

1985-115-81077

NASA Technical Memorandum 87077

NASA-TM-87077 19850025837

Telecommunications Forecast for ITU Region 2 to the Year 1995

James E. Hollansworth, Jack A. Salzman,
and James R. Ramler
*Lewis Research Center
Cleveland, Ohio*

LIBRARY COPY

SEP 23 1985

LEWIS RESEARCH CENTER
LIBRARY, NASA
WAMPY, OH, 44135

August 1985



NF00150

Inserted 12/07/85
[Signature]

ERRATA

NASA Technical Memorandum 87077

TELECOMMUNICATIONS FORECAST FOR ITU REGION 2
TO THE YEAR 1995

James E. Hollansworth, Jack A. Salzman,
and James R. Ramler
October 1985

Page 35, under the 1980 data column, the "a" footnote for Intelsat E/S should be a "b".

Page 38 should be page 43.

Page 39 should be page 42.

Page 42 should be page 39.

Page 43 should be page 38.

NASA Technical Memorandum

TELECOMMUNICATIONS FORECAST FOR
ITU REGION 2 TO THE YEAR 1995

James E. Hollansworth, Jack A. Salzman, and James R. Ramler
Lewis Research Center
Cleveland, Ohio

June 1985

NASA

018 5-34150#

CONTENTS

| | Page |
|------------------------------------------------------------------------------------|------|
| SUMMARY | 1 |
| INTRODUCTION | 1 |
| OBJECTIVES | 2 |
| APPROACH | 3 |
| OVERVIEW OF TELECOMMUNICAION ACTIVITY WORLDWIDE | 3 |
| TELECOMMUNICATIONS ACTIVITY IN ITV REGION 2 | 5 |
| TABLES | 11 |
| FIGURES | 22 |
| APPENDIES | |
| A - WORLD SUBMARINE CABLE | 24 |
| B - TELECOMMUNICATIONS EQUIPMENT BY COUNTRY IN ITU REGION 2 1980-1985 | 32 |
| C - NARRATIVE DESCRIPTION OF COUNTRIES IN ITU REGION 2 | 68 |
| D - SATELLITE SYSTEMS STATUS AND PLANS | 114 |
| REFERENCES | 125 |

TELECOMMUNICATIONS FORECAST FOR ITU REGION 2 TO THE YEAR 1995

James E. Hollansworth, Jack A Salzman, and James R. Ramler
National Aeronautics and Space Administration
Lewis Research Center
Cleveland, Ohio

SUMMARY

A study of current and future (to 1995) telecommunications activity within ITU Region 2 was performed by the Space Communications Division of NASA's Lewis Research Center. The primary objective of this study was to forecast the need for Fixed Service Satellites (FSS) by countries within ITU Region 2 excluding the United States and Greenland. As a part of this study, forecasts of telecommunications equipment needs were developed as a yardstick of the relative level of telecommunications activity among developing countries within the region.

The study forecasts a likely scenario for the implementation of domestic and regional communications satellites to provide services to and among countries in ITU Region 2. By 1995, it is forecast that 15 fixed service satellites will be implemented as follows:

| | |
|----------------------------------------|---|
| Canada (domestic) | 5 |
| Mexico (domestic) | 2 |
| Brazil (domestic) | 2 |
| Colombia/Venezuela (regional) | 2 |
| Argentina/Chile (regional) | 2 |
| South America and Caribbean (regional) | 2 |

A forecast of these countries' requirements indicates that, with the possible exception of Canada, this constellation of satellites (with replacements as needed) will meet these countries' needs to beyond the year 2000.

INTRODUCTION

Over the last 15 to 20 years, the world and more specifically, Region 2*, has seen a continuous growth in satellite communications. This growth has

*As defined by the International Telecommunication Union (ITU).

been two-fold: (1) growth in usage by countries with established satellite systems and (2) growth in the number of countries implementing satellite systems. With this growth, there has been an increasing concern over the diminishing availability of orbital arc space and allocated spectrum. One of the concerns of all satellite users and potential users is "Will there be orbital arc and spectrum available for the new users and the new systems needed to satisfy future satellite communications requirements?". Although this is a global problem, it is of particular concern within Region 2. It is of paramount importance to be able to predict and determine the impact that new and proposed satellite systems will have upon the available orbital arc and allocated spectrum.

OBJECTIVES

The objectives of this study were to:

1. Assess the current worldwide telecommunications (Free World) activity and forecast the likely growth of that activity through 1990 (and beyond when feasible). This worldwide assessment was to be at the geographic region level (e.g., Asia, Africa, etc.) and the assessment for ITU Region 2 was to be at the country level. Activity was to be described in terms of equipment installations, plant investment, and, if possible, communications traffic.
2. Assess the potential for implementing communications satellites for domestic, regional (grouping of neighboring countries) and international telecommunication services within ITU Region 2.
3. Forecast the implementation of communications satellites in ITU Region 2 in the early to mid 1990's. The forecast was to provide a description of the likely satellite systems including information on launch dates, coverage areas, etc..

Although the United States' future implementation of domestic communications satellite systems is of prime importance in Region 2, it is not discussed in this report because of previous extensive studies. There are several available well-documented scenarios covering the United States (e.g., refs. 1 to 4).

APPROACH

The approach used in this study was to:

1. Review existing data on worldwide telecommunication activity, future requirements, and likely growth (refs. 5 to 16). Specific emphasis was placed on current reports concerning communications satellites and their implementation in Region 2;
2. Review on a country by country basis (Region 2) telecommunication requirements to include: (a) demographics; (b) economic status; (c) existing and planned terrestrial plant-in-place (including fiber optics and microwave systems); and (d) current and potential satellite usage;
3. Forecast the satellite addressable circuit demand in Region 2 for voice and video services for the years 1990 and 1995 (data services were assumed to be included in voice services); and
4. Determine the likely implementation of communications satellite systems by individual countries or by regional groups of countries.

OVERVIEW OF TELECOMMUNICATIONS ACTIVITY WORLDWIDE

For the purposes of this study, the world was divided into 6 major World Zones as shown in Figure 1. The estimated worldwide plant-in-place is shown in Table 1. It should be noted that data for the Soviet Union is not included. The data in Table 1 were derived from various sources as noted on the Table. Table 1 contains mixed year data, 1980 through 1984, and, as such, represents a primary data base. Details of the plant-in-place submarine cable are shown in Appendix A.

The telecommunications equipment categories included in Table 1 provide a good measure of current telecommunications activity worldwide. Each of these elements are briefly defined below.

1. Telephones - Total number of reported telephones in service.
2. Telex - Total number of telex stations identified with a dial number and/or derived by usage. Telex is a universal worldwide service. Note that in the United States and Canada there is, in addition to Telex, a similar system called Teletypewriter Exchange Service (TWX), which is similar to Telex, and it has been included in the count.
3. Intelsat Earth Stations - For convenience, a distinction is made between Intelsat earth stations that are used for domestic service only (strictly usage within a country) and international service only (strictly usage between countries). This distinction is as designated by Intelsat.
4. Submarine Cable - Cable which is laid under water for transmission within countries and between countries. There are three unique categories of submarine cable defined in this study. They are: (a) domestic - cable which originates and terminates in the same country; (b) intra-region - cable which originates and terminates within the same geographic region but not the same country; and (c) inter-region - cable which originates in one geographic region and terminates in another geographic region. The format of Table 1 does not permit a tabulation of inter-region submarine cable. However, this may be obtained from Appendix A.
5. Coax Cable - a conducting pair consisting of a wire inside an outer conducting tube. This cable is typically made to extremely high standards and well shielded (ref. 27).
6. Multipair - a set of conducting pairs each consisting of two parallel wire conductors (ref. 27). This type of cable comes in sizes of 25, 50, 100, etc., pairs.

7. Fiber Optic Cable - transmission medium consisting of cable containing a number of low-attenuation glass fibers through which may be transmitted digitally modulated light waves. Fiber optic cable is typically manufactured in 12, 24, 36, etc., fibers per cable.
8. Microwave Radio System - terrestrial line-of-sight radio communications at microwave frequencies between terminals usually located on towers or buildings.

It will be noted that a tabulation of domestic earth stations used with domestic satellites is not included in Table 1. Currently within Region 2, only Canada and Brazil (aside from the U.S.) operate domestic satellite systems and therefore domestic earth stations. Details may be found in Appendix B.

TELECOMMUNICATIONS ACTIVITY IN ITU REGION 2

Region 2 as defined by the International Telecommunication Union (ITU) includes North and South America, the Caribbean Basin, and Greenland (see Figure 2). For the purposes of this study, the United States and Greenland are not considered.

In order to develop a firm starting point for analyzing and forecasting the telecommunications activity within Region 2, data on telecommunications equipment were first developed for each of the years 1980 to 1984 (see Tables 2 to 6). Data are shown for five areas within Region 2. These data are further broken down by country in Appendix B. To provide some insight and perspective on the factors affecting telecommunications activity in each country, a data sheet including a brief narrative on each country is provided in Appendix C.

Based upon the announced plans of the countries within Region 2 and forecasts made in this study, the growth in telecommunications activity over the next decade in Region 2 (U.S. and Greenland excluded) is expected to be fairly brisk. In terms of announced terrestrial activity, the major activities appear to be in the following areas: (1) replacement and/or upgrading of existing switch capacity; (2) expansion of existing capacity with new switches; (3)

upgrading of existing cable plant; and (4) installation of new cable plant plus microwave and fiber optical cable. Forecasts reflecting such growth are shown in Tables 7(a), (b), and (c) for the years 1985, 1990 and 1995, respectively.

With the introduction of communications satellites into the developing countries of Region 2, the accessibility to many areas that are remote or inaccessible by current methods will be achieved. In addition to the increased accessibility, the overall telecommunications system reliability will improve.

In forecasting the likely need for satellites in the various countries within Region 2, forecasts were made only for voice circuits and video channels. The requirement for data circuits was judged to be negligible through 1995. Even in the U.S., with its highly developed economy, data services are forecast to account for only about 20 percent of the satellite-addressable traffic in the 1990 to 2000 time frame (ref. 1). It is assumed that whatever data services are required in other countries within Region 2 can be accommodated by the forecast voice circuits.

To determine the potential demand for satellite voice circuits, the analysis was broken into three steps. The first step was to forecast the total long-haul voice circuit requirements for each of the countries for the years 1990 and 1995. The next step was to estimate what percentage of that circuit requirement would likely be supplied (captured) by satellites in those same years. The final step was to convert the resulting satellite circuit requirement into equivalent 36 MHz transponders which is a commonly used measure of satellite capacity.

Rather than trying to make an independent forecast of each country's long-haul voice requirement, available forecasts were used wherever possible (refs. 5 to 9, 11, and 17 to 21). In order to assess the available forecasts and synthesize them into a single forecast, it was first necessary to convert them to a common unit of demand (i.e., voice half circuits). Since much of the baseline and forecast data were in terms of long-distance calls (N_{LD}) per year (e.g., refs. 5 to 8 and 20), the following formula was used to compute the equivalent voice half circuits (N_C) required to handle those calls:

$$N_C = 1.2 \times 10^{-4} \times N_{LD}$$

This conversion formula is based on standard calling statistics such as average peak-hour loading, average call length, acceptable blocking rates, etc. Although several simplifying assumptions were necessary in its derivation, the formula yields consistent results with the conversion methodologies used in refs. 3, 4, and 19.

Once the various voice data had been converted to numbers of voice half circuits, they were compared and cross-checked with other existing data with the intent of arriving at a best estimate. Although in some cases there were discrepancies among the different forecasts, it was possible to find sufficient agreement and supporting rationale through independent analyses to verify that the estimates made in this study were reasonable for each country in 1990 and 1995.

The next step was to estimate the percent of long-haul voice circuits likely to be captured by satellites. Several studies have examined the ability of satellites to supply or capture a portion of the long-haul voice traffic. In refs. 2 and 22, indices were determined to help estimate the potential of implementing a domestic satellite system, the formation of a regional type system or leasing of transponders from a satellite carrier for domestic service. Reference 22 used indices such as a "Telecommunication Traffic Dispersion Index (TDI)," "Volume of Telecommunication Traffic Index (TVI)," and a "Financial Position Index (FPI)" to compute a "Satellite Communications Procurement Index (SCPI)." Reference 9 derived an index by using an algorithm with parameters such as: (1) GNP; (2) population; (3) land area; (4) equivalent medium-size cities; (5) telecommunication market; (6) telephones; (7) radio receivers; and (8) television receivers. In reference 19, actual estimates of the percent of long-haul voice traffic that could be captured by satellites were offered.

Although the units or indices in each of the references are not directly comparable, the relative ranking of the countries as to their satellite potential was consistent. In general, when there were discrepancies, a logical

explanation could be found and a decision as to a logical choice between the indices could be made. After comparing the data, an estimate of the likely percentage of voice traffic capturable by satellite was made for each country.

The estimated capture percentage was then applied to the forecast voice circuit demand to compute the number of circuits likely to be captured by satellite.

The capturable satellite circuits were then converted to equivalent 36 MHz satellite transponders. With the technology likely to be used in these systems, it was assumed that one 36 MHz transponder could handle 1,200 voice half circuits. The results of these forecasts for 1990 and 1995 are shown in Tables 8 and 9, respectively.

To determine the satellite-delivered video service requirements for the individual countries, the information offered on such services by refs. 11, 14, 17, 18, and 23 to 26 were used. These references gave enough data to make what is believed to be reasonable estimates of the demand for video transponders. Table 10 presents these estimates for 1990 and 1995.

Using Tables 8, 9, and 10, the total number of satellite transponders forecast to be required in 1990 and 1995 is shown in Table 11.

IMPLEMENTATION OF SATELLITES IN ITU REGION 2

Although the forecast satellite demand shown in Table 11 represents what is believed to be a reasonable estimate of each country's satellite requirements, it must be used in combination with other factors to determine the most likely implementation scenario for these countries. One important factor is the announced plans of countries to launch satellite systems. These plans may be based on a perceived need different from that forecast in this study or on reasons which transcend simply implementing a system to meet a projected demand. The current status and plans for satellites for Canada, Mexico, Brazil, Argentina, and Colombia are described in Appendix D. A summary of these countries' plans for domestic satellite systems is as follows:

1. Canada - 5 satellite system
2. Mexico - 2 satellite system
3. Brazil - 2 satellite system
4. Argentina - 2 satellite system
5. Colombia - 2 satellite system

In addition to the individual country plans listed above, PanAm Sat has proposed a regional satellite system with one satellite serving South America and the Caribbean (ref. 22). Also, Cuba has filed for a one-satellite system but has requested an orbital slot already occupied by RCA's Satcom 4 (83.0°W).

By combining the announced plans of the various countries to launch satellite systems with their needs forecast in this study, a likely scenario for the implementation of communications satellites in Region 2 (excluding the United States) was forecast and is described below:

Canada - Will fill its current reserved orbital slots with satellites and maintain its current replacement policy. Even though Canada is today experiencing a serious excess satellite capacity, expected demand growth in the next 10 to 15 years will result in capacity requirements approaching that of five standard satellites (twenty-four 36 MHz transponders per satellite).

Mexico - Will have 2 satellites in orbit by 1986 and will maintain them through at least the 1995 to 1997 time frame. When this system begins to fail, Mexico will likely replace it with a similar system. At the growth rates forecast in this study, a 2-satellite system will be more than adequate to handle all of their needs well into the early 2000's. Mexico's first satellite was scheduled for launch in June 1985.

Brazil - Will have 2 satellites in orbit by 1986 and will maintain them through at least the 1995 to 1997 time frame. As this system begins to fail, Brazil will likely replace it with a similar system. At the growth rates forecast in this study, a 2-satellite system will be more than adequate to handle all of their needs into the early 2000's. Brazil's first satellite was launched in February 1985 and is presently on station and operational.

The forecast satellite requirements of the remaining Region 2 countries do not appear to justify a dedicated domestic satellite system such as those discussed above. However, neighboring countries which could pool their individual satellite needs could utilize a satellite system much like the various Arab countries use Arabsat. Two regional satellite systems which appear to be logical, from the standpoint that the countries have a common border and significant inter-country traffic, are forecast below.

Colombia/Venezuela - Will form a regional consortium in the 1986-1988 time frame and launch a 2-satellite system in the early 1990's. This system would handle each country's domestic long-haul telephony and video traffic as well as the inter-country satellite traffic.

Argentina/Chile - Will form a regional consortium in the 1986-1988 time frame and launch a 2-satellite system in the early 1990's. This system would handle each country's domestic long-haul telephony and video traffic as well as the inter-country satellite traffic.

