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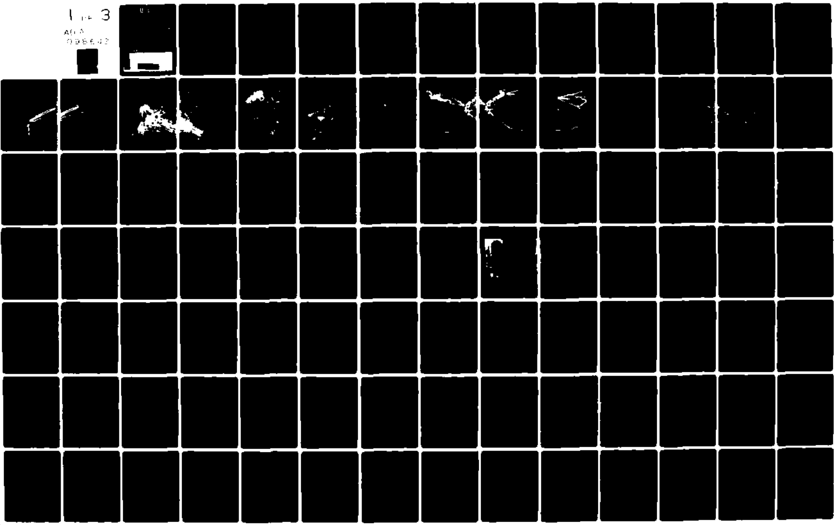

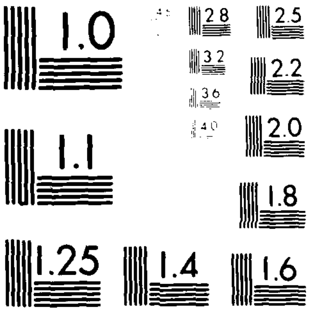

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TASK 2 REPORT

IDENTIFICATION OF EXISTING COMMUNICATIONS SYSTEMS WORLDWIDE CRISIS ALERTING NETWORK, PHASE II

April 1980

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Prepared for
DEFENSE COMMUNICATIONS AGENCY
WASHINGTON, D.C. 20305
under Contract DCA100-80-C-0010

ARINC RESEARCH CORPORATION

DISTRIBUTION STATEMENT A
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ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCANII). The objective of the program is to provide communication connectivity between specified U.S. and allied military and civilian subscriber groups.

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TASK 2 REPORT

IDENTIFICATION OF EXISTING COMMUNICATIONS SYSTEMS

6 WORLDWIDE CRISIS ALERTING NETWORK, PHASE II.

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Prepared for

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by

10 H.P. Himpler
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ARINC Research Corporation
a Subsidiary of Aeronautical Radio, Inc.
2551 Riva Road
Annapolis, Maryland 21401

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CONTENTS

CONTENTS Continued

LIST OF TABLES

LIST OF FIGURES

CONTENTS Continued

CHAPTER ONE

INTRODUCTION

ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCAN II) under contract DCA100-80-C-0010 for the Defense Communications Agency. The objective of the program is to identify alternative procedures and means to provide communication connectivity between specified U.S. and allied military and civilian subscriber groups. The effort encompasses the simplification and standardization of the means associated with the submission of crisis alerting messages so that they can be handled more reliably and expeditiously than is currently possible. The project will examine the telecommunications systems currently serving each subscriber group and for each such telecommunication system, postulate interface means and procedures. The resulting modification of interface means and procedures will permit incidents, that are first recognized outside the military, to be reported quickly and efficiently to the proper authorities. This report addresses the results of our effort on Task 2 - Identification of Existing Communications Systems.

1.1 OBJECTIVES OF TASK 2

The primary purpose of the second task of the project, "Identification of Existing Communications Systems", is to identify and describe principal in-place communications systems serving the commercial aviation, maritime and offshore petroleum industry as well as non-DoD Government entities (e.g., FAA and Coast Guard), and NATO. The results of this task will serve as inputs to later tasks assessing the potential of interfacing these systems with the WWMCCS.

1.2 CONDUCT OF TASK 2

The conduct of Task 2 encompassed the performance of the following four subtasks:

- Develop Preliminary Subscriber Operation and Communications Descriptions - These descriptions cover the general system description including ownership, types of service, geographic coverage, and system availability as well as terminal/interface descriptions including equipment types, transmission codes, speeds and protocols and terminal locations.

- Develop Sample Survey Plan - The survey plan was necessary to serve as a guide during our interface with both subscriber groups and telecommunications systems operators in order to portray accurately the technical characteristics of the various communications systems.

- Survey Selected Subscribers and Communications Systems Operators and Finalize Communications System Descriptions - Representative subscriber and communications systems operators were surveyed in each subscriber category prior to the finalization of the communications systems descriptions.

- Prepare Task 2 Report - This report is the result of the completion of this subtask.

As stated in the Task 1 report, a portion of the Task 1 effort included the gathering of documents describing telecommunications systems related to the continuing performance of the WCAN II project. Most of the documentation was gathered from existing ARINC Research files. These telecommunications systems descriptions, on file at ARINC Research, are voluminous and detailed. For example, a five-volume set of the "Air Navigation Plan" details the facilities, services and procedures for international, worldwide air navigation. Included in these volumes are landline teletypewriter networks, HF radio teletypewriter networks, UHF radio voice networks, radiotelephone networks, HF and VHF radio transceiver locations, the recommended procedures for the use of all services, worldwide air routes, and air route usage frequency. Similar detailed documentation is on file for the Aeronautical Radio, Inc. (ARINC) system.

Detailed documentation related to the maritime service is likewise on file. This documentation includes listings of U.S. and NATO country flag vessels, worldwide sea routes, probability of the number of vessels transiting ocean segments during monthly periods, listing of MARISAT equipped vessels, and vessels that rely solely on HF radio.

Each telecommunications system described in Chapter Two is detailed on a large, transparent chart on file at ARINC Research. Similar charts are included in the descriptions of each subscriber reported herein; however, the amount of detail is necessarily reduced. The purpose of preparing large, detailed, transparent charts of each subscriber communications system during Task 2 is to enable correlation of these systems with the WWMCCS network later in Task 3.

The telecommunications systems descriptions presented in this report include references to transmission speed and protocol. Transmission speed refers to record and data transmission in bits per second (bps) or words per minute (wpm). Protocol refers to the character sequence which must be used at the heading and ending of a record or data message in order to transmit a message into a given system. In those cases where a standard exists which details speeds and protocols, that standard is included as a part of the report by reference. For example, the International Civil Aviation Organization (ICAO) standards are used worldwide for aviation air/ground and ground/ground communications. All such referenced standards are on file at ARINC Research.

1.3 ORGANIZATION OF THE REPORT

Chapter One of this report has served as an introduction to the Task 2 effort, Identification of Existing Communications Systems. Chapter Two contains the primary deliverable for Task 2 of the contract, Description of Existing Communications Systems. Chapter Three contains a Preliminary Assessment of the various subscriber Communications Systems as Applied to WCAN II Needs.

CHAPTER TWO

DESCRIPTION OF EXISTING SUBSCRIBER COMMUNICATIONS SYSTEMS

2.0 INTRODUCTION

This chapter serves to describe the various non-DOD communications systems which could potentially interface to the AUTODIN network to enable WCAN reporting. These systems support communications in the following subscriber groups:

- Commercial Aviation
- Commercial Maritime
- Commercial Offshore Petroleum
- United States Coast Guard
- Federal Aviation Agency (FAA)
- North Atlantic Treaty Organization (NATO)
- United States Department of State*

The description of the communications systems serving the subscriber groups listed above are presented in terms of (1) a general description and (2) a terminal/interface description. The general description covers the items of ownership, type of services provided (e.g. voice, data), geographic coverage, and system availability. The terminal/interface description addresses equipment types, codes, speeds and protocols, and most importantly, terminal locations.

2.1 COMMERCIAL AVIATION COMMUNICATIONS SYSTEMS

Commercial aviation communications systems are worldwide and provide a wide range of services including air traffic control, administration (company communications) and weather. These services are provided via

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* Information regarding the Department of State communications network is not available at the time of this writing. Efforts are underway to secure this information and when this research is completed, the system description will be provided later under separate cover.

both air/ground and terrestrial communications links.

Of particular interest to this study is that there are approximately 5700 commercial aircraft in the world and, as indicated in Table 2-1, the United States and its NATO allies account for over two-thirds of the world's commercial aircraft.

Of key importance in terms of communications is the in-flight location of the almost 4,000 NATO ally commercial aircraft. Figures 2-1 through 2-6 illustrate the international air traffic patterns (for all the world's aircraft) over various portions of the world. It should be noted that the thickness of the lines (direct air routes) and the areas of the circles (airports) in these Figures are proportional to the number of flights per week. For the purpose of this project, it can be assumed that the air traffic densities shown in Figures 2-1 through 2-6 can be scaled by two-thirds to account for U. S. and NATO ally traffic.

In terms of commercial aviation communications systems, it was determined that there are four major systems of prime interest to the WCAN. These four are:

- Airline Fixed Telecommunications Network (AFTN)
- Aeronautical Radio Inc. (ARINC)
- Societe Internationale de Telecommunications Aeronautiques (SITA)
- Federal Aviation Administration (FAA)

These four systems are described in the following sub-sections.

2.1.1 Airline Fixed Telecommunications Network (AFTN)

2.1.1.1. General Description

The Airline Fixed Telecommunications Network, consisting of both fixed and mobile services, provides for necessary air/ground communications for all the world's commercial aviation. The network exists on the basis of international agreements sponsored by the International Civil Aviation Organization (ICAO). The results of these agreements are documented in the Air Navigation Plan (ANP) which specifies minimum required services and facilities for all civil aviation. The government of each subscribing nation is responsible for establishing and maintaining these facilities and services within their particular geographic locations. This is a co-operative effort on behalf of international commercial aviation interests. For example, in the continental United States, the Federal Aviation Administration (FAA) has been assigned the responsibility for implementation and operation of AFTN.

The ICAO headquarters is located in Canada and has regional and local representatives throughout the world. The headquarters address is:

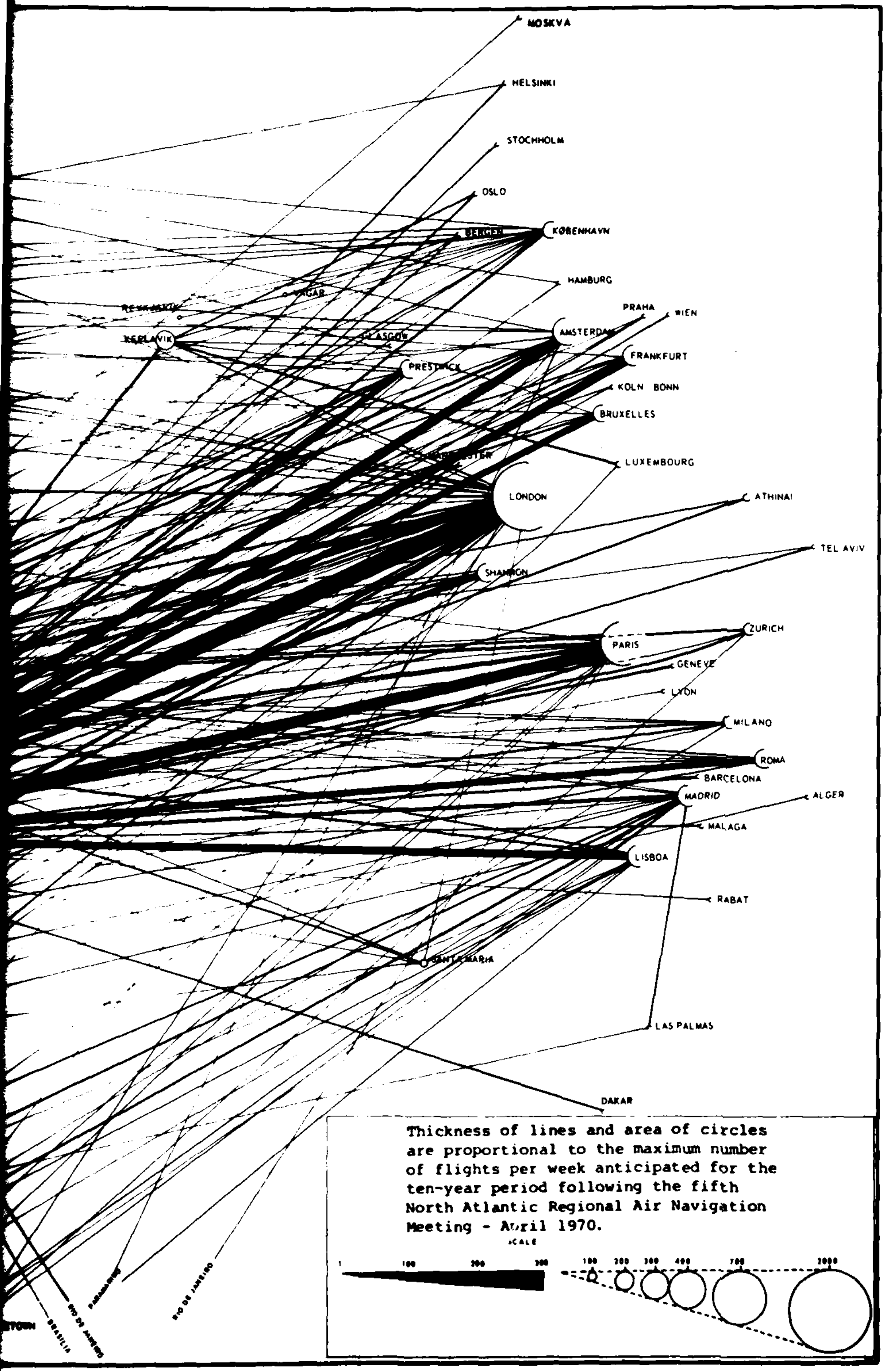
TABLE 2-1

POPULATION OF NATO ALLY COMMERCIAL AIRCRAFT*

COUNTRY	NUMBER OF AIRCRAFT	PERCENTAGE OF WORLD AIRCRAFT
USA	2,733	48.0
BELGIUM	42	.7
CANADA	246	4.3
DENMARK	33	.6
FRANCE	125	2.2
W. GERMANY	114	2.0
GREECE	31	.5
ICELAND	11	.2
ITALY	101	1.8
LUXEMBOURG	7	.1
NETHERLANDS	47	.8
NORWAY	41	.7
PORTUGAL	25	.4
TURKEY	18	.3
UNITED KINGDOM	314	5.5
TOTAL	3,888	68.1

*Based on World Aviation Directory (Winter 1978) Airline Statistics

Figure 2-1. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBER OF FLIGHTS PER
NORTH ATLANTIC AND NORTH AMERICA



Thickness of lines and area of circles are proportional to the maximum number of flights per week anticipated for the ten-year period following the fifth North Atlantic Regional Air Navigation Meeting - April 1970.

PATTERNS AND NUMBER OF FLIGHTS PER WEEK -
TIC AND NORTH AMERICA

2

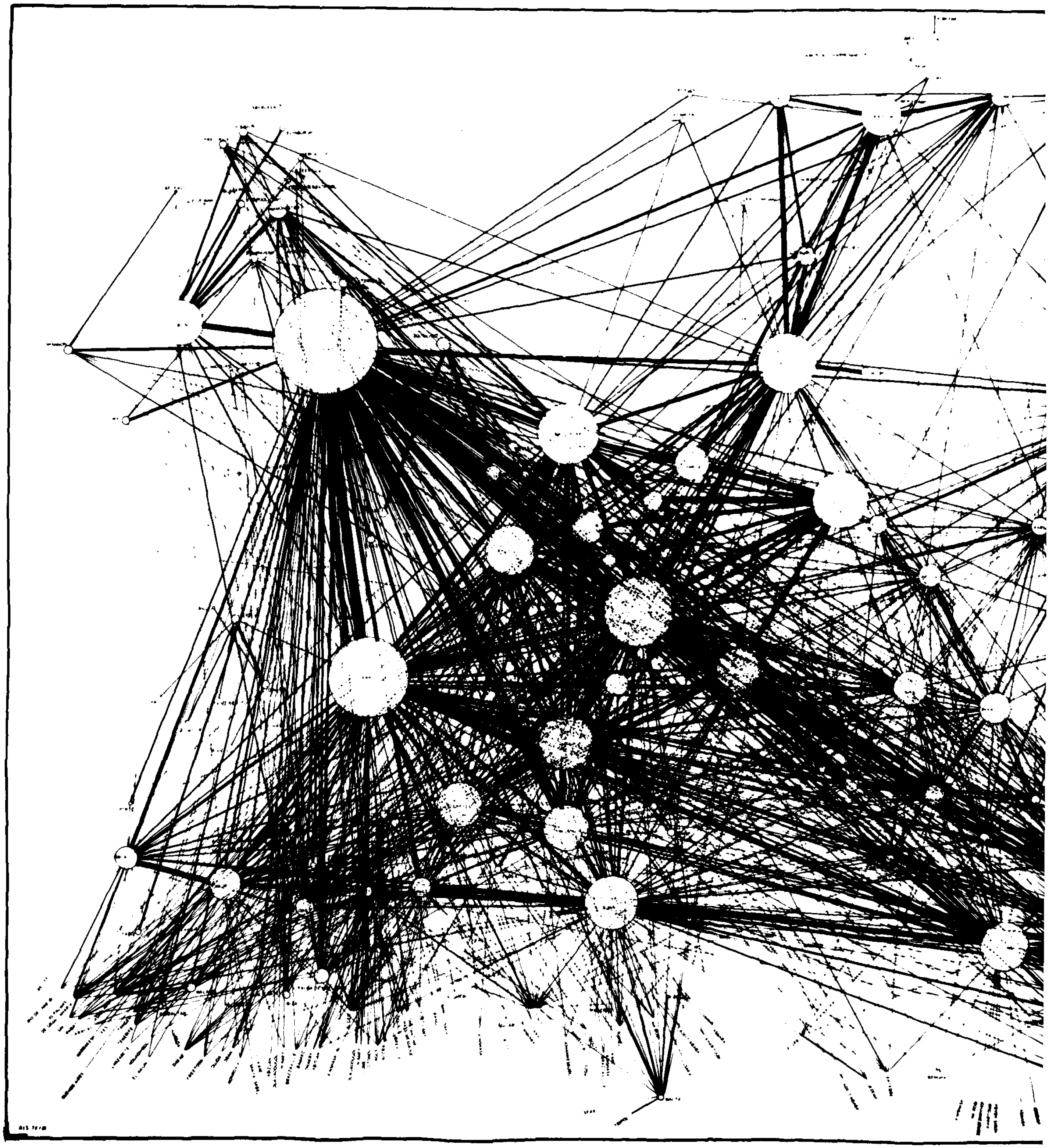
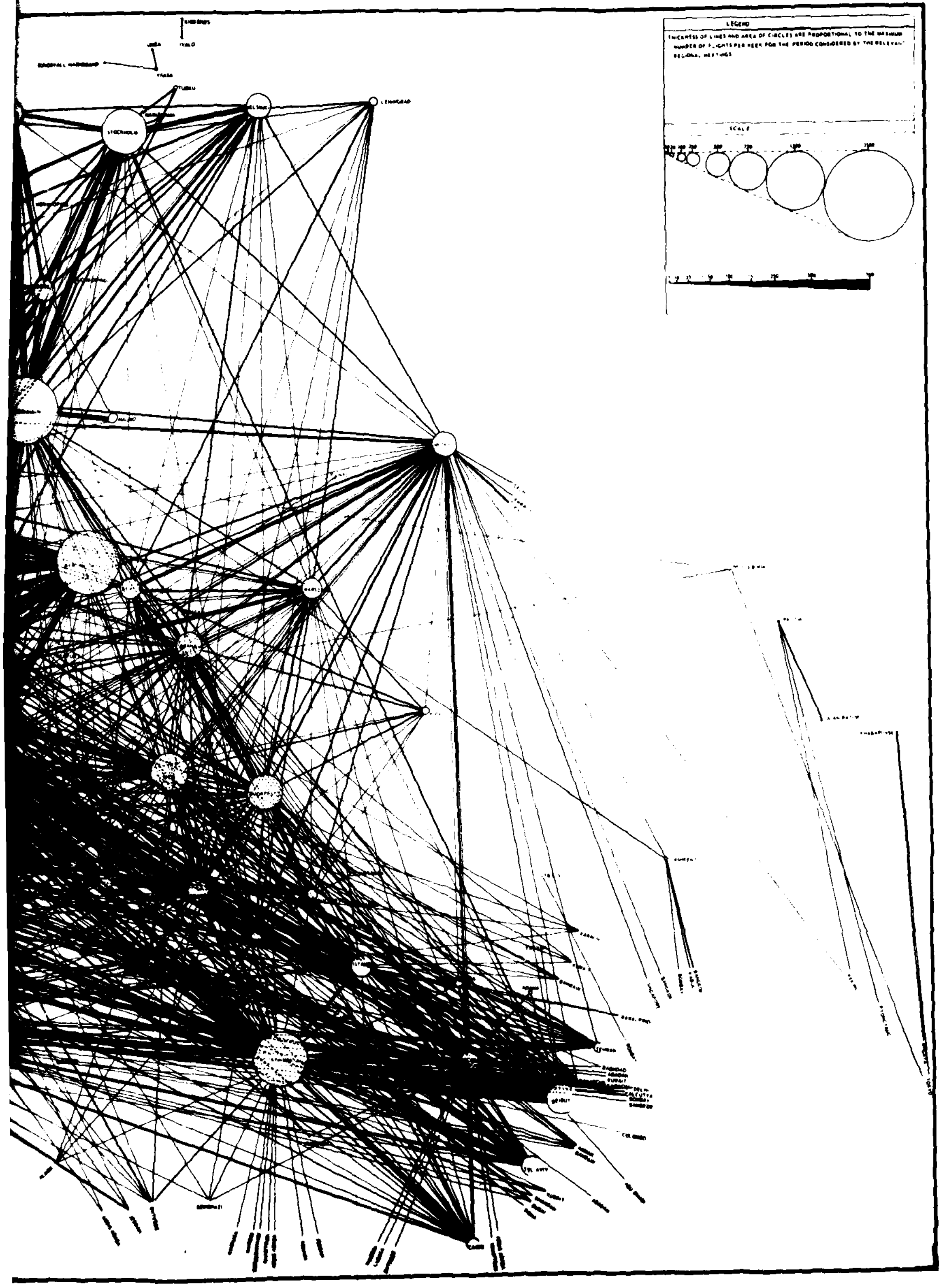


Figure 2-2. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBER OF F



C PATTERNS AND NUMBER OF FLIGHTS PER WEEK - EUROPE

2

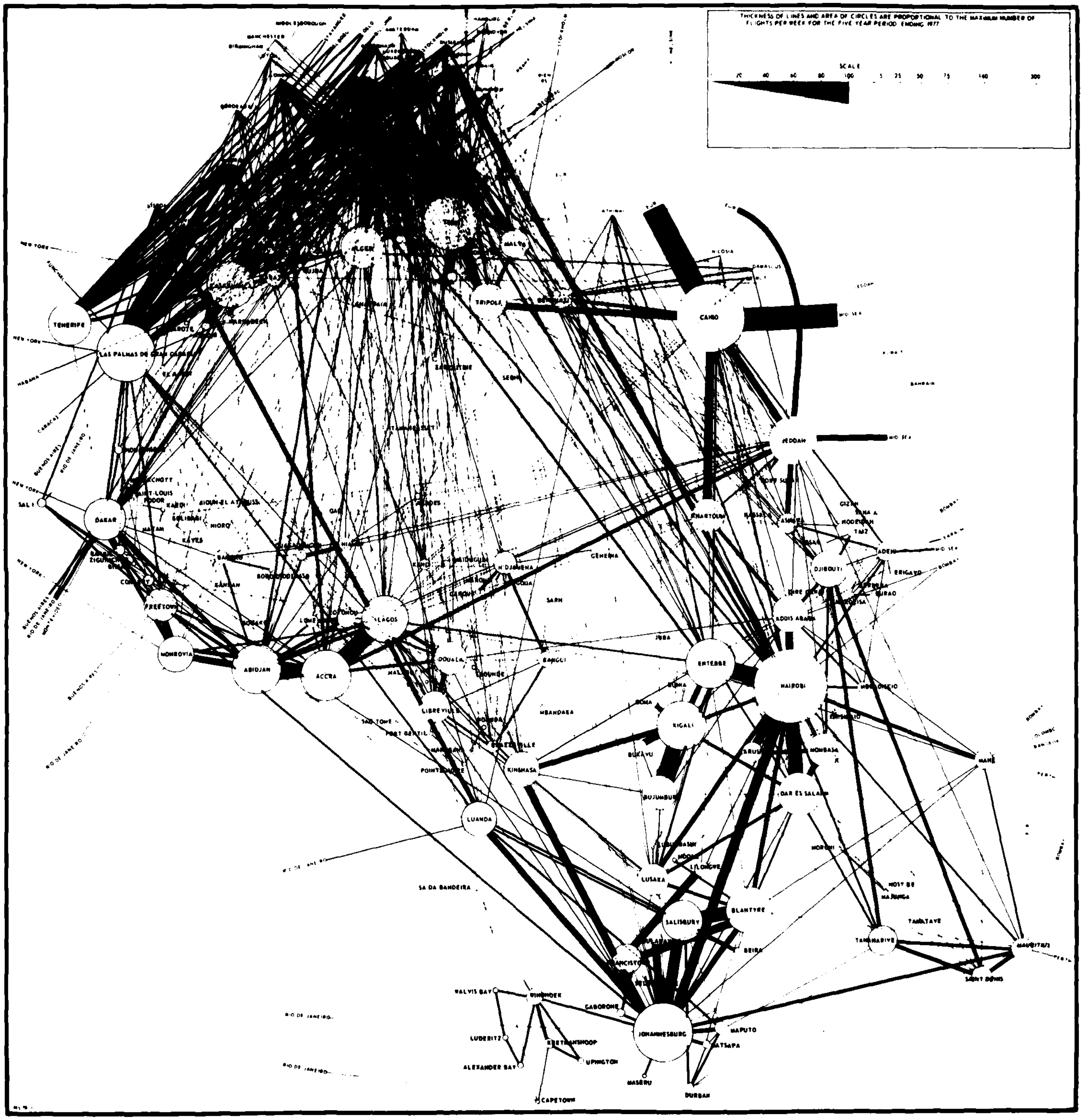


Figure 2-3. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBER OF FLIGHTS PER WEEK - AFRICA AND INDIAN OCEAN

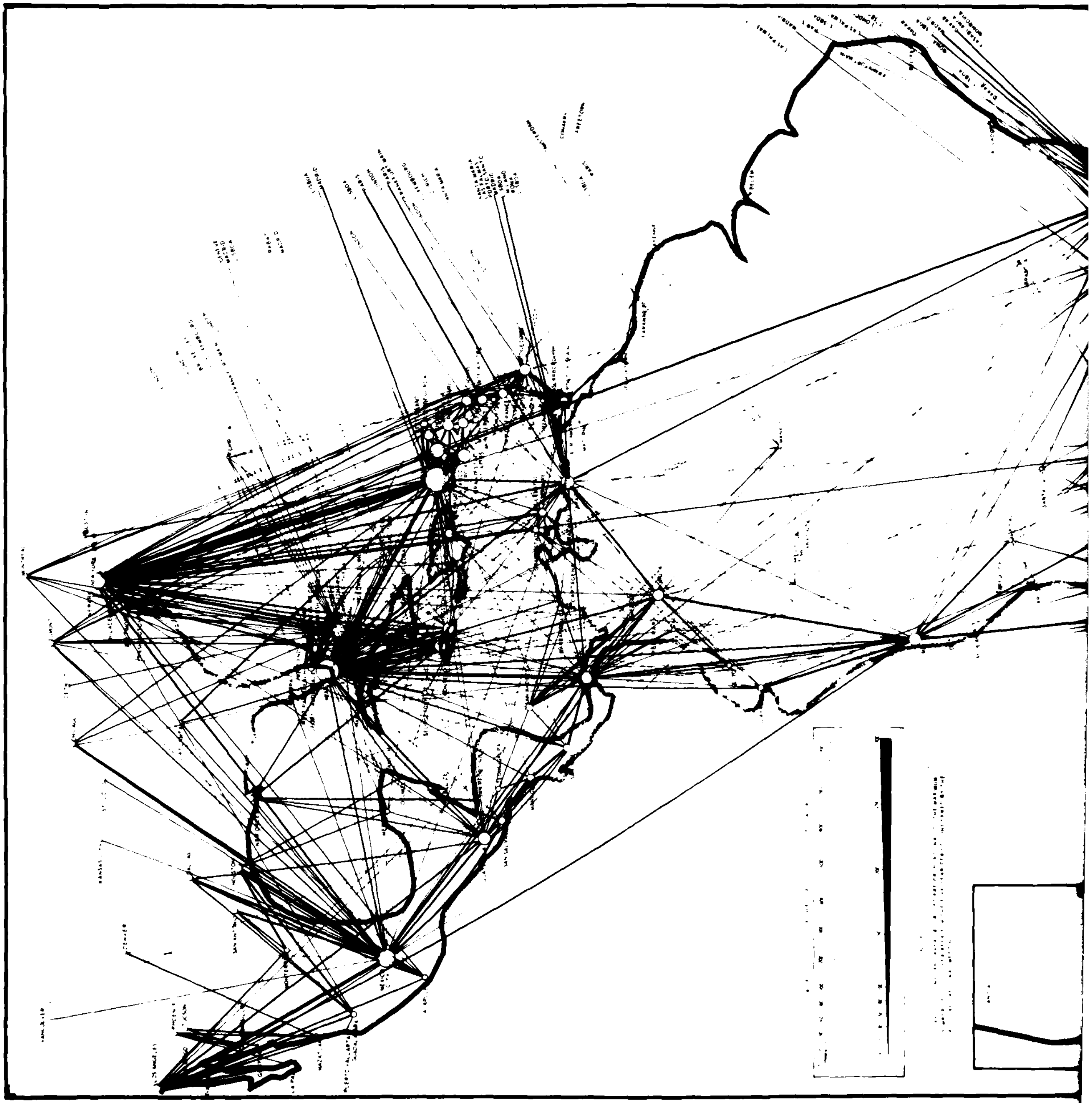
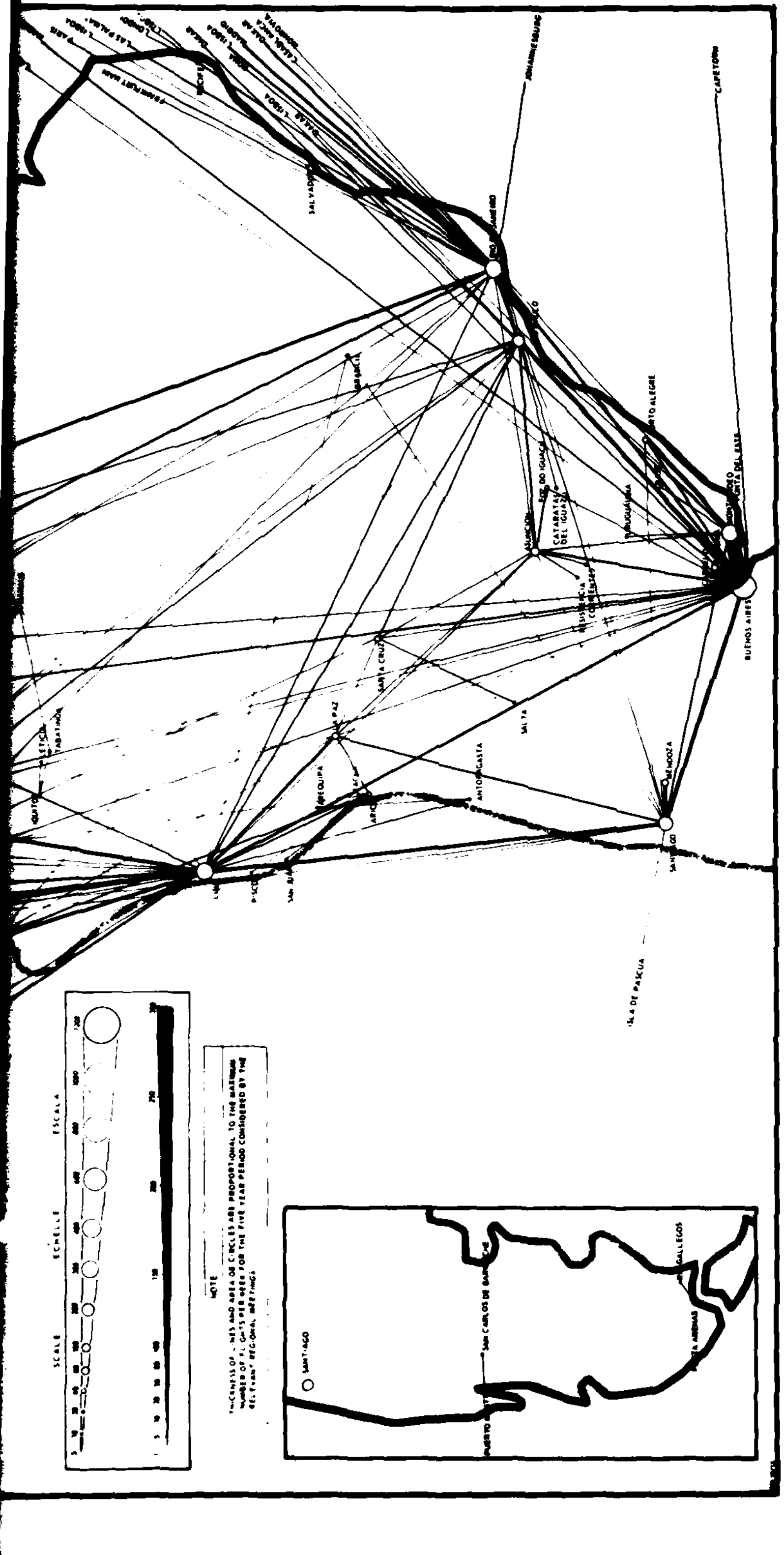


Figure 2-4. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBER OF FLIGHTS PER W
CARIBBEAN AND SOUTH AMERICA



