 600 movements, while during a weekend traffic will ordinarily peak to 800 daily movements. Mexico City International Airport is served by 33 airlines.

The traffic mix is about 50% air carrier and 50% general aviation, of which single engine aircraft is the most prevalent type. A majority of the general aviation traffic operates under visual flight rules. The airport has a considerable VFR/IFR mix of traffic.

ii) Mexico City Area Control Centre. The Mexican ATC system has four area control centres, of which the busiest, at Mexico City, was visited. The Centre consists of two sectors for enroute airspace, a terminal sector and air approach control sector.

iii) Guadalajara Airport, Control Tower and Approach Control. Guadalajara is an active airport, recording 68,000 movements in 1975 and 75,000 in 1976. The facility has two intersecting runways. Some 35% of the traffic consists of flights by air carriers, with the rest consisting of movements by general aviation.

b) VFR/IFR Mix

Following the trips made to the various countries during the period July to October, 1977 an evaluation with regard to the VFR/IFR mix of traffic carried out by the consultants showed that the airports at Mexico City and Geneva had a level of activity and a VFR/IFR mix similar to Dorval Airport. Further observations of VFR/IFR operations were taken at both airports, are to be found in Exhibit 275, and are considered in Chapter 8, Section 2.

c) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The Mexican AIP communications section contains no reference to language use in ATC communications.

RAMSA was granted official status in 1944. From the outset a knowledge of the English language as well as Spanish was a pre-requisite to becoming a controller. The first controllers were in fact chosen more because of language ability than technical ability. English usage was observed as follows:

- Mexico City International Airport

  --Local Control - 5 percent
  --Ground Control - 21 percent

- Enroute Control - 11 percent

- Inter and Intra Facility Coordination - Negligible

Special Procedures

There are no special procedures because of bilingual air traffic control.

Special Practices

There are no special practices because of bilingual air traffic control.

Incidents/Accidents

No incidents/accidents could be recalled by RAMSA officials that occurred due to bilingual air traffic control. We did not examine written records.

Publications

All aeronautical publications, i.e., enroute supplements, SIDS, STARS, Air Regulations (ICAO Annex 2), etc. are published only in Spanish. International airlines and other users get pertinent publications translated by companies such as Jeppesen. Class I and II NOTAMS are in Spanish unless of concern to international airports, then they are in Spanish and English. Finally the AIP is only in Spanish, except for the phraseology section which is in Spanish and English.

Lexicon

A Spanish-English air traffic control Lexicon has been developed and is under continuous review and revision."

3.6 Rome, Italy

a) Facilities visited

i) Rome Area Control Centre. The Rome ACC is the busiest in Italy, controlling over 300,000 IFR aircraft in 1976. The airspace is crossed by 29 lower airways (ground to but not including FL 250), 31 upper airways and nine advisory routes. The Centre has 11 approach control zones, three of which are in the Rome Terminal Area. Thirty-two airports are located within the boundaries of the airspace for which the Centre is responsible.

ii) Rome International Airport, Control Tower and Approach Control. The Rome International Airport is the busiest air carrier airport in Italy, with 145,000 movements in 1976. Since the airport is restricted to IFR traffic there is no VFR/IFR mix. IFR general aviation traffic may only use the airport after having received authorization. Other general aviation and VFR traffic use two airports, Ciampino and Urbe, in the environs.

b) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The Italian Aeronautical Information Publication (AIP) communications section contains no reference to language in use for radio/telephony communications but only Italian and English are offered in conformity with the provisions of ICAO Annex 10. The AIP does indicate those airports where control in English is available.

The United States Air Force began the initial air traffic control in Italy in the years immediately following World War II. The U.S.A.F. controlled in English, but the system was fully bilingual utilizing both Italian and English once the Italians staffed it in 1949 and has remained that way ever since. We were informed that English usage is in the following proportions:

- Enroute Control - 30 percent
- Rome International Airport (Leonardo da Vinci) - 65 percent

Special Procedures

There are no special procedures because of the use of two languages in air traffic control.

Special Practices

We were told of a special practice which has evolved because of the use of two languages in ATC. If a controller begins to speak English to an Italian flight (to whom he has previously been communicating in Italian) it means that in his view all aircraft in his sector should overhear the communication of all other aircraft. When the controller changes from Italian to English, the pilot knows the reason for this change and generally will communicate henceforth in English as well. This is an accepted 'practice' in the Rome area and has the effect of reducing the requests for potentially conflicting traffic.

VFR/IFR Mix

Rome International Airport is restricted to only IFR airline traffic. General aviation must have prior authorization, hence there is no VFR/IFR mix.

Incidents/Accidents

No incidents or accidents could be recalled by ITAV officials that occurred due to the use of two languages in air traffic control. No written records were examined by us.

Publications

The Class I NOTAMS are only in Italian if they pertain to domestic airports; however, they are bilingual for international airports. Class II NOTAMS are always bilingual. The Lexicon section of DOC. 4444-RAC/501/10 has been translated into Italian. Most words were translated into Italian; however some "jargon" words such as squawk, although translated "inserite", are used in practice in

English form. The AIP is bilingual and contains most information used by the pilots such as the enroute IFR supplement, SIDS, STARS, and IFR charts. Changes to the AIP are issued as Class II NOTAMS and are bilingual.

Lexicon

The Italian-English Lexicon is a translation of ICAO DOC. 4444-RAC/501/10 Lexicon Section."

3.7 Geneva, Switzerland

a) Facilities visited

i) Geneva Area Control Centre. The Geneva ACC is one of two ACCs in Switzerland, the other being located at Zurich. Because of its location there are a great many flights over Switzerland. The airways intersection formed by the St. Prex VOR, near Lausanne, is possibly the busiest air intersection in Europe. The Geneva ACC therefore controls an enormous amount of enroute high level traffic: Scandinavian flights going to Spain, German flights enroute to Spain, English flights to Italy, and so on. The nature of the traffic handled by the Centre is reflected in the figures for 1976: 80,505 arrivals and departures, 176,378 overflights.

The Centre has written agreements with both France and Italy which permit it to control aircraft over some portions of those countries. As a result, some traffic in Italian airspace may be controlled in the French language.

ii) Geneva Airport Control Tower. Geneva Airport is operated by the Canton of Geneva, and is located in the extreme northern limits of Geneva. Over a length of two kilometres the northern boundary of the airport is coterminous with the boundary of France. Activity at the Geneva Airport increased from 101,100 movements in 1969 to 134,400 in 1976. Thirty-four percent of the movements were generated by general aviation aircraft. There is a substantial mix of VFR and IFR traffic at the airport.

b) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The Switzerland AIP indicates the following availability of languages for ATC in Switzerland:

Geneva - French, English

Berne - English, German

Zurich - English

Locarno - Italian, English

Grenchen - English, German

We were told that, basically, French and English are used in ATC in Switzerland but on occasion German and Italian are also available. Zurich handles most of its traffic (even VFR) in English. Geneva uses English and French for both VFR and IFR aircraft. According to the AIP, at Berne an aircraft could use German or English, and Italian or English at Lugano.

We observed the following language use:

- Geneva Control Tower - 77% English
- Geneva Area Control Center, Sector One (10,000-19,500) - 73% English
- Geneva Area Control Center, Sector Three (27,000-30,000) - 100% English

Special Procedures

There are no special procedures used by Geneva ATC because of the use of two languages in air traffic control.

Special Practices

There are no special practices because of bilingual air traffic control.

VFR/IFR Mix

Of the 134,400 movements at Geneva Airport in 1976, we were told that 45,700 were generated by VFR general aviation. Presently the VFR general aviation aircraft are not controlled in the Geneva TMA, (1) only a two way radio is required. Their movements in the TMA are, however, restricted. Incidents between this VFR and IFR traffic, however, have caused the Swiss to begin instituting positive control for VFR general aviation aircraft in the TMA, i.e., the aircraft must have an ATC clearance to fly through the TMA.

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(1) TMA: Terminal Manoeuvre Area

(Further observations concerning the VFR/IFR mix at Geneva were taken by the Commission's consultants at a later date, and are reported in Exhibit 275. Their findings are considered in Chapter 8, Section 2.)

Incidents/Accidents

Reports of accidents and incidents are kept by the airport authorities. We were told that there have been no incidents/accidents in Geneva because of language.

Publications

Our review of publications and language use showed:

- AIP is in four languages: English, French, German and Italian.
- Volume I of Air Traffic Control Manual is in English only except for the rules of air which are in French in Geneva and German in Zurich.
- Volume II of above manual is not printed in English, but is in French for Geneva and German for Zurich.
- IFR charts are only in English.
- VFR charts are in German and English for Zurich, and French and English for Geneva.
- The flight plan form in Geneva is in French and English.
- ATIS is only in English.
- Meteorological broadcasts are in English.
- NOTAMS Class I, Series A - International; English
  Series B - States adjacent to Switzerland; English
  Series C - Switzerland only; English
- NOTAMS Class II, Series A - German, French, English
  Series B - International; English
  Series C - Domestic general aviation; German and French

Lexicon

Our review indicated that the Lexicons for Geneva ATC Tower, Approach Control and Area Control are provided in French and English. English phrases are adopted from ICAO but are not always the same because the Swiss authorities have expanded the phraseology to account for recent developments in procedures."

3.8 Frankfurt, Germany

a) Overview

After World War II the U.S. Air Force organized and staffed the German air traffic control system. English only was used. Responsibility for the control of air traffic was assigned to the Federal Republic on May 15, 1955. English remained the only language for IFR control. However, in the interests of improving safety, the use of German, in addition to English, was immediately instituted for VFR air traffic control. In the words of Exhibit 278:

> "Communications with those pilots whose knowledge of the English language was insufficient to permit proper air traffic control presented a potentially hazardous situation which was rectified by providing control in the German language."

b) Facilities visited

i) Frankfurt Area Control Centre, Frankfurt Airport Control Tower and Approach Control. By international agreement control of the upper airspace (altitude 24,500 and above) over the Federal Republic of Germany has been assigned to Eurocontrol. The latter furnishes air traffic control services for Northern Germany through its Upper Air Centre (UAC) at Maastricht in the Netherlands. Upper airspace in the southern part of the country is controlled from Karlsruhe through an UAC manned and operated by the Federal Republic under contract with Eurocontrol. As shown on Figure 2-2 following page 7-3 of Exhibit 278, lower airspace (below 24,500) is served by four Area Control Centres located at Bremen, Frankfurt, Dusseldorf and Munich. Figure 2-2 also shows the three corridors leading from the Federal Republic to West Berlin.

Germany has ten international airports and three others which provide ATC for IFR traffic. There are 875 airports which can accommodate airline traffic and 275 airfields accommodating only general aviation. There are 130 military airfields located in the Federal Republic.

In 1971 VFR restricted areas were established around the control zones of international airports. In time this proved inadequate to provide the assured separation desired. In 1977, therefore, areas requiring Controlled VFR Flight (CVFR) were established within the Terminal Manoeuvre Areas. When Exhibit 278 was prepared CVFR areas had been established for the TMAs at Dusseldorf, Frankfurt, Hamburg, Hanover, Munich and Stuttgart. CVFR traffic must file a flight plan, have VOR, VHF and standard equipment on board, and be capable of complying with vector instructions.

A special frequency was established for the CVFR traffic. The following is from page 7-3 of Exhibit 278:

> "However, it is sometimes awkward for the local controller to use two frequencies thus. We are told that, therefore, a new control practice has been instituted at Stuttgart; the VFR frequency is used by aircraft for initial tower contact and feeding into final approach, while the tower frequency is then used to control both VFR and IFR landings. Thus the local frequency at Stuttgart is now bilingual and handles both VFR and IFR traffic."

c) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The German Aeronautical Information Publication (AIP), Page Com 0-2, provides

> On demand of the crew and with approval of the air traffic service, the radio/telephone communication may be performed in the German, Russian or English languages. The language spoken by the aeronautical station has the priority.

Language use was observed as follows:

- Enroute Control - English only
- Approach Control - English only
- Frankfurt Control Tower - English only (IFR traffic only)
- Inter and Intra Facility Coordination - Both English and German

Special Procedures

It has been customary for the larger airports to have an assigned frequency for the control of VFR traffic. This frequency was assigned, principally to accommodate pilots who speak German only, but is a bilingual English/German frequency. This frequency is used to control VFR traffic in landing and takeoff, while another frequency is used to control IFR traffic during landing and takeoff. Since IFR operations are English only, the IFR frequency is thus kept free of German language usage except in those unusual circumstances referred to at Page 3 above and under VFR/IFR mix below.

Special Practices

There are no special practices because of bilingual air traffic control.

VFR/IFR Mix

This is being handled at major airports by bringing VFR aircraft under control through restricted and controlled areas. However, at all major airports except Stuttgart, VFR and IFR aircraft use shared airspace, but VFR traffic is handled on a frequency separate from the frequency used for IFR aircraft. At Stuttgart, VFR traffic is handled on a separate frequency to control the traffic onto final approach. Through the final approach phase, all inbound VFR and IFR aircraft are on the same frequency.

Incidents/Accidents

There is no record of which we are aware of accidents or incidents connected with language usage.

Publications

We observed the following status of publications relative to language:

- ATC manual is bilingual.
- The AIP Manual is bilingual.
- All pilot publications are English/German.
- NOTAMS I are English only; NOTAMS II are English/German.
- Flight Plan forms are English/German.
- Controller Manops are in English and German.

Lexicon

An updated ICAO 4444-RAC/501/10 Lexicon is used for both languages."

3.9 Paris, France

a) Facilities visited

i) Le Bourget Airport Control Tower, Charles de Gaulle Airport Control Tower and Approach/Departure Control, Orly Airport Control Tower and Approach/Departure Control, Area Control Centre at Orly. In 1976 there were almost 1,500,000 movements in French airspace, of which nearly 700,000 took place in the northern control region, CRNA NORD, for which the Area Control Centre at Orly is responsible. The high peak day for the region was about 3,000 aircraft. Just over 40% of the traffic used cruising levels of 29,000 through 35,000 feet, probably indicating a sizeable percentage of long-haul and international traffic.

The Paris area has a high total of air traffic. In 1976 there were 335,573 operations, of which 96% were IFR.

General aviation traffic is not permitted at either Orly or Charles de Gaulle airports. Since there are practically no VFR operations there is no VFR/IFR mix at these air carrier airports. VFR flight is limited throughout the Paris area. An Air Traffic Zone (ATZ) is established and entry is permitted only after radio contact with the appropriate ATC authority. The Zone extends from ground level to 750 metres. While general aviation usually is served at Toussus-le-Noble, an airport located west of Orly, some traffic does go to Le Bourget Airport. VFR aircraft inbound to that airport must call the tower, when over specific checkpoints on the edge of the ATZ, to receive clearance. Annual traffic for 1976 at Le Bourget was 88,102, of which some 90% were on IFR flight plan.

b) Summary of Findings

The following findings are in the words of Exhibit 278:

"Language Use

The French Aeronautical Information Publication (AIP) does not specifically refer to the subject of language usage in radio/telephony; it does indicate those airports where English is available. Availability conforms to ICAO recommendations as per Annex 10:

"5.2.1.1.1. RECOMMENDATION. -- In general, the air-ground radiotelephony communications should be conducted in the language normally used by the station on the ground."

"5.2.1.1.2. RECOMMENDATION. -- Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, the English language should be used as such and should be available, on request from any aircraft station unable to comply with 5.2.1.1.1. at all stations on the ground serving designated airports and routes used by international air services."

In accordance with the above recommendation, French and English are used, and we observed varying degrees of use of each language on our visits to facilities. The relative usage as provided to us is shown by the following estimates:

	French	English
Le Bourget Tower	40%	60%
ACC	40%	60%
ACC Overflights	50%	50%
Orly Tower	60%	40%
Charles de Gaulle Tower	55%	45%
Charles de Gaulle IFR Room	65%	35%

Inter and intra facility coordination is generally French within the country and English with neighboring facilities other than Brussels and Geneva.

Special Procedures

There are no special procedures which have been adopted by French ATC because of the fact that bilingual control is offered.

Special Practices

There are no special practices because of bilingual air traffic control.

VFR/IFR Mix

There are practically no VFR operations at either Orly Airport or Charles de Gaulle Airport; thus, there is no VFR/IFR mix. Le Bourget has about 90 percent IFR and so has a VFR/IFR mix, but at low traffic levels, and with aircraft having similar operating characteristics.

Incidents

We were told there have been no incidents attributable to the use of two languages in ATC.

Publications

All publications are in French only pursuant to legal requirements; there is an English language lexicon for ATC terminology."

Section 4. VISITS MADE BY THE DEPARTMENT OF TRANSPORT

4.1 Investigations carried out

Officials of the Department of Transport, who were also members of the BICSS team, made visits in June, 1978 to Brussels, Geneva, Paris and Toulouse to examine the experience and procedures used in the provision of bilingual communications for IFR flights within Switzerland, Belgium and France. Eurocontrol Headquarters and the Maastricht ACC were also visited. In July, 1978 a visit was made to Mexico City.

As part of the investigation in Europe such things as airspace characteristics, communication techniques, training programmes and publications were examined. At each location a detailed set of questions was covered, and an overview obtained. Wherever possible some time was spent in observing the operation, and in listening to the air-ground frequencies for periods up to two hours.

While the primary objective of the Mexican visit was to examine procedures used for the recruiting and training of controllers who operate in a bilingual environment, Mexican air traffic control services in general were also considered. Detailed questions concerning various aspects of air traffic control were submitted to the Mexican authorities.

It will have been noted that, apart from those of Belgium, the air traffic control facilities studied by Departmental officials had also been investigated by the Commission's consultants. The report of the Departmental visit to Brussels will be dealt with in the following section. Except for Eurocontrol, it would appear unnecessary to discuss the Departmental study further except to say that reference is made to several of its observations elsewhere in this Report.

4.2 Belgium

Air traffic control services in the high level airspace over Belgium have been delegated to Eurocontrol. Services for low level airspace are provided from one centre, located at the Brussels airport.

All general aviation activity in the Brussels area is highly regulated. VFR operations to and from the Brussels airport are permitted by special approval only, and, in a manner similar to special VFR operations in Canada, must conform to assigned slot times or "windows". In the low level airspace outside of airways there are numerous restricted military areas in which a wide variety of operations take place, and into which civil flights may not penetrate except by permission of the military air traffic controllers.

Brussels Airport handles 350-400 movements daily. English is used for 95 to 98% of the communications involving IFR flights on the airport, approach and centre frequencies, with the remainder being in French. Sabena, the Belgian national carrier, employs English only for air-ground communications. Ground control will use Flemish with non-aircrew personnel in the northern region of the country. Ground-ground communications, permitted in both English and French, are almost entirely carried out in English, with Flemish occasionally being used. In the north of Belgium English is used exclusively by VFR units, except, as mentioned above, for communications in Flemish with non-aircrew personnel. In the south French is used as well as English in VFR operations.

Following World War II English was used exclusively because all pilots and controllers had been trained in the RAF. By the 1950s the use of French in IFR operations had increased to approximately 40%. Details of current language use in Belgium for air traffic control purposes is to be found in Working Document 6 of the BICSS Report.

Section 5. EUROCONTROL

The facilities of Eurocontrol were visited by the Commission's consultants in 1977, and by officials of the Department of Transport in 1978. The Eurocontrol International Convention, which relates to airspace above 20,000 feet, was signed on December 13, 1960 by Belgium, the Federal Republic of Germany, France, Luxembourg, the Netherlands, the United Kingdom and Ireland. The aims of the Organization are expressed in Article 1 of the Convention in the following terms:

> "The Contracting Parties agree to strengthen their cooperation in matters of air navigation and in particular to provide for the common organization of air traffic services in the upper airspace."

The Convention came into force March 1, 1963. Eurocontrol set up its permanent headquarters in Brussels in September of that year.

The Eurocontrol Organization is composed of two bodies: the Permanent Commission for the Safety of Air Navigation, a deliberative body, and the Air Traffic Services Agency, an executive body.

Initially, all operations were provided by the member states under contract to Eurocontrol. This was intended as a temporary arrangement until operational units could be designed and built and the required staff hired and trained.

The Maastricht Upper Area Control Centre (UAC), which is the only totally Eurocontrol operational unit, is located in the south-east corner of the Netherlands, and has a staff drawn from all seven member states. In March, 1972 the Maastricht UAC took over responsibility for the provision of air traffic services in the Belgian and Luxembourg upper airspace. Services for the northern part of the Federal Republic of Germany were provided beginning in March, 1974. In 1975 the Federal German Air Force began operating services, completely separate as to personnel and operation, but located in the Maastricht Centre, for the control of military air traffic in the northern part of the Federal Republic.

The Upper Area Control Centre at Karlsruhe, which provides service over the Rhine Region, went into operation in 1976. As mentioned in subsection 3.8 the facility at Karlsruhe is being operated by the Federal Republic of Germany under contract with Eurocontrol, and is totally German staffed.

Facilities are in place to provide service over the Netherlands, but the Dutch authorities have not yet agreed to release the airspace. For various reasons the other member states (the United Kingdom, France and Ireland) have not delegated responsibility to Eurocontrol and continue to provide the air traffic control service themselves under contract to Eurocontrol.

In July 1976 about 20,000 flights were controlled in the upper airspace of Belgium and Luxembourg, and some 14,000 in that of the northern part of the Federal Republic of Germany.

The language policy of Eurocontrol is stated in the Convention as follows:

> "1. The language used for the air traffic control operations ensured by the agency shall be the English language, subject to the subsequent adoption of an

> international aeronautical language by the International Civil Aviation Organization. Nevertheless, provision shall be made for pilots to use their own language during flight over their national territory. The appropriate measures shall be taken by the Agency at the request of the Contracting Parties concerned.
>
> 2. The Committee shall determine the administrative language of the Agency."

To date, the Maastricht UAC has not been asked to provide service in any language other than English. The Karlsruhe UAC provides service in English only, as do the ATC units in the United Kingdom and in Ireland. In the case of France, where service in the upper airspace is provided by that country under contract to Eurocontrol, the use of both French and English has not been questioned.

At Maastricht there is a unit requirement for all internal coordination to be conducted in English, but this is not always enforced. The language of coordination with adjacent units is normally English, but other national languages may be used where they are common to the controllers concerned.

Eurocontrol charts are issued in English only. However, Class II NOTAMs and the AIP are produced in both English and French.

Section 6. VIEWS OF CALPA AND COPA

6.1 CALPA

CALPA's views on language used in air traffic control systems in other countries are set forth in its written argument in a section entitled "ICAO STANDARDS, FOREIGN REGULATIONS & STANDARDIZATION".

The first submission made by CALPA is expressed in these terms:

> "Evidence was also presented that ICAO Annex No. 10, while providing that English is the language of international aviation also allows communication to be conducted in the language normally used by the station on the ground. This, of course, does not mean that the language normally used by the station on the ground will be the language of the state concerned. In the Netherlands and the Federal Republic of Germany, for example, English is the language of the station

> on the ground although not the language of the country. It would have been interesting to ascertain why those two countries, both very advanced in terms of civil aviation, chose to exclude their national language from IFR and most air traffic control services."

Although already set out earlier in the Report, the Commission believes it useful to again refer to the precise wording of the two sections of Volume II of Annex 10 to the ICAO Convention:

> "5.2.1.1.1. RECOMMENDATION. -- In general, the air-ground radiotelephony communications should be conducted in the language normally used by the station on the ground.
>
> 5.2.1.1.2. RECOMMENDATION. -- Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, the English language should be used as such and should be available, on request from any aircraft station unable to comply with 5.2.1.1.1. at all stations on the ground serving designated airports and routes used by international air services."

As mentioned in the Interim Report a note to Recommendation 5.2.1.1.1. points out that the language normally used by a station on the ground may not necessarily be the language of the State in which it is located.

Apart from its involvement with Eurocontrol, no evidence was submitted to the Commission concerning language use in the Netherlands other than that, as is seen from Figure B, only the English language is available for air traffic control.

The situation in the Federal Republic of Germany is described in Subsection 3.8 where it is pointed out that when responsibility for air traffic control was taken over by the Republic from the U.S. Air Force in 1955 German was immediately instituted for VFR traffic, in addition to English, in the interest of improving safety. It does not seem to the Commission worthwhile to endeavour to ascertain whether, in fact, English is the only language used for IFR air traffic control in the Federal Republic, and if so, the reasons therefor. Such an investigation would inevitably involve a study of developments in Western Europe in the aftermath of World War II, including the separation of Berlin, the Berlin Airlift, and the role played by the three corridors leading from the Republic to West Berlin, shown on Figure 2-2 of Chapter 7 of Exhibit 278.

As has been mentioned, Switzerland is a country where several languages are available for air traffic control. In its argument CALPA refers to the following provision in a document, filed as Exhibit 335, which sets out the requirements for an aircraft radio operator's license:

> "It is strongly recommended that private pilots use English phraseology wherever possible, even when French is authorized. In this way they will keep in sufficient practice and at the same time contribute to the general safety of air traffic." (Translation)

It will be recalled that in discussing Swiss air traffic control in the Interim Report the Commission said this:

> "If one goes further and examines the Aeronautical Information Publication (AIP) published by Switzerland, the following statement is to be found:
>
> 'Radiotelephony
>
> Pilots are invited, in the general interest of flight safety, to use primarily the English language for communicating with the air traffic services.'"

As to the situation in Switzerland the Commission believes the facts establish beyond doubt that two languages can be used safely for air traffic control purposes in both IFR and VFR conditions, especially when the investigations of the bilingual operations at the Geneva Airport made by the Commission's consultants are taken into account.

The second submission by CALPA concerning the world situation is best put in words taken from its written argument:

> "For many decades now it has been universally accepted that standardization is essential to aviation safety. Virtually all of the technical and operational work carried out by the International Civil Aviation Organization is directed to standardization. Indeed, ICAO 'Standards' govern civil aviation throughout the world. All efforts are directed to reducing complexity and eliminating differences or variations.
>
> Whether dealing with navigational aids, rules of the air, runway markings, the phonetic alphabet or lexicons, the move is to standardization. Historical, administrative or political reasons may cause differences to exist in many areas, including communications and may well be the reason that a large number of countries still use more than one standard language for air traffic control communications, but this does not detract from the desirability of standardization."

CALPA has referred the Commission to a State letter (Exhibit 345) from ICAO dated February 12, 1979 announcing that its Air Navigation Commission was establishing a radiotelephony study group to undertake, as a matter of urgency, a complete review of the existing provisions regarding radiotelephony with a view to eliminating existing ambiguity and developing a standard phraseology for use by both pilots and ground personnel. The ICAO letter states in part:

> "The problems relating to radiotelephony provisions and phraseology are such that it is essential that members of the Study Group have a sound knowledge of the English language, in order that the difficulties of pronunciation of specific words or phrases may be identified and eliminated as far as it is possible and that phrases which have exact equivalents in the working languages of ICAO can be chosen whenever possible."