TABLE I - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT WORLDWIDE* PRIMARY DATA BASE - MIXED YEAR DATA - NO PROJECTIONS

| World Zone | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | | |
|-----------------|------------------------------|----------------------|---------------------------|-------|--------------------------------------|--------------|-------------------|------------------------|--------------------------|------------------------|
| | Telephones ^a | Telex ^b | Intelsat E/S ^c | | Submarine ^{d,e} | | Coax ^f | Multipair ^f | Fiber Optic ^f | Microwave ^f |
| | | | Dom | Int'l | Domestic | Intra-Region | | | | |
| North America** | 197,634,723 | 234,652 ^g | NR | 24 | 2,835,229 | NR | 488,200,000 | 113,175,000 | 10,775,000 | 1,036,025,000 |
| Latin America | 24,258,624 | 68,800 | 389 | 48 | 8,168,677 | 557,646 | 3,855,556 | 4,388,889 | NR | 81,544,445 |
| Europe | 172,098,479 | 475,926 | 69 | 82 | 13,376,247 | 194,771,183 | 1,623,878,378 | 40,148,649 | 1,324,325 | 545,432,433 |
| Asia | 81,115,601 | 166,020 | 104 | 93 | NR | NR | 2,308,657 | 72,815 | NR | 375,417 |
| Africa | 6,135,956 | 43,610 | 112 | 87 | 564,566 | 2,672,807 | NR | 3,031,381 | NR | 118,085,119 |
| Oceania | 13,379,615 | 38,535 | 79 | 25 | 5,487,420 | 11,492,297 | 552,239 | NR | NR | 7,805,970 |
| Totals | 494,027,530 | 1,027,543 | 753 | 359 | 31,432,139 | 209,493,933 | 2,118,794,830 | 160,816,734 | 12,099,325 | 1,781,463,265 |

Notes

NR = No Record

*USSR not included

**Includes United States data

^aAmerican Telephone & Telegraph Co - long lines 1982 data (includes U S)

^b1980 data Sources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^c1984 data Source Intelsat

^d1980 data Sources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

^eSee Appendix A for Interregional data

^f1980 data

^g1980 data - Canada-Canadian Astronautics Limited Report entitled "Final Report - A Study of Canadian EHF Communication Requirements and Technology Development" dated September 1983, pp 4-38 and 4-43 Data in report as of 1983 - have adjusted downward to 1980 at 3 percent average annual growth rate - includes telex and TWX terminals USA - Western Union Telegraph Co report entitled "Satellite Provided Fixed Communications Services A Forecast of Potential Domestic Demand Through the Year 2000," Final Report - Volume II dated August 1983, pp 3-21 Data includes telex and TWX terminals

TABLE II - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1980

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | | |
|-----------------|------------------------------|--------------------|---------------------------|-------|--------------------------------------|------------|------------|------------|-------------|-------------|
| | Telephones ^a | Telex ^b | Intelsat E/S ^c | | Submarine ^d | | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | Intra-Area | | | | |
| Canada | 15,560,264 | 104,045 | NR | 4 | 1,076,923 | NR | 78,420,000 | 22,875,000 | 1,166,355 | 384,250,000 |
| Mexico | 4,532,557 | 8,700 | NR | 1 | 132,653 | NR | NR | 434,000 | NR | 14,255,102 |
| Central America | 607,021 | 7,379 | NR | 4 | NR | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,308,346 | 5,377 | NR | 7 | NR | NR | NR | NR | NR | NR |
| South America | 13,359,626 | 62,031 | 14 | 19 | 8,036,024 | 557,646 | 3,149,969 | 10,181,150 | NR | 40,951,267 |
| Totals | 35,367,814 | 187,532 | 14 | 35 | 9,245,600 | 557,646 | 81,569,969 | 33,490,150 | 1,166,355 | 439,456,369 |

Note

Canada had 137 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1980 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE III - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1981

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | | |
|-----------------|------------------------------|--------------------|---------------------------|-------|--------------------------------------|------------|------------|------------|-------------|-------------|
| | Telephones ^a | Telex ^b | Intelsat E/S ^c | | Submarine ^d | | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | Intra-Area | | | | |
| Canada | 16,178,158 | 107,263 | NR | 5 | 1,174,923 | NR | 74,499,000 | 23,058,000 | 1,790,354 | 391,935,000 |
| Mexico | 5,082,718 | 9,170 | 4 | 3 | 145,653 | NR | NR | 454,783 | NR | 15,652,102 |
| Central America | 676,931 | 8,247 | NR | 7 | NR | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,328,438 | 5,612 | NR | 8 | NR | NR | NR | NR | NR | NR |
| South America | 15,150,815 | 73,048 | 25 | 21 | 6,642,024 | 557,646 | 3,112,696 | 10,370,150 | NR | 46,752,267 |
| Totals | 38,417,120 | 203,340 | 29 | 44 | 7,962,600 | 557,646 | 77,611,696 | 33,882,933 | 1,790,354 | 454,339,369 |

Note

Canada had 211 domestic, non-Intelsat system earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1981 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE IV - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1982

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | | |
|-----------------|------------------------------|--------------------|---------------------------|-------|--------------------------------------|------------|------------|------------|-------------|-------------|
| | Telephones ^a | Telex ^b | Intelsat E/S ^c | | Submarine ^d | | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | Intra-Area | | | | |
| Canada | 16,741,723 | 110,580 | NR | 5 | 1,281,841 | NR | 70,774,050 | 23,242,464 | 2,748,194 | 399,773,700 |
| Mexico | 5,411,108 | 9,665 | 119 | 3 | 159,927 | NR | NR | 475,703 | NR | 17,186,008 |
| Central America | 746,425 | 8,498 | NR | 8 | NR | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,410,741 | 5,859 | NR | 8 | NR | NR | NR | NR | NR | NR |
| South America | 16,294,327 | 86,785 | 82 | 21 | 5,604,956 | 557,646 | 3,115,444 | 10,574,086 | NR | 53,397,678 |
| Totals | 40,604,324 | 221,387 | 201 | 45 | 7,046,724 | 557,646 | 73,889,494 | 34,292,253 | 2,748,194 | 470,357,386 |

Note

Canada had 317 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds
 *Excludes United States and Greenland
 NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE V - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1983

| Area | Terminal Equipment (Numbers) | | Long-Haul Transmission Media (Ch-Km) | | | | | | | |
|-----------------|------------------------------|--------------------|--------------------------------------|-------|------------------------|------------|------------|------------|-------------|-------------|
| | Telephones ^a | Telex ^b | Intelsat E/SC ^c | | Submarine ^d | | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | Intra-Area | | | | |
| Canada | 17,079,769 | 114,000 | NR | 6 | 1,398,489 | NR | 67,235,348 | 23,707,313 | 4,218,479 | 407,769,174 |
| Mexico | 5,963,041 | 10,187 | 120 | 3 | 175,600 | NR | NR | 497,585 | NR | 18,870,237 |
| Central America | 827,660 | 8,754 | NR | 8 | NR | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,472,222 | 6,107 | NR | 8 | NR | NR | NR | NR | NR | NR |
| South America | 18,045,676 | 103,536 | 119 | 23 | 4,824,009 | 557,646 | 3,159,282 | 10,793,218 | NR | 61,013,913 |
| Totals | 43,388,368 | 242,584 | 239 | 48 | 6,398,098 | 557,646 | 70,394,630 | 34,998,116 | 4,218,479 | 487,653,324 |

Note

Canada had 476 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds
 *Excludes United States and Greenland
 NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE VI - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1984

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | | |
|-----------------|------------------------------|--------------------|---------------|-------|--------------------------------------|------------|------------|------------|-------------|-------------|
| | Telephones ^a | Telex ^b | Intelsat E/SC | | Submarine ^d | | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | Intra-Area | | | | |
| Canada | 18,531,549 | 117,420 | NR | 7 | 1,525,756 | NR | 63,873,581 | 24,181,459 | 6,475,365 | 415,924,551 |
| Mexico | 6,571,271 | 10,737 | 162 | 3 | 192,809 | NR | NR | 520,474 | NR | 20,719,520 |
| Central America | 918,084 | 9,508 | NR | 8 | NR | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,536,452 | 6,369 | NR | 8 | NR | NR | NR | NR | NR | NR |
| South America | 19,838,509 | 124,086 | 227 | 26 | 4,227,388 | 557,646 | 3,246,135 | 11,027,842 | NR | 69,746,880 |
| Totals | 47,395,865 | 268,120 | 389 | 52 | 5,945,949 | 557,646 | 67,119,716 | 35,729,775 | 6,475,365 | 506,390,957 |

Note

Canada had 710 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds
 *Excludes United States and Greenland
 NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE VII(a) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1985

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | |
|-----------------|------------------------------|---------|--------------|-------|--------------------------------------|------------|------------|-------------|-------------|
| | Telephones | Telex | Intelsat E/S | | Submarine | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | | | | |
| Canada | 20,106,730 | 120,943 | NR | 7 | 1,664,595 | 60,679,902 | 24,374,911 | 9,939,686 | 424,243,049 |
| Mexico | 7,241,541 | 11,317 | 162 | 3 | 211,704 | NR | 544,416 | NR | 22,750,033 |
| Central America | 1,018,780 | 10,341 | NR | 8 | NR | NR | NR | NR | NR |
| Caribbean Basin | 1,603,618 | 6,642 | NR | 10 | NR | NR | NR | NR | NR |
| South America | 21,749,710 | 149,368 | 227 | 26 | 3,763,933 | 3,378,560 | 11,278,290 | 0 | 79,765,089 |
| Totals | 51,720,379 | 298,611 | 389 | 54 | 5,640,232 | 64,058,462 | 36,197,617 | 9,939,686 | 526,758,171 |

*Excludes United States and Greenland

Notes

- 1 Canada will have 1,065 Domestic, non-Intelsat, type earth stations working with the Canadian Anik series birds
- 2 Mexico is expected to remove all of its domestic Intelsat earth stations and replace them with their own earth stations between 1985 and 1990. Estimated number of earth stations is 2000
- 3 Brazil can be expected to install its own domestic earth station beginning in 1985 for use with their own domestic satellite system

TABLE VII(b) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1990

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | |
|-----------------|------------------------------|---------|--------------|-------|--------------------------------------|------------|------------|-------------|-------------|
| | Telephones | Telex | Intelsat E/S | | Submarine | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | | | | |
| Canada | 32,170,768 | 193,509 | NR | 9 | 2,663,352 | 67,084,843 | 28,999,858 | 15,903,498 | 478,788,873 |
| Mexico | 11,586,466 | 18,107 | NR | 4 | 338,726 | NR | 871,066 | 2,560 | 36,400,053 |
| Central America | 1,616,255 | 16,250 | 23 | 8 | NR | NR | NR | NR | NR |
| Caribbean Basin | 2,581,810 | 10,627 | NR | 13 | NR | NR | NR | NR | NR |
| South America | 34,799,379 | 238,988 | 240 | 38 | 3,109,441 | 5,405,696 | 18,045,263 | 45,000 | 127,624,143 |
| Totals | 82,754,678 | 477,481 | 263 | 72 | 6,111,519 | 72,490,539 | 47,916,187 | 15,951,058 | 642,813,069 |

*Excludes United States and Greenland

TABLE VII(c) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1995

| Area | Terminal Equipment (Numbers) | | | | Long-Haul Transmission Media (Ch-Km) | | | | |
|-----------------|------------------------------|---------|--------------|-------|--------------------------------------|------------|------------|-------------|-------------|
| | Telephones | Telex | Intelsat E/S | | Submarine | Coax | Multipair | Fiber Optic | Microwave |
| | | | Dom | Int'l | Domestic | | | | |
| Canada | 51,473,229 | 309,614 | NR | 11 | 4,261,363 | 73,340,549 | 32,399,773 | 25,445,597 | 538,062,204 |
| Mexico | 18,538,346 | 28,971 | NR | 5 | 541,962 | NR | 1,393,706 | 4,096 | 58,240,085 |
| Central America | 2,586,012 | 26,002 | 23 | 8 | NR | NR | NR | NR | NR |
| Caribbean Basin | 4,130,898 | 17,005 | NR | 13 | NR | NR | NR | NR | NR |
| South America | 55,678,709 | 382,378 | 383 | 40 | 4,882,946 | 8,649,113 | 28,872,422 | 72,000 | 204,198,630 |
| Totals | 132,407,194 | 763,970 | 406 | 77 | 9,686,271 | 81,989,662 | 62,665,901 | 25,521,693 | 800,500,919 |

*Excludes United States and Greenland

TABLE VIII - VOICE/TRANSPONDER FORECAST 1990

| Country | Voice Half Circuits | Satellite Capture, % | Satellite Capture (Circuits) | Equiv 36 MHz Transponders |
|-----------|---------------------|----------------------|------------------------------|---------------------------|
| Canada | 118,000 | 30 | 36,000 | 30 |
| Brazil | 78,000 | 20 | 16,000 | 13 |
| Mexico | 44,000 | 13 | 6,000 | 5 |
| Colombia | 14,000 | 12 | 1,700 | 1.4 |
| Chile | 6,000 | 14 | 800 | 0.7 |
| Argentina | 12,000 | 11 | 1,300 | 1 |
| Venezuela | 10,000 | 11 | 1,100 | 1 |
| Bolivia | 1,500 | 10 | 150 | 0.1 |
| Ecuador | 1,500 | 10 | 150 | 0.1 |
| Peru | 1,700 | 9 | 150 | 0.1 |

TABLE IX - VOICE/TRANSPONDER FORECAST 1995

| Country | Voice Half Circuits | Satellite Capture, % | Satellite Capture (Circuits) | Equiv 36 MHz Transponders |
|-----------|---------------------|----------------------|------------------------------|---------------------------|
| Canada | 151,000 | 33 | 50,000 | 42 |
| Brazil | 100,000 | 25 | 25,000 | 21 |
| Mexico | 56,000 | 22 | 12,000 | 10 |
| Colombia | 18,000 | 17 | 3,000 | 2.5 |
| Chile | 8,000 | 18 | 1,500 | 1.3 |
| Argentina | 15,000 | 19 | 2,800 | 2.3 |
| Venezuela | 12,000 | 19 | 2,300 | 2 |
| Bolivia | 1,900 | 15 | 300 | 0.3 |
| Ecuador | 1,900 | 15 | 300 | 0.3 |
| Peru | 2,200 | 13 | 300 | 0.3 |

TABLE X - VIDEO TRANSPONDER FORECAST

| Country | 1990 | 1995 |
|-----------|------|------|
| Canada | 63 | 71 |
| Brazil | 8 | 9 |
| Mexico | 4 | 5 |
| Colombia | 2 | 3 |
| Chile | 1 | 1 |
| Argentina | 2 | 2 |
| Venezuela | 2 | 3 |
| Bolivia | 1 | 1 |
| Equador | 1 | 1 |
| Peru | 2 | 3 |

TABLE XI - TOTAL TRANSPONDER FORECAST

| Country | 1990 | 1995 |
|-----------|------|------|
| Canada | 93 | 113 |
| Brazil | 21 | 30 |
| Mexico | 9 | 15 |
| Colombia | 3 4 | 5 5 |
| Chile | 1 7 | 2 3 |
| Argentina | 3 | 4 3 |
| Venezuela | 3 | 5 |
| Bolivia | 1 1 | 1 3 |
| Equador | 1 1 | 1 3 |
| Peru | 2 1 | 3 3 |

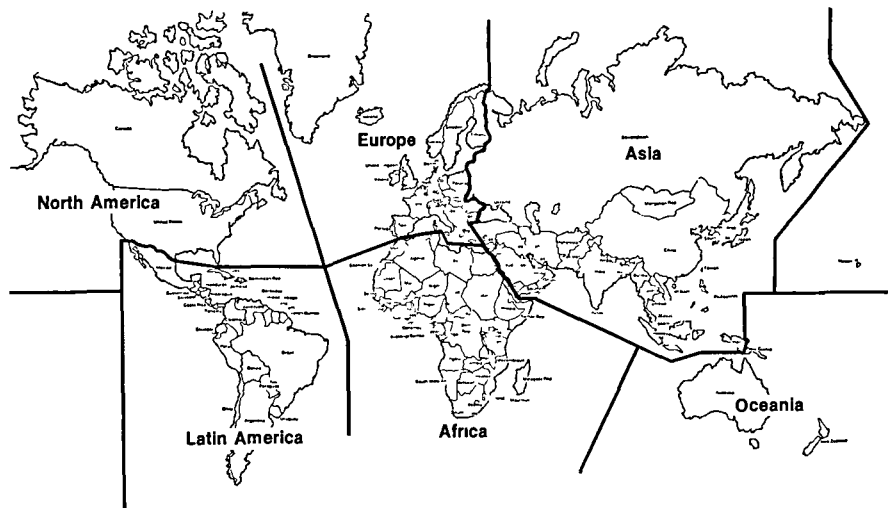


Figure 1 - World Zones

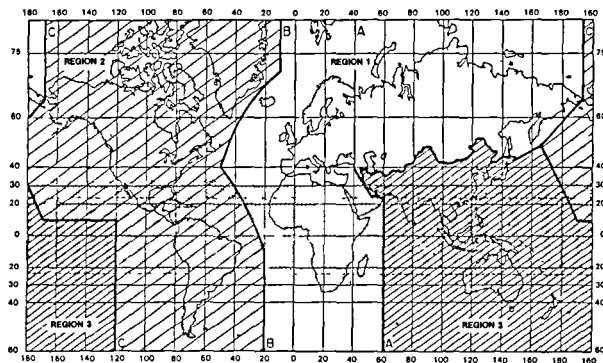


Figure 2. - International Telecommunication Union (ITU) World Region Definition.

APPENDIX A
WORLD SUBMARINE CABLES

| <u>Submarine Cables</u> | <u>Miles Cables</u> | <u>Ch/Km</u> | <u>Number VF's</u> | <u>Service Points</u> | |
|-----------------------------------|-------------------------|--------------|------------------------|-----------------------------|--------------|
| 1 USA - Cuba | 119 | 4,595 | 24 | USA/Cuba | Inter-region |
| 2 USA - Cuba | 129 | 4,981 | 24 | USA/Cuba | Inter-region |
| 3 Marseille - Bordj el Kiffan | 477 | 61,399 | 80 | France/Algeria | Inter-region |
| 4 Cape Dyer - Thule - White Bay | 2740 | 317,424 | 72 | Canada/Greenland-Military | Inter-region |
| 5 Transatlantic No 2 | 2,209 | 170,605 | 48 | Canada/France | Inter-region |
| 6 Florida - Puerto Rico | 1,136 | 91,391 | 50 | USA/Puerto Rico | Inter-region |
| 7 Canada Transatlantic 1 | 2,073 | 266,837 | 80 | Canada/England | Inter-region |
| 8 Iceland - Greenland - Canada | 1,777 | 68,621 | 24 | Canada/Iceland | Inter-region |
| 9 Canet Plage - Mers el Kebir | 542 | 69,766 | 80 | France/Algeria | Inter-region |
| 10 New Jersey - Bermuda | 750 | 98,954 | 82 | Bermuda/USA | Inter-region |
| 11 Commonwealth Pacific Cable | 8,233 | 1,086,246 | 82 | Canada/Australia | Inter-region |
| 12 Florida - Jamaica - Canal Zone | 1,455 | 337,118 / | 144 | USA/Jamaica/Panama | Inter-region |
| | | 299,660 | 128 | | Inter-region |
| 13 Transatlantic No 3 | 3,518 | 781,144 | 138 | USA/England | Inter-region |
| 14 Transpacific No 1 | 5,282 | 1,206,821 / | 142 | USA (Hawaii - Japan) | Inter-region |
| | | 1,172,826 | 138 | | Inter-region |
| 15 Florida - St Thomas No 1 | 1,179 | 269,376 | 142 | USA (Florida/Virgin Isle) | Inter-region |
| 16 Transatlantic No 4 | 3,599 | 799,129 | 138 | USA/France | Inter-region |
| 17 Cape Canaveral - Grand Turk | 763 | 331,470 / | 270 | USA/Bahamas/Grand Turk | Inter-region |
| | | 73,660 | 60 | | Inter-region |
| 18 Canet Plage - Tetorian | 758 | 117,084 | 96 | France/Morocco | Inter-region |
| 19 Florida - St Thomas No 2 | 1,298 | 1,503,707 | 720 | USA (Florida - Virgin Isle) | Inter-region |
| 20 Marseille - Tel Aviv | 1,833 | 377,510 | 128 | France/Israel | Inter-region |

APPENDIX A (cont)

| | | | | | | |
|----|----------------------------------|-------|------------------|--------------|-----------------------------------------------------|--------------|
| 21 | Agrigento - Tripoli | 298 | 57,538 | 120 | Italy/Libya | Inter-region |
| 22 | Japan Sea Cable | 477 | 92,099 | 120 | Japan/USSR | Inter-region |
| 23 | South Atlantic No 1 | 5,878 | 3,404,773 | 360 | Portugal/Canary Isle/Cape Verde Isle/Ascension Isle | Inter-region |
| | | | | | South Africa | Inter-region |
| 24 | Marseille - Bizerte | 462 | 71,362 | 96 | France/Tunisia | Inter-region |
| 25 | Marseille - Beirut | 1,837 | 472,917 | 160 | France/Lebanon | Inter-region |
| 26 | Transatlantic No 5 | 3,461 | 4,705,593 | 845 | USA/Spain | Inter-region |
| 27 | Mill Village - Bermuda | 825 | 637,164 | 480 | Canada/Bermuda | Inter-region |
| 28 | Pisa - Algiers | 580 | 447,946 | 480 | Italy/Algeria | Inter-region |
| 29 | Marseilles - Bordj El Kiffan | 444 | 342,910 | 480 | France/Algeria | Inter-region |
| 30 | Florida - Bahamas | 222 | 492,933 | 1,380 | Bahamas/USA | Inter-region |
| 31 | Catanzaro - Alexandria | 890 | 687,365 | 480 | Italy/Egypt | Inter-region |
| 32 | Brazil - Canary Isls No 1 | 2,649 | 681,959 | 160 | Canary Isle/Brazil | Inter-region |
| 33 | Penmarch - Casablanca | 1,035 | 1,065,802 | 640 | France/Morocco | Inter-region |
| 34 | Wedemouth - Halifax | 2,805 | 8,304,371 | 1,840 | England/Canada | Inter-region |
| 35 | France-Greece-Cyprus-Lebanon | 1,981 | 1,529,966 | 480 | France/Greece Cyprus/Lebanon | Inter-region |
| 36 | Transpac 2 | 4,880 | 6,634,872 | 845 | USA (Hawaii/Guam) | Inter-region |
| 37 | Telpal | 1,470 | 3,264,017 | 1,380 | Israel/Italy | Inter-region |
| 38 | Annibal | 509 | 524,148 | 640 | France/Tunisia | Inter-region |
| 39 | Algeria - Spain | 182 | 140,462 | 480 | Spain/Algeria | Inter-region |
| 40 | Transatlantic 6 | 3,396 | 21,856,656 | 4,000 | USA/France | Inter-region |
| 41 | Australia-Papua New Guinea Cable | 485 | 374,575 | 480 | Australia/Papua | Inter-region |
| 42 | Spain - Venezuela | 3,239 | 9,589,254 | 1,840 | Spain/Venezuela | Inter-region |
| 43 | Amitie | 825 | <u>3,106,175</u> | <u>2,340</u> | France/Morocco | Inter-region |
| | Subtotals | | 77,995,251 | 23,016 | | |