AND NUMBER OF FLIGHTS PER WEEK -
AMERICA

2

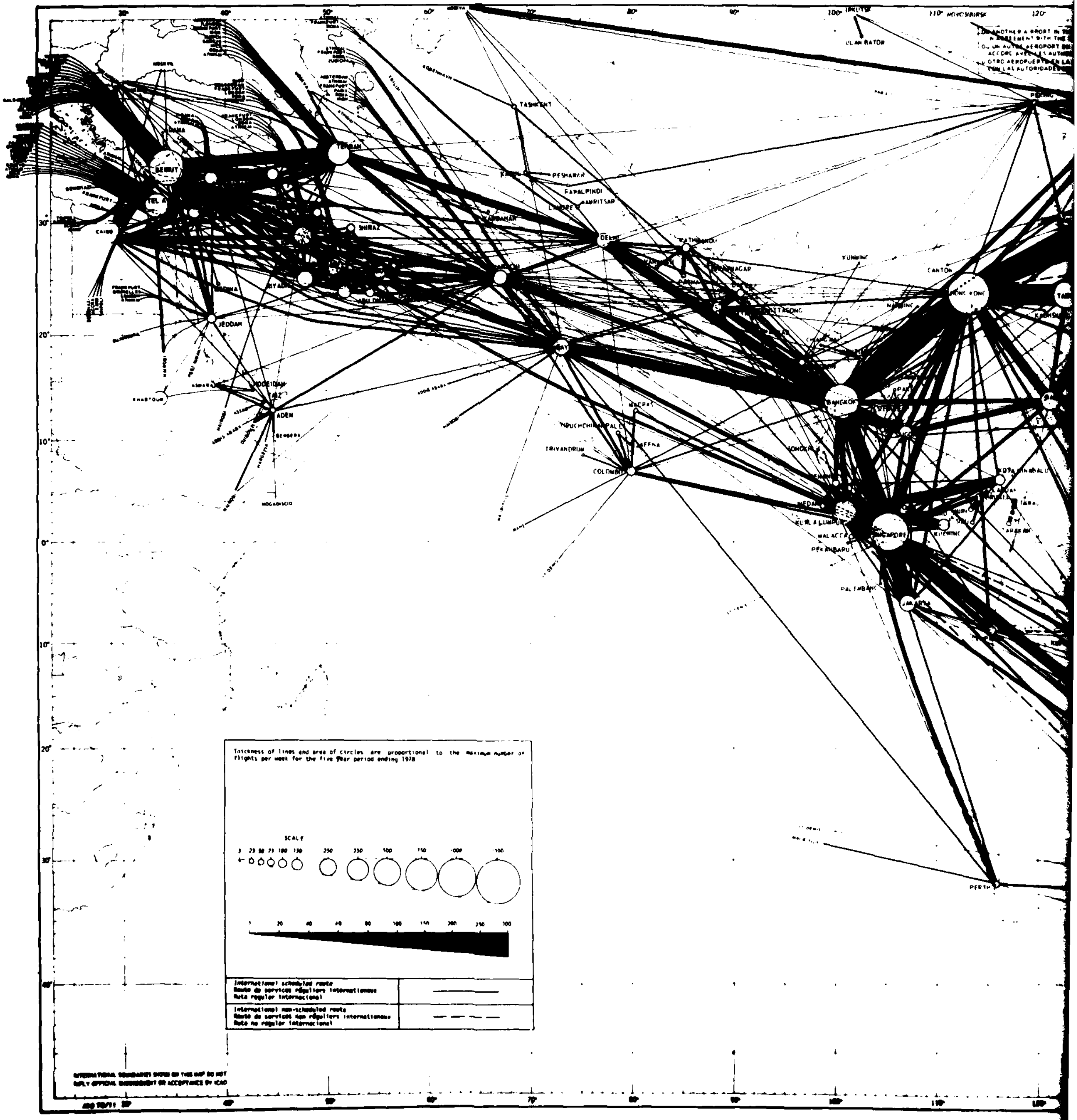
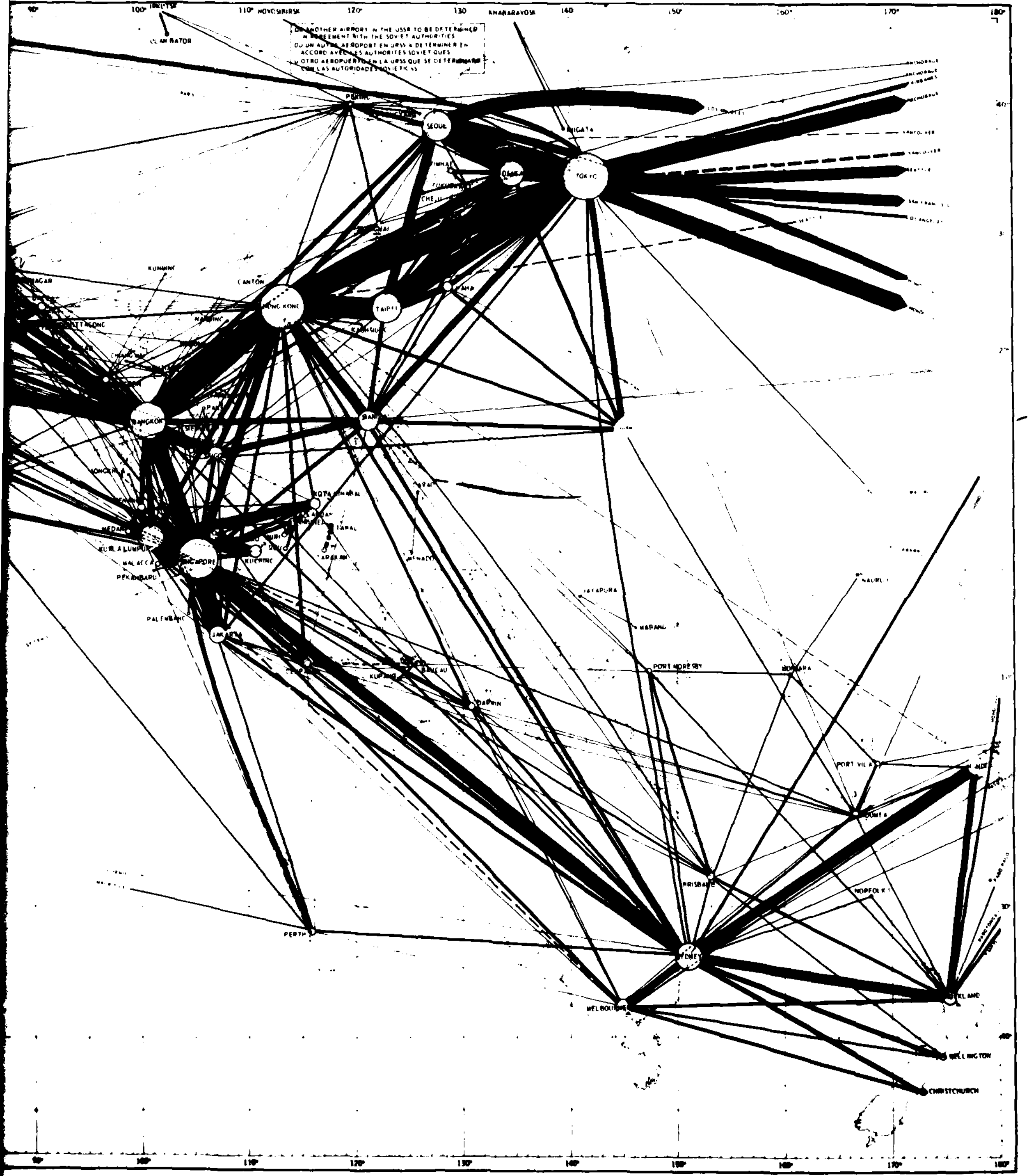


Figure 2-5. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBE
MIDDLE EAST AND SOUTHEAST ASIA



L AIR TRAFFIC PATTERNS AND NUMBER OF FLIGHTS PER WEEK -
IDDLE EAST AND SOUTHEAST ASIA

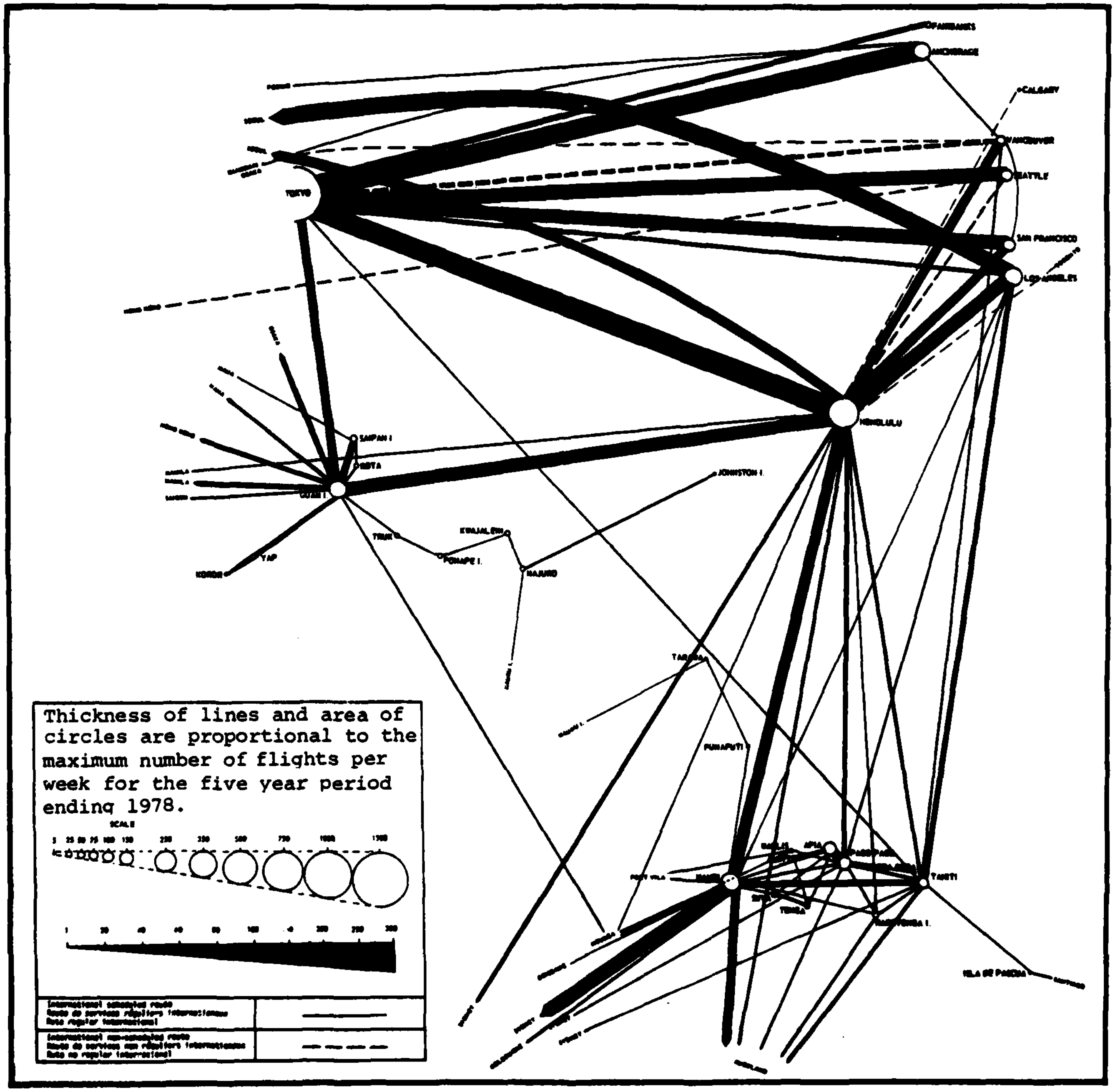


Figure 2-6. INTERNATIONAL AIR TRAFFIC PATTERNS AND NUMBER OF FLIGHTS PER WEEK - PACIFIC

Secretary General ICAO
P.O. Box 400
Succursale: Place de l'Aviation Internationale
1000 Sherbrooke Street West
Montreal, Quebec, Canada H3A 2R2

Ownership

ICAO publishes and documents the ANP and International Aeronautical Telecommunications Standards (known as ANNEX 10 to the Convention). As discussed above, ownership and operation of the facilities is provided by each of the sovereign states. Aircraft, airline companies, and the operating agencies are normally the only authorized users of the AFTN facilities and services.

Type of Service

AFTN fixed and mobile telecommunications service include voice and data for air traffic control (both close-in VHF and long-range HF) weather advisories and administration. Fixed services are provided via landline teletypewriter, radio teletypewriter, voice, and radio telephone. Mobile facilities and services for traffic control, flight information, and radio navigation communications are also provided.

Geographic Coverage

An indication of the AFTN facilities providing global coverage is presented in Figure 2-7. This Figure depicts the major AFTN switching centers and AFTN airport or HF transceiver sites. Solid interconnecting lines indicate communications by landline, cable, VHF, UHF, or SHF. Dashed lines indicate HF or troposcatter teletypewriter. More detailed discussion of AFTN can be found in the individual Air Navigation Plans, copies of which are on file in the ARINC Research WCAN II data base. For illustrative purposes, a portion of an Air Navigation Plan describing the AFTN is presented in Appendix A.

System Availability

Telecommunications availability varies throughout the world depending on traffic patterns. Frequently, in major centers, coverage is continuous. In more remote regions, availability may be limited. Facilities and services described in the ANP are minimum requirements and do not attempt to reflect all of the facilities and services available in particular subscriber states. Publication of these supplemental facilities and services is the responsibility of the individual states.

2.1.1.2 Terminal/Interface Description

Equipment Type

There are as many equipment types in AFTN as there are manufacturers.

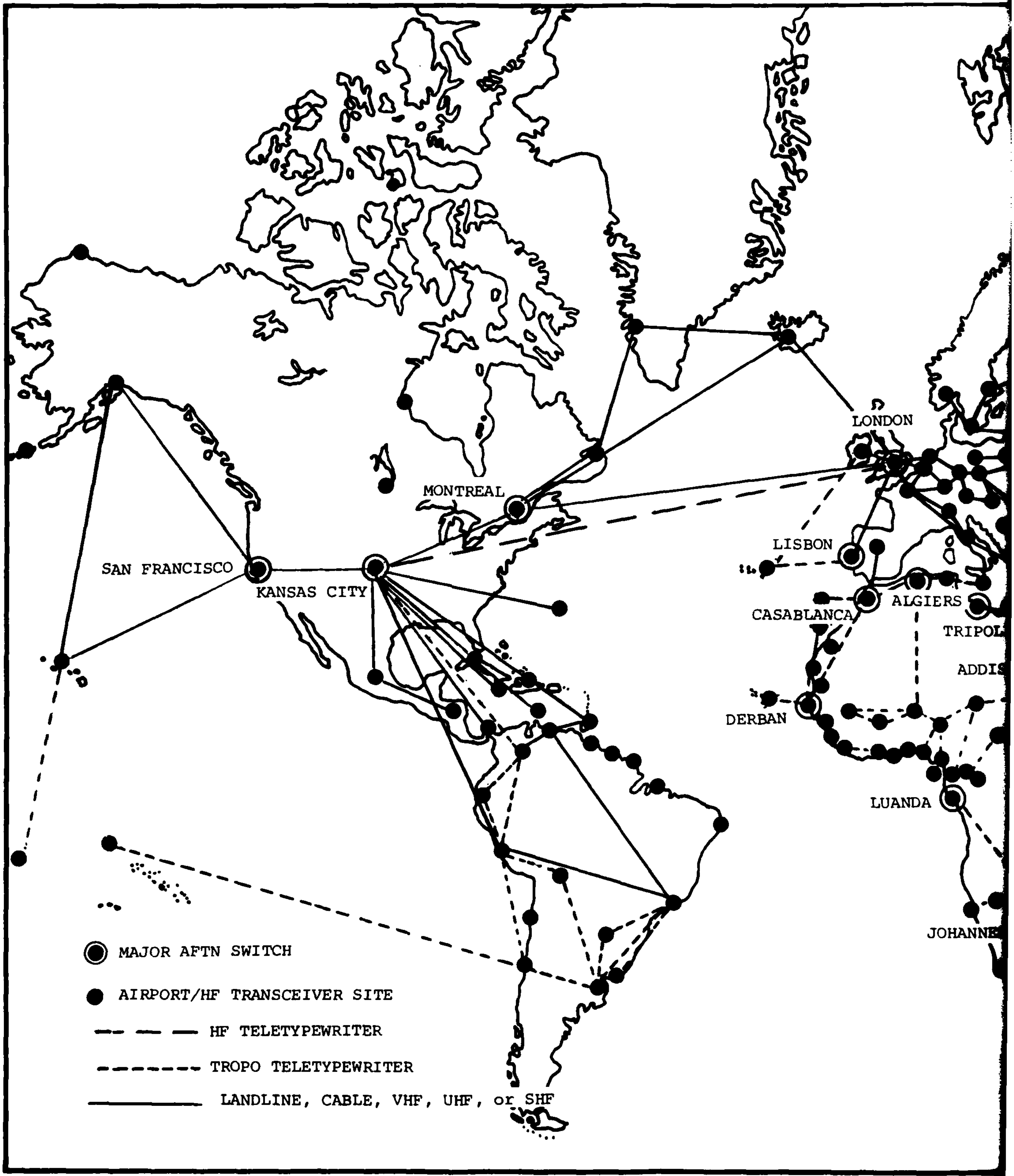
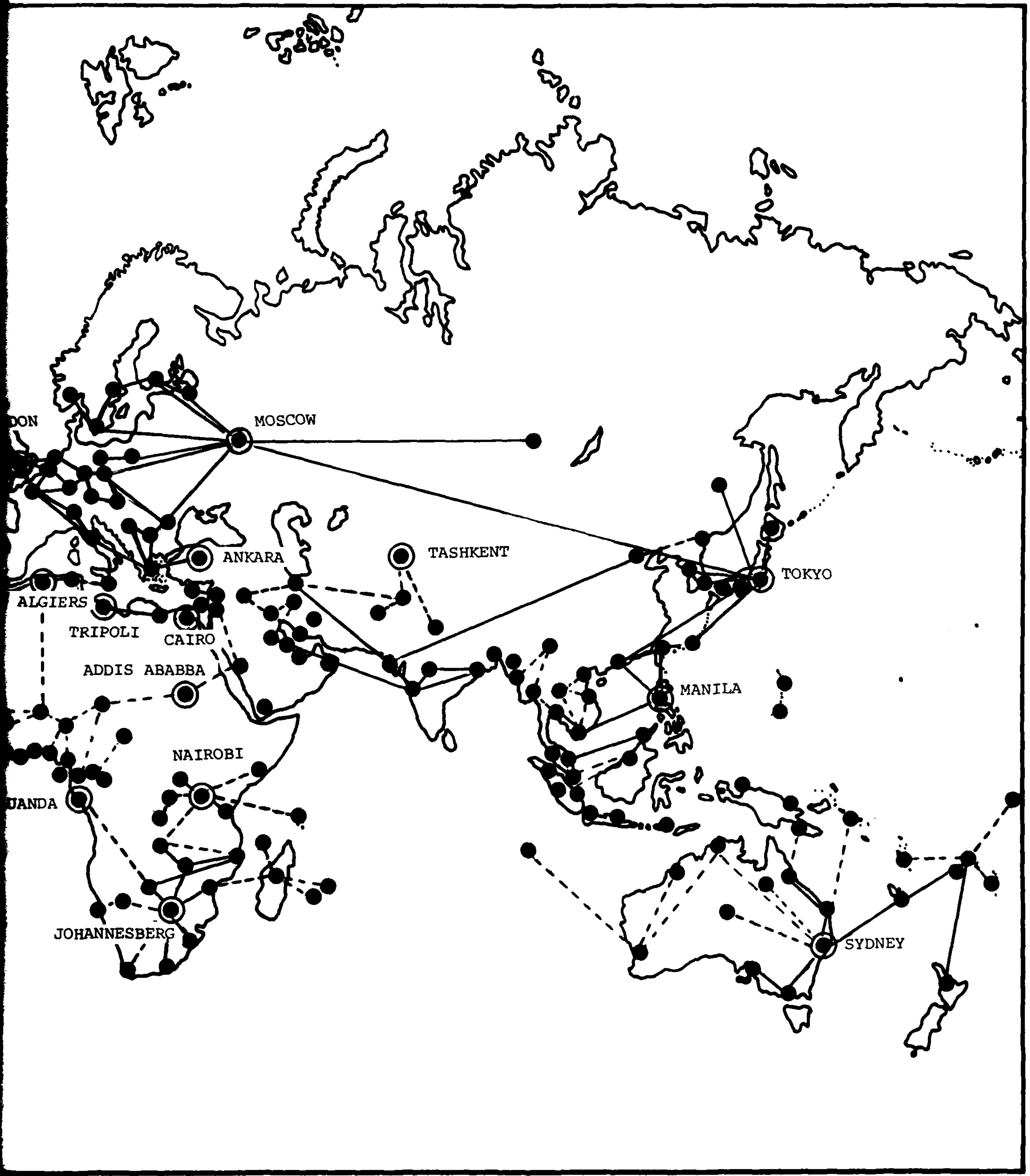


Figure 2-7. AERONAUTICAL FI



AUTICAL FIXED TELECOMMUNICATIONS NETWORK (AFTN)

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There is little standardization of equipment and the only restriction is adequacy to provide the planned service. AFTN system standardization is achieved at major switching centers where automatic conversions permit communication between dissimilar equipments.

Codes

Codes used in the AFTN are dependent on both the type of service and type of equipment provided in different parts of the world. ICAO recommends standard codes for various alternative communications which most users adhere to. Detailed data on these codes is found in Appendix A.

Speeds and Protocols

Transmission speeds and message protocols are recommended in Annex 10 and the Interline Communications Manual published by the International Air Transport Association (IATA). These standards are generally adhered to by the users.

Additional data is to be found in Appendix A and in IATA publication DOC, GEN/1840, a copy of which is on file in the ARINC Research data base.

Terminal Locations

AFTN Terminals are located at virtually all of the world's airports and other airline offices (Refer to Figure 2-7).

2.1.2 Aeronautical Radio, Inc. (ARINC)

2.1.2.1 General Description

Aeronautical Radio, Inc. (ARINC) is a unique organization having no true counterpart elsewhere in the world. Established in 1929, it exists to serve the telecommunications requirements of the air transport industry. ARINC provides a wide range of services to its user organizations including the following:

- Private Network Services
  - Airport Telephone Service (ATS) - Airlines shared telephone PBX switching at airports.
  - Time Assigned Speech Interpolation (TASI) - In its efforts to provide more cost effective telephone communications, ARINC tests and applies state of the art methods such as TASI which will by mid 1980 offer lower cost voice telephone service to the industry.
  - Other Services - ARINC provides 31 airport public address systems, 79 business radio systems and 61 aero-utility

mobile stations operating on airport ramps. In addition, ARINC provides maintenance services for equipments owned and operated by members of the industry.

- Intercity Services
  - Private Line Intercity Network (PLIN) - This is one of the world's largest private voice and data networks with over 23,000 circuits totaling more than 7,000,000 voice channel miles. These circuits support reservation and administrative traffic at 420 PLIN service points interconnecting 1,520 cities.
  - Weather Services - ARINC provides coordination, ordering assistance, and facilities to deliver weather information from government networks to users in support of their flight operations.
- Data Communications Services
  - Electronic Switching System (ESS) - ARINC's ESS, presently centered in Chicago, provides message switching service to the air transport industry. During 1979 the system handled 663 million messages with a peak month total of 60 million messages. There are 304 subscribers with 1,454 terminal stations including 39 computer systems linked to ESS. The ESS is currently being upgraded to a distributed network consisting of nine ESS nodes which will reduce access transmission costs for the industry.
  - International Point-to-Point - This service provides direct access to ESS for a number of the world's air carriers extending from the U.S. mainland to Hawaii, Puerto Rico, Alaska and other locations in the Pacific and Latin America.
  - Private Line Intercity Data Service (PLIDS) - ARINC subdivides voice-grade channels for multi-user data transmission.
- Regulatory/Industry/Government
  - ARINC represents the air transport industry in telecommunications regulatory matters before the FCC and state public utilities commissions. ARINC staff members participate in the work of the Aeronautical Frequency Committee (AFC) and were active participants in the World Administrative Radio Conference (WARC) of the International Telecommunication Union (ITU) as industry representative. ARINC also participates in ICAO in implementing rule changes and in RTCA in studies such as FM

broadcast interference to ILS, VOR and VHF equipment. ARINC chairs the Airlines Electronic Engineering Committee (AEEC) and participates in matters such as: Automatic Flight Control and Auto-Throttle Computers, Automatic Navigation and Fuel Management Computers, Weather Radar, Air Data Computer, ACARS and Voice Communications.

The service most directly related to the WCAN project is the ARINC Air/Ground service. Under the jurisdiction of the Federal Communications Commission (FCC), specific HF and VHF radio frequencies are assigned for air/ground communications. Within the United States, ARINC is the radio licensee for the air transport industry. Thus, if an airline or other corporate entity requires a radio frequency in the bands assigned to the air transport industry, ARINC obtains and holds the license even though that airline or other corporate entity owns and operates the radio facility.

As a part of its air/ground operations, ARINC operates five communications centers at which HF and VHF air/ground frequencies are guarded. All conversations on all of the guarded radio frequencies are recorded on magnetic tapes and retained on file for a month. Thus if an aircraft emergency occurs, a complete record of the related conversations is available to proper authorities. The ARINC voice air/ground communications system has improved technologically since 1929 and improvements continue. At the present time, when an aircraft contacts ARINC, the contact is picked up by a radio transceiver within line-of-sight of the aircraft. The contact is carried over landline to one of five communications centers (Honolulu, San Francisco, Chicago, New York, San Juan) at which point an ARINC radio operator acknowledges the radio contact. At the moment the radio operator receives the contact he places his cathode ray tube (CRT)/keyboard in readiness to copy the conversation in message form. Upon completion of the conversation, the radio operator inserts the message routing information (header) and depresses the send button. The message is received by an electronic switch, the message header is placed automatically in front of the message by the switch and the message is then transmitted to the proper destination.

During any given day, an aircraft may wish to carry on an oral conversation directly with another party such as maintenance or dispatch. Each ARINC operator station is equipped to provide a direct landline voice path to the requested party. Generally, the ARINC operator prepares a copy of the conversation and transmits it as a message to the proper address as described previously. Hard copies of all contact messages are retained on file by ARINC and, with the magnetic tape recordings, are available for review by proper authorities. In those cases where airlines or others associated with the air transport industry operate their own radio facilities, each such operator (on a monthly basis) sends a count of the contacts for each frequency. As licensee, ARINC retains these records and submits periodic usage reports to the FCC.

A new air/ground service offering is the ARINC Communications Addressing and Reporting System (ACARS). As current aircraft are equipped with digital transmission systems and new digital equipped aircraft are joining the fleets, air/ground data transmission is replacing much of the air/ground voice communications contacts. In ACARS a front end processor is interfaced with ESS to control and insure the integrity of the 2400 bps data exchange between aircraft and ground. Thus an ACARS contact is switched automatically by ESS between an aircraft and an airline company computer. It is estimated that as much as 82% of the present total voice contacts will be replaced eventually by ACARS providing the opportunity for new and improved air/ground services.

Ownership

ARINC owns and operates the nationwide and extended range air/ground and ground/ground telecommunications system. ARINC in turn is owned by approximately 130 member airlines. It is a not-for-profit corporation with headquarters in Annapolis, Md. at the following address:

Headquarters: 2551 Riva Road
Annapolis, Maryland 21401
Telephone (301) 266-4000

President: Dr. G.P. Mansur

Authorized users include aircraft operators and designated employees of member airline companies. Any aircraft may access the ARINC air/ground system at any time by simply transmitting on an ARINC guarded frequency.

The tariffs, under which ARINC leases telecommunications facilities, are those filed by the communications common carriers with the FCC and various state public utilities commissions. As a not-for-profic corporation, ARINC, in turn, charges each user for each radio contact at a rate necessary to recover the cost of service.

Type of Services

The ARINC domestic communication channels are used primarily for the handling of company operational control communications as distinct from FAA air traffic service which is on adjacent VHF frequency bands. The ARINC overseas services handle both company operational control and FAA air traffic service communications. All communication flows directly through the ARINC communication center to and from the airline dispatcher, FAA controller, or others directly involved with flight operations. The ARINC Electronic Switching System (ESS) handles the entire message switching requirements for many of the airlines (some airlines have privately owned facilities interfaced with ARINC). In addition, this ARINC information handling and processing facility provides the multiple access interconnection between all airlines for voluminous interline traffic.

ARINC serves the operational communications needs of the air-transport industry via its nationwide VHF air/ground communications network, provides communication service (for the FAA) to aircraft operating over oceanic routes via long-range HF and extended range VHF from ARINC gateway stations, furnishes point-to-point communications via radio and leased wire circuits, and operates one of the largest private electronic message switching and processing systems in existence.

Geographic Coverage

The ARINC geographic coverage is shown in Figure 2-8. As indicated, the HF and extended range VHF system interconnections with AFTN and SITA provide world-wide coverage.

System Availability

The ARINC air/ground and ground/ground systems are available continuously.

2.1.2.2 Terminal/Interface Description

Equipment Types

ARINC equipment represents a number of manufacturers and various technologies from computer controlled automatic and remotely operated systems to some older, manually operated systems. These equipments are maintained and upgraded periodically. Some features of ARINC equipment include the Electronic Switching System (ESS) located at Chicago, and interfaces to AFTN at Kansas City and to the SITA network at New York.

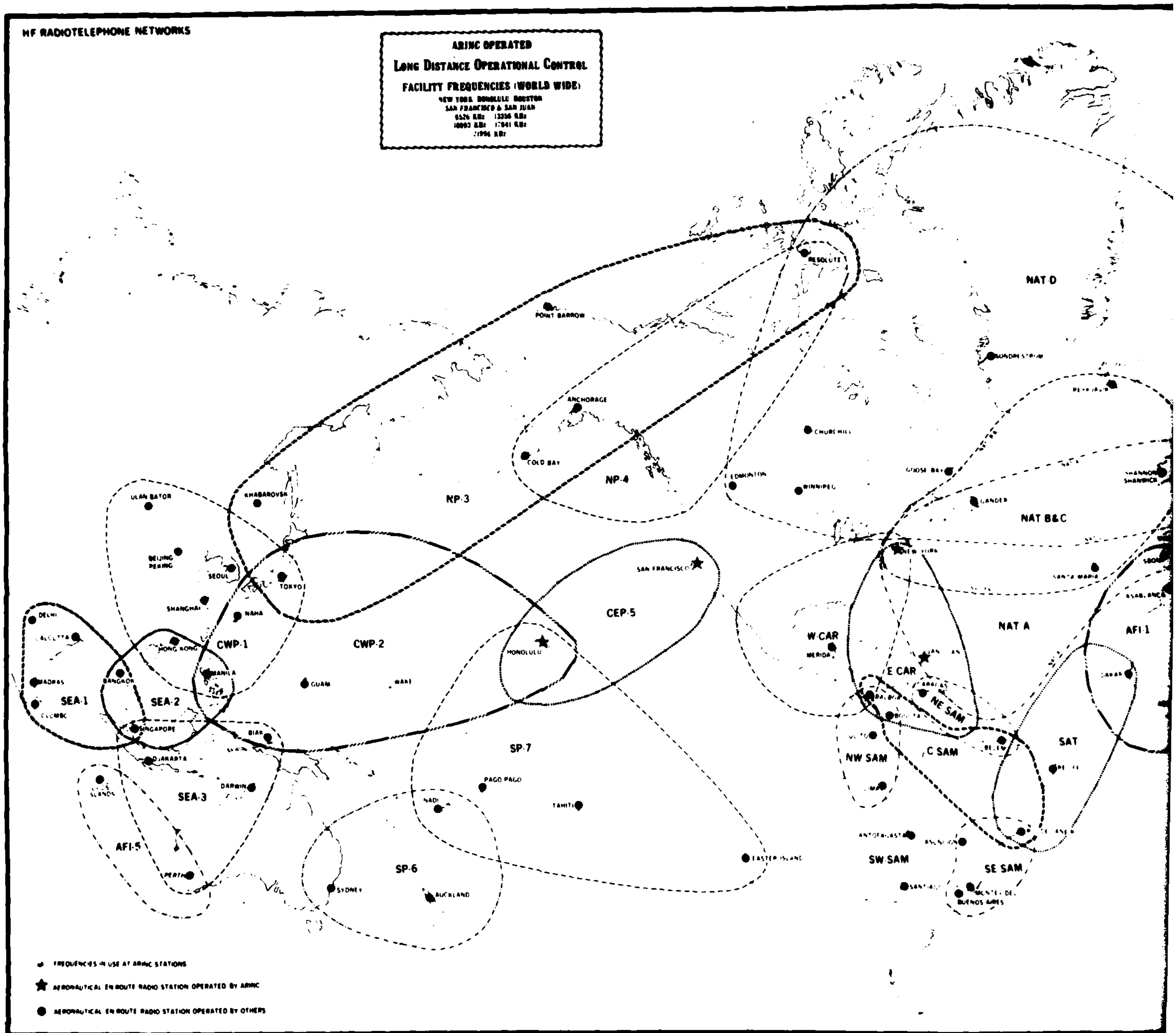
ARINC interfaces to AFTN for HF and extended range VHF coverage at San Francisco, Honolulu, San Juan, and New York. There, "gateway" stations are also operated for the FAA by ARINC (see Figure 2-8). Other electronic terminal and recording equipment used by ARINC is selected to be compatible with aircraft equipment.

Codes

The majority of ARINC record and data transmissions are in ASCII although Bandot is still used in some cases. The Chicago ESS automatically converts codes when necessary to provide system interface.

Speeds and Protocols

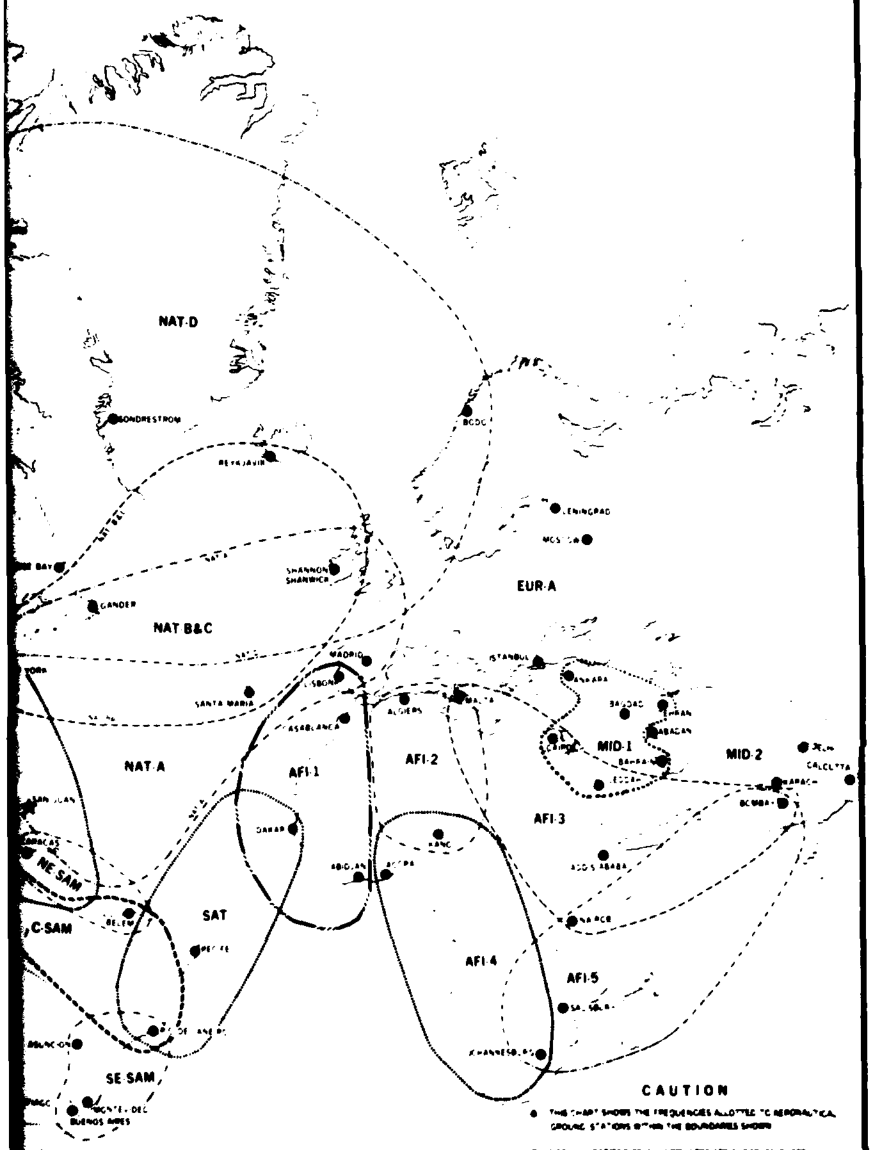
A wide range of speeds are in use by ARINC subscribers dependent



SEA-1	SEA-2	SEA-3	CWP-1&2	NP-3&4	CEP-5	SP-6&7	NW & SW SAM	NE-SE-C SAM	SAT	W-CAR	E-CAR	NAT-A	NAT-B	NAT-C	NAT-D	AFI-1	AFI 2&4	AFI-3	AFI-5
2987	2868	2987	• 2896	2910	3001	• 2945	2889	2910	3432	2966	• 2952	• 2931	• 2987	2945	2868	3432	3411	2966	3481
5673	5624	5673	• 5505	5589	• 3467	• 5638	4696	5582	6610	• 5568	• 5484	• 5610	• 5673	5638	5624	6610	5519	5505	6561
8882	8840	8868	6631	8938	• 5554	• 8847	6666	8847	8882	6561	• 6540	• 8945	• 8889	8854	8910	8882	8826	8959	10025
13288	8868	8854	• 8854	13264	• 5603	•13304	8826	11327	10049	6568	6568	•13328	•13288	13288	13328	13344	13304	13336	13336
17965	13312	13288	•11303	17909	• 8875	•17909	11343	13320	13344	• 8840	• 8959	•17941	• 17941	17941	17941	17925	17925	17925	17925
	17965	17965	•13296		• 8931		17917	17917	17949	•10017	11343								
			•17909		•13312					•13320	• 11367								
					•13336					•17925	•17925								ALL FREQUE
					•17909														

Figure 2-8. ARINC OPERATED LONG DISTANCE OPERATIONAL CONTRO

HF RADIOTELEPHONE NETWORKS



CAUTION

- THIS CHART SHOWS THE FREQUENCIES ALLOTTED TO AERONAUTICAL GROUND STATIONS WITHIN THE BOUNDARIES SHOWN
- NOT ALL STATIONS OR ALL NETWORKS ARE SHOWN ON THESE DIAGRAMS
- NOT ALL FREQUENCIES LISTED ARE IMPLEMENTED AT ALL STATIONS
- ICAO REGIONAL AIR NAVIGATION PLANS SHOULD BE REFERRED TO FOR ADDITIONAL DETAILS
- CURRENT OPERATIONAL DATA MUST BE OBTAINED FROM AERONAUTICAL CHARTS AND NOTAMS

AFI - 2 & 4	AFI-3	AFI-5	EUR-A	MID-1	MID-2	LDOCF
3411	2966	3481	2910	3404	3446	• 6526
5519	5505	6561	4689	5603	6624	• 10093
8826	8959	10025	6582	8847	10009	• 13356
13304	13336	13336	8875	13336	13336	• 17941
17925	17925	17925	11303			• 21996

ALL FREQUENCIES ARE EXPRESSED IN KILOHERTZ

ICAO HIGH FREQUENCY EN-ROUTE RADIOTELEPHONY NETWORKS

SERVING THE MAJOR WORLD AIR ROUTE AREAS [illegible]

EFFECTIVE 1300Z
NOV. 30, 1978

AERONAUTICAL RADIO INC
2551 Riva Road
Annapolis, Md. 21401

OPERATIONAL CONTROL

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upon individual requirements. Speeds in use include 75, 110, 1050, 1200, 2400 and 4800 bps. The system is capable of operating at 9600 bps should that requirement develop.

Several different protocols are in use on the ARINC system dependent upon the service requirements, code, and speed. Multi drop circuits at 75 baud use the 83B protocol and at 1050 bps the 81A protocol. High speed processor to processor protocols vary by subscriber. Transmissions between ARINC and AFTN are sent without protocol so that after message receipt, both systems apply their own protocol to the message for onward transmission.

Terminal Locations

ARINC Communications Centers are located in Honolulu, HA, San Mateo, CA (San Francisco), Elkgrove Village, IL (Chicago), Bohemia, NY (New York) and San Juan, PR. Terminals are located at all airports and at airline corporate offices including directly connected locations in Australia, British West Indies, Canada, Great Britian, Mexico, etc.