An attachment to the State letter contains background information prepared to assist in the selection of members of the Study Group. The attachment mentions that increased traffic "has resulted in congestion on tower and approach channels with the result that the communication time available for each message has been reduced."

The attachment refers to a report made to the Air Navigation Commission by another ICAO body, the European Air Navigation Planning Group. The following passage is from the report:

> "It was, however, found that, when dealing with the subject of radiotelephony within ICAO, it would be desirable, for safety reasons, to give priority consideration to radiotelephony procedures related to the taxiing, take-off, approach and landing of aircraft because experience had shown that ambiguities in the language used by both pilots and controllers during these stages of flight could have the most serious consequences."

The attachment to the ICAO State letter also alludes to views expressed by the International Federation of Air Line Pilots Associations (IFALPA) and by the International Air Transport Association (IATA). In summary, concern is expressed by IFALPA over a deterioration in recent years in the quality of RTF communications on a world-wide basis. IFALPA is of the view "that the review of radiotelephony provisions should be conducted with the objective of the eventual incorporation of all RTF phraseologies and procedures in a single Annex and the publication by ICAO of a suitable handbook for the use of pilots and controllers world-wide."

The views of IATA are summarized in the attachment to the ICAO State letter as follows:

"IATA is of the opinion that a number of changes have occurred during the past 15 years which appear to warrant a serious review of RTF communications procedures and phraseology, including the following:

- A tremendous increase in aircraft speed and a corresponding reduction in the time available for human reaction;

- Widespread application of operations in Categories II and III conditions, in which, under the associated weather conditions, neither pilot nor ATC are able to see what is going on;

- A significant increase in the number of terminal areas qualifying as high traffic density areas in which congestion on RTF frequencies is a common occurrence;

- A trend towards reduced separation standards (radar separation as opposed to procedural separation) in order to increase terminal area and runway capacity;

- To an increasing extent, the use of discrete frequencies for RTF (e.g. ground control, departure control, approach control, etc.) thereby precluding the possibility of monitoring."

In its written argument CALPA also referred to an amendment to the IATA Technical Policy Manual, effective July 1, 1978, and entitled: "LANGUAGE TO BE USED IN AVIATION COMMUNICATIONS". The amendment reads:

"INTRODUCTION

1. Recognizing that the language of work can be a highly sensitive political and emotional problem in many countries, it is nevertheless a BASIC FLIGHT SAFETY issue that misunderstandings due to the use of multiple languages in aviation communications be avoided.

POLICY

2. IATA encourages, for FLIGHT SAFETY reasons, the following:

   a) Worldwide, all air-ground communications should be made in the English language in airspace used by international aviation.

      Note: There is a need for the English words used to be governed by standard international phraseology.

b) On the flight deck the language concerning operational matters should be understood by all crew members.

REASON

3. Experience has shown that misunderstandings in air-ground communications, and intra-cockpit discussions, due to the use of multiple languages, have in the past been contributory factors in aircraft accidents and incidents."

The views expressed in the ICAO material just mentioned are consistent with Article 37 of the ICAO Convention, which came into effect in 1947, and which reads in part:

> "Each contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation."

As the Commission sees it, so far as concerns language use, the policy of ICAO, of IATA, of IFALPA, of CALPA and indeed of all concerned with flight safety, is to adopt practices and procedures that will help to avoid misunderstandings and to improve comprehension in the light of changing conditions. To the extent compatible with the achievement of effective comprehension there can be no question but that the adoption of standard phraseology, proper lexicons and other measures is desirable. Indeed, the tenor of the ICAO State letter is that such measures are compatible with the use of more than one language for air traffic control.

It must always be remembered that by its Terms of Reference the Commission is essentially charged with inquiring into the safety of the introduction of bilingual IFR Air Traffic Services in the Province of Quebec. Accordingly, in considering the views as to comprehension expressed in the ICAO and in the IATA material, the Commission must have uppermost in mind the real world of Quebec. And in considering the situation in Quebec the Commission believes it particularly relevant to take into account the experience in countries where, from the investigations conducted by the Commission's technical consultants, the evidence establishes beyond doubt that, in the changing conditions described in the attachment to the ICAO State letter and in the IATA material, and over a long period of time, air traffic control services have been developed and safely provided in two or more languages.

6.2 COPA

In its written submission to the Commission COPA says there is no value in examining the experience in other countries where bilingual air traffic control procedures are used. Referring to the numbers of active civil registered aircraft and licensed pilots in the United States and Canada, COPA suggests that the United States and Canada should be grouped together if any such comparison is to be made. The following passages from the COPA brief appear to sum up the Association's position:

> "It must be presumed, therefore, that all pilots flying into Quebec airspace from other countries, and mainly from the United States because of their close proximity, will expect to find procedures that are compatible with ICAO standards."
>
> "Pilots instinctively dread the thoughts of having to fly in an environment which does not conform to normal or common established procedures as such is not conducive to promoting air safety. Quebec airspace will be the only area on the North American continent where bilingual IFR - ATC procedures may be permitted. This means that where itinerant non-Quebec based pilots are concerned, there will be a decrease in safety because of the decrease of comprehension a pilot experiences. We know of no other country in the world that does not have a common system of air traffic control within its national boundaries."

By way of comment the Commission would simply observe:

a) Procedures involving the use of two languages in Quebec will be compatible with ICAO standards.

b) When preparing its submission COPA appears to have overlooked the experience in Mexico, and not to have understood the situation in Switzerland, which, as will be seen in Chapter 8, is comparable to Montreal.

c) The Interim Report dealt with an earlier submission by COPA concerning a comparison of the number of civil aircraft registrations and licensed pilots in Canada and in Europe.

Section 7. CONCLUSIONS

The on-site investigations of air traffic control systems in other parts of the world conducted by the Commission's consultants, as well as the examinations undertaken by officials of the Department of Transport, constitute

a vital part of the evidence before the Commission. The contribution of these studies is valuable for several reasons: firstly, the real-life information obtained is an essential element in weighing the findings of the simulation studies and in assessing the recommendations of the BICSS Report; secondly, the experience in places where two or more languages are currently used in air traffic control is valuable in considering aspects of the study that cannot effectively be tested by simulation, and that might be affected by language use, such as the party-line element of the listening watch, and the VFR/IFR mix; and, thirdly, the conclusions that emerge from the facts disclosed are of themselves relevant and important.

As mentioned, the evidence obtained constitutes real-life verification of the findings of the simulation studies. The need for such verification is pointed out by V. David Hopkin, Head of the General Psychology Section of the Royal Air Force Institute of Aviation Medicine in his paper "An Appraisal of Real-time Simulation in Air Traffic Control" (Exhibit 308), where he says:

> "The findings from a real-time simulation should not be treated as definitive. They need verification in real life. They are never completely valid or totally useless, but it can be difficult to judge what credence they should be afforded. Simulation tends to be more valid for relative than for absolute findings."

The simulation exercises were subject to certain constraints, some of them inherent in the programme itself. The fidelity of the tests has been challenged for this reason. Since this matter has been dealt with earlier there is no need to go into it here. Neither is it necessary here to inquire into why it is impossible to effectively simulate the party-line aspect of the listening watch or the VFR-IFR mix. What is important to remember is that all the elements said to have been lacking in the simulation studies are present to a greater or lesser degree in the world described in this chapter, a real world where controllers and pilots function safely and efficiently in a variety of situations where more than one language is used for communication between them.

Let us now turn to consider some of the broader conclusions that emerge from the investigations described in this chapter.

The investigations were made of air traffic control facilities and airports located in four continents and involved operations conducted in a number of different languages. The major airports investigated are served by air carriers from countries throughout the world.

In some of the countries investigated air traffic services appear always to have been available in more than one language. In others, they were originally provided exclusively in English, and a national language was

subsequently introduced by the state. In the latter cases there is no evidence before the Commission as to the investigations, if any, that were made before it was decided to make the national language available.

It seems impossible to determine in any rational way the reasons that have led to the availability in different countries, or in different regions of one country, of various languages for air traffic control purposes. In similar vein, even if they could be found, which is unlikely, no useful purpose would be served in searching for the reasons governing the extent to which a language is in fact used. One common thread seems to be that, as recommended by ICAO, English is available, and used, with or without other languages, at airports and over routes used by international air services.

At a number of airports general aviation aircraft are prohibited or restricted, and IFR operations are mostly, if not exclusively, to be found. In other locations there is a substantial mix of VFR and IFR traffic. Restrictions imposed by military operations are sometimes a factor. In some cases facilities are located near water, in others they are situated close to mountains, in yet others they are surrounded by built-up areas.

Despite this diversity of conditions, there is one thing that emerges crystal clear from the on-site investigations made by the Commission's consultants: day in, day out, and all over the world, an enormous number of flights of all kinds are made - safely and efficiently - using air traffic services provided in two or more languages.

FIGURE A

LANGUAGES AVAILABLE FOR AIR TRAFFIC CONTROL
IN ICAO COUNTRIES

AF - Afrikaans
AR - Arabic
BU - Bulgarian
CH - Chinese
CZ - Czechoslovakian
DA - Danish
DR - Dari
EN - English
FI - Finnish
FR - French
GE - German
GR - Greek
HU - Hungarian
IC - Icelandic
IT - Italian
JA - Japanese
NA - Not Available
NO - Norwegian
PA - Pashtu
PE - Persian
PO - Polish
PT - Portuguese
RO - Romanian
RU - Russian
SC - Serbo-Croatian
SL - Slovak
SP - Spanish
SW - Swedish
TU - Turkish

FIGURE B

CONTRACTING STATES OF ICAO

1. Afghanistan, Republic of (PA, DR, EN)
2. Algeria (FR, EN)
3. Angola (EN)
4. Argentina (SP, EN)
5. Australia (EN)
6. Austria (GE, EN)
7. Bahamas (EN)
8. Bahrain (EN)
9. Bangladesh (EN)
10. Barbados (EN)
11. Belgium (EN)
12. Benin (FR, EN)
13. Bolivia (SP, EN)
14. Botswana (EN)
15. Brazil (PT, EN)
16. Bulgaria (BU, RU, EN)
17. Burma (EN)
18. Burundi (FR, EN)
19. Canada (EN, FR)
20. Cape Verde (EN)
21. Central African Empire (FR, EN)
22. Chad (FR, EN)
23. Chile (SP, EN)
24. China, People's Republic of (CH)
25. Colombia (SP, EN)
26. Congo, People's Republic of the (EN, FR)
27. Costa Rica (SP, EN)
28. Cuba (SP, EN)
29. Cyprus (EN)
30. Czechoslovak Socialist Republic (CZ, SL, RU, EN)
31. Democratic Kampuchea (FR, EN)
32. Democratic People's Republic of Korea (NA)
33. Democratic Yemen (AR, EN)
34. Denmark (DA, EN)
35. Djibouti (NA)
36. Dominican Republic (SP, EN)
37. Ecuador (SP, EN)
38. Egypt, Arab Republic of (EN)

Contracting States of ICAO (Continued)

39. El Salvador (SP, EN)
40. Equatorial Guinea (PT, EN)
41. Ethiopia (EN)
42. Fiji (EN)
43. Finland (FI, EN)
44. France (FR, EN)
45. Gabon (FR, EN)
46. Gambia (EN, FR)
47. Germany, Federal Republic of (EN, GE)
48. Ghana (EN)
49. Greece (GR, EN)
50. Guatemala (SP, EN)
51. Guinea (FR, EN)
52. Guyana (EN)
53. Haiti (FR, EN)
54. Honduras (SP, EN)
55. Hungary (HU, EN)
56. Iceland (IC, EN)
57. India (EN)
58. Indonesia (EN)
59. Iran (PE, EN)
60. Iraq (EN, AR)
61. Ireland (EN)
62. Israel (EN)
63. Italy (IT, EN)
64. Ivory Coast (FR, EN)
65. Jamaica (EN)
66. Japan (JA, EN)
67. Jordan (AR, EN)
68. Kenya (EN)
69. Kuwait (EN)
70. Lao People's Democratic Republic (FR, EN)
71. Lebanon (AR, FR, EN)
72. Lesotho (EN)
73. Liberia (EN)
74. Libyan Arab Republic (AR, EN)
75. Luxembourg (FR, EN)
76. Madagascar (FR, EN)
77. Malawi (EN)
78. Malaysia (EN)
79. Maldives (EN)
80. Mali (EN, FR)
81. Malta (EN)
82. Mauritania (FR, EN)

Contracting States of ICAO (Continued)

83. Mauritius (FR, EN)
84. Mexico (SP, EN)
85. Morocco (FR, EN, SP, PT)
86. Mozambique (EN)
87. Nauru (NA)
88. Nepal (EN)
89. Netherlands, Kingdom of the (EN)
90. New Zealand (EN)
91. Nicaragua (SP, EN)
92. Niger (FR, EN)
93. Nigeria (EN)
94. Norway (NO, EN)
95. Oman (EN)
96. Pakistan (EN)
97. Panama (SP, EN)
98. Papua New Guinea (EN)
99. Paraguay (SP, EN)
100. Peru (SP, EN)
101. Philippines (EN)
102. Poland (PO, RU, EN)
103. Portugal (EN)
104. Qatar (EN)
105. Republic of Korea (EN)
106. Republic of South Viet-Nam (FR, EN)
107. Romania (RO, EN)
108. Rwanda (FR, EN)
109. Sao Tome and Principe (EN)
110. Saudi Arabia (EN)
111. Senegal (FR, EN)
112. Seychelles (EN)
113. Sierra Leone (EN)
114. Singapore (EN)
115. Somalia (EN)
116. South Africa (AF, EN)
117. Spain (SP, EN)
118. Sri Lanka (EN)
119. Sudan (AR, EN)
120. Surinam (EN)
121. Swaziland (EN)
122. Sweden (SW, EN)
123. Switzerland (GE, FR, EN)
124. Syrian Arab Republic (AR, EN)
125. Thailand (EN)
126. Togo (FR, EN)

Contracting States of ICAO (Continued)

127. Trinidad and Tobago (SP, EN)
128. Tunisia (FR, EN)
129. Turkey (TU, EN)
130. Uganda (EN)
131. Union of Soviet Socialist Republics (NA)
132. United Arab Emirates (EN)
133. United Kingdom (EN)
134. United Republic of Cameroon (FR, EN)
135. United Republic of Tanzania (EN)
136. United States (EN)
137. Upper Volta (FR, EN)
138. Uruguay (SP, EN)
139. Venezuela (SP, EN)
140. Yemen (EN)
141. Yugoslavia (SC, RU, EN)
142. Zaire, Republic of (EN)
143. Zambia (EN)

FIGURE C

The team from the Canadian Commission of Inquiry into Bilingual Air Services will be interested in obtaining information on the following matters during their visit to Japan:

- Activity Statistics - annual, monthly, daily, hourly operations.
- Weather - weather minimums for VFR and IFR operations.
- Airspace Structure - approach, departure, circling and local patterns for VFR and IFR aircraft.
- Management - management organization of the air traffic control department.
- Personnel - personnel staffing in control units.
- Equipment - equipment layout and use for control units and near future improvements.
- Training - details and language certification process for controllers and pilots
- Lexicon - if a special ATC lexicon exists, details of its contents (obtain a copy) and any history of its developmental process.
- Coordination - inter/intra facility coordination procedures regarding language.
- Special Procedures - whatever special procedures, i.e., extra separation, higher VFR weather minimums, etc., exist because of two languages.
- Language Use - records on percent of English versus a second language use.
- History - history of bilingual use in the country.
- Survey - conduct a one-day survey in each control unit. Also review some past ATC tapes. Data recorded would include:
    - false starts of wrong language
    - percent transmission in each language
    - percent repeat transmissions
    - irregularities due to language
    - aircraft movements by type

- Interviews - interview controllers and discuss language and how it affects certain procedures. Mechanics of keeping track of languages. Problems of switching from one language to another. Extra communication workload due to two languages.

Chapter 8

ARGUMENTS RELATING TO THE SAFETY OF THE INTRODUCTION OF BILINGUAL IFR AIR TRAFFIC SERVICES IN QUEBEC

Section 1. THE PARTY LINE ELEMENT OF A LISTENING WATCH AND THE NEED FOR COMPLETE COMPREHENSION

1.1 General

A pilot is required to maintain a listening watch on an appropriate radio frequency so that he can receive messages addressed to his aircraft by an air traffic controller, and to communicate with the controller. This is the primary purpose of the listening watch, and it is fundamental to the whole process of air traffic control. Only one frequency at a time is normally involved.

A second feature of the listening watch is that the pilot can listen in on communications exchanged between the controller and other aircraft on the same frequency. This feature is well described as being the "party line aspect", or element, of the listening watch. During the first phase of the hearings the term "redundancy" was most often used when referring to this factor. Since a "party line" is a more apt description of the concept, that expression is used in this Report instead of "redundancy". It should be pointed out, however, that the expression "listening watch", without more, is frequently, if imprecisely, used in the Report, as it was during the hearings, when the party line concept is being considered.

The party line element of the listening watch has been depicted in various ways. During the first phase of the hearings it was said by pilots to involve a mental picture of flights operating in the same airspace - a "three-dimensional situation" according to Mr. Hubbard, a "three dimension picture" as it was put by Mr. Beauvais. In the course of the recent hearings Mr. MacWilliam described his perception of the factor:

> "As a pilot, as a professional pilot, Mr. MacWilliam, what is your definition of the listening watch?
>
> A Well, it is tough thing to give definition to.
>
> I guess, to me, it is my ability to be able to understand the transmissions that go on around me outside of my own cockpit, and to be able to gather whatever useful information I might be able to gather from those transmissions, that is kind of my definition of what it is.
>
> Q So, phrased differently, these would be advantages to which you, as a pilot, can put the party-line which exists?
>
> A Yes, I guess you could say that.

> It is my ability for, probably ability isn't right, but the availability to me of that information so that I can sift it and do whatever I want to do with it, sort of thing."

Information potentially available on the party line may be helpful to a pilot in several ways. He may, for instance, anticipate control instructions based on clearances and control instructions directed to other flights on the same frequency. Or he may learn of situations which are developing - thunderstorms and landing conditions, for instance - which may be useful in planning his future course of action.

There is another feature to the party line aspect of the listening watch, a feature that may be said to lie at the heart of the opposition to the introduction of bilingual air traffic control in Quebec. As he listens to other transmissions on the same frequency a pilot can sometimes detect errors, and take or cause corrective action to be taken. This feature of the listening watch - a kind of safety factor inherent in the system - gave rise to the use of the word "redundancy" during the earlier stages of the Inquiry.

Many pilots can recall instances where, as a result of close monitoring of a control frequency, the party line enabled them to take some action which resulted in a more efficient or safer flight.

The inability of a pilot to understand transmissions on the same frequency inevitably results in some loss of the potential of the party line. This is the principal reason advanced by CALPA and the groups with which it is associated for resisting the introduction of bilingual air traffic control in Quebec. The concern is expressed this way by Mr. MacWilliam, the CALPA representative, during the course of his testimony:

> "Q . . . I think you said it quite clearly, you and many other pilots had always assumed that the listening watch was so important to you that you couldn't do anything which would tamper with it?
>
> A Well, certainly if it was our choice, that is right, we wouldn't want to do anything, because it is a tool that we can use hopefully to avoid situations that we really don't want to get ourselves in and we don't want to lose that ability unless, in fact we don't want to lose it period, I guess that that is the attitude."

The BICSS Report points out that there are some disadvantages to the party line:

"a) a pilot may initiate some action based on erroneous information overheard on an aeronautical frequency,

b) a pilot may accept and execute instructions addressed to another flight with a similar identification."

This aspect of the listening watch was mentioned in Exhibit 167, a Status Report on Accident Analysis prepared for the Commission by its technical advisers and filed during the first phase of the hearings:

> "The 'redundancy' factor was identified in nine of the accidents listed. The analysis of the redundancy factor in these cases does not easily lead to clear cut conclusions. There are times where the overhearing of a communication meant for another pilot has contributed toward an accident. For example, a pilot, in one case, elected to continue an approach in marginal and deteriorating weather conditions because he overheard another aircraft report that the ceiling was 1,000 feet although the tower had indicated to him specifically that the cloud base was 600 feet with thunderstorms and heavy rain.
>
> In another case a pilot followed instructions that were not meant for him during a radar identification procedure. As a result, the other aircraft was misidentified and was vectored into a mountain by the controller."

The listening watch was considered at length in the first series of hearings, and dealt with by the Commission in the Interim Report, particularly in Section 6 of Chapter 9. Although the effect of the listening watch was then being studied essentially in connection with VFR flights, many of the points raised in the Interim Report are relevant to the present phase of the Inquiry. The Commission's conclusions in the Interim Report concerning this topic are expressed in the following passages:

> "Notwithstanding all these limitations to the listening watch, the Commission believes the redundancy element is important to all types of pilots, that its value is universally recognized, and that any step tending to diminish its effectiveness must be resisted unless clearly required in the overall interest of safety.
>
> Those who are of the opinion that air traffic control services in both official languages for VFR flights in Quebec must be provided recognize the importance of the redundancy element inherent in the listening watch, but say

> that the need for clear understanding between pilot and controller is even more important. Indeed, it is their position that such comprehension is fundamental to the functioning of an air traffic control system. It seems difficult, logically, not to accept this proposition as self-evident."
>
> "To summarize, the Commission is of the opinion that, even at the cost of some redundancy, it is safer for everybody to have all pilots in the air functioning in a language they comprehend, capable of fully understanding instructions addressed to them, and able to give clear and accurate reports of essential flight information."

During the second phase of the hearings a large part of the discussion concerning the listening watch turned around those parts of the BICSS Report which deal with the subject.

1.2 The BICSS listening watch study

a) The study

The simulation programme was not designed to test the party line element of the listening watch. Mr. Proulx had felt that as the exercises unfolded controllers or simulator pilots would probably make some errors which other pilots would have the opportunity of detecting. However, during the first phase of the simulation exercises the representatives of the pilot and aviation industry associations requested that specific tests be carried out to ascertain the ability of flight simulator pilots to detect controller or other pilot errors while operating in a simulated environment.

After discussions, it was agreed that it would be possible to develop procedures by which such tests could be carried out during the Phase III and IV exercises. It was also decided that a search would be undertaken to gather data from the real world so as to identify situations where pilots might have detected and corrected controller or pilot errors. The search would include instances where, because of the party line, pilots had the opportunity to detect conflicts or errors but had not done so.

A Listening Watch Review Committee was established to review the data collected during the study. The group was made up of two members from the Department of Transport, a representative from AGAQ, and a representative of CALPA.

The first attempts to come up with a worthwhile method of carrying out such an experiment did not yield sufficient data and were unsuccessful. Agreement was eventually reached that the air traffic controllers taking part in the Phase III and IV simulations of the James Bay and Terminal sectors of the Montreal ACC would be required to create potentially hazardous situations, or to accept incorrect readbacks of air traffic control clearances and other flight information. It was understood that although the listening watch might be broader in scope, the area to be tested would be restricted to third party detection of controller and pilot error. The terms of reference relating to the tests contained the following statement:

> "a) because of the limitations inherent in the simulation to test the listening watch (i.e. limited number of aircraft simulator flights), and
>
> b) due to the limited amount of data available from the 'real world' environment about the listening watch, and
>
> c) because of the difficulty in counterbalancing the benefits derived from the listening watch with the benefits accrued by better comprehension by some pilots in a bilingual air traffic control environment, and
>
> d) because the aircraft simulator pilots (Air Canada and Transport Canada aircraft simulators) were forewarned that controller and pilot errors would be injected into the simulation exercises to test their ability to detect errors,
>
> a qualitative rather than quantitative assessment of the listening watch would be carried out by the group reviewing the available data."

The Committee initiated a search to obtain data on the party line aspect of the listening watch. It was agreed that the study would be restricted to situations that had occurred in Canada. Data was obtained from the following sources:

- Department of Transport: Aviation Safety Branch, Air Traffic Services Incident Records and Canadian Air Transportation Administration Regional files.

- Canadian Air Line Pilots Association.

- Air Canada.

As a result of the Committee's search some 72 situations were found and documented. They included cases where pilots had detected an error or had sufficient information to detect an error but did not do so. Approximately 90% of the cases occurred between 1974 and 1978.

It was acknowledged by the Committee that the 72 situations probably did not accurately represent the number of controller and pilot errors that occur on a day-to-day basis in the real world environment. The Committee believed the two most probable reasons for the paucity of data would likely be, firstly, the reluctance of air traffic controllers and pilots to report and document errors they have detected, and secondly, the fact that many incidents or losses of separation go undetected.

An analysis of the results of both aspects of the listening watch study - simulation and the real world situations - is set out in Chapter 5 of Volume 2 of the BICSS Report. As has been noted the terms of reference for the listening watch study called for a qualitative rather than a quantitative assessment of the data to be made. It was perhaps to be expected that the application of this kind of subjective standard to the data collected would prove no easy task. In the result, while the associations had the opportunity to take part in their preparation, the conclusions relating to the listening watch study set out in the BICSS Report are those of the Department of Transport.

b) Conclusions of the study

It will be useful to deal with the conclusions concerning the listening watch set out in the BICSS Report as a means of bringing into focus the issues involved in an assessment of the impact of bilingual air traffic control on the listening watch. Such an assessment will naturally involve the primary as well as the secondary aspect of the listening watch.

> "1. Although there is a paucity of data, the analysis of the effectiveness of the party line concept in a simulated environment and in the review of real world cases tends to support the fact that errors are detected by pilots, some of which could be considered critical."

The use of the word "tends" has been criticized by CALPA as inclining to downplay the importance of the party line aspect of the listening watch. It seems unnecessary to enter into such a debate. As already mentioned, the position of the Commission on this point was plainly expressed in the Interim Report, in words that bear repeating:

> "Notwithstanding all these limitations to the listening watch, the Commission believes the redundancy element is important to all types of pilots, that its value is universally recognized, and that any step tending to diminish its effectiveness must be resisted unless clearly required in the overall interest of safety."

The Commission remains firmly committed to these beliefs.

The difficulty encountered in securing objective, reliable data led to the recommendation in the BICSS Report that the Department investigate the establishment of a voluntary reporting system, to be administered by an independent agency. The Commission has earlier commended this proposal.

Before turning to deal with the second conclusion of the BICSS Report concerning the listening watch, it should be mentioned that several reports of fact-finding boards relating to incidents in Quebec were filed as exhibits with the Commission. Those in which two languages were being used have already been dealt with in Chapter 6, Section 2.

The reports were analyzed by CALPA in its written argument as a means of illustrating points the Association wished to make concerning the possible effect of the further introduction of bilingual air traffic control.

In view of the conclusions of the Commission as to the value of the party line element of the listening watch earlier expressed under the present heading there seems little point in dealing further with the fact-finding board reports.