APPENDIX A (cont)

| | | | | | | |
|----|------------------------------|-------|------------------|------------|-------------------------|----------------|
| 44 | Alexandria - Beirut | 375 | 72,405 | 120 | Egypt/Lebanon | Intra - Africa |
| 45 | Antinea | 1,464 | 1,507,569 | 640 | Morocco/Senegal | Intra - Africa |
| 46 | Fraternite | 1,415 | <u>1,092,833</u> | <u>480</u> | Senegal/Ivory Coast | Intra - Africa |
| | Subtotals | | 2,672,807 | 1,240 | | |
| 47 | Oostmahorn - Romo | 142 | 27,417 | 120 | Netherlands/Denmark | Intra - Europe |
| 48 | Oostmahorn - Romo | 142 | 27,417 | 120 | Netherlands/Denmark | Intra - Europe |
| 49 | Weybourne - Fans | 307 | 3,952 | 8 | England/Denmark | Intra - Europe |
| 50 | Holyhead - Dublin A | 62 | 5,985 | 60 | Wales/Irish Rep | Intra - Europe |
| 51 | Holyhead - Dublin B | 63 | 6,082 | 60 | Wales/Irish Rep | Intra - Europe |
| 52 | Strabhalie - O's | 307 | 17,783 | 36 | Scotland/Norway | Intra - Europe |
| 53 | Sicily - Malta | 53 | 4,093 | 48 | Malta/Italy | Intra - Europe |
| 54 | Kristiansand - Thisled | 69 | 6,661 | 60 | Norway/Denmark | Intra - Europe |
| 55 | Westterschelling - Maade | 182 | 17,570 | 60 | Netherlands/Denmark | Intra - Europe |
| 56 | Aideburgh - Domburg No 6 | 82 | 23,749 | 180 | England/Netherlands | Intra - Europe |
| 57 | Weybourne - Fano | 307 | 3,952 | 8 | England/Denmark | Intra - Europe |
| 58 | Dumpton Gap - Middelkerke | 76 | 14,674 | 120 | England/Belgium | Intra - Europe |
| 59 | Goteborg - Middlesbrough | 528 | 50,973 | 60 | Sweden/England | Intra - Europe |
| 60 | Denmark - Poland | 105 | 30,410 | 180 | Denmark/Poland | Intra - Europe |
| 61 | Scotland - Faeroes - Iceland | 685 | 28,656 | 26 | England/Denmark/Iceland | Intra - Europe |
| | | | 33,065 | 30 | | Intra - Europe |
| 62 | Colwyn Bay - Lancaster | 73 | 14,095 | 120 | England/Wales | Intra - Europe |
| 63 | Winterton - Borkum 1 | 251 | 48,463 | 120 | England/Germany | Intra - Europe |
| 64 | Winterton - Borkum 2 | 249 | 48,077 | 120 | England/Germany | Intra - Europe |
| 65 | St Margarets Bay - Xa Panne | 48 | 32,437 | 420 | England/Belgium | Intra - Europe |
| 66 | Winterton - Maade | 298 | 57,538 | 120 | England/Denmark | Intra - Europe |

APPENDIX A (cont)

| | | | | | | |
|----|--------------------------------|-------|-----------|-------|---------------------------|----------------|
| 67 | Covehitte - Katwijk No 1 | 109 | 21,046 | 120 | England/Netherlands | Intra - Europe |
| 68 | Peninsula - Canary Isle No 1 | 754 | 194,110 | 160 | Spain (Spain-Canary Isle) | Intra - Europe |
| 69 | Kristiansand - Thisted 2 | 80 | 61,786 | 480 | Norway/Denmark | Intra - Europe |
| 70 | Garrlock - Stornoway | 48 | 4,634 | 60 | Scotland/England | Intra - Europe |
| 71 | Covehitte - Kalwijk No 2 | 109 | 84,183 | 480 | Netherlands/England | Intra - Europe |
| 72 | Kristiansand - Scarborough | 393 | 303,522 | 480 | Norway/England | Intra - Europe |
| 73 | Germany - Sweden 1 | 121 | 93,451 | 480 | Germany/Sweden | Intra - Europe |
| 74 | Barcelona - Pisa | 430 | 332,098 | 480 | Spain/Italy | Intra - Europe |
| 75 | Goonhilly - Scsibra | 951 | 979,302 | 640 | England/Portugal | Intra - Europe |
| 76 | Mediterranean - Atlantic 1 | 986 | 1,015,343 | 640 | Spain/Italy | Intra - Europe |
| 77 | U K - Spain 1 | 477 | 368,397 | 480 | England/Spain | Intra - Europe |
| 78 | Winterton - Fedderwarden | 285 | 577,792 | 1,260 | England/Germany | Intra - Europe |
| 79 | Aldeburgh - Donburg 7 | 83 | 168,269 | 1,260 | England/Netherlands | Intra - Europe |
| 80 | Broadstairs - Oostende | 64 | 129,750 | 1,260 | England/Belgium | Intra - Europe |
| 81 | St Peter Port-Tuchton Bridge A | 89 | 197,617 | 1,380 | England/Buernsey Isle | Intra - Europe |
| 82 | Lerwich - Torshavn | 235 | 181,495 | 480 | England/Denmark | Intra - Europe |
| 83 | Scarborough - Thisted | 381 | 772,417 | 1,260 | England/Denmark | Intra - Europe |
| 84 | Barcelona - Rome | 513 | 1,139,076 | 1,380 | Italy/Spain | Intra - Europe |
| 85 | Germany - Sweeden 2 | 113 | 218,180 | 1,200 | Germany/Sweden | Intra - Europe |
| 86 | U K - Spain No 2 | 465 | 1,032,495 | 1,380 | England/Spain | Intra - Europe |
| 87 | U K - Netherlands 9 | 82 | 182,074 | 1,380 | England/Netherlands | Intra - Europe |
| 88 | Marpal | 370 | 1,535,951 | 2,580 | France/Italy | Intra - Europe |
| 89 | France - U K 1 | 104 | 575,636 | 3,440 | France/England | Intra - Europe |
| 90 | Italy - Turkey | 1,083 | 836,423 | 480 | Italy/Turkey | Intra - Europe |
| 91 | St Margaret's Bay-St Idesbald | 56 | 351,406 | 3,900 | England/Belgium | Intra - Europe |
| 92 | Denmark - Norway 4 | 77 | 334,511 | 2,700 | Norway/Denmark | Intra - Europe |
| 93 | Germany - Sweden 3 | 109 | 210,457 | 1,200 | Germany/Sweden | Intra - Europe |

APPENDIX A (cont)

| | | | | | | |
|-----|--------------------------------|-------|----------------|--------------|--------------------------------------------|------------------------------------|
| 94 | Holywell Retreat - St Valery | 60 | 405,468 | 4,200 | England/France | Intra - Europe |
| 95 | Barcelona - Genoa | 389 | 2,591,230 | 4,140 | Italy/Spain | Intra - Europe |
| 96 | Portugal - France | 802 | 3,329,278 | 2,580 | Portugal/France | Intra - Europe |
| 97 | Lovesloft - Egmond | 119 | <u>746,737</u> | <u>3,900</u> | England/Netherlands | Intra - Europe |
| | Subtotals | | 194,771,183 | 47,936 | | |
| 98 | Tortola - Bermuda | 902 | 116,105 | 80 | Tortola B V I /Bermuda B C C | Intra - LAmer Intra - LAmer |
| 99 | St Thomas - Venezuela | 545 | 72,783 | 83 | Venezuela-U S Virgin Isle | Intra - LAmer |
| 100 | St Thomas - Dominican Republic | 386 | 89,435 | 144 | USA (Virgin Isle - Dominican Rep) | Intra - LAmer Intra - LAmer |
| 101 | Kingston - Grand Cayman | 388 | 99,887 | 160 | Jamaica/Cayman Isles | Intra - LAmer |
| 102 | St Thomas-St Maarten-Curacao | 697 | 179,436 | 160 | USA (Virgin Isle/ Netherlands Antilles) | Intra - LAmer Intra - LAmer |
| | Subtotals | | 557,646 | 627 | | |
| 103 | Grand Turk - Antigua | 713 | 68,833 | 60 | USA - Military | Intra - Oceania |
| 104 | Southeast Asia Communications | 4,080 | 538,307 | 82 | Singapore/Malaysia/Hong Kong/Guam | Intra - Oceania Intra - Oceania |
| 105 | Hawaii - Johnson Isle | 769 | 74,239 | 60 | USA (Hawaii-Johnson Isle) Military | Intra - Oceania Intra - Oceania |
| 106 | Southwest Asia Comm Cable | 3,005 | 802,617 | 166 | Australia/Papua/Guam | Intra - Oceania |
| 107 | Taiwan - Okinawa | 363 | 35,044 | 60 | Taiwan/Okinawa | Intra - Oceania |
| 108 | East China Sea Cable | 480 | 370,714 | 480 | Japan/China | Intra - Oceania |
| 109 | Tasman Sea Cable | 1,190 | 919,061 | 480 | Australia/New Zealand | Intra - Oceania |

APPENDIX A (cont)

| | | | | | |
|----------------------------------|-------|----------------|------------------|-----------------------------|-------------------|
| 110 Okinawa - Luzon - Hong Kong | 1,203 | 2,322,752 | 1,200 | Japan/Luzon/ | Intra - Oceania |
| | | 2,671,165 | 1,380 | Hong Kong | Intra - Oceania |
| 111 Philippines - Singapore | 1,534 | 3,406,124 | 1,380 | Philippines/Singapore | Intra - Oceania |
| 112 Japan - Republic of China | 367 | <u>283,441</u> | <u>480</u> | Japan/Taiwan | Intra - Oceania |
| Subtotals | | 11,492,297 | 5,828 | | |
| 113 Kelibia - Bon Fichta | 59 | 11,392 | 120 | Tunisia | Domestic - Africa |
| 114 Tripoli - D Benghazi | 382 | <u>553,174</u> | <u>900</u> + 2TV | Libya | Domestic - Africa |
| Subtotals | | 564,566 | 1,020 + 2TV | | |
| 115 Italy - Tunisia | 60 | 5,792 | 60 | Italy - Military | Domestic - Europe |
| 116 Italy - Sardinia 1 | 130 | 12,550 | 60 | Italy | Domestic - Europe |
| 117 St Helier - Tuckton Bridge A | 131 | 25,293 | 120 | Jersey Isle/England | Domestic - Europe |
| 118 Colwyn - Douglas | 61 | 11,778 | 120 | Wales/Isle of Man | Domestic - Europe |
| 119 Trapani - Cagliari | 218 | 42,091 | 120 | Italy | Domestic - Europe |
| 120 Cannes - Isle Rousse | 106 | 16,373 | 96 | France (Cannes-Isle Rousse) | Domestic - Europe |
| 121 St Helier - Tuckton Bridge B | 137 | 105,808 | 480 | England/Jersey | Domestic - Europe |
| 122 Nejkobing - Rome | 103 | 79,549 | 480 | Denmark | Domestic - Europe |
| 123 Cotanzaro - Leklaina | 286 | 220,884 | 480 | Italy | Domestic - Europe |
| 124 Italy - Sardinia 2 | 135 | 104,263 | 480 | Italy | Domestic - Europe |
| 125 St Raphael - St Tropez | 15 | 11,585 | 480 | France | Domestic - Europe |
| 126 Sljernesksansen - Haleskor | 10 2 | 265,871 | 16,200 | Denmark | Domestic - Europe |
| 127 Copenhagen - Aarhus | 17 4 | 17,918 | 16,200 | Denmark | Domestic - Europe |
| 128 Trans - Canary Cable | 217 | 167,593 | 480 | Canary Isle | Domestic - Europe |
| 129 Peninsula - Balearic Isle 1 | 183 | 406,337 | 1,380 | Spain | Domestic - Europe |

APPENDIX A (cont)

| | | | | | | |
|-----|--------------------------------|-------|------------------|--------------|---------------------------|--------------------|
| 130 | Peninsula - Canary Isle 2 | 737 | 2,181,933 | 1,840 | Spain | Domestic - Europe |
| 131 | Las Palmas - Tenerife | 60 | 177,634 | 1,840 | Spain | Domestic - Europe |
| 132 | Lisboa - Funchal | 616 | 118,937 | 120 | Portugal | Domestic - Europe |
| 133 | Orkney - Shetlands | 108 | 83,411 | 480 | England | Domestic - Europe |
| 134 | Civitavecchia - Cagliari | 301 | 668,346 | 1,380 | Italy | Domestic - Europe |
| 135 | St Raphael - La Foux | 19 | 71,536 | 2,340 | France | Domestic - Europe |
| 136 | Aegus | 184 | 408,557 | 1,380 | Greece | Domestic - Europe |
| 137 | Fridtorp - Hornsudde | 50 | 9,654 | 120 | Sweden | Domestic - Europe |
| 138 | Rome - Palermo | 257 | 726,946 | 1,800 + 2TV | Italy | Domestic - Europe |
| 139 | Marseille - Bastia | 181 | 681,476 | 2,340 | France | Domestic - Europe |
| 140 | Peninsula - Balearic Isle No 2 | 162 | 1,016,566 | 3,900 | Spain | Domestic - Europe |
| 141 | Grossenbrode - Burg By-Pass | 7 | 13,516 | 1,200 | Germany | Domestic - Europe |
| 142 | Peninsula - Canary Isle No 3 | 743 | 4,160,295 | 3,480 | Spain | Domestic - Europe |
| 143 | Genoa - Sassari | 272 | <u>1,575,533</u> | <u>3,600</u> | Italy | Domestic - Europe |
| | Subtotals | | 13,376,247 | 63,056 + 2TV | | |
| 144 | Hawaii - California | 2210 | 181,350 | 51 | USA | Domestic - NAmer |
| 145 | Hawaii No 2 | 2,383 | 544,463 | 142 | USA (California-Makaha) | Domestic - NAmer |
| 146 | Oahu Submarine Tic | 49 | 7,569 | 96 | USA (Hawaii) | Domestic - NAmer |
| 147 | Hawaii No 3 | 2,379 | <u>3,234,500</u> | <u>845</u> | USA (Hawaii - California) | Domestic - NAmer |
| | Subtotals | | 3,967,882 | 1,134 | | |
| 148 | Guam - Philippines | 1,468 | 302,338 | 128 | Guam/Philippines | Domestic - Oceania |
| 149 | Mori-Muroran 1 | 19 | 27,514 | 900 | Japan | Domestic - Oceania |
| 150 | Kure - Matsuyama 1 & 2 | 34 | 295,412 | 5,400 | Japan | Domestic - Oceania |

APPENDIX A (cont)

| | | | | | | |
|-----|-----------------------------|-------|------------------|---------------|-----------|--------------------|
| 151 | Sagami Bay Loop 1 | 13 | 56,476 | 2,700 | Japan | Domestic - Oceania |
| 152 | Okinawa - Zamami - Kumejima | 64 | 92,678 | 900 | Japan | Domestic - Oceania |
| 153 | Sagami Bay 2 | 65 | 125,502 | 1,200 | Japan | Domestic - Oceania |
| 154 | Aomori - Bahodate | 30 | 130,329 | 2,700 | Japan | Domestic - Oceania |
| 155 | Miura - Ibaraki | 244 | 1,060,009 | 2,700 | Japan | Domestic - Oceania |
| 156 | Miura - Itok | 34 | 65,647 | 1,200 | Japan | Domestic - Oceania |
| 157 | Mori - Muroran 2 | 19 | 82,542 | 2,700 | Japan | Domestic - Oceania |
| 158 | Okinawa - Mayako | 194 | 280,931 | 900 + 2TV | Japan | Domestic - Oceania |
| 159 | Okinawa - Miyazaki | 483 | 2,098,297 | 2,700 | Japan | Domestic - Oceania |
| 160 | Kynshu - IRI - Tsushima | 72 | 312,790 | 2,700 | Japan | Domestic - Oceania |
| 161 | Tsushima By-Pass | 22 | 31,858 | 900 | Japan | Domestic - Oceania |
| 162 | Sagami Bay 3 | 53 | 102,332 | 1,200 | Japan | Domestic - Oceania |
| 163 | Itok - Miyahe | 62 | 269,347 | 2,700 | Japan | Domestic - Oceania |
| 164 | Miyahe - Hachijo | 79 | 114,400 | 900 | Japan | Domestic - Oceania |
| 165 | Sagami Bay No 4 | 81 | <u>39,018</u> | <u>10,800</u> | Japan | Domestic - Oceania |
| | Subtotals | | 5,487,420 | 43,328 + 2TV | | |
| 166 | Argentina - Argentina | 127 | 96,000 | 480 | Argentina | Domestic - SAmer |
| 167 | Brazil - Brazil | 966 | 4,155,710 | 5,400 | Brazil | Domestic - SAmer |
| 168 | Venezuela - Venezuela | 2,379 | <u>3,784,314</u> | <u>3,400</u> | Venezuela | Domestic - SAmer |
| | Subtotals | | 8,036,024 | 9,600 | | |

APPENDIX B
TELECOMMUNICATIONS EQUIPMENT BY COUNTRY IN ITU REGION 2 1980-85
CANADA TELECOMMUNICATIONS
[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 15,560,264 | 16,178,158 | 16,741,723 | 17,079,769 | 18,531,549 | 20,106,730 |
| Telex | 104,045 | 107,263 | 110,580 | 114,000 | 117,420 | 120,943 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 384,250,000 | 391,935,000 | 399,773,700 | 407,769,174 | 415,924,557 | 424,243,049 |
| Coaxial Cable Ch-Km | 78,420,000 | 74,499,000 | 70,774,050 | 67,235,348 | 63,873,581 | 60,679,902 |
| Multipair Cable Ch-Km | 22,875,000 | 23,058,000 | 23,242,464 | 23,707,313 | 24,181,459 | 24,374,911 |
| Fiber Optical Cable Ch-Km | 1,166,355 | 1,790,354 | 2,748,194 | 4,218,479 | 6,475,365 | 9,939,686 |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | a4 | b4+1 | 5 | c5+1 | d5+2-1 | 7 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | 137 | e211 | 317 | 476 | 710 | 1,065 |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | 1,076,923 | 1,174,923 | 1,281,841 | 1,398,489 | 1,525,752 | 1,664,595 |