Appendix B to this report contains listings and diagrams of ARINC frequencies, geographic coverage, technical locations, and operating personnel.

2.1.3 Societe Internationale de Telecommunications Aeronautiques (SITA)

2.1.3.1 General Description

SITA is a cooperative body formed in order to offer terrestrial telecommunications and related services to the community of world-wide scheduled airlines -- some 226 companies as of 31 December 1978.

The following are locations of SITA officials:

Registered Office: 16, Avenue Henri-Matisse
Brussels, Belgium

Administrative Head Office: 112 Avenue Charles de Gaulle
92522 Nevilly-Sur-Seine
Paris, France
Telephone: 758.13.22

Director General: C.J. LaLanne, Paris

North American Headquarters: 38th Floor, 500 Fifth Avenue
New York, New York 10036
Telephone: (212) 221-6111
H.W. Burt, Superintendent of Operations

Ownership

SITA is essentially owned by its member organizations. Authorized SITA users are limited to employees of member airlines and designated SITA operators. Since the majority of SITA circuits are leased land-line circuits, they are subject to the tariffs applicable in each country where service is provided. SITA has a protected tariff structure based on negotiations with the country(s) in which terminals are located. Costs are billed to the airlines on a percentage of use basis.

Type of Services

SITA provides telecommunications, voice, telex, data, and support services in four categories, as follows:

Category 1 - Communications Services - Traditional SITA telecommunications (reservations, traffic, administrative, etc.) and planned developments such as VHF air-to-ground voice and digital data links (not yet implemented).

Category 2 - Data Processing Services - Those that are cooperative in nature, have a primary interest for the entire airline community, and depend upon interline communications (such as inter-airline ticket services).

Category 3 - Other Data Processing - Utilized by groups of SITA members, not necessarily the entire airline community, for region-wide purposes.

Category 4 - Support Activity - Of interest to airlines but also to be provided to third parties on a profit-making basis (e.g. maintenance).

SITA networks are described as Type A (Inquiry-Response type traffic, protected or unprotected, requiring immediate transmission/ delivery in six seconds or less and Type B (Protected Message Exchange between airlines of slower handling priority).

Geographic Coverage

In as much as SITA serves virtually every foreign airport (and many airline business offices), the geographic coverage is world wide. All U.S. airlines have domestic access to SITA via ARINC which interconnects with SITA in New York, N.Y.

Network Availability

Network availability is continuous at major (high level) centers and may vary in other regions usually as a function of the volume of air traffic in that region.

2.1.3.2 Terminal/Interface Description

Equipment Type

SITA equipment consists of a large variety from almost every known manufacturer. This wide disparity in equipment types has been the source of some problems for SITA reflected in recent modernization and upgrading programs. In general, the network is made up of reservation computer systems, remote processor systems, switching computer systems (similar to the ARINC ESS), and both manual teletypewriters and automatic data terminals. As a result of the large variety of equipments, there are a large variety of circuit interfaces which ultimately connect to switches by which dissimilar terminals can intercommunicate.

Codes

All SITA transmission codes must comply with IATA and ICAO standards including international Baudot and ASCII.

Speeds and Protocols

Transmission speeds vary from 50 to 75 baud for teletypewriter service and up to 9600 bps for data transmission. High level centers operate at both 4800 and 9600 bps while medium level or regional centers operate at one or more of 2400, 4800, and 9600 bps.

Terminal Locations

Both type A and B networks, described previously, are interconnected through nine major switching centers located at:

Amsterdam, Netherlands
Beirut, Lebanon
Frankfurt, Germany
Hong Kong, British Crown Colony
London, United Kingdom
Madrid, Spain
New York, New York, USA
Paris, France
Rome, Italy

Terminals are located in 117 countries (including NATO countries) with a total of 144 countries capable of accessing the networks through public connection or dedicated facilities. Figure 2-9 shows the switching locations and the primary interconnecting circuits of SITA

Appendix C to this report provides further details of SITA services and locations. This Appendix contains excerpts of the SITA Telecommunications Manual and is limited to only those pages on which NATO countries are listed. It should be noted that any NATO air carrier has direct communications to its office from each of the 117 countries served by SITA.

2.1.4 Federal Aviation Administration (FAA)

2.1.4.1 General Description

Ownership

The FAA is an agency of the U.S. Department of Transportation dedicated to regulating the safety and quality of aviation facilities and services within their assigned region - the 50 United States. Headquarters for the FAA is in Washington, D.C. but there are a large number of regional and field facilities. With respect to commercial aviation telecommunications, FAA is responsible for the Aeronautical Fixed

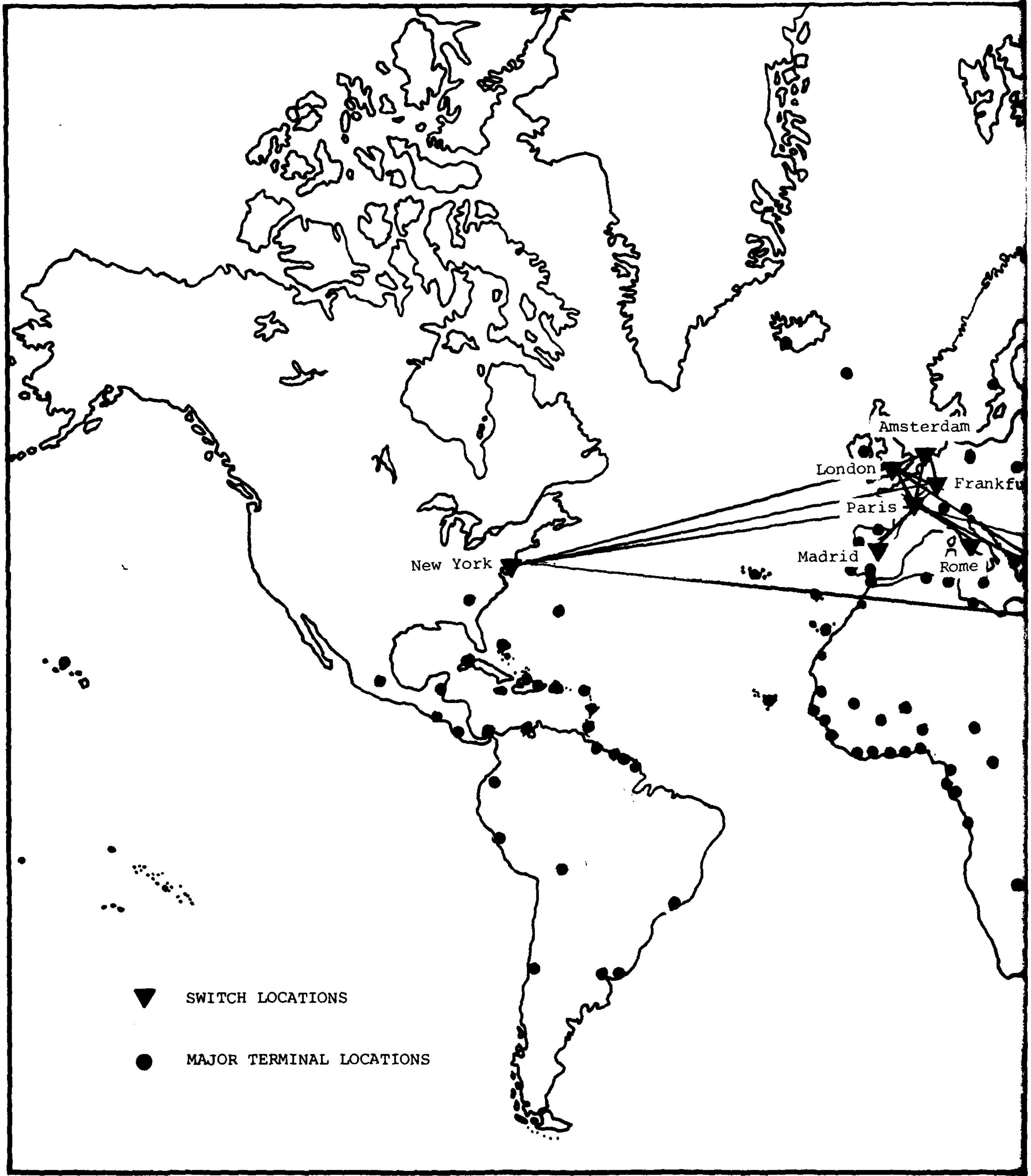
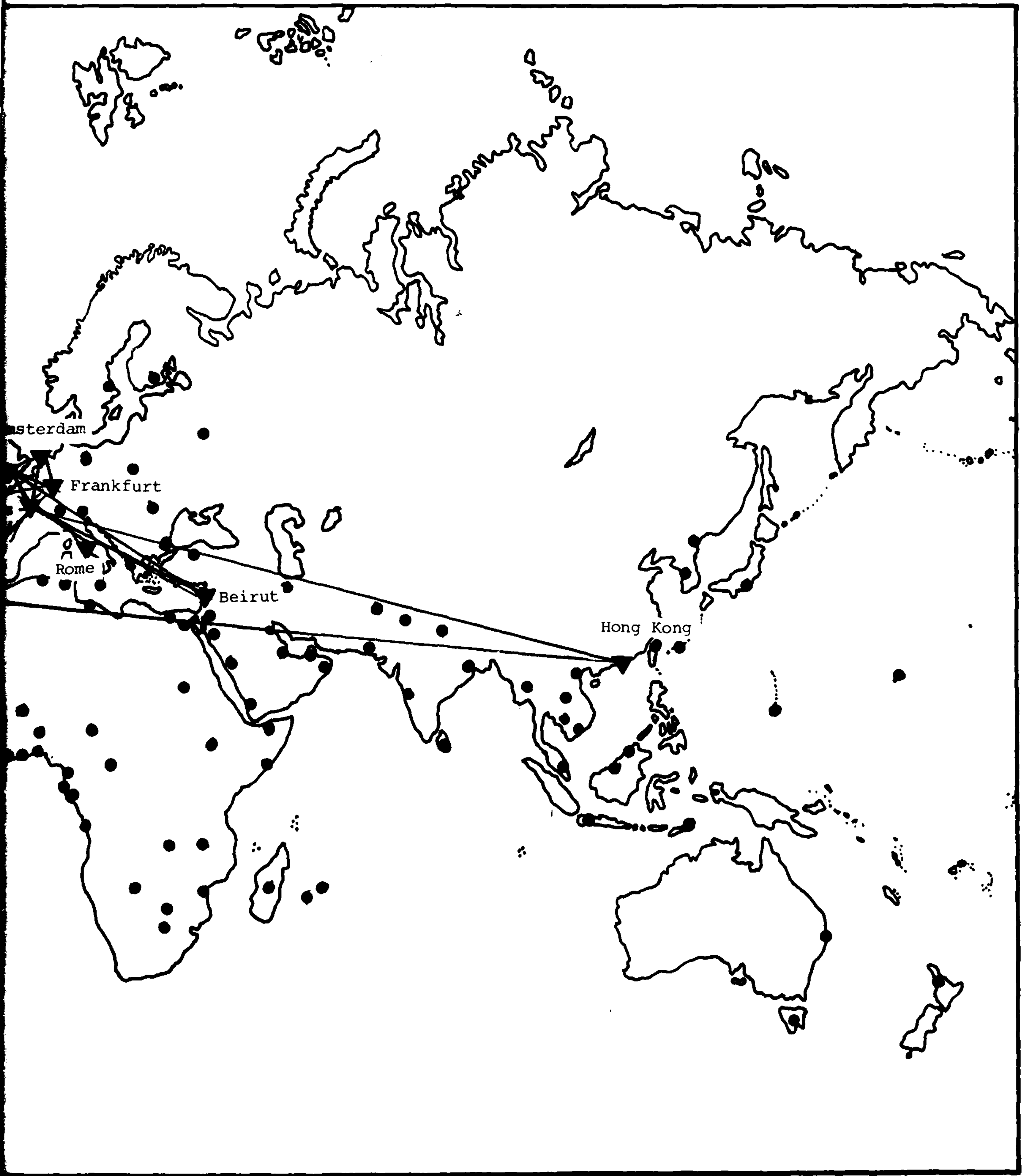


Figure 2-9. SITA INTERSWITCH NETWORK



ITCH NETWORK AND MAJOR TERMINAL LOCATIONS

Telecommunications Network (AFTN) in the U.S. (refer to Section 2.1.1).

Type of Services

The FAA provides a number of domestic communications services, some as an adjunct to AFTN and others related specifically to FAA operations. Various networks and facilities operated by the FAA are as follows:

- Aeronautical Fixed Telecommunications Network
- Air-To-Ground (Service F)
- Ground-To-Ground (Service F)
- Remote Link Services
- Weather Network
- Service B Network
- Computer B Network
- National Flight Data Center (NFDC)
- Air Traffic Control System Command Center (ATCSCC)
- Administration Networks

A more detailed description of each of these services is presented in the following paragraphs:

- Aeronautical Fixed Telecommunications Network (AFTN)

As discussed earlier in Section 2.1.1, the AFTN is an integrated worldwide system that provides communications service for international aircraft movements, administrative messages, and operational meterological data between the U.S. and other International Civil Aviation Organization (ICAO) states. Each ICAO member has certain responsibilities to provide service to the AFTN. The FAA provides service to the AFTN through data-switching centers and circuits in its geographical area of responsibility. These circuits are all low-speed circuits leased from both domestic and international record carriers. These circuits are connected to a large FAA owned and operated message-switching processor located at Kansas City. This processor, a Philips DS714, is similar to the processor used for the FAA's Weather Network. There are a variety of low-speed terminals in the FAA AFTN, the most common of which is the Teletype Model 28.

- Air-To-Ground (Service F)

The air-to-ground (Service F) communications subsystem supports the requirements for communicating with aircraft during all phases of flight, from initial taxi and takeoff, through the enroute portion of the flight, to the final approach, landing, and taxi at the destination. Communications are accomplished by means of VHF air/ground radio for civilian aircraft and UHF air/ground radio for military aircraft. At present, all controller/pilot air/ground communications are accomplished by means of voice transmission on discrete radio frequencies or channels assigned to each geographical sector. All such transmissions operate on a party-line basis between the controller and a number of aircraft in the geographical sector under consideration. Each aircraft within line-of-sight can monitor all communications between the controller and other aircraft on the same channel. All air/ground communications involve VHF/UHF transmitter-receiver units located in both the aircraft and the ground facility.

Air/ground communications can be subdivided into three functional areas: (1) enroute communications systems encompass those used by the Air Route Traffic Control Centers (ARTCC) for controller/pilot communication. They include air/ground (VHF or UHF) transmitting and receiving equipment which is usually located at some distance from the ARTCC and connected to the ARTCC by dedicated commercial telephone lines. These remote sites, called Remote Center Air/Ground (RCAG) communications facilities, house all the transmitting and receiving equipment necessary for multiple radio channels. Since air/ground communications is a critical function in the overall FAA mission, there is a back-up emergency communications system for use in the event of a failure in the normal system. The air/ground facilities for this system are located at long-range radar sites.

The second air/ground functional area is terminal communications; controller/pilot communications during the take-off/departure and approach/landing portion of aircraft flights. This communications function is implemented by air/ground radios at Remote Transmitter/ Receiver (RTR) facilities that are similar to RCAGs but are located comparatively close to terminal facilities (such as airports) and connected to the controlling facilities by dedicated telephone lines. In many cases, where the distance between the controller facility and the RTR is small, FAA-owned telephone cables are used in lieu of commercial telephone services.

The third air/ground functional area, support communications, includes all air/ground communications supporting both the Flight Service Stations (FSS) and non-towered airports. Air-to-ground communications to serve this category are implemented over a rather broad range of facilities. In some cases, RTRs are used in the same manner as with the terminal communications. In other cases, the communications facilities range from remote communications outlets (RCO) and single-frequency outlets (SFO) to voice modulation of a navigational aid such as a VHF omnidirectional range (VOR) or a nondirectional beacon.

- Ground-To-Ground (Service F)

The ground-to-ground (Service F) network, sometimes known as the Interphone/Intercom Network, includes all ground point-to-point voice circuitry. It is used primarily by controllers to coordinate flight movements. Ancillary functions of the ground/ground network provide miscellaneous services such as Pilot's Automatic Telephone Weather Answering Service (PATWAS), Flight Assistance Service (FAS), and other services associated with the filing and processing of flight plans. Practically all of the information that flows over the ground/ground network is time-critical, requiring real-time transmission feedback. Otherwise, communications would normally flow over the data communications networks (record communications networks) such as the Service B network (discussed later).

Circuits in the ground-to-ground network consist almost exclusively of leased commercial point-to-point telephone lines that connect Air Route Traffic Control Centers (ARTCCs), Terminal Radar Approach Control (TRACON) facilities, control towers, Flight Service Stations (FSSs), and other facilities where there is a need for flight plan processing, transmission, or servicing. In addition, there are lines connecting these facilities with national facilities such as the Air Traffic Control Systems Command Center (ATCSCC). Most lines are terminated at operating positions in telephone switching systems (again, leased commercial equipment) specially designed for the FAA. This equipment, predominantly the Western Electric Company Model 300 or 301 switching system, is similar to a standard key telephone system such as the Bell System Model 1A1 and terminates up to 72 lines at any given position. Some push buttons of this system connect directly (direct access) to other positions; the balance connect to dial access lines (indirect access). The Bell 300 switching system has special circuit-override functions built into it so that for a higher-priority (or emergency) condition, an existing connection can be broken into.

Most of the full-period point-to-point leased lines at FSSs, towers, and TRACONs are also terminated in Bell System key telephone equipment similar to the model 1A1 system. Some FSSs and International Flight Service Stations (IFSSs) have Automatic Call Distributor telephone systems to distribute the incoming-call load equally among several FSS specialists.

- Remote Link Services

The Remote Link Service includes all radio links that are used to transfer information from one fixed point to another where normal commercial telephone service is neither available nor suitable. This category of service consists primarily of the Remote Microwave Links (RML) and the UHF/VHF links. The RML links are used to transmit long-range radar video signals (in either analog or digital form) to ARTCCs and control towers from their respective radars. The UHF/VHF links are used primarily to transfer voice on low-speed data channels a short distance where commercial telephone service is not available. A typical example is the use of a UHF/VHF link to connect a remote weather monitoring station to the nearest telephone service or to the nearest FAA facility. Both the RMLs and the UHF/VHF links are limited to line-of-sight transmission. There is also a smaller number of tropospheric scatter (TROPO) radio facilities used to transfer information beyond the horizon. These facilities are used primarily in locations outside the continental United States.

Each Air Route Traffic Control Center (ARTCC) is served by as many as eight Air Route Surveillance Radars (ARSR) geographically dispersed throughout the ARTCC area in such a way that almost complete radar coverage is possible. The Remote Microwave Links (RMLs) relay the wideband radar video signals from these widely dispersed ARSR sites to the ARTCC, where it is processed and displayed for the traffic controller. Generally, these ARSR sites are so far from the ARTCC that ten or more microwave relay stations (or hops) are used in tandem. With the advent of NAS Stage A automation, radar video signals are now digitized at the ARSR site before transmission, but the RML system is still used for transmission of the analog radar video as a backup in case of failure of the digital system. The digitized radar video is also sent over commercial telephone company transmission systems. The RML system is physically implemented with S-band microwave radio, which is frequency-modulated (FM) to carry the required information. The UHF/VHF remote links are used primarily to carry a small number of discrete voice or data channels where commercial telephone service is either not available or suitable. These links are primarily implemented by combining the AM, PM, or FM output of the radios, using additional modulation in any multiplixing equipment that is required.

- Weather Network

The Weather Network consists primarily of a series of leased low- and medium-speed data communications lines and terminals that are connected by one large store-and-forward data communications computer located at the Weather Message Switching Center (WMSC) in Kansas City, Missouri. This network represents the combination of the old Service A, C, and O weather networks. The Weather Network serves to collect and distribute weather observations, forecasts, and Notices to Airmen (NOTAMS) to FSSs, ARTCCs, airline offices, and other users.

Most of the terminals of the Weather Network are low-speed Baudot teletypewriter terminals, although, as a result of a modernization program, an increasing number are being converted to medium-speed ASCII terminals. Virtually all of the data lines are leased from commercial common carriers. The WMSC in Kansas City is a Philips DS714 data-communications switch owned and operated by the FAA.

- Service B Network

The Service B Network comprises a group of area and nationwide sub-networks that are used for a variety of record-communications functions, both operational and administrative: (1) the Area B Data Interchange System (BDIS), (2) the Center B network, and (3) the Utility B network. Each is a polled network devoted to a specific type of message function in the general category of flight plans or information related to the safe and expeditious control of flight movements. These three sub-networks are composed of leased full-period, low-, medium- and high-speed data circuits; data terminal equipments, most of which are owned; and a small number of data-switching centers, which are all FAA-owned.

The Area B Data Interchange System (BDIS) consists of a series of low-speed polled networks, each serving an area roughly corresponding to an ARTCC area of responsibility. These low-speed networks terminate at FSSs, control towers, and ARTCCs. They are all interconnected to a single medium-speed transcontinental circuit through a low- to medium-speed reperforator and switch. Record communications can therefore flow within the ARTCC area via the low-speed sub-network or from one ARTCC area to another via the medium-speed transcontinental circuit. A master Area B Data Interchange Network controller is located at the National Communications Center (NATCOM) in Kansas City.

The Center B network is a low-speed network that interconnects all of the ARTCCs. It is controlled by an automatic low-speed switch at the NATCOM switching center.

The Utility B network is a series of small low-speed sub-networks or lines that connect high-volume military or commercial-carrier users to their respective ARTCCs. These independent networks are used to transmit IFR flight plans to ARTCCs for insertion into the Air Traffic Control (ATC) system. After the flight plan has been transmitted to the associated ARTCC, it is disseminated to other points as necessary via other record communications networks.

- Computer B Network

The Computer B Network is a medium-speed network used to interconnect the NAS Stage A computers at the ARTCCs, the Automated Terminal Radar System (ARTS) computers at the terminals, and the Flight Data Entry Printout (FDEP) data terminals. This network transfers information between NAS Stage A computers as a flight progresses from one ARTCC area to another, and between the enroute computer and the ARTS computer as an aircraft approaches or departs the terminal phase of the flight. It is also used to transmit flight-progress strips from the NAS Stage A computers to the various controllers involved in handling a flight. This transmission is effected through the FDEP data terminals located at ARTCCs, terminal control locations, and control towers.

- National Flight Data Center (NFDC)

The NFDC, located at FAA Headquarter, maintains a national data base for domestic and international Notices to Airmen (NOTAMs). This

NOTAM data base is part of the National Airspace System (NAS) and utilizes the Weather Network for dissemination of information to air traffic facilities and other operational users. The NFDC also operates the aeronautical data base containing information on the status of airports, air navigation facilities, instrument approach procedures, and other data utilized by companies and agencies that produce aeronautical charts and air navigation publications. Both data bases are located at the Aeronautical Center at Oklahoma City.

- The Air Traffic Control System Command Center (ATCSCC)

The ATCSCC, located at FAA Headquarters, was designed to be the overall realtime NAS management facility. It consists of several component facilities: the Central Flow Control Facility (CFCF), the Airport Reservation Office (ARO), the Central Altitude Reservation Facility (CARF), and the Contingency Command Post (CCP). The CFCF utilizes voice and data circuits to major elements of the NAS (e.g., all ARTCCs, several high density ATCTs) in order to regulate air traffic flow throughout the NAS. The principal basis for flow control is a computer data base containing airline schedules, which are updated daily and then combined with current weather data; the system enables controllers to adjust the flow of scheduled air traffic to minimize time and fuel-consuming delays. The ARO allocates the air traffic arrivals and departures among both scheduled and unscheduled aircraft operators at several high density airports in order to minimize airborne delays. In addition to the use of Service B facilities, the ARO utilizes foreign exchange (FX) circuits to connect system elements. The CARF collects data on military aircraft operations to preclude conflict between military and civil aircraft. Communications primarily are between the CARF facility and DOD components over the DOD-operated Automatic Voice Network (AUTOVON). The CCP is collocated with the CFCF and is used to manage the ATC functions associated with Presidential aircraft, to manage catastrophic events within the enroute portion of the ATC system, and to track hijacked aircraft. The CCP utilizes CFCF communications systems when it is activated.

- Administrative Networks

Administrative communications networks are used to interconnect FAA Headquarters, regional offices, field offices, facilities, and installations and to connect these organizations with other federal agencies for the conduct of non-operational business activities. The FAA utilizes the Federal Telecommunications System (FTS) as the major source of this communications service. The FTS is managed by the GSA and provides voice, data, and facsimile services over both switched and point-to-point sub-networks. Major components of the FTS are the inter-city voice network, the consolidated local telephone service, and the Advanced Record System (ARS). The FAA utilizes both the inter-city and local voice network but uses its own leased Administrative

Data Communications Network (ADCN) rather than the ARS. In areas where FTS telephone service is not available and cannot be furnished economically, the FAA provides administrative communications by leasing equipment and circuits directly from local telephone companies.

2.1.4.2 FAA AFTN Operation

As discussed earlier, the FAA is the U.S. entity providing AFTN services. In terms of the potential application of FAA communications to WCAN, the FAA's AFTN operation is of key interest. Therefore, for additional details and characteristics of the AFTN, (e.g. ownership, type of services, geographic coverage, etc.) refer to Section 2.1.1.

2.2 MARITIME COMMUNICATIONS SYSTEMS

Today's operators of ships and other seagoing vessels employ a mix of voice, telgraphic, teletypewriter, data and facsimile communications services. Of key interest to the WCAN effort is the location of U.S. and NATO ally commercial flag ships during voyages. Figure 2-10 illustrates the essential U.S. foreign trade routes used by U.S. and NATO ally flag vessels. A complete listing of all ocean trade routes is on file at ARINC Research. In addition, the Transportation Systems Center (TSC) of the Department of Transportation has developed a Maritime Dynamic Traffic Generator to predict oceanwide ship movements by week through 5-degree square ocean segments. Copies of these TSC documents are on file at ARINC Research.

Until recently, maritime communications modes were limited to the use of medium-frequency (MF), high-frequency (HF) and very high frequency (VHF) radio. Since the introduction of MARISAT, satellite capabilities have expanded the range of options available for ship-to-shore communications. The following subsections describe the MARISAT maritime satellite system and the MF, HF, and VHF systems used by operators of commercial merchant vessels and private fleets.

2.2.1 MARISAT Maritime Satellite System

2.2.1.1 General Description

Ownership

MARISAT is a satellite-based system for communications between shore points and ships at sea. It is a commercial service owned and operated by COMSAT General Corporation. Shipboard terminals may be bought or leased from COMSAT and are available from other sources (e.g., RCA Global Communications). COMSAT headquarters are located at:

COMSAT General Corporation
950 L'Enfant Plaza, S. W.
Washington, D. C. 20024

Type of Services

MARISAT provides general, distress and medical emergency communications capability for ships at sea. It also provides shore-to-ship broadcasting of news (Western Union News Service; Atlantic and Pacific coverage only). The general types of service offered through MARISAT are:

- Voice
- Data (up to 1200 and 2400 bps)
- Facsimile (up to 2400 bps)
- Telex/TWX with the following options:
  - On-demand (store-and-forward option available)
  - Format conversion (speed and protocol)
  - Mailed Telex message
  - Multiple-address/common text

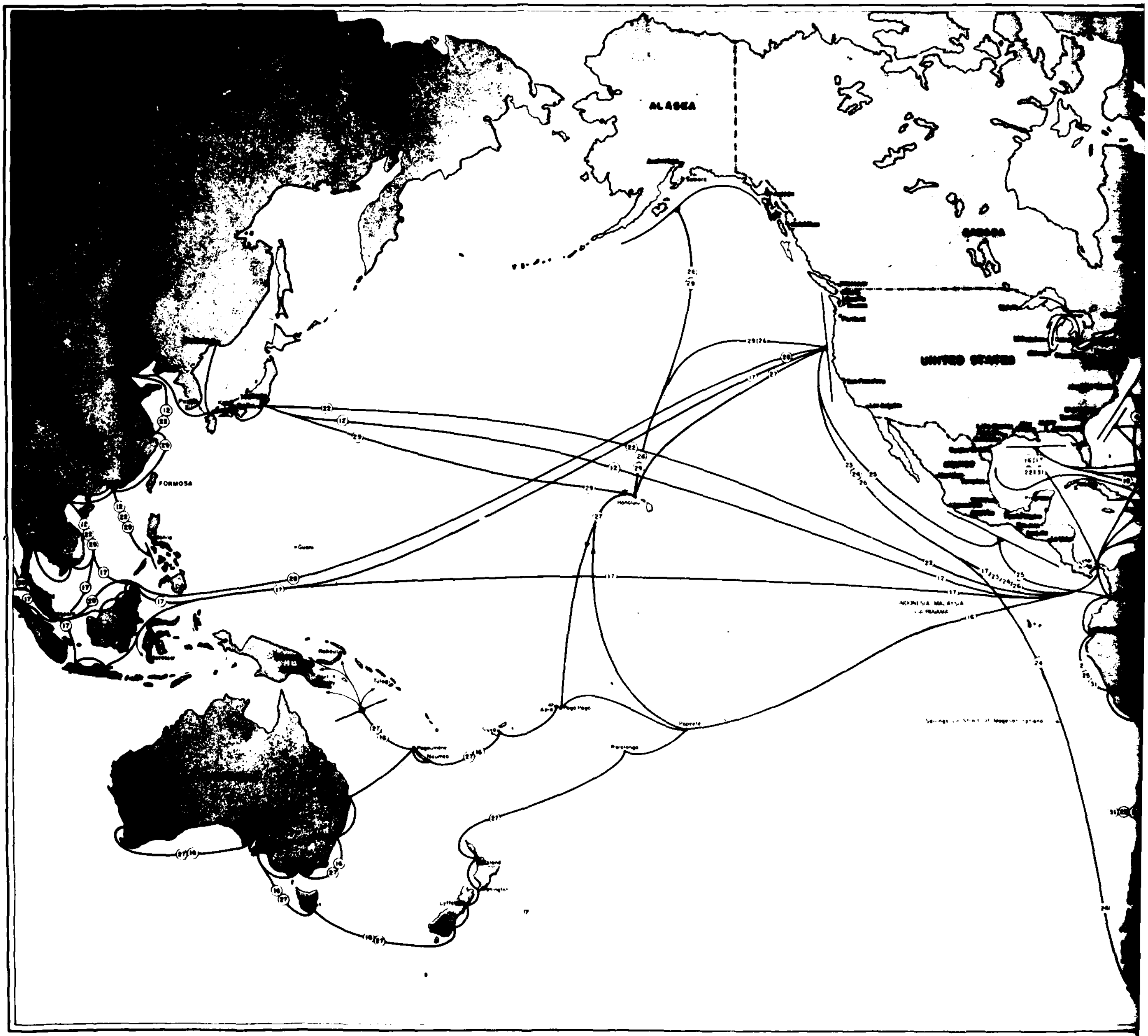
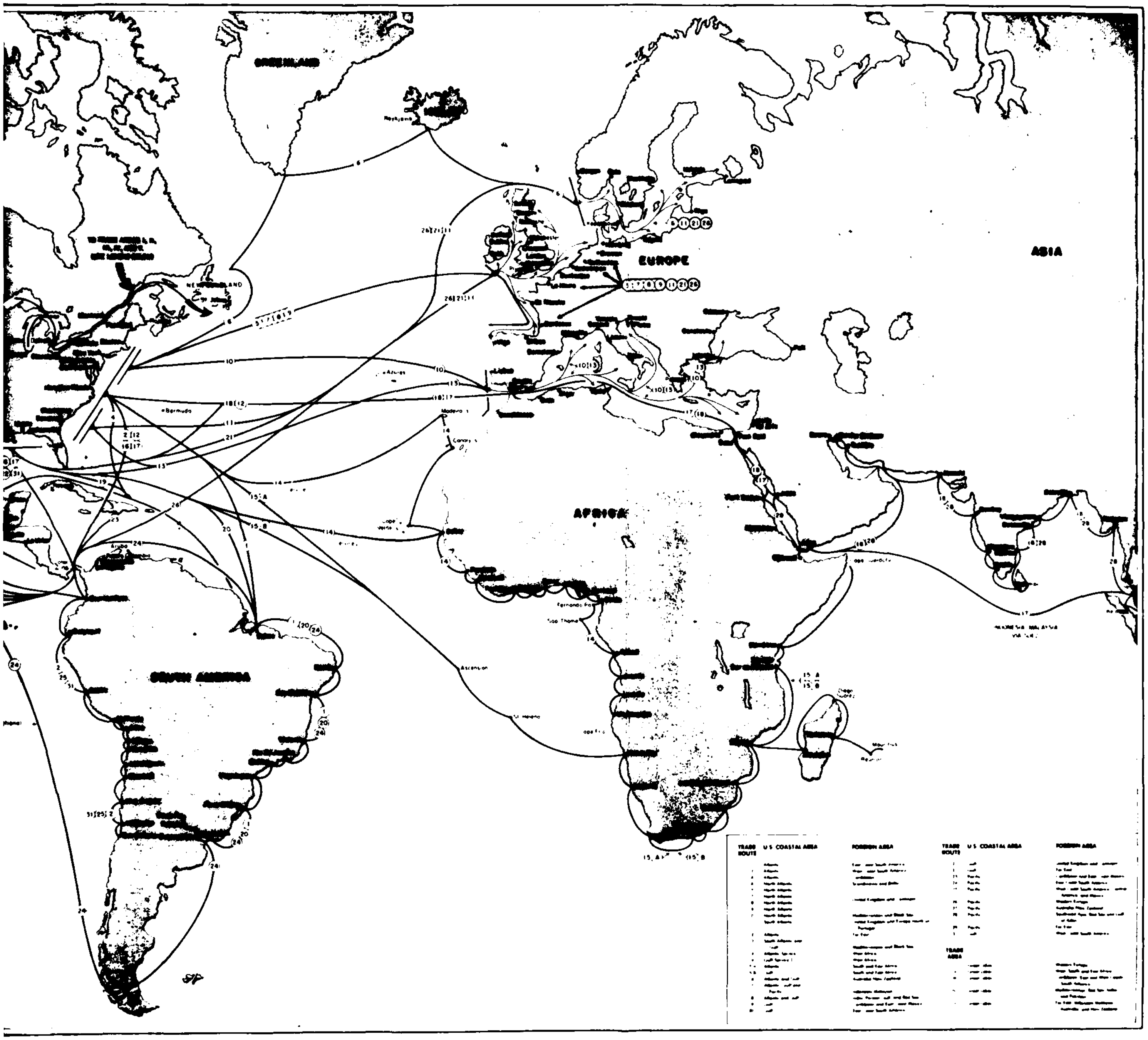


Figure 2-10. ESSENTIAL UNIT



TIAL UNITED STATES FOREIGN TRADE ROUTES

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In addition, the following special services are available:

- Distress messages -- voice and Telex
- Medico (medical emergency) -- Telex recommended
- Link with the USCG Automated Mutual-Assistance Vessel Rescue (AMVER) system via Telex

The MARISAT terminal contains a DISTRESS button for use in emergency situations. Use of this feature establishes an immediate connection with a COMSAT shore station and then to the appropriate U.S. Coast Guard Rescue Coordination Center.

The AMVER service permits MARISAT-equipped ships to participate in the Coast Guard Automated Mutual-Assistance Vessel Rescue program. This system is an international program to maintain and provide information on merchant vessels for use in search and rescue operations at sea. The AMVER center is located at Governors Island, New York. AMVER is available for Atlantic and Pacific coverage only.

Geographic Coverage

Figure 2-11 indicates the geographic coverage provided by MARISAT. As illustrated, MARISAT provides virtually worldwide coverage. Exceptions are the polar regions and a strip of the Pacific Ocean west of Central and South America which will be covered when the satellites are repositioned in 1982. As indicated in Figure 2-11, the three MARISAT satellites are located in geosynchronous orbit above the equator at longitude 15°W (Atlantic Ocean coverage), 176.5°E (Pacific Ocean coverage) and 73°E (Indian Ocean coverage).

System Availability

The MARISAT satellites and shore stations operate continuously. COMSAT General recommends that shipboard terminals be turned on at all times, but this is under the control of the individual radio operators aboard the vessels.

2.2.1.2 Terminal/Interface Description

Equipment Type

The shipboard terminal consists of an Operator's Console with a teletypewriter, telephone, data jack and associated controls. The Telex portion of the console is a five-level, automatic send/receive (ASR) multicopy teletypewriter with a tape punch and tape reader. A telephone handset provides voice capability. Two equipment jacks are provided for baseband (300Hz to 3KHz) connection of data or facsimile equipment. An optional accessory to the MARISAT Operator's Console is a microprocessor-controlled data interface with internal memory (1K bytes of memory is standard; additional memory may be added).

Codes

The Telex service uses standard Baudot code. Data transmission over voice channels can be in ASCII or other codes.

Speeds and Protocol

The Telex service transmits at the standard (CCITT No. 2) speed of 66 wpm (50 baud). Data and facsimile transmission is limited by existing terrestrial circuits and can be at speeds up to 2400 bps in the U.S. and 1200 bps for international connections. If conditioned dedicated lines are connected to the MARISAT shore stations, the data rate can be increased to 4800 bps. Communication at speeds up to 240 Kbps is possible in the ship-to-shore direction.