> "2. Bilingual air-ground communications will have an impact on the listening watch. This impact will vary depending on the airspace, location and sectors where bilingual communications are used and the percentage of each language used at any one time."

The evidence supports this conclusion.

It is appropriate at this point to mention that the role played by the listening watch in uncontrolled airspace will be dealt with in Chapter 12.

> "3. The proposed procedures for the provision of traffic information in the holding pattern and for the merging targets will compensate for some of the loss in the party line aspects of the listening watch."

Since these procedures have been considered at length in Section 8.3 of Chapter 8 of this Report there is no need to deal with them further.

"4. It is acknowledged that comprehension is of paramount importance in communications between the air traffic controller and the pilot. These communications must be clear, concise and in a language they both understand well. It is expected that improved comprehension in a bilingual environment will enhance the primary goal of the listening watch."

Before discussing this conclusion it must again be emphasized that, as provided in ANO Series I, No. 1, in a bilingual environment the pilot will determine the language he wishes to use during the flight. The controller will be bilingual.

To say that comprehension is of paramount importance in communications between the air traffic controller and the pilot is to state the obvious. The notion is vividly presented in the cross-examination of Mr. MacWilliam by Mr. Deschênes, counsel for the Department of Transport:

"Q Now, this morning, Mr. Fortier asked you a question, and if I have it correctly, you agreed with a statement:

That clear, concise communications is what should happen in lexicon which both the pilot and the controller understands well.

A Yes, I agreed to that, yes.

That is as a flight safety officer I would call motherhood. You can't disagree with it, of course.

Q Would you not agree that this statement should also apply to the unilingual francophone pilot in an English environment?

A I think the statement should apply to anyone who flies."

Speaking as Director of Air Traffic Services and from years of experience as a controller at Quebec City and Montreal, Mr. Proulx related the compelling need for comprehension to the situation existing in Quebec. Examined by Mr. Fortier, he said:

"The comprehension and the need for a clear understanding between the pilot and the controller in any system, unilingual or bilingual and we feel that it is of paramount importance that controllers communicate with pilots and vice-versa in a way that is clear and concise and in a language that they both understand well.

> And I think that in relating this to Quebec, that there are some pilots who encounter some difficulty with communications between themselves and the air traffic controller; now, this recurs in the system and some cases have been identified where through a lack of comprehension it creates additional workload for the controller and it can create some potentially dangerous situations and that the provision of bilingual communication affords the pilot to select the language in which he feels most comfortable to communicate with the air traffic controller. The air traffic controller being bilingual can provide the pilot with the information in the language that he understands well and therefore ensuring that his messages are well understood, and I think that comprehension is paramount whether we are talking of unilingual or bilingual, but that introducing bilingual communications would afford pilots the opportunity of choosing the language and better comprehension.
>
> Q Is it your view that having in mind the safety of the system as being paramount, that decision as to which language should be used for purposes of air traffic control should vest in the pilot user?
>
> A Yes, he is in the best position to select the language and obtain air traffic control clearances or instructions in the language he understands best and that decision cannot be made by the controller."

It is convenient to pause here to consider the procedure proposed by CALPA to deal with French-speaking pilots who encounter difficulties. CALPA says the present system most effectively compensates for a lack of comprehension on the part of such pilots. The present system is found in Section 6 of ANO, Series I, No. 1:

> "6. Where an emergency occurs during flight within the Province of Quebec, the pilot-in-command may communicate in the French language with any aeronautical radio station located within that Province with respect to any matter relating to the emergency."

The Commission believes the view expressed by CALPA represents a serious misapprehension of the cumulative effect of the evidence presented during both phases of the Inquiry. It seems to the Commissioners, with respect, that the solution proposed by CALPA fails to take into account the evolution in the use of the French language that in recent years has accompanied the growth of aviation throughout the province of Quebec. Bearing in mind their duty under the Terms of Reference ". . . to consider, evaluate and report upon . . . the IFR procedures finally developed . . . in terms of . . . the implications in relation to aviation safety," the Commissioners are of the opinion that the procedure proposed by CALPA is unsatisfactory.

"5. It is recognized that the party line aspect of the listening watch has some value in the existing system but technological innovations in progress and proposed for the future in the Canadian air traffic control system will, in certain areas, progressively reduce the amount of information available to the pilot from which to detect errors."

During the course of the second phase of the hearings considerable attention was directed to developments in air traffic control having the effect of reducing voice communications between pilots and controllers. Among these developments are:

Standard instrument departures (SIDs)
Standard arrival routes (STARs)
Profile descents
Automatic terminal information service (ATIS)
Secondary radar with mode C capability
Computer stored flight plans

Except for the secondary radar with mode C capability, these developments have been adopted as part of the Canadian air traffic control system. Not all, however, are to be found everywhere in the system. STARs and profile descents, for instance, are not yet used in the Montreal FIR.

Secondary radar with mode C capability has been in use in the United States and other parts of the world for several years. It is in the process of being installed in Canada under the name of JETS (Joint Enroute Terminal System). By means of JETS the controller will have available on an automated display the identification, altitude and speed of each aircraft equipped with mode C capability. All air carriers are so equipped. The use of this equipment will reduce the number of communications by voice in radar areas by as much as thirty to fifty per cent.

In its written argument CALPA has commented on Conclusion 5 of the BICSS Report as follows:

"Evidence in this respect, however, has demonstrated that rather than reducing the amount of information available to the pilot from which to detect errors, the near-future regimented procedures and other procedural innovations while reducing the numbers of communications will increase the information available to the pilots from any particular communication, thereby rendering all the more important the necessity to detect any errors in that particular communication.

To this effect, see for example, the testimony of Mr. MacWilliam at Volume 51, pages 7696-7697 of the transcript:

> 'In the one aspect, it has reduced the amount of talk that goes on, so you lose that amount of talk, whatever value that might have been to you; and the other aspect of those SIDs and STARs are that they are very regimented procedures; in other words; the aircraft will be at a certain point, at a certain altitude, etc., etc., ... and because it is very structured, and because certain points, certain altitudes are required and the airplane will be there, ... it allows you, as a pilot, to gain a lot more information from that one transmission that you would have before ...'"

It would appear that Mr. MacWilliam's remarks are directed to SIDs and STARs, and not to JETS.

It is now three years since the Commission was appointed. Throughout this period work leading to the introduction of the JETS system in Canada has been proceeding. As mentioned, the use of that system will result in a reduction in voice communication between pilots and controllers of around thirty to fifty percent. There was, however, no evidence presented to the Commission during either of its hearings that opposition has been raised to this substantial impairment to the party line. Nor has it been suggested that any studies have been made in Canada or the United States as to the effect of mode C capability on the listening watch.

1.3 Measuring the effect of the listening watch

According to Dr. Frigon, in experimental psychology one must be very careful not to inform the subjects being tested of the exact nature of the experiment or the results will be "contaminated." Viewed in such a light, it is clear that the listening watch tests conducted during the last two phases of the BICSS simulation exercises were subject to a serious defect. The pilots who took part were well aware of the object and importance of the experiment. Dr. Frigon said that from the moment the pilots were told errors were going to be introduced into the system it was self-evident that, if attention were paid, the errors would be detected. He was accordingly of the view that the results of the tests had been "contaminated."

It must be pointed out that Dr. Stager was not involved in the design of the listening watch tests. He, too, questioned the validity of the experiment because of information that had been given to the pilots who were taking part.

CALPA took some objection to the way in which the listening watch tests were conducted. It said, in effect, that in simulation there were not as many pilots on a frequency who would have the opportunity of detecting an error as there would be in the real world. CALPA was also critical of the fact that a simulated flight only represented a segment, and not an entire flight. The association's only suggestion as to how a worthwhile experiment might be carried out was to refer the Commission to the facilities of the Eurocontrol Experimental Centre, and to the possibility of putting as many as 20 pilot positions on a frequency at one time. It should be said that the existence of these facilities is known to the Department of Transport and the Commission's technical advisers.

John Keitz, a member of the Commission's team of technical advisers and its principal observer at the simulation exercises, was asked for his view as to the value of the tests which were made of the listening watch in Hull:

> "Well, I think they do provide us with some valuable data.
>
> I think we all would have hoped that we could come up with a conclusive quantitative measure of the value of the listening watch, but obviously that was not available from those experiments, although I think we did get some usable data from the experiments.
>
> Q The, such a determination, a conclusive determination of the quantitative proof of the listening watch, have you applied your mind, you and your colleagues applied your minds as to how that might be done?
>
> A Yes, we have considered that on a number of occasions, and we don't believe that there is any practical experiment which could be conducted that would give this conclusive quantitative measure of the value of the listening watch."

Asked whether it would be possible to design a valid simulation experiment to measure the importance of the party line aspect of the listening watch, Dr. Frigon testified that on many occasions he had tried to think of a way to carry out a worthwhile test. He said it was extremely difficult, indeed impossible, to devise an experiment that would give an exact idea of the importance of the party line element.

Dr. Frigon went on to explain that in his opinion it was unnecessary to carry out a laboratory-type experiment because there was another method, an experimental method, of evaluating the importance of the listening watch. As a general rule, he said that when one has the choice between a situation which can be reproduced in the field or in the laboratory, one chooses the former because it will usually be much more valid. Dr. Frigon continued:

"Q In your opinion, the situation which was reproduced in the Hull laboratory, in order to determine the relative value of the listening watch, does this situation already exist in the real world?

A Yes, it exists in all countries of the world where two or more languages are used in the air traffic control system.

Q Could you please explain whether you are suggesting that an ex post facto analysis could have been conducted of the situation prevailing in the countries of the world where two languages or more are used in the air traffic control system?

A Yes. If we take the situation prevailing in all countries of the world where two or more languages are used in the air traffic control system, pilots flying in that particular airspace do not have this opportunity when communications take place in another language, to understand these communications.

So .....

Q If they are unilingual?

A Yes, if they are unilingual.

In such a case, in the countries where the situation prevails, then, we can deal with the situation in the field.

And if we try to reproduce it in a laboratory to assess its importance, if I had the choice, I think that I would choose the real situation.

Q An empirical analysis?

A Yes, an empirical analysis.

We can do a theoretical analysis of the listening watch concept, but this theoretical analysis must be supported by an empirical analysis.

The empirical analysis can be done in the laboratory, or it can be conducted in the field. In other words, we can reproduce the real situation in order to assess it, if the situation does not exist.

But if the situation exists in the real world, then we carry out an ex post facto analysis; we study the results obtained, and then we can draw our conclusions on the basis of the results.

Q And what should be analysed in that manner, in those countries?

What should we look for, in your opinion?

A We should determine whether or not there are more accidents in those countries; or whether there are accidents due to the lack of redundancy from the listening watch.

Q When you speak of the lack of redundancy, you are referring to the use of a second . . .

A A second language.

Q . . . or a third language in air/ground communications?

A Yes. This prevents the pilot from understanding what is happening in the other language.

Q Would this type of analysis reflect the real value of the listening watch?

A Yes, the real importance is that we would have a real measure, and this would be much more valuable than any laboratory experiments." (Translation)

Cross-examined by Captain Daley of CALPA, Dr. Frigon expanded on the concept of his real world listening watch study:

"Q Perhaps I could ask you, Dr., how you, personally, would go about determining the number of incidents that occur in a bilingual environment, in the real world?"

"A I would go to the ultimate level. What I said this morning regarding accidents, what happens when accidents are due to the lack of redundancy due to the use of more than one language." (Translation)

"Q I guess the simplest question to ask you is: why would you consider accidents a valid assessment of incidents?"

"A Because it is the ultimate result of an incident." (Translation)

As it turns out, an empirical study of the kind recommended by Dr. Frigon had already been carried out for the Commission by its aviation consultants. The results of the study are to be found in Chapters 6 and 7 of this final Report. It seems appropriate to repeat the concluding portion of Section 1.5 of Chapter 6:

"In the final analysis, in the cold light of day, the safety of any method of transportation must be measured by the number of accidents it produces. There are 79 countries throughout the world where air traffic control services are provided in varying degrees in two or more languages. Recognizing that differences in conditions exist in various parts of the world, differences that include weather, terrain, density and mix of aircraft, quality of control services and the origin, destination and duration of flights, if one stops to think of the number of flights that must have been made in those countries, of the miles flown and passengers carried, of the take-offs and landings safely accomplished, one is left with an abiding conviction that there is nothing inherently dangerous in bilingual air traffic control, to restate the conclusion reached in the Interim Report."

1.4 Conclusions of the Commission

In considering the two elements of the listening watch there can be no doubt but that the primary element - direct communication between pilot and controller - is fundamental to the whole process of air traffic control. It is worth recalling the opinion given during the first phase of the hearings by Charles O. Miller, an aviation safety consultant, and reproduced in the Interim Report:

"Q. Do you feel that any reduction in this listening watch capability by the pilot will render an air traffic control system less safe?

A. Well, it certainly has the potential to do that, but I find it hard to speak in terms of safety of a system based on any one parameter. I think that again is an over-simplification of it. All other things being equal, yes, it is going to make it less safe.

But very rarely do things come into existence like this, everything else being equal."

In determining the global effect on flight safety that would result from the further introduction of bilingual communication in air traffic control in the Province of Quebec, the benefit to the system as a whole to be gained from improved comprehension between French-speaking pilots and controllers must be weighed against the diminution in the availability of the party line.

As has already been mentioned, the Commission believes that any step tending to diminish the effectiveness of the party line concept must be resisted unless clearly required in the overall interest in safety. At the conclusion of the first series of hearings the Commission was of the opinion that "it is safer for everybody to have all pilots in the air functioning in a language they comprehend, capable of fully understanding instructions addressed to them, and able to give clear and accurate reports of essential flight information."

The first hearings were of course essentially concerned with VFR flights. The Commission has had the benefit of a great deal of evidence during the second phase of the hearings as to the role of the listening watch in IFR flights. That evidence has included the simulation tests and the listening watch study was well as the studies conducted for the Commission by its technical advisers.

Subject to the conditions set forth in Chapters 9, 10 and 11 the Commissioners are of the opinion that bilingual air traffic services can safely be provided for IFR flights in controlled airspace in the Province of Quebec, as well as for VFR flights at Dorval and for VFR flights landing and taking-off at Mirabel.

Section 2. THE VFR/IFR MIX

2.1 What is the VFR-IFR mix?

The expression VFR/IFR mix, or interface, is used to describe the situation where VFR and IFR aircraft come together in an airport area, especially on landing or on takeoff.

Aircraft flying IFR adhere to an assigned speed, route and altitude. In return Air Traffic Control provides separation, or in other words, protection from other IFR flights. A flow of IFR aircraft is highly disciplined and carefully controlled. When an IFR aircraft is descending to land at a busy airport it is guided by radar vectors (1) to align it with an Instrument Landing System. Similarly, a departing IFR aircraft follows specific instructions as to headings and altitudes to establish itself on its requested route. IFR air traffic generally consists of large aircraft equipped with sophisticated navigational aids. The aircraft are usually flown by pilots with many hours of experience, rigidly trained in the strict procedures required for IFR flight.

VFR is very different. The pilot provides his own separation from other aircraft. He is not normally under directions from a controller. VFR air traffic generally consists of smaller aircraft which carry a minimum of instrumentation. The planes are normally flown by pilots with fewer flying hours, and who are frequently not accustomed to the rigid requirements dictated by a busy terminal area. In certain areas the problem is accentuated by the presence of training flights. Additionally, the aircraft are not transponder-equipped (2) and radar controllers cannot always clearly see their targets on radar.

It ought not, of course, be overlooked that the VFR/IFR mix only exists in VFR conditions, when the basic principle is "see and avoid" or "see and be seen". The pilot must have visual contact with the ground at all times. He must be able to see other aircraft, and his own must be visible to other pilots.

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(1) Vector: A heading assigned by a radar controller.

(2) A transponder is a device which responds to a coded radar pulse with a coded return, displaying a distinctive blip which provides positive radar identification.

2.2 The VFR/IFR mix and the Interim Report

The VFR/IFR mix was examined at considerable length during the first phase of the hearings, particularly in connection with the recommendations that were made by the Commission to introduce bilingual air traffic control for VFR flights in the Montreal Terminal Radar Service Area (TRSA), and for VFR flights traversing the Mirabel PCZ. To better appreciate the background of this matter it may be helpful to refer to the following passages from the Interim Report:

> "By the mid 60's the intermixing of high volumes of VFR and IFR traffic was making it difficult to organize air traffic in the vicinity of several major Canadian airports. Volume was growing, and with the greater operating speeds of modern jet aircraft and the heavier workload in the cockpit, especially in terminal areas, reports of serious problems were becoming more and more frequent."
>
> "George Gledhill, a controller who worked at the Toronto Terminal during those years, described to the Commission the kind of situations that were developing. A test programme aimed at tackling this problem was completed at the Ottawa International Airport in 1965, and new procedures were adopted by the Department of Transport to provide additional services to VFR aircraft operating in several high density areas, including Montreal.
>
> Studies conducted by the FAA in the United States in 1968 showed that airspace within 30 nautical miles of controlled airports, and below 8,000 feet, provided the greatest potential for mid-air collision. Most significantly, the FAA study revealed that 95% of the terminal incidents occurred during excellent VFR weather conditions. It was apparent that while IFR traffic was for the most part being handled in a systematic manner, VFR aircraft were frequently operating in terminal airspace without radio contact, and in some instances unknowingly creating a hazard.
>
> The problem could have been solved outright by 'sterilizing the airspace' - prohibiting VFR operations within the vicinity of major airports. Such a solution would have been unacceptable to the aviation community in Canada as a whole since private and commercial pilots and aircraft far outnumber those involved in airline carrier operations."

The Interim Report continues:

> "In the early 1970s the Department of Transport put together a team of specialists to find ways and means of accommodating the safe operation of VFR and IFR aircraft in terminal areas. After extensive investigations, the Team issued a report known as 'VFR/IFR Terminal Area Services (VITAS) Project'.
>
> One of its main conclusions was that the 'see and be seen' concept of collision avoidance was no longer effective by itself to provide separation between high-speed IFR controlled aircraft and lower-speed uncontrolled VFR aircraft. The Team found the collision hazard in terminal airspace was closely related to this deficiency, and recommended that the 'see and be seen' principle be supplemented by a form of air traffic control.
>
> The VITAS experts first decided that air traffic controllers needed more room to safely organize the heavy flow of jet traffic arriving and departing from major airports. They reported that the airspace around this kind of airport should be structured like a two-layered cake. The bottom layer would consist of a Positive Control Zone, rising 2,000 feet above ground and 22 nautical miles in diameter with the airport at its centre. Stacked directly above this would be the second layer, rising from 2,000 to 9,500 feet (in some parts of Canada this would be 12,500 feet), and 44 nautical miles in diameter. This second layer would be known as a Terminal Radar Service Area.
>
> VFR aircraft could continue to fly as usual below 2,000 feet under that part of the TRSA which extended beyond the Positive Control Zone. They could not, however, enter either the TRSA or the PCZ without permission of Air Traffic Control."

The reasons leading to the choice of these dimensions for the TRSA and the PCZ are described in the Interim Report. Essentially, the dimensions were chosen so as to separate IFR traffic from uncontrolled VFR aircraft outside the TRSA and the PCZ. A method had then to be provided to keep VFR aircraft operating in the TRSA clear of the larger, faster and less manoeuvrable IFR aircraft. The VITAS Report recommended special operating rules and equipment for VFR flights. The "see and be seen" principle would be supplemented with air traffic control clearances, instructions and traffic information. The VITAS study did not deal with the use of the two official languages for air traffic control.

The Montreal TRSA became operational May 1, 1976. The organization and operation of the TRSA are described in the Interim Report.

As has been earlier mentioned, the Commission recommended that air traffic control services in both official languages be made available within the Montreal TRSA for VFR flights, subject to certain conditions.

In reaching this decision the Commission said this:

> "For the proper functioning of the air traffic control system in the Montreal Terminal Area (of which the TRSA is an important element) it is essential that controllers be able to effectively communicate with all pilots, whether IFR or VFR, and whatever their skill and experience. There can be no doubt but that a significant number of French-speaking VFR pilots in the Montreal Region are unable to speak English well enough to communicate effectively in that language. In the interests of their own safety as well as that of others using the same airspace these pilots should be provided with means to effectively communicate with Air Traffic Control.
>
> As we have seen, the key to the TRSA concept is to keep VFR traffic away from IFR traffic. Efficient but complicated arrangements have been worked out by the air traffic controllers to enable this to be done. For these arrangements to be effective the controllers must be aware of the position of all the aircraft they are handling. Determining the position of the IFR flights is made easier by the skill of the IFR pilots, and by the sophisticated equipment used by them. The location of the VFR flights is more difficult, and depends to a considerable extent on accurate reports of position, altitude, destination and route made by pilots who are usually less experienced and are less used to communicating by radio than are pilots who fly by instrument.
>
> It is accordingly fundamental to the functioning of the TRSA, and to the safety of all aircraft flying within its space, that communications between the TRSA controller and the VFR aircraft he is guiding be as clearly understood as possible. To achieve that end, it is the Commission's view that the evidence received during the hearings leads to one conclusion; that in the interest of safety, service in the TRSA must be made available in both official languages. The diminution, if any, in the ability of a unilingual VFR pilot, whatever his language, to listen in on conversations between other VFR pilots and the controller will be far outweighed by the increased security with which he will be provided by a more effective air traffic control."

The segregation of VFR and IFR traffic at Mirabel was considered during the first phase of the hearings, and dealt with in the Interim Report. It may be recalled that the Mirabel Task Force had thought it essential to add a recommendation to the effect that Mirabel should continue to be primarily an IFR airport so that its international and domestic commitments would not be compromised. The Task Force mentioned some restrictions that might be directed to that end.

The Chairman of the Mirabel Task Force, Mr. Foy, recognized that such restrictions were not related to the use of language for air traffic control. It seems to the Commission that the following passage from the Interim Report is as appropriate today as it was two years ago, and that, moreover, it is relevant to the question of the VFR/IFR mix wherever it is to be found in Quebec:

> "When he was cross-examined by Jean-Luc Patenaude, Mr. Foy said this:
>
> > 'Q Is the need for bilingualism at Mirabel and your position on bilingualism at Mirabel, would they change with the evolution of traffic in IFR-VFR mix or is it rather the location of the Mirabel airport which will influence the VFR-IFR mix?
> >
> > Could you perhaps elaborate on this?
> >
> > A I think that is the point I have tried to consistently explain throughout my testimony. What we would do at Mirabel is to preserve this vocation and the problems such as we perceive it in order to fulfil this vocation is situated at the level of IFR-VFR mix as such independently from the question of bilingualism.' (Translation)
>
> Mr. Foy's remarks seem to be on point when one considers that some of the evidence concerning Mirabel had to do with the possibility of establishing corridors for VFR traffic, something that is already done at a number of airports. Mention was made, too, of a 'window' concept by which VFR aircraft are limited to using an airport during certain periods. And reference was made to airports, such as Charles de Gaulle near Paris, which do not serve VFR flights at all.

Indeed, at times during the hearings it seemed to the Commission that the concern of some of the parties was as much directed to the presence of VFR flights and inexperienced pilots in Mirabel and its vicinity as it was to the provision of air traffic control services to such pilots in both official languages.

The Commission is of course only empowered to inquire into the language aspect of the situation at Mirabel and other airports, and not into the commercial carrier versus general aviation controversy that apparently exists throughout the aviation industry in North America, if not elsewhere."

2.3 Can the VFR/IFR mix be simulated?

This question arose during the first phase of the hearings, and was dealt with in the Interim Report when the Commission was considering an argument that the introduction of bilingual VFR services in the TRSA should await simulation studies. The extract that follows is relevant to the second phase of the hearings:

"The evidence before the Commission was clearly to the effect that VFR flight does not lend itself readily to simulation. Walter M. McLeish, Administrator, Canadian Air Transportation Administration, said this:

> 'We, in Canada, have been working as hard as our sister states that have an equivalent degree of advancement in aviation, in searching for a suitable means for simulating VFR operations. And, to date, we have not found one, and neither has any other state. And I emphasize that.'

Charles O. Miller, the aviation safety consultant who was formerly Director of the Bureau of Aviation Safety in the U.S.A., told the Commission that he was not aware of any existing technique that would enable the simulation of the visual cues that are important in visual flight. While Mr. Miller said it was 'probably in the state of the art to do it,' he does not know of a facility that could do it today.

On the other hand, it is clear that air traffic control of IFR flight can be simulated.

The question has arisen as to whether what is called the 'VFR/IFR mix' can be simulated, and, if so, whether a consideration of the introduction of bilingual air traffic control in the TRSA should await the results of such a study.

After carefully considering the evidence of Mr. McLeish and of Mr. Miller, the principal witnesses who dealt with this subject, it seems to the Commission that the term 'VFR/IFR mix' is an expression that can have various shades of meaning.

There is a VFR/IFR mix present in the TRSA in the sense that some planes are flying IFR and some are flying VFR even though the two types are not flying on the same frequency, and are kept segregated by Air Traffic Control.

There is also a VFR/IFR mix present when a VFR aircraft and an IFR aircraft approach an airport, yet both are on separate frequencies. And such a mix is still present when the two types of flight are on the same frequency as they come in to land.

Mr. McLeish told the Commission that simulation of VFR/IFR mix is difficult, but possible. The thrust of Mr. Miller's evidence is to the same effect. Both seemed to be referring to the kind of VFR/IFR mix where all aircraft are, or ought to be, on the same frequency. That is not the situation that exists in the TRSA."

The simulation programme had originally been seen as involving three phases: Enroute, Terminal and VFR/IFR mix. In December, 1977 it was decided that a study would be made to "determine the possibility and feasibility of simulating, in a realistic mannner, the VFR/IFR mix situations for flights operating in the Dorval Positive Control Zone or operating at the Dorval International Airport." A VFR/IFR Mix Study team was established, consisting of Messrs. Fudakowski, Gardner and Simms.

The work carried out by the team is described at length in its report, which is to be found in Chapter V of Working Document 6 of the BICSS Report. It seems unnecessary to discuss at length the investigations carried out by the team, except to say that it examined the procedures then in use for segregating VFR from IFR traffic in the PCZs of Quebec City, Mirabel, Dorval, Toronto, Hamilton and Sept-Iles. Following the visit to

Sept-Iles the team inspected the ATS facility at Hamilton Civic Airport because it was similar to the operation at Sept-Iles from a tower/ACC point of view. As concerns Dorval, the team was required to explain in detail the sequence of events, including distances, altitudes and frequencies for VFR flights of various origins approaching the airport for a landing.

The conclusions of the VFR/IFR Mix Study team were as follows:

"1. There are procedures established to segregate IFR and VFR traffic at all units visited that have an IFR unit co-located with the tower.