^aIntelsat earth station installed 1966, 1969, 1972 and 1979 - A model

^bIntelsat earth station installed January 1981 - A model

^cIntelsat earth station installed December 1983 - E model

^dIntelsat earth station installed May and June 1984 - A model The 1966 installed earth station is retired in July 1984

^eYankee Group Telecommunications Analysis and Research, Vol 3, 1984 Canadian Communication, p 15, Figures 1-5 - adjusted to reflect beginning of year status

MEXICO TELECOMMUNICATIONS

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|------------------|--------------------|--------------------|---------------------|-------------|
| Telephones | 4,532,557 | 5,082,718 | 5,411,108 | 5,963,041 | 6,571,271 | 7,241,541 |
| Telex | 8,700 | 9,170 | 9,665 | 10,187 | 10,737 | 11,317 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 14,255,102 | 15,652,102 | 17,186,008 | 18,870,237 | 20,719,520 | 22,750,033 |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | 434,783 | 454,783 | 475,703 | 497,585 | 520,474 | 544,416 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | a ₁ | b ₁₊₂ | 3 | 3 | 3 | 3 |
| Intelsat Domestic E/S | NR | c ₄ | d ₄₊₁₁₅ | e ₁₁₉₊₁ | f ₁₂₀₊₄₂ | 162 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | 132,653 | 145,653 | 159,927 | 175,600 | 192,809 | 211,704 |

^aIntelsat earth station installed January 1969 - A model

^bIntelsat earth station installed January and July 1981 - A and B models

^cIntelsat earth station installed December and April 1981 - domestic use

^dIntelsat earth station installed 1982 - domestic use

^eIntelsat earth station installed August 1983 - domestic use

^fIntelsat earth station installed 1984 - domestic use

CENTRAL AMERICA TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 607,021 | 676,931 | 746,425 | 827,660 | 918,084 | 1,018,780 |
| Telex | 7,193 | 8,247 | 8,498 | 8,754 | 9,508 | 10,341 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | 4 | 7 | 8 | 8 | 8 | 8 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

BELIZE TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 4,526 | 6,250 | 8,645 | 9,942 | 11,433 | 13,148 |
| Telex | 94 | 168 | 210 | 224 | 250 | 280 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^b 1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Telecommunications Summary (see p 34)

^bIntelsat earth station installed July 1978 - A model

Note First year telephone data available 1981 - 1980 data derived

COSTA RICA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|------------------|----------------|-------------|-------------|-------------|-------------|
| Telephones | 194,528 | 236,132 | 255,898 | 281,487 | 309,635 | 340,598 |
| Telex | ^b 893 | 995 | 1,018 | 1,049 | 1,143 | 1,245 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | ^c 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Telecommunications Summary (see p 34)^b1977 data updated to 1980^cIntelsat earth station installed November 1981 - A model

EL SALVADOR TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 64,584 | 75,920 | 86,316 | 96,673 | 108,273 | 121,265 |
| Telex | 563 | 558 | 580 | 599 | 658 | 723 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b ₁ | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Summary (see p 34)

^bIntelsat earth station installed August 1978 - A model

Note First year telephone data available 1981 - 1980 derived

BAHAMAS TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 68,080 | 71,883 | 75,071 | 78,073 | 81,195 | 84,442 |
| Telex | 263 | 273 | 284 | 295 | 306 | 318 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | NR | NR | NR | NR |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

CARIBBEAN TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|---------------------------------------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 1,308,346 | 1,328,438 | 1,410,741 | 1,472,222 | 1,536,452 | 1,603,618 |
| Telex | 5,377 | 5,612 | 5,859 | 6,107 | 6,369 | 6,642 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | 7 | 8 | 8 | 8 | 8 | 10 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |
| Intra LANer | 5 cable system 627 VF's 557,646 Ch-Km | | | | | |

NICARAGUA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 57,863 | 54,550 | 51,237 | 56,360 | 61,996 | 68,195 |
| Telex | 334 | 419 | 402 | 425 | 467 | 513 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed November 1972 - A model

Note 1981 telephones is derived number - 1980 and 1982 are hard numbers

PANAMA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 176,477 | 191,913 | 212,992 | 232,161 | 253,055 | 275,829 |
| Telex | 2,984 | 3,567 | 3,715 | 3,774 | 3,962 | 4,160 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | c1+1 | 2 | 2 | 2 | 2 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed September 1968 - A model

^cIntelsat earth station installed April 1981 - A model

HONDURAS TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|----------------|-------------|-------------|------------------|
| Telephones | 27,421 | 30,544 | 33,667 | 38,717 | 44,524 | 51,202 |
| Telex | 1,022 | 1,177 | 1,453 | 1,556 | 1,789 | 2,057 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | ^b 1 | 1 | 1 | ^c 1+1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed December 1982 - A model

^cIntelsat earth station installed February 1985 and the December 1982 earth station retired - A model

Note 1981 telephones is derived number - 1980 and 1982 are hard numbers

GUATEMALA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 81,622 | 89,646 | 97,670 | 112,320 | 129,168 | 148,543 |
| Telex | 1,303 | 1,363 | 1,120 | 1,127 | 1,239 | 1,363 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | b1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed July 1981 - A model

BARBADOS TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 54,071 | 66,679 | 72,850 | 76,492 | 80,316 | 84,331 |
| Telex | 142 | 149 | 156 | 163 | 171 | 179 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth station installed October 1972 - A model

DOMINICAN REPUBLIC TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 155,400 | 165,253 | 175,054 | 185,557 | 196,690 | 208,491 |
| Telex | 900 | 945 | 992 | 1,041 | 1,093 | 1,147 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b ₁ | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p. 42)^bIntelsat earth station installed March 1975 - A model

GRENADA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 5,422 | 5,648 | 5,873 | 6,107 | 6,351 | 6,668 |
| Telex | 18 | 26 | 36 | 39 | 43 | 48 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | NR | NR | NR | NR |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

Note 1980 derived telephone data - 1981 is hard telephone data

HAITI TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 34,900 | 36,645 | 38,477 | 40,400 | 42,420 | 44,541 |
| Telex | 347 | 364 | 382 | 401 | 421 | 442 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth station installed April 1976 - A model

Note The only data available for telephones was 1980

JAMAICA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 117,252 | 119,402 | 124,258 | 129,228 | 134,397 | 139,772 |
| Telex | 301 | 313 | 325 | 338 | 351 | 365 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^b 2 | 2 | 2 | 2 | 2 | 2 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth stations operational December 1970 and December 1971 - both A models

NETHERLANDS ANTILLES TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|------------------|-------------|-------------|-------------|------------------|
| Telephones | 67,664 | 69,916 | 72,168 | 75,054 | 78,056 | 81,178 |
| Telex | 782 | 813 | 845 | 878 | 913 | 949 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b ₁ | c ₁₊₁ | 2 | 2 | 2 | d ₂₊₁ |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth station installed May 1978 - A model

^cIntelsat earth station installed April 1981 - A model

^dIntelsat earth station planned installation December 1985 - B model

Note First year telephone data available 1982 - years 1980 and 1981 derived

PUERTO RICO TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|----------------|
| Telephones | 651,388 | 631,458 | 678,447 | 705,584 | 733,827 | 763,159 |
| Telex | 2,147 | 2,232 | 2,321 | 2,413 | 2,509 | 2,609 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | NR | NR | NR | b ₁ |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bPlanned operational December 1985 standard A station Atlantic

TRINIDAD/TOBAGO TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 116,502 | 120,380 | 124,258 | 129,228 | 134,397 | 139,772 |
| Telex | 339 | 352 | 366 | 380 | 395 | 410 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

^bOperational November 1, 1971 standard A station Atlantic Intelsat earth station installed November 1971 - A model

Note First year telephone data available 1982 years 1980 and 1981 derived

U S VIRGIN ISLES TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 37,667 | 41,175 | 44,285 | 46,499 | 48,823 | 51,264 |
| Telex | 138 | 145 | 152 | 159 | 167 | 175 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | NR | NR | NR | NR |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in Caribbean Summary (see p 42)

SOUTH AMERICA TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 13,359,626 | 15,150,875 | 16,294,327 | 18,045,676 | 19,838,509 | 21,749,710 |
| Telex | 62,031 | 73,048 | 86,785 | 103,536 | 124,086 | 149,368 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 40,951,267 | 46,752,267 | 53,397,678 | 61,013,913 | 69,746,880 | 79,765,089 |
| Coaxial Cable Ch-Km | 3,149,696 | 3,112,696 | 3,115,444 | 3,159,282 | 3,246,135 | 3,378,560 |
| Multipair Cable Ch-Km | 10,181,150 | 10,370,150 | 10,574,086 | 10,793,218 | 11,027,842 | 11,278,290 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | 19 | 21 | 21 | 23 | 26 | 26 |
| Intelsat Domestic E/S | 14 | 25 | 82 | 119 | 227 | 227 |
| Domestic E/S | NR | NR | NR | NR | NR | 23 |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | 8,036,024 | 6,642,024 | 5,604,956 | 4,824,009 | 4,227,388 | 3,763,933 |
| Intra-S A | 557,646 | 557,646 | 557,646 | 557,646 | 557,646 | 557,646 |

ARGENTINA TELECOMMUNICATIONS^a

[NR = No Record]

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|------------------------------|--------------------|-----------|------------------|-------------------|------------|------------|
| Telephones | 2,759,736 | 2,880,754 | 3,041,475 | 3,345,622 | 3,680,184 | 4,048,202 |
| Telex | ^b 3,860 | 4,246 | 4,670 | 5,137 | 5,650 | 6,215 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 6,491,936 | 7,296,936 | 8,201,756 | 9,218,774 | 10,361,902 | 11,646,778 |
| Coaxial Cable Ch-Km | 2,042,553 | 1,850,553 | 1,676,601 | 1,519,001 | 1,376,215 | 1,246,851 |
| Multipair Cable Ch-Km | 2,083,334 | 2,158,334 | 2,236,034 | 2,316,531 | 2,399,926 | 2,486,323 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 2 | 2 | ^d 2+1 | 3 | 3 | 3 |
| Intelsat Domestic E/S | NR | NR | ^e 4 | ^f 4+29 | 933+6 | 39 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | 96,000 | 96,000 | 96,000 | 96,000 | 96,000 | 96,000 |

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 10% per year

^cIntelsat earth stations installed September 1969 and March 1972 - both A stations

^dIntelsat earth station installed December 1982 - A station

^eIntelsat earth station installed calendar year 1982 - domestic use only

^fIntelsat earth station installed calendar year 1983 - domestic use only

^gIntelsat earth station installed calendar year 1984 - domestic use only

BOLIVIA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|------------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 127,114 | 135,100 | 144,300 | 151,515 | 159,090 | 167,045 |
| Telex | ^b 350 | 385 | 423 | 465 | 511 | 562 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 40,000 | 48,000 | 57,600 | 69,120 | 82,944 | 99,533 |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 17% per year

^cIntelsat earth station installed December 1978 - A station

Note 1980 data derived - 1981 hard telephone data

BRAZIL TELECOMMUNICATIONS^a

[NR = No Record]

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|------------------------|---------------------|------------------|------------|-------------------|--------------------|-----------------|------------------|
| Telephones | 6,494,000 | 7,496,000 | 8,536,000 | 9,577,392 | 10,592,595 | 11,651,854 | |
| Telex | ^b 37,406 | 46,757 | 58,446 | 73,057 | 91,321 | 114,151 | |
| <u>Media</u> | | | | | | | |
| Microwave | 25,625,851 | 29,392,851 | 33,713,600 | 38,669,499 | 44,353,916 | 50,873,941 | |
| Ch-Km | | | | | | | |
| Coaxial Cable | NR | NR | NR | NR | NR | NR | |
| Ch-Km | | | | | | | |
| Multipair Cable | 5,500,000 | 5,687,000 | 5,880,358 | 6,080,290 | 6,287,020 | 6,500,779 | |
| Ch-Km | | | | | | | |
| Fiber Optical Cable | NR | NR | NR | NR | NR | NR | |
| Ch-Km | | | | | | | |
| <u>Satellite</u> | | | | | | | |
| Intelsat E/S | ^c 3 | 3 | 3 | 3 | 3 | 3 | ^d 3+1 |
| Intelsat Domestic E/S | ^e 7 | ^f 7+9 | 916+40 | ^h 56+1 | ⁱ 57+21 | 78 | |
| Domestic E/S | NR | NR | NR | NR | NR | ^j 23 | |
| <u>Submarine Cable</u> | | | | | | | |
| Domestic Ch-Km | 4,155,710 | 2,954,710 | 2,100,799 | 1,493,668 | 1,061,998 | 755,081 | |

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 25% per year

^cIntelsat earth station installed February 1969, April 1975 and October 1978 - 2 A stations and 1 B station

^dIntelsat earth station to be installed July 1986 - A station

^eIntelsat earth station installed calendar years 1974, 1975, 1978, 1979 and 1980 - domestic use only

^fIntelsat earth station installed calendar year 1981 - domestic use only

^gIntelsat earth station installed calendar year 1982 - domestic use only

^hIntelsat earth station installed calendar year 1983 - domestic use only

ⁱIntelsat earth station installed calendar year 1983 - domestic use only

^jBrazil scheduled to launch domestic satellite February 1985 - 22 E/S + 1 command and control

CHILE TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|--------------------|------------------|-------------|------------------|------------------|-------------|
| Telephones | 553,856 | 569,969 | 595,108 | 624,863 | 656,105 | 688,910 |
| Telex | ^b 2,210 | 2,431 | 2,674 | 2,941 | 3,235 | 3,558 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 1,013,245 | 1,166,245 | 1,342,348 | 1,545,043 | 1,778,345 | 2,046,875 |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | 125,000 | 137,000 | 150,152 | 164,567 | 180,365 | 197,680 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 2 | 2 | 2 | 2 | 2 | 2 |
| Intelsat Domestic E/S | ^d 1 | ^e 1+1 | 2 | ^f 2+1 | ^g 3+1 | 4 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 11% per year

^cIntelsat earth station installed July 1968 and October 1977 - both A stations

^dIntelsat earth station installed November 1977 - domestic use only

^eIntelsat earth station installed December 1981 - domestic use only

^fIntelsat earth station installed August 1983 - domestic use only

^gIntelsat earth station installed calendar year 1984 - domestic use only

COLOMBIA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|--------------------|------------------|------------------|-------------|-------------------|-------------|
| Telephones | 1,524,000 | 1,623,105 | 1,747,689 | 1,922,457 | 2,114,702 | 2,326,172 |
| Telex | ^b 3,220 | 3,445 | 3,686 | 3,944 | 4,220 | 4,515 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 4,009,434 | 4,434,434 | 4,904,484 | 5,424,359 | 5,999,341 | 6,635,271 |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | 1,269,231 | 1,236,231 | 1,204,089 | 1,172,782 | 1,142,289 | 1,112,590 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 1 | ^d 1+1 | 2 | 2 | 2 | 2 |
| Intelsat Domestic E/S | ^e 3 | 3 | ^f 3+5 | 98+3 | ^h 11+7 | 18 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 6.7 percent per year

^cIntelsat earth station installed March 1970 - A station

^dIntelsat earth station installed June 1981 - A station

^eIntelsat earth station installed calendar year 1978 and 1979 - domestic use only

^fIntelsat earth station installed calendar year 1982 - domestic use only

^gIntelsat earth station installed calendar year 1983 - domestic use only

^hIntelsat earth station installed calendar year 1984 - domestic use only

EQUADOR TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 260,000 | 275,100 | 290,200 | 316,318 | 344,786 | 375,816 |
| Telex | 1,168 | 1,318 | 1,468 | 1,768 | 2,068 | 2,368 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 1,179,775 | 1,284,775 | 1,399,120 | 1,523,642 | 1,659,246 | 1,806,919 |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b ₁ | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed August 1972 - A station additional A station planned for operation June 1988

Note 1980 hard telephone data - 1981 derived data

FALKLAND ISLANDS TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|------------------|-------------|----------------|-------------|-------------|
| Telephones | 580 | ^b 590 | 595 | 600 | 610 | 620 |
| Telex | 5 | 5 | 5 | 5 | 5 | 5 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | NR | NR | NR | ^c 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bMagneto telephones, 1 central office

^cIntelsat earth station installed November 1983

Note: 1981 hard telephone data - 1980 and 1982 derived data

FRENCH GUIANA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 13,687 | 18,134 | 19,627 | 21,589 | 23,747 | 26,122 |
| Telex | 20 | 23 | 23 | 26 | 27 | 30 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | b1 | 1 | 1 | 1 | c1+1 | 2 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed May 1974 - A station

^cIntelsat earth station installed calendar year 1984 - A station

GUYANA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 24,484 | 26,562 | 28,468 | 30,460 | 32,592 | 34,873 |
| Telex | 100 | 139 | 142 | 146 | 150 | 155 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S ^b | 1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p. 53)

^bIntelsat earth station installed January 1979 - B station planned retirement December 1985
A station planned for operational status December 1989

Note 1980 derived telephone data - 1981 is hard telephone data

PARAGUAY TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|
| Telephones | 55,550 | 58,713 | 61,648 | 64,730 | 67,966 | 71,364 |
| Telex | 222 | 411 | 461 | 507 | 557 | 613 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^b 1 | 1 | 1 | 1 | 1 | 1 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed December 1977 - A station

Note 1980 derived telephone data - 1981 hard telephone data

PERU TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------|---------------------|------------------|------------------|------------------|--------------------|-------------|
| Telephones | ^b 86,603 | 87,123 | 129,742 | 149,203 | 171,583 | 197,321 |
| Telex | ^c 2,400 | 2,520 | 2,646 | 2,778 | 2,916 | 3,062 |
| <u>Media</u> | | | | | | |
| Microwave | 78,948 | 96,948 | 119,052 | 146,196 | 179,529 | 220,462 |
| Ch-Km | | | | | | |
| Coaxial Cable | NR | NR | NR | NR | NR | NR |
| Ch-Km | | | | | | |
| Multipair Cable | 112,676 | 120,676 | 129,244 | 138,420 | 148,248 | 158,774 |
| Ch-Km | | | | | | |
| Fiber Optical Cable | NR | NR | NR | NR | NR | NR |
| Ch-Km | | | | | | |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^d 1 | 1 | 1 | 1 | ^e 1+1 | 2 |
| Intelsat Domestic E/S | ^f 3 | ^g 3+1 | ^h 4+5 | ⁱ 9+3 | ^j 12+49 | 61 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIncomplete data

^cBasic data 1977 growth at 10% per year

^dIntelsat earth station installed July 1969 - A station

^eIntelsat earth station installed August 1984 - A station

^fIntelsat earth station installed calendar year 1979 - domestic use only

^gIntelsat earth station installed calendar year 1981 - domestic use only

^hIntelsat earth station installed calendar year 1982 - domestic use only

ⁱIntelsat earth station installed calendar year 1983 - domestic use only

^jIntelsat earth station installed calendar year 1984 - domestic use only

SURINAME TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|---------------------|-------------|-------------|-------------|-------------|
| Telephones | 21,262 | ^b 21,262 | 27,495 | 30,244 | 33,268 | 36,595 |
| Telex | 195 | 238 | 332 | 395 | 474 | 568 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 2 | 2 | 2 | 2 | 2 | 2 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIncomplete data