The message protocols for MARISAT communications are described below:

- Telex/TWX - After completing appropriate console switch settings, the REQUEST CALL key is pressed. The teletypewriter turns on and prints its own answerback, then the COMSAT General identification, message sequence number, month, day, time, and own answerback. Calls to the U.S. or Canada are preceded by appropriate routing number, the called party's Telex number and a plus (+) sign. International calls are preceded by the appropriate country code, the called party's Telex number and a plus (+) sign. Upon connection, the terminal prints the called party's answerback. After the message text is transmitted, an upper-case D is transmitted to receive the called party's answerback for acknowledgement. To disconnect, five periods are typed. The system responds with date, time, and chargeable minutes.

- Voice/Data/Facsimile - After completing appropriate console switch settings, the REQUEST CALL key is pressed. When an intermittent audio tone is received, the telephone is picked up and the MARISAT operator is provided with the following information: type of call, name of called city and country, called number, called party's name and calling party's name. Either station-to-station or person-to-person calls can be made.

- Distress Calls Via Telex - After completing appropriate console switch settings, the DISTRESS BUTTON is pressed. The teletypewriter prints its own answerback, then the COMSAT General identification, month, day, time and own answerback. The Telex number for the appropriate Coast Guard Rescue Coordination Center is entered, followed by a plus (+) sign. Upon receipt of the Coast Guard answerback, the following distress information is typed according to ITU Radio Regulations:

    - The distress signal SOS, SOS, SOS
    - The name or other identification of the station in distress
    - Position information
    - The nature of the distress and description of assistance required
    - Other appropriate information

- Distress Calls via Telephone - After completing appropriate console switch settings (SOS setting), the REQUEST CALL button is pressed. A channel is assigned immediately. When the VOICE light flashes and an intermittent tone is received, the telephone is picked up and the MARISAT operator is advised that a distress call is being made. Upon connection to the rescue center, the following distress information is provided as defined in the ITU Radio Regulations:

- .. The distress signal MAYDAY
- .. The name or other identification of the station in distress
- .. Position information
- .. The nature of the distress and description of assistance required
- .. Other appropriate information

It should be noted that maritime distress calls via telephone can only be made through MARISAT.

- AMVER Calls via Telex - After completing appropriate console switch settings, the REQUEST CALL button is pressed. The teletypewriter (TTY) turns on and prints own answerback, the COMSAT General identification, message sequence number, month, day, time, and own answerback. The AMVER code (127594) is typed, followed by a plus (+) sign. Upon connection, the terminal prints out the AMVER answerback. After the message text is transmitted, an upper-case D is transmitted to receive the AMVER answerback. To disconnect, five periods are typed or the TTY OFF button is pressed.

Terminal Locations

The three MARISAT shore stations are located at:

- Southbury, Connecticut
- Santa Paula, California
- Yamaguchi, Japan

These locations are shown in Figure 2-11. The two U.S. locations are owned and operated by COMSAT General. The shore station in Japan is owned and operated by Kokusai Denshin Denwa Co., Ltd.

The vessels and ocean platforms of NATO countries which are equipped with MARISAT terminals are listed in Table 2-2. It should be noted that additional MARISAT terminals are being installed periodically and also that vessels and ocean platforms change ownership frequently. Therefore, Table 2-2 represents a snapshot of installations as of April 1980. There are a total of 236 MARISAT terminal installations. Of these, 66 are onboard U.S.-flag ships, 55 are onboard other NATO-flag ships, and another 24 are onboard friendly or neutral-flag ships (Australia, Japan, Sweden, Switzerland).

2.2.2 Commercial/Private Maritime Radio Systems

2.2.2.1 Description

The law requires a minimum Safety of Life at Sea (SOLAS) communications capability aboard merchant ships. Each ship must be equipped with a CW transmitter/receiver which operates at 500kHz. This equipment must have an automatic alarm to alert the crew to emergency traffic. A radio officer must stand eight hours' watch between 0900 and 2100 local time. It is also required by law that a VHF voice transceiver be installed on the bridge of the ship. Beyond these requirements, the ship operator has complete discretion regarding other communications equipments aboard the vessel.

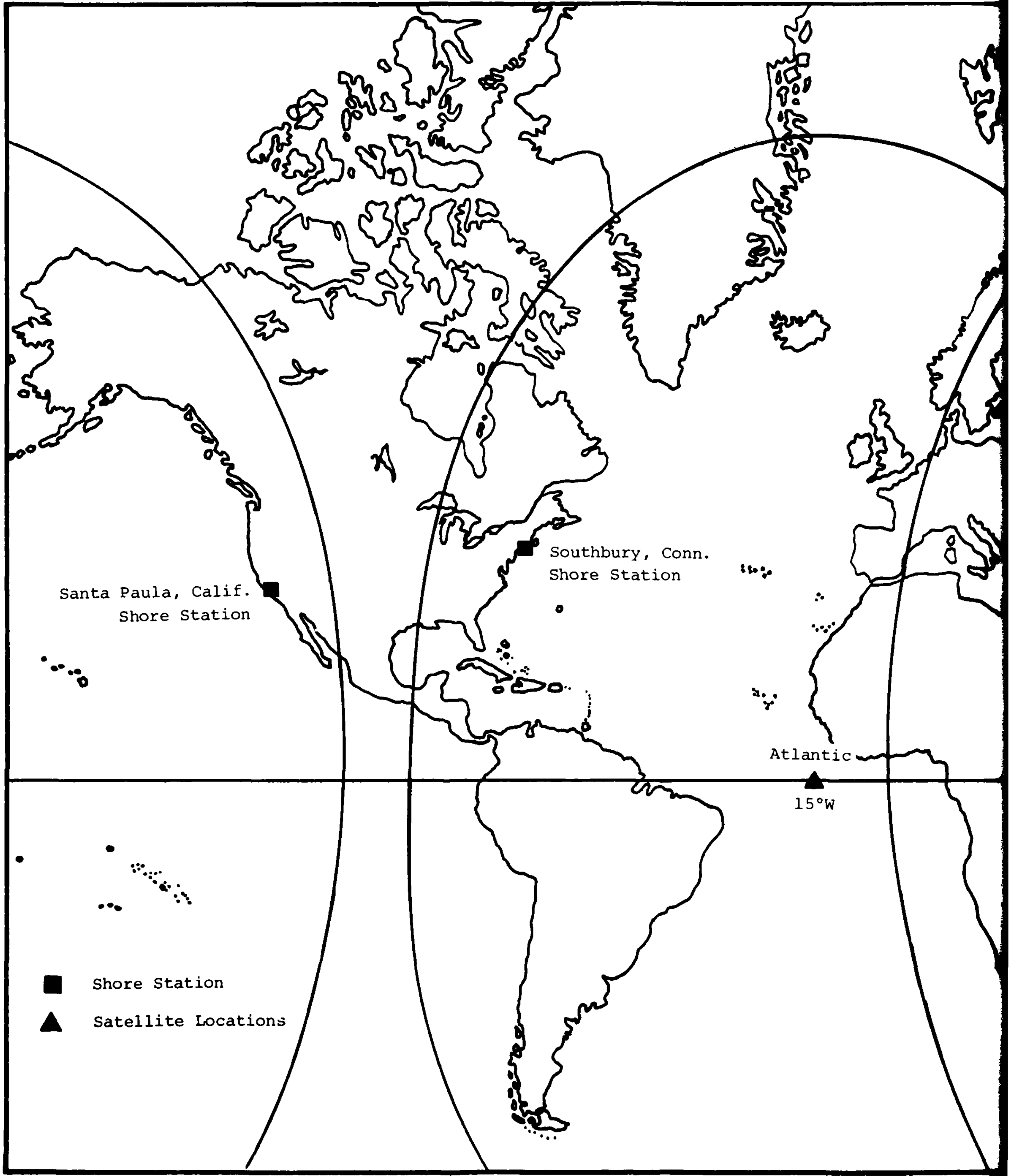
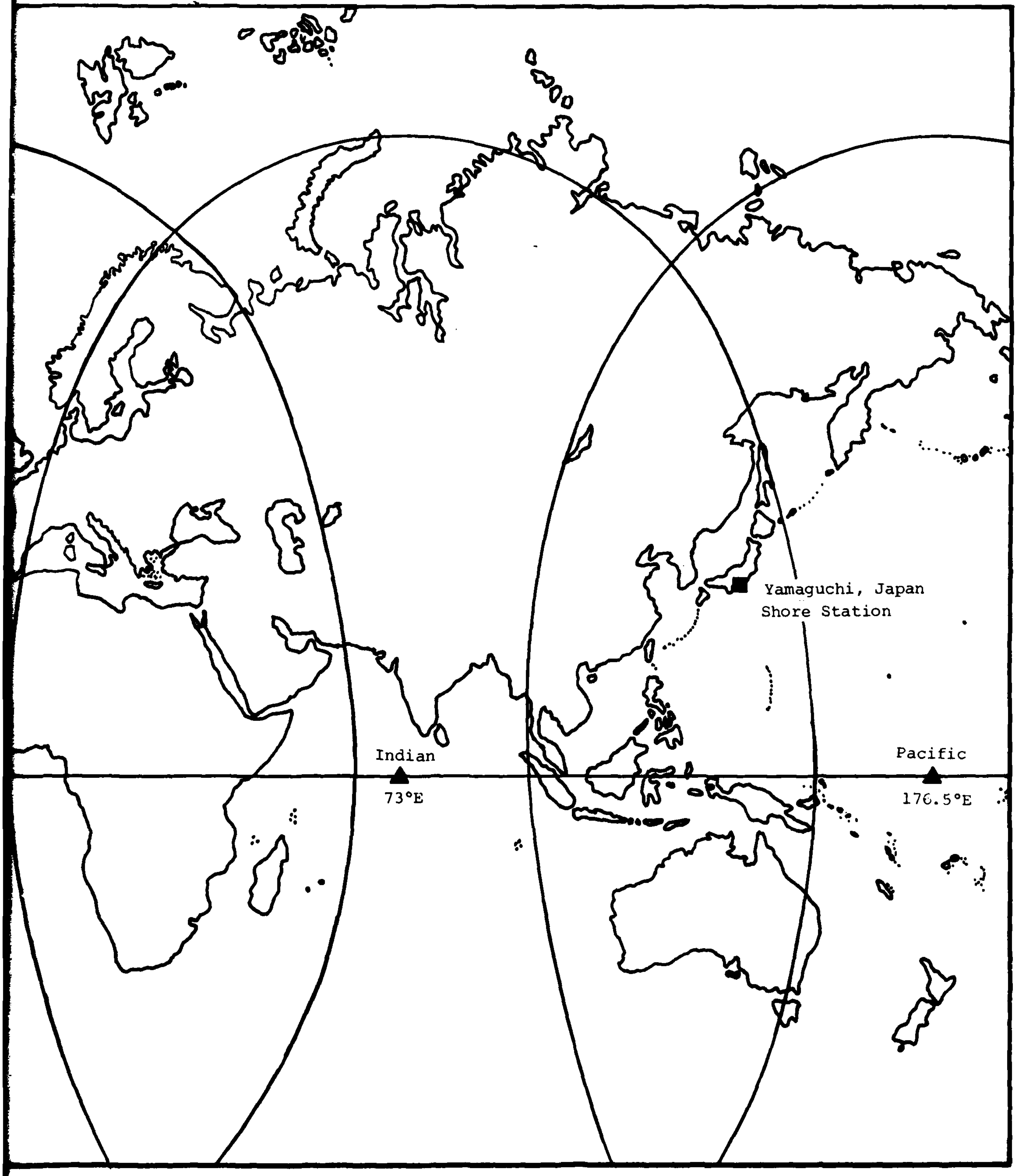


Figure 2-11. MARISAT



MARISAT AREA COVERAGE

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Table 2-2. MARISAT EQUIPPED VESSELS

Name	Answerback	Type	Customer
	COUNTRY OF REGISTRY BELGIUM		
Petrel	ONPC 1546102	Drill	Total Eastcan
	COUNTRY OF REGISTRY CANADA		
Canmar Kigoriak	DOME 1560401	TUG/TKR/Ice Breaker	Dome Petroleum
J.E. Jonsson	VYXD 1560201	Seismic	Geophysical Service
John A. MacDonald	CGBR 1560101	Ice Breaker	Canadian Dot
Sedco J	VGB2 1560303	Semi Sub Drill	Chevron US Pet.
	COUNTRY OF REGISTRY DENMARK		
Anne Bravo	ANBR 1610301	Research	Western Geophysical
Boringia	OXPF 2610103	Cargo	East Asiatic Co. Ltd.
Fionia	OYYX 2610102	Cargo	East Asiatic Co. Ltd.
Kirsten Bravo	OWTI 1610202	Seismic	Arnessen/Esso Seismic
M.T. Panama	OYDY 1610101	Tanker	East Asiatic Co. Ltd.
	COUNTRY OF REGISTRY FRANCE		
Riv Calypso	FIRQ 110201	Research	The Cousteau Society
ETPM 1601	FNPU 1110101	Pipelaying	ETPM
Pelican	FNJF 1110202	Drill	Total Eastcan
	COUNTRY OF REGISTRY GERMANY		
Europa	DDQH 1120401	Passenger	Hapag Lloyd AG
Hanse	DEIE 1120173	Multi-Purpose	Chemikalien Seetransport GMBH
Meteor	DBBH 1220501	Research	German Hydrografic Inst.
Rheinfels	RHEI 1220201	Container	DDG "Hansa"
Transvaal	DJOT 1120174	Container	Korrespondentreeder Gmbh & Co.

Table 2-2 Continued

Name	Answerback	Type	Customer
COUNTRY OF REGISTRY GREECE			
Capt. John Livanos	SXLG 1133101	Tanker	Ceres Hellenic
Mount Olympos	SYJQ 2130201	Cargo	Nissho Iwai/Good Hope
Mount Parnasse	MOPA 1130203	Cargo	Nissho Iwai/Good Hope
Navarino	SYBO 2130102	Cruise	Karageorgis Lines
Never on Sunday	SXNU 2130202	Cargo	Nissho Iwai/Good Hope
COUNTRY OF REGISTRY ITALY			
Bannock	DFVL 1150103	Research	DFVLR
Maumauterzo	IYUM 1150102	Yacht	Sunboat Italiana Spa
Nai Maria Amelia	lBFR 2150201	Tanker	Nai Navigazione Alta Italia
COUNTRY OF REGISTRY NETHERLANDS			
Esso Saba	PJUJ 1300301	Tanker	Exxon International
Ms Prinsdendam	PJTA 1750102	Passenger	Holland America
Rotterdam	PJSU 1750101	Passenger	Holland America
COUNTRY OF REGISTRY NORWAY			
Hoegh Trigger	LCHX 1310501	Car Carrier	Leif Hoegh & Co.
Longva II	LKUS 2310302	Seismic	NTA/GEO AS
Pelerin	LDMR 1310402	Drill	Total Eastcan
Royal Viking Sea	LECK 2310101	Cruise	NTA/Royal Viking Lines
Royal Viking Sky	LADE 2310102	Cruise	NTA/Royal Viking Lines
Royal Viking Star	LILY 2310103	Cruise	NTA/Royal Viking Lines
Treasure Seeker	LEPJ 1310303	Drill Platform	Wilh. Wilhelmsen
Zapata Ugland	LFAE 1310403	Semi Sub Drill	Tenneco Oil
COUNTRY OF REGISTRY UK			
Asiafreighter	GOYX 1440502	Container	Seatrain Lines, Inc.
Asialiner	GOYY 1440503	Container	Seatrain Lines Inc.
Ben Ocean Lancer	GUUU 1440401	Drill	Satellite Services/ODECO
Cable Enterprise	GNCH 1440103	Cableship	Cable & Wireless
Cable Venture	GUXZ 2440102	Cable	C & W London
HMS Endurance	GXRH 1440701	Ice Patrol	Mod (N)
Eurofreighter	GOUS 1440504	Container	Seatrain Lines
Euroliner	GOUR 1440501	Container	Seatrain Lines
Khalida	GQUB 1443701	Yacht	Khalida Marine

Table 2-2 Continued

Name	Answerback	Type	Customer
COUNTRY OF REGISTRY UK (con't)			
MV Kingnorth Fisher	GSVU 1443173	Nuclear Fuel Carrier	UK Atomic Energy Comm.
Mercury	GJXH 2440101	Cable	C & W London
Offshore Mercury	GZQA 1443301	Drill Barge	Tenneco Oil Co.
Pacific Fisher	GUUR 1443174	Carrier	James Fisher & Sons
Pacific Swan	GYAB 1440303	Carrier	Pacific Nuclear Transport
Prins der Nederlanden	GYLM 2440601	Dredge	Bos & Kalis
Queen Elizabeth 2	GBTT 2440301	Passenger	Cunard Lines
Rfa Olmeda	GPBE 1443201	Tanker	Government of UK
Wild Gannet	GWAQ 2440202	Cargo	Penninsular & Oriental SS Co.
COUNTRY OF REGISTRY USA			
Aequinox	CASH 1503215	Utility	Satellite Serv. Inc.
Alaskan Star	KGPJ 1501577	Semi Sub Drill	North Star Drilling
American Sun	WNEJ 1501670	Tanker	Sun Transport Co.
American Ace	KFCV 1500101	Container	US Lines
ARCO Anchorage	WCIO 501104	Tanker	ARCO
ARCO Endeavor	KALD 1501110	Tanker	ARCO
ARCO Fairbanks	WGWB 1501103	Tanker	ARCO
ARCO Heritage	KAHA 1501107	Tanker	ARCO
ARCO Enterprise	KALC 1501113	Tanker	ARCO
ARCO Juneau	KSBG 1501102	Tanker	ARCO
ARCO Prestige	WKDU 1501111	Tanker	ARCO
ARCO Prudhoe Bay	KPFD 1501101	Tanker	ARCO
ARCO Sag River	WLDF 1501106	Tanker	ARCO
Arctic Seal	WXTI 1503205	Scientific Explor.	Geophysical Service
Atlantic Seal	SEAL 1503203	Seismic	Digicon
Black Seal	KOLK 1503216		
Caribbean Seal	WZCS 1503207	Geophysical Survey	Geophysical Serv.
Cecil H. Green	KJWO 1503214	Scientific Explor.	Geophysical Serv.
Crest	WBGF 1501576	Dredge	Great Lakes Dredge
Delta Caribe	WMIG 1500203	Container	Delta SS Lines
Delta Mar	KICF 1501202	Lash	Delta SS Lines
Diamond M Epoch	WYQD 1501470	Semi Sub Drill	EXXON USA
Duchess Diane	MGNA 1501574	Motor Vessel	Mangavox Adv. Prod. Div.
Dutch Maid II	FISH 1501567	Fishing Vessel	Kachemar Seafood Inc.
El Paso Arzew	EPAZ 1500403	LNG Tanker	El Paso Marine
El Paso Howard Boyd	EPHB 1500405	LNG Tanker	El Paso Marine
El Paso Southern	EPSO 1500401	LNG Tanker	El Paso Marine
Glomar Atlantic	WSLF 1501304	Drill	Chevron Overseas Pet.
Glomar Coral Seas	KUBL 1501474	Drill	Exxon USA
Global Grande Isle		Drill	
Gulf Seal	GULF 1503211	Survey	Digicon Geophysical Corp.
Haggerty	WPEH 1503213	Scientific Explor.	Geophysical Services

Table 2-2 Continued

Name	Answerback	Type	Customer
COUNTRY OF REGISTRY USA (con't)			
Indian Seal	WZEK 1503212	Seismic	U.S. Navy
Java Seal	WYMB 1503206	Survey	Digicon
L.B. Meador	KCSL 1502301	Barge	Brown & Root
Lash Atlantico	WEZU 1500201	Container	Prudential Lines
Lash Italia	WJAJ 1500204	Container	Prudential Lines
Lash Pacifico	WIEE 1500202	Container	Prudential Lines
LNG Aquarius	WSKJ 1500702	LNG Tanker	Energy Transportation
LNG Aries	KGBD 1500703	LNG Tanker	Energy Transportation
LNG Capricorn	KHLN 1500704	LNG Tanker	Energy Transportation
LNG Gemini	KHCF 1500705	LNG Tanker	Energy Transportation
LNG Leo	WDZB 1500706	LNG Tanker	Energy Transportation
LNG Libra	WDZG 1500707	LNG Tanker	Energy Transportation
LNG Taurus	WDZX 1500710	LNG TANKER	Energy Transportation
LNG Virgo	WDZX 1500711	LNG Tanker	Energy Transportation
Mobil Aero	WLBY 1500601	Tanker	Mobil Shipping Co.
Mr. J.	TSFD 1500504	Seafood Processor	Triden Seafood Co.
T.W. Nelson	MOBL 1500605	Geophysical	Mobil Explor. & Proc.
Niobe	KPKV 1501575	Research	Shell Oil Co.
Northland	MVNP 1501570	Seafood Processor	Northland Sea Prod.
Ocean Victory	TXTL 1500502	Semi Sub Drill	Texaco Inc.
Phaedra	WPSH 1501573	Seismic	Shell Oil Co.
Rowan Alaska	WRDC 1502205	Drill Platform	Rowan Companies
Ron Tappmeyer		Drill Platform	
Sedco 472	KCVG 1501302	Drill	Sedco Inc.
Sedco 703	GOIL 1501303	Drill	Gulf Oil (Ireland)Ltd.
Sedco 709	KBCG 1501571	Semi Sub Drill	Sedco Inc.
Staflo	STAF 1503301	Semi Sub Drill	Sedco Inc.
Tasman Seal	WSTS 1503204	Geo. Survey	Geophysical Service
Texico Georgia	WLDW 1502101	Tanker	Texaco
Tiger Seal	SDTS 1501566	Research	Delta Exploration Co.
Western Off shore IX	WRSO 1500503	Drill	Lagoven SA
Zapata Concorde		Platform	Zapata Offshore Co.
Zapata Lexington		Platform	Zapata Offshore Co.
King Oscar	WYYC 1501201	Comm. Fishing Boat	Tuna Fleet Mgmt.

Ownership

Most shipboard equipment is either owned outright by the ship operator or leased from a commercial company which supplies an interconnect system. In addition to the MARISAT system owned by COMSAT General Corporation (see Section 2.2.1), the principal owners of ship-to-shore communications shore stations are:

- ITT World Communications Inc.
  67 Broad Street
  New York, NY 10004

- North American Philips Corporation
  Communications Systems Division
  31 McKee Drive
  Mawah, NJ 07430

- RCA Global Communications, Inc.
  60 Broad Street
  New York, NY 10004

- Western Union International
  1 WUI Plaza
  New York, NY 10004

Type of Services

When a ship is within line-of-sight distance of a harbor or other ship, VHF voice communications may be used. This mode of communication is basically local and used to support harbor operations. The principal maritime communications modes (not including the earlier described MARISAT System) at sea are:

- HF Single-Sideband (SSB) voice
- HF CW (Morse Code)
- HF Simplex Teleprinting Over Radio (SITOR)
- HF (SSB) Telex
- MF (500kHz) emergency CW

Each of the first four of these ship-to-shore communications modes requires intermediate contact with a common carrier such as those four listed previously or, in the case of countries other than the U.S., with the Postal Telegraph and Telephone (PTT) organization in order for a ship to establish connection with an inland location. In the case of SSB voice communications, contact is made with a shore-based station which patches the radio into the local telephone network. In the HF CW mode, communication is between the shipboard radio operator and a Morse operator at a shore station, who relays the information by telegram, Telex or TWX. For HF Telex or SITOR communications, the shore station punches a paper tape as the message is received and feeds this tape into the hinterland Telex network when the connection can be made. Medium-frequency (MF) emergency messages are intercepted by all shore and ship stations in range and the information is relayed by other communications modes.

The services described above are used by commercial merchant fleets and also by private companies who operate their own fleets. The equipment aboard these two categories of vessels is generally compatible and allows communication between vessels and ship-to-shore, although frequency assignments may differ.

Geographic Coverage

These commercial/private services provide worldwide coverage either by direct communications to shore stations or via communications with other ships.

System Availability

Virtually all of these commercial/private maritime services operate continuously. The international 500kHz emergency frequency is guarded continuously by international agreement. As mentioned earlier, individual ship radio operators must be on duty for an eight-hour duty shift during the period of 0900 to 2100 local time.

2.2.2.2 Terminal/Interface Description

Equipment Types

The voice and CW equipment aboard ships and at shore stations is manufactured by a variety of international vendors. However, there are a number of conventions followed. Communication in the VHF band is generally Frequency-Modulated (FM). Voice and Telex communications in the HF band are mostly single-sideband (SSB), although some Amplitude Modulated (AM) equipment is still in use. Equipment used for Telex and TWX messages is all compatible for international communications. SITOR equipment complies with CCIR Recommendation 476-1.

Codes

All Telex/TWX and SITOR equipment uses Baudot code. CW communications use Morse code.

Speeds and Protocols

All Telex/TWX and SITOR communications are at the standard speed of 66 wpm (50 baud) according to CCITT-2. SITOR equipment provides an interface between teletypewriter and radio equipment and employs Automatic Request for Repetition (ARQ) and Forward Error Correction (FEC) modes of operation. SITOR transmissions are blocked into 27-bit groups.

Standard international Telex/TWX procedures are followed for ship-to-shore communications in these modes. These procedures are:

- Communications are established with a shore station
- Marine Telex service is requested and the ship provides its selective call number

- Information is exchanged between the ship and the shore station regarding working frequencies.
- The ship's equipment is set to the call sign and selective call number of the shore station and the established working frequencies.
- The message is transmitted. If the shore number to which the ship wishes to be connected is busy or does not answer, the message can be stored on paper tape for later forwarding.

Terminal Locations

The locations of shore stations for commercial/private marine communications services are shown in Table 2-3. The table also indicates which shore stations provide marine Telex service. There are over 650 vessels with Telex capability. Of these, approximately 468 are NATO-flag vessels, including 43 of U.S. registry.

2.3 U.S. COAST GUARD COMMUNICATIONS SYSTEMS

2.3.1 General Description

Ownership

The U.S. Coast Guard operates HF, VHF, LF, satellite and terrestrial telecommunications systems designed to provide the necessary communications in support of all Coast Guard functions and to provide basic maritime telecommunications networks for the non-military agencies of the Federal Government. Coast Guard communications are under the supervision of:

Commander J. Williams
Chief, Telecommunications Management Division
U.S. Coast Guard
Code G-OTM/74
Trans Point Building
2100 2nd Street, S.W.
Washington, D. C. 20590
(202) 426-1345

Type of Services

The Coast Guard communications subsystems operate in voice, data, teletypewriter and radio telegraph (Morse code) modes. Responsibilities for communications functions are divided into long-range radio communication, short-range radio communication, the interconnecting network and telephone services. These general areas are discussed below.

- Long-Range Radio Communications - This network is divided into two systems: one in the Atlantic area and one in the Pacific area. The two area systems provide radio telephony, radiotelegraphy (manual Morse and direct printing) and facsimile modes for ships and aircraft. In addition, a constant guard is maintained on the 500kHz radiotelegraphy distress frequency.

Table 2-3. LOCATIONS OF COMMERCIAL MARITIME SHORE STATIONS

Location of Shore Station	Call Sign	Telex Service
Amagansett, L.I., New York	WSL	X
Galveston, Texas	KLC	X
Los Angeles, California	KOK	X
San Francisco, California	KFS	X
Seattle, Washington	KLB	X
Manila, Philippines	DZG	X
Sydney, Australia	VIS	X
Bahrein, Bahrein	A9M	X
Oostende, Belgium	OST	X
Bermuda	VRT	X
Lyngby, Denmark	OXZ	X
Helsinki, Finland	OHG	X
St. Lys, France	FFL	X
Nordeich, Germany	DAF	X
Athinai, Greece	SVA	X
Hong Kong	VPS	X
Monaco	3AE/3AF	X
Scheveningen, Netherlands	PCH	X
Rogaland, Norway	LGB	X
Singapore	9VG	X
Goteborg, Sweden	SAG	X
Bern, Switzerland	HEB	X
Portishead, United Kingdom	GKA	X
Bolinas, California	KPH	X
Chatham, Massachusetts	WCC	X
Mobile, Alabama	WLO	X
San Francisco, California	KPH	X
Latana Rio, Florida	WOR	X
Port Arthur, Texas	WPA	X
Baltimore, Maryland	WMH	X
Tampa, Florida	WPD	X
Halifax, Nova Scotia	N/A	

Table 2-3. Continued

Location of Shore Station	Call Sign	Telex Service
Curacao, Venezuela	N/A	
Leningrad, USSR	N/A	
Gdynia, Poland	N/A	
Rome, Italy	N/A	
Pozuela del Ray, Spain	N/A	
Dumai, Indonesia	N/A	
Ambon, Indonesia	N/A	
Jakarta, Indonesia	N/A	
Surbaga, Indonesia	N/A	
Wellington, Australia	N/A	
Belawan, Australia	N/A	

- Short-Range Radio Communications - This network is oriented toward control of Coast Guard aircraft, boats, groups, stations, vessel traffic control systems, and marine safety offices operating near the coasts. Medium frequency (MF) and very-high frequency (VHF-FM) radio telephony distress frequencies are constantly monitored. Citizens' Band Channel 9 (the designated emergency channel) is also monitored.

- Interconnecting Telecommunications Network - The telecommunications network is composed of the following elements:

    - Leased point-to-point and multipoint teletype grade (100 wpm) circuits
    - AUTODIN is provided to the Coast Guard via Commander, Naval Telecommunications Command
    - Commercial Telex is used at all district offices and provides 50 bps switched service to all other Telex users
    - Specialized switching/conversion nodes are located in district offices and Coast Guard Headquarters. These nodes link the leased, AUTODIN, and commercial networks

- Telephone Service - The voice communications system is used to pass information in a non-record manner. Digital data can be transmitted at speeds up to 4800 bps. The Coast Guard uses three distinct telephone networks:

    - Public Switched Network
    - Federal Telecommunications System (FTS)
    - AUTOVON - for communications with Department of Defense agencies only

Geographic Coverage

The basic radio communications system of the U.S. Coast Guard provides coverage within approximately 300 miles of both continental U.S. coasts and around Alaska, Hawaii and Guam. These stations are interconnected by terrestrial circuits which provide complete CONUS coverage, including interconnections with AUTODIN.

System Availability

The Coast Guard communications system generally operates continuously. Some guard bands are monitored only during prescribed hours, however.

2.3.2 Terminal/Interface Description

Equipment Type

In addition to telephone and radio voice equipment, the Coast Guard system uses standard radio teletype, Simplex Teleprinting Over Radio (SITOR), and AUTODIN terminals. The Coast Guard is in the process of upgrading most of its existing AUTODIN service from Mode V (controlled character asynchronous) to Mode I (synchronous character). The SITOR equipment provides an interface between teleprinter and radio equipment and is designed to protect against errors caused by poor propagation conditions, fading, noise or other interference.

Teletypewriter equipment consists largely of Teletype Corporation Model 28 units in various configurations. Some of the more modern communications stations employ Model 37 equipment. Commercial Telex and TWX circuits are terminated by Model 32 and Model 33 machines, respectively. The Model 32 teletypewriters are used only in the Automatic Send/Receive (ASR) with Keyboard and Tape Punch configuration. Other equipment includes:

- On-line cryptographic equipments KG-13, K-26, and KW-7
- Message Header Generators - limited number of centers, but deployment is expanding
- Optical scanner - used at Headquarters for processing of outgoing messages

Each district communications center is equipped with a Semi-Automated Message Processing System (SAMPS) to provide:

- Interface with commercial Telex
- Interface between the message record network and the data communications network
- Speed and code conversion to permit networking of incompatible telecommunications and data terminals

Codes

Existing teletypewriter equipment uses Baudot code. However, replacement equipment will use ASCII code.

Speeds and Protocols

The Model 28 equipments operate at 100 wpm (75 Baud). Model 33 equipment on TWX also operates at 100 wpm. Model 32 equipment on Telex operates at 66 wpm. The record communications follow standard Telex, TWX or AUTODIN protocols relative to message heading, message ending, routing codes, etc. Some locations are equipped with automated message header and generator equipment.

Terminal Locations

The major Coast Guard HF Communications/Radio Stations (and their AUTODIN connections) are shown in Figure 2-12. As indicated, these facilities are located at:

- Boston, Massachusetts
- Portsmouth, Virginia
- Miami, Florida

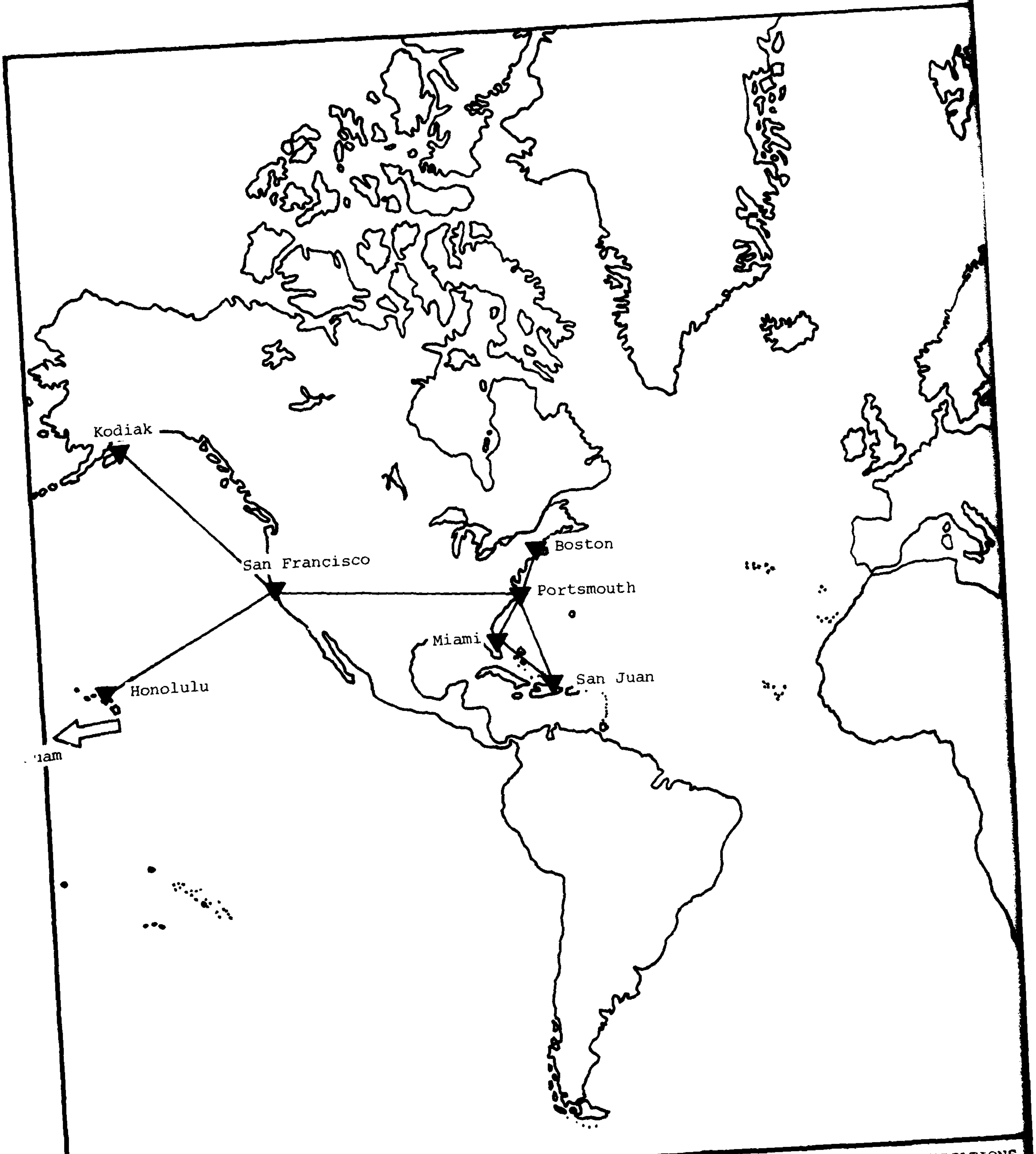
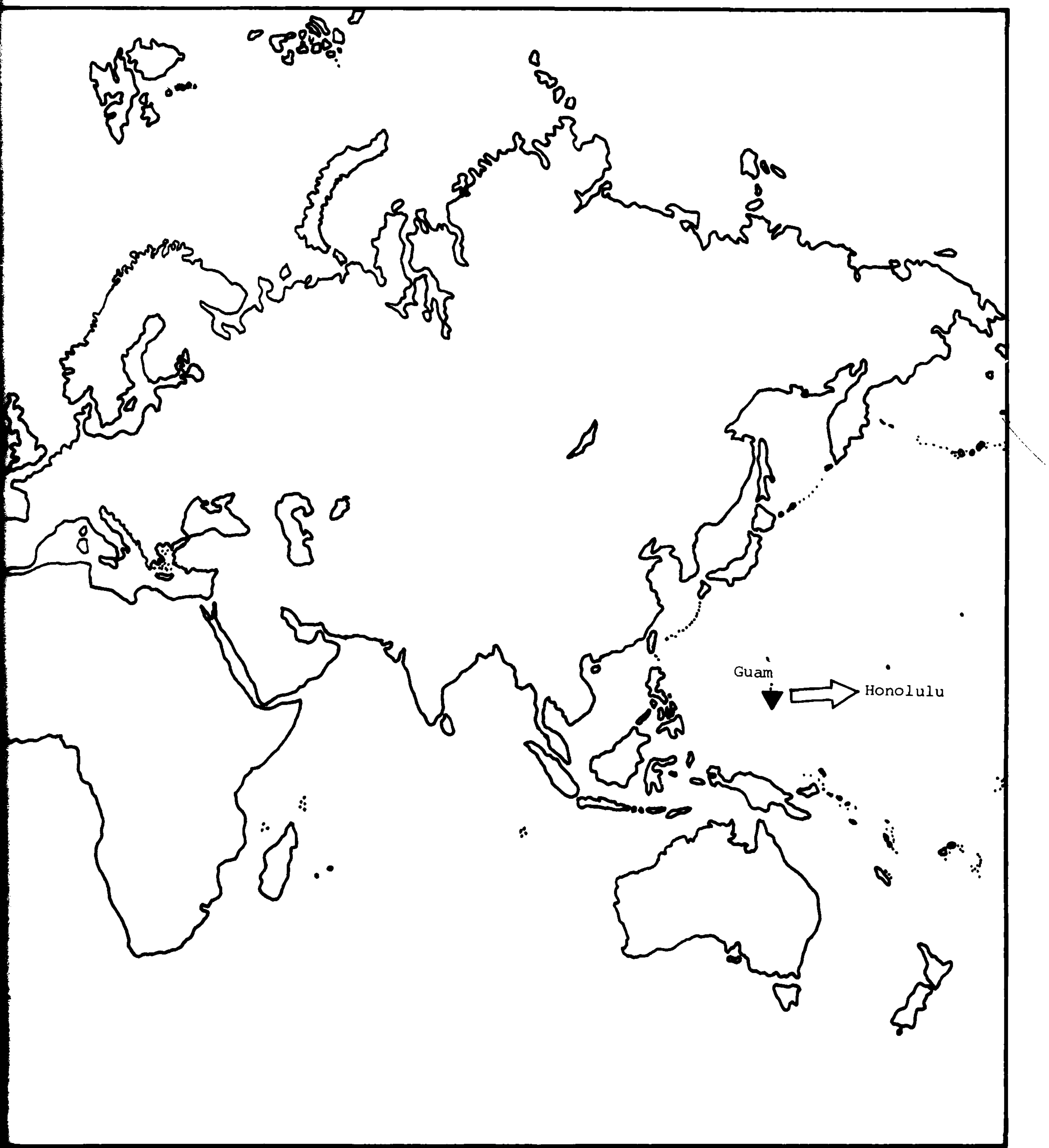


Figure 2-12. MAJOR U.S. COAST GUARD HF COMMUNICATIONS



UNICATIONS STATIONS INTERCONNECTED TO AUTODIN SWITCHES

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- San Juan, Puerto Rico
- San Francisco, California
- Honolulu, Hawaii
- Kodiak, Alaska
- Guam

The locations, call signs, working frequencies and guard bands for the Coast Guard Atlantic and Pacific radio coverage is shown in Tables 2-4 and 2-5 respectively.