2. At other units visited there are few written procedures for segregation of IFR and VFR traffic, but most controllers use similar control techniques as required - generally VFR aircraft are restricted to accommodate IFR aircraft.

3. Procedures at the major units visited results in IFR and VFR arrivals being on the same frequency for only a very short period of time, usually with the IFR aircraft established on the final approach course.

4. Most problems appear to be caused by the mix of aircraft with different operating characteristics (i.e. 'high speed vs. low speed' -VFR or 'high speed vs. low speed' -IFR), not the IFR/VFR mix.

5. Almost all communications required for the integration of IFR and VFR traffic is inter-unit coordination, ground to ground, requiring no input from the pilot.

6. There is little traffic information exchanged between IFR and VFR aircraft at units with radar as they are generally separated procedurally."

The VFR/IFR Mix Study team made the following recommendations:

"It is possible to simulate the VFR/IFR mix in the Montreal area to some extent, but because:

a) A radar presentation would have to be used to simulate airport control, thus taking the airport controller out of his normal environment and giving him a completely unrealistic perspective on his traffic, and

b) If aircraft simulators are used, the pilots will be unable to react realistically to traffic exchanges (i.e. they will never see their traffic), and

c) In real life IFR and VFR aircraft operate on separate frequencies for a majority of the time, thus diminishing the effect of redundancy, and

d) The ground control function would be extremely difficult to simulate realistically (i.e. ground traffic crossing active runway, etc.), and

e) In real life at major airports the VFR/IFR mix is segregated procedurally, and

f) In almost all cases ground to ground coordination, as opposed to air/ground communications, is used in the segregation of IFR and VFR traffic.

The VFR/IFR Mix Study Team feels that:

i) This type of operation cannot be realistically simulated, and

ii) Even if realistic simulation was possible, such simulation would have little relevance to the development of bilingual procedures.

Therefore, the IFR/VFR Mix Study Team recommends that no attempt be made to simulate VFR/IFR mix in the current set of bilingual simulation studies."

The CALPA representative at the simulation exercises agreed that the VFR/IFR mix could not be realistically simulated. AGAQ was also in agreement. The CATCA representative did not comment.

Finally, it will be seen in Exhibit 275 that the Commission's technical advisers were of the view that "the operation of Dorval ATC with respect to VFR/IFR operating conditions cannot be feasibly simulated."

2.4 The Montreal Area Bilingual Air/Ground Communications Study and the VFR/IFR Mix.

Since the VFR/IFR mix at Dorval could not be realistically simulated a decision was made to study the situation in another way. As will be seen in Chapter 10 a team was organized to conduct what is known as the Montreal

Area Bilingual Air/Ground Communications Study. The objectives of the study, the composition of the team, the methodology used and the findings and recommendations of the team are all described in Chapter 10.

The team was to conduct the study in two phases: the first would deal with procedures needed to introduce bilingual air/ground communications for VFR flights in the Dorval PCZ and the second with procedures for the segregation and sequencing of VFR and IFR flights in a bilingual environment within the Montreal TRSA and the four PCZs underlying it - Dorval, Mirabel, St-Hubert and St-Jean. The present section of the Report will deal with the second phase of the study.

Although some of the matters that follow have been discussed elsewhere in this Report and in the Interim Report, it may be helpful to give a summary of procedures used for segregating VFR and IFR flights within the Montreal TRSA and for segregating and sequencing VFR and IFR flights at Dorval, Mirabel, St-Hubert and St-Jean. Unless otherwise noted, quotations are from the Montreal Area Bilingual Air/Ground Communications Study, Volume 3 of the BICSS Report.

a) VFR overflights through the TRSA

"VFR aircraft must contact the Montreal TCU on frequency 125.4 MHZ and obtain approval for flight through the TRSA. If the requested route and altitude will not conflict with IFR arrivals or departures, the TRSA controller will approve the request and monitor the progress of the flight until it exits the TRSA. If either the route or altitude will cause confliction, the TRSA controller will provide radar vectors or a change in altitude to keep that flight segregated from IFR aircraft or clear of flight paths in use. Traffic is exchanged between VFR flights within the TRSA if no separation is provided. IFR aircraft are kept advised of pertinent VFR traffic although separation is provided. When the VFR aircraft leaves the TRSA, it is cleared to enroute frequencies."

b) VFR flights enroute to a PCZ underlying the TRSA for landing.

"VFR aircraft within the TRSA under the control of the Montreal TCU are either vectored or geographically routed to enter the Dorval PCZ at a point clear of arrival and departure paths and at an altitude of 2,500 feet. At approximately 13 miles from the airport, the inbound aircraft is changed to the Dorval control tower

frequency 119.9 after being handed-off to the tower. If the aircraft is inbound to a PCZ other than Dorval, it is handed-off to the appropriate tower prior to entering the PCZ at an altitude of 2,500 feet."

c) Segregation of VFR flights from IFR flights within the Dorval PCZ.

"In general, segregation of VFR flights from IFR flights is accomplished by requiring VFR aircraft to operate in different areas of the PCZ from those used by IFR flights. Inbound VFR aircraft are given radar vectors or instructed to proceed along specific routes that will not conflict with IFR arrival or departure paths. If this method is not practicable for the type of operation required, altitude restrictions are used."

d) Segregation of VFR flights from IFR flights within the Mirabel PCZ.

"As at Dorval, segregation of VFR flights from IFR flights is accomplished by requiring local VFR flights to operate in areas of the PCZ clear of arrival and departure paths. VFR overflights are routed directly overhead the control tower to avoid crossing the flight paths of IFR arrivals and departures."

e) Sequencing of VFR and IFR arrivals and departures at Dorval and Mirabel.

"Sequencing of VFR and IFR arrivals and departures at both Mirabel and Dorval is accomplished primarily through segregation, that is, by using different runways for VFR and IFR whenever possible.

When weather conditions dictate the use of the same runway, VFR arrivals are kept clear of the final approach course until such time as they can be integrated with the IFR arrivals on close final.

Mirabel has few VFR arrivals; consequently, controllers are seldom required to integrate these flights.

Whenever VFR and IFR departures are required to use the same runway, when airborne, VFR departures are given a turn away from the runway heading to clear the departure path."

f) Segregation and sequencing of VFR and IFR flights at St. Hubert.

"IFR aircraft represent only a small portion of St. Hubert's traffic. There are no special procedures to handle these aircraft. During instrument meteorological conditions (IMC) only runway 24R or 06L can be used for IFR departures. IFR aircraft arriving or on low approach and overshoot are sequenced in the flow of VFR and generally given priority. VFR traffic is kept clear of IFR aircraft on approach. IFR arrivals are normally vectored for a straight in ILS runway 24R or straight in back course runway 06L. The main reporting point for VFR aircraft returning from the training area north east of the airport, is the town of Ste. Julie located on final approach for 24R. When IFR traffic is on approach and VFR traffic reports by Ste. Julie, it leaves very little time for the controller to exchange traffic or remove the VFR aircraft away from the IFR. Better quality radar would facilitate the segregation of high performance or IFR aircraft from the light VFR, as well as the exchange of traffic with TCU, TRSA and Dorval Tower."

g) Segregation and sequencing of VFR and IFR flights at St-Jean.

"IFR itinerant movements at St. Jean in 1977 represented only 1.7% of total itinerant movements. In view of this small percentage of IFR itinerant movements, there are no special procedures for segregating and sequencing VFR and IFR flights.

When IFR instrument approaches are in progress, VFR flights are kept clear of the area within the PCZ being used by the IFR aircraft."

The findings and recommendations of the Montreal Area Bilingual Air/Ground Communications Study team with respect to the segregation and sequencing of VFR and IFR flights are as follows:

"Findings:

The team examined the existing procedures for segregating and sequencing VFR and IFR flights within the Montreal TRSA and within the PCZs underlying the TRSA and found them to be adequate. These procedures are described earlier in the report.

The next step was to determine the impact of proposed changes on these procedures. At Dorval, when an Airport Control no. 2 position is implemented, better traffic management will result and procedures for segregating and sequencing IFR and VFR flights will still be adequate.

With the introduction of bilingual air/ground communications to VFR flights within the Dorval PCZ, control procedures for segregation and sequencing of VFR and IFR flights will still be adequate and no changes to these procedures will be required. It was also found that no changes would be required in the adjacent PCZs (St. Hubert, Mirabel and St. Jean) or within the TRSA, as procedures are adequate now and the expansion of bilingual communications within the Dorval PCZ will have little or no effect on operations at these airports where bilingual service to VFR flights is already provided.

The last step was to look at the impact that the expansion of bilingual air/ground communications to IFR flights would have on the procedures for segregating and sequencing VFR and IFR flights within the four PCZs (Dorval, St. Hubert, Mirabel and St. Jean) and within the TRSA. The team found that with the introduction of bilingual communications to IFR flights, the procedures for segregating and sequencing VFR and IFR flights would remain adequate.

Recommendations:

No recommendations are deemed necessary."

Before leaving the report of the Montreal area study team the following passage should be noted:

"The team discussed the 'listening watch' or more properly termed the 'party line' concept. Many pilots indicated on the questionnaires that, should bilingual communications be introduced, they would lose their 'listening watch'. It was recognized by the team members that indeed, unilingual pilots will not have the ability to acquire information from transmissions in the other language from the frequency's 'party line'. However, the introduction of the French language in communications will result in better understanding for pilots with limited knowledge of English. An in-depth study of the listening watch concept was

constrained by the lack of sufficient data from the real world environment and also due to the fact that the airport control and VFR/IFR mix environment do not lend themselves to realistic simulation tests which could have generated some valid data for further study. The latter view is also borne out by the Conclusions and Recommendations of the Report of the VFR/IFR Mix Study Team of December 2, 1977."

This statement, based on the experience of the members of the team and arrived at after due deliberation, had the agreement of all the members of the team, including the representatives of CALPA and CATCA. The team was satisfied that it had dealt with the listening watch to the extent it was necessary.

2.5 The VFR/IFR mix in other countries.

Chapter 7 has described how, in August and September, 1977, the Commission's technical advisers examined the airports at Mexico City and Geneva as part of visits made to several countries in order to observe air traffic operations where bilingual air traffic control was in use. As concerns the VFR/IFR mix of aircraft, an evaluation of the trips disclosed that the airports of Mexico City and Geneva had a level of activity and VFR/IFR mix similar to Dorval. Since, as has already been mentioned, the advisers believed the VFR/IFR operating conditions at Dorval could not be feasibly simulated, they decided to take observations of VFR/IFR operations at both Mexico City and Geneva. The observations were scheduled for April 1978, far enough into spring weather to insure there would be substantial general aviation traffic. To gather further data, the advisers decided to survey two unilingual airports having similar traffic characteristics. The airports of San Diego and Minneapolis - St. Paul were selected.

The results of the survey made by the Commission's technical advisers are incorporated in a report which was filed as Exhibit 275. In the United States the FAA had recently announced comprehensive changes to that country's air traffic control system aimed at greatly increasing the area under mandatory and voluntary radar control. The FAA News Release is attached to Exhibit 275 as an appendix.

A number of the findings made by the advisers with respect to the airports at Mexico City, Geneva and Dorval will be mentioned, frequently by quoting from the report itself. Before so doing, however, it will be useful to compare aircraft movements at the three airports for the year 1976:

	Mexico City	Geneva	Dorval
Air carrier	102,509	65,040	118,153
General aviation	90,248	63,582	34,700
Government/military	19,896	-	6,073
Total	212,653	128,622	158,926

a) Procedures and airspace structure.

The report says that specific procedures have been adopted to facilitate the control of the VFR/IFR traffic mix in each terminal area by reducing the interface as far as possible.

b) VFR/IFR traffic interface.

"Mexico City: The only area where VFR and IFR aircraft interface at common altitudes is within the Mexico City Airport Traffic Zone which is a circle centered on the airport with a radius of six nautical miles. A degree of segregation is maintained in this area also by the designation of a VFR corridor.

Geneva: VFR traffic is assigned special flight tracks to join the final approach pattern close in to the runway and separate from the IFR pattern of flight in or parallel to the IFR aircraft approach path.

The staggered runway thresholds also afford a degree of altitude separations during the final approach phase of flight.

Dorval: VFR traffic is also separated from IFR flow until close into the airport. At that point it is merged with the IFR Flow."

c) Transponder equipment.

"Mexico City: No requirement; transponder 'recommended'.

Geneva: No requirement, transponder 'encouraged'.

Dorval: No requirement, transponder requirement under study."

d) Airport runway utilization.

"Mexico City: Special effort is made to separate VFR and IFR traffic by runway. VFR aircraft are urged to operate on the cross-wind runway when possible and hold short of the main runway intersection. This offers complete separation from IFR flow on primary parallel runways. Touch-and-Go operations are prohibited.

Geneva: VFR traffic is assigned the parallel turf strip whenever possible. This offers reduced interface with IFR traffic flow. Touch-and-Go traffic is limited to three aircraft in the pattern. However, when a single runway is in use, training activity will be further restricted as needed to avoid traffic congestion.

Dorval: VFR traffic is generally assigned Runway 24L/6R because it is adjacent to the general aviation area. Traffic volume prohibits complete segregation by runway. Touch-and-Go operations by "ab initio" pilots are prohibited."

2.6 Position of CALPA and CATCA

a) CALPA

It is clear that CALPA is opposed to the introduction of bilingual air traffic services in a VFR/IFR mix situation even though its representative, Mr. Martineau, agreed with the contents and recommendations of the report of the Montreal Area Bilingual Air/Ground Communications Study team.

CALPA's position, however, goes beyond the question of language, as appears from the following answer of its representative, Mr. MacWilliam, during the second phase of the hearings:

"Q What would CALPA's position be in regards to, in general, the IFR/VFR mix as it exists today?

A I think CALPA's position is now and has always been that the IFR/VFR mix should be eliminated - from our point of view it is not a good thing."

The Commission has already made it clear that it is only empowered to inquire into the language aspect of the VFR/IFR mix situation, "and not into the commercial carrier versus general aviation controversy that apparently exists throughout the aviation industry in North America, if not elsewhere", to use words from the Interim Report.

b) CATCA

Although CATCA's representative signed and accepted the report of the Montreal Area Bilingual Air/Ground Communications Study team, in the written argument filed by CATCA's counsel after the conclusion of the second phase of the hearings is to be found the following:

"Since the Association opposes the use of French in the IFR environment, it must oppose the use of French for VFR traffic in the 'mixed' environment."

2.7 Conclusions of the Commission.

In assessing the impact of language use in the VFR/IFR mix in the Montreal area, the experience at the airports in Mexico City and, particularly, Geneva, is of considerable relevance and importance.

In comparing the situation at Mexico City with that at Dorval, Mr. Keitz, a member of the Commission's team of technical advisers, said that the two airports were comparable by way of traffic mix even though the numbers might not be exactly the same. He also explained that because, generally speaking, the weather is better at Mexico City than at Montreal, the VFR/IFR mix situation would apply more often at Mexico City.

When they conducted their survey of the VFR/IFR mix in the control tower at Mexico City the Commission's advisers found the predominant language in use was Spanish, 84% of the total. And as has been pointed out in Chapter 5, a tape from the Mexico City airport which was monitored disclosed the following:

Operations	No.	(%)	Language used (%) Spanish	English
Air carriers	120	(41%)	71%	29%
General aviation	169	(57%)	97%	3%
Military	7	(2%)	100%	Nil

The Montreal Area Bilingual Air/Ground Communications Study estimated that 5% of the IFR flights and 20% of the VFR flights would use the French language. Since the Dorval itinerant traffic in 1977 was 28% VFR and 72% IFR, it was estimated that approximately 10% of the total traffic would communicate in the French language if the use of two languages were authorized.

Turning to Geneva, the report of the Commission's team of observers says that during nine hours of observation in April 1977:

> "The main runway accommodated 65 percent of all operations, and the grass strip 35 percent. This also represents the approximate split of 35 percent VFR and 65 percent IFR operations."

It seems clear, however, that a large number of operations by general aviation aircraft use the main runway, and not the grass strip. The following is also to be found in Exhibit 275:

> "In 1976, airport activity was 128,622 operations, of which 63,582 were generated by general aviation aircraft. The grass strip accommodated approximately 26,000 of the total operations. The VFR/IFR split was approximately 34 percent VFR operations and 66 percent IFR."

These figures would indicate that the grass strip at Geneva accomodated 41% of the general aviation operations. This percentage seems realistic when one takes note of the tape of April 9, 1978 from Geneva that was monitored by the Commission's advisers, as reported in their Air Traffic Control Tape Monitoring Report, Exhibit 279:

> "Of the 216 operations conducted by general aviation aircraft, 97 (45%) of them utilized the short grass landing strip which is parallel to the main concrete runway. Aircraft using the grass strip do not require control of the same magnitude as aircraft operating on the main runways, because the grass strip is equipped with control lights similar to highway traffic signals. As a result, less communications are needed in controlling these aircraft."

As was pointed out in Chapter 5 the language used at the Geneva airport during the eight hour period covered by the tape of April 9, 1978 was:

Operations	- No. (%)	Language used (%) French	English
Air carriers	- 185 (46%)	9%	91%
General aviation	- 216 (54%)	60%	40%

It seems to the Commission that the situation at Geneva is comparable to that in Montreal. Indeed, this was the uncontradicted evidence of Mr. Keitz. He said that the two airports were comparable from the point of view of traffic, that both serve many long intercontinental flights, that they have similar weather conditions and that the VFR/IFR mix is similar.

The Commission believes the observations made by its advisers at Mexico City and Geneva to be particularly valuable so far as concerns the possible effect of bilingual air traffic control on the party line aspect of the listening watch where there is a VFR/IFR mix in a busy airport. It will be recalled that Dr. Frigon, the experimental psychologist who was a member of the Commission's team of technical advisers, was of the opinion that it would be desirable to analyze the effect of two languages on the listening watch concept in the field because in this way one would have a real measure.

Dr. Frigon said that the ultimate measure would be the number of accidents that had occurred. The extensive investigations made for the Commission have not disclosed any accidents or incidents at the airports of Geneva and Mexico City that are in any way related to the use of two languages.

No special procedures or practices related to the fact that air traffic control is conducted in two languages are in effect at either Mexico City or Geneva.

In the light of the experience at Mexico City and Geneva, and having regard to the investigations made by the VFR/IFR Mix Study team and by the Montreal Area Bilingual Air/Ground Communication's Study team, the Commission is of the opinion that the VFR/IFR mix of traffic at airports in Quebec will not be adversely affected by the introduction of bilingual air traffic control.

Section 3. THE POSSIBILITY OF UNILINGUAL FRENCH-SPEAKING PILOTS FLYING INTO AIRSPACE CONTROLLED IN THE ENGLISH LANGUAGE ONLY.

3.1 Introduction

In dealing with this subject it is worth recalling that by its Terms of Reference the Commission, among other things, is obliged to inquire into the safety of the introduction of bilingual IFR air traffic services in Quebec. Such an examination has given rise to a collateral issue, vigorously argued by those opposing the further introduction of such services, that once bilingual IFR air traffic control is available in Quebec, unilingual French-speaking pilots on IFR flights may find themselves in adjoining airspace where control is available only in English, thereby endangering their own and the lives of others.

During the first phase of the hearings Mr. McLeish said such a possibility had to be given full consideration, and appropriate procedures developed to circumvent it. The subject is discussed in Section 9.4 of the Interim Report.

There are basically two ways in which a French-speaking pilot with an insufficient knowledge of English to effectively deal with air traffic control might find himself in English-only airspace during an IFR flight: firstly, because of a forced deviation, like a sudden storm, or, secondly, because he believed his ability to communicate with air traffic control in English was better than it actually was.

3.2 The experience in Canada

Apart from ANO, Series I, No. 1, there are no regulatory measures specifically relating to the use of language for aeronautical voice communications. As mentioned in Section 3.2 of Chapter 1 of this Report, on November 22, 1978 the Minister of Communications of Canada announced that "Unilingual Francophone pilots will no longer be required to have a knowledge of English in order to obtain the Department of Communications certificate needed to operate aircraft radios."

Bilingual communications have now been available for some years in the VFR environment in Quebec. Except for a VFR flight from St-Jean to Toronto, no case was cited to the Commission where a pilot from Quebec had difficulty in communicating with air traffic control outside the Province. In that instance the pilot was unable to understand instructions from the control tower at Toronto. This was not a situation where the flight was deviated out of Quebec because of weather. There was no injury or damage to property.

While there is ample proof that many French-speaking pilots in Quebec have difficulty in communicating with air traffic controllers in English, there is no evidence that such pilots have ever been forced to deviate to an airport outside Quebec, whether because of weather or for any other reason.

During the first phase of the hearings there were predictions that unilingual French-speaking pilots would find themselves in Montreal Region airspace where air traffic control service was not provided in their language. In particular, it was said that if the use of French for air traffic control were approved at St-Hubert, for many years Canada's busiest or second busiest airport, it was possible that unilingual French-speaking pilots would stray into the adjoining Dorval Positive Control Zone where service was available only in English. Immediately following the Interim Report the use of French at St-Hubert was approved. No evidence was introduced during the second phase of the hearings to suggest that unilingual French-speaking pilots from St-Hubert were straying into the Dorval PCZ, or, for that matter, into any airspace where air traffic services in English were required.

CATCA says it is logical to assume that with a system of IFR bilingual air traffic control the number of such incidents outside Quebec will increase. It seems to the Commission that the lack of evidence that unilingual pilots presently create hazardous situations outside Quebec is sufficient proof that they will not create a problem when bilingual communications in air traffic control within the Province are expanded to include IFR.

3.3 The situation in other countries

A system of Radio/Telephone (R/T) licenses involving language requirements for pilots was found in each of the countries visited by the Commission's team of technical advisers. Extracts from Exhibit 278 are shown on Figure D.

Mr. Proulx said that when the Departmental members of the BICSS team visited the air traffic control authorities in Mexico they were told of a couple of incidents where Mexican pilots had strayed into the United States. This had not caused a problem since there were always Spanish-speaking controllers in the border towers. No special procedures had been developed. The Commission's technical advisers looked into this matter during their trip to Mexico. This is what they said in Exhibit 278:

> "Straying into English-only U.S. Airspace could occur but was not considered an obstacle to the use of two languages in Mexico. As we were told, a pilot should know his own limitations, including those which are language related."

The Departmental members of the BICSS team said that during their visit to Europe they were not informed of any special procedures for taking care of a pilot who found himself in airspace where another language was spoken. Mr. Fudakowski said the European authorities to whom they had spoken did not regard the matter as a problem, and, indeed, were puzzled when asked about it.

When cross-examined by Ms. MacLean, counsel for CATCA, Mr. Fudakowski said that in Europe there would appear to be few situations where a pilot might find himself in the airspace of another country, and not find someone who spoke his language. It was suggested that the situation in Quebec might be different.

It seems to the Commission, with respect, that the evidence before it is quite to the contrary. In a case referred to in the Interim Report, a landing at Loring, Maine by a citizen of France who failed to observe VFR weather conditions while on a flight in the Maritimes, the U.S. military air traffic controllers were able to supply the pilot with service in the French language. And in the case of a pilot from France, to be mentioned later, who was in difficulty in the region of Sept-Iles, it was a bilingual pilot on the same frequency who was able to translate into French, for the benefit of the foreign pilot, arrival and departure clearances made in English from the Moncton air traffic control centre.

3.4 The BICSS Report

The possibility, once bilingual IFR air traffic control is available in Quebec, that unilingual French-speaking pilots might find themselves in adjoining airspace where services are available only in English, is dealt with in the BICSS Report.

a) Pilot exceeding his language abilities

As mentioned by Mr. McLeish during the first phase of the hearings, and recognized by Mr. MacWilliam during the second, the possibility of a pilot exceeding his capabilities is far from being related solely to language skills. Indeed, according to these witnesses, such a thing often happens to pilots - a VFR-rated pilot flying into clouds, to give but one example.

In the final analysis, it seems to the Commission that the onus and the responsibility to determine his language capability must be on the pilot. Such is the effect of the following recommendation of the BICSS Report that:

"ANO Series 1, No. 1 be amended to advise pilots of their responsibility to insure that their communication skills are consistent with the language of services provided by air traffic units controlling airspace within which they undertake controlled flights."

b) Forced deviation into English-only airspace

The likelihood of such a forced deviation seems remote. A unilingual French-speaking pilot planning an IFR flight will obviously choose an alternate airport where bilingual services are available in case his airport of destination becomes unavailable. From the evidence there would appear to be many options available to him.

Speaking from his experience in Quebec City, Mr. Beaudry said the chance of a forced deviation was very rare. Weather would be the major factor, and the effects would be greatest on lighter aircraft whose alternate airport would not be far away in Quebec. If circumstances should force the pilot to fly into airspace where services are provided only in English, Mr. Beaudry explained that the necessary mechanisms are available to resolve the problem through coordination with adjacent units. At the worst, he said, the situation could be handled as if it were a radio failure.

It seems clear that if a unilingual French-speaking pilot were forced into airspace where air traffic services were unavailable in French the situation would not be as disabling as a communications failure in the existing system. An important fact which must be considered is that a total communications failure is an unexpected event, and carries no forewarning. In the case of a forced deviation there is advance warning while the pilot is still in communication with a unit providing bilingual services. Action can thus be taken to resolve the situation. That is why the BICSS Report considered some procedure for a communications failure in IFR flight should be developed beyond that laid down in ANO Series V, No. 5.

The BICSS Report considered a second solution - the establishment of local procedures - to be the most suitable way to deal with forced deviations into English only airspace. From a safety point of view, the Commission is of the opinion that this would be an effective and practical way to handle the situation. The following recommendation is made in the BICSS Report:

"To adequately prepare for the possibility of a unilingual French pilot being forced into English only airspace that:

Local unit procedures be established and promulgated to controllers covering such points as:

- maintaining communications

- coordinating with adjacent English only unit

- issuing appropriate clearance to safely direct the flight to an alternate destination"

A third solution considered by the BICSS Report would involve the issuing of restricted radio operator's certificates, or pilot's licenses. As explained by Mr. Fudakowski, such an endorsement would be related to language and not to geographical areas.

The BICSS Report assessed the three possible solutions just described in these terms:

> "It is considered that approach 1) is unacceptable by itself. In spite of some similarities, the inability to communicate because of language is less disabling than a radio failure, since the procedure described in 2) could still provide a limited means of communication. The approach in 3) is undoubtedly effective in terms of air traffic safety and efficiency, but from a linguistic rights point of view is unacceptable. Approach 2) appears to be the most suitable and it is recommended for further consideration."

The Commission does not read that passage of the BICSS Report as saying approach 3) is safer than approach 2). It appears from the cross-examination of Mr. Fudakowski by Mr. MacWilliam and Mr. Deschênes that in declaring a licensing system to be unacceptable "from a linguistic rights point of view", the authors of the BICSS Report are emphasizing that if an equally safe method is available to resolve the collateral problem - the forced deviation of a unilingual pilot - it would be unwise to adopt a method which would fail to solve the main issue, that is, the provision of IFR air traffic services in their own language to French-speaking pilots operating in Quebec.