^cIntelsat earth stations installed September 1978 and July 1979 - B stations A station planned for installation December 1987

URUGUAY TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|----------------|-------------|-------------|-------------|------------------|-------------|
| Telephones | 273,738 | 287,140 | 294,350 | 309,067 | 324,520 | 340,746 |
| Telex | 1,028 | 1,046 | 1,064 | 1,085 | 1,106 | 1,128 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | NR | NR | NR | NR | NR | NR |
| Coaxial Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Multipair Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^b 1 | 1 | 1 | 1 | ^c 1+1 | 2 |
| Intelsat Domestic E/S | NR | NR | NR | NR | NR | NR |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | NR | NR | NR | NR | NR | NR |

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed December 1980 - B station

^cIntelsat earth station installed calendar year 1984 - A station

Note 1980 derived telephone data - 1981 is hard telephone data

VENEZUELA TELECOMMUNICATIONS^a

[NR = No Record]

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> |
|------------------------------|--------------------|-------------|----------------|------------------|-------------------|-------------|
| Telephones | 1,165,016 | 1,271,323 | 1,377,630 | 1,501,616 | 1,636,761 | 1,784,070 |
| Telex | ^b 9,747 | 10,234 | 10,745 | 11,282 | 11,846 | 12,438 |
| <u>Media</u> | | | | | | |
| Microwave Ch-Km | 2,512,078 | 3,032,078 | 3,659,718 | 4,417,280 | 5,331,657 | 6,435,310 |
| Coaxial Cable Ch-Km | 1,107,143 | 1,262,143 | 1,438,843 | 1,640,281 | 1,869,920 | 2,131,709 |
| Multipair Cable Ch-Km | 1,090,909 | 1,030,909 | 974,209 | 920,628 | 869,994 | 822,144 |
| Fiber Optical Cable Ch-Km | NR | NR | NR | NR | NR | NR |
| <u>Satellite</u> | | | | | | |
| Intelsat E/S | ^c 2 | 2 | 2 | ^d 2+1 | 3 | 3 |
| Intelsat Domestic E/S | NR | NR | ^e 3 | 3 | ^f 3+24 | 27 |
| Domestic E/S | NR | NR | NR | NR | NR | NR |
| <u>Submarine Cable</u> | | | | | | |
| Domestic Ch-Km | 3,784,314 | 3,591,314 | 3,408,157 | 3,234,341 | 3,069,390 | 2,912,852 |

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 14% per year

^cIntelsat earth station installed November 1970 and November 1980 - A stations

^dIntelsat earth station installed August 1983 - B station planned A station calendar year 1987

^eIntelsat earth station installed calendar year 1982 - domestic use only

^fIntelsat earth station installed calendar year 1983 - domestic use only

Note 1981 telephones is a derived number - 1980 and 1982 data is hard

APPENDIX C
NARRATIVE DESCRIPTIONS OF COUNTRIES IN ITU REGION 2
Canada

Country: Canada

N. America - Intelsat Member

Data Year: 1980

General Location of Country: The second-largest nation in the world in land area and very rich in natural resources. Canada is located north of the United States and is bordered on the east by the Atlantic Ocean and the west by the Pacific Ocean and Alaska on the north by the Arctic Ocean and Arctic Circle.

Population: 24,152,300 (1980)

Density: 2.4 persons/km²

Land Area: 9,976,139 sq/km

Language: English and French

Gross Domestic Product¹: \$249,310,340,000

Main Products: Leading Industries - manufacturing (steel, paper, electricity, aluminum, food processing, vehicles), mining (petroleum, copper, zinc, iron, lead, natural gas, asbestos, nickel, salt), agriculture (cattle, hogs, poultry, dairy products, wheat, barley, potatoes, corn, rapeseed tobacco), forestry, fishing, tourism.

Foreign Trade: Exports - manufactured goods, newsprint, wood, wood pulp, wheat, natural gas.

Imports - motor vehicles and parts, chemical products, tools, machinery, aircraft petroleum, communication equipment.

Telecommunications:

System Ownership: Private and Government

Subdivision if Available: There are some 600 Canadian telephone companies with 8 major corporations

Regulatory Environment: Canadian Radio - Television and Telecommunications (CRTC)

Regulatory: Restrictive Trade Practices Commission (RTPC) - authority over matters pertaining to but not restricted to the telecommunications industry.

¹In 1980 U.S. dollars.

Canada (continued)

Department of Communications (DOC) - charged to see that all Canadians have the best possible access to communications.

All radio communications in Canada except for matters covered by the Broadcasting Act are regulated under the Radio Act.

Telephone Demographics: Total telephones 15,560,264 (1980)

1. TeleSat Canada - Domestic Satellite Network

TeleSat is the sole supplier of domestic satellite services. TeleSat is a quasi government-owned communication operation. Ownership in addition to its federal government ownership the major telecommunication carriers are also owners. TeleSat as a member of Telecom Canada receives a share of the interprovincial trunked voice traffic but receives the majority of the video distribution. The video distribution consists of: (1) pay television from the cable TV companies; (2) direct broadcast satellite carriers; and (3) Canadian Broadcasting Corporation radio distribution. Additionally, a number of large Canadian corporations are looking at establishing their own private corporate networks outside of the local telco. TeleSat would be the carrier of record for this bypass.

CANADIAN SATELLITES

| <u>Satellite Name</u> | <u>Fre-quency</u> | <u>Orbital Position</u> | <u>Launch Date</u> | <u>Trans-ponders</u> | <u>Status</u> | <u>Owner</u> |
|-----------------------------|-------------------|-------------------------|--------------------|----------------------|---------------|----------------|
| Anik D | C | 104.5 ⁰ W | 1982 | 24 | Active | Telesat Canada |
| Anik A-1 | C | 104 ⁰ W | 1972 | 12 | Retired | Telesat Canada |
| Anik B1 | C/Ku | 109 ⁰ W | 1978 | 12/6 | Active | Telesat Canada |
| Anik 3 (A-2/3) ^a | C | 114 ⁰ W | 1975 | 12 | Active | Telesat Canada |
| Anik D2 ^b | C | 114 ⁰ W | 1985 | 24 | Active | Telesat Canada |
| Anik C2 | Ku | 105 ⁰ W | 1983 | 16 | Active | Telesat Canada |
| Anik C3 | Ku | 117.4 ⁰ W | 1982 | 16 | Active | Telesat Canada |

Notes:

^aAnik A3 retired from active service and moved to higher orbit.

^bAnik D2 storage orbit pending either sale or moved to commercial svc..

Sources:

Satellite channel chart January/February 1985, Vol. 5, No. 1., The Official Westsat Communications Telecommunication Analysis and Research - Canadian Communication Vol. 3, 1984, The Yankee Group, Table 3-2, p. 58.

Canada (continued)

As sole satellite carrier has contracts for video distribution

1. Pay TV to the cable TV co
2. DBS carrier
3. for Canadian Broadcasting Corp.(CBC radio distribution)
2. Telecom - provides focal point to coordinate the activities of members interprovincial service in four basic areas: (1) technical; (2) financial; (3) regulatory; and (4) marketing.
Members are: (1) Bell Telephone of Canada; (2) Newfoundland Telco; (3) New Brunswick Tel; (4) Maritime Tel & Tel.; (5) The Island Telco; (6) Alberta Government Tel; (7) Saskatchewan Govt Tel,; (8) Manitoba Tel; (9) British Columbia Tel; and (10) TeleSat Canada and some 590 other independents.
3. Canadian National and Canadian Pacific (CNCP) - only competition to Telecom Canada members. Joint venture between Canadian National (a Crown Corporation - government-owned and operated at arm's length from Parliament) and Canadian Pacific Railroad investor-owned. CNCP is the sole provider of Telex in Canada.
4. Communications Services -
Data - CNCP - TLX Telecom - TWX. Telenet and Tymnet spilled over to Canada both essentially a packet-switched network with different sized packets - split again - CNCP - Tymnet Infoswitch Telecom - Telenet - Datapac - Private line service are growing very strong with good revenues still only fraction of total telecom market. Digital data services have just recently been introduced to the Canadian user in the form of a Dataphone Digital Service which is very similar to its namesake in the United States offered by American Telephone & Telegraph Co. An additional service offered was via satellite called Strataroute 2000 and conference 600. Strataroute 2000 is a dedicated customer premises to customer premises type service offering integrated digital voice, data and video communications. Strataroute 2000 is a SBS-type service using TDMA across the ANIK C satellites. This system is operating in C-band as opposed to Ku-band which SBS is operating. Conference 600 is as the name implies, a teleconferencing-originated digital satellite offering. This service operates again at C-band in a TDMA environment with video compression to 1.544 Mbps line.

Canada (concluded)

Voice - Telecom Canada is the majority supplier of all voice services within Canada. However, CNCP has filed with the CRTC to provide alternative long distance voice services within Canada. In the filing, CNCP indicated it would offer a price differential over Telecom of Canada only between designated sites covered by federal regulations. It appears as though CNCP is attempting to operate in the voice area similar to the way the specialized voice carriers do in the United States. These carriers being MCI, Sprint, Skylink, etc.

International - Canadian international is handled exclusively by TeleGlobe Canada, a Crown corporation. This corporation was established to handle all of Canada's external telecommunication services and, as such, is a member of Intelsat. There is no reported interrelationships between TeleGlobe and TeleSat due to the double hop problem. There is, of course, interconnection between TeleGlobe and the terrestrial long-haul carrier (Telecom and CNCP).

There was just recently, within the last 6 months or so, an agreement signed between Canada and the United States allowing Satellite Business Systems (SBS) to transmit services from the United States to Canada without entering the Canadian domestic network. It is expected that other United States other specialized common carriers (OCC's) may be planning to enter this market.

Resellers - If the application of CNCP is approved by the CRTC, the door will be open to the establishment of reseller in a big way. Presently there are two or three very small resellers operating in British Columbia telephone territory along the border of the United States.

Mexico

Country: Mexico

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Northern-most country of Central America bordered on the north by the United States, southeast by Guatemala and Belize, east by the Caribbean Sea, and on the west by the Pacific Ocean.

Population: 73,171,478 (1980)

Density: 37.0 persons/km²

Land Area: 1,972,547 sq/km

Language: Spanish

Gross Domestic Product¹: \$120,097,000,000

Main Products: Leading Industries - trade and services, manufacturing (steel, petroleum products, cement, automobiles, fertilizers, textiles, paper, aluminum, electricity), tourism, agriculture (sugarcane, coffee, cattle, cotton, wheat, rice, maize, fruits, vegetables), mining (petroleum, natural gas, coal, iron ore, copper, manganese, zinc, lead), fishing, construction.

Foreign Trade: Exports - petroleum, cotton, sugar, coffee, shrimp, zinc, lead and copper.

Imports - food, machinery, consumer goods.

Telecommunications:

System Ownership: Government-owned and operated

Subdivision if Available:

Regulatory Environment: Secretaria de Comunicaciones y Transportes (SCT)

Regulatory: A department of the executive branch of the federal government.

The SCT is further divided into two agencies which provide public telecommunications. These agencies being:

1. Direccion General de Telegrafos Nacionales (DGTN) which operates the national and international telegraph services.
2. Direccion General de Telecomunicaciones (DGT) which operates the domestic and international telex, video distribution and broadcasting stations, data communications, rural and marine communications and international communications. The DGT also

¹1980 U.S. Dollars.

Mexico (continued)

operates part of the long-haul national microwave network and the Intelsat earth stations. Telefonos de Mexico SA (Telemex) which provides all domestic public telephone service is a mixed-ownership corporation. The Mexican government owns 51 percent of Telemex. The Board of Directors consists of 11 board members; 6 members represent the government. There are no independent telephone companies in Mexico.

Telephone Demographics²: Total telephones 4,532,557

Transmission Facilities:

1. Morelos 1 and 2 - Domestic Satellite Network System

Regulated most likely by the Direccion General de Telecomunicaciones (DGT) and solely owned by the DGT. Morelos is being constructed by Hughes Communication International as a hybrid C and Ku-band design of the Hughes HS-376 series satellites. The Morelos system is designed to provide television distribution, expanded telephony service and data transmission services throughout all of Mexico. It is planned that a large part of the television distribution will be educationally oriented through inexpensive ground stations. The Morelos satellites are scheduled to be launched in May and September of 1985 aboard the Space Shuttle. The planned orbital locations are 113.5°W longitude and 116.5°W longitude. Additionally, Mexico has indicated a desire for an orbital slot at 145°W longitude.

| | | | |
|-----------|------|-------------------|----------|
| Morelos 1 | C/Ku | 113.5°W longitude | May 1985 |
| Morelos 2 | C/Ku | 116.5°W longitude | May 1985 |

Mexico presently has a very extensive terrestrial network for television including 184 earth stations of varying sizes. Additionally, there are two trailer-mounted and mobile. Of the 184 domestic earth stations, there are 7 transmit/receive stations: Mexico City - 4, Tiajuana - 1, Cancun - 1, and Tulancingo - 1. The balance are TU RO's which have the capability to become transmit stations should the need arise.

²1980 reported numbers by country to AT&T long lines for publication World Telephone A Statistical Compilation as of January 1980.

Mexico (continued)

National Television Ground Station Network (1983)³

| <u>Region</u> | <u>Antenna Diameter</u> | | |
|----------------------|-------------------------|----------|-----------|
| | <u>5</u> | <u>7</u> | <u>11</u> |
| Mexicali | 1 | 6 | 1 |
| Hermosillo | 13 | 8 | 1 |
| Culiacan | 5 | 14 | 1 |
| Guadalajara | | 19 | 1 |
| Merida | 11 | 7 | 2 |
| Oaxaca | | 20 | 1 |
| Chihuahua | | 10 | 2 |
| Torreon | | 7 | |
| Leon | | 13 | |
| Monterey | | 10 | 1 |
| Tampico | | 9 | |
| Veracruz | | 3 | |
| Zona Centro (Puebla) | | 11 | |
| Zona Metropolitana | | 1 | 6 |
| Total | 30 | 138 | 16 |
| Grand Total: 184 | | | |

Presently, Mexico has plans for an additional 45 earth stations, either under construction or awaiting construction.

2. Microwave Network -

Mexico, as compared with other Latin American countries, has a highly developed national microwave network with excellent route diversity. The most commonly used bands are 6 GHz, 2 GHz, 4 GHz, and 7 GHz bands. It is interesting that the DGT and Telemex have totally separate facilities on most routes but share facilities on others. Service is provided for each other where possible to avoid duplication of routes and there is no financial settlements as in this country. Microwave usage: (a) DGT - distribution of TV programming to broadcaster studios; and (b) Telemex - solely for voice communications.

3. Communications Services -

Data - DGTN - Telegraph DGT - TLX. The demand for domestic telegram has steadily fallen since the mid 1970's. This decline is because the telegraph service was used as a substitute for the poor mail service. The DGTN is planning to modernize the telegraph system which should stem the

³AIAA - 84-0716 Mexico's First Domestic Satellite, Miguel E. Sanchez-Ruiz and Bruce & Elbert, p. 316, Table 4.

Mexico (continued)

decline in its use. The telex system, on the other hand, is growing quite nicely. During the 1970's, it grew at about 9 percent per year. During the 1980's, it is expected to grow at about 5.4 percent per year.

Voice - Telmex - Telephone service is divided into three distinct divisions: (a) local service; (b) long distance service; and (c) international service. Telmex has operating authority over the local and long distance, while DGT assumes the authority for all international traffic. Telephone installation has proceeded at an average annual growth rate of 13 percent⁴ through the early to late 70's. During the late 70's and into the 80's, this average annual growth rate appears to have slipped to around 8 to 9 percent. Telmex has been spending large sums of dollars to upgrade the country's switching capacity as well as adding more facilities.

International - DGT - International telephone traffic has been segregated into two unique groups: (1) North America and Caribbean basin; and (b) the rest of the world. The switching hierarchy is again divided into 2 levels: Mexico City the highest, followed by Chihuahua and Hermosillo at the second level. The second level generally handles North American traffic. Interconnection with the United States at Dallas, Texas. All other international traffic exits via Mexico City.

Resellers - There are none.

⁴Arthur D. Little, p. 224, Volume 2.

Mexico (concluded)

MEXICO - DOMESTIC TELEX SUBSCRIBER MIX

| | |
|---------------------|-----|
| INDUSTRIAL | 25% |
| COMMERCIAL | 19% |
| BANKING AND FINANCE | 12% |
| FEDERAL GOVERNMENT | 10% |
| OTHER | 34% |

MEXICO - DOMESTIC TELEGRAPH OFFICES

| | |
|-------------------------|-----------|
| MAIN OFFICES | 1,356 |
| RADIOTELEGRAPH OFFICES | 45 |
| BRANCH OFFICES | 63 |
| TELEPHONE OFFICES | 2,045 |
| RADIOTELEGRAPH STATIONS | 21 |
| RADIOTELEPHONE STATIONS | <u>45</u> |
| TOTAL | 3,575 |

Argentina

Country: Argentina

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Argentina and Chile occupy the extreme southern portion of South America. Argentina stretches some 3,700 Km north to south. Argentina shares a common border with Chile to the west and south, the Atlantic Ocean to the east and south (some 2,580 Km) and Uruguay and Brazil to the east and Bolivia and Paraguay to the north.

Population: 27,261,500

Density: 9.9 persons/km²

Land Area: 2,766,889 km²

Language: Spanish

Gross Domestic Product¹: \$102,500,000,000

Main Products: Manufacturing (steel, food processing, textiles, chemicals, vehicles, machinery, petroleum refining), agriculture (cattle, sheep, hogs, corn, wheat, cotton, citrus fruits, rye, alfalfa), mining (petroleum, gas, coal, iron ore, salt, uranium).

Foreign Trade: Exports - meat, corn, wheat, hides and skins, wool, quebracho extract, linseed.

Imports - nonelectric machinery, iron, steel, motor vehicles, paper and paperboard.

Telecommunications: N/A

System Ownership: Empresa Nacional de Telecomunicaciones (ENTEL)

Subdivision if Available: N/A

Regulatory Environment: Run by the Secretary of State for Communication

Telephone Demographics²: 2,759,736 telephones. ENTEL is responsible for the domestic as well as international telephone and telex service. Prior to 1946, ITT owned and operated the communication plant. Currently, there are two small privately held telephone companies owned by L.M. Ericsson providing less than 10 percent of the telephones. ENTEL's administrators have decided that to make the administration easier, decentralization was necessary. As a result, five operating regions were established: (1) Metropolitan;

¹In 1980 U.S. dollars.

²1980 data.

Argentina (concluded)

(2) Central-east; (3) Northeast; (4) Northwest; and (5) South. These regions are structured similar to our (U.S.) recently established regional holding companies.

Transmission Facilities: Demand for all types of public communication services far exceeds the supply of facilities. It is estimated that some 700,000 persons are awaiting telephony service alone.

ENTEL, due to: (1) demand for service; (2) age of switching gear (some exchanges date back to 1926-1927 era) and poor quality of cable plant has established very optimistic growth and replacement plans for the near term. ENTEL is planning the installation of approximately 3.5 million telephony main lines by 1986. The switching hierarchy has four levels similar to ours in the U.S.; however, we only have five.

Bolivia

Country: Bolivia

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Is completely landlocked, remote and dominated by high mountains. Bolivia and Utah have many similarities in area and geography. In the northwest is Peru, southwest is Chile, southeast Paraguay, south, Argentina and to the north and east, Brazil.