The Coast Guard has AUTODIN terminals at the following locations:

- Boston, Massachusetts (CCGD 1)
- St. Louis, Missouri (CCGD 2)
- New York, New York (CCGD 3)
- Portsmouth, Virginia (CCGD 5)
- Miami, Florida (CCGD 7)
- New Orleans, Louisiana (CCGD 8)
- Cleveland, Ohio (CCGD 9)
- Long Beach, California (CCGD 11)
- San Francisco, California (CCGD 12)
- Seattle, Washington (CCGD 13)
- Honolulu, Hawaii (CCGD 14)
- Juneau, Alaska (CCGD 17)
- Washington, D. C. (Commandant Coast Guard)
- Elizabeth City, N. C.(Air Station)
- Baltimore, Maryland (Group)
- Kodiak, Alaska (Comm. Station)
- Guam (Radio Station)

The locations that are serviced by the Naval Communications Processing and Routing System (NAVCOMPARS) are:

- Guam
- Portsmouth, Virginia
- San Francisco, California
- Honolulu, Hawaii

The locations that have Remote Information Exchange Terminal (RIXT) services of AUTODIN are:

- New Orleans, Louisiana
- Seattle, Washington
- Honolulu, Hawaii
- Washington, D. C.

2.4 OFFSHORE PETROLEUM INDUSTRY COMMUNICATIONS SYSTEMS

2.4.1 General Description

Ownership

Due to the highly competitive nature of the offshore petroleum industry, communications are not shared as they are in other industries such as

TABLE 2-4. USCG ATLANTIC COMMUNICATIONS CENTERS

CALL	LOCATION	BANDS GUARDED DAY	BANDS GUARDED NIGHT	WORKING FREQUENCY
		454 kHz		461 kHz
	NORTHEASTERN NORTH ATLANTIC			421 kHz
		500 kHz	500 kHz	
	NETHERLANDS	2030 kHz	2030 kHz	1764 kHz
		2182 kHz	2182 kHz	
PCH	Scheveningen	2520 kHz		2824 kHz
		4075.4 kHz		4369.8 kHz
		4125 kHz#		4419.4 kHz#
		6203.1 kHz		6509.5 kHz
		6215.5 kHz#		6521.9 kHz#
		8272.5 kHz		8796.4 kHz
		8257 kHz#		8780.9 kHz#
		12367.2 kHz		13138 kHz
		12392 kHz#		13162.8 kHz#
		16568.5 kHz		17341.4 kHz
		16522 kHz#		17294.9 kHz#
		22012.4 kHz		22608.4 kHz
		22062 kHz#		22658.0 kHz#
		4 MHz		4250 kHz
				6404 kHz
		8 MHz	8 MHz	8562 kHz
				8622 kHz
				8654.4 kHz
		12 MHz	12 MHz	12768 kHz
				12799.5 kHz
				12853.5 kHz
				12966 kHz
		16 MHz		16900.3 kHz
				17007.2 kHz
				17104.2 kHz
		22 MHz		22539 kHz
	NORWAY			22324.5 kHz
LGA	Alesund	500 kHz	500 kHz	487 kHz
		2182 kHz	2182 kHz	
		2442 kHz	2442 kHz	1722 kHz
LGN	Bergen	500 kHz	500 kHz	416 kHz
		2182 kHz	2182 kHz	
		2463 kHz	2463 kHz	1743 kHz
LGP	Bodø	500 kHz	500 kHz	487 kHz
		2182 kHz	2182 kHz	
		2139 kHz	2139 kHz	2656 kHz
LGZ	Farsund	500 kHz	500 kHz	476 kHz
		2182 kHz	2182 kHz	
		2470 kHz	2470 kHz	1750 kHz
LGL	Florø	2182 kHz	2182 kHz	
		2132 kHz	2132 kHz	2649 kHz
LGI	Hammerfest	500 kHz	500 kHz	438 kHz
		2182 kHz	2182 kHz	
		2442 kHz	2442 kHz	1722 kHz
LGH	Harstad	500 kHz	500 kHz	516 kHz
		2182 kHz	2182 kHz	
		2456 kHz	2456 kHz	1736 kHz
LFO	Ørlandet	2182 kHz	2182 kHz	
		2118 kHz	2118 kHz	2635 kHz
LGD	Rørvik	500 kHz	500 kHz	441 kHz
		2182 kHz	2182 kHz	
		2576 kHz	2576 kHz	1757 kHz
LGQ	Rogaland	500 kHz	500 kHz	516 kHz
		2182 kHz	2182 kHz	
		2449 kHz	2449 kHz◆	1729 kHz
LFW			4 MHz◆	4325 kHz
			4185 kHz◆	
LGU			6 MHz◆	6432 kHz
			6277.5 kHz◆	6467 kHz
LFN		8 MHz	8 MHz	8527.5 kHz
LGB		8370 kHz	8370 kHz	8574 kHz
LFB				8678 kHz
LGJ		12 MHz	12 MHz	12727.5 kHz
LFJ		12555 kHz	12555 kHz	12876 kHz
LFI				12961.5 kHz
LFT		16 MHz	16 MHz	16952.4 kHz
LGX		16740 kHz		17074.4 kHz
LFF				17165.6 kHz
LGG		22 MHz◆		22425 kHz
LFG	Rogaland	22242 kHz◆		22473 kHz
LGT	Tjome	500 kHz	500 kHz	438 kHz
		2182 kHz	2182 kHz	
		2456 kHz	2456 kHz	1736 kHz

MARISAT equipped vessels may send AMVER messages without charge. Messages must be less than one minute in length, and sent via TELEX. This does not apply to the Indian Ocean satellite.

AMVER TELEX No. 127594

Remember that all AMVER traffic should now be addressed to the AMVER radio station receiving the message. For example: "AMVER [illegible]."

CALL	LOCATION	BANDS GUARDED DAY	BANDS GUARDED NIGHT	WORKING FREQUENCY
LGE		500 kHz	500 kHz	444 kHz
		2182 kHz	2182 kHz	
		2470 kHz	2470 kHz	1750 kHz
LGV		500 kHz	500 kHz	522 kHz
		2182 kHz	2182 kHz	
		2449 kHz	2449 kHz	1729 kHz
	OCEAN STATION SHIPS			
C7L	57°-00'N 20°-00'W	2182 kHz	2182 kHz	**
C7M	66°-00'N 02°-00'E	2182 kHz	2182 kHz	**
C7R	47°-00'N 17°-00'W	2182 kHz	2182 kHz	**
	NORTHWESTERN NORTH ATLANTIC			
	CANADA[1]			
VFF[2]	Frobisher, NWT	500 kHz'	500 kHz	430 kHz
		2182 kHz'	2182 kHz	2582 kHz
		4195 kHz	4195 kHz	4236.[illegible] kHz
		6292.5 kHz	6292.5 kHz	6493 kHz
		8390 kHz	8390 kHz	8712 kHz
		12585 kHz	12585 kHz	13089.5 kHz
VCM	St. Anthony, Nfld.	500 kHz	500 kHz	448 kHz
		2182 kHz	2182 kHz	2582 kHz
VCP	St. Lawrence	2182 kHz	2182 kHz	2582 kHz
VCG	Riviere-au-Renard, P.Q.	500 kHz	500 kHz	434 kHz
		2182 kHz	2182 kHz	2582 kHz
VCN	Grindstone, M.I.	500 kHz	500 kHz	440 kHz
		2182 kHz	2182 kHz	2582 kHz
VCS	Halifax, N.S.	500 kHz	500 kHz	484 kHz
		2182 kHz	2182 kHz	2582 kHz
			4 MHz◆	4285 kHz
		6 MHz◆	6 MHz◆	6491.5 kHz
		8 MHz◆	8 MHz◆	8440 kHz
		12 MHz◆	12 MHz◆	12974 kHz
		16 MHz◆	16 MHz◆	16948.5 kHz
VCO	Sydney, N.S.	500 kHz	500 kHz	464 kHz
		2182 kHz	2182 kHz	2582 kHz
VAW[2]	Killinek, N.W.T.	500 kHz	500 kHz	484 kHz
		2182 kHz	2182 kHz	2582 kHz
VAR	St. John, N.B.			
		2182 kHz	2182 kHz	2582 kHz
VON	St. John's, Nfld.	500 kHz	500 kHz	478 kHz
		2182 kHz	2182 kHz	2582 kHz
VCK	Sept Isles, P.Q.	500 kHz	500 kHz	420 kHz
		2182 kHz	2582 kHz	2582 kHz
VAU	Yarmouth, N.S.	500 kHz	500 kHz	489 kHz
		2182 kHz	2182 kHz	2582 kHz
VOO	Comfort Cove, Nfld.	500 kHz	500 kHz	430 kHz
		2182 kHz	2182 kHz	2582 kHz
VOJ	Stephenville, Nfld.	500 kHz	500 kHz	416 kHz
		2182 kHz	2182 kHz	2182 kHz
	EAST CENTRAL ATLANTIC			
	SPAIN			
EAC	Tarifa	500 kHz	500 kHz	484 kHz
EAF	Vigo	500 kHz	500 kHz	484 kHz
				450 kHz
EAT	Santa Cruz de Tenerife	500 kHz	500 kHz	418 kHz
	IRELAND			
EJM	Malin Head	500 kHz	500 kHz	429 kHz
		2182 kHz	2182 kHz	1841 kHz
EJK	Valentia Island	500 kHz	500 kHz	421 kHz
		2182 kHz	2182 kHz	1827 kHz
	WEST CENTRAL ATLANTIC			
	UNITED STATES	500 kHz	500 kHz	440 kHz
NMA	Miami, Fla.	SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		SHIP XMIT	SHIP XMIT	SHORE XMIT
		6200.0	6200.0	6506.4

NOTES TO ATLANTIC AMVER COMMUNICATIONS CHART:

1) Messages forwarded via any Atlantic Canadian station should be addressed to AMVER HALIFAX to ensure that no charge is applied in delivery.
2) First week in July through end of October only.
3) Guarded between 2000 GMT and 0500 GMT only.
4) Guarded between 1430 GMT and 2300 GMT only.
* Available upon request

\# For Calling Only

◆) Bands guarded when listed on call slip only.
** Working frequency to be arranged after initial call 2182 kHz.

TABLE 2-4. USCG ATLANTIC COMMUNICATIONS CENTERS (continued)

CALL	LOCATION	BANDS GUARDED DAY	BANDS GUARDED NIGHT	WORKING FREQUENCY
	UNITED STATES (Cont.)			
NMF	Boston, Mass.	500 kHz	500 kHz	427/472 kHz
		CALLING FREQUENCIES (Channel 4-5-6)		
		8 MHz	8 MHz	8459.0 kHz
		12 MHz	12 MHz	12783.0 kHz
		DIRECT PRINTING RADIOTELETYPE SELCALL 1.01095 (Assigned Frequency Shown)		
		*4176.0 kHz	*4176.0 kHz	4355.5 kHz
		*6262.0 kHz	*6262.0 kHz	6500.0 kHz
		8349.5 kHz	8349.5 kHz	8710.5 kHz
		12497.0 kHz	12497.0 kHz	13077.0 kHz
		16666.0 kHz	*16666.0 kHz	17203.0 kHz
		·22198.0 kHz	*22198.0 kHz	22567.0 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		6200.0 kHz	6200.0 kHz	6506.4 kHz
NMG	New Orleans, La.	500 kHz	500 kHz	486/432 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		1200-0200GMT	0200-1200GMT	
			4134.3 kHz	4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506.4 kHz
		8241.5 kHz	8241.5 kHz	8765.4 kHz
		12342.4 kHz		13113.2 kHz
NMN	Portsmouth, Va.	500 kHz	500 kHz	466 kHz
		CALLING FREQUENCIES (Channel 4-5-6)		
		8 MHz	8 MHz	8465.0 kHz
		12 MHz	12 MHz	12718.5 kHz
		16 MHz		16976.0 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		1200-0200GMT	0200-1200GMT	
			4134.3 kHz	4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506 4 kHz
		8241.5 kHz	8241.5 kHz	8765.4 kHz
		12342.4 kHz		13113 2 kHz
SOUTHEASTERN ATLANTIC				
	SOUTH AFRICA	4 MHz	4 MHz	4145 kHz
ZSJ2	Commcen Cape		4 MHz[8]	4283 kHz
ZSJ3			6 MHz[9]	6386.5 kHz
ZSJ4		8 MHz[10]	8 MHz	8566 kHz
ZSJ5		12 MHz[11]		12849 kHz
ZSJ6		16 MHz		17132 kHz
ATLANTIC/CARIBBEAN				
	UNITED STATES			
NMR	San Juan, P.R.	500 kHz	500 kHz	466 kHz 430 kHz
		2182 kHz	2182 kHz	2670 kHz
		8 MHz Channels 4-5-6	8 MHz Channels 4-5-6	8471 kHz
		12 MHz Channels 4-5-6	12 MHz Channels 4-5-6	12700 kHz
		16 MHz Channels 4-5-6		16983 2 kHz
NBA	Balboa	500 kHz	500 kHz	470 kHz
			4 MHz	4222 kHz
		8 MHz	8 MHz	8614 kHz
		12 MHz	12 MHz	12883 kHz
		16 MHz		17136.8 kHz
	ATLANTIC/CARIBBEAN (con't)			
	ARGENTINA			
LPD4	Pacheco	500 kHz	500 kHz	444.5 kHz
LPL		2182 kHz	2182 kHz	
LPD68			4 MHz	4268 kHz
LPD86		8 MHz	8 MHz	8646 kHz
LPD88			12 MHz	12988.5 kHz
LPD46		16 MHz	16 MHz	17065.6 kHz
LPD91		22 MHz		20520 kHz
LOL				17665 kHz
				19441 kHz
	BERMUDA			
ZBM	St. George	500 kHz	500 kHz	476 kHz
		2182 kHz	2182 kHz	2582 kHz
		156.8 MHz	156.8 MHz	156.5 MHz
				156.6 MHz
OTHER ATLANTIC				
IRM	Rome, Italy	4 MHz	4 MHz	4342 kHz[a]
				4350 kHz[b]
		6 MHz	6 MHz	6365 kHz[c]
				6420 kHz[b]
		8 MHz	8 MHz	8685 kHz[d]
		12 MHz	12 MHz	12760 kHz[e]
				12748 kHz[b]
		16 MHz	16 MHz	17105 kHz[f]
		22 MHz	22 MHz	22525 kHz[b]
	Gothenburg, Sweden			
SAG2		4 MHz	4 MHz	4262 kHz
SAG3		6 MHz	6 MHz	6372.5 kHz
SAG4		8 MHz	8 MHz	8498 kHz
SAB4		8 MHz	8 MHz	8646 kHz
SAG6		12 MHz	12 MHz	12880.5 kHz
SAB6		12 MHz	12 MHz	12755.5 kHz
SAG8		16 MHz	16 MHz	17079.4 kHz
SAG9		22 MHz	22 MHz	22413 kHz
SAG25		25 MHz	25 MHz	25461 kHz
GREAT BRITAIN				
GKA	Portishead, U.K.	Frequencies and times in accordance with I.T.U. LIST OF COAST STATIONS - LIST IV		
GKR	Wick, U.K.			
GND	Stonehaven, U.K.			
GCC	Cullercoats, U.K.			
GXZ	Humber, U.K.			
GNF	Northforeland, U.K			
GNI	Niton, U.K.			
GLD	Landsend, U.K.			
GIL	Ilfracombe, U.K.			
GLV	Anglesey, U.K.			
GPK	Portpatrick, U.K.			
GNE	Oban, U.K.			
DENMARK				
OXZ	Lyngby, Denmark	Frequencies and times in accordance with I.T.U. LIST OF COAST STATIONS - LIST IV		

<u>New Frequency Name</u> The U.S Coast Guard is adopting a new frequency identification which will include all AMVER frequency families. The new identification is to be known as Contact And Long-range Liaison (CALL) frequencies. CALL are HFs providing radio contact and long-range communications between vessels and U S Coast Guard Radio Stations for the purposes of AMVER messages, navigational safety, distress, medical or other non-public correspondence messages.

NOTES TO ATLANTIC AMVER COMMUNICATIONS CHART:

8) 2000 - 0400 GMT.
9) 1600 - 0600 GMT.
10) 0400 - 2000 GMT.
11) 0600 - 1300 GMT.
a. On request and in order to answer ships using medium frequencies.
b) Available when necessary.
c) Winter night service.
d) Replaces the 12760 kHz frequency when this is used for other services, and on request.
e) Continuous. When used for other services it is replaced by 8685 or 12748 kHz.
f) Continuous during the summer season, daytime during the winter.

TABLE 2-5. USCG PACIFIC COMMUNICATIONS CENTERS

CALL	LOCATION	BANDS GUARDED		WORKING FREQUENCY
		DAY	NIGHT	
	NORTHEAST PACIFIC			
	CANADA[1]			
VAJ	Prince Rupert, B.C	500 kHz 2182 kHz	500 kHz 2182 kHz	420 kHz 1630 kHz
VAG	Bull Harbor, B.C.	500 kHz 2182 kHz	500 kHz 2182 kHz	484 kHz 1630 kHz
VAE	TOFINO B.C.	500 kHz 2182 kHz	500 kHz 2182 kHz	478 kHz 1630 kHz
VAK	Victoria, B.C.	500 kHz 2182 kHz	500 kHz 2182 kHz	430 kHz 1630 kHz
VAI	Vancouver, B.C.	500 kHz 2182 kHz 4 MHz 6 MHz 8 MHz 12 MHz 16 MHz	500 kHz 2182 kHz 4 MHz 6 MHz 8 MHz 12 MHz 16 MHz	420 kHz 1630 kHz 4235 kHz 6351.5 kHz 8453 kHz 12876 kHz 17175.2 kHz
4YP	OCEAN STATION SHIP 50°-00'N 145°-00'W	500 kHz 2182 kHz	500 kHz 2182 kHz	480 kHz 1630 kHz
	UNITED STATES			
	SEE OPPOSITE PAGE			
	NORTHWEST PACIFIC			
	JAPAN			
NDT	Yokosuka	500 kHz	500 kHz	450 kHz
JNX	Kushiro	500 kHz	500 kHz	444 kHz
JNN	Shiogama	500 kHz	500 kHz	464 kHz
JGC	Yokohama	500 kHz	500 kHz	444 kHz
JNT	Nagoya	500 kHz	500 kHz	464 kHz
JGD	Kobe	500 kHz	500 kHz	472 kHz
JNR	Moji	500 kHz	500 kHz	444 kHz
JNJ	Kagoshima	500 kHz	500 kHz	478 kHz
JNB	Okinawa	500 kHz	500 kHz	472 kHz
	CENTRAL PACIFIC			
	UNITED STATES SEE OPPOSITE PAGE			
	SOUTHWEST PACIFIC			
	AUSTRALIA			
VIS[2]	Sydney	500 kHz 2182 kHz 4125 kHz	500 kHz 2182 kHz 4125 kHz	440,476, 512 kHz 2201 kHz 4428.7 kHz
VIS53[3]			4 MHz Chs 5,6,17	4245 kHz
VIS53		6215.5 kHz	6215.5 kHz	6512.6 kHz
	Sydney (continued)			
VIS3[4]			6 MHz Chs 5,6,17	6464 kHz
VIS26		8 MHz Chs 5,6,17	8 MHz Chs 5,6,17	8521 kHz 8452 kHz
VIS5		12 MHz Chs 5,6,17	12 MHz Chs 5,6,17	12952.5 kHz 12979.5 kHz
VIS6[z]		16 MHz Chs 5,6,17	16 MHz Chs 5,6,17	17161.3 kHz 17194.4 kHz
VIS42[5]		22 MHz Chs 3,4,9		22474 kHz
VIP	Perth	500 kHz 2182 kHz 4125 kHz 6215.5 kHz	500 kHz 2182 kHz 4125 kHz 6215.5 kHz	484,512 kHz 2201 kHz 4428.7 kHz 6512.6 kHz
VIP3[*]		8 MHz Chs 5,6,16	8 MHz Chs 5,6,16	8597 kHz
VIP4[x]		12 MHz Chs 5,6,16	12 MHz Chs 5,6,16	12994 kHz
VIP5[8]		16 MHz Chs 5,6,16	16 MHz Chs 5,6,16	16947.6 kHz
VIP6[8]		22 MHz Chs 3,4,10	22 MHz Chs 3,4,10	22315.5 kHz
	NEW ZEALAND			
ZLD	Auckland	500 kHz 2182 kHz 4125 kHz	500 kHz 2182 kHz 4125 kHz	487.5 kHz 2207 kHz 4143.6 kHz
ZLB	Awarua	500 kHz 2182 kHz 4125 kHz	500 kHz 2182 kHz 4125 kHz	515 kHz 2423 kHz 4143.6 kHz
ZLB2[8]		4 MHz Chs 5,6,17	4 MHz Chs 5,6,17	4277 kHz
ZLB3[*]		6 MHz Chs 5,6,17	6 MHz Chs 5,6,17	6393.5 kHz
ZLB4		8 MHz Chs 5,6,17	8 MHz Chs 5,6,17	8504 kHz
ZLB5[a]		12 MHz Chs 5,6,17	12 MHz Chs 5,6,17	12740 kHz
ZLB6		16 MHz Chs 5,6,17		17170.4 kHz
ZLB7		22 MHz Chs 3,4, 9		22533 kHz
ZLW	Wellington	500 kHz 2182 kHz 4125 kHz	500 kHz 2182 kHz 4125 kHz	417.5 kHz 2153 kHz 4143.6 kHz
ZLC	Chatham Isl.	2182 kHz	2182 kHz	2104 kHz
	FIJI			
3DP	Suva	500 kHz 2182 kHz 8 MHz[6]	500 kHz 2182 kHz 12 MHz[7]	518 kHz 2111 kHz 8690 kHz 12700 kHz
	FRENCH POLYNESIA			
FJA	Mahina, Tahiti	500 kHz 2182 kHz 8230 kHz	500 kHz 2182 kHz 8230 kHz	432 kHz 2620 kHz 8764 kHz
	SAMOA			
KUQ	Pago Pago	500 kHz 4 MHz 6 MHz 8 MHz 12 MHz	500 kHz 4 MHz 6 MHz 8 MHz 12 MHz	[illegible] kHz 5475 kHz 6361 kHz 8585 kHz 12871.5 kHz
	MARIANA ISLANDS			
	SEE OPPOSITE PAGE			
	PHILIPPINES			
DZG	Las Pinas	500 kHz 6 MHz 8 MHz 12 MHz 16 MHz 22 MHz	500 kHz 6 MHz 8 MHz 12 MHz 16 MHz 22 MHz	483 kHz 6441 kHz 8588 kHz 12882 kHz 17176 kHz 22506 kHz

Remember that all AMVER traffic should now be addressed to the AMVER radio station receiving the message. For example: "AMVER SYDNEY."

NOTES TO PACIFIC AMVER COMMUNICATIONS CHART:

a)2000-0600 GMT, 1 May-15 Sep; continuous at other times.

1)Messages forwarded via any Pacific Canadian station should be addressed to AMVER VANCOUVER to ensure no charge applied in delivery

2)Continuous watch is also kept on the HF special spot frequencies 6279.75, 8373, 12559.5, 16746 and 22262.5 kHz with calls being answered by appropriate working frequency.

3)Watch 1100-2100 GMT.

4)Watch 0800-2200 GMT.

5)Watch 2200-0800 GMT.

6)Watch 0040-55 and 0940-55 GMT.

7)Watch 0040-55 and 2140-55 GMT.

8)Watch 0600-2000 GMT; 1 May-15 Sep; other times upon request.

*)Available upon request.

x)Watch 0000-1400 GMT.

z)Watch 2100-1100 GMT.

+)Watch 0000-1600 GMT.

8)Watch 0200-1000 GMT.

TABLE 2-5. USCG PACIFIC COMMUNICATIONS CENTERS (continued)

CALL	LOCATION	BANDS GUARDED DAY	BANDS GUARDED NIGHT	WORKING FREQUENCY
SOUTHEAST PACIFIC				
	CANAL ZONE			
NBA	Balboa	500 kHz	500 kHz	470 kHz
			4 MHz	4222 kHz
		8 MHz	8 MHz	8614 kHz
		12 MHz	12 MHz	12882 kHz
		16 MHz		17136.8 kHz
	ECUADOR			
NCG[9]	Guayaquil	500 kHz	500 kHz	469 kHz
		2182 kHz		2182 kHz
		8 MHz	8 MHz	8476 kHz
		12 MHz	12 MHz	12711 kHz
		16 MHz	16 MHz	16948 kHz
	CHILE			
CBV	Valparaiso	500 kHz	500 kHz	438/464.5 kHz
		4 MHz		4349 kHz
			8 MHz	8478 kHz
		12 MHz		121714 kHz
		16 MHz		16945 kHz
		22 MHz		22473 kHz
CBA	Antofasta	500 kHz	500 kHz	418.5 kHz
				447/483 kHz

NOTES TO PACIFIC AMVER COMMUNICATIONS CHART:

9) 1220-2320 radio telephone working frequencies: 4386 kHz, 6210.4 kHz 8281.2 kHz

MARISAT equipped vessels may send AMVER messages without charge. Messages must be less than one minute in length, and sent via TELEX. This does not apply to the Indian Ocean satellite.

AMVER TELEX No.127594

CALL	LOCATION	BANDS GUARDED DAY	BANDS GUARDED NIGHT	WORKING FREQUENCY
NORTHEAST PACIFIC				
	UNITED STATES			
NMC	San Francisco, Calif. (In addition to transmitters located at San Francisco, NMC remotely keys 500 kHz with transmitters located in Long Beach, CA and Astoria, OR)	500 kHz	500 kHz	448/420 kHz
		2182 kHz	2182 kHz	2670 kHz
		CALLING FREQUENCIES (Channels 5-6-11)		
			6 MHz	6383.0 kHz
		8 MHz	8 MHz	8574 0 kHz
		16 MHz		16880.9 kHz
		DIRECT PRINTING RADIOTELETYPE SELCALL 1.01096 (Assigned Frequency Shown)		
			*4176.0 kHz	4355.5 kHz
			*6266.0 kHz	6504.0 kHz
		8353.5 kHz	8353.4 kHz	8714 5 kHz
		12501.0 kHz	12501.0 kHz	13081 0 kHz
		16670.0 kHz	16670.0 kHz	17207.0 kHz
		22202.0 kHz	22202.0 kHz	22571.0 kHz
		25085.8 kHz		25380.0 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		4134.3 kHz	4134.3 kHz	4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506.4 kHz
		8241.5 kHz	8241.5 kHz	8765.4 kHz
		12342.4 kHz	12342.4 kHz	13113 2 kHz
NMJ	Ketchikan, Alaska	500 kHz	500 kHz	416 kHz
		2182 kHz	2182 kHz	2670 kHz
NOJ	Kodiak, Alaska	500 kHz	500 kHz	470 kHz
		2182 kHz	2812 kHz	2670 kHz
		CALLING FREQUENCIES (Channels 5-6-11)		
		8 MHz	8 MHz	8628.5 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		6200.0 kHz	6200.0 kHz	6506 4 kHz
NOX	Adak, Alaska	500 kHz	500 kHz	450 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		4134.3 kHz		4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506.4 kHz
CENTRAL PACIFIC				
	UNITED STATES			
NMO	Honolulu, Hawaii	500 kHz	500 kHz	440 kHz
		2182 kHz	2182 kHz	2670 kHz
		CALLING FREQUENCIES (Channels 5-6-11)		
		8 MHz	8 MHz	8650.0 kHz
		12 MHz	12 MHz	12889.5 kHz
		(Channels 3-4)		
		22 MHz		22476.0 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
		4134.3 kHz	4134.3 kHz	4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506.4 kHz
		8241.5 kHz	8241.5 kHz	8765.4 kHz
SOUTHWEST PACIFIC				
	MARIANA ISLANDS			
NRV	Guam	500 kHz	500 kHz	466 kHz
		2182 kHz	2182 kHz	2670 kHz
		SSB VOICE FREQUENCIES (Carrier Frequency Shown)		
			6200.0 kHz	6506.4 kHz
		12342.4 kHz		13113.2 kHz

aviation and maritime. Each corporation involved in exploration and production has its own, separate communications system. The exploration and production companies contract with the drilling companies to drill exploration and production wells. Appendix D lists the major U.S. petroleum and gas exploration and production companies together with major U.S. companies specializing in drilling operations.

All seismic vessels and drill ships are maritime flag vessels and as such are equipped with HF radio as described earlier in Section 2.2.2. In addition to HF communications, a number of the drill ships, seismic vessels and the fixed platforms are equipped with MARISAT terminals and are included in the MARISAT vessel list presented earlier in Table 2-2. The fixed production platforms are generally equipped with HF radio and, dependent upon their location and proximity to other platforms and the shore, they may also be equipped with MARISAT, VHF, or microwave. Fixed production platforms within the continental limits of a foreign country are generally restricted to transmission via that country's government-controlled communication carrier.

Typically, administrative, exploration and production information is transmitted from the vessels and platforms to U.S. corporate headquarters located primarily in Chicago, IL, Houston, TX, Los Angeles, CA, New York, NY, San Francisco, CA, and Tulsa, OK.

Type of Services

The telecommunications services utilized by the U.S. offshore operations include the following:

- Voice
- Data
- Facsimile (e.g., Seismic profiles and weather)
- Telex and TWX
- Special services for MARISAT equipped operations (see Section 2.2.1)

Geographic Coverage

Figure 2-13 indicates the principal areas of exploration and production activity of U.S. owned off-shore interests. Vessels in transit between these sites and the United States normally transit the appropriate trade routes shown earlier in Figure 2-10.

System Availability

Considering the heterogeneous nature of communications in the offshore oil industry, system availability will vary from full time to part time operation depending on the company. Our preliminary survey indicated that during unattended periods in the various corporate communications centers, hard copy transmissions are received for later action.

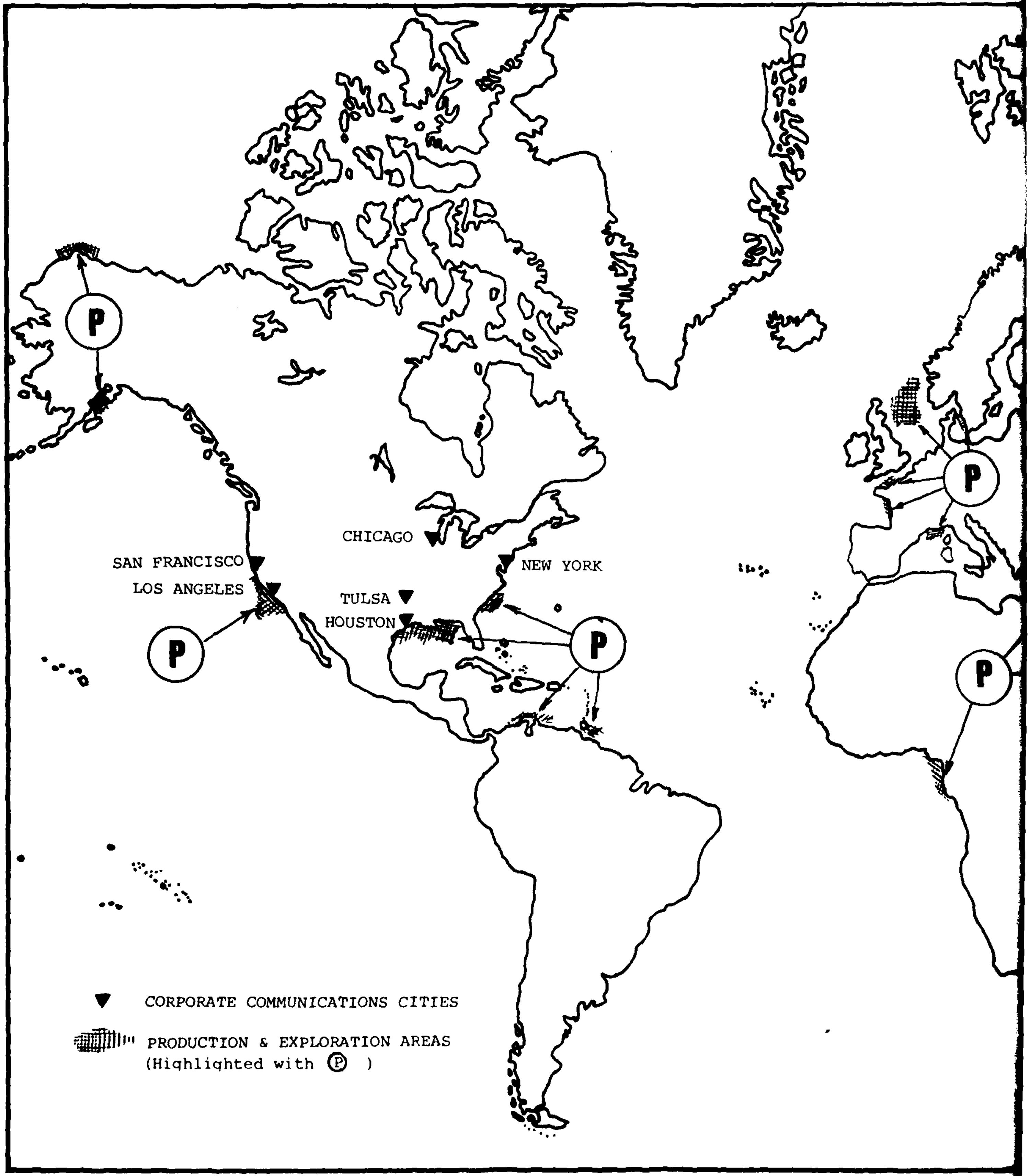
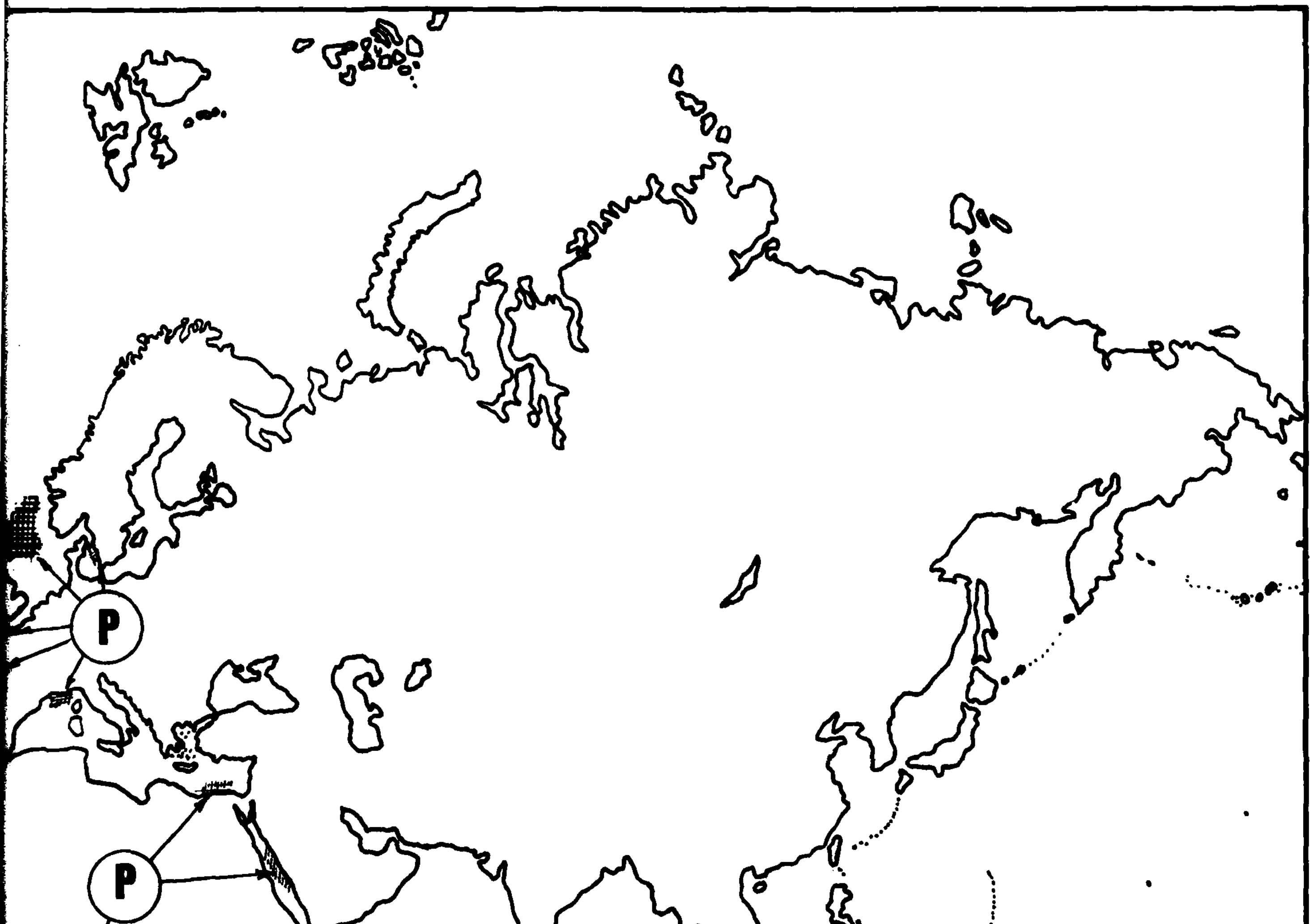


Figure 2-13. U.S. OFFSHORE PETROLEUM INDUSTRY
U.S. COPRORATE COM



UM INDUSTRY PRINCIPAL AREAS OF ACTIVITY AND
PRORATE COMMUNICATIONS CITIES

2

2.4.2 Terminal/Interface Description

Equipment Type

A wide range of terminals are used in the U.S. offshore petroleum industry depending upon the particular service requirements of each company. These terminal types include teletypewriters, facsimile and data equipment.