Moreover, it seems to the Commission that the evidence falls short of establishing that a linguistic licensing system "is undoubtedly effective in terms of air traffic safety and efficiency." During the second phase of the hearings the Commission was told of an IFR flight made by a pilot from France, in an aircraft of French registry. The pilot had great difficulty in communicating with air traffic control in English. He got into trouble over the Cleveland-Toronto area, and, later, in the region of Sept-Iles, Quebec where, as has been mentioned, a bilingual pilot on the same frequency was able to translate both arrival and departure clearances into French for the benefit of the foreign pilot. As is set out in Figure D, before a pilot can obtain an IFR license in France authorizing him to fly in airspace where English is used for air traffic control, he must undergo a practical test in aeronautical English.

It would seem that the situation in which the pilot from France found himself could have been better handled by means of pre-arranged procedures rather than by relying on a licensing endorsement system which proved to be ineffective. Although the results of such a study will of course not be known until it is carried out, the Commission nevertheless believes it is possible some useful information might result from a recommendation of the BICSS Report that:

> "The feasibility of requiring pilots and air-traffic controllers to demonstrate proficiency in the practical use of aviation phraseology in order to obtain and maintain a Restricted Radio Operators' Certificate or pilots licence and that such a certificate or licence be endorsed for the use of French, English or both languages be investigated."

3.5 Argument of CALPA

CALPA is opposed to the authorization of two languages for IFR control in Quebec. If, however, the use of two languages is authorized, CALPA's written argument says that ". . . the potential problems of unilingual francophone pilots must be solved as an integral part of any such authorization."

The section of CALPA's written argument dealing with the subject concludes in these terms:

> "We do not feel it necessary to consider each of the specific problems listed under this heading individually since they all have the same root cause and there is only one safe solution to all these problems. The MOT report recognizes this and even proposes such a solution (an endorsement system similar to that used in Europe) but then does not recommend it because of linguistic rights considerations. CALPA's concerns regarding the MOT's approach to the bilingual ATC question have in large measure been that the MOT was considering safety as being secondary to political and/or linguistic constraints. It appears that our concerns are well founded. Important as these factors may be, technical studies should not enter upon such considerations, but rather confine themselves to operational expertise."

The Commission has already given reasons in support of its opinion that, from a safety point of view, the solution chosen by the BICSS Report would be an effective and practical way to handle the matter. The Commission does not believe the Department of Transport is proposing a procedure which it recognizes as being less safe than another.

FIGURE D

EXTRACTS FROM EXHIBIT 278 RELATING TO
R/T LICENSE REQUIREMENTS

Brazil

"Two classes of licenses are available in Brazil, a domestic which has no English language requirement and an international which requires demonstration of competence in English phraseology."

France

"There are two grades of radio/telephone licenses which apply both to VFR and IFR qualified pilots, one for national use, (which extends to all countries and French overseas possessions where French is used as a language of ATC) for which the pilot need only demonstrate a knowledge of control procedures in the French language and the second for international use which includes examinations both in French and English control terminology."

Germany

"There are three categories of R/T licenses:

* General operators R/T license for pilots operating nationally and internationally with an IFR rating; they must qualify both in English and German.

* Restricted operators license No. 1 for VFR pilots who wish to go out of Germany; they must also qualify both in English and German.

* Restricted operators license No. 2 - qualified only for operation in Germany, Austria and Switzerland, and only German is required."

Italy

"A Radio/Telephone (R/T) license can be issued with either an Italian or English language endorsement. Pilots possessing a license with an Italian endorsement may only fly within the confines of Italy, where Italian is utilized for ATC. Pilots with a R/T license and an English endorsement may fly within Italy and also outside Italy. An English language endorsement is mandatory for an IFR pilots rating."

Japan

"All pilots must be able to communicate with ATC in English for any license."

Mexico

"There are five classes of licenses in Mexico: Student, Private, Commercial, Restricted Public Transport and Unrestricted Public Transport. English is required for the latter three classes."

Switzerland

"Two categories of National R/T Licenses are issued. The first is subject to no geographic restrictions and the pilot must demonstrate a knowledge of English ATC phraseology in order to obtain it. The second is a license with a geographic restriction due to language and is issued with a language endorsement. It is then the responsibility of the pilot to restrict his flying to areas within Switzerland where that language is available in air traffic control. Restricted licenses are issued with French, German and Italian restrictions and are good only for VFR use. An IFR qualified pilot must have obtained the first category of license."

Section 4. THE OPINION OF MR. R. DIXON SPEAS

4.1 Mr. R. Dixon Speas and PRC-Speas

From the beginning it was apparent to the Commissioners that the assistance of technical advisers was essential. In October, 1976 the Commission retained the services of R. Dixon Speas Associates, aviation consultants, of Long Island, New York.

The business had its origins in 1951 when R. Dixon Speas founded a firm known as R. Dixon Speas Incorporated. In 1967 the firm was acquired by Planning Research Corporation, and operated as a subsidiary, with Mr. Speas continuing as president. It will be convenient to refer to the business as PRC-Speas. On November 1, 1976, shortly after the firm was engaged by the Commission, Mr. Speas retired as president. He continued as an employee until October 31, 1977. Mr. Speas eventually withdrew from the activity of PRC-Speas on July 18, 1978.

Mr. Speas' curriculum vitae is shown in Figure E.

When the Interim Report of the Commission was issued in June, 1977 the simulation studies at Hull had only just got under way. It was not practical until the studies were completed, and the results available, for the Commissioners to resume hearings in order to report on the simulation studies and the other matters set out in the Terms of Reference which had not been dealt with in the Interim Report.

After consultation with PRC-Speas, the Commissioners had assigned a number of specific tasks to their technical advisers. A team of 23 persons was put together by PRC-Speas to handle these assignments. Richard Kip was project manager throughout the entire period. R. Dixon Speas was associated with the group until July, 1978.

These projects have been dealt with in some detail at various places in this Report, but it is worth mentioning the status of a number of them as at May 31, 1978:

a) John Keitz, Roger Pelletier, M. Warskow, and Dr. Jean-Yves Frigon had been monitoring the simulation exercises, the last of which took place on May 5, 1978. While progress reports had been given by or on behalf of these members of the PRC-Speas team at monthly meetings, the Commissioners did not request, nor did they receive, from their advisers, an appreciation of the simulation studies, of the listening watch study and of the BICSS Report until they heard the evidence given by Mr. Keitz and Dr. Frigon during the second phase of the hearings.

b) Members of the PRC-Speas team had already made the detailed on-site investigations of air traffic control systems at Tokyo, Rio de Janeiro, Sao Paulo, Mexico City, Guadalajara, Rome, Geneva, Frankfurt, Paris and Eurocontrol. Messrs. Conte, Miller and Warskow had been involved in this feature of the consultants' work. The report of these investigations, which is dated January, 1979, was not seen by the Commissioners until it was filed as an exhibit during the second phase of hearings.

c) The monitoring of air traffic control tower tapes from Quebec City, St-Hubert, Geneva, Mexico City, San Diego and Minneapolis-St. Paul, which was carried out among a group consisting of Messrs. Pelletier, Puckli, Guijarro, Venturino and Keitz, had not yet been completed. The report of this study would be dated January, 1979, and filed during the second phase of the hearings, when it would be seen by the Commissioners for the first time.

d) The VFR/IFR Traffic Survey of airports at Mexico City, Geneva, Minneapolis-St. Paul and San Diego, conducted by Messrs. Warskow, Conte, Pelletier, Puckli and Guijarro, had not yet been completed.

e) The Mirabel Traffic Analysis, January-September 1977 vs. January-September 1978, had not yet been done.

On May 31, 1978, while the Commissioners were awaiting the report on the simulation studies, which had just terminated, and the completion of the studies and reports undertaken by PRC-Speas, Mr. Speas thought it advisable to express a number of observations and concerns to the Commissioners. Such views had not been requested by the Commissioners, by their counsel or by PRC-Speas. Mr. Speas' opinions were subsequently reduced to writing in a document entitled:

"PRIVATE
OBSERVATIONS AND CONCERNS
BILINGUAL IFR-ATC FOR QUEBEC PROVINCE

A SYNOPSIS OF AN INTERIM REPORT TO
THE COMMISSION OF INQUIRY INTO
BILINGUAL AIR TRAFFIC SERVICES IN QUEBEC"

The contents of this document, which it will be convenient to call Mr. Speas' submission, will be mentioned shortly.

The Commissioners had made it clear during the first phase of the hearings, in the spring of 1977, that the role of their technical advisers was to assist the Commissioners in technical matters, but not to arrive at conclusions. The Commissioners had emphasized that it was the duty of the Commissioners, and theirs alone, to form opinions and to draw conclusions based on the evidence adduced.

Accordingly, upon the receipt of Mr. Speas' submission the Commissioners asked their counsel to determine if Mr. Speas' views represented those of the Commission's team of technical advisers.

On July 12, 1978, Commission counsel received the following letter from Mr. Kip, Vice President of R. Dixon Speas Associates, Inc., and project manager of the consulting team:

> "I have discussed at length with all members of our project team, Dix Speas' observations and concerns about the possible introduction of bilingual air traffic control procedures in the Province of Quebec which he presented to the Commission of Inquiry in Ottawa on May 31. We have pointed out to Dix that while the study is continuing our position must remain objective and neutral. We have also indicated that none of our assignments have called for the development of conclusions to this point in time.
>
> While we understand that the views set forth are personal and while we fully respect his opinions, we, the R. Dixon Speas Associates, Inc. technical team retained by the Commission to perform certain specific tasks, find that we must disassociate ourselves from the position which he has taken. All members of the RDSA project group disavow the opinions expressed and the conclusions reached and we disclaim concurrence with them. Dix has been advised of our disclaimer.
>
> In connection with our position we are now prepared to take whatever further action the Commission deems advisable in order to preserve the integrity of the technical group."

Following receipt of this letter, the Commissioners instructed counsel to request their technical advisers to analyze and comment upon the content of the document submitted by Mr. Speas. Such a report was prepared by PRC-Speas, and will be referred to as the PRC-Speas comments.

Although Mr. Speas' submission is marked "Private", it has been the unyielding policy of the Commissioners, well known to all who have taken part in the hearings, that no submission or evidence would be received by

the Commission on a confidential basis. Accordingly Mr. Speas' submission of May 31, 1978, together with Mr. Kip's letter of July 12, 1978 and the PRC-Speas comments of November, 1978, were filed as exhibits during the second phase of the hearings.

During the late stages of these hearings an application was made by CALPA to have Mr. Speas called as a witness. During the first phase of the hearings the Commissioners had ruled that, in general, it would not be necessary to hear persons who wished to give opinion evidence. In such cases it would be sufficient to receive the views in the form of a written submission. Although the Commissioners felt that Mr. Speas would probably fall into this category, they nevertheless decided he should be heard as a witness on the following day, March 30. The Commissioners had understood Mr. Speas would be available to testify at that time.

On March 30 the Commissioners were advised by their counsel that Mr. Speas could not be present in Montreal that day. A telegram was received from Mr. Speas saying he regretted any misunderstanding as to his availability on the 30th, but that he would be pleased to appear on April 11 or at a mutually convenient later date. Mr. Speas is an American citizen who could not be compelled to attend, the Commission had before it his considered written opinion and an application made to adjourn the hearings until April 11 was refused by the Commissioners.

As representative of PRC-Speas, Mr. Keitz was then cross-examined by the parties concerning the contents of the PRC-Speas comments. The hearings were adjourned until April 3 and 4 for oral argument.

On April 11, 1979 Mr. Speas wrote a letter to the Commissioners stating he had just completed a preliminary review of the transcripts for March 28, 29 and 30. He said the record did not accurately reflect the facts as to, firstly, his professional participation in the activities of PRC-Speas concerning bilingual air traffic services in Quebec, secondly, the events surrounding the submission of his May, 1978 report, and, thirdly, his willingness and ability to testify before the Commission.

The letter elaborated upon these matters in considerable detail. An annex referred to various passages of the three transcripts. The letter concluded:

> "I am sending twelve copies of this letter and attachment to the attention of the Executive Director of your Commission with the request that they be made available to interested parties. I am also sending copies to those parties I would wish to reassure concerning the factual circumstances leading to the matters discussed above."

The Commission sent copies of the letter and attachment to the parties represented at the hearings.

On May 3, 1979 Mr. Speas wrote another letter to the Commissioners, this time so as to respond to the PRC-Speas comments, and of whose existence Mr. Speas had not learned until April 2. Mr. Speas questioned the extent to which members of the Commission's team of technical advisers, other than Mr. Keitz, had participated in the preparation of the PRC-Speas comments. The letter offered several comments relating to statements contained in the PRC-Speas comments.

Part of Mr. Speas' letter of May 3 consisted of a reproduction of a letter dated February 20, 1979 written by Mr. Speas to Mr. Kip. The letter contained observations of Mr. Speas concerning Volume 1 of the BICSS Report which Mr. Speas had obtained from Mr. Kip.

Mr. Speas' letter concluded with the following:

> "I am sending twelve copies of this letter and attachment to the attention of the Executive Director of your Commission with the request that they be made available to interested parties. I am also sending copies to those parties I wish to inform of my response to the rebuttal which was made public at your Hearing leading to the matters discussed above."

Copies of the letter and attachment were sent to the parties represented at the hearings.

On May 10, 1979 the Commissioners received a letter from counsel for CATCA asking that the hearings be reopened to permit the testimony of Mr. Speas. The letter concluded:

> "It seems clear from the documentation which was submitted with his letters that Mr. Speas would be an extremely willing witness. What is more important, however, is that his testimony would appear to be of great assistance to your Lordships in the carrying out of your task."

The Commissioners met in Ottawa to consider this request. They instructed their Executive Director to reply as follows:

> "In reply to your letter of May 10th, I have been instructed by the Commissioners to advise you that they do not intend to re-open the hearings.

They have before them the 'private observations and concerns' of Mr. Speas which they felt must be made public and caused to be filed as exhibit 357.

They also have his letters of April 11 and May 3, 1979 which expand on his detailed opinion referred to above and discuss the evidence pertaining to it. These letters have been circulated to the parties.

The Commissioners believe that exhibit 357, together with the two letters, adequately set forth the observations and concerns of Mr. Speas, and that no useful purpose would be served by asking him to testify.

They realize, however, that no reference was made in your written submissions on behalf of your client CATCA to these letters of Mr. Speas which were not available to you when you prepared your submissions and they will grant you a delay of fifteen days from the date of this letter to submit additional argument based on the letters should you desire to do so."

On May 22 counsel for CATCA acknowledged receipt of the Commission's decision in these terms:

"This is to advise you that I shall not be making additional arguments based on the letters which were submitted by Mr. Speas. While we do feel it would have been helpful to obtain further evidence of Mr. Speas, in the Association's view the information which was contained in the letters is clearly stated. The Association, therefore, simply asks the Members of the Commission to consider Mr. Speas' arguments as additional and supporting arguments to those advanced by the Association in both its oral and written submissions."

4.2 Mr. Speas' submission of May 31, 1978 and the PRC-Speas comments of November, 1978.

The Commission proposes to mention the topics raised in Mr. Speas' submission in the order contained in that document, and using its headings.

a) "Successful introduction of bilingual VFR-ATC"

The Commission does not believe any comment is required.

b) "Redundancy requirements of IFR-ATC procedures"

It seems unnecessary to discuss here the points concerning this subject raised by Mr. Speas since the subject is considered at great length elsewhere in this Report. The Commission concurs in the following observation made in the PRC-Speas' comments, and which, as Mr. Speas says in his letter of May 3, 1979, merits emphasis:

> "Regardless of the difficulty in measuring system benefits, the fear of communications redundancy loss as perceived by Mr. Speas is a factor which is wide-spread among airmen and which must be recognized as such."

c) "Logical introduction of bilingual IFR-ATC at future date"

Mr. Speas mentioned that several research and development programmes are under way in different parts of the world aimed at automating IFR-ATC procedures. He said that the end result of one or more of these programmes would be that verbal communications would no longer be needed for IFR aircraft separation. PRC-Speas said it considered that automated ATC systems are neither close enough to wide adoption, nor sufficiently comprehensive in nature, to help in providing acceptable solutions to the questions before the Commission. The Commissioners agree with this assessment of the situation, noting, as mentioned in Chapter 10, Section 1, that 40% of the VFR flights in the Dorval PCZ are as yet not even equipped with transponders.

d) "Erosion of safety factors if bilingual IFR-ATC were undertaken under the present operational environment conditions"

i) "The nature of aviation safety requires reliance upon the judgment of professionally experienced personnel, and these personnel have expressed grave reservations regarding the safety of bilingual IFR-ATC." The Commissioners do not believe it necessary to comment other than to say that one of the objects of the Inquiry is to determine if such reservations are based on fact.

ii) "The importance of redundancy ingredients in safe aviation operations is directly illustrated by multiple causes in most aviation accidents." The arguments raised by Mr. Speas were canvassed during the hearings.

iii) "One of the major requirements for improved safety in the air is improved communications." The Commissioners agree.

iv) "Introduction of bilingual IFR-ATC operations in the Province of Quebec would reduce the 'Hear and be Heard' safety redundance of the vast majority of airline operations." Mr. Speas listed 23 airlines, not including Canadian carriers, which fly into Quebec, and then said this:

> "These 23 airlines representing 20 nations, fly approximately 500 flights per week carrying approximately 40,000 passengers in foreign air commerce to land in the Province of Quebec. There are sixteen different native languages represented among the 23 airlines. Everyone of these airlines requires that the flight crews on these operations speak and understand English. Approximately five percent of the flight crews are proficient in French. In order to preserve the current redundancy factor of language commonality which helps protect against verbal misunderstandings, the other 95 percent of the flight crews would have to be taught French, were bilingual (French and English) IFR-ATC operations introduced into the Province of Quebec."

The Commission is aware of this argument, which, of course, is an aspect of the introduction of bilingual IFR air traffic control which has been examined during the course of the Inquiry. The Commission would also observe that of the twenty-three airlines listed by Mr. Speas, six are from the United States and seventeen from other parts of the world. According to Exhibit 165, sixteen of the seventeen non-American carriers serve Geneva, while two of the American (Eastern and American), and seven of the other carriers, serve Mexico City.

v) "The safety exposures under IFR-ATC conditions which involve language or accent misunderstandings are mainly during the ground operations and takeoff-landing procedures." This matter was considered in the course of the Inquiry.

vi) "There are several factors of serious operational concern in contemplating the introduction of bilingual IFR-ATC procedures in the Province of Quebec." Mr. Speas' submission lists these factors as being:

> "The relatively fast-paced Canadian IFR-ATC procedures which do not allow margins for more relaxed exercise of bilingual procedures as is available in other areas of the world.
>
> The pace of IFR-ATC operations in Canada, particularly at Montreal-Dorval provides less time and distance separation to accommodate bilingual misunderstandings than is available at most other locations in the world where bilingual IFR-ATC procedures are presently practiced. The unique Quebec circumstances include:
>
> (1) Heavy traffic flows -- both in Quebec and adjacent areas;

(2) Extended bad weather periods;

(3) Arrival conditions wherein flight crews are in fatigued circumstances because of long flights or alternate operations."

No data to support Mr. Speas' views are presented in the submission. ICAO statistics for 1976 show that total aircraft movements at Montreal were 168,000. By comparison, there were 212,000 movements at Mexico City, 134,000 at Geneva and 151,000 at Orly, Paris. As mentioned in Section 2.7 of Chapter 8 of this Report, it seems to the Commission that the situation at Geneva is comparable to that in Montreal.

vii) "Unplanned simulations of potential accidents have occurred under unilingual operations wherein under bilingual IFR-ATC conditions accidents would probably have happened." Mr. Speas' submission refers to three instances, of which one is the Deer Lake incident mentioned in the Interim Report, in which the party line aspect of the listening watch seems to have been involved. The Commission would repeat what it said in the Interim Report and again in this Report:

> "Notwithstanding all these limitations to the listening watch, the Commission believes the redundancy element is important to all types of pilots, that its value is universally recognized, and that any step tending to diminish its effectiveness must be resisted unless clearly required in the overall interest of safety."

viii) "Introduction of bilingual IFR-ATC operations in the Province of Quebec would discourage and/or eliminate the requirements that Canadian pilots of IFR rating be proficient in English thereby creating potential safety problems for those Canadian pilots when those pilots operate in other countries which use the English unilingual system." This subject has been dealt with by the Commission in the preceding section of this Report.

e) "Canada's status in IFR-ATC state-of-the-art"

Mr. Speas points out that the installation of advanced ATC equipment in Canada has lagged behind a number of other countries. His submission says:

> "If the professional management expertise of the Canadian government agencies which have ATC responsibilities is diverted into the heavy effort required to evoke and implement a bilingual IFR-ATC program of maximum integrity, needed advancement programs will be delayed."

The following is from the PRC-Speas comments:

> "The reasons for delay in the implementation of JETS in Quebec are known, and are unrelated to the language issue that Canada faced during the equipment development period. No evidence has been uncovered to date which would indicate that the effort required to implement a bilingual ATC system is so heavy that it would result in a significant diversion of resources from other equipment or systems advancements. Not only is this the case but the bilingual ATC issue has resulted in the identification of certain advanced equipment needs, such as radio coverage for the uncontrolled airspace in the north, which may otherwise not have been noted."

There was no evidence put forward during the second phase of the hearings which would have the effect of changing these observations made by the Commission's technical advisers.

f) "Safety exposure in system change"

In his submission Mr. Speas says this:

> "It is a proven axiom in aviation safety that if a system is working well, it is best not to change it other than for improved safety reasons. Under these circumstances there is a strong resistance to change by experienced professional personnel in aviation because of their prior experiences."

The following is from the PRC-Speas comments:

> "It is questionable whether or not the axiom has been proven that it is best not to change a system that works well or that there is strong resistance to change by experienced professional personnel."

In the view of the Commissioners it is unnecessary for them to become engaged in a discussion of this kind.

Mr. Speas' submission continues:

> "Such resistance is particularly strong when elements of the unknown exist. Based upon the simulation experience to date, it must be concluded that there are excessive areas of unknown results which would be generated by the introduction of bilingual IFR-ATC in the Province of Quebec. One of the most important such areas is the combination of IFR-ATC with VFR-ATC operations. Also, the transition of an

> airport from IFR-ATC to VFR-ATC operations because of the respective transition of operating conditions raises matters of concern with respect to bilingual ATC control."

The subject of the VFR/IFR mix is dealt with in Chapter 8, Section 2 of this Report.

In his letter to the Commissioners of May 3, 1979 Mr. Speas points out that his concern about "unknown results" goes beyond the fact that VFR/IFR mix conditions could not be simulated at Hull. He refers to his letter to Mr. Kip of February 20, 1979, written after he had read a copy of Volume 1 of the BICSS Report. The letter to Mr. Kip ends as follows:

> "I find nothing in the Summary Report of 152 pages which would give confidence that a bilingual IFR-ATC program could be introduced in the Province of Quebec without substantial erosion of fundamental safety factors. Furthermore, there is good reason to believe that in no more than 7-8 years beyond the projected 7-8 year implementation plan (with its inherent safety exposures) there will no longer be a vital dependence upon voice communication for IFR-ATC operations."

With great respect, the Commissioners are of the opinion that the evidence presented during the course of the Inquiry does not support the views expressed by Mr. Speas.

g) "Safety concerns of operating principles [sic]"

Mr. Speas' point is expressed in this extract from his submission:

> "Were the operating participants dragged 'kicking and screaming' against their will and best judgment into bilingual IFR-ATC operations, the emotional upheaval would represent a safety hazard."

He adds the following in his letter to the Commissioners of May 3, 1979:

> "There were not the deep and strong concerns of operating personnel expressed with respect to limited VFR application of a bilingual system in Quebec as is the case with respect to bilingual IFR-ATC operations."

The Commission is of the opinion that the evidence establishes there were originally equally deep and strong concerns expressed as to the introduction of two languages with respect to VFR operations in Quebec.

h) "Publicity impact of controversial decision"

As to this subject, Mr. Speas said this:

> "The front page story of Figure 5 results from a policy of IALPA (International Air Line Pilots Association) to publicize their views concerning safety hazards.
>
> Not all international pilots believe that conditions at Honolulu International Airport and Los Angeles International Airport are hazardous. There is sufficient concern in this respect, however, to support the bad publicity levied against the two airports by the international airline pilots as evidenced in the current assignment of a red star and a black star respectively against the two airports by IALPA. The pilots know that such publicity gets results and it can be expected that similar harmful publicity would be focused upon a bilingual IFR-ATC system were one activated in Canada."

Figure 5 is a copy of the front page of the Honolulu Star-Bulletin for May 24, 1978, having the headline "Poor Safety Rating for Honolulu Airport."

It is perhaps best only to say that an argument of this kind, from whatever source, has not the slightest influence on the Commissioners in the exercise of the duties entrusted to them.

4.3 Conclusion

The observations and concerns expressed by Mr. Speas in his submission of May 31, 1978, as expanded in his letters of April 11 and May 3, 1979, have been considered by the Commissioners in arriving at their conclusions and recommendations.

FIGURE E

R. DIXON SPEAS
President

Speas Associates Professional Experience

Founder of the firm. Active in development and direction of project work in air transportation since 1951, including management and organization planning, market analysis studies, aircraft selection studies, traffic forecasts, route analyses, maintenance facilities, equipment planning; business aircraft fleet selection, operation and evaluation, airport requirements planning, advanced all weather flying studies.

Prior Professional Experience

During ten years with a major airline, held administrative positions in the technical and executive departments such as Special Assistant to the President, Director of Engineering and Maintenance - Air Cargo Division, and Assistant to Vice President - Engineering. With another major airline, served in the Sales and Traffic Department. Participated in the conduct of research and demonstration flight programs of North America's first jet transport.

Education

Massachusetts Institute of Technology - Bachelor of Science
Boeing School of Aeronautics - Transport Pilot Rating

Organizations

American Institute of Aeronautics and Astronautics - Fellow and Past Treasurer
National Aviation Club
Society of Automotive Engineers - Past Member of Council and Past Vice President
Wings Club - Past President and Member of Council

Listings

"Who's Who in America"
"Who's Who in Engineering"
"Who's Who in World Aviation"
"Who's Who in Commerce and Industry"

Chapter 9

INTRODUCTION OF BILINGUAL IFR AIR TRAFFIC SERVICES IN QUEBEC

Section 1. SAFETY AND THE INTRODUCTION OF BILINGUALISM FOR IFR FLIGHTS

Two studies have been conducted: one in simulation by the Department of Transport with the participation of the aviation industry and associations; the other in the real world, principally by Commission consultants.