Population: 5,120,530

Density: 4.6 persons/km²

Land Area: 1,098,581 km²

Language: Spanish, Quechua, Aymara

Gross Domestic Product¹: \$4,500,000,000

Main Products: Agriculture (potatoes, corn, sugarcane, cassava, cotton, barley, rice, wheat, coffee, bananas, llamas, alpacas), mining (tin, petroleum, natural gas, lead, zinc, copper, tungsten, bismuth, antimony, gold, silver, sulfur, iron ore), manufacturing (textiles, handicrafts, food processing).

Foreign Trade: Exports - tin, antimony, tungsten, zinc, silver, lead, oil, natural gas.

Imports - flour, motor vehicles.

Telecommunications: N/A

System Ownership: Government/private industry

Subdivision if Available: N/A

Regulatory Environment: Under the Minister of Communication

Telephone Demographics²: 135,100 telephones. The Minister of Communication has a Subsecretary of Communication and him a Director General of Telecommunication (DGT). This Directorate provides a rudimentary magneto telephone and HF radiotelephone service to those parts of the country that are not connected to the public telephony network. The DGT is also responsible for regulating: (1) use of the frequency spectrum; (2) licensing of fixed and mobile radio communications; and (3) setting of public telecommunication tariffs. The national long-haul carrier Empresa Nacional de Telecomunicaciones (ENTEL), a

¹In 1980 U.S. dollars.

²1981 data.

Bolivia (concluded)

government-owned and operated organization, does not provide any telephone service but exists solely to provide long-haul inter-departmental and international communications. ENTEL provides all public telex and telegraph service as well as operating the Intelsat earth station. Local telephone service is provided by a growing number of local independent telephone companies.

Transmission Facilities: N/A

Brazil

Country: Brazil

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Fifth largest country in the world and slightly larger in area than the United States. Brazil has borders with every country in South America except Chile and Equador.

Population: 123,675,000

Density: 14.5 persons/km²

Land Area: 8,511,965 km²

Language: Portuguese

Gross Domestic Product¹: \$187,000,000,000

Main Products: Agriculture (cattle, coffee, corn, rice, sugarcane, rubber, cocoa, soybeans), manufacturing (steel, automobiles, plastics, paper, alcohol, chemicals, machinery, consumer goods), mining (iron ore, manganese, coal, petroleum, bauxite, nickel), construction.

Foreign Trade: Exports - industrial products, cocoa, coffee, soybeans, sugar, iron ore.

Imports - petroleum, wheat, machinery.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Ministry of Communications

Telephone Demographics²: 6,494,000 telephones

The National Communication Council controls: (1) licensing; (2) regulation; (3) standardization; and (4) planning for communications agencies. These include: (1) Telecommunicacoes Baasileiros, S.A. (Telebras) - telephone holding company which controls Empresa Brasileria de Telecommunicacoes (Embratel) - the long-haul and international carriers; (2) Departmenta Nacional de Telecommunicacoes - (DENTEL) - controls radio equipment licensing and frequency allocation, and monitors the radio spectrum; (3) Empresa Brasileria de radiodifuso (Radiobras) - the national radio broadcasting service; and (4) Empresa

¹In 1980 U.S. dollars.

²1980 data.

Brazil (concluded)

Brasileira de Casseios e Telegrafos (ELT) - controls the public postal and telegraph service. It is interesting that with all this regulation, the subscriber, to the telephone network, is free to provide his own PABX, PBX and key set equipment from Telebras. Modems, approved types can be provided by Embratel as part of the data service. To subscribe for service a new subscriber is required to purchase shares in his local telephone company.

Transmission Facilities: Brazil's present telecommunication services are very inadequate by U.S. standards to include old switching technology (rotary and step-by-step switching equipment), old cable (underground and drop cable) and the instruments themselves. In 1974 Brazil initiated a five-year plan for significant investment in the national telephone plant in total. However, due to economic hard times in the late 1970's, their outlay was drastically reduced. The telex system was reorganized and in November 1974 and started the National Telex Network increasing number of lines, terminals, switches and availability resulting in fantastic growth and demand for this service.

Chile

Country: Chile

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Chile to the east and south has a common border with Argentina, to the east with Bolivia, north, Peru, and to the west, the South Pacific Ocean. In addition, Chile has several dependencies in Pacific Ocean they are: Easter Island, Juan Fernandez, Chilean Antarctic territory, Diego Ramirez Islands and Salay Gomez Islands, San Ambrosio Island, and San Felix Island. All these islands are located in the South Pacific.

Population: 11,381,700

Density: 15.0 persons/km²

Land Area: 756,945 sq/km

Language: Spanish

Gross Domestic Product¹: \$17,087,600,000

Main Products: Mining (copper, iron ore, sodium nitrate, coal), manufacturing (steel, textiles, food processing, consumer goods), agriculture (wheat, sugar beets, livestock, potatoes, corn, beans).

Foreign Trade: Exports - copper, iron ore, nitrates, coal.

Imports - electrical machinery, chemical products, cereals, crude petroleum.

Telecommunications: N/A

System Ownership: Public owned

Subdivision if Available: N/A

Regulatory Environment: Ministry of Transportation and Telecommunication

Telephone Demographics²: 553,856 telephones

Actual regulations are administered and regulated through the Subsecretary of Telecommunications which establishes technical standards and controls, issues compliance with regulations, manages RF spectrum allocation, regulates internal telecommunication and manages internal telecommunication. Public telephone service is provided by three companies which have effectively divided the country into thirds. The break-up is as follows: (1) Compania de

¹In 1980 U.S. dollars.

²1980 data.

Chile (concluded)

Telefonos de Chile (CTC) handling over 96% of the lines in service; (2) Companio Nacional de Telefonos de Valdivia in the middle part of the country with some 3.4% of the lines in service; and (3) Companio de Telefonos de Corkaique in the southern part of the country with only .4% of the total lines. Long-haul transmission is provided by Empresa de Telecomunicacione (ENTEL) which operates all microwave and Intelsat earth station (international and domestic). Additionally, all international channels for telegraph and telex are supplied.

Transmission Facilities: Chile's telecommunication plant is way underdeveloped in terms of main lines (local) and long-haul trunks. Additionally, there is no redundancy for the long-haul backbone network. Chile has no DDD service which must be handled by long distance operators. It is planned to introduce automatic DDD. Telex plant is being upgraded; however, there is still significant demand for the service. Planned expansion was little discussed. Chile operates INTELSAT antenna for both international and domestic services through ENTEL.

Regulatory: N/A

Colombia

Country: Colombia

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Colombia as a country is larger than Texas and California combined with coastline on the Caribbean Sea on the north, and Pacific Ocean to the west. On the Northwest is Panama on the northwest, on the northeast by Venezuela, on the southeast by Brazil, and on the south by Peru and Equador.

Population: 27,417,400

Density: 24 persons/km²

Land Area: 1,138,914 sq/km

Language: Spanish

Gross Domestic Product¹: \$22,795,000,000

Main Products: Agriculture (coffee, cattle, bananas, sugar, tobacco, cotton, rice, wheat, potatoes), mining (petroleum, gold, silver, platinum, emeralds, coal, iron, nickel), food processing, manufacturing (textiles, steel, chemicals).

Foreign Trade: Exports - coffee, petroleum, coal, bananas, cotton, beef, sugar.

Imports - machinery, motor vehicles, consumer goods.

Telecommunications: N/A

System Ownership: Government and private industry

Subdivision if Available: NA

Regulatory Environment: Very structured and complex

Telephone Demographics²: 1,524,000 telephones

The Ministry of Communication is directly responsible for the coordination of all general policy making, for providing regulation and for coordinating public telecommunications. The ministry makes recommendation before tariff alterations are submitted to the National Planning Department's Tariff Board for approval. Tariff approval must be secured from Ministry of Communications, Ministry of Finance and Tariff Board. Expansion plans of all the telephones are also reviewed at this level. The Ministry of Communication is organized

¹In 1980 U.S. dollars.

²1980 data.

Colombia (concluded)

as follows: Under the Minister is a Vice Minister, a Secretary General and five operating divisions: (1) Administration Division; (2) Audio-visual and Publicity Media; (3) Legal; (4) Radio; and (5) Telephone, Telegraph and Postal Services.

The Radio Division handles spectrum regulation and monitoring as well as the technical requirements for radio equipment.

The Telephone, Telegraph and Postal Service Division has following subsections: (1) engineering section with switching and transmission groups; (2) evaluation section with technical and economic administrative groups; and (3) postal section.

There are some 40 department and municipal telephone companies plus a national company Empresa Nacional de Telecomunicaciones (TELECOM). TELECOM provides: (1) long-distance telephone service; (2) national telegraph and Gentex; (3) toll switching; (4) local service in some small towns; and (5) all international services.

TELECOM has been authorized to take over local companies or to develop local companies where none exist with proper approval. Since 1969, the number of local companies has declined and standardization of equipment has improved. The ultimate goal is to have one national telecommunication system.

Transmission Facilities: Starting in the 70's, there was significant effort devoted to the expansion of the telephone system in terms of facilities expansion local and long-haul, telephone instruments, and telephone switches. This expansion is partially financed by a new subscriber connection charge. The expansion is taking place mostly in the major cities and then to the rural area. Telex and Gentex as well as telegraph services are provided to all towns with populations greater than 3,000. The telex network is also expanding with the addition of electronic switches and electronic as well as electro-mechanical terminals. High speed data communication is very limited. Satellite communication for domestic as well as international service has a high priority within Telecon. Colombia is one of the more progressive South American countries as it relates to satellite communications.

Regulatory: N/A

Equador

Country: Equador

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Equador is about the size of Nevada with the equator passing through the country. Located on the west coast of South America bordered by the Pacific Ocean on the west, Colombia to the north, and Peru to the south.

Population: 8,497,870

Density: 29.9 persons/km²

Land Area: 283,561 km²

Language: Spanish (official), Quechua, Jivaro

Gross Domestic Product¹: \$8,570,000,000

Main Products: Agriculture (bananas, cocoa, coffee, sugarcane, cattle, dairy-
ing), mining (petroleum, gold, copper, sulfur, natural gas),
manufacturing (textiles, cement, lumber, tobacco products,
sugar), fishing.

Foreign Trade: Exports - petroleum, bananas, coffee, cocoa, sugar, seafood.

Imports - machinery, vehicles, paper, textiles, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 260,000 telephones

All telecommunications services are provided by Instituto Ecuatoriano de Tele-
comunicaciones (IETEL) one of the three government agencies in the Ministry of
Public Works and Communications. IETEL was found as a national telecommunica-
tion monopoly, legally taking over several small telephone companies. IETEL,
organized under a General Manager and National Technical and Financial Director.
Equador is divided telecommunication-wise into two regions with its own similar
organization. Through a Frequency Management Department (Direccion de
Frecuencias), IETEL controls all frequency assignments and regulates the 300

¹In 1980 U.S. dollars.

²1980 data.

Equador (concluded)

commercial radio stations. There still exists outside of IETEL a private telecommunications market mainly PBX's and telephone sets.

Transmission Facilities: Equador's public telecommunication facilities are relatively underdeveloped in terms of switching, facilities, and key sets. There are plans to significantly modernize the total telecommunication plant. Microwave is being used quite extensively for the long-haul transmission. Public telegraph and telex are provided by IETEL also. There is significant effort to updating and expanding the telex network with electronic switches and terminals. Satellite communications are handled by Intelsat; however, Equador is very interested in participating in a regional satellite network should one develop.

Falkland Islands

Country: Falkland Islands

S. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: Located in the south Atlantic some 480 miles northeast of Cape Horn and 500 miles east of Argentina. This island a British Crown Colony and also claimed by Argentina and known as the Malvinas. England and Argentina had a brief confrontation in 1983 over these islands.

Population: 2,086

Density: 5.8 persons/km²

Land Area: 12,173 km²

Language: English

Gross Domestic Product¹: N/A

Main Products: Sheep farming.

Foreign Trade: Exports - Sheep products.
Imports - all necessities.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 590 telephones

Transmission Facilities: N/A

¹Figures included with United Kingdom (England).

²1981 data The World Telephones footnote no. 340, p. 107.

French Guiana

Country: French Guiana

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Located on the northern coast of South America bordered on the north by the Atlantic Ocean, on the east and south by Brazil, and on the west by Suriname. Member of the French community of nations. Main space port of France.

Population: 71,428

Density: 1.3 persons/km²

Land Area: 91,000 km²

Language: French

Gross Domestic Product¹: N/A

Main Products: Agriculture (cattle, bananas, pineapples, sugarcane, fruits and vegetable), mining (gold and bauxite).

Foreign Trade: Exports - gold.

Imports - petroleum products, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 13,687 telephones

Transmission Facilities: N/A

¹Figures included with France.

²1980 data.

Guyana

Country: Guyana

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Guyana is about the size of Idaho and largely covered by a thick, uninhabited tropical rain forest. Located on the northern coast of South America, bordered on the north by the Atlantic Ocean.

Population: 855,400

Density: 4.0 persons/km²

Land Area: 214,969 km²

Language: English (official), East Indian dialects

Gross Domestic Product¹: \$472,000,000

Main Products: Mining (bauxite, gold, diamonds), agriculture (rice, sugarcane, palm kernals, coffee, fruits, vegetables), processing bauxite into alumina, food processing, fishing, forestry and lumbering.

Foreign Trade: Exports - sugar, bauxite, alumina, rice, gold, diamonds, shrimp.

Imports - machinery, petroleum, textiles, motor vehicles, wheat.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Guyana Telephone Co. (GUYTEL Co.)

Telephone Demographics²: 26,562 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1981 data.

Paraguay

Country: Paraguay

S. America - Intelsat Member

Data Year: 1980

General Location of Country: About the size of California and is one of the poorest nations in South America. Argentina lies to the south and west, Brazil to the northeast, and Bolivia to the northwest.

Population: 3,299,170

Density: 8.1 persons/km²

Land Area: 406,752 km²

Language: Spanish, Guarani

Gross Domestic Product¹: \$3,087,800,000

Main Products: Agriculture (wheat, corn, manioc, sweet potatoes, beans, rice, sugarcane, livestock, fruits, vegetables), lumbering and forestry, food processing, manufacturing (electricity, oil refining, cement, consumer goods).

Foreign Trade: Exports - meat, timber, oilseed, tobacco, cotton, quebracho extract, hides.

Imports - machinery, food, steel, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 58,713 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1981 data.

Peru

Country: Peru

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Peru is almost as large as Texas and among the world leading nations in fishing and the mining of lead and zinc. Ecuador and Colombia lie on the north, Brazil and Bolivia on the east, Chile on the south and the Pacific Ocean on the west.

Population: 18,025,200

Density: 14.0 persons/km²

Land Area: 1,285,216 km²

Language: Spanish, Quechua

Gross Domestic Product¹: \$13,525,000,000

Main Products: Agriculture (sugarcane, cotton, rice, wheat, coffee, potatoes, livestock, fruits, vegetables), mining (petroleum, iron ore, copper, gold, silver, lead, zine, tungsten, manganese, coal), fishing, food processing, manufacturing (textiles, cement, leather products, plastics, chemicals).

Foreign Trade: Exports - fish meal, copper, sugar, iron ore, silver, cotton, zinc, coffee, lead.

Imports - machinery, food, trucks, chemicals.

Telecommunications: N/A

System Ownership: Government and public ownership

Subdivision if Available: N/A

Regulatory Environment: Minister of Transportation and Communication

Telephone Demographics²: 86,603

Under the minister is the Director General who has the responsibility for international telecommunications affairs and administration of national telecommunications. Under the Director General is the Director of Telecommunication who has responsibility for spectrum management and radio licensing. There are two public carriers, Empresa Nacional de Telecomunicaciones del Peru (ENTEL) and Compania Peruana de Telefonos, S.A. (CPT). ENTEL is partially

¹In 1980 U.S. dollars.

²1980 data.

Peru (concluded)

state-owned and was found by two other telecommunication companies. Public telegraph was formerly the responsibility of the Directorate of Posts and Telegraph (Direccion de Correos y Telegrafos or CyT) which is a separate government department. ENTEL assumed ownership in 1978. Service is handled as follows: ENTEL - public telephone service - national long-haul and international facilities - public telex service - national and international. National broadcasting authority was Entel facilities for distribution of radio and television program.

CPT - Serves the capital district which has about 80% of the Peruvian telephones. Service costs as follows: residential service about \$175 for new service to \$450 for commercial service plus a \$100 connection charge.

Transmission Facilities: Generally speaking, the Peruvian facilities are very poor and inadequate. Demand has outstripped supply. ENTEL is in the process of improving this in two ways: (1) installation of a domestic satellite system using Intelsat; and (2) installation of in-land microwave routes. Currently, the telephone switching hierarchy is three level with the addition of automatic exchanges. ENTEL took over the public telegraph and telex services in 1978 and has plans to improve the service availability over the next few years. Peru has no data services as we (U.S.) know them. Peru operates internationally via Intelsat and has in place a domestic network using Intelsat.

Suriname

Country: Suriname

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Somewhat larger than the state of Georgia, Suriname is the smallest and newest of the South American nations. Suriname is the fourth-leading producer of bauxite in the world. Guyana is to the west, Brazil to the south, French Guiana to the east, and the Atlantic Ocean to the north.

Population: 413,535

Density: 2.5 persons/km²

Land Area: 163,265 km²

Language: Dutch (official), English, Sranang Tongo

Gross Domestic Product¹: \$675,000,000

Main Products: Mining (bauxite), agriculture (rice, bananas, coconuts, fruits, vegetables), manufacturing (aluminum, electricity, food processing, clothing), forestry and lumbering, fishing.

Foreign Trade: Exports - bauxite, aluminum, alumina.

Imports - food, machinery, petroleum, steel, cotton, grain, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 21,262 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1980 data.

Uruguay

Country: Uruguay

S. America - Intelsat Member

Data Year: 1980

General Location of Country: About the size of Missouri. Brazil lies to the northeast, and Argentina to the west, and to the east and south, the Atlantic Ocean.

Population: 2,907,260

Density: 16.4 persons/km²

Land Area: 177,508 km²

Language: Spanish

Gross Domestic Product¹: \$7,292,000,000

Main Products: Agriculture (cattle, sheep, hogs, rice, wheat, corn, fruits, vegetables), manufacturing (food processing, electricity, leather products, glass, ceramics, furniture, clothing), forestry and lumbering, tourism, fishing, construction.

Foreign Trade: Exports - meat, wool, leather, fish, rice, shoes, glass, ceramics, cement.

Imports - petroleum, machinery, motor vehicles and aircraft, chemicals, iron and steel.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 287,140 telephones

Transmission Facilities: N/A

¹In 1980 U.S. Dollars.

²1981 data.

Venezuela

Country: Venezuela

S. America - Interlsat Member

Data Year: 1980

General Location of Country: Larger than California, Oregon and Washington combined. Venezuela is the most prosperous country in South America. Bordered on the north by 1,750 miles of Caribbean Sea, Colombia lies to the west, Brazil to the south, and Guyana to the east.

Population: 15,267,700

Density: 16.7 persons/km²

Land Area: 912,050 km²

Language: Spanish

Gross Domestic Product¹: \$39,252,000,000

Main Products: Manufacturing (steel, motor vehicles, ships, oil refining, chemicals, food processing, textiles, cement), mining (petroleum, iron, diamonds, manganese), services, agriculture (livestock, coffee, cocoa, corn, rice, sugar, tobacco, cotton, fruits, vegetables), tourism, forestry and lumbering.