Codes

For the industry's record and data transmission, codes include International Telex, Baudot and ASCII.

Speeds and Protocols

Transmission speeds vary from 50 baud to 2400 bps depending upon the particular equipment utilized. System protocols vary considerably between companies for their private services but do include international Telex and other commercial system protocols.

Terminal Locations

Figure 2-13 provides an indication of the locations of major U.S. offshore petroleum operations and the cities housing their corporate headquarters. As indicated earlier, terminal locations are in the principal areas of activity and the corporate centers (refer to Figure 2-13).

2.5 NATO COMMUNICATIONS SYSTEMS

Most NATO communications systems can be currently characterized as manual, dedicated point-to-point analog circuits in a "hierarchical command-oriented configuration". It has been determined that these systems do not meet the command and control requirements of either NATO's military or political users. This deficiency has led to the development of the NATO Integrated Communications System (NICS), one of NATO's highest priority efforts to solve its current communications problems. The NICS will replace or absorb most of the existing NATO dedicated communications networks. As a viable, rapid, secure, flexible, and survivable integrated system, it is being implemented today under the control of a unique, independent NATO organization formed in 1971: the NATO Integrated Communications System Management Agency (NICSMA).

2.5.1 General Description

2.5.1.1 The NICS Concept

In terms of today's system, communications growth in the NATO environment has followed a classical evolutionary path. Voice and telegraph systems, mostly manual, were established in user areas of activity and then interconnected by transmission links which were either NATO-owned or leased. For example, to meet common-user voice requirements, the entry point into NATO's long-haul network is generally through a manual switchboard or console. Specialized requirements of the NATO commanders, such as responsiveness, are normally accommodated by direct connection of selected voice users, either local or remote, which "bypass" a switchboard to ensure that a transmission path is available when needed.

Although voice communications have been upgraded in performance and service over the years, the penalties of a predominantly manual network still remain. Automatic voice switching, when available, consists of Private Automatic Branch Exchanges (PABXs) which provide dial service to users within an area of activity. These PABXs have not been fully adapted for extended area dialing or integrated into a uniform NATO numbering plan for automatic switched services, since the automatic switching is typically confined within individual areas or to adjoining areas of user activity. Manual switchboards co-located with a PABX generally provide the long-haul connectivity between PABXs. This means that in NATO today it is impossible to place a call from, for example, NATO Headquarters in Belgium to AFSOUTH in Naples, Italy, without going through a manual switchboard.

As in the case of voice communications, NATO's existing message system is also old and outdated. Manual torn tape relay centers are located throughout the Alliance, but information flow is slow and, in time of crisis or military exercises, delays of many hours are not uncommon for even the important traffic. Most of the message traffic is transmitted over NATO's ACE-HIGH European "backbone" communications network located at over 80 sites ranging from Norway to eastern Turkey. The carrier telegraph channels are applied in the available frequency spectrum between carrier telephone channels.

The terminal equipment used in the torn tape centers is primarily Siemens and Olivetti and a mixture of others. Equipment failures are commonplace, more so today as replacement parts are difficult to obtain. Operation and maintenance of the torn tape centers are primarily by the NATO military forces.

The terminal equipment uses the simple CCITT 2, 5 unit Baudot code, which is the International Telegraph Alphabet 2 - space (start) + 5 unit Comite Consultatif International Telegraphique code 2 + mark (stop). Transmission speeds which are limited by the terminal equipment being utilized are primarily 50 baud -- although 75 baud is not uncommon.

After World War II the U.S., Canada, UK, Australia, and New Zealand jointly developed the basic ACP (Allied Communications Publication) 127 still in use by NATO today. This torn tape station publication describes the standard message formats, and alternate routing procedures , and protocols, to be used. In the early 1970s NATO developed and published NATO Supplement 3 to ACP 127 which expanded and revised the formats and provides examples for their use. NATO has been slow in changing to ACP 127 Supplement 3 although usage is mandatory with the introduction of the NICS.

It has become obvious to NATO's communications planners that the rapidly expanding "individualized" communication networks discussed above should be combined so that different types of user communications could traverse an automatically integrated switched system. Coordinated planning efforts to include clear voice, secure voice, low-speed/medium-speed data, facsimile and computer-to-computer communications needs then commenced within the NATO framework to form the basis for the concept of the NICS today.

In the late 1960s the principal characteristics of the NICS concept were based upon a common-user, automatically-switched nodal network. This "grid-type network" configuration was chosen because it could provide improved routing capability, better damage absorption and user-network separation. Other characteristics of the concept included survivability (obtained by a combination of dispersion and redundancy), avoidance of target areas, hardening and some mobile reserves. High performance would be made possible by automation of switching and control functions, use of medium and high-speed telegraph and data transmission, automation of internal message distribution and voice communications, and by encryption of all types of transmission. Separation of the user from the network would be achieved; users could be distinct from the network and only linked into it. This would provide better protection for both the system and the user installation and flexibility for users to enter or leave the network. Finally, existing transmission facilities would be utilized to the maximum extent possible, resulting in economic and manpower savings, more flexibility and redundancy.

In this NICS concept, the system would be based on the principle of a circuit-switched telephone network through which all forms of traffic would pass. This means that for ordinary or secure voice transmission, for a telegraph message, for data transmission between computers or for facsimile, normal CCITT, 4kHz four-wire telephone circuits would be used and users would be provided with much-improved service. The main elements of the system would be switching nodes, access switches, Message Distribution Centers (MDCs) and transmission media.

From the telephone-user's point of view, a subscriber would be able to call directly from his desk telephone to NICS subscribers in any NATO country. If a called number were busy and the demander was entitled to precedence calls, lower priority calls would be automatically pre-empted after a warning tone. Off-hook connections (pre-programmed connections between defined subscribers) could be established without any delay just by lifting the handset or pushing the appropriate button; this service provided with a FLASH precedence would be called "Hot Line". Secure telephone facilities would be available to selected subscribers as well as conference calls involving three or more conferees. To transmit a message, a telephone connection would be established under the same conditions and in the same time as a telephone call. For multi-address messages, MDCs would provide automatic distribution to all addressees, and could verify delivery upon request. Precedence facilities as well as secure teletype conference and broadcast facilities would also be provided.

2.5.1.2 Two Implementation Stages

After a detailed study of the NICS concept, the NICSMA concluded that implementation would require two transition stages. These stages would allow for further testing and experimentation to establish the feasibility of those elements of the NICS which involved development risk. This approach would also allow planners time to more fully define a mature NICS while simultaneously implementing those portions of the network which would provide an early, much-needed improvement in the NATO communications capability.

2.5.1.3 Stage I NICS

During the early 1970s planning for Stage I NICS, two major factors had to be taken into consideration. First, the most urgent requirement in NATO was to improve message traffic, so the existing manual torn tape telegraph relay system had to be automated. Second, the NATO SATCOM Phase II satellites (ending their usable life) were due to be replaced by the newly-designed Phase III satellites, and these would be of considerably greater capacity than SATCOM Phase II.

The NATO-approved philosophy for the Stage I NICS was to accept that, within the limited timeframe, it would be impossible to procure switching nodes of the type and complexity defined in the overall NICS concept. The Stage I implementation plan therefore envisaged the procurement of "off-the-shelf" voice and telegraph access switches to be installed at locations of major user concentrations, mainly major NATO headquarters and other principal sites. Table 2-6 lists the Stage I military and political users and their subscriber categories.

Stage I of the NICS, in development since the mid-1970s, will cost in the order of $500M and is divided into three major subsystems:

- IVSN (Initial Voice Switched Network)
- TARE (Telegraph Automatic Relay Equipment)
- SATCOM III (Ground and Space Segments)

In addition there are three other projects necessary to implement Stage I:

- PVSP (Pilot Secure Voice Project)
- Numerous terrestrial transmission media projects
- SSIP (Sub-system Integration Project)

Table 2-6. NATO INTEGRATED COMMUNICATION SYSTEM USERS

List of users encompasses

- NATO Headquarters
- The Political and Military authorities of all of the countries of the Alliance
- The Headquarters of the Major NATO Commanders, the Headquarters of their Subordinates and those Headquarters of National Forces to which communications are eligible for common funding and under the command and control of a Major NATO Commander
- The NATO Civil Wartime Agencies

Subscriber categories

Secure direct subscriber	over	500
Non-secure direct subscriber	over	1000
Secure indirect subscriber	over	1000
Non-secure indirect subscriber	over	6000
Operational direct line subscribers	over	300
Single channel radio terminals	under	100

The three Stage I NICS subsystems and the three associated projects are discussed below.

- Initial Voice Switched Network (IVSN)

The IVSN program involves procurement of 24 operational access switches together with two additional switches for training and software development. Switch installation, which will start at the first site (Norfolk) in Spring, 1980, will take approximately two years. The switches will be connected in groups and accepted at the sites on the dates indicated in Table 2-7. By the end of 1980, direct links will have been provided to the major NATO commanders (SACLANT, SACEUR, CINCHAN) as well as NATO Headquarters. The training switch will be installed at the NATO Communications Training Center which is situated at Latina just south of Rome. A software maintenance switch will be installed in a new building to be constructed at NATO Headquarters, Evere, Belgium. The IVSN, when operational, will provide a modern telephone system with characteristics similar to the U.S. AUTOVON.

- Telegraph Automatic Relay Equipment (TARE)

The TARE program involves procurement of 18 operational message switches plus two additional equipments for training and software development co-located with their voice counterparts. Switch installation, beginning at the first site (Norfolk) in May 1980, will take approximately three years. Sites and acceptance dates are listed in Table 2-8. When completed, the TARE network will be the largest message processing system in the world and will provide telegraph services with characteristics similar to the U.S. AUTODIN.

- NATO SATCOM III

The NATO SATCOM III subsystem presently consists of three satellites (1 active, 2 in storage) in orbit over the North Atlantic and twelve fixed ground terminals provided under the earlier SATCOM II program. This subsystem will be enhanced with the addition of nine new fixed and two transportable terminals and the upgrading of the existing twelve ground stations. When completed this subsystem will provide the first all-digital "network" within the NICS. The planned terminal site acceptance dates for the new equipment, as well as the new site locations are listed in Table 2-9.

The three NATO III satellites were successfully launched in April 1976, January 1977, and November 1978. The second NATO satellite, launched in January 1977, has until recently been on loan to the U.S. authorities; in return NATO will be provided with similar capacity, later on, from a U.S. military satellite. As an interim measure, in order to make use of the significantly greater capability of the NATO III satellites now in orbit, the capacity of the existing twelve NATO static ground terminals has been increased so as to extend the number of voice channels from 57 to 151.

The NATO III satellites provide three communications channels designated as the 17MHz, 50MHz and 85MHz bands. One set of transponders, with a narrow beam (NB) transmit antenna is used to relay the carriers in the 17MHz and 85 MHz bands. The remaining two transponders with a wide beam (WB) transmit antenna are utilized to relay the carriers located in the 50MHz band.

TABLE 2-7

IVSN ACCESS SWITH LOCATIONS AND INSTALLATION SCHEDULE

GROUP	SITE	PSA	GPA	FNA
1.	NORFOLK, US	JUL 80		
	CARP, CA	AUG 80		
	KOLSAAS, NO	AUG 80		
	CASTEAU, BE	SEP 80		
	RHEINDAHLEN, GE	SEP 80	OCT 80	
2.	NORTHWOOD, UK	AUG 80		
	OEIRAS, PO	SEP 80		
	OEGSTGEEST, NL	OCT 80		
	BRUNSSUM, NL	NOV 80	DEC 80	
	LATINA, IT (TRAINING)	DEC 80		
3.	IZMIR, TU	JAN 81		
	ERWIN, GE	FEB 81		
	ATHENS, GR	MAR 81		
	ANKARA, TU	APR 81		
	VIBORG, DA	MAY 81	JUL 81	
4.	VERONA, IT	JUN 81		
	SANTA ROSA, IT	JUL 81		
	RUPPERTSWEILER, GE	AUG 81		
	REITAN, NO	SEP 81		
	HEIDELBERG, GE	OCT 81	NOV 81	
5.	PITREAVIE, UK	NOV 81		
	VEDBAEK, DA	DEC 81		
	EVERE, BE (SOFTWARE)	JAN 82		
	EVERE, BE	FEB 82		
	NAPLES, IT	FEB 82		
	RENDSBURG, GE	MAR 82	APR 82	MAY 82

PSA = PROVISIONAL SITE ACCEPTANCE
GPA = GROUP PROVISIONAL ACCEPTANCE
FNA = FINAL NETWORK ACCEPTANCE

TABLE 2-8

TARE SWITCH INSTALLATION SCHEDULE

SEQUENCE NUMBER	SITE	PSA*
1.	NORFOLK, US	Nov 80
2.	KOLSAAS, NO	Jan 81
3.	COSTA DA CAPARICA, PO	Mar 81
4.	MAASTRICHT, NL	May 81
5.	GELINTEPE, TU	Jul 81
6.	IZMIR, TU	Sep 81
7.	ATHENS, GR	Sep 81
8.	VIBORG, DA	Jan 82
9.	BAUMHOLDER, GE	Mar 82
10.	DEBERT, CA	May 82
11.	VERONA, IT	Jul 82
12.	LATINA, IT (TRAINING)	Sep 82
13.	SENDEN, GE	Nov 82
14.	EVERE, BE	Jan 83
15.	EVERE, BE (SOFTWARE)	Mar 83
16.	NAPLES, IT	May 83
17.	REITAN, NO	Jul 83
18.	PITREAVIE, UK	Sep 83
19.	NORTHWOOD, UK	Nov 83
20.	CASTEAU, BE	Jan 84

* PSA = Provisional Site Acceptance

TABLE 2-9

SATCOM III TERMINAL INSTALLATION SCHEDULE

SITE	PSA
LATINA, IT	Jan 81
SACEUR (TRANSPORTABLE)	Mar 81
SACLANT (TRANSPORTABLE)	Mar 81
SCHOONHOVEN, NL	May 81
NORFOLK, US	Jun 81
EUSKIRCHEN, GE	Jul 81
CARP, CA	Aug 81
OAKHANGER, UK	Sep 81
CIVITAVECCHIA, IT	Oct 81
KESTER, BE	Oct 81
VERONA, IT*	Dec 81
LUNDEBAKKE, DA	Jan 82
IZMIR, TU*	Mar 82
LISBON, PR	Apr 82
ANKARA, TU	May 82
ATALANTI, GR	Jun 82
EGGEMOEN, NO	Jul 82
KEFLAVIK, IC*	Aug 82
BJERKVIK, NO*	Sep 82

* = NEW

TABLE 2-9 (continued)

SITE	PSA
BALADO BRIDGE, UK*	Nov 82
FOLLY LAKE, CA*	Dec 82
GIBRALTAR, UK*	Feb 83
LANDAU, GE*	Mar 83
CATANIA, IT*	Apr 83

* = NEW

The NB transponder transmit antenna illuminates the European Area, while the WB transponder antenna illuminates both the European and the Atlantic areas. A single receive antenna is utilized for both the European and Atlantic areas for the purpose of reception of all communication signals transmitted to the satellite.

- Pilot Secure Voice Project (PSVP)

This project involves all the efforts required to provide a secure voice capability for about 1500 NICS subscribers. A preliminary dedicated manual network of 24 four-wire switchboards located at major user sites presently exists. Ultimately, this network will become automatic and will be integrated into the IVSN. The project is also developing high, medium, and low speed cryptographic devices to be used in the IVSN, TARE, and SATCOM subsystems.

- Numerous Terrestrial Transmission Media Projects

This work comprises the present and future NATO-owned subsystems such as the "ACE HIGH" network (which provides line-of-sight and troposcatter links at over 80 sites throughout the area of Allied Command Europe from Norway to Eastern Turkey) together with the CIP-67 network (which will provide line-of-sight links in the Central Region where a large number of NATO subscribers are concentrated). Extensive use is also to be made of PTT links.

In order to provide the additional transmission media facilities needed to support the main NICS projects, the capacity of the existing NATO-owned communications is being increased, and there are some 20 separate projects being implemented by NICSMA under this heading. Where possible these new links are to be digitalized. In general it is planned that the total NICS transmission network will utilize satellite links, NATO-owned terrestrial links and PTT links in roughly equal tertiary proportions.

- Subsystem Integration Project (SSIP)

The most important and difficult aspect of Stage I is tying the major subsystems and transmission media together on a site-by-site basis. The SSIP will provide the ancillary facilities necessary at each site to ensure that all of the equipments can function operationally as part of the total NICS. The SSIP involves an enormous amount of detailed work in coordination with the various NATO and national authorities concerned. The NICS involves installations at 33 principal sites and, when allowance is made for the secondary sites, the total number of different locations at which work must be carried out will be approximately 300. At each site different configurations and different local authorities are involved and thus no common plan can be implemented to suit all. Table 2-10 lists the provisional site acceptance schedule for the first 21 NICS sites to receive the NICS SSIP technical control facilities.

2.5.1.4 Stage II NICS

The requirement for further development and expansion of the NICS beyond Stage I has already been agreed to in principle by NATO Heads of State and Government when they met in Washington during May, 1978. This further development of the NICS now forms part of the overall NATO Long-Term Defense Program which was approved at that meeting.

TABLE 2-10

TECHNICAL CONTROL FACILITIES AND INSTALLATION SCHEDULE*

Sequence Number	Site	Provisional Site Acceptance
1.	NORTHWOOD, UK	Feb 81
2.	COSTA DA CAPARICA, PO	Mar 81
3.	KOLSAAS, NO	Mar 81
4.	MARRSTRICHT, NL	Apr 81
5.	GELINTEPE, TU	Apr 81
6.	VIBORG, DA	May 81
7.	IZMIR, TU	May 81
8.	CASTEAU, BE	Jun 81
9.	ANKARA, TU	Jun 81
10.	ATHENS, GR	Jul 81
11.	RHEINDAHLEN, GE	Jul 81
12.	NORFOLK, US	Aug 81
13.	BRUNSSUM, NL	Aug 81
14.	RUPPERTSWEILER, GE	Sep 81
15.	SANTA ROSA, IT	Sep 81
16.	HEIDELBERG, GE	Oct 81
17.	CARP, CA	Oct 81
18.	VERONA, IT	Nov 81
19.	REITAN, NO	Nov 81
20.	OEIRAS, PO	Dec 81
21.	OEGSTGEEST, NL	Dec 81

(*) Agreed schedule comprising the first twenty one sites only

Detailed proposals for this further development have now been produced and are contained in the NICS Stage II Architecture Report which was presented to the NATO Joint C-E Committee (NICS Policy Committee) at their semi-annual meeting in Autumn 1979. It is anticipated that general approval of the proposed architectural concept will be forthcoming during 1980.

The major aims of the Stage II Architecture are:

- The integration of the Stage I separate subsystems into one overall system which will, to the maximum extent possible, operate in the digital mode
- Expansion and improvement of the quantity and quality of NICS services to all entitled subscribers as foreseen when the original NICS concept was approved
- Enhanced survivability through the addition of nodal switches into a meshed grid network and through the incorporation of increased physical protection
- Achievement of the maximum degree of interoperability with national tactical and strategic communications systems through the use of common standards, or of agreed interface equipments and/or procedures
- Increased security with the introduction of new cryptographic equipment

It is anticipated that the capital costs for the NICS Stage II program will amount to about $1.5 billion. Implementation of the program is planned to take place over an approximate 15-year period. The aim will be to achieve the Stage II goals in four steps although this is still subject to approval by the NATO nations. Step 1 will involve digitization and expansion of the NATO-owned transmission media together with the necessary security protection. Step 2 will involve the installation of the nodal switches and new and additional access equipment which will greatly expand NICS services throughout NATO and will provide the basis for the final integration of the NICS Stage I subsystems. Step 3 will involve the introduction of new wideband security equipment and associated automation. Last, Step 4 will see the introduction of circuit switched telegraphy and the integration of the TARE network into a fully integrated system through the introduction of Message Distribution Centers (MDCs).

2.5.1.5 The NICS Management Structure

The management responsibility for the NICS is divided between several NATO bodies. As mentioned earlier, overall NICS policy is decided by the NATO Joint C-E Committee on which all of the NATO nations except Iceland are represented. The Committee, supported by a small, permanent secretariat, meets semi-annually at NATO Headquarters.

The planning, development and implementation of the NICS is the responsibility of the NICSMA, located in Brussels near NATO Headquarters. At present it has a staff of about 300 military and civilian personnel. NICSMA is organized into three functional Divisions, each headed by a brigadier general or equivalent responsible respectively for Planning and Engineering;

Implementation; and System Direction and Support (logistics, network control, procedures, manpower planning and training). The Agency staff includes both civilian and military personnel drawn from most of the NATO nations participating in the NICS.

The responsibility for day-to-day operation of the NICS is the task of the NICS Control Organization. This consists of a Central Operating Authority (COA) formed in January 1976, with a staff of about 60 personnel located at SHAPE (Casteau), Belgium; five Regional Operating Centers (ROCs) located at HQs ACLANT, ACCHAN, AFNORTH, AFCENT and AFSOUTH; a number of Local Control Organizations (LCOs), roughly one to each nation; and the Technical Control Facilities (TCFs) located at every major NICS equipment and transmission media interface. The ROCs are partly formed, and planning for the LCOs is underway. The latter are expected to take over the functions of the several existing ACE HIGH and SATCOM control centers in the near future. The COA will use as its main tool an automated NICS Network Control System (NNCS) being developed to provide the equipment, communications and procedures necessary for control of the system. The COA, ROCs, LCOs, and TCFs will all have 24-hour staff of five shifts.

Programs of logistic support for the NICS switches and other equipments are being staffed. Selected spare parts will be stocked on-site and at one or more main supply depots. Depot maintenance for the NICS is still under study. The NATO Maintenance and Supply Agency (NAMSA) located in Luxembourg will play a key role.

2.5.1.6 NATO Interoperability

Of particular interest to the WCAN II effort is that there are numerous NATO Groups, Sub-Groups and Working Groups presently fostering cooperative efforts to enhance interoperability of both the existing and future NATO strategic and tactical communications.

In his 18 January 1977 report to Congress on "Rationalization/Standardization Within NATO", former Secretary of Defense Donald Rumsfeld noted that despite obstacles, the Alliance had made significant advances in communications interconnection and interoperability. He stated: "the United States has endorsed the principle that, after 1985, members of the Alliance should adopt new communications for use in NATO only if they are interoperable with other national tactical systems and the NATO Integrated Communications System (NICS)". Achievement of this objective depends on Alliance endorsement of the common communications Stage II architecture mentioned previously. Although no real disagreement exists within NATO that interoperability is the basis for a truly integrated system, methods for its accomplishment, what parameters of the NATO Standard Agreements (STANAGS) to use, and the level and degree of interoperability, have been difficult problems to solve.

Some commonality has been achieved through the use of agreed standards. As an example, STANAG 5040, which deals with interoperability of tactical systems, has been used for development and limited production of NATO interface black boxes by France, Canada, West Germany and the United States. NATO and NICSMA are tracking other standards which are in various stages of agreement. These cover telephone, telegraphic, civil/postal telegraphic and telephone, and Automatic Data Processing systems. The United States has also encouraged NATO participation in the development of specifications for the future ACE HIGH digital replacement program by establishing agreements to assess foreign candidate radios.

Perhaps one of the most important areas that these STANAGS must cover is digitization techniques to be used by the NICS. This issue is presently one of the thorniest in NATO telecommunications circles. In an effort to conserve frequency spectrum, ease encryption and minimize interface problems with tactical military systems, NICSMA has suggested future NICS systems choose the DELTA modulation digitization technique. Yet the NICS must also depend heavily upon European civil postal telegraphic and telephone systems, all of which have chosen and use pulse code modulation. Both have merits and limitations and the common method eventually chosen shall have far-reaching implications. This issue is being debated by national experts as part of the NICS Stage II architectural effort and will be resolved in the Stage I/Stage II transition plan.

2.5.1.7 U.S./NATO Interface Points

For a number of years, both the United States and NATO have expended considerable sums of money to operate, maintain and improve their unilateral communications systems in Europe. Although they are independent systems, they cover much of the same geographical area, use many parallel transmission paths and, in some cases, co-locate equipment on site.

For example, the Defense Communications Agency (DCA) is converting the United States backbone transmission system in Europe from an analog to a digital network under its Digital European Backbone (DEB) program. One of the project objectives is interconnection with NATO. Since 1975, there have been eight European locations where existing portions of the U.S. DCS interfaces with the present NATO twenty-year old ACE HIGH backbone communications. Although these interface points are presently for analog transmissions only, joint U.S./NATO tests have been successfully performed proving the effectiveness of digital transmissions over existing ACE HIGH operational troposcatter links.

Today there are also two "transparent" (automatic) message interfaces between the U.S. AUTODIN switches at Croughton, UK, and Coltano, IT, and the existing two NATO TARES (not to be confused with the yet-to-be-installed NICS TARES) located at Northwood, UK, and Naples, IT. These interfaces, implemented over a year ago, presently pass U.S./NATO message traffic at 600 baud (Coltano) and 75 baud (Croughton) respectively. They allow messages to flow unrestricted between terminals. For example, NATO can pass traffic automatically from England to Italy via AUTODIN (Northwood-Croughton-Coltano-Naples) rather than directly.

In addition to these two automatic interfaces, nine other AUTODIN/NATO manual interconnects exist:

AUTODIN-NATO Link	Speed(Baud)
Pirmasens - Erwin, GE	1200
Pirmasens - Kindsbach, GE	300
Pirmasens - Rupertsweiler, GE	75
Croughton - Maastricht, NL	300
Croughton - Casteau (SHAPE), BE	75
Croughton - Kolsaas, NO	75
Coltano - Bagnoli, IT	75
Coltano - Izmir, TU	75
Coltano - Verona, IT	75

These manual links use either the existing DCS/ACE HIGH transmission networks or PTT links. With the exception of Erwin, NATO has supplied and maintains the terminal equipment at these NATO sites.

Next year the first of five NICS/AUTODIN interfaces will be implemented at Norfolk with AUTODIN connections to at least the Maastricht (Croughton), Baumholder (Pirmasens), Verona (Coltano), and Northwood (Croughton) NICS TARES (to follow in that order -- tied to NICS TARE installation schedule). These connections are being arranged through U.S./NATO MoUs (Memoranda of Understanding) with the major NATO commanders as in the previous cases. The U.S.-developed terminal hardware will be capable of speeds up to 4800 bps, but these new interfaces will be maintained at 600 baud (the presently planned trunking capability of the NICS TARES). As before, the U.S. will provide the interface boxes, crypto equipment and modems at no cost to NATO at the appropriate AUTODIN switch locations, and operate and maintain the equipment.

It should be noted that in addition to the ACE HIGH and NICS TARE interfaces with the U.S. Defense Communications System, other arrangements have been agreed to concerning interconnections between the satellite ground terminals of both NATO and the United States.

Having described the current and emerging NATO communications systems, it is appropriate to summarize these systems as follows:

Ownership

The existing NATO system is owned by the fifteen NATO member organizations and administered primarily by the representative military organizations.

Type of Services

The current NATO system provides a wide range of clear and secure manual services including:

- Voice
- Message
- Data
- Facsimile

Geographic Coverage

As shown in Figure 2-14, the NATO system serves all member nations in Europe as well as Iceland, the U.S. and Canada.

System Availability

The NATO system operates continuously, 24 hours per day, 7 days per week.

Equipment Type

As discussed earlier, the current NATO systems consist of an assortment of non-standard equipment; although with the introduction of Stage I NICS, the equipment and operations will be standardized.

Codes

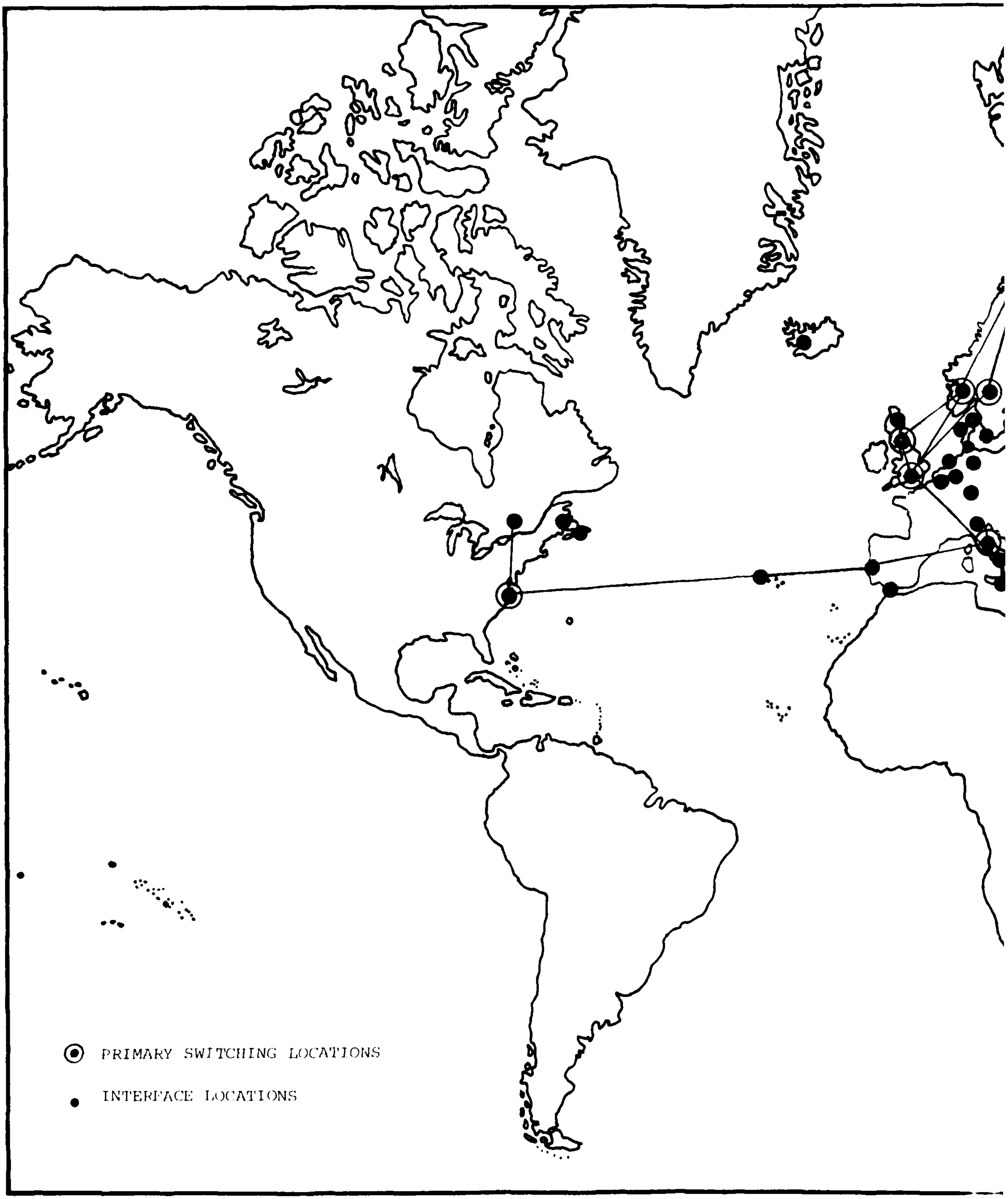
The current message code utilized in the NATO system is the CCITT 2 (5-unit Baudot).

Speeds and Protocols

Current message speeds are 50 to 75 Baud using ACP 127 and NATO Supplement 3 protocols. NICS will utilize up to 600 Baud in the NATO Supplement 3 protocol format.

Terminal Locations

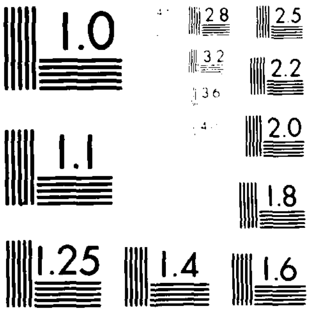
Current NATO terminals are located throughout Europe, Iceland, Canada and the U.S. Tables 2-7 through 2-9 provided an indication of the emerging IVSN, TARE, and SATCOM III terminal locations.



Figure

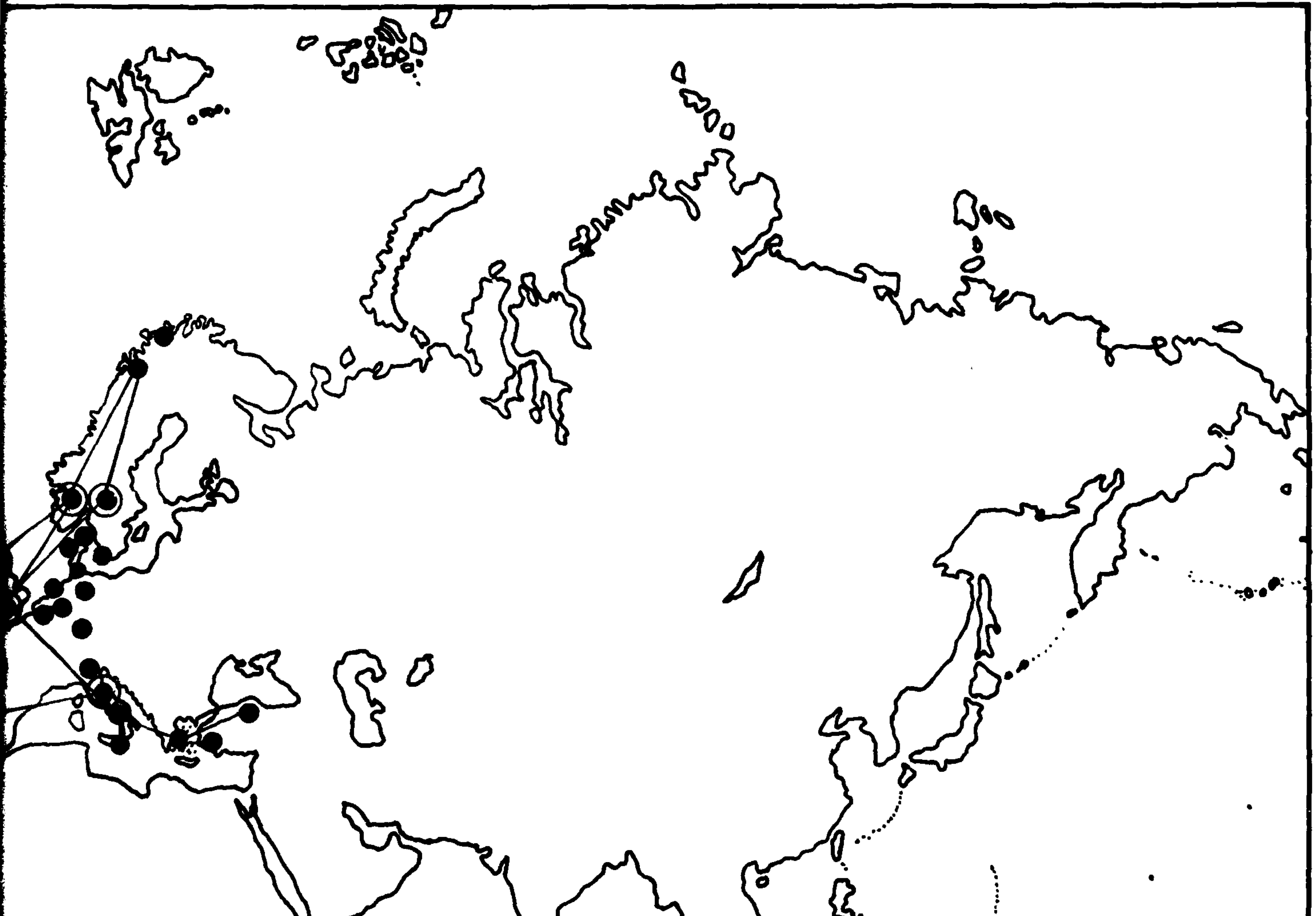
AD-A098 642 ARINC RESEARCH CORP ANNAPOLIS MD F/G 17/2
WORLDWIDE CRISIS ALERTING NETWORK, PHASE II. TASK 2. IDENTIFICA--ETC(U)
APR 80 H P HIMPLER, J F HOLMES, G K PRUITT DCA100-80-C-0010
UNCLASSIFIED 1377-01-TR-2167 NL

2 OF 3
AD A
098642



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963 A



IMARY SWITCH AND INTERFACE LOCATIONS

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CHAPTER THREE

PRELIMINARY ASSESSMENT OF SUBSCRIBER COMMUNICATIONS SYSTEMS AS APPLIED TO WCAN II NEEDS

This chapter provides an overview of the subscriber communications systems described in Chapter 2 and presents a preliminary assessment of the potential applicability of these systems as interfaces for WCAN Phase II crisis alerting.