The latter study consists of a detailed on-site investigation of selected ATC systems; the monitoring of air traffic control tower tapes; a review of accidents and incidents, and a survey of the manner in which the VFR/IFR mix is handled at Mexico City, Geneva, Minneapolis-St. Paul and San Diego.

The conclusion of the BICSS Report reads:

> "The impact on safety which bilingual communications may have on the air traffic control system has been reviewed. It is considered that no detrimental impact on safety will result and that some improvements in system safety may be achieved if the recommended procedures are implemented and rigorously applied."

In the real world in Quebec, there has been no detrimental impact on safety at St-Hubert, in the Montreal TRSA or with respect to "Runway 88" flights at Mirabel following the introduction of bilingual VFR air traffic services after the Interim Report was issued. Nor has safety been adversely affected at the seven airports where the use of two languages for VFR flights was introduced before the Interim Report.

In Chapter 6 of the present Report, which deals with language use and aviation accidents on a world-wide basis, the Commission has come to the following conclusion:

> "In the final analysis, in the cold light of day, the safety of any method of transportation must be measured by the number of accidents it produces. There are 79 countries throughout the world where air traffic control services are provided in varying degrees in two or more languages. Recognizing that differences in conditions exist in various parts of the world, differences that include weather, terrain, density and mix of aircraft, quality of control services and the origin, destination and duration of flights, if one stops to think of the number of flights that must have been made in those countries, of the miles flown and passengers carried, of the take-offs and landings safely accomplished, one is left with an abiding conviction that there is nothing inherently dangerous in bilingual air traffic control, to restate the conclusion reached in the Interim Report."

The detailed on-site investigation of selected ATC systems, and other studies carried out by its consultants have convinced the Commission that such a conclusion would equally apply to bilingual IFR air traffic control in Quebec, and that the arguments relating to safety discussed in Chapter 8 and elsewhere in this Report do not detract from such a finding.

Section 2. CONCLUSION

The Commission has come to the conclusion that bilingual IFR air traffic services can safely be introduced in Quebec.

The recommendations that follow are based on those pertaining to IFR flights contained in the BICSS Report.

Section 3. RECOMMENDATIONS

The Commission recommends that air traffic control services provided for IFR flights within the present Montreal FIR be available in both official languages, subject to the following conditions:

- That implementation follow or be concurrent with implementation of air traffic control services in both languages for VFR flights in the Dorval PCZ and the Mirabel PCZ.

- That before the service is provided, ANO Series I, No. 1 be amended to authorize bilingual communications for:

    a) IFR air-ground communications in the Montreal FIR

    b) the Dorval PCZ (VFR)

    c) the Mirabel PCZ (for landing and departing VFR aircraft)

- That an implementation team be established before the service is provided, and maintained for a minimum period of one year after implementation. This team should be authorized to issue directives consistent with implementation policies and be directed to closely monitor the application of procedures for compliance.

    The implementation team would:

    - monitor implementation activities

- ensure application of procedures

- ensure adequacy of procedures

- identify new requirements

- maintain contacts with the aviation community

- conduct in-flight and tape monitoring programmes

- investigate language related complaints

- attend all fact-finding boards into operating irregularities that occur in Quebec.

- That implementation of bilingual communications in IFR in Quebec be restricted to air traffic control units located in Quebec.

- That before the service is provided training programmes related to the French lexicon and practical application of bilingual communications be undertaken based on the following criteria:

a) Current controller and supervisor staff
(certified for bilingual ground-ground communication)

i) Concentrated lexicon review and practical training in IFR air-ground phraseology for a minimum of 5 days leading to certification.

NOTE: This may be reduced for those already trained for simulation purposes and those with prior experience.

ii) Concentrated lexicon review and practical training in VFR air-ground phraseology for a minimum of 3 days leading to certification.

b) New controller recruits

i) Recruits to be certified bilingual in accordance with Public Service Commission standards at level BBCC prior to attending basic controller training.

ii) All controller training programmes from basic training through advanced training be given in a bilingual format for both classroom and practical sessions.

c) All controllers

That the annual refresher training programme incorporate an appropriate review of lexicon terms and phraseology.

- That before the service is provided, procedures reviewed in other parts of this Report relating to the subjects enumerated below be certified, taking whatever steps are required, including simulation should it be deemed necessary:

a) Language identification on flight data strips.

b) Replacement of strip when language changes from French to English.

c) Exchange of traffic in the holding pattern.

d) Exchange of traffic for merging targets.

e) Relay of clearances in language of pilots.

f) Use of phonetics for civil aircraft.

g) Use of phonetics for identification of low frequency airways and air routes.

h) Identification of VHF airways.

i) Use of language initially chosen by pilot unless requested to change.

j) Inadvertent use of wrong language by controller.

k) Inadvertent use of wrong language by pilot.

l) Initial radio contact where pilot language unknown.

m) Relay of clearances by pilot of another aircraft.

n) Coordination of language between two IFR units.

o) Coordination of language between IFR units and towers and aeradio stations.

p) Clearance readbacks.

q) Provision at each control position of plasticized reference cards containing air traffic control phraseology not frequently used. Such information may be displayed by other appropriate methods, such as OIDS, when available.

r) Local procedures for unilingual French pilot forced into English only airspace.

s) Provision by the Montreal Terminal Arrival Controller to tower controllers of information on the position of all arriving IFR aircraft.

- That the procedure requiring the use of individual digits for altitudes be enforced. (Paragraph 2312.4 of MANOPS)

- That before the service is provided, ANO Series I, No. 1, be amended to advise pilots of their responsibility to ensure that their communication skills are consistent with the language services provided by air traffic units controlling airspace within which they undertake controlled flights.

- That Transport Canada investigate the establishment of an aviation safety reporting programme for the voluntary reporting of incidents, hazards and discrepancies in the Canadian aviation system. Such a programme should be administered by an independent agency.

- That a continuing programme be established with the objective of reducing the frequency of all types of errors (including language errors) in air-ground communications. This programme should be directed at developing increased emphasis on communication accuracy through establishment of minimum standards, improved training methods, supervision and monitoring programmes.

-That before the service is provided, the Department of Transport arrange for broader distribution of Lexicon TP 415 for pilots. In addition, the audio-visual presentation and audio training tapes on the proper use of French phraseology should be provided to flying clubs which operate ground schools for pilots, and to Quebec-based aviation associations.

- That a direct override access to hotlines be provided for the coordinator position at the Quebec Terminal Control Unit.

-That before the service is provided, a new Aviation Notice be published describing the expansion of bilingual services, and encouraging pilots (a) to be thoroughly familiar with air traffic control terminology of the language selected and (b) not to change language during flight without formally indicating their intention to the controller.

- That the Air Traffic Services Branch maintain a continuing review of the operational deficiencies identified during the Bilingual IFR Communications Simulation Studies.

- That further studies be conducted to determine the most effective method of indicating language of communications as part of the information tag incorporated in the automated air traffic system JETS which is planned for installation over the next two years.

- That before the service is provided the following publications be made available in both official languages:

Radio Navigation Charts:
Enroute Low Altitude
Enroute High Altitude
Terminal Area

IFR Supplement

Canada Air Pilot (East)

The Commission further recommends that bilingual IFR air traffic services be expanded to coincide with each phase of the expansion of the Montreal FIR, subject to the following condition:

- That the French language be made available on request at the Magdalen Islands; in south-western Quebec, north-west of Ottawa; and in the area over Quebec above FL 290, east of Sept-Iles or approximately 70°W., to the extent that any such airspace has not already been included in the expanded Montreal FIR (1).

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(1) See Chapter 13.

Chapter 10

VFR FLIGHTS AT DORVAL

Section 1. AIR TRAFFIC WITHIN THE DORVAL POSITIVE CONTROL ZONE (PCZ)

Dorval is by far the most important international airport in Quebec.

There were 159,361 aircraft movements at Dorval in 1977, of which 157,293 were itinerant, and only 2,068 or 1.3% local. (1) Seventy-two percent of the itinerant movements were IFR, and 28% VFR. No noticeable change would be made to those figures by the addition of local movements which represent only 1.3% of the total movements.

Dorval is not, however, the busiest airport in Quebec since St-Hubert had 282,222 movements in 1977, ranking first in Canada, a distinction it alternately shares with Pitt Meadows, British Columbia. There were 83,371 itinerant as compared with 198,851 local movements. There are so few IFR flights at St-Hubert that it can be appropriately described as a VFR airport.

There were 50,447 total movements at Mirabel during the same year. At Quebec City there were 85,234 itinerant and 53,116 local movements, for a total of 138,350. Seventy-seven percent of these flights were VFR.

There are no ab intitio training flights at Dorval.

It is to be noted that approximately 40% of the VFR flights in the Dorval PCZ are not transponder equipped.

The following users are based at Dorval: Execair (6 aircraft), Air Canada (106 aircraft), Innotech/Innovair (7 aircraft), Northern Wings Helicopters Ltd. (24 helicopters), Nordair Ltd. (12 aircraft), Hélicoptère Canadien (33 helicopters, of which 3 or 4 are based at Dorval, the others coming for maintenance), Québecair (9 aircraft), Société-d'énergie de la Baie James (6 aircraft), Transport Canada (7 aircraft) Air Caravane (2 aircraft).

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(1) Local movements are movements performed by aircraft which (a) operate in the local traffic pattern or within sight of the tower; (b) are known to be departing for, or arriving from, flight in local practice areas located within a 30 mile radius of the Control Tower; (c) execute simulated instrument approaches or low passes at the airport.

Itinerant movements are all aircraft landings and take-offs other than local movements.

Section 2. THE DORVAL INTERNATIONAL AIRPORT PCZ

The Dorval PCZ is a circular area eleven nautical miles in radius centered on the Dorval International Airport surveillance radar and extends from the surface to (and including) 3,000 feet Above Sea Level (ASL). For operational reasons involving instrument landings on Runway 06 (left and right) a two nautical mile extension has been added to the south-west.

As is shown in Figure C in the Interim Report, the Dorval PCZ impacts upon and alters the normal shape of the neighboring Mirabel PCZ, and alters and is altered by the St-Hubert Airport PCZ. Where the Dorval PCZ overlaps these areas, agreements permit release of Dorval PCZ airspace to affected facilities.

Section 3. RUNWAYS AT DORVAL

There are three main runways at the Dorval airport. Two parallel runways that run roughly north-east and south-west are known as Runway 24 R (right) and Runway 24 L (left) when approached from the north-east, and 06L and 06R when approached from the opposite direction. The other runway, which runs approximately east and west, is known as Runway 28 when approached from the east, and as Runway 10 when approached from the west.

Section 4. AIR TRAFFIC CONTROL IN THE DORVAL PCZ

4.1 The Montreal Terminal Control Area

As was set out in the Interim Report with respect to Mirabel, to better understand the situation at Dorval it will be useful to review the division of responsibility for air traffic control in the general Montreal Region. Quoting from the Interim Report:

> "In general it may be said that the Montreal Area Control Centre (Montreal ACC) has overall responsibility for the provision of air traffic services in that large expanse of Quebec airspace known as the Montreal Flight Information Region (Montreal FIR). The Centre handles its obligations in a number of ways.

Responsiblity for high-altitude en route traffic is delegated to a number of sectors. A special sector looks after service for the large James Bay area.

The control of traffic arriving at and departing from busy terminal areas such as Montreal and Quebec City, and of local traffic flying within those areas, is assigned by the Montreal ACC to units known as Terminal Control Units.

Physically located at Dorval, the Montreal Terminal Control Unit (Montreal TCU) is responsible for the airspace 13,000 feet and below over an area that extends considerably beyond the boundaries of the Montreal TRSA and the Positive Control Zones at Mirabel, Dorval and St-Hubert. This airspace is called the Montreal Terminal Control Area (Montreal TCA).

Responsibility for air traffic control within the Montreal TCA is shared between a number of positions in the Montreal TCU (such as Dorval Arrival and Montreal Departure) that handle IFR movements, and the towers at the various airports which control traffic in the air within visual range, and on the ground."

4.2 The Dorval Control Tower

The Dorval Control Tower has four operating control positions: Airport, Radar Coordinator, Ground, and Clearance Delivery. In addition, there is a Data position manned by an assistant, and a Supervisor position.

Coordination with adjacent control units is of course required. To facilitate this the following equipment is available: hot lines with the TRSA, Departure, High Arrival and Low Arrival positions in the Montreal TCU; and interphone circuits with the St-Hubert, Mirabel and St-Jean control towers, and with Montreal TCU (Data) and flight planning (Clearance Delivery).

The tower is equipped with three scan converted radar displays - two at eye level with a 20 NM presentation, and one at the Coordinator's position with a 40 NM presentation. Both 20 NM displays are controlled from the tower, while the 40 NM display is controlled from the TCU. There is no Direction Finding equipment. Finally, the tower Radar Coordinator can monitor the Low Arrival, High Arrival and Departure frequencies.

The duties relating to the interface with adjacent control units are described as follows in Volume 3 of the BICSS Report:

"The Clearance Delivery Controller issues appropriate ATC departure clearances, and coordinates all non standard runway departures with Montreal TCU. The Ground Controller prepares flight data strips for VFR aircraft. The Radar Coordinator assists the Airport Controller by coordinating with the Montreal TCU Arrival, Departure and TRSA sectors via hot lines and with the control towers at Mirabel and St. Hubert via interphone circuits. The Airport Controller is responsible for all traffic within the Dorval PCZ."

4.3 Segregation of VFR flights from IFR flights within the Dorval PCZ

The following is also from Volume 3:

"In general, segregation of VFR flights from IFR flights is accomplished by requiring VFR aircraft to operate in different areas of the PCZ from those used by IFR flights. Inbound VFR aircraft are given radar vectors or instructed to proceed along specific routes that will not conflict with IFR arrival or departure paths. If this method is not practicable for the type of operation required, altitude restrictions are used."

4.4 Sequencing of VFR and IFR arrivals and departures at Dorval

The sequencing of VFR and IFR arrivals and departures at Dorval is accomplished primarily though segregation, that is, by using different runways for VFR and IFR whenever possible.

When weather conditions dictate the use of the same runway, VFR arrivals are kept clear of the final approach course until such time as they can be integrated with the IFR arrivals on close final.

Whenever VFR and IFR departures are required to use the same runway, VFR departures, when airborne, are given a turn away from the runway heading to clear the departure path.

Section 5. THE MONTREAL AREA BILINGUAL AIR/GROUND COMMUNICATIONS STUDY

5.1 The objectives

The principal objectives of the study are described as follows in Volume 3 of the BICSS Report:

"1. To develop procedures necessary for the introduction of bilingual air/ground communications for VFR flights operating within the Dorval PCZ and at the Dorval International Airport.

2. To examine in detail the adequacy of existing procedures for the segregation and sequencing of VFR and IFR flights within the Montreal TRSA and within the Positive Control Zones underlying that airspace for application in a bilingual environment and develop any new procedures that may be required by the expansion of bilingual airground communications to VFR flights in the Dorval PCZ and to IFR flights.

3. To recommend a detailed implementation plan including, interalia:

a) any additional manpower resources required,

b) any additional equipment required,

c) language and lexicon training requirements,

for the introduction of bilingual air/ground communications in the Dorval Tower."

A number of supplementary objectives were also included in the terms of reference of the study team:

"1. a) to describe in detail the interface between:

i) Dorval Control Tower

ii) Montreal TRSA Sector

iii) Montreal Terminal Sectors

iv) Mirabel Control Tower

v) St. Hubert Control Tower

b) to determine the impact that the expansion of bilingual air/ground communications may have on this interface.

2. To estimate the percentage of flights which will likely use the French language in both VFR and IFR Operations.

3. Through direct consultation with the users based at Dorval International Airport, to determine:

   i) the types of aircraft operated

   ii) the avionics carried by these aircraft

   iii) the mode (VFR or IFR) and frequency of flight normally undertaken.

   iv) the qualifications of the pilots operating these aircraft.

4. By monitoring actual operations and audio tapes, to determine the communication problems presently encountered at Dorval Control Tower."

It will have been seen that the study served a dual purpose: firstly, to report on the introduction of bilingualism for VFR flights at Dorval, and, secondly, to determine the procedures that might be required to accommodate the VFR/IFR mix in a bilingual environment. The present chapter is primarily concerned with the first of these subjects. The second purpose of the study has already been discussed in Section 2 of Chapter 8.

5.2 The study team

The study team was organized in February, 1978. Its report, dated January 5, 1979, was originally prepared in July, 1978.

The team was composed of:

Project Manager: E.L. Taylor, operational requirements specialist with the Department of Transport.

Quebec Regional ATS Representative: J.L. Patenaude, an air traffic controller at Quebec City, and holder of a pilot's license.

CATCA Representative: R. Laviolette, an air traffic controller who was also an observer for CATCA at the simulation studies.

AGAQ Representative: R. Lemay, an air traffic controller at St-Hubert.

CALPA Representative: M. Martineau, a pilot.

5.3 Methodology

The methodology used by the team in carrying out its study is best described in the words of Volume 3 of the BICSS Report:

"The team agreed to conduct the study in two phases: the first, dealing with procedures necessary for the introduction of bilingual air/ground communications for VFR flights in the Dorval PCZ, the second, dealing with procedures for segregating and sequencing VFR and IFR flights in a bilingual environment in the Montreal Area."

Then follows a summary of the way the team went about its work:

"The team began by reviewing events leading to the initiation of the study and improving its knowledge of the Dorval Tower operation.

Questionnaires for pilots, operators and Dorval Tower controllers were designed and distributed. Operators at Dorval and at most airports within a 25 mile radius of Dorval were visited and interviewed. The total number of operators visited was 21. These were located at Dorval, Cedars, St. Lazare, St. Hubert, Beloeil, Richelieu, St. Jean, Mascouche, St. Jérôme and Ste. Thérèse. Eleven completed operator questionnaires were received. Approximately 1,500 pilot questionnaires were distributed. About 900 were sent to airline pilots operating from Dorval; the remainder were left with operators to be made available for interested pilots. About 435 replies were received from pilots. In addition, a few pilots visited or telephoned the team to express their views.

The team received 16 completed controller questionnaires from a Dorval Tower staff of 20.

Numerous visits by team members were made to Dorval Tower. Visits were also made to Mirabel, St. Hubert and St. Jean Towers.

In addition, briefings on the Dorval Tower and TCU operation were provided to the team.

Descriptions of the towers at Dorval, Mirabel, St. Hubert and St. Jean as well as the Montreal TCU sectors including TRSA were prepared. These descriptions address staffing, equipment, duties relevant to the interface between these Towers/Units and interface procedures.

Radio communications in Dorval Tower were monitored using tape recordings and on site monitoring.

Airport traffic statistics for Dorval for the period 1970-77 were analyzed and graphs prepared. Preliminary traffic forecasts were also studied. Inquiries were made regarding the future of Dorval and Mirabel in order to estimate the effect on traffic at Dorval which could result from further relocation of airline operations to Mirabel. In addition, 1977 statistics for Mirabel, St. Hubert and St. Jean were studied to determine the ratio of VFR and IFR.

A visit was made to the Toronto International Tower, TRSA and TCU to observe their operations because of their similarity to a proposal regarding Dorval Tower operation presently being reviewed by Regional officials.

A visit was also made to Quebec City tower and TCU to observe operations with a high percentage of French being used and a high degree of VFR/IFR mix.

Team members visited Sept-Iles control tower to observe a non radar environment with a significant degree of VFR/IFR mix and a high percentage of French being used in air/ground communications.

The team analyzed the Dorval Tower operations in a bilingual context in order to anticipate any problem areas which could result from the introduction of bilingual air/ground communications for VFR flights at Dorval.

The team studied VFR and IFR procedures at Dorval, Mirabel, St. Hubert and St. Jean airports and prepared a summary of IFR and VFR/IFR mix procedures.

Videotape recordings of Bilingual IFR Communication Simulation Studies of the Montreal TCU were observed by the team.

The team was given a briefing by the Director, Bilingual IFR Communications Simulation studies on the procedures being developed for bilingual air/ground communications for IFR flights and evaluated the impact of these procedures on the present system for segregating and sequencing of VFR and IFR flights with the Montreal area.

A few problem areas which require resolution were identified, while in other areas investigated, the team did not anticipate any problem.

Alternative methods of resolving problem areas were identified and evaluated and the most suitable alternative solutions were selected for recommendation.

An implementation plan was developed and is outlined in a separate section.

The report terminates with a description of the impact of implementing the recommended plan."

5.4 Findings and recommendations of the study team.

a) Through consultation with the Dorval Tower controllers the team came to the conclusion, suggested by the controllers, that before they could control efficiently in two languages the controllers would require lexicon training, including practical exercises.

A recommendation has already been made in Chapter 9 with regard to the training of controllers, including Tower controllers.

b) The team found that the use of improper terminology could create confusion, and lead to misunderstandings. As well, it concluded that incorrect language selection by the controller could also lead to similar problems. Similar conclusions had of course been reached in the simulation studies.

The team therefore recommended that an Aviation Notice be issued encouraging pilots to be thoroughly familiar with air traffic control terminology of the language selected, and not to change language without formally indicating to the controller their intention to do so.

An Aviation Notice to this effect was in fact published on October 17, 1978 with reference to those areas in Quebec where the use of two languages is authorized. A recommendation is made in Chapter 9 that a new Aviation Notice be published describing the expansion of bilingual services, but also containing similar references to language terminology and language changes.

c) The team identified frequency congestion as a problem in the present system which will be affected by the introduction of bilingual air traffic control.

As previously mentioned, the team observed the operations of the Toronto International Tower, TRSA and TCU. In particular, the team wished to familiarize itself with the Airport Control No. 2 position which had been established in the Toronto Tower in the fall of 1970.

The team recommended that an Airport Control No. 2 position be implemented at Dorval.

To alleviate frequency congestion in so far as it may be caused by pilots seeking information from the controller, the team proposed that the use of the ATIS by VFR aircraft be promoted by means of posters advertising the service at flying clubs in the area, or by the controller requiring the pilots to monitor the ATIS message before being permitted to enter the control zone.

Finally, the team recommended that the TRSA sector of the Montreal TCU be staffed during its published hours of operation. This recommendation was implemented before the commencement of the second phase of the hearings. As has been seen, the last time the TRSA sector was closed was November 10, 1978.

d) As had been the case with the simulation studies, the team concluded that some method was needed to enable controllers to identify the language used by a pilot. During its visit to the Quebec City facilities the team had observed that "Because of the high percentage of French speaking flights and an effective strip-marking procedure, there are few false language starts or changes in language." Accordingly, and following the solution proposed in the simulation studies, the team recommended the use of a yellow highlighter felt marker to identify, on the data strip, an aircraft using French, and that the strip be replaced when the pilot changes language. Both proposals are included in the procedures recommended in Chapter 9.

e) After recognizing that "the need for bilingual ATIS in a bilingual control environment is self evident", the team recommended that two dual channel ATIS recorders be installed in the Dorval Tower, each recorder being on a specific frequency. Both messages should be recorded before broadcasting begins.

f) The team estimated there will be an increase in total traffic of approximately three percent as a result of the introduction of bilingual air/ground communications. When this is added to an estimated normal increase in traffic of some three or four percent per year, an increase in such communications of around six or seven percent in the first year might be expected. The ATIS will be recorded in two languages. The language used by pilots will have to be indicated on the strips. In the result, the team found that control staff duties will increase "slightly".

However, the team concluded that the recommendation concerning the establishment of an Airport Control No. 2 position "would distribute the workload more equally amongst controllers."

The team completed its assignment with respect to the supplementary objectives contained in its terms of reference by making the findings listed in paragraphs g), h) and i) below. Quoting from Volume 3 of the BICSS Report:

g) Estimated changes in traffic characteristics.

"We examined current traffic statistics and obtained a 'preliminary' forecast for Dorval for the period up to and including 1996. No major changes are anticipated in the next 5 years. Traffic is forecasted to increase an average of 3 or 4 percent per year until operators start moving to Mirabel. Such a move is not likely to occur before 1984 according to present plans. In addition, as explained under the topic 'Staff Deployment' above, the introduction of bilingual air/ground communications to VFR flights could result in an additional increase in total traffic of 3% per year."

h) Percentage of flights which will use the French language

"It is very difficult to estimate the demand for service in the French language at Dorval; however, through impressions gained from consultation with pilots, controllers and operators and from the knowledge of the Montreal area by team members, it was estimated that 5% of the IFR flights and 20% of the VFR flights would use the French language.

Therefore, since Dorval itinerant traffic in 1977 was 28% VFR and 72% IFR, it is estimated that approximately 10% of the total traffic will communicate in the French language."

i) Interface between units.

"The team found a few problems in the interface between the ATC units in the Montreal area. These problems were:

1. TRSA is not always staffed and this results in an increased workload on Dorval tower controllers.

2. TCU Arrival Controller does not always provide the arriving aircraft sequence to the tower controllers. This forces the Radar Coordinator in the tower to monitor the TCU frequencies.

3. Mirabel radar is not functioning, making the exchange of traffic with TCU and TRSA more demanding and making it more difficult, if not impossible, for tower controllers to ensure that VFR traffic is clear of IFR flight paths.

4. St. Hubert would also benefit from better radar for the reasons mentioned for Mirabel."

The team pointed out that earlier in its report it had made recommendations concerning the staffing of the TRSA. As has been seen, this observation is no longer pertinent. The team made two other recommendations:

1. That the TCU Arrival Controller provide the Tower Controller with information on the position of arriving aircraft. (This proposal is included in the procedures recommended in Chapter 9).

2. That the Mirabel radar be commissioned as soon as practicable. (The Commission was informed that this step had in fact been accomplished before the second phase of the hearings began.)

Finally, as regards the interface between units, the team found that the:

"Expansion of bilingual air/ground communications to VFR flights within the Dorval PCZ and to IFR flights is not expected to affect the interface between units."

5.5 Implementation plan recommended by the study team.

The plan proposed by the team is as follows:

"1. Lexicon and language training as outlined under Findings and Recommendations must be completed before the introduction of bilingual air/ground communications at Dorval. The length and content of this Lexicon training is to be determined by the Training and Human Resources Development Division, ATS Headquarters, Ottawa. The simulation and Lexicon training is to be provided by the Quebec Regional Air Traffic Service Training School.

2. An Airport Control no. 2 position should be in operation in Dorval Tower when bilingual air/ground communications are introduced. This would allow the controllers to become familiar with the procedures

and coordination required under this concept. Under the proposed plan, no additional manpower is required, only a reassignment of control duties within existing personnel. The equipment required as outlined in Appendix C, Section V would cost approximately $30,000.

3. In addition to amending ANO Series 1, No. 1, a NOTAM should be distributed specifying the extent to which bilingual services will be available at the Dorval airport. This NOTAM should be available at the Dorval airport. This NOTAM should be available 3 to 4 weeks prior to the introduction of bilingual air/ground communications at Dorval.