Foreign Trade: Exports - petroleum and petroleum products, iron ore, coffee, cocoa.

Imports - machinery, steel, automobiles, wheat.

Telecommunications: N/A

System Ownership: Autonomous government institute

Subdivision if Available: N/A

Regulatory Environment: Minister of Transportation and Communication

Telephone Demographics²: 1,165,016 telephones

Within the Ministry there is the Direccion General of the Secretariat de Comunicaciones which has responsibility for regulating policies and planning for communications. The Direccion General de Comunicaciones is organized into three operating units: (1) Planning; (2) Engineering; and (3) Radio Broadcasting. The Planning office sets standards for quality of service offered by public carriers and establishment of a National Communications plan. The Engineering office controls the regulation and RF spectrum monitoring. Compania Anonima Nacional Telefonos de Venezuela (CANTV) is the

¹In 1980 U.S. Dollars.

²1980 data.

Venezuela (concluded)

sole provider of telephone and telex services. Additionally, private leased voice circuits are provided for government and private users. The microwave system is used for distribution of video and radio broadcast programming.

Transmission Facilities: The transmission plant that is in place is good. However, there is not nearly enough to meet the growing demand. In terms of switching hierarchy, they use a system similar to the Bell System, a 5-level hierarchy. Due in part to the lack of interoffice facilities, a high number of unsuccessful call attempts happen. In addition to the lack of adequate facilities, there is a high turnover of personnel in all areas resulting in shortage of skilled and experienced personnel. The long-haul facilities use basically microwave radio with some ground cable system. The international facilities are handled primarily via Intelsat. The telex growth recently has been good due to the installation of new exchanges and terminal availability.

Belize

Country: Belize

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Formally British Honduras. Bordered on the north by Mexico, on the west and south by Guatemala and on the east by the Caribbean Sea.

Population: 164,777

Density: 7.2 persons/km²

Land Area: 22,965 km²

Language: English

Gross Domestic Product: N/A

Main Products: Sugar, citrus, forestry products and fishing

Telecommunications: N/A

System Ownership: Government and private

Subdivision if Available: N/A

Regulatory Environment: The domestic telecommunication are handled through the Belize Telecommunication Authority. The international telecommunication is currently being handled through Cable and Wireless (C&W); however, the contract of operation will expire in a couple of years at which time operation will revert to Belize Telecommunication Authority. The Belize Telecommunication Authority appears to operate like our FCC in terms of regulation.

Telephone Demographics¹: 6,250

Transmission Facilities: One microwave link between Intelsat earth station to the capital city. Future microwave expansion planned.

¹1981 data - 1980 data not available.

Costa Rica

Country: Costa Rica

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Has the highest standard of living in Central America. Bordered on the east by Panama, west and south by the Pacific Ocean and north by the Caribbean Sea and Nicaragua.

Population: 2,240,380

Density: 44.2 persons/km²

Land Area: 50,700 sq/km

Language: Spanish

Gross Domestic Product¹: \$4,250,000,000

Main Products: Agriculture (coffee, bananas, cattle, cocoa, maize, pineapples, sugarcane, tobacco, rice, potatoes), food processing, manufacturing (textiles, clothing, footwear, cigarettes, furniture, construction materials), mining (gold, salt).

Foreign Trade: Exports - coffee, bananas, beef, sugar, cocoa

Imports - paper products, machinery, iron and steel, pharmaceuticals, petroleum, chemicals, food, manufactured goods

Telecommunications: N/A

System Ownership: Government-owned

Subdivision if Available: N/A

Regulatory Environment: Instituto Costarricense de Electricidad (ICE)

Telephone Demographics: 194,528

Prior to 1963, the telephone was held in private hands consisting of approximately 10,000 manual lines basically in one area. The government took over its operation to include all of Costa Rica. With this takeover, the following structure was formally established. ICE's telecommunications sector is directly responsible for all internal services. The international traffic is handled by Radiografica Costarricense S.A. (RACSA). RACSA is wholly owned by ICE. RACSA operates as a separate entity; however, there is close coordination of all planning activity. Services are split out as follows: FACSA - telephone, telex, and telegraph throughout the world except to Mexico, Panama and Central America. Operator assisted traffic to the United States.

¹In 1980 U.S. dollars.

Costa Rica (concluded)

ICE - handles all automated traffic and Central America, Panama, Mexican and Spanish circuits.

Costa Rica has developed an extensive plan consisting of 5 stages of installation of a new modern telephone system. The telex network has been expanding and new modern switches have been installed to handle this demand.

Transmission Facilities: Extensive plans for expansion and implementation of service to areas not now having access to both telex and telephony.

Regulatory: N/A

El Salvador

Country: El Salvador

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on the north by Honduras and Guatemala and the south by the Pacific Ocean.

Population: 4,666,320

Density: 221.7 persons/km²

Land Area: 21,041 km²

Language: Spanish

Gross Domestic Product¹: \$3,100,000,000

Main Products: Agriculture (coffee, cotton, corn, millet, sugarcane, Henequen, beans, cattle, sheep, goats), mining (gold, silver), food processing, manufacturing (textiles, steel, cement, consumer goods), fishing (shrimp).

Foreign Trade: Exports - coffee, cotton, sugar, shrimp, textiles.

Imports - crude petroleum, iron and steel, fertilizers, medicines, paper.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: No record

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Guatemala

Country: Guatemala

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on the south and west by Mexico, on the east by Belize, Honduras and El Salvador, and the south by the Pacific Ocean.

Population: 7,113,280

Density: 65.3 persons/km²

Land Area: 108,889 km²

Language: Spanish (official), Maya

Gross Domestic Product¹: \$7,110,000,000

Main Products: Agriculture (coffee, cotton, bananas, sugarcane, cattle, corn, rice, beans, wheat, tobacco), manufacturing (tobacco products, chemicals, textiles, plastics, consumer goods), food processing, construction, mining (nickel, petroleum).

Foreign Trade: Exports - coffee, cotton, bananas, sugar, beef, wood, chicle.
Imports - iron and steel, textiles, pharmaceuticals, vehicles, petroleum, food, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 81,622

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Honduras

Country: Honduras

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on north by the Caribbean Sea, on the south by Nicaragua, on the west by the Pacific Ocean, El Salvador and Guatemala.

Population: 3,758,190

Density: 33.5 persons/km²

Land Area: 112,088 km²

Language: Spanish

Gross Domestic Product¹: \$2,067,000,000

Main Products: Agriculture (bananas, coffee, cattle, corn, beans, rice, sugarcane, tobacco, vegetables, fruits), forestry and lumbering, manufacturing (textiles, detergents, cement, paper, chemicals, food products, clothing), mining (gold, silver, copper, lead, zinc).

Foreign Trade: Exports - bananas, coffee, wood, silver, tobacco.

Imports - paper and paperboard, textile, yarn and fabrics, electrical machinery, petroleum products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 27,421

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Nicaragua

Country: Nicaragua

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Located to the north of Costa Rica and South of Honduras, on the east, the Caribbean Sea, and the west by the Pacific Ocean.

Population: 2,513,910

Density: 19.3 persons/km²

Land Area: 130,000 km²

Language: Spanish (official), English, Indian dialects

Gross Domestic Product¹: \$1,319,000,000

Main Products: Trade and services, agriculture (coffee, cotton, sugarcane, cattle, bananas, corn, tobacco, rice, beans, fruits, vegetables), mining (gold, silver, gypsum), fishing, manufacturing (food processing, textiles, clothing, footwear, tobacco products).

Foreign Trade: Exports - cotton, meat, coffee, sugar, sesame, cottonseed.

Imports - insecticides, motor vehicles, pharmaceuticals, iron and steel, petroleum, machinery.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 57,863

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Panama

Country: Panama

L. America - Intelsat Member

Data Year: 1980

General Location of Country: The southern most of the central American countries, bordered on the east by Colombia, on the west by Costa Rica, on the north by the Caribbean Sea, and the south by the Pacific Ocean.

Population: 1,971,360

Density: 25.6 persons/km²

Land Area: 77,083 km²

Language: Spanish

Gross Domestic Product¹: \$2,306,000,000

Main Products: Agriculture (rice, bananas, corn, cocoa, abaca, tobacco, coffee, palm kernels, livestock), fishing, trade and services, manufacturing (food processing, oil refining, tobacco products, textiles, soap, cement), forestry and lumbering, mining (gold).

Foreign Trade: Exports - bananas, refined petroleum, shrimp, cocoa.

Imports - crude petroleum, motor vehicles, foodstuffs.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 176,477

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Bahamas

Country: Bahamas

L. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: The Bahamas contain more than 700 islands covering 90,000 square miles. They lie in a band like appearance approximately 500 miles long and 200 miles wide beginning 50 miles east of Florida bounded on the east by the Atlantic Ocean and on the west by the Caribbean Sea. Approximately 40 of the islands are inhabited.

Population: 244,692

Density: 17.6 persons/km²

Land Area: 13,935 km²

Language: English

Gross Domestic Product¹: \$825,000,000

Main Products: Tourism, banking, fishing, petroleum refining, agriculture (fruits and vegetables), cement, salt, chemicals.

Foreign Trade: Exports - petroleum products, tomatoes, salt, rum, seafood, cement, pulpwood.

Imports - food, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 68,080

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Barbados

Country: Barbados

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Barbados lies on the eastern edge of the Lesser Antilles. The east coast faces the Atlantic Ocean and the west coast faces the Caribbean Sea.

Population: 255,043

Density: 591.7 persons/km²

Land Area: 431 km²

Language: English

Gross Domestic Product¹: \$440,000,000

Main Products: Tourism, agriculture (sugarcane, corn, yams, fruits), sugar refining, manufacturing (rum, molasses, soup), fishing.

Foreign Trade: Exports - raw sugar, seafood, molasses, rum.

Imports - petroleum, meat, dairy products, automobiles, steel

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: The domestic telephone plant is owned by The Barbados Telephone Co. which is controlled by the Barbados Ministry of Information and Culture. The international telecommunication is owned by the Barbados External Communication (BEC) which is controlled by the Barbados External Communication. Regulatory environment appears very restrictive.

Telephone Demographics: 54,071

Transmission Facilities: Trunk lines only. No microwave.

¹In 1980 U.S. dollars.

Dominican Republic

Country: Dominican Republic

L. America - Intelsat Member

Data Year: 1980

General Location of Country: The Dominican Republic covers the eastern two-thirds of the island of Hispaniola. It has a 193-mile border with Haiti on the west. On the east, the Mona Passage separates it from Puerto Rico. On the south it is bordered by the Caribbean Sea and on the north, the Atlantic Ocean.

Population: 5,518,430

Density: 113.2 persons/km²

Land Area: 48,734 km²

Language: Spanish (official), French/English

Gross Domestic Product¹: \$4,695,000,000

Main Products: Agriculture (sugarcane, tobacco, vegetables, coffee, cocoa, bananas, rice, corn, cattle, poultry), food processing (sugar, molasses, rum), tourism, manufacturing (textiles, cement, bottles, paper, matches, tobacco products), mining (bauxite, gold, silver, iron ore, salt gypsum).

Foreign Trade: Exports - sugar, gold, silver, nickel, coffee, cocoa, bauxite, tobacco.

Imports - iron and steel, machinery, chemical and pharmaceuticals products, foodstuffs.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 155,400

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Grenada

Country: Grenada

L. America - Non Intelsat Member

Data Year: 1980

General Location of Country: Southern end of the Windward Islands, due north the island of Trinidad and Venezuela. Bordered on the east by the Atlantic Ocean and on the west by the Caribbean Sea. The island of Grenada was invaded in 1984 by United States forces resulting in a change of government. A new government was recently elected and installed. It is expected that the island of Grenada will apply for membership in Intelsat, and the growth in other forms of telecommunications will experience significant growth.

Population: 90,348

Density: 262.6 persons/km²

Land Area: 344 km²

Language: English

Gross Domestic Product¹: \$56,000,000

Main Products: Tourism, agriculture (nutmeg, cocoa, bananas, fruits, vegetables, sugarcane, cotton, spices), fishing, food processing.

Foreign Trade: Exports - nutmeg, cocoa beans, mace, bananas.

Imports - petroleum products, food, consumer goods.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Domestic telecommunication handled by Ministry of Construction and Public Utilities. International telecommunication handled by Cable and Wireless (E&W)

Telephone Demographics: 5,648

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Haiti

Country: Haiti

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Haiti covers the western one-third of the island of Hispaniola. It has a 193-mile border with the Dominican Republic on the east. On the west, the Windward Passage separates it from Cuba. On the south, it is bordered by the Caribbean Sea, and on the north, the Atlantic Ocean.

Population: 5,054,090

Density: 182.1 persons/km²

Land Area: 27,750 km²

Language: French (official), Creole

Gross Domestic Product¹: \$1,785,000,000

Main Products: Agriculture (coffee, sisal, sugarcane, rice, cocoa, poultry, vegetables, fruits), food processing, mining (copper, bauxite), tourism, manufacturing (textiles, soap, cement, assembly plants), fishing.

Foreign Trade: Exports - coffee, bauxite, sugar, sisal.

Imports - cotton textiles, foodstuffs, petroleum, machinery.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 34,900

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Jamaica

Country: Jamaica

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Jamaica lies approximately 90 miles south of Cuba surrounded entirely by the Caribbean Sea.

Population: 2,214,120

Density: 201.4 persons/km²

Land Area: 10,991 km²

Language: English

Gross Domestic Product¹: \$2,426,797,300

Main Products: Agriculture (sugarcane, bananas, cattle, hogs, poultry, cocoa, coconuts, fruit, vegetables), mining (bauxite, gypsum), tourism, manufacturing and processing (alumina, rum, molasses, cement, chemicals, petroleum products, consumer products), fishing.

Foreign Trade: Exports - alumina, bauxite, sugar, bananas.

Imports - crude petroleum, automobiles.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Jamaica Ministry of Public Utilities and Transport

Telephone Demographics: 117,252

Transmission Facilities: Most extensive microwave of all Caribbean countries

¹In 1980 U.S. dollars.

Neitherland Antilles

Country: Netherland Antilles

L. America - Intelsat Dependency Member

Data Year:

General Location of Country: Netherland Antilles lie about 15 to 40 miles off the northwestern coast of Venezuela. In process of separating from mother country.

Population: 250,338

Density: 260.5 persons/km²

Land Area: 961 km²

Language: Dutch (official), English and Papiamento

Gross Domestic Product: Included as part of Netherlands GNP

Main Products: Tourism, petroleum, refining, mining (phosphates).

Foreign Trade: Exports - petroleum products, mining (phosphates).

Imports - food, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics¹: 72,168

Transmission Facilities: N/A

¹First year data available 1982.

Puerto Rico

Country: Puerto Rico

L. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: Located east of the island of Hispaniola, separated by the Mona Passage, and west of the Virgin Islands, on the north, the Atlantic Ocean, and on the south by the Caribbean Sea.

Population: 3,615,598

Density: 406.4 persons/km²

Land Area: 8,896 km²

Language: English

Gross Domestic Product: Included as part of United States GNP

Main Products: Manufacturing (clothing, chemicals, electrical equipment, machinery), food processing, agriculture (sugarcane, coffee, tobacco, bananas, dairy products, poultry), tourism.

Foreign Trade: Exports - N/A

Imports - N/A

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: FCC

Telephone Demographics: 651,388

Transmission Facilities: N/A

Trinidad/Tobago

Country: Trinidad/Tobago

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Trinidad-Tobago lie off the Venezuelan coast to the northeast. The islands are encompassed totally by the Caribbean Sea.

Tobago, the smallest of the two islands, is approximately 20 miles.

Population: 1,179,100

Density: 229.8 persons/km²

Land Area: 5,130 km²

Language: English (official), Spanish

Gross Domestic Product¹: \$4,335,000,000

Main Products: Mining (petroleum, natural gas), manufacturing (oil refining, chemicals, textiles, cement, food processing), agriculture (sugarcane, cocoa, coconuts, fruit, vegetables), tourism, fishing.

Foreign Trade: Exports - petroleum, sugar, cocoa, natural asphalt, chemicals.
Imports - steel, food, chemicals, machinery, vehicles.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Trinidad/Tobago External Telecommunication Co. Ltd.
(TEXTEL)

Telephone Demographics²: 124,258

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1983 data - no prior data available.

Virgin Islands

Country: Virgin Islands

L. America - Intelsat - Dependency Member

Data Year: 1980

General Location of Country: Located east of Puerto Rico. Made up of several islands with two major islands, St. Thomas and St. Croix.

Population: 71,236

Density: 207.1 persons/km²

Land Area: 344 km²

Language: English

Gross Domestic Product: Included as part of the United States GNP

Main Products: Tourism, manufacturing (rum, refined bauxite, petroleum, refining, textiles), agriculture (beef cattle, dairy products, poultry, vegetables, fruit, nuts).

Foreign Trade: Exports - petroleum, sugar, cocoa, natural asphalt, chemicals.
Imports - steel, food, chemicals, machinery, vehicles.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: FCC

Telephone Demographics: 37,667

Transmission Facilities: N/A

APPENDIX D
SATELLITE SYSTEMS STATUS AND PLANS
Argentina

The current Argentinian government has undergone a complete change in leadership in the last few years. This leadership change was from military rule to civilian democratic rule. Under the previous rule, there was serious discussion of implementation of a domestic satellite system. However, due to economic conditions, not only in Argentina but the rest of the world, these plans had to be set aside.

Argentina has been leasing transponder capacity from Intelsat since 1969 for domestic service. Currently, Argentina is leasing 1-1/2 transponders for this service.

The Argentinian government is again beginning to revisit the question of a domestic satellite system. In the current leased system, there are some 39 domestic earth stations and 3 devoted to international traffic.

Forecasted Domestic Transponder Demand for 1990 and 1995

| | <u>Voice</u> | <u>Video</u> | <u>Total</u> |
|------|--------------|--------------|--------------|
| 1990 | 1 | 2 | 3 |
| 1995 | 2.3 | 2 | 4.3 |

It is interesting that Argentina has twice as many telephones as does Colombia; however, the Argentina telecommunication have not advanced at the same rates or direction as Colombia. With its announced growth and modernization plan, Argentina could be developing its own domestic satellite system in the next 5 to 7 years. If and when they do establish a system, it would parallel in basic structure that of Brazil and Mexico, basically, a 2-satellite system on-orbit.

Brazil

Brazil, like Mexico, despite its problems, is developing into one of the more progressive Latin American countries with regards to its telecommunication

systems development. The Brazilian government has long been a member of Intelsat with regards to its international telecommunication traffic. Brazil began leasing domestic transponder capacity from Intelsat in 1975. In July of 1982, the Brazilian government formally filed an application for orbital slots for a domestic satellite system.

EMBRATEL, which is the Brazilian national telecommunication carrier, is a very progressive and forward-looking carrier. EMBRATEL, in addition to satellite communication, has built a significant domestic microwave network over the last 20 years. For those areas that are impractical to reach via microwave, a low-capacity troposcatter system was established or a satellite earth station was installed. Today, all Brazilian state capitals are linked by either high-capacity microwave or satellite.