3.1 OVERVIEW OF EXISTING SUBSCRIBER COMMUNICATIONS SYSTEMS

Table 3-1 presents a condensation of the descriptions of the nine subscriber communications systems described earlier in Chapter Two. This table contains the fundamental characteristics of these systems that are pertinent in assessing their suitability for inclusion in plans for WCAN II. A review of this information indicates that the communications mode which provides the most commonality among these subscriber groups is international Telex. It also shows that there is considerable overlap in the geographical coverage of these systems, particularly in areas of major trade/transportation routes.

3.2 POTENTIAL APPLICABILITY OF SUBSCRIBER SYSTEMS TO WCAN II

A review of Table 3-1 reveals interconnectivity already exists among the identified subscriber groups, at least in certain central locations. Table 3-2 shows the degree of this interconnectivity. As indicated, all of the subscriber groups, except NATO, use international standard Telex as part of their communications systems. The table also shows that the Coast Guard is connected to Telex, AUTODIN, the AFTN switch at Kansas City (which in turn is connected to ARINC, SITA and the FAA), and MARISAT and also monitors the 500 KHz distress frequency. MARISAT is connected to the international Telex network, the Coast Guard, vessels at sea and oil platforms. The 500 KHz distress frequency is continuously monitored by all vessels and oil platforms at sea, by commercial/private maritime shore stations and by the Coast Guard. The Coast Guard and the NATO communications systems are connected to AUTODIN.

Table 3-1. OVERVIEW OF SUBSCRIBER COMMUNICATIONS SYSTEMS

Subscriber Group	Communications System	Ownership	Type Service	Geographic Coverage	Codes	Speeds/ Protocols	Comments
Commercial Aviation	AFTN	Sovereign nation where located	Voice (VHF,HF) Air traffic control Data & Telex Weather, NavAids	Worldwide	ICAO Standards[1] IATA Standards[2]	ICAO Standards[1] IATA Standards[2]	Interfaces with ARINC (operator) at San Francisco, Honolulu New York, and San Juan Major switch at Kansas City for North America, North Atlantic, Pacific, and Caribbean regions
	ARINC	Scheduled airline companies	Voice (VHF,HF) Data, Telex, Phone Patch, FAX (Air/Ground and Landline)	CONUS plus gateway stations to CONUS	ICAO Standards[1] IATA Standards[2]	Up to 2400 bps protocol per ARINC documents and interline guides	Interfaces with AFTN at Kansas City; Interfaces with SITA at New York; operates gateway HF/VHF for FAA (AFTN); major switch at Chicago
	SITA	Cooperative - Airline Companies	Reservations, Data, Telex and FAX (Ground/Ground only)	Worldwide (177 countries)	ICAO Standards[1] IATA Standards[2]	Up to 9600 bps protocols per SITA Telecommunications manual	Interfaces with ARINC at New York; all regions connected through one or more of nine major switches at Frankfurt, Beirut, London, Paris, Madrid, Rome, Hong Kong, Amsterdam, and New York
	FAA	U.S. Department of Transportation	Air/Ground and landline air traffic control, data, weather, NavAids, and Telex	CONUS only	ICAO Standards[1] IATA Standards[2]	ICAO Standards[1] IATA Standards[2]	Significant only as owner and operator of CONUS AFTN
Maritime	MARISAT	COMSAT General	Voice, Telex/ TWX, Data, Facsimile, AMVER, MEDICO, Distress	Worldwide	. Baudot Telex . Data in user-specified	. CCITT-2 Telex at 66 wpm . Data up to 2400 bps	. Interface with Coast Guard AMVER service . Special distress procedures
	Commercial/ Private	. ITT World Communications . RCA Global Communications . North American Philips . Western Union International . Private Ship Operators	MF CW, HF CW, HF SSB Voice, HF SSB Telex, VHF Voice, MARISAT	Worldwide	. Baudot Telex . Morse radio-telegraphy	. CCITT-2 Telex at 66 wpm . CCIR 476-1 SITOR . Up to 2400 bps data via MARISAT	. Interface with international Telex service . Continuous guard of 500kHz emergency channel . Interface with Coast Guard
U.S. Coast Guard	Coast Guard	U.S.Coast Guard	Voice,Telex, CW,AMVER, Distress	CONUS, Alaska, Hawaii, Guam including coastal areas	. Baudot Telex	. CCITT Telex at 66 wpm . Internal tele-typewriter at 100 wpm . SITOR ARQ Telex	. Interface with AUTODIN . Interface with MARISAT . Monitor emergency channels . Interface with FAA/AFTN switch at Kansas City . Interface with State Department
Offshore Petroleum Industry	MARISAT, HF, VHF, Microwave	By individual company	Voice, tele-typewriter, Telex, Facsimile, Data	Various areas including U.S. S.A., Africa, Europe, Micronesia	Baudot and ASCII	Per CCITT and ANSI Standards	Requires individual petroleum company agreement for interconnection into WWMCCS
NATO	Satellite, HF, VHF, Troposcatter, Landlines	15 NATO member countries	Voice, tele-typewriter, Facsimile, Data	Europe, Turkey, U.S., Canada	Baudot	From 75 to 1200 bps, various protocols	Presently interconnects to AUTODIN

1 - ICAO - International Standards and Recommended Practices Aeronautical Telecommunications, Annex 10 to the Convention on International Civil Aviation.
2 - IATA - Interline Communications Manual (DOC. GEN/1840), International Air Transport Association

Table 3-2. SUBSCRIBER SYSTEM INTERCONNECT MATRIX

Subscriber System	Interconnectivity					
	Telex	AUTODIN	AFTN	USCG	500kHz	MARISAT
AFTN	X		X			
ARINC	X		X			
SITA	X		X			
FAA	X		X	X		
MARISAT	X			X		X
Commercial/Private Maritime	X			X	X	X
Coast Guard	X	X	X	X	X	X
Off-Shore Petroleum	X				X	X
NATO		X				X[1]

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[1] NATO-flag vessels

An analysis of the interconnect patterns evident in Table 3-2 and other information which was presented in Chapter Two indicates that it may be possible to provide comprehensive worldwide communications coverage with a minimum number of AUTODIN installations. A preliminary assessment of this potential, based on the information available to date, indicates that a relatively small number of strategically placed AUTODIN terminals in the United States could provide worldwide coverage. Neglecting speed, protocol, and other related systems interfacing problems in this preliminary assessment, a number of potential AUTODIN interfaces emerge as shown in Table 3-3.

The efforts in Task 3 will focus on the evaluation of these identified subscriber communications systems in terms of their applicability to WCAN II.

TABLE 3-3. POTENTIAL AUTODIN INTERFACES

SUBSCRIBER GROUP	AUTODIN INTERFACE LOCATION	SUBSCRIBERS SERVED
Commercial Aviation	ARINC (Chicago)	ARINC, AFTN, SITA, FAA
Maritime	COMSAT (Southbury, CT)	MARISAT Subscribers Maritime, USCG Offshore Petroleum
	COMSAT (Santa Paula, CA)	MARISAT Subscribers Maritime, USCG Offshore Petroleum
USCG	Presently connects to AUTODIN at New York, San Francisco, Guam, Washington, DC	Maritime, USCG Offshore Petroleum
Offshore Petroleum Industry	COMSAT, USCG	Offshore Petroleum
NATO	Presently connects to AUTODIN	NATO allied countries

APPENDIX A

AERONAUTICAL FIXED TELECOMMUNICATIONS NETWORK (AFTN) DETAILED DATA

The data in this Appendix represent a sample of AFTN regional information included in the Air Navigation Plan (ANP). This Appendix includes data representative of the North Atlantic (NAT), North American (NAM) and Pacific (PAC) regions only. Similar sets of tables are on file for the following regions:

- Middle East (MID) and South East Asia (SEA)
- Europe (EUR)
- Africa-Indian Ocean (AFI)
- Caribbean (CAR) and South American (SAM)

Pages A-2 through A-7 of this Appendix describe the various AFTN Telecommunications Services. Pages A-8 through A-18 are tables of AFTN terminal locations and types of Fixed Telecommunications Services (e.g. landline teletypewriter, radio telephone). Pages A-19 through A-36 are tables of AFTN terminal locations and descriptions of these terminal facilities (e.g. function, number of channels, service range, frequency of operation).

Part III

COMMUNICATIONS

1.— Introduction

1.1 The relevant Standards, Recommended Practices and Procedures to be applied are contained in:

1) Annex 10 — Aeronautical Telecommunications, Volumes I and II;
2) Regional Supplementary Procedures — Applicable in the Regions (Doc 7030).

1.2 Background information which is of importance in the understanding and effective application of the Plan is contained in the Reports of the Fifth North Atlantic Regional Air Navigation Meeting (Doc 8879/NAT V), Agenda Items 4, 15 and 16, and the Asia/Pacific Regional Air Navigation Meeting (Doc 9077-ASIA/PAC (1973)), Agenda Items 13, 14, 16 and 17, and the Limited North Atlantic Regional Air Navigation Meeting (Doc 9182 (1976)), Agenda Items 1.1, 3 and 4, supplemented by those appropriate to the NAT/NAM/PAC Regions which are contained in the Reports of the other Regional Air Navigation Meetings listed in the Preface (page 0-5).

1.3 RAN Meeting recommendations shown within brackets below a heading indicate the source of the paragraph or sub-paragraph following that heading. They are shown immediately following each paragraph or sub-paragraph either when there is no heading, or when the sub-paragraphs have their origin in different recommendations.

2.— Aeronautical Fixed Service

(Table COM 1, Charts COM 1, 2 and 3)

2.1 *General*

2.1.1 The aeronautical fixed service plan comprises:

1) AFTN circuits (Table COM 1, Chart COM 1);
2) exclusive ATS direct speech circuits (Chart COM 3).

Note.— The detailed arrangements of the SCOTICE/ICECAN landline and cable system are shown in Chart COM 2 for convenience.

2.2 *Functions of the SCOTICE/ICECAN Landline and Cable System*

2.2.1 A combination AFTN, AFS, and speech landline/cable connecting Canada, Greenland, Iceland and Scotland (termed the SCOTICE/ICECAN System) is designed to provide two telephony channels and four teletypewriter channels. The functional allocations of this system are detailed below and are illustrated in Chart COM 2.

2.2.1.1 *First Teletypewriter Channel*

This channel is to provide an AFTN channel between London and Reykjavik (SCOTICE Cable), and also an AFTN channel Reykjavik-Sóndre Strómfjord utilising the Eastern segment of Channel 1 in the ICECAN Cable and a VHF RTT link Frederiksdal-Sóndre Strómfjord. The SCOTICE segment of the channel between Reykjavik and London operates at 75 bauds, whilst the ICECAN segment operates at 50 bauds.

2.2.1.2 *Speech/Remote Control Circuit*

A combined speech/remote control circuit replacing the former western segment of telegraph channel 1B in the ICECAN cable permits operation of GPS ER-VHF channels at Frederiksdal and Prins Christian Sund from Gander. Liaison between the air-ground staffs at the latter three aeronautical stations is permitted and also relay of air-ground messages as desired.

2.2.1.2.1 *Second Teletypewriter Channel*

[NAT IV, Rec. 6/3]

An AFTN channel split at Reykjavik is to provide duplex channels between Reykjavik and London and between Reykjavik and Montreal, to be used also for overspill AFTN traffic between Europe and Montreal with Reykjavik effecting any necessary relay.

2.2.1.2.2 *Third and Fourth Teletypewriter Channels*

Two direct AFTN Duplex channels are to be provided between London and Montreal.

2.3 *Additional AFTN Channel United Kingdom-Canada*

[NAT V, Rec. 15/5]

The recommended additional direct circuit London-Montreal is integrated with the two existing direct channels from a system point of view.

2.4 *AFTN Message Compilation*

[NAT V, Rec. 15/16]

Methods should be devised and applied, including use of pro formas, automatic equipment, etc., to permit AFTN messages to be prepared by non-specialized personnel, particularly with regard to the use of correct AFTN format, thus speeding the injection of traffic into automatic systems.

2.5 *Provision of Automatic Switching Facilities*

[ASIA/PAC, Rec. 13/2]

Fully automatic message switching facilities should be provided or retained at the following AFTN centres: Anchorage, Honolulu, San Francisco.

2.6 *Entry/Exit Points*

[ASIA/PAC, Rec. 13/5]

The entry/exit points

1) between the SEA and PAC Regions should be Tokyo, Manila and Sydney;
2) between the PAC and NAM Regions should be San Francisco;
3) between the PAC and SAM Regions should be Balboa and Santiago.

2.7 *Circuit Occupancy Measurement*
[ASIA/PAC, Rec. 13/7]

AFTN circuits should be arranged for peak hour occupancy to be determined on a routine basis. Frequency of measurements should be adequate to detect approaching overload situations to enable additional channel capacity to be provided before a situation involving regular overload occurs.

2.8 *RTT Circuit Performance*
[ASIA/PAC, Rec. 13/9]

PAC States concerned should arrange to exchange circuit performance data when required for solving specific problems.

2.9 *Transit Time Statistics*
[ASIA/PAC, Rec. 13/8]

1) PAC States concerned should arrange to exchange transit time statistics, whenever required, in order to resolve specific problems.

2) The recorded data should be exchanged directly between the correspondent stations, with copies to Administrations concerned and to the ICAO Regional Office.

2.10 *Implementation*

2.10.1 *Provision of Automatic Switching Facilities*
[ASIA/PAC, Rec. 17/33]

Automatic switching facilities should be provided at the San Francisco COM Centre as soon as practicable, but not later than the fourth quarter of 1977.

2.10.2 *Implementation of the AFTN Plan*
[ASIA/PAC, Rec. 17/34]

Efforts should be intensified to improve the AFTN with a view to implementing the new plan in its entirety as soon as practicable but not later than 31 December 1978.

2.11 *ATS Direct Speech Circuits*
(Charts COM 2 and 3)

2.11.1 A direct speech capability between Canada, Iceland and the United Kingdom should consist of the following:

1) One channel with selective calling facilities providing direct speech communications between the following points of adjacent air traffic control centres (or air/ground stations):

   - Gander ATC — Reykjavik ATC
   - Gander ATS — Prestwick ATC
   - Rekjavik ATC — Prestwick ATC

   and conference type simultaneous speech communications amongst the three centres;

2) a Gander-Prestwick (ATC) Direct Circuit.

2.11.2 *Implementation*
[NAT V, Rec. 15/11]

The ATS speech circuit Reykjavik-Stavanger should be implemented as soon as new switching arrangements at Prestwick are available. Additionally Iceland, Norway and the United Kingdom should co-ordinate arrangements for through switching of the Stavanger-Prestwick and Prestwick-Reykjavik ATS speech circuits.

Note. — The basic ATS requirement is for the provision of telecommunication facilities giving direct speech communication capability, not necessarily direct ATS speech circuits.
[Doc 9182, 3.1]

2.11.2.2 *Implementation*
[ASIA/PAC, Rec. 17/21]

The priority in implementation of the recommended ATS Direct Speech circuits is listed in Part II (ATS), 6.3.

3.— Aeronautical Mobile Service
(Table COM 2, Chart COM 4)

3.1 *General*

3.1.1 The Aeronautical Mobile Service Communication plan comprises all facilities recommended in respect to air/ground communications for international air navigation. The plan is detailed in Table COM 2.

3.1.2 *SELCAL Checks on GP VHF Channel*
[NAT V, Rec. 16/25]

3.1.2.1 In order to reduce the number of transmissions on HF AMS channels, the SELCAL check should, whenever possible, be conducted on the GP VHF channel at the time of allocation of primary and secondary frequencies.

3.1.2.2 *Selective Calling System (SELCAL)*
[ASIA/PAC, Rec. 14/6]

1) Selective calling (SELCAL) devices should be employed at HF aeronautical stations and wherever possible and necessary on VHF/GP frequencies.

2) An established SELCAL facility should be notified to users by publication of the appropriate information.

3.2 *VHF Aeronautical Mobile Facilities Plan*

3.2.1 *General*
[NAT IV, Rec. 7/7 and NAT V, Rec. 4/5 Note]

3.2.1.1 The Canadian and United States administrations are to co-ordinate frequency assignments for those VHF facilities required for North Atlantic West of 30°W and Pacific operations and which are located in the North American Continent.

3.2.1.2 *Development and Application of Geographical Separation Criteria in the NAM and EUR Regions*
[NAT V, Rec. 16/8]

The appropriate frequency planning bodies in the NAM and EUR Regions should develop as necessary, and apply, any additional criteria for the geographical separation of VHF facilities, to ensure there is adequate frequency protection for the stated ATS VHF communications requirements.

3.2.1.3 *Application of Georgraphical Separation Criteria in Certain Areas of the NAT Region*
[NAT V, Rec. 16/9]

The agreed geographical separation criteria for the EUR Region should be applied within those areas of the NAT Region East of 30°W where no international frequency planning body exists, and the agreed criteria for the NAM Region in those areas west of 30°W.

3.2.1.4 *Development of Geographical Separation Criteria for VHF Communications Serving SST Operations*
[NAT V, Rec. 16/10]

The appropriate international frequency planning bodies of the NAM and EUR Regions should develop additional geographical separation criteria, when so required, to ensure the necessary frequency protection for any specific VHF requirements for SST operations.

3.2.1.5 *Potential Interference Involving Extended-Range VHF Facilities*
[SP NAT (1965), Rec. 6.ix/4]

In assigning frequencies for extended range VHF facilities due consideration should be given to all possibilities of interference which might result.

3.2.1.6 *Frequency Assignments for VHF Operational Control Channels*
[NAT V, Rec. 16/26]

1) Where a requirement exists for provision of Pilot-to-Company VHF communication channels, frequencies for such channels for locations west of 30°W should be assigned from the group 128.825 to 132.025 MHz inclusive and for locations east of 30°W from the group 131.4 to 131.95 MHz inclusive and specific assignements co-ordinated between the airline operating agencies and Administrations concerned.

   Note— In the United States and Canada, frequencies in the band 128.825 to 132.025 MHz have already been assigned for en-route communications and therefore may not be available for international use in these countries.

2) Assignments made in this respect should be notified to ICAO for promulgation.

3.2.1.7 VHF frequency 123.1 MHz is the SAR scene-of-action auxiliary channel.

3.2.1.8 The attention of all concerned is directed to the need to restrict the use of the VHF Emergency Frequency 121.5 MHz to that outlined in Annex 10, Volume I, Part II, Chapter 4, 4.1.3.1.

3.2.1.9 *Delivery by Prins Christian Sund of AMS Traffic for Gander*

All concerned should keep under review the possible need to improve the transit time of aircraft messages received at Prins Christian Sund for delivery to Gander.

3.2.1.10 In order to provide adequate coverage to the maximum distance possible on the main arterial routes in the PAC area, extended range VHF installations should be established at locations shown in Table COM 2.

3.2.1.11 Aircraft stations, when filing an air-to-ground message requiring relay by an aeronautical station, should be permitted normally to include not more than two aircraft operating agency addresses, in addition to the addressee referred to in (a) of 2.1.1.4 of PANS-RAC, Part VIII (Doc 4444) (aircraft operators may nominate the addressees on a predetermined basis).

Note 1.— Under exceptional circumstances messages containing more than two addressees may be filed but these would be limited to addressees concerned with the text of the message.

Note 2.— Filing of DEP messages while en-route is to be avoided to the extent possible since these messages can be filed at the point of departure for transmission on the AFTN. Non-compliance with this procedure leads to unnecessary loading of the air-to-ground channels.

3.3 *HF En-Route Communications*

3.3.1 *Optimum Use of HF Channels Assigned and Reduction of Guard on Discrete HF Channels at Aeronautical Stations*
[NAT V, Recs. 16/1 and 16/2]

When designating Primary and Secondary frequencies, aeronautical stations should take into consideration the need to avoid overloading on HF channels employed and utilize to the extent practicable all assigned frequencies available which are suitable for the operation.

Note.— Aeronautical stations may discontinue guard on discrete HF channels assigned to them if the expected seasonal propagation conditions indicate that their use will not be required for certain periods provided prior co-ordination is effected between all aeronautical stations concerned and with the users. Such action should be promulgated by AIRAC NOTAM. Frequencies guarded at any time should be such as to permit communications with aircraft anywhere at that time within the area served. Annex 15 requires that the watch schedules be published in States' AIP.

3.3.2 *Interim Family of Frequencies for NAT SSB A3J Operations*
[NAT V, Rec. 16/5]

In view of the urgent requirement for securing an additional family of frequencies for implementation at Gander, Shannon, New York and Reykjavik for SSB A3J operations, immediate action should be taken to obtain frequencies for interim use until a family is available perhaps from the EUR Region.

Note.— Consideration may be given to securing the use of 2031 kHz from the NAT A family and efforts should also be made to secure frequencies of the order of 5 or 6 MHz and 9 or 10 MHz to complete this interim A3J family. Frequency 2931 kHz could continue to be used at other assigned locations in the NAT area in the DSB or SSB/A3H modes.

3.3.3 *Assessment of Additional Frequency Requirements for SSB A3J Operations*
[NAT V, Rec. 16/6]

When the majority of aircraft are equipped to operate with SSB A3J equipment, the States concerned should assess the need for conversion of additional NAT frequencies to SSB A3J operation with a view to proposing appropriate amendments to the AMS plan.

3.3.4 *Aircraft Reporting Time Schedules*

When the provisions of Annex 10, Vol. II, 5.2.2.2.4 or 5.2.2.3.1.2 are applied, reporting schedules for transmission of position reports and "Operations Normal" reports (if employed) should be designated after correlation between the appropriate aeronautical stations so as to ensure minimum conflict for the network operations.

Note.— When applied in association with Annex 10, Vol. II, 5.2.2.2.4, the designation of reporting times will be done by a "Regular Station". Application in association with 5.2.2.3.1.2 of Annex 10, Vol. II, will result in the designation being made by the network station with which the aircraft makes its preflight check or its initial contact after take-off.
[SUPPS]

3.3.5 *Introduction of SSB in the International HF Aeronautical Mobile Service*
[ASIA/PAC, Rec. 14/4]

In areas where complete VHF en-route coverage cannot be provided, urgent consideration should be given by States to introducing SSB (A3H and A3J) transmit/receive capability at the MWARA (Major World Air Route Area) network stations under their jurisdiction on a co-ordinated basis as soon as practicable but not later than 31 December 1978.

3.3.6 *Operational Efficiency at VOLMET HF Stations*
[ASIA/PAC, Rec. 14/7]

Provision should be made at en-route and VOLMET HF stations for:

1) modern equipment, taking into account the following factors:
   a) transmitters with adequate power output;
   b) adequate standby equipment and power;
   c) efficient antennae, feeder lines and related equipment;
   d) transmitted signal monitoring provisions for VOLMET broadcasts.
2) adequate premises and operating environment, taking into account the following factors:
   a) arranging the layout of the equipment in the station to conform to good engineering practices;
   b) sound-proofing and air-conditioning the station;
   c) selection of low noise reception site.
3) full application of the operational provisions contained in Volume II of Annex 10, including special attention to:
   a) transmission techniques;
   b) call sign identification procedures;
   c) 24 hours daily continuous operation;
   d) checking quality of modulation.
4) adequate co-ordination between mobile and fixed services taking into account the need to accommodate the agreed transit times for message handling between origin and destination stations.

   Comment: Directives on handling techniques for transfer of messages are contained in the Report of the VI Session of the COM Division (Doc 7031, COM/551-1, pages VII-6 to VII-18).
5) employment of fully trained operating and supervisory personnel of appropriate grade and in sufficient numbers, and arranging periodic refresher courses for the station personnel.

3.3.7 *Elimination of Interference on HF RTF Frequencies*
[ASIA/PAC, Rec. 14/8]

States are urged:

1) to co-ordinate on a national basis with the appropriate interested authorities a programme directed towards achieving the elimination of the interference currently being experienced on some of the frequencies allocated to the Aeronautical Mobile (R) Service in the Region;
2) when reviewing methods for developing such a national programme, to consider the procedures prescribed in:
   - Chapter III, Article 9 (Notification and Recording of Frequencies in the Master International Frequency Register);
   - Article 13 on International Monitoring;
   - Article 15 on Procedure in a case of Harmful Interference,

   of the ITU Radio Regulations.
3) in the case of an unidentified interfering station, to notify the Regional Office concerned;
4) however, in the case of persistent harmful interference to an aeronautical service which may affect safety, to immediately report to ICAO and to the ITU using the prescribed format, for appropriate action.

   Comment: The Regional Office will circulate the information received on interference to other States as appropriate in an endeavour to identify the interfering station. The ICAO Technical Assistance Regional Electronics Engineer will provide a valuable contribution in this regard.

3.3.8 *Implementation*

Amendments to the SP-RDARA (Regional and Domestic Air Route Areas) Network
[ASIA/PAC, Rec. 17/39]

The aeronautical stations listed below along with the assigned frequencies should be added to the network as soon as practicable, but not later than 30 September 1974.

Aeronautical Station	*Frequencies (kHz)*
Cook Island	
Rarotonga	3460, 6575 8924, 11391
Eilice Island	
Funafuti	6575, 8924
Gilbert Island	
Tarawa	3460, 6575 8924, 11319
Niue Island	
Alofi	3460, 6575
Tonga	
Tonga Intl.	3460, 6575, 8924
Western Samoa	
Apia/Faleolo	3460, 6575

4.— Aeronautical Radionavigation Service
(Table COM 3, Charts COM 5N, 5P, 6 and 7)

4.1 *General*

4.1.1 The plan for radionavigation aids designates for each location the aids required for all functions and, with some exceptions, the frequency to be used.

4.1.2 *Radio Navaids Frequency Planning*
[NAT V, Rec. 4/5]

The appropriate frequency planning bodies in the EUR and NAM Regions should, in their respective areas, co-ordinate, as necessary, the frequency assignments for the radio navaids facilities recommended, to ensure that there is adequate frequency protection.

Note.— In general the planning criteria apply for the NAM Region to the west of longitude 30° W and for the EUR Region to the east of this meridian.

4.1.3 *Frequency Protection for VHF/UHF Navaids Related to SST High Level Tracks*

States, in their future planning of VHF/UHF Navaids, e.g. VOR and DME, should:

1) give early consideration to the need to provide frequency protection to a standard service height of 20 000 m (66 000 ft) where these facilities are directly relevant to SST high level tracks;

2) take full advantage of methods for adapting the service areas to the operational requirement of such facilities, e.g. by the "keyhole" method.
[NAT V, Rec. 4/6]

4.1.4 To assist in the assignment of frequencies, LF/MF and VHF frequencies presently assigned are listed in ascending order in the indexes to Table COM 3. These indexes do not show the status of implementation of the facilities.

4.2 *Long-distance Radionavigation Aids*

4.2.1 The basic long-distance radionavigation aids included in the plan are CONSOL and LORAN, supplemented by a number of high-powered non-directional radio beacons (NDB). The stations constituting the LORAN and CONSOL plans do not appear in the tabulations, but on Charts COM 5N and 5P only.

4.2.2 *Aircraft Long-Range Navigation Requirements on Extreme Northern Routes*
[NAT V, Rec. 4/7]

Aircraft flying typical air routes in the NAM area (cf. ATS Chart 3) such as Alert-Anchorage, Resolute-Anchorage, Frobisher-Anchorage, and Frobisher-Seattle, should be provided with suitable long-range navigation equipment for sectors of such routes not adequately provided with en-route navigation aids.

4.2.3 *Withdrawal of LORAN-A Stations*
[SP NAT/PAC (1974), Recs. 1/2 and 1/4]

4.2.3.1 The date for the withdrawal of LORAN-A facilities from the NAT Regional Plan is 29 December 1977.

4.2.3.2 The LORAN-A stations now included in the PAC Regional Plan should be retained in operation up to at least 31 December 1979, on the understanding that, should justified requirements for an extension of operation beyond that date be brought forward, this be made the subject of further review.

4.3 *Short-Distance Radionavigation Aids and Approach and Landing Aids*

4.3.1 The basic short-distance radionavigation aids included in the Plan are Very High Frequency Omnidirectional Radio Range (VOR) associated with Distance Measuring Equipment (DME) and Non-directional Radio Beacons (NDB). The basic final approach and landing aid is the Instrument Landing System (ILS).
[Amendment NAM/CAR 74/2 COM]

4.3.2 Within the United States of America:

1) VOR frequency assignments for general use between 108 and 117.975 MHz may be made on odd twentieths of a megahertz as of 1973;
[Amendment NAM/CAR 71/2 COM Revised]

2) ILS localizer assignments for restricted use between 108 and 111.975 MHz may be made on odd tenths plus a twentieth of a megahertz. Localizer assignments on odd tenths will continue to be made on a general use basis. The appropriate glide path paired frequency will be selected in accordance with Annex 10, Volume I, Part I, 3.1.5.1 (Amendment 52);
[Amendment NAM/CAR 74/2 COM]

3) where DME is located with VOR or ILS facilities that are operating on odd twentieths of a megahertz, the channel assignment will be the corresponding "Y" channel shown in Annex 10, Volume I, Part I, 3.5.2.3.3.
[Amendment NAM/CAR 71/2 COM Revised]

4.3.3 *Siting of VOR and DME*
[ASIA/PAC, Rec. 16/4]

Where a requirement has been established, VOR and DME should be so collocated as to facilitate the provision of an optimum air traffic control and air navigation system within the terminal area. The precise siting of aids to provide for such a system should be decided in consultation with operators concerned. Where DME is provided by means of TACAN, it should be collocated and frequency paired with its associated VOR.

4.4 *Implementation*

4.4.1 *General Guidance on Priorities for Implementation of Required Radio Navigation Aids*
[ASIA/PAC, Rec. 17/40]

1) First priority should be given, not necessarily in the sequence listed, to co-ordinate implementation of:
   - required aids (VOR, VOR/DME) for ATC terminal area operations at aerodromes;
   - required aids for approach and landing;
   - necessary improvements to existing ILS installations to ensure that the ILS performs to at least the Facility Performance Category I Standards of Annex 10;
   - improved ILS performance at aerodromes used by heavy transport jet aircraft;
   - required aids (VOR, VOR/DME and/or NDB) at key en-route or terminal area points to meet the needs of the Air Traffic Services.

2) Second priority should be given, not necessarily in the sequence listed, to co-ordinate implementation of:
   - required en-route aids (VOR, VOR/DME and/or NDB) at other key points for transition from oceanic to continental ATS environment;
   - upgrading of existing Facility Performance Category I ILS systems to Facility Performance Category II where required.

3) Third priority should be given to implementation of the remaining radio navigation aids' requirements for en-route ATS operations/aircraft navigation purposes in co-ordination with priorities for establishment of the plan of ATS routes.

4.4.2 When radio navigation aids have been installed, they should be commissioned and made operationally available to the relevant performance capability as soon as practicable.
[ASIA/PAC, Rec. 17/41]

5.— Aeronautical Broadcasting Service

5.1 *General*

5.1.1 The plan for radiotelephony broadcasts of meteorological information (VOLMET) from designated locations on a time-shared basis appears in Table MET 5.

5.1.2 *Need to Reduce Ground Initiated Messages to Aircraft in Flight*

[SPL NAT (1965) Rec. 6.viii/4]

Where a VOLMET broadcast system is implemented the recognized objective should be that no ground initiated meteorological information, duplicating the VOLMET data, be transmitted to an aircraft, unless specifically requested from the aircraft.

Note. — Maximum possible use could be made of simplified formats and abbreviations in preparing airline operating agency originated messages for transmission to aircraft, e.g. in lieu of giving a complete MET report or forecast for a particular airport it would only be necessary to indicate "ABOVE or BELOW Company Minima" and only in the case of the latter would additional detailed information be provided.

TABLE COM 1 – AERONAUTICAL FIXED TELECOMMUNICATION NETWORK

EXPLANATION OF TABLE

Column

1 & 2 The terminal stations of individual circuits. The circuits are listed alphabetically, by the Terminal 1 station. Each circuit is listed once only; Terminal 1 is always the station which is first alphabetically within the circuit.

3 Type of operation specified:

LTT – Landline teletypewriter (landline, cable, VHF, UHF or SHF)
RTT – Radio teletypewriter (HF)
MAS – Manual A1 Simplex
RTF – Radiotelephone

dx – duplex
di – diplex

Underlined where not implemented

4 Supplementary information and references to notes.

Where a type of operation is provided other than that which is recommended, the type existing is shown in this column when it is deemed of interest to provide supplementary information, but this does not imply endorsement on the part of ICAO.

For a complete appreciation of all circuits required, Chart COM 2 should be consulted in conjunction with the description of the system in the Introduction.

TABLEAU COM 1 – RESEAU DU SERVICE FIXE DES TELECOMMUNICATIONS AERONAUTIQUES

EXPLICATION DU TABLEAU

Colonne

1 & 2 Stations terminales du circuit. Les circuits sont indiqués dans l'ordre alphabétique des stations terminales 1. Chaque circuit ne figure qu'une fois; la station terminale 1 est toujours la première dans l'ordre alphabétique à l'intérieur du circuit.

3 Type d'exploitation spécifiée:

LTT – Téléimprimeur par fil (fil, cable, VHF, UHF ou SHF)
RTT – Radiotéléimprimeur (HF)
MAS – Simplex manual A1
RTF – Radiotéléphone

dx – duplex
di – diplex

Indication soulignée si le service n'est pas assuré

4 Renseignements complémentaires et renvois à des notes.

Lorsque le type d'exploitation qui est assuré est autre que celui qui est recommandé, le type d'exploitation actuel est indiqué dans cette colonne lorsqu'il est jugé utile de donner ce renseignement supplémentaire, mais cette indication n'indique aucune approbation de la part de l'OACI.

Pour évaluer complètement l'ensemble des circuits requis, consulter la Carte COM 2 conjointement avec la description du système donnée dans l'Introduction.