4. Two dual-channel ATIS recorders are required with two separate frequencies to be used for the French and English messages when bilingual air/ground communications are introduced. The team was advised that Quebec Region has budgeted for an extra ATIS for Dorval during the fiscal year 1978-79; therefore, it would not add to the implementation cost.

5. Pertinent Inter-Unit Agreements and Operations Letters must be amended to incorporate new procedures prior to the introduction of bilingual air/ground communications.

6. The TCU sector of the Montreal ACC should have a full staff complement so that the TRSA position of the TCU will be manned during its published hours of operation.

7. The Mirabel radar should be commissioned as soon as possible. At the time of preparing this report, modifications to the Mirabel radar antenna have been made but a flight check is required before the radar is commissioned. The commissioning of the Mirabel radar will not add to the implementation cost.

8. The English-French Lexicon (TP415) should be given wider distribution in the Province of Quebec, especially in the Montreal area, to familiarize as many pilots as possible with the proper terminology. This can be accomplished by distributing the Lexicon booklet to flying clubs, associations connected with aviation and advertising the availability of the

booklet in an Information Bulletin. The regional audio-visual presentation (Communication Air Sol Bilingue au Quebec) should be given wider distribution in the Montreal area.

9. An Aviation Notice should be issued encouraging pilots to become thoroughly familiar with Air Traffic Control terminology of language selected and to formally indicate any change of language to the controller.

10. After the introduction of bilingual air/ground communications, the overall tower operation should be monitored closely to detect and rectify any problem areas."

The following observations by the Commission concerning the implementation plan proposed by the team are appropriate:

With respect to Item 5, it appears from the evidence that no changes to the Inter-Unit Agreements will be required. The recommendation still applies, however, to the operations letters.

Items 6 and 7 are no longer applicable.

Item 8 is covered by the recommendations to be found in Chapter 9.

So far as Item 9 is concerned, it has already been mentioned that an Aviation Notice has been published and that a new one is recommended in Chapter 9.

5.6 Impact on the present system.

The impact resulting from the changes proposed by the team is in their report as follows:

"Until the end of 1977 the trend in IFR traffic at Dorval was on the decrease, mostly due to the opening of Mirabel and the introduction of wide-body jets. The impact of Mirabel on Dorval has now been absorbed until 1985 and the airlines are predicting additions in the number of flights. The Dorval forecast for the next year shows an increase of approximately 5% in total traffic. Also the percentage of VFR itinerant flights in Dorval has been increasing steadily from 18.8% in 1973 to 28.3% in 1977 and there has been a 50% increase in total VFR itinerant traffic since 1970. These factors prompted the team to forecast an increase in VFR-IFR

mix; furthermore, the estimate of 2% to 3% increase in total traffic generated by the introduction of bilingualism at Dorval incited the team to recommend solutions to the frequency congestion detected in the analysis of the present system.

The following is a summary description of the team's evaluation of the impact of implementing the recommendations contained in this report.

The Lexicon training given to the tower controllers and the exposure that the pilots will receive will increase the efficiency of communications, i.e. standard, shorter transmissions. This will result in a decrease of frequency congestion. The introduction of the Airport Control no. 2 position will provide for a better distribution of controller workload, reduce the number of aircraft worked by a specific controller at any given time and increase his availability to the flights under his control. The manning of the TRSA sector will reduce the number of flights which will transit the control zone. ATIS messages provided on separate frequencies in specific languages will reduce monitoring time by the users and improve efficiency."

Section 6. THE POSITIONS OF CATCA AND CALPA

During the second phase of the hearings very little was said by the parties other than the Department of Transport concerning Dorval or Mirabel, which led the Department's counsel to suggest in his argument that CATCA and CALPA had not opposed the introduction of air traffic services in both languages at those airports.

6.1 The position of CATCA

In her written argument counsel for CATCA had this to say:

"In the republishing of his oral presentation and in his reference to the Montreal Area Study Findings Counsel for the Ministry leaves the impression that CATCA is not opposed to the introduction of bilingual air traffic control for VFR traffic in these two zones.

This is clearly contrary to the Association's position. CATCA's signing of the report reproduced in Volume 3 of the BICSS Report does not indicate acceptance of the basic

> premise that bilingual air traffic control should be introduced to the IFR environment or that any benefits which might accrue from increased comprehension outweigh the disadvantages from the reduction of the potential for the listening watch. The arguments presented at the Hearing clearly indicate the reasons for CATCA's position on these two issues. Since the Association opposes the use of French in the IFR environment, it must oppose the use of French for VFR traffic in the 'mixed' environment."

It is also CATCA's position that the use of French is permissible to alleviate emergency situations.

6.2 The position of CALPA

It is clear from the evidence that the report of the Montreal Area Bilingual Air/Ground Communications Study team was unanimous, and that every member of the team, including Mr. Martineau who represented CALPA, agreed with its contents and recommendations. CALPA, however, did not agree to its representative signing the report, and he did not.

Section 7. CONCLUSION

The Commission said this concerning Dorval in its Interim Report:

> "In his letter to L'Association des Gens de l'Air du Québec dated November 2, 1976, the Minister of Transport of Canada, the Honourable Otto Lang, indicated that 'the Dorval Control Zone study will be conducted concurrently with the IFR terminal phase of the simulation program". This program is presently under way, having started in March 1977, and is to last 50 weeks.
>
> In his testimony Mr. McLeish stated that the complexity of the traffic mix and the traffic count are such that the study of VFR procedures, at Dorval should await the study of IFR procedures and the development of new procedures, as the case may be.
>
> No representations to the contrary were made to the Commission.
>
> In the result no report has been submitted to the Commission, no evidence adduced, and no proposals made regarding Dorval. The Commission will therefore make no findings or recommendations on Dorval at this time."

The introduction of Bilingual IFR Air Traffic Services in Quebec is now being recommended.

As set forth in Section 2 of Chapter 8 of this Report, the Commission has concluded that the VFR/IFR mix does not constitute an obstacle, and that no new procedures are required to accommodate the mix in a bilingual environment.

In the light of that conclusion, and of the report of the Montreal Area Bilingual Air/Ground Communications study, the Commission believes bilingual services can be provided to VFR flights in the Dorval PCZ without detriment to safety.

Section 8. RECOMMENDATIONS

The Commission recommends that air traffic control services in both official languages be made available within the Dorval PCZ for VFR flights, subject to the following conditions:

- That before the service is provided, ANO Series I, No. 1, be amended accordingly.

- That before the service is provided, a NOTAM be distributed specifying the extent to which bilingual services will be available at the Dorval airport. The NOTAM should be available 3 to 4 weeks before the introduction of bilingual air/ground communications at Dorval.

- That before the service is provided, the training programmes related to the French lexicon and to the practical application of bilingual communication, all as described in the recommendations of Chapter 9, be undertaken by VFR controllers to the extent applicable.

- That before the service is provided, pertinent Operations Letters be amended to incorporate new procedures.

- That before the service is provided, the procedures enumerated in the recommendations of Chapter 9 be certified, except for such procedures as are related exclusively to IFR Air Traffic Services.

- That the procedure requiring the use of individual digits for altitudes be enforced. (Paragraph 2312.4 of MANOPS)

- That before the service is provided, ANO Series I, No. 1, be amended to advise pilots of their responsibility to insure that their communication skills are consistent with the language of services provided by air traffic units controlling airspace within which they undertake controlled flights.

- That before the service is provided, the Department of Transport arrange for broader distribution of Lexicon TP 415 for pilots. In addition the audio-visual presentation and audio training tapes on the proper use of French phraseology should be provided to flying clubs which operate ground schools for pilots, and to Quebec-based aviation associations.

- That before the service is provided, a new Aviation Notice be published describing the expansion of bilingual services, and encouraging pilots (a) to be thoroughly familiar with air traffic control terminology of the language selected and (b) not to change language during flight without formally indicating their intention to the controller.

- That before the service is provided, an Airport Control No. 2 position be implemented.

- That before the service is provided, two dual channel ATIS recorders be installed in the Dorval Tower, each recorder being on a specific frequency. Both messages should be recorded before broadcasting begins.

- That the use of the ATIS by VFR aircraft be promoted. Such use could be promoted by posters advertising the service at flying clubs in the area, or by controllers requiring pilots to monitor the ATIS message before they are permitted to enter the Dorval control zone or the Montreal TRSA.

- That after the introduction of bilingual air/ground communications, the overall tower operation be monitored closely to detect and to rectify any problems.

Chapter 11

VFR FLIGHTS AT MIRABEL

Section 1. INTRODUCTION

In its Interim Report the Commission recommended that air traffic control services in both official languages be made available to VFR flights that communicate with the control tower while traversing the Mirabel Positive Control Zone to another destination without landing at the airport. This recommendation has been implemented.

With respect to VFR flights landing and taking-off at Mirabel, the Commission recommended that no changes be introduced pending the results of the simulation tests.

A detailed account, which need not be repeated here, was given in the Interim Report of the Mirabel PCZ, the air traffic within it, the interface with small neighboring airports, the runways (1), the air traffic control in the PCZ, the segregation of VFR and IFR traffic, the report of the Mirabel Task Force and the factors to be considered in evaluating the safety of the introduction within the PCZ of air traffic control services in both official languages.

During the second phase of the hearings Mr. McLeish stated that the position of the Department of Transport concerning Mirabel had not changed since 1977, and that the Department continues to recommend that services for all VFR flights at Mirabel be provided in both languages. Otherwise, no further evidence concerning Mirabel was presented.

Section 2. CONCLUSION

In the light of the recommendation now being made for the introduction of bilingual IFR Air Traffic Services in Quebec, of the findings and recommendations of the Mirabel Task Force Report examined in the Interim Report, and of the conclusion of the Montreal Area Bilingual Air/Ground

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(1) In the French version of the Interim Report a small error was made in the description of the runways. It would seem appropriate to repeat the correct description: There are two main runways at the Mirabel airport. That which runs roughly north-east and south-west is known as Runway 24 when approached from the north-east, and 06 when approached from the opposite direction. The other runway, which runs approximately east and west, is known as Runway 29 when approached from the east, and 11 from the west.

Communications Study that no new procedures are required to accommodate the VFR/IFR mix in the bilingual environment in the Montreal area, the Commission has reached the conclusion that bilingual air traffic services can be provided to VFR flights in the Mirabel PCZ without a detrimental impact on safety.

Section 3. RECOMMENDATIONS

The Commission recommends that air traffic control services for VFR flights in the Mirabel Positive Control Zone be provided in both official languages, subject to the following conditions:

- That before the service is provided, ANO Series I, No. 1 be amended accordingly.

- That before the service is provided a NOTAM be distributed specifying the extent to which bilingual services will be available at the Mirabel airport. This NOTAM should be available 3 to 4 weeks prior to the introduction of bilingual air/ground communications at Mirabel.

- That before the service is provided, the training programmes related to the French lexicon and to the practical application of bilingual communication, all as described in the recommendations of Chapter 9, be undertaken by VFR controllers to the extent applicable.

- That before the service is provided, the procedures enumerated in the recommendations of Chapter 9 be certified, except for such procedures as are related exclusively to IFR Air Traffic Services.

- That the procedure requiring the use of individual digits for altitudes be enforced (Paragraph 2312.4 of MANOPS).

- That before the service is provided ANO Series I, No. 1 be amended to advise pilots of their responsibility to insure that their communication skills are consistent with the language of services provided by air traffic units controlling airspace within which they undertake controlled flights.

- That before the service is provided, the Department of Transport arrange for broader distribution of Lexicon TP 415 for pilots. In addition, the audio-visual presentation and audio training tapes on the proper use of French phraseology should be provided to flying clubs which operate ground schools for pilots, and to Quebec-based aviation associations.

- That before the service is provided, a new Aviation Notice be published describing the expansion of bilingual services, and encouraging pilots (a) to be thoroughly familiar with air traffic control terminology of the language selected and (b) not to change language during flight without formally indicating their intention to the controller.

- That the use of the ATIS by VFR aircraft be promoted. Such use could be promoted by posters advertising the service at flying clubs in the area, or by controllers requiring pilots to monitor the ATIS messages before they are permitted to enter the Mirabel control zone or the Montreal TRSA.

Chapter 12

UNCONTROLLED AIRSPACE

Section 1. GENERAL

Uncontrolled airspace is described in Working Document No. 6 of the BICSS Report as "airspace in which, for reasons of insufficient demand, inadequate communication capability or both, no air traffic control service is provided."

In the Southern Control Area such airspace will be found only below 18,000 feet, in the Northern Control Area only below FL 230, and in the Arctic Control Area only below FL 290. Above those altitudes all airspace is controlled. The control areas just mentioned are illustrated in Figure F following this chapter.

There are no regulations which apply to the use of language in uncontrolled airspace. It follows that both languages may be used. In fact, there is no requirement that aircraft be equipped with a two-way radio, and it is therefore possible to fly NORDO (without a radio).

As explained in the Working Document:

> "Within such airspace, flight information and advisory services are available in varying degrees; from full and ready availability to virtually no availability.
>
> Within uncontrolled airspace adjacent to controlled airspace, direct communication with an Air Traffic Control Unit is normally possible. In such circumstances, a full range of flight information and advisory services are available to the pilots. It follows that within the Province of Quebec this service is available in both official languages to the extent that current/proposed legislation permits.
>
> Within certain other areas, communications with an Air Traffic Control Unit is non-existent, but communications with an Aeradio Facility is possible. In such circumstances, a full range of flight information and advisory service is still available although the relay of data from an ATC unit may be slower. In any event, it is again reasonable to assume that within the Province of Quebec this service is available in both official languages to the extent that current/proposed legislation permits.

Within still other areas, the only communications facility available on the ground may be a private UNICOM Facility. In such instances, little or no information of an advisory nature can be expected. That information which may be available is normally limited to the particular interests of the UNICOM operator/owner, and then only in the language consistent with his individual requirement.

Within the remainder of the uncontrolled airspace, and this is a very substantial part of such airspace, it is not possible for a pilot to communicate with any ground station. This condition exists because the aircraft is either beyond or below the radio propagation patterns of existing ground communications facilities. In such cases, the only method for exchange of flight information is by direct pilot to pilot communication. Obviously, use of both official languages without assurance of a common understanding by both pilots, is a potentially hazardous situation. Language of communication under these conditions is <u>authorized</u> in either official language, but the need for common understanding remains unresolved."

The following is from Volume 1 of the BICSS Report:

"The limited availability of ground-based communication facilities and the lack of regulation governing the use of language by UNICOM stations could engender potentially hazardous situations to flights operating in uncontrolled airspace in the following situations:

1. Two unilingual pilots, one French speaking, the other English, approach a common destination, where there are no ground-based communication facilities, and broadcast their intentions on the frequency 122.2 MHz. Neither pilot can understand what the other is saying.

2. Two unilingual pilots speaking different languages, approach a common destination where UNICOM services are available. If the UNICOM operator is unilingual French or English, he cannot provide advisory services to one of the flights.

Problems such as these have existed for many years in uncontrolled airspace and with the impending introduction of bilingual IFR air-ground communications in the controlled airspace of the Province of Quebec, it is felt that the use of French in this environment may increase substantially."

To solve these problems, and to prevent these "potentially hazardous situations" the following options are identified in the BICSS Report:

"1. Because of the light volume of traffic and because individual pilots may have the time and individual resources to ensure the safety of their flights, maintain the status quo.

2. Impose language requirements on pilots and UNICOM operators operating in the uncontrolled airspace of Quebec.

3. Expand the existing communication capability to provide coverage within all the uncontrolled airspace.

4. Expand control services to all uncontrolled airspace and restrict the flow of IFR flights where communication is not available or impractical.

5. Expand control services to all the uncontrolled airspace of the Province of Quebec.

6. Any combination of the above solutions."

The Report considers that "there is a need to undertake an in-depth study of the activities in that airspace" before specific recommendations can be made. However, the only recommendation of the BICSS Report reads as follows:

> "It is recommended that, subsequent to recommendations by the Commission of Inquiry into Bilingual IFR Air Traffic Services in Quebec, a detailed study be undertaken to recommend the most appropriate options for the provision of control services or third party communications capability in the existing uncontrolled airspace in the Province of Quebec."

Nevertheless, even if the study were undertaken immediately after the submission of the Commission's Report, such a recommendation would, in effect, amount to maintaining the status quo. The implementation plan recommended by the BICSS Report is the subject of the next chapter. When one looks at the plan it will be seen that action with respect to uncontrolled airspace is last on the list. Even though such items are not necessarily listed in chronological order, and without wishing to get involved with the schedule of implementation, it must be recognized that action relating to uncontrolled airspace may not be undertaken at an early date.

Reverting to Option 3 mentioned above, the Commission believes it is essential that improvements be carried out without awaiting the results of an in-depth study, and the completion of the other phases of implementation.

Option 3 is more fully described in Working Document No. 6:

> "This option contains sub-options that can be examined individually or collectively. An expansion of communication capabilities may be in the form of:
>
> i) additional aeradio peripheral frequencies
>
> ii) additional aeradio stations
>
> iii) additional air traffic control peripheral frequencies
>
> iv) satellite communication station with terminations at either aeradio or air traffic control facilities
>
> v) any combination of i) to iv).
>
> The option would tend to ensure the capability for third party intervention in all aeronautical communications within uncontrolled airspace in the Province."

During his testimony Mr. Fudakowski said:

> "A Yes, I think we recognize the fact; on the other hand, I think that I have to add that Transport Canada's position is where we are going to provide third party communication capability in that airspace as soon as this is possible and it is an ongoing program.
>
> That is likely to take place before any recommendations with respect to bilingual IFR communications occur."

He added later:

> "This is a situation where a Transport Canada air radio station which has bilingual capability will be in a position to provide the exchange of information between this situation that we described of two unilingual pilots, one in French and one in English."

Mr. Fudakowski continued:

> "A They are already available in the areas where there is sufficient demand for that and that is the situation in Northern Quebec right now in the case of La Grande if you want to use that for an example, there is an MOT air radio station.
>
> Q Where there is bilingual personnel?
>
> A That is correct.
>
> And all Transport Canada air radio stations are manned by bilingual personnel certified to provide the service in both languages.
>
> Q But there would still remain a substantial portion of the province where in your view there is no point in putting in aeradio stations because the demand is not high enough, is that not true?
>
> A Substantial only in the sense that it covers large areas, but not substantial in terms of the traffic or the demands there, yes.
>
> Q So we will still have the problems to which I was referring that there will be an area before the airspace becomes controlled where there is a potential increase in these items which have been referred to as potentially hazardous situations?
>
> A Yes, there will be areas."

The Commissioners are of the opinion that the "ongoing program" referred to by Mr. Fudakowski should be conducted with all possible dispatch in order to alleviate the possibility of such "potentially hazardous situations." The costs involved have been taken into account in the estimate of implementation costs which will be examined in Chapter 14.

Section 2. RECOMMENDATIONS

The Commission recommends that the existing communication capability be expanded within the shortest possible delay to provide coverage within all the uncontrolled airspace in Quebec. With regard to the northern part of

the Province, such coverage should be provided before, or at the latest, concurrently with, the expansion of the Montreal FIR to the north (NASP-E). With regard to the eastern part of the Province, such coverage should be provided before, or at the latest, concurrently with, the expansion of the Montreal FIR to the east (Odynski Study).

The Commission further recommends that a study be undertaken as soon as possible to determine the most appropriate way to provide air traffic services in uncontrolled airspace in Quebec.

ARCTIC, NORTHERN AND SOUTHERN CONTROL AREAS

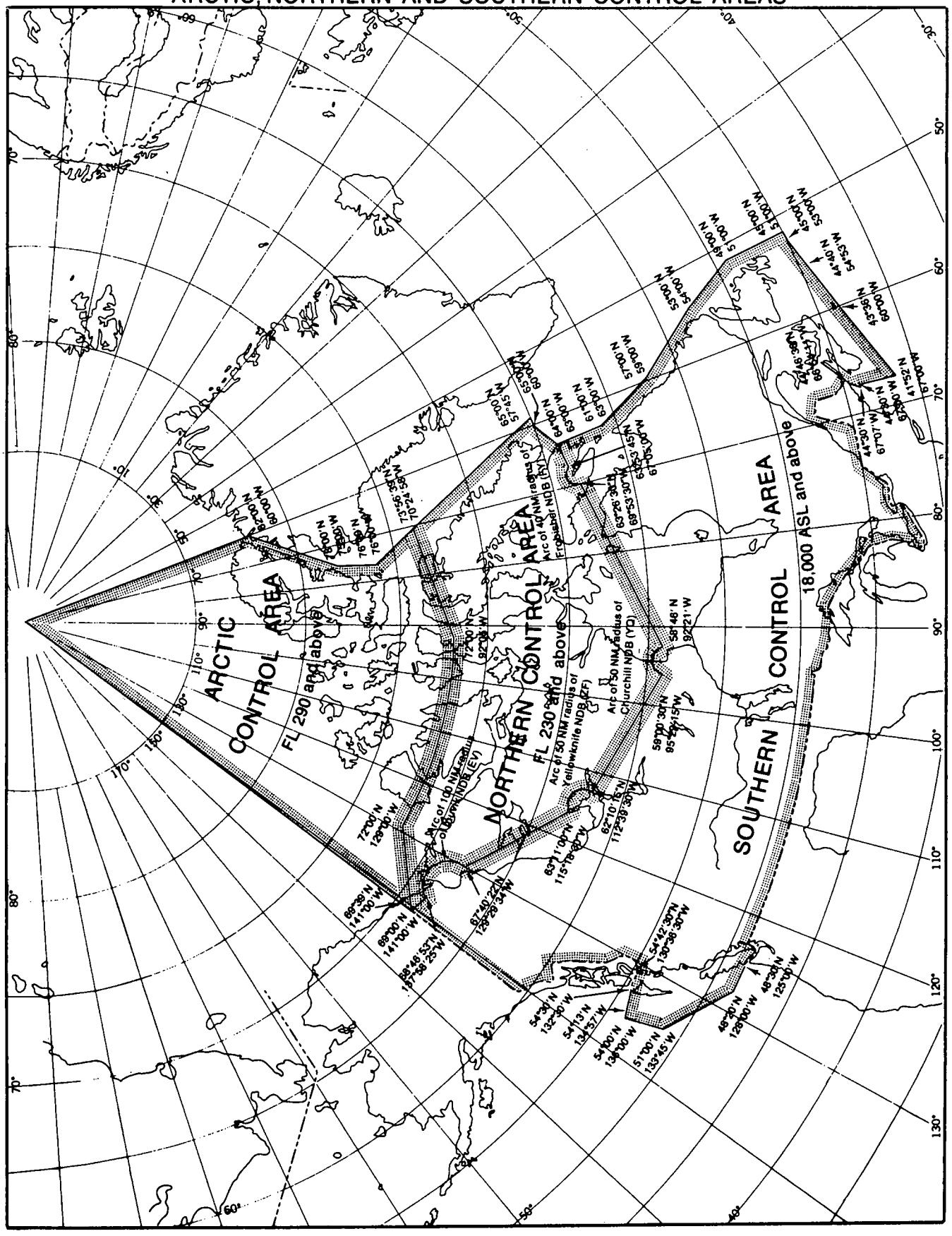

Figure F

Chapter 13

IMPLEMENTATION

Before introducing evidence with respect to Chapter 28 of the BICSS Report, entitled "Schedule of Implementation," Commission counsel expressed serious doubts as to whether the subject fell within the Terms of Reference of the Inquiry. He accordingly proceeded subject to that limitation.

On the other hand, counsel for the Department of Transport, both in his oral and written arguments, submitted that the subject was properly before the Commission. However, should the Commission find that the "mandatory aspects of the Order-in-Council do not oblige it to report on implementation", counsel for the Department suggested, using the words of paragraph (e) of the Terms of Reference, that the topic is a "relevant matter that may in the course of the Inquiry arise or develop and that, in the opinion of the Commissioners, should be included in the report."

It seems to the Commission that it is possible to resolve this difference of opinion - a distinction between an implementation plan, on the one hand, and an implementation schedule, on the other.

At the very least, the implementation plan is relevant to the Terms of Reference to the extent that matters which must be dealt with are identified. And, as suggested by counsel for the Department, sequencing is also pertinent in the sense that some steps must be taken before others if safety and efficiency are to be maintained. Thus, for example, it seems evident that bilingual air traffic services must be introduced in the Dorval PCZ before, or at least at the same time, as they are made available for IFR flights generally.

On the other hand, the schedule of implementation would seem to fall into a different category. Responsibility for implementing any recommendations of the Commission that may be adopted is that of the Department of Transport. The Department may encounter administrative problems in such areas as the availability of staff, the recruitment and training of additional controllers required, and the provision of new equipment. It will be the responsibility of DOT to take care of such difficulties. In the recommendations relating to the Montreal TRSA in the Interim Report the Commission made it a condition that "the service must be provided from a dedicated position at least 16 hours per day, and at all times on a discrete frequency. The Commission recognizes that it is the responsibility of the Department of Transport to provide the personnel required." However, the Commission made no direction as to the time required to provide the personnel since it did not consider such a responsibility fell within its Terms of Reference. It seems to the Commission that the same considerations apply in the present case. Accordingly, the Commission will make no findings concerning the schedule of implementation.

As for the implementation plan, a determination of the extent to which it is relevant to the Terms of Reference is made difficult by the fact that the plan is designed to make the introduction of bilingual air traffic control coincide with physical (move of Montreal ACC into a new building), technological (introduction of new equipment), and jurisdictional (expansion of Montreal FIR) changes which are not of themselves related to the use of two languages.

The subject of implementation is introduced in the BICSS Report in the following manner:

> "The proposed provision of bilingual air traffic control services to IFR flights along with other major changes envisioned within the Province of Quebec has necessitated the development of a detailed operational plan which would rationalize the step by step implementation of all air traffic services activities associated with such changes. The ATS Headquarters and Quebec regional branch was charged with the development of this operation plan.
>
> Existing projects such as automation of air traffic control systems, reallocation of airspace in accordance with the National Airspace Plan-East as well as further reallocation of airspace associated with bilingual air traffic service expansion to cover the Province of Quebec had to be rationalized. Preservation of operational integrity and efficiency of the air traffic control system during these changes was determined to be a prerequisite, while expeditious implementation consistent with available resources, the goal."

The plan consists of two stages. One involves the existing airspace, that is to say, the Montreal FIR with its present boundaries. The other has to do with the future expansion by means of which the boundaries of the Montreal FIR will be extended to coincide almost completely with the territorial boundaries of Quebec.

In Stage one, bilingual control will be implemented in:

i) The Dorval and Mirabel towers so as to complete the VFR control environment.

ii) The Montreal ACC and the Quebec TCU in order to include the IFR control environment.