In 1979, a study of Intelsat users, both domestic and international, showed that Brazil was the fourth¹ largest Intelsat user in the world. When this information became available, EMBRATEL studied its costs very closely, and it became evident that Brazil could in fact afford its own domestic satellite system. With the decreasing cost of satellite technology, increased capacity and capability increases were the factors which helped support the drive toward a domestic system. In terms of cost, EMBRATEL was paying Intelsat some \$2 million² annual lease cost per transponder for domestic service. EMBRATEL decided that it could purchase its own satellite system with 24 transponders for an annual cost of \$16 million² per satellite. It further calculated that the satellite would be paid for in approximately 8 years.

Brazil launched its first satellite in February 1985 aboard Ariane to a location of 70°W longitude. The second satellite is scheduled for launch either late 1985 or early 1986 to a location of 65°W longitude.

¹Satellite Communications, January 1984, p. 35, Berta Sichel.

²Satellite Communications, January 1984, P. 34, Berta Sichel.

Forecasted Domestic Transponder Demand for 1990 and 1995

| | <u>Voice</u> | <u>Video</u> | <u>Total</u> |
|------|--------------|--------------|--------------|
| 1990 | 13 | 8 | 21 |
| 1995 | 21 | 9 | 30 |

With the establishment of Brazil's own domestic satellite system, it will have the capability to reach the remote areas of the country with a vast array of telecommunications services. A study done by the Brazilian Commission of Space Studies indicated the following transponder allocation:³

1. 14 or 15 transponders for public usage (telephony, etc.);
2. 2 transponders for military communication;
3. 4 transponders for television;
4. 2 transponders for space applications; and
5. 1 transponder for high-speed data.

The Brazilian domestic satellite system is to be configured as follows:

1. Tracking, telemetry and control station located outside of Rio de Janeiro with the capability for control up to 3 satellites configured only for 2 presently. The station has a 14.2 meter antenna.⁴
2. The Advanced Publication of Information on a planned satellite network as filed with the IFRB indicates the following sized domestic earth stations will be utilized: 15 M, 10 M, 7.5 M, 6 M, and 5 M. It could be assumed that the traffic requirement of the served area will determine the size of the antenna installed.⁵
3. Brazil, however, will launch the second satellite in either September or December 1985 aboard Ariane. With this launch, Brazil will have an estimated excess capacity of 1-1/2 satellites or 36 transponders at a minimum.

³Satellite Communications, January 1984, p. 34, Berta Sichel.

⁴Design of the Brazilian domestic satellite system - SBTS, B. M. Berridge and N.M.G. Freitas paper presented at Satellite Communication Conference, Ottawa, Canada, June 14-17, 1983, p. 20.5.3.

⁵Special Section No. AR11/A/16 annex to I.F.R.B. Circular 1526, July 1982, p. 4.

Based upon all that is known at this time about the Brazilian satellite system, there will not be any additional requirements in terms of satellites in the near-term. In the early 1990's, thought will have to be given to replacements for the 2 existing satellites.

Canada

Canada has been one of the more progressive countries with regards to its telecommunication systems. Relative to satellite communication, the Canadians first communication satellite was launched in November of 1972. Since that time, there have been a series of satellites placed in orbit. Canada has an orbital arc assignment from 104.5° W to 117.5° W for fixed services. Presently, Canada has in-orbit the following satellites:⁶

| <u>Satellite Name</u> | <u>Location</u> | <u>Launch Date</u> | <u>Freq. Band</u> | <u>Transponders</u> | <u>Equiv. 36 MHz Transponders</u> |
|-----------------------|-----------------|--------------------|-------------------|---------------------|----------------------------------------------------------|
| Anik D-1 | 104.0°W | 1982 | C | 24 | 24 |
| Anik B-1 | 109°W | 1978 | C/Ku | 12/6 | 24 |
| Anik D-2* | 114°W | 1985 | C | 24 | 24 |
| Anik C-2 | 105°W | 1983 | Ku | 16 | 24 |
| Anik C-3 | 117.4°W | 1982 | Ku | 16 | 24 |
| | | | | | 96 transponders available not including Anik D-2 and B-1 |

*In-orbit storage and for sale

Forecasted Domestic Transponder Demand for 1990 and 1995

| | <u>Voice</u> | <u>Video^a</u> | <u>Total</u> |
|------|--------------|--------------------------|--------------|
| 1990 | 30 | 63 | 93 |
| 1995 | 42 | 71 | 113 |

^aCanadian Astronautics Limited, July 19, 1983, A Study of EHF Communication Requirements and Technology Development, p. 38, Table 15.

Canada is presently entering its second generation of communications satellites with significant excess capacity. This is evidenced by the fact that Canada has placed Anik D-2 for sale even though it is on-orbit. The

⁶The official Westsat Communication Satellite Channel Chart, January/February 1985, Vol. 5, No. 1.

original demand estimates for satellite addressable traffic have not grown at the original estimates, thus resulting in the excess capacity.

Based on 1985 transponder capacity of some 96 transponders with a transponder demand of 38 giving an available transponder capacity of 58. Even in 1995 there will be a forecasted excess capacity of some 40 transponders based upon present transponder availability.

In conclusion, it appears that with the five orbital slots already allocated to Canada and what they have in-orbit, no additional slots would be required. In terms of satellites, they have a sufficient number. The only communications satellite activity would be required will be replacements in 1988, 1992, 1993, and 1995.

Colombia

Colombia initiated international satellite service in 1978 utilizing Intelsat IV-A (F-2) through 3 international earth stations. Following this exercise, the Colombia government issued an RFP for a domestic satellite system. The government to date has not acted on the RFP, and it is believed to be a dead issue at this time.

In Colombia's RFP, the following requirements were listed:⁷

1. Two 24 transponder C-band satellites;
2. Six 13-meter type "A" earth stations to be co-located near major telephone exchanges;
3. Fourteen 13-meter type "B" earth stations to be co-located near smaller telephone exchanges;
4. One hundred fifty 4 to 5-meter type "C"--"D" to be located in the rural areas; and
5. Tracking, telemetry and control for the spacecraft.

⁷Satellite Marketing Digest - Satellite Systems Engineering, Inc., 1983, p. II/3.1.6.1-3.

Based upon Colombia's current Intelsat usage and the anticipated demand, it appears that a 1-satellite system would be more than adequate to handle all their needs through the mid to late 90's.

Forecasted Domestic Transponder Demand for 1990 and 1995

| | <u>Voice</u> | <u>Video</u> | <u>Total</u> |
|------|--------------|--------------|--------------|
| 1990 | 1.4 | 2 | 3.4 |
| 1995 | 2.5 | 3 | 5.5 |

Colombia has been involved in some discussion about establishing a regional system with its neighboring countries. This discussion has apparently terminated as little information is currently available.

Currently Colombia has some 18 domestic Intelsat earth stations in use and 2 for international usage.

Mexico

Mexico, despite its many problems, is developing into one of the more progressive Latin American countries with regard to its telecommunication systems. The Mexican government has long been a member of Intelsat with regard to its international telecommunications traffic. However, in 1981 the need to lease transponder space on Intelsat for domestic use was great. The factors leading up to this demand were many, but the tremendous overnight growth of the oil industry in Mexico really agitated this demand requirement. With the unavailability of terrestrial capacity and a domestic satellite, Mexico was forced to secure Intelsat transponders.

In the late 1970's, the Mexican government realized that it should develop a domestic satellite system to handle its growing telecommunication demand. This was accomplished, and Hughes was the successful bidder for the satellite part of the system. Additionally, Mexico planned to install some 2000⁸

⁸Satellite Marketing Digest, 1983, Satellite System Engineering, p. II 3.1.6.1-1.

domestic earth stations to support the system. Of the 2000, some 1600⁸ are planned to be devoted to rural towns which have no telephones or way of communicating with the rest of the world. Additionally, Mexico has ordered 80⁸ 7-meter receive-only earth stations from Scientific-Atlanta (SA) to be used with 10⁸ transmit/receive-only stations for a domestic television network. Presently, Mexico is leasing 1⁸ transponder on Western Union's Westar III for television service.

Forecasted Domestic Transponder Demand for 1990 and 1995

| | <u>Voice</u> | <u>Video</u> | <u>Total</u> |
|------|--------------|--------------|--------------|
| 1990 | 5 | 4 | 9 |
| 1995 | 10 | 5 | 15 |

Mexico filed for orbital slots as follows: (1) Morelos A at 113.5⁰W longitude; (2) Morelos B at 116.5⁰W longitude; (3) Ilhuicahu 3 at 141⁰W longitude; and (4) Ilhuicahu 4 at 145⁰W longitude. The Morelos series are scheduled for shuttle launch in 1985 and 1986. The Ilhuicahu series are still in the proposal stage and no launch dates have been set.

The proposed Mexican satellite system is quite extensive in its structure. A tracking, telemetry, and control station will be located on the outskirts of Mexico City. Additionally, Mexico is planning to use the satellite extensively for educational TV and television.

National Television Ground Station Network (1983)^a

| Region | Antenna Diameter | | |
|----------------------|------------------|----------|----------|
| | 5 M | 7 M | 11 M |
| Mexicali | 1 | 6 | 1 |
| Hermosillo | 13 | 8 | 1 |
| Culiacan | 5 | 14 | 1 |
| Guadalajara | | 19 | 1 |
| Merida | 11 | 7 | 2 |
| Oaxaca | | 20 | 1 |
| Chihuahua | | 10 | 2 |
| Torreon | | 7 | |
| Leon | | 13 | |
| Monterey | | 10 | 1 |
| Tampico | | 9 | |
| Veracruz | | 3 | |
| Zona Centro (Puebla) | | 11 | |
| Zona Metropolitana | — | <u>1</u> | <u>6</u> |
| Total | 30 | 138 | 16 |

^aMexico's First Domestic Satellite, Miguel E. Sanchez-Ruiz and Bruce R. Elbert, AIAA-84-0716, p. 316, Table 4.

Mexico currently is leasing 3 transponders from Intelsat at a cost of some \$2 million per transponder per year or about \$6 million per year plus what it is paying Western Union for the video service. With these kind of costs, it would appear that one could substantiate the establishment of a country-owned domestic satellite service. With a domestic system, there is additional capacity for little or no additional cost. In reviewing their various applications and projected usage, it appears that a one-satellite system would be more than adequate to meet total needs through 1995.

REFERENCES

1. Stevenson, S., et al.: Demand for satellite-provided domestic communications services up to the year 2000. NASA-TM-86894, 1984.
2. Bowyer, J.M.; Frankfort, M.; and Steinnagel, K.M.: Worldwide satellite market demand forecast. (NASA-1-4-W-1-T11, Western Union Telegraph Co.; NASA Contact NAS3-22461) NASA-CR-167918, 1981.
3. Kratochvil, D., et al.: Satellite provided fixed communications services; A forecast of potential domestic demand through the year 2000, Vol. 2, NASA-CR-168146, 1983.
4. Gamble R.B.; Saporta, L.; and Heidenrich, G.A.: Customer premises services market demand assessment 1980-2000, Vol. 2, NASA-CR-168151.
5. The world's telephones a statistical compilation as of January 1982. AT&T Long Lines, Overseas Dept., Morris Plains, NJ, 1982.
6. The world's telephones a statistical compilation as of January 1981. AT&T Long Lines, Overseas Dept., Morris Plains, NJ, 1981.
7. The world's telephones a statistical compilation as of January 1980. AT&T Long Lines, Overseas Dept., Morris Plains, NJ, 1980.
8. Communication platform payload definition study, Task 1, review. Ford Aerospace and Communications Corporation, Sept. 27, 1984.
9. Communication platform payload definition study, Task 1, Data base development. RCA Astro-Electronics, Oct. 11, 1984.
10. Schmitt, Carl H.: Comsat's satellite locations guide, an introduction. Comsat Communication Satellite Corporation Magazine, Nov. 15, 1984, pp. 18-26.
11. World telecommunications 1980-1990, Vols. 1-4, Arthur D. Little Inc., 1982.
12. Nations of the world: Money, Economy, Transportation. 1981 Almanac and Yearbook, Readers Digest, pp. 474-477.
13. Iran, Czardana; and Myers, Del: 1985 World Spending. Telephony, vol. 208, no. 8, Feb. 25, 1985, p. 38.
14. Filep, Robert: The World Communications Satellite Market Through 2000: Analysis and Forecast. Satellite Communications, Developments, Applications, and Future Prospects, Online Publications, 1984 pp. 163-173.
15. Filep, R.T.; Schnapf, A.; and Fordyce, S.W.: World Communications Satellite Market Characteristics and Forecasts. (COMM-21-384-T6, Communications 21 Crop.; NASA Contract NAS3-23782) NASA-CR-168270, 1983.
16. 1980 World's Submarine Telephone Cable System. NTIA-CR-80-6, Telecommunications and Information Administration, U.S. Dept. of Commerce, 1980.

17. Ng, D.C.P., et al.: A Study of Canadian EHF Communications Requirements and Technology Development. DSS File No. 12ST.36100-2-4064, Canadian Astronautics Limited, Sept. 1983.
18. Canadian Communications. Telecommunication Analysis and Research Vol. 3, 1984.
19. FCC Space WARC 1985 Advisory Committee Working Group A-1, Requirement Analysis Through Year 2000. WGA-1/56, Sept. 15, 1983.
20. Yearbook of Common Carrier Telecommunication Statistics and Radio Communications, 1981, International Telecommunications Union, Geneva, Switzerland, 1981.
21. National Telecommunications and Information Administration, Computer Printouts: "History Listing of Communications Data (1946-1982); Telegraph, Telephone, Telex" May 25, 1984. "History of Satellite Half-Circuits in Use at Years End, 1973-1983", Oct. 8, 1984. "Percentage Growth of Satellite Half-Circuits in Country-to-Country Basis, 1973-1983", Oct. 8, 1984.
22. PanAm Sat. Application of Pan American Satellite Corporation for a Subregional Western Hemisphere Satellite System, (214 Filing with FCC), May 31, 1984.
23. Special Section No. AR11/A/16 (annexed to IFRB Circular No. 1526), July 6, 1982; Advanced Publication of Information on a Planned Satellite Network, SBST A-1 and SBST A-2, Nov. 1982.
24. Sanchez-Ruiz, M.E.; and Elbert, B.R.: Mexico's First Domestic Satellite. Communications Satellite Systems Conference, 10th, AIAA, 1984, pp. 310-318.
25. Berridge, b.M.; and Freitas, N.M.G.: The Design of The Brazilian Domestic Satellite System-SBTS. Canadian Domestic and International Satellite Communications Conference, 1st, K. Feher, ed., North Holland, 1984, pp. 20.5.1 to 20.5.4.
26. Satellite Marketing Digest. Satellite Systems Engineering, Inc., 1984.
27. Klie, Robert H.: Telecommunications Transmission Engineering, Vol. 1, Principles, Second ed., American Telephone and Telegraph Co., 1977, p. 139.
28. Satellite Channel Chart. Westsat Communications, Vol. 5, No. 1, Jan.-Feb. 1985.
29. Sichel, Berta: Brazilsat. Satellite Communications, Jan. 1984, pp. 34-35.
30. Chaves, Nilo; and Fiho, Teixeira: Brazil - Moving Into Its Own. Satellite Communications, July 1984, pp. 24-25.
31. INTELSAT interoffice memorandum dated Oct. 22, 1984: Subject - Statistics of Antennas, Earth Stations and Country Data - Sept. 30, 1984, by P. Casey, Jr.

32. Luhan, P.: Despite the Worldwide Recession, the Total Number of Telephone Stations Throughout the World Has Steadily Increased Over the Last Few Years. *Telecommunication Journal*, Vol. 51, No. 4, Apr. 1984, pp. 179-195.
33. Pelton, J.N.: *Communications: Developing Nations Faster*. *Satellite Communications*, Vol. 8, No. 7, July 1984, pp. 19-22.
34. Dawidziuk, B.M.: *International Communications in the South Atlantic Region*. *International Communications Exposition, 4th, INTELCON 80*.
35. *Present and Projected Business Utilization of International Telecommunications*. National Telecommunication and Information Administration, Sept. 1981.

| | | | | | | | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------|-----------|-------------------|---|-------------------|---|-------------------|---|-------------------------------|---|---------------------------|---|----------------------------------------|---|
| 1 Report No NASA TM-87077 | 2 Government Accession No | 3 Recipient's Catalog No | | | | | | | | | | | | | |
| 4 Title and Subtitle Telecommunications Forecast for ITU Region 2 to the Year 1995 | | 5 Report Date August 1985 | | | | | | | | | | | | | |
| | | 6 Performing Organization Code 146-20-1A | | | | | | | | | | | | | |
| 7 Author(s) James E. Hollansworth, Jack A. Salzman, and James R. Ramler | | 8 Performing Organization Report No E-2653 | | | | | | | | | | | | | |
| | | 10 Work Unit No | | | | | | | | | | | | | |
| 9 Performing Organization Name and Address National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio 44135 | | 11 Contract or Grant No | | | | | | | | | | | | | |
| | | 13 Type of Report and Period Covered Technical Memorandum | | | | | | | | | | | | | |
| 12 Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546 | | 14 Sponsoring Agency Code | | | | | | | | | | | | | |
| | | 15 Supplementary Notes | | | | | | | | | | | | | |
| 16 Abstract <p>A study of current and future (to 1995) telecommunications activity within ITU Region 2 was performed by the Space Communications Division of NASA's Lewis Research Center. The primary objective of this study was to forecast the need for Fixed Service Satellites (FSS) by countries within ITU Region 2 excluding the United States and Greenland. As a part of this study, forecasts of telecommunications equipment needs were developed as a yardstick of the relative level of telecommunications activity among developing countries within the region. The study forecasts a likely scenario for the implementation of domestic and regional communications satellites to provide services to and among countries in ITU Region 2. By 1995, it is forecast that 15 fixed service satellites will be implemented as follows:</p> <table style="margin-left: 100px;"> <tr><td>Canada (domestic)</td><td>5</td></tr> <tr><td>Mexico (domestic)</td><td>2</td></tr> <tr><td>Brazil (domestic)</td><td>2</td></tr> <tr><td>Colombia/Venezuela (regional)</td><td>2</td></tr> <tr><td>Argentina/Chile regional)</td><td>2</td></tr> <tr><td>South America and Caribbean (regional)</td><td>2</td></tr> </table> <p>A forecast of these countries' requirements indicates that, with the possible exception of Canada, this constellation of satellites (with replacements as needed) will meet these countries' needs to beyond the year 2000.</p> | | | | Canada (domestic) | 5 | Mexico (domestic) | 2 | Brazil (domestic) | 2 | Colombia/Venezuela (regional) | 2 | Argentina/Chile regional) | 2 | South America and Caribbean (regional) | 2 |
| Canada (domestic) | 5 | | | | | | | | | | | | | | |
| Mexico (domestic) | 2 | | | | | | | | | | | | | | |
| Brazil (domestic) | 2 | | | | | | | | | | | | | | |
| Colombia/Venezuela (regional) | 2 | | | | | | | | | | | | | | |
| Argentina/Chile regional) | 2 | | | | | | | | | | | | | | |
| South America and Caribbean (regional) | 2 | | | | | | | | | | | | | | |
| 17 Key Words (Suggested by Author(s)) Telecommunications; Communications; Forecasts; Communications Satellites; Satellite Market; ITU Region 2 | | 18 Distribution Statement Unclassified - unlimited STAR Category 17 | | | | | | | | | | | | | |
| 19 Security Classif (of this report) Unclassified | 20 Security Classif (of this page) Unclassified | 21 No of pages | 22 Price* | | | | | | | | | | | | |

End of Document