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
EMPLACEMENTS		SERVICE	OBSERVATIONS
TERMINAL I	TERMINAL II		
LUGARES		SERVICIO	OBSERVACIONES
TERMINAL I	TERMINAL II		
1	2	3	4

AERONAUTICAL FIXED TELECOMMUNICATION NETWORK

RESEAU DU SERVICE FIXE DES TELECOMMUNICATIONS AERONAUTIQUES

RED DE TELECOMUNICACIONES FIJAS AERONAUTICAS

ANCHORAGE	HONOLULU	LTT	
	SAN FRANCISCO	LTT-dx	
	TOKYO	LTT	
APIA (Faleolo)	NANDI	RTT	MAS P -/-
AUCKLAND/	NANDI	LTT	
	RAROTONGA	RTT	
BERMUDA	KANSAS CITY	LTT	
BOGOTA	KANSAS CITY	LTT	RTT/ISB/LTT through/via/a través de: PANAMA
BRISBANE	HONIARA	RTT	
CARACAS	KANSAS CITY	LTT	
CURACAO	KANSAS CITY	LTT	
FUNAFUTI	NANDI	MAS	
GOOSE	MONTREAL	LTT	
	SØNDRE STRØMFJORD	VHF RTT	
GUAM	HONOLULU	LTT	
	SAIPAN	LTT	
GUAYAQUIL	KANSAS CITY	LTT	RTT/ISB/LTT through/via/a través de: PANAMA
HABANA	KANSAS CITY	LTT	
HONOLULU	MANILA	LTT	
	PAGO PAGO	RTT-d1	RTT/ISB
	SAN FRANCISCO	LTT-dx	
	PAPEETE (TAHITI)	LTT	P -/-
	TOKYO	LTT	
ISLA DE PASCUA (Easter I.)	PAPEETE (TAHITI)	LTT	RTT P -/-
	SANTIAGO	RTT	

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
KANSAS CITY	KINGSTON	LTT	
	LIMA	LTT	
	LISBOA	LTT/RTT	Provided via/assuré via/proporcionado vía: NEW YORK
	MEXICO CITY	LTT	
	MONTREAL	LTT	
	NASSAU	LTT	
	PANAMA	LTT	
	PORT-AU-PRINCE	LTT	
	PORT-OF-SPAIN	LTT	
	SAN FRANCISCO	LTT	
	SAN JUAN	LTT	
	SANTO DOMINGO	LTT	
	ST. MAARTEN	LTT	
	TEGUCIGALPA	LTT	
LISBOA	SANTA MARIA	RTT	
LONDON	MONTREAL	LTT	1 channel on common carrier - 1 voie sur le réseau publique - 1 canal en portadora común
	MONTREAL	LTT	Channels 3 & 4 of the SCOTICE - ICECAN cables - Voies Nos 3 et 4 des cables SCOTICE/ICECAN - Canales 3 y 4 de los cables SCOTICE/ICECAN
	REYKJAVIK	LTT	Channels 1 & 2 of SCOTICE cable - Voies Nos 1 et 2 du câble SCOTICE - Canales 1 y 2 del cable SCOTICE.
MONTREAL	REYKJAVIK	LTT	Channel 2 of ICECAN cable - Voie No. 2 du câble ICECAN - Canal 2 del cable ICECAN
NANDI	HONOLULU	LTT	
	NAUSORI	LTT	
	NIUE	MAS	
	NOUMEA/LA TONTOUTA	RTT	
	PAPEETE	RTT	
	PAGO PAGO	RTT	
	PORT VILA	RTT	
	SYDNEY	LTT	
	TARAWA	MAS	
	TONGA	MAS	
	WALLIS I.	MAS	
NAURU	SYDNEY	LTT	
OAKLAND	SAN FRANCISCO	LTT	
REYKJAVIK	SØNDRE STRØMFJORD	LTT	Eastern segment of Channel 1 on ICECAN cable plus VHF RTT FREDERIKSDAL-SØNDRE STRØMFJORD - Tronçon est de la voie 1 sur câble ICECAN plus VHF RTT FREDERIKSDAL-SØNDRE STRØMFJORD - Tramo oriental del canal 1 del cable ICECAN, más VHF RTT FREDERIKSDAL-SØNDRE STRØMFJORD.

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
REYKJAVIK	SØNDRE STRØMFJORD	VHF/RTT	To be retained pending achievement of adequate reliability of the VHF-RTT link FREDERIKSDAL-SØNDRE STRØMFJORD A conserver en attendant que la liaison VHF RTT FREDERIKSDAL-SØNDRE STRØMFJORD soit suffisamment fiable - Debe conservarse mientras no se logre el funcionamiento seguro del enlace VHF RTT FREDERIKSDAL-SØNDRE STRØMFJORD.
SANTA MARIA	SHANNON	RTT	

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
MULTIPOINT CIRCUITS Numbers 2, 3 and 4 CIRCUITS MULTIPOINTS Numéros 2, 3 et 4 CIRCUITOS PARA VARIOS PUNTOS Numéros 2, 3 y 4			
MULTIPOINT CIRCUIT Number 2			
UNITED STATES (Kansas City)	BARBADOS	LTT	
	DOMINICA	LTT	
	GRENADA	LTT	
	MARTINIQUE	LTT	
	ST. LUCIA	LTT	
	ST. VINCENT	LTT	
MULTIPOINT CIRCUIT Number 3			
UNITED STATES (Kansas City)	ANTIGUA	LTT	
	GUADELOUPE	LTT	
	MONTSERRAT	LTT	
	ST. KITTS	LTT	
MULTIPOINT CIRCUIT Number 4			
UNITED STATES (Kansas City)	PORT OF SPAIN	LTT	
	SCARBOROUGH-TOBAGO	LTT	

TABLE COM 1A - AERONAUTICAL METEOROLOGICAL CIRCUITS (AFS)

TABLEAU COM 1A - CIRCUITS METEOROLOGIQUES AERONAUTIQUES (AFS)

TABLA COM 1A - CIRCUITOS METEOROLOGICOS AERONAUTICOS (AFS)

Circuits handling MET data in a separate system external to AFTN

Circuits acheminant les données MET dans un système séparé, distinct du AFTN

Circuitos por los cuales se cursan datos meteorológicos (MET), en un sistema separado, externo a la red de telecomunicaciones fijas aeronáuticas (AFTN)

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
EMPLACEMENTS		SERVICE	OBSERVATIONS
TERMINAL I	TERMINAL II		
LUGARES		SERVICIO	OBSERVACIONES
TERMINAL I	TERMINAL II		
1	2	3	4
Anchorage	San Francisco	LTT	
Lisboa	Santa María	RTT	
	Suitland	LTT/RTT	Provided via - Assuré via - Proporcionado vía : NEW YORK

TABLE COM 1C – ATS DIRECT SPEECH CAPABILITY TO LINK ADJACENT FIC/ACC AND ATS UNITS LOCATED OUTSIDE THE CONTROL AREAS OF THESE FIC OR ACC OR BETWEEN TWR

EXPLANATION OF TABLE

Column

1 & 2 The terminal stations of the circuit. The circuits are listed alphabetically by the Terminal 1 station. Each circuit is listed once only, and Terminal 1 is always the station which is first alphabetically within the circuit.

3 Type of operation specified:

RTF – Radiotelephone
LTF – Landline telephony (landline, cable, VHF, UHF, SHF or scatter)
HF/DSB – High frequency double side band modulation
HF/ISB – High frequency independent side band modulation. In general combined with one or more telegraph channels in the opposite side band

Underlined where not implemented.

4 Supplementary information and references to notes.

Where a type of operation is provided other than that which is recommended, the type existing is shown in this column when it is deemed of interest to provide supplementary information, but this does not imply endorsement on the part of ICAO.

TABLEAU COM 1C – MOYENS DE COMMUNICATIONS VERBALES DIRECTES ATS DESTINES A RELIER DES FIC/ACC ADJACENTS A DES ORGANES ATS SITUES A L'EXTERIEUR DES REGIONS DESSERVIES PAR CES FIC OU ACC, OU A RELIER DES TOURS DE CONTROLE D'AERODROME

EXPLICATION DU TABLEAU

Colonne

1 & 2 Stations terminales du circuit. Les circuits sont indiqués dans l'ordre alphabétique des stations terminales 1. Chaque circuit ne figure qu'une fois; la station terminal 1 est toujours la première dans l'ordre alphabétique à l'intérieur du circuit.

3 Type d'exploitation spécifié:

RTF – Radiotéléphone
LTF – Téléphonie par fil (fil câble, VHF, UHF, SHF ou diffusion troposphérique)
HF/DSB – Modulation d'ondes HF à bande latérale double
HF/ISB – Modulation d'ondes HF à bandes latérales indépendantes. En général, une ou plusieurs voies télégraphiques sont incorporées à la bande latérale opposée

Souligné si le service n'est pas mis en oeuvre.

4 Renseignements complémentaires et renvois à des notes.

Lorsque le type d'exploitation qui est assuré est autre que celui qui est recommandé, le type d'exploitation actuel est indiqué dans cette colonne lorsqu'il est jugé utile de donner ce renseignement supplémentaire, mais cette indication n'implique aucune approbation de la part de l'OACI.

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
EMPLACEMENTS		SERVICE	OBSERVATIONS
TERMINAL I	TERMINAL II		
LUGARES		SERVICIO	OBSERVACIONES
TERMINAL I	TERMINAL II		
1	2	3	4
ALBUQUERQUE ACC	MAZATLAN ACC	LTF	
	MONTERREY ACC	LTF	
ANCHORAGE	EDMONTON		
	HONOLULU		
	OAKLAND		
	PETROPAVLOVSK KAMCHATSKIY		
	TOKYO		
	VANCOUVER		
APIA (FALEOLO)	PAGO PAGO		Provided by switching at NANDI when operationally required - Assuré par commutation à NANDI lorsque l'exploitation l'exige - Suministrado por conmutación en NANDI cuando las operaciones lo requieran
AUCKLAND	HONOLULU		
	NANDI		
	PAGO PAGO		Provided by switching at NANDI - Assuré par commutation à NANDI - Suministrado por conmutación en NANDI
	PAPEETE		
	RAROTONGA		
BORA BORA	PAPEETE		
BOSTON	NEW YORK	LTF	
EDMONTON	REYKJAVIK	LTF	Direct with drop at: Direct, avec dérivation à: Directo, con derivación en: SØNDRE STRØMFJORD
	SØNDRE STRØMFJORD	LTF	

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
GUAM	HONOLULU		
	SAIPAN		
GANDER	FREDERIKSDAL	LTF	Remote Control speech - Télécommande verbales - Telemando verbal.
	NEW YORK	LTF	
	PRESTWICK	LTF	
	PRESTWICK	LTF	With drop at: Avec dérivation à: REYKJAVIK Con derivación en:
	PRINS CHRISTIAN SUND	LTF	Remote Control speech - Télécommande verbales - Telemando verbal.
	REYKJAVIK	LTF	
	SANTA MARIA	RTF §	
	SØNDRE STRØMFJORD	LTF	With drop at: Avec dérivation à: GOOSE Con derivación en:
HABANA ACC	HOUSTON ACC	LTF	Through/via/a través de: MIAMI
	MIAMI ACC	LTF	
HONOLULU	MANILA		
	NAHA		
	NANDI		
	OAKLAND	RTF	
	PAGO PAGO		
	TOKYO		
HOUSTON ACC	MERIDA ACC	LTF	Through/via/a través de: MEXICO
	MEXICO ACC	LTF	
	MIAMI	LTF	
	MONTERREY ACC	LTF	
ISLA DE PASCUA	PAPEETE (Tahiti)		
	SANTIAGO	HF/ISB	

§ To be replaced by LTF/RTF with switching at New York, when New York-Santa Maria adequate -
A remplacer par LTF/RTF avec commutation à New York lorsque RTF New York-Santa Maria sera adéquat -
Se sustituirá por LTF/RTF mediante conmutación en Nueva York, cuando el LTF Nueva York-Santa María sea adecuado.

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
JACKSONVILLE	NEW YORK	LTF	
LISBOA	SANTA MARIA	RTF	
LOS ANGELES ACC	MAZATLAN ACC	LTF	
MADRID	SANTA MARIA	LTF/RTF	To be provided by switching at: Prévu avec commutation à: Se proporcionará mediante conmutación en: LISBOA
MIAMI ACC	NASSAU ACC	LTF	
	NEW YORK	LTF	
	PORT-AU-PRINCE ACC	HF/DSB	
	SAN JUAN ACC	HF/ISB	
	SANTO DOMINGO	HF/DSB	LTF through/via/a través de: SAN JUAN
MONCTON	NEW YORK	LTF	
NANDI	NAUSORI		
	NOUMEA	RTF	
	PAGO PAGO	RTF	
	SYDNEY		
NEW YORK	SAN JUAN	LTF	
	SANTA MARIA	RTF	
OAKLAND	VANCOUVER		
PAPEETE (Tahiti)	RANGIROA RAROTONGA		
PRESTWICK	REYKJAVIK	LTF	
	SANTA MARIA	LTF/RTF	Landline PRESTWICK-LISBOA and Radiotelephony LISBOA-SANTA MARIA - PRESTWICK-LISBOA par fil et LISBOA-SANTA MARIA en radiotéléphonie - Línea alámbrica PRESTWICK-LISBOA y radiotelefonía LISBOA-SANTA MARIA. To be provided by switching at: Prévu avec commutation à: Se proporcionará mediante conmutación en: LISBOA

LOCATIONS		SERVICE	REMARKS
TERMINAL I	TERMINAL II		
1	2	3	4
REYKJAVIK	SØNDRE STRØMFJORD	LTF	
	STAVANGER	LTF	To be provided by switching at: Prévu avec commutation à: Se proporcionará mediante conmutación en: PRESTWICK
SAN JUAN	SANTA MARIA	LTF/RTF	To be provided by switching at: Prévu avec commutation à: Se proporcionará mediante conmutación en: NEW YORK

TABLE COM 2 – AERONAUTICAL MOBILE SERVICE

EXPLANATION OF TABLE

Column	
1	Name of Station
2	Functions for which frequencies are required, using abbreviations and identifiers as listed in the "Explanation of functions and symbols" below
3	Total number of channels required for stated function or combination of functions
4	The area or distance within which each required channel is to be used
5, 6, 7, 8	Recommended radio frequency of facility for the function(s) shown in Column 2 arranged by protection height as follows: Column 5: up to 1 200 m/4 000 ft (S/T) Column 6: up to 3 050 m/10 000 ft (L) Column 7: up to 7 600 m/25 000 ft (I) Column 8: up to 13 700 m/45 000 ft; for SST up to 19 800 m/65 000 ft (U) (where extended range coverage is required it is annoted ER)
9	Frequencies of facility providing HF radiotelephony en-route communications (selected from the Allotment Plan in Appendix 27 to the ITU Radio Regulations)
10	Supplementary information Where the service is operating on a non-recommended frequency, the existing frequency is shown in this column when it is deemed of interest to provide supplementary information, but this does not imply endorsement on the part of ICAO.

Explanation of functions and symbols

ACC-L	Area control service up to 7 600 m/25 000 ft
ACC-LU	Area control service up to 13 700 m/45 000 ft
ACC-SR	Area radar control service up to height indicated by L, LU or U
ACC-U	Area control service from 6 000 m/20 000 ft up to 13 700 m/45 000 ft
APP-L	Approach control service up to 3 050 m/10 000 ft (PAC) and FL 100/25 NM (NAT/NAM)
APP-I	Approach control service up to 7 600 m/25 000 ft (PAC) and FL 150/40 NM (NAT/NAM)
APP-LU	Approach control service up to 13 700 m/45 000 ft
APP-PAR T	Precision approach radar service up to 1 200 m/4 000 ft (PAC)
APP-SR	Approach surveillance radar service up to height shown by L, L LU or U (PAC)
APP-U	Approach control service from 6 000 m/20 000 ft up to 13 700 m/45 000 ft (PAC)
FIS	Flight information service up to height shown by L, I, LU or U
GPS	General purpose communication up to height shown by L, I, LU or U (NAT NAM – L-4 550 m/15 000 ft)
SMC	Surface movement control
TWR	Aerodrome control service

LEGEND

Underlining has been used where the service is not implemented or when the service is provided on a non-recommended frequency.

**ACC provides service in Oceanic CTA.

In some cases the frequencies assigned to ACC are operated at locations different from the location of the ACC, either as "remote sectors" or, where the provision of direct pilot-controller communications are not yet feasible, by means of air-ground communication stations These remote locations are shown against the frequency concerned in Column 10.

§§§ indicates that no frequency is specified.

LOCATION EMPLACEMENT LUGAR	FUNCTION FONCTION FUNCION	NO. OF CHANNELS NOMBRE DE VOIES NÚM. DE CANALES	SERVICE RANGE PORTEE UTILE ALCANCE DEL SERVICIO	FREQUENCIES FREQUENCES FRECUENCIAS					REMARKS OBSERVATIONS OBSERVACIONES
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
AMERICAN SAMOA									
PAGO PAGO/Intl	APP-U FIS-U(GP)	1 1	150 150				12[illegible].3/ 12[illegible].9	SP-7 2945 5638 8847 13304 17909+	/Shared with airport Advisory Service - Partagé avec le service consultatif d'aéroport - Compartido con el servicio consultativo del aeropuerto +Note - Nota 3
AUSTRALIA									
SYDNEY								SP-6 2945 5638 8847 13304 17909+ SEA-3 2987 5673 8868 13288 17965	+Note - Nota 3
TOWNSVILLE								CWP-1+ 2896 5505 CWP-2+ 8854 13296 17909 11303	+Note - Nota 3
BERMUDA (United Kingdom)									
BERMUDA	ACC-LU	2					126.9		
BERMUDA NAS	TWR APP	1 1	25	118.1			121.5 119.9		
CANADA									
ABBOTSFORD	TWR	1	25	§§§					
CALGARY	TWR/SMC APP-LU	1 2	25	§§§	§§§		§§§		
CAMBRIDGE BAY								NAT-D# 2868 5624 8910 13228*	#Note - Nota 7 *Note - Nota 5

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FRECUENCIES					REMARKS
				VHF				HF	
				S/T	L	:	U		
1	2	3	4	5	6	-	8	9	10
CANADA (Cont'-suite-cont)									
CHURCHILL	GPS	1					§§§ ER	NAT-D# 2868 5624 8910 13328	#Note - Nota 7
COMOX	TWR	1	25	§§§					
EDMONTON	ACC-LU GPS	2 1			§§§		§§§ §§§		
EDMONTON/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
FROBISHER BAY	GPS	1					§§§ ER	NAT-D# 2868 5624 8910 13328*	#Note - Nota 7 *Note - Nota 5
GANDER***	ACC-LU FIS-U GPS	2 1 2			§§§ §§§		§§§ ER §§§ §§§ ER	NAT-A# 2931 5610 8945 13328 NAT-B# 2987 5673 8889 13288 NAT-C# 2945 5638 8854 13288 NAT-D# 2868 5624 8910 13328 17941§	#Note - Nota 7 See also/voir aussi/véase tambien: FREDERIKSDAL and/et/y PRINS CHRISTIAN SUND (Greenland) §Note - Nota 3 P Nil
GANDER/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
GOOSE	GPS	1					§§§ ER		See also/voir aussi/véase tambien:HOPEDALE
GOOSE/Goose	TWR APP-L	1 1	25	§§§	 §§§				
HALIFAX/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
HOPEDALE	GPS	1					§§§ ER		Remote controlled from: Télécommandé de: Telecomando de: GOOSE
MONCTON ACC	ACC-LU	2			§§§		§§§		
MONTREAL	ACC-LU GPS	2 1			§§§		§§§ §§§		
MONTREAL/Dorval	TWR/SMC APP-L	1 1	25	§§§	 §§§				
OTTAWA/Intl	TWR/SMC APP-LU	1 2	25	§§§	 §§§		 §§§		

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
CANADA (Cont'-suite-cont)									
RESOLUTE	GPS	1					§§§ ER		
ST. JOHN'S/ St. John's	TWR/SMC	1	25	§§§					
SCHEFFERVILLE	GPS	1					§§§ ER		
SYDNEY/Sydney	TWR/SMC	1	25	§§§					
TORONTO	ACC-LU	2			§§§		§§§		
TORONTO/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
VANCOUVER	ACC-LU GPS	2 1	CTA		§§§		§§§ §§§		
VANCOUVER/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
WINDSOR/Windsor	TWR/SMC	1	25	§§§					
WINNIPEG	ACC-LU GPS	2 1			§§§		§§§ §§§		
WINNIPEG/Intl	TWR/SMC APP-L	1 1	25	§§§	 §§§				
CHILE									
ISLA DE PASCUA (Easter I.)Mataveri	TWR APP-U ACC-U FIS-U	1 1 1 1	25 100 FIS FIS	118.1			*120.3* 125.9 126.9	SW-SAM 8/ 2889 4696 6666 8826 11343 17925+ SP-7 5638+ 8847+ 13304+ 17909+	/Note - Nota 1 +Note - Nota 3
CHINA									
CANTON+								**CWP-I** **5505** **8854** **13296** **17909**	**+Note - Nota 3**
PEKING+								**CWP-1** **5505** **8854** **13296** **17909**	**+Note - Nota 3**
SHANGHAI								**CWP-1** **5505** **8854** **13296** **17909**	

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
COOK IS.									
RAROTONGA	TWR SMC	1 1	25 AD	118.1 121.9				SP-9 RDARA 3460/ 6575/ 8924/ 11319/	/SP MWARA 2945 5638 8847 13304
DENMARK									
FREDERIKSDAL, Greenland	GPS						127.9		Remote controlled from:- Télécommandé de: Telecomando de: GANDER
KULUSUK, Greenland	GPS	1					127.9 ER		Remote controlled from: Télécommandé de: Telecomando de: SØNDRE STRØMFJORD
PRINS CHRISTIAN SUND, Greenland	GPS						127.9/ ER		/Remote controlled from: Télécommandé de: Telecomando de: GANDER
QAQATOQAQ (Greenland)	GPS	1					127.9		Remote controlled from: Télécommandé de: Telecomando de: SØNDRE STRØMFJØRD
SØNDRE STRØMFJORD	FIS*	1					127.9 ER	NAT-D# 2868/ 5624/ 8910/ 13328/**	#Note - Nota 7 /Note - Nota 4 *Communication service provided from SØNDRESTRØM Radio for flights below FL 195 within SØNDRESTRØM FIR - Service de communications assuré à partir de SØNDRESTRØM pour les vols au-dessous de FL 195 dans la FIR SØNDRESTRØM - Servicio de comunicaciones proporcionado desde SØNDRESTRØM para vuelos a debajo del FL 195 dentro de la FIR de SØNDRESTRØM **Note - Nota 5
SØNDRE STRØMFJORD/ Søndre Strømfjord Greenland	TWR APP	1 2	25	126.2		126.2 121.5			
VAGAR/Vagar (Faroe Is.)	TWR APP	1	25	118.1	118.1				
ELLICE ISLAND (United Kingdom)									
FUNAFUTI/Funafuti	TWR	1	25	118.1				SP-9 RDARA 6575* 8924	*3640, 6645

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
FIJI									
NANDI	GPS						126.7 ER	SP-6/7 2945 5638 8847 13304 17909+ RDARAø 3460 6575 8924 11319	*119.1 +Note - Nota 3 øNote - Nota 2
NANDI/Intl	TWR SMC APP-I	1 1 1	25 AD 75	118.1* 121.9		119.1			
SUVA/Nausori	TWR SMC APP-L	1 1 1	25 AD 50	118.7* 121.9	119.7				*119.7
FRENCH POLYNESIA									
BORA BORA/Motu-Mute	TWR	1	25	118.9				SP-7 2945 5638 8847	
RANGIROA/Rangiroa	TWR APP-U	1 1	25 150	118.3			119.1	SP-7 5638 8847	
TAHITI/Faaa	TWR APP-U FIS-U	1 1 1	25 150 FIR	118.1			121.3* 126.7	SP-7# 2945 5638 8847 13304 17909+	#Note - Nota 1 *118.1 +Note - Nota 3
GILBERT IS. (United Kingdom)									
TARAWA/Bonriki	TWR	1	25	118.1				SP-9 RDARA 3460 6575 8924 11319	
HONG KONG (United Kingdom)									
HONG KONG	GPS	1					127.1 ER	CWP-1 5505 8854 13296 §	§Cf. MID/SEA
ICELAND									
AKUREYRI/Akureyri	TWR APP	2 1		118.1 121.5	118.1				
GAGNHEIDI	GPS						127.9 ER		Remote controlled from: Télécommandé de: Telecomando de: REYKJAVIK
HAFELL	GPS						127.9§ ER		§Remote controlled from: Télécommandé de: Telecomando de: REYKJAVIK

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
ICELAND (Cont'd-suite-cont)									
KEFLAVIK/Keflavik	TWR	2		118.3 121.5					Remote controlled from: Télécommandé de: Telecomando de: REYKJAVIK
	SMC	1		121.9					
	APP				119.3				
REYKJAVIK	ACC	3			119.7 121.5		120.7	* NAT-B# 2987 5673 8889 13288 NAT-C# 2945 5638 8854 13288 NAT-D# 2868 5624 8910 13328 17941	*Note - Nota 6 §See also: Voir aussi: Véase tambien: GAGNHEIDI HAGELL THORBJORN and/et/y THVERFJALL #Note - Nota 7
	GPS	1					127.9§ ER		
REYKJAVIK/Reykjavik	TWR	2		118.1 121.5					
	SMC	1		121.7					
	APP				119.1				
THORBJORN	GPS						127.9§ ER		§Remote controlled from: Télécommandé de: Telecomando de: REYKJAVIK
THVERFJALL	GPS						127.9§ ER		
IRELAND									
SHANNON/Shanwick	GPS	1					127.9 ER	NAT-A# 2931 5610 8945 13328 NAT-B# 2987 5673 8889 13288 NAT-C# 2945 5638 8854 13288 NAT-D# 2868 5624 8910 13328 17941	# Note-Nota 7 * Note-Nota 6 Communication Service provided from Shannon with Prestwick furnishing ATC in the Oceanic Control Area - Service de communications assuré à partir de Shannon, Prestwick assurant le contrôle de la circulation aérienne dans la région de contrôle océanique - Servicio de comunicaciones proporcionado desde Shannon, en el que Prestwick suministra ATC en el área de control oceánica

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
JAPAN									
NAHA, Okinawa I.	GPS	1					126.9 ER	CWP-1/2 2896 5505 6631 8854 11303 13296 17909#	# Note-Nota 4
TOKYO	GPS	3					126.7 ER 127.3 ER 127.4 ER	NP-3 2910 5589 8938 13264 17909 CWP-1 CWP-2 2896 5505 6631 8854 13296 17909	
KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF									
PYONGYANG								CWP-1 5505 8854 13296 17909	
KOREA, REPUBLIC OF									
SEOUL	[illegible]S	1					127.1 ER	CWP-1 2896 5505 8854 13296	
MARIANA IS. (United States)									
GUAM I./Agana NAS	ACC-U FIS-U TWR SMC APP/SR-U	1 2 2 1	150 225 25 AD 225	118.1 126.2 121.9			118.7 123.6 126.7 120.5≠ 119.3≠ 118.9*	CWP-2 2896 5505 8854 11303 13296 17909≠≠	* For/Pour/Por ARRIVALS ≠ For/Pour/Por DEPARTURES ≠≠Note-Nota 4
MONGOLIA									
ULAN BATOR +								CWP-1 5505+ 8854+ 13296+ 17909+	+ Note-Nota 3
NAURU									
NAURU/Nauru								SP-9 RDARA 3460* 6575≠ 8924	* 3008 ≠ 5498

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
NEW CALEDONIA (France)									
NOUMEA								RDARA* 6575 8924	* Note-Nota 2
NEW HEBRIDES (France/ United Kingdom)									
PORT VILA								RDARA* 3460 6575 8924	*Note-Nota 2
NEW ZEALAND									
AUCKLAND								SP-6 2945 5638 8847 13304 17909+	+ Note-Nota 3
NIUE I. (New Zealand)									
ALOFI/Niue Intl (Hanan)	TWR	1		25	118.1			SP-9 RDARA 3460 6575	
NORWAY									
BODØ								NAT-D# 2868 5624 8910	# Notes-Notas 5 & 7
PHILIPPINES									
MANILA	GPS						124.9 ER 127.3 ER	CWP-1, CWP-2 2896 5505 6631 8854 13296 17909 §	§ Cf MID/SEA
PORTUGAL									
LISBOA	GPS						127.9 ER	NAT-A# 2931 5610 8945 13328 §	# Note-Nota 7 § Cf AFI
PONTA DELGADA/ Ponta Delgada	TWR APP			118.3	 118.3				

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
PORTUGAL (Cont'd-suite-cont)									
SANTA MARIA	ACC-U GPS						126.5 132.15 127.9	NAT-A# 2931 5610 8945 13328 NAT-B# 2987 5673 8889 13288 NAT-C# 2945 5638 8854 13288 17941	# Note-Nota 7 ≠ For flights up to- Pour les vols jusqu'à - Para vuelos hasta- FL 150/50 NM (NAT/NAM)
SANTA MARIA/ Santa Maria I. Açores	TWR APP ACC(TMA)	2		118.1	119.1 123.9≠ 124.3≠				
PUERTO RICO (United States)									
SAN JUAN								NAT-A# 2931 5610 8945 13328 17941 §	# Note-Nota 7 § Cf. CAR/SAM
SURINAM (Netherlands, *Kingdom of the*)									
PARAMARIBO	GPS	1					126.9	NAT-A 2931 5610 8945 13328 §	§ Cf. CAR/SAM
TONGA									
TONGATAPU/Fua'amotu Intl	TWR	2	25	118.1 118.5				SP-9 RDARA 3460 6575 8924	
UNION OF SOVIET SOCIALIST REPUBLICS									
KHABAROVSK								NP-3 2910 5540≠ 8938 13264 17909	≠ Note-Nota 3

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
UNITED KINGDOM									
PRESTWICK/SHANWICK#									# Communication Service provided from Shannon with Prestwick furnishing ATC in the Oceanic Control Area - Service de communications assuré à partir de Shannon Prestwick assurant le contrôle de la circulation aérienne dans la région de contrôle océanique - Servicio de comunicaciones proporcionado desde Shannon, en el que Prestwick suministra ATC en el área de control oceánica
UNITED STATES *									
ADAK I./Adak NS	FIS	1	FL 150			127.1			P NIL
ALBUQUERQUE	ACC-L+U				§§§		§§§		
ANCHORAGE **	ACC-L+U				§§§		§§§	NP-3, NP-4 2910 5589 8938 13264 17909	
	GPS-L+U				§§§		§§§ ER		
ANCHORAGE/ Elmendorf AFB	TWR/SMC	1		§§§					
	APP-L	1			§§§				
ANCHORAGE/Intl	TWR	1	25	118.3					
	APP-PAR	2	35		119.1 120.4				
ATLANTA	ACC-L+U				§§§		§§§		
BALTIMORE/Baltimore-Washington Intl	TWR			§§§					
	APP-I					§§§			
BANGOR/Bangor Intl	TWR/SMC			§§§					
	APP-L				§§§				
BOSTON	ACC-L+U				§§§		§§§		
	GPS-L+U				§§§		§§§		
BOSTON/Logan Intl	TWR/SMC			§§§					
	APP-L				§§§				
CHICAGO	ACC-L+U				§§§		§§§		
CHICAGO/O'Hare Intl	TWR/SMC			§§§					
	APP-L				§§§				

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dessus du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertura VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
UNITED STATES * (Cont'd-suite-cont)									
CLEVELAND	ACC-L+U				§§§		§§§		
	GPS-L+U				§§§		§§§		
CLEVELAND/Cleveland-Hopkins Intl	TWR/SMC			§§§					
	APP-L				§§§				
COLD BAY	FIS-U	1					§§§ ER	NP-3, NP-4 2910 5589 8938 13264 17909	
COLD BAY/Cold Bay	TWR	1		§§§					
CORPUS CHRISTI/Intl	TWR/SMC			§§§					
	APP-I					§§§			
DALLAS-FORT WORTH/ Regional Airport	TWR/SMC			§§§					
	APP-I					§§§			
DENVER	ACC-L+U				§§§		§§§		
DETROIT/Metropolitan Wayne County	TWR/SMC			§§§					
	APP-L				§§§				
EL PASO/Intl	TWR/SMC			§§§					
	APP-I					§§§			
EVERETT/Snohomish County	TWR/SMC	1		§§§					
	APP-L	1			§§§				
FAIRBANKS/Eielson AFB	TWR	1	25	§§§					
	APP-L	1	50		§§§				
FAIRBANKS/Intl	TWR	1	25	118.3					
	APP-PAR	1	50	118.1					
	ACC-L+U	2			§§§		§§§		
FORT LAUDERDALE/ Hollywood Intl	TWR/SMC			§§§					
	APP-L				§§§				
FORT WORTH	ACC-L+U				§§§		§§§		
FRESNO AIR TERMINAL	TWR/SMC	1		§§§					
	APP-L	1			§§§				
GREAT FALLS	ACC-L+U				§§§		§§§		
HILO/Gen. Lyman Field	TWR	2	25	118.1 122.5					
	SMC	1	AD	121.9					
	APP-I	1	75			119.7			
	FIS-U	1	150				123.6		

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dessus du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertura VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L		U		
1	2	3	4	5	6	7	8	9	10
UNITED STATES * (Cont'd-suite-cont)									
HONOLULU **	ACC/SR-LU#						124.1 127.6 119.3 126.0 126.5 119.9 135.4	SP-7 2945 5638 8847 13304 17909	# FL 600
	FIS-U#	4	150				122.6 122.4 122.2 122.1	CEP-5 3001+ 3467 5554 5603 8875 8931 13312+ 13336 17909 CWP-2 2896 5505 8854 11303 13296 17909⌿	+ Note-Nota 3 # FL 600 ⌿ Note -Nota 4
HONOLULU/Intl	TWR	2	25	118.1 122.5					# Clearance delivery Emission des autorisation Difusión de las autorizaciones ⌿ Ramp control Contrôle aire de trafic Control de la plataforma ≠ UNICOM
	SMC	3	AD	121.9 121.6# 121.8⌿ 123.0≠					
		1	25						
	APP/SR-I	5	75			119.1 118.3 121.1 124.8 120.9			ARR-East/Est/Este ARR-West/Ouest/Oeste DEP-East/Est/Este DEP-West/Ouest/Oeste VFR/Radar
HOUSTON **	ACC-L+U				§§§		§§§		
HOUSTON/Intercontinental	TWR/SMC APP-I			§§§		§§§			
INDIANAPOLIS	ACC-L+U				§§§		§§§		
INDIANAPOLIS/Intl	TWR/SMC APP-I			§§§		§§§			
JACKSONVILLE	ACC-L+U				§§§		§§§		
KAHULUI/Kahului, Maui I.	FIS-U	2	150				123.6 122.1		
	TWR	2	25	118.7 122.5					
	SMC	1	AD	121.9					
	APP-I	1	75			119.5			
	APP/SR-I	1	75			119.1			

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dessus du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertura VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
UNITED STATES * (Cont'd-suite-cont)									
KANSAS CITY	ACC-L+U				§§§		§§§		
KING SALMON	TWR/SMC APP-L	1 1		§§§	§§§				
LAS VEGAS/McCarran Intl	TWR/SMC APP-L	1 1		§§§	§§§				
LOS ANGELES	ACC-L ACC-U FIS-U	1 1 1			§§§		§§§ §§§ ER		
LOS ANGELES/Intl	TWR/SMC APP-L	1 1		§§§	§§§				
McALLEN/Miller Intl	TWR/SMC			§§§					
MEMPHIS	ACC-L+U GPS-L+U				§§§ §§§		§§§ §§§		
MIAMI **	ACC-L+U ~~GPS-U~~				§§§		~~§§§ 123.4≠ ER 130.4~~	~~E-CAR 2952 5484 6540 8959 11367 17925+≠ 17917≠ W-CAR 2966 5568 8840 1001 1343 13320 17925~~	~~≠BROWNSVILLE, LAKE CHARLES~~ ~~+ Note-Nota 3~~ ~~≠ Note-Nota 4~~
MIAMI/Intl	TWR/SMC APP-I			§§§		§§§			
MILWAUKEE/Gen. Mitchell	TWR/SMC APP-L			§§§	§§§				
MINNEAPOLIS	ACC-L+U				§§§		§§§		
MINNEAPOLIS/Minneapolis-St.Paul Intl	TWR/SMC APP-L			§§§	§§§				
NEWARK/Newark	TWR/SMC APP-L			§§§	§§§				
NEW ORLEANS	~~AG-GPS~~						~~[illegible]4#~~		~~* Service provided by - Service assuré par - Servicio suministrado por MIAMI~~
NEW ORLEANS/Intl	TWR/SMC APP-I			§§§		§§§			

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dess_s du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertu-a VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
UNITED STATES * (Cont'd-suite-cont)									
NEW YORK **	ACC-L+U GPS-U				§§§	129.4	§§§ §§§ ER	NAT-A# 2931 5610 8945 13328 NAT-B# + 2987 5673 8889 13288 17941 §	* Note-Nota 7 + Note-Nota 6 §Cf. East/est/este CAR
NEW YORK/John F. Kennedy Intl	TWR/SMC APP-L			§§§	§§§			E-CAR 2952 6540 8859 11367 11925+	+ Note-Nota 3
NIAGARA FALLS/Intl	TWR/SMC APP-L			§§§	§§§				
OAKLAND	ACC-L+U	2			§§§		§§§		
OAKLAND/Intl	TWR/SMC APP-L			§§§	§§§				
ONTARIO/Intl	TWR/SMC APP-L	1 1		§§§	§§§				
PALMDALE/P.F.T.I.	TWR/SMC APP-L	1 1		§§§	§§§				
PHILADELPHIA/Intl	TWR/SMC APP-L	1 1		§§§	§§§				
PHOENIX/Sky Harbor	TWR APP-I	1 1		§§§	§§§				
PITTSBURGH/Greater Pittsburgh	TWR/SMC APP-L	1 1		§§§	§§§				
PORTLAND/Intl	TWR/SMC APP-L	1 1		§§§	§§§				
SACRAMENTO	TWR/SMC APP-L	1 1		§§§	§§§				
SALT LAKE CITY	ACC-L+U				§§§		§§§		
SAN ANTONIO/Intl	TWR/SMC APP-I	1 1		§§§		§§§			
SAN DIEGO/Intl	TWR/SMC APP-I	1 1		§§§		§§§			

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dessus du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertura VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L	I	U		
1	2	3	4	5	6	7	8	9	10
UNITED STATES * (Cont'd-suite-cont)									
SAN FRANCISCO								CEP-5 3001+ 3467 5554 5603 8875 8931 13312+ 13336 17909+	+ Note-Nota 3
SAN FRANCISCO/Intl	TWR/SMC	1		§§§					
	APP-L	1			§§§				
SEATTLE	ACC-L	1			§§§				
	ACC-U	2					§§§ §§§ ER		
SEATTLE/Seattle-Tacoma Intl