Although not mentioned specifically in the BICSS Report, it was established in evidence that bilingual services for IFR flights would be made available concurrently at Bagotville by the Department of National Defence.

As it now stands, Stage two provides for the implementation of bilingual air traffic services in virtually the rest of Quebec airspace by means of expanding the Montreal FIR. At the same time, however, several changes, not related to languages, would be made.

The Montreal ACC would be moved into a new building and a number of new projects put into operation: an Integrated Communication Control System (ICCS); a new strip printing system, Montreal Automated Interim Data Display System (MAIDDS); an Operational Information Display System (OIDS), and the provision of JETS consoles (Joint Enroute Terminal System). The second stage would be carried out in eight phases, spread over a period of years. The eight phases are:

1. Move the Montreal ACC to the new building
2. Automate the terminal radar (Terminal JETS)
3. Automate the enroute radar (Enroute JETS)
4. Remote Quebec radar and re-sectorize airspace
5. Expand northward into James Bay airspace (NASP-E)
6. Complete northward expansion of NASP-E airspace (non-radar)
7. Remote Sept-Iles radar and expand airspace eastward (Odynski Study)
8. Expand air traffic services or provide third party communication capability to resolve the uncontrolled airspace issue. (1)

It is understood that throughout Phases 1 to 4 bilingual air traffic services will be available for IFR flights within the present boundaries of the Montreal FIR. Such services will be progressively introduced into the remaining Quebec airspace as Phases 5, 6 and 7 are completed in turn.

The eight-phase option just described is recommended for Stage two by the BICSS Report "as the most acceptable course of action to follow as it does not degrade system integrity and results in only short duration inefficient use of staff during phase 6 while providing a rational plan for implementation of all phases."

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(1) The Commission's recommendations concerning this subject are contained in Chapter 12.

Taken as a whole, it would seem that the plan cannot be approved or disapproved as such by the Commission because three aims are pursued concurrently: automation of the system, expansion of the Montreal FIR, and introduction of bilingual air traffic services in the existing, and, later, expanded Montreal FIR. The first two objectives do not, of course, come directly within the Commission's Terms of Reference.

Automation concerns the system throughout the whole of Canada.

The re-allocation of airspace is and has been the subject of other studies. On the other hand, the Terms of Reference speak of the introduction of bilingual air traffic services in the Province of Quebec, which, as regards airspace, the Commission interprets to mean that which coincides with the geographical boundaries of the Province, without reference to regional administrations, and their areas of jurisdiction.

As for the rest, the plan appears commendable. The carrying out of Stage one will involve taking care of the matters listed as conditions in the Recommendations contained in Chapters 9, 10 and 11, and which the Commission has said should be carried out before the service is provided. The sequencing involved as between Stages one and two, and the sequencing of the expansion to the north and subsequently to the east within Stage two, appear to be in the proper order.

Before concluding this chapter, some remarks are necessary concerning the provision of air traffic services in three areas of Quebec airspace which, after the expansion, would still not be integrated in the Montreal FIR.

The expansion plan to the north is the result of a study called the National Airspace Plan-East (NASP-E), which is reflected in the Canadian Airspace Capability Plan 1977-1986, dated December 31, 1976. The expansion plan to the east is the result of a further study entitled "Provision of Bilingual Air Traffic Services - Province of Quebec - Airspace Management", dated June 1, 1977 and commonly called the Odynski study. (1)

At the present time the Montreal FIR has jurisdiction over 35% to 40% of the Quebec airspace. The NASP-E study would increase the coverage to 70% and the Odynski study to approximately 98% or 99%.

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(1) Figures G, H and I following this chapter illustrate respectively the present boundaries of the Montreal FIR, the boundaries expanded northwards in accordance with NASP-E, and further expanded eastwards in accordance with the Odynski study.

Three areas would be excluded: the Magdalen Islands; a small area in south-western Quebec, north-west of Ottawa; and the airspace above FL 290 (29,000 feet) east of Sept-Iles, or approximately 70°W.

Mr. Odynski explained that the Magdalen Islands were excluded because of airspace configuration and conflicts with traffic flying in the area from and to destinations under the control of Moncton ACC:

> "Q If you were to include Les Iles de la Madeleine in that airspace, what kind of possible configuration of airspace would you have, if I referred to Appendix G and Volume No. 1 of the recommendations?
>
> A Well, I think it would be a difficult configuration to say the least.
>
> There would be some sort of airway, or a narrow band of airspace, maybe even a triangle of some sort, that would jut down into the Moncton jurisdiction, as we see it, and it would increase the coordination required within the system in order to accommodate it."
>
> . . . . . .
>
> "Q So, then, if you were to extend the triangle that we were talking about before, to include the Magdalen Islands, all that main traffic would remain within the boundary of the Quebec control units, wouldn't it?
>
> A Well, yes, if there was such a triangle.
>
> Q Would you then not have reduced coordination with the Moncton FIR with respect to the Magdalen Islands/Gaspe area?
>
> A Not necessarily, because that is not the only traffic that is there. There is also traffic that traverse that airspace between New Brunswick and Newfoundland, and it is conflicting traffic in that sense, crossing traffic, if you will."

The exclusion of an area in south-western Quebec was explained by Mr. Odynski:

> "Why was it, in your view, impossible to control this airspace in southwestern Quebec from the Montreal ACC?

A The configuration in the first place would have made the coordination load, if that were to happen, the coordination of traffic between the units involved would have been quite high.

Ottawa is situated very close to the Ontario/Quebec boundary, and some of the traffic patterns for the airport actually cross the boundary into Quebec. This is what made it very difficult."

And the exclusion of the area above FL 290 east of Sept-Iles:

"Q Why did your team feel that this airspace above flight level 290 had to be excluded?"

. . . . . .

"A The traffic that flies in that airspace is basically international transatlantic traffic and it would not, the use of both official languages for that traffic would not necessarily serve it any better.

They are coming across the ocean in one language and in English and they are going into an English environment, for the largest part in the United States.

Q Was it a function of the need that you concluded existed or did not exist, or was it a technical problem which you were attempting to solve?

A We were also concerned about the traffic coming off the ocean, having to cross too many jurisdictions in its transition from oceanic configuration to domestic or North American configuration where the transition from oceanic tracks into an airways system we tried to keep the number of jurisdictional units to a minimum and that is the airspace where that transition takes place."

Mr. Odynski subsequently recognized, however, that the traffic in such airspace is not exclusively transatlantic in and out of the United States or the rest of Canada, but that there is traffic in and out of Quebec as well.

On the other hand, it should be noted that a "chunk", as it was called, of airspace over Labrador will be included in the Montreal FIR for the following reasons given by Mr. Odynski:

"Basically the airway from Wabush to Shefferville goes through the eastern-most portion of Labrador in that area.

Wabush, as you know, lies practically on the boundary between the two provinces.

Shefferville lies more to the north. The airway from Seven Islands to Wabush, to Shefferville passes through that airspace."

Mr. Odynski said that bilingual service would nevertheless be available on request at the Magdalen Islands:

"A Well, Moncton ACC would continue to control Les Iles de la Madeleine as they do today.

They would, we envisaged that there would be bilingual aeradio operators on scene; however, if an aircraft requested service in the French language, arrangements would be made whereby Montreal could be asked to step in if Moncton could not handle it.

Q Montreal could issue a clearance, for example, to an aircraft wishing to depart from the islands?

A It would be made possible for them to do so.

Q And that would have to be coordinated with Moncton, I presume?

A Yes."

Mr. Odynski also said that the same considerations would apply to the other two areas excluded, and that a pilot could obtain services in French on request. Later, however, he seemed to qualify this statement by limiting the availability of French to contingencies "in the sense that a flight, a domestic flight in that strata who is flying, he is bilingually capable but runs into a problem and at that point feels more comfortable in his native tongue, then the French language would be made available to him." The Odynski study itself seems to make a similar distinction between the Magdalen Islands, where French would be available on request, and the other two areas where only "contingencies requiring the use of the French language could be accommodated."

As said before, we do not believe our Terms of Reference direct us to make recommendations with respect to the allocation of airspace, but to make recommendations with respect to the safety of the introduction of bilingual

air traffic services in Quebec airspace as a whole. The finding that such services can safely be introduced in the Province as a whole necessarily includes the three areas which expansion would leave outside the Montreal FIR. We are of the opinion that services in French should be made available in those areas upon request by means of appropriate inter-unit agreements.

The Commission has therefore recommended (1) that the French language be made available on request at the Magdalen Islands; in south-western Quebec, north-west of Ottawa; and in the area over Quebec above FL 290, east of Sept-Iles or approximately 70°W, to the extent that any such airspace has not already been included in the expanded Montreal FIR.

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(1) See Chapter 9.

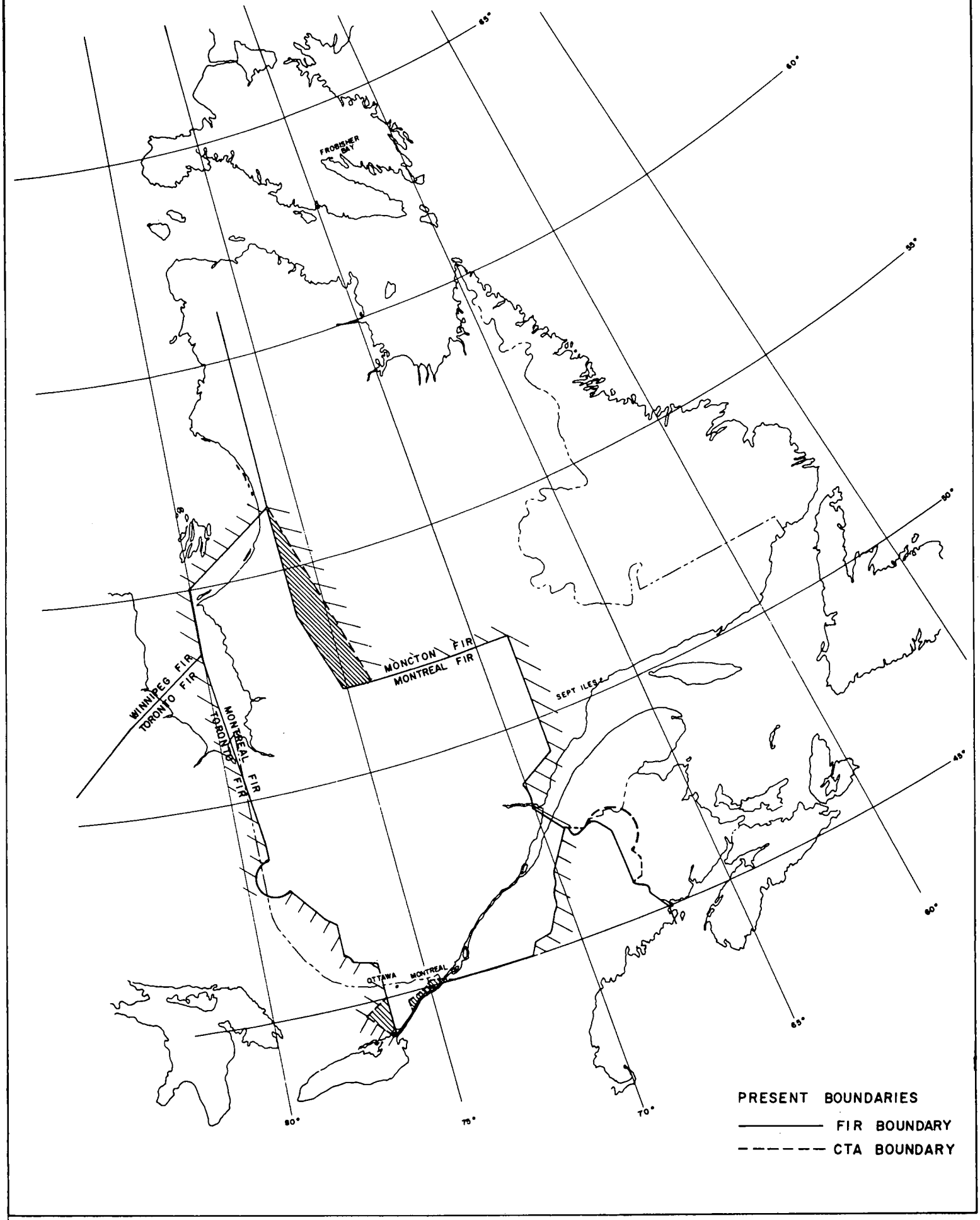
FROBISHER BAY
WINNIPEG FIR
TORONTO FIR
MONCTON FIR
MONTREAL FIR
MONTREAL FIR
TORONTO FIR
SEPT ILES
OTTAWA
MONTREAL
65°
60°
55°
50°
45°
80°
75°
70°
PRESENT BOUNDARIES
FIR BOUNDARY
CTA BOUNDARY

Figure G

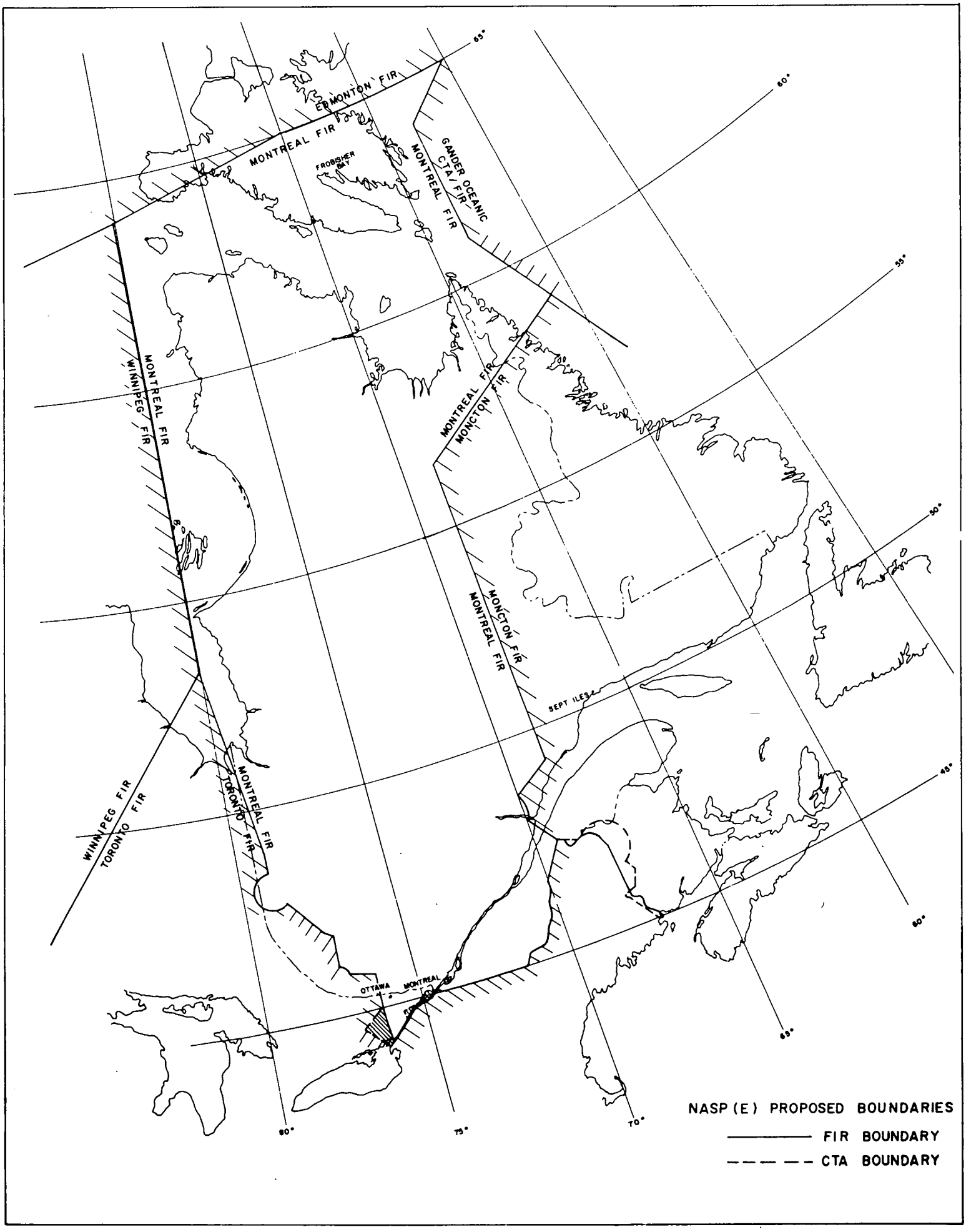
EDMONTON FIR
MONTREAL FIR
FROBISHER BAY
GANDER OCEANIC CTA/FIR
MONTREAL FIR
MONTREAL FIR
WINNIPEG FIR
MONTREAL FIR
MONCTON FIR
MONCTON FIR
MONTREAL FIR
SEPT ILES
WINNIPEG FIR
TORONTO FIR
TORONTO FIR
MONTREAL FIR
OTTAWA
MONTREAL
65°
60°
55°
50°
45°
80°
75°
70°
NASP (E) PROPOSED BOUNDARIES
FIR BOUNDARY
CTA BOUNDARY

Figure H

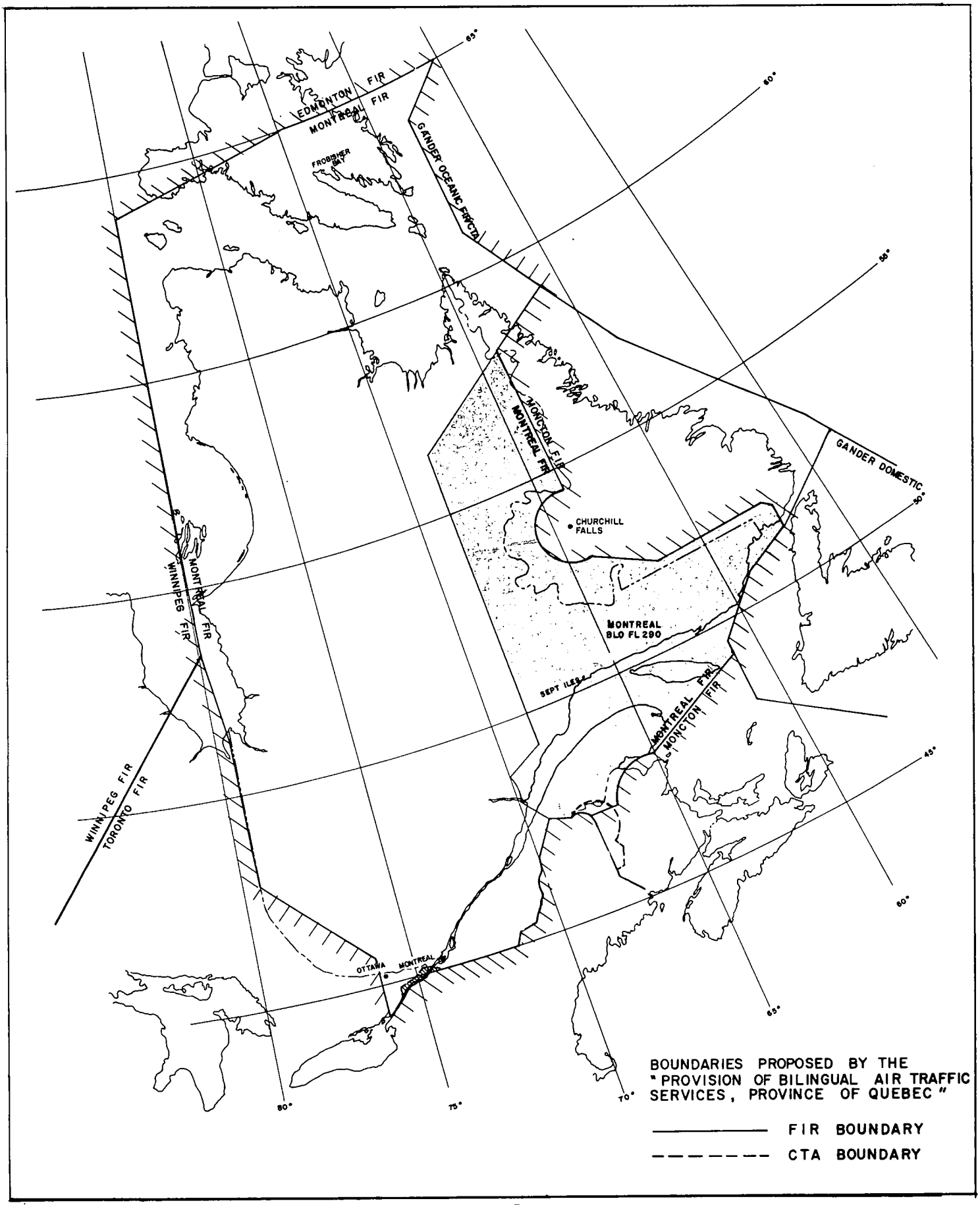
EDMONTON FIR
MONTREAL FIR
FROBISHER BAY
GANDER OCEANIC FIR/CTA
MONCTON FIR
MONTREAL FIR
GANDER DOMESTIC
CHURCHILL FALLS
WINNIPEG FIR
MONTREAL FIR
MONTREAL BLO FL 290
SEPT ILES
MONTREAL FIR
MONCTON FIR
WINNIPEG FIR
TORONTO FIR
OTTAWA
MONTREAL FIR
80°
75°
70°
65°
60°
55°
50°
45°
BOUNDARIES PROPOSED BY THE "PROVISION OF BILINGUAL AIR TRAFFIC SERVICES, PROVINCE OF QUEBEC"
FIR BOUNDARY
CTA BOUNDARY

Figure I

Chapter 14

OPERATIONAL EFFICIENCY AND IMPLEMENTATION COSTS

Section 1. OPERATIONAL EFFICIENCY

As was the case in the first phase of the Inquiry with respect to the three locations where the introduction of bilingualism was recommended in the Interim Report, the evidence on record leads to the conclusion that operational efficiency will not be affected by the introduction of bilingualism for IFR flights in Quebec, and for VFR flights at Dorval and Mirabel.

The BICSS Report concludes:

> "In all three conditions reviewed (enroute non-radar, enroute radar, and terminal radar) no significant differences in control efficiency between language conditions were identified. No similar comparisons were made for Phase III and IV simulations because conditions of traffic and exceptional situations were never the same under both English and bilingual conditions for a given controller.
>
> Observations by qualified observers made during the course of simulations did not reveal any obvious deficiency relating to control efficiency under bilingual conditions. It was therefore concluded that there were no perceptible differences in terms of operational efficiency between the two language conditions."

CBAA, for one, however, suggested in its brief to the Commission that "a real world study is required to determine whether operational efficiency is affected."

In fact, there is data from the real world in the evidence which supports the conclusions of the BICSS Report.

There has been no impact on operational efficiency at those places where bilingualism was introduced in Quebec for VFR flights following the Interim Report, nor where it was already authorized prior to the Report.

The detailed on-site investigation of selected ATC systems conducted by Commission consultants at Tokyo and Chofu, Japan; Rio de Janeiro and Sao Paulo, Brazil; Mexico City and Guadalajara, Mexico; Rome, Italy; Geneva, Switzerland; Frankfurt, Germany; and Paris, Orly and Charles de Gaulle, France, has revealed no detrimental impact on operational efficiency.

The same result follows from the air traffic control tower tape monitoring done by the consultants at Quebec City, St-Hubert, Geneva-Cointrin, Mexico City, San Diego and Minneapolis-St. Paul.

One procedure, the merging target service, was mentioned in particular as having the potential to cause a reduction in operating efficiency. Mr. St. Denis thought the procedure, if mandatory, could force the controller to slow down traffic during busy periods when he would not have time to pass the information to the pilots concerned. Mr. Beaudry, however, was of the opposite view.

The provision of this information is currently done as a matter of practice in some 80% of the cases at Montreal.

Furthermore, although this procedure was developed on the occasion of the studies relating to the introduction of bilingualism, it is meant to apply to the system at large, and not just to the bilingual environment. In this respect, counsel for the Department of Transport said in his written argument:

> "The three additional procedures which were discussed at length during the hearings, i.e. use of phonetics and traffic information exchange in the case of holding patterns and merging targets. Although it is conceivable that the adoption of these procedures will increase slightly the communications workload of the controllers and even though their necessity was found as part of the bilingual studies the Department of Transport intends to implement them across the country as added safety measures required by the whole system. Their impact on efficiency should not therefore be taken into consideration as a consequence of the implementation of bilingual communications in Quebec."

Section 2. IMPLEMENTATION COSTS

The costs have been estimated at approximately $12,000,000. But, as will be seen, a large portion, perhaps most, of these costs are not directly related to the introduction of air traffic services in both languages.

CBAA was of the view that the costs were "considerably underestimated" since no allowance had been made for inflation, and no estimates given for the costs of site acquisition and for navaids. It should be mentioned that inflation was in fact taken into account in the estimate of $7,100,000 relating to reconfiguration of the airspace, the largest single item. CBAA was concerned that the implementation costs would be passed on to the operators through the application of a "user pay" policy. As to this aspect of the matter, there is simply no evidence before the Commission. Indeed, while the Terms of Reference require a report on costs, the Commission is not obliged to determine by whom they should be paid.

COPA expressed the same concern, and also pointed out that the BICSS estimate does not include "the additional annual amount of operating expenses to be incurred that are over and above what a unilingual system would cost." No evidence was introduced in this regard.

Some of the costs included in the estimate were incurred before the Commission was created, and thus cannot be said to be associated with the implementation of any of its recommendations. These costs are: Committee on Inter and Intra ATS Unit Coordination - $398,000; Pilot Information Programme - $88,500.

It could be argued that the cost of $650,000 for the Bilingual IFR Communications Simulation Studies is not an item relating to the cost of implementation, as such.

The No. 2 air control position at Dorval, at a cost of $30,000, had earlier been identified as being required because of frequency congestion. The same could be said for the sum of $5,000 needed to instal override capability for the coordinator in the Quebec TCU.

It should be noted that the $7,100,000 for reconfiguration of the Montreal FIR is only partly attributable to the proposed introduction of bilingual air traffic services. The expansion to the north so as to increase the jurisdiction of the Montreal FIR from 35% or 40% of Quebec airspace to 70% was recommended in the National Airspace Plan-East (NASP-E), completed between 1972 and 1974, when a study was made of all Canadian airspace.

Finally, if the option of converting uncontrolled to controlled airspace is the one selected after the proposed study is completed, the cost of $3,000,000 for such conversion could perhaps be said to relate to improved airspace management, as well as to the introduction of bilingual air traffic control services into airspace where flights are already carried out in both languages.

On the other side of the ledger, the Commission would point out that the BICSS Report omitted to include the item of $80,000 incurred for the translation of documents.

It follows that, strictly speaking, implementation costs may well be under the estimated figure of $12,000,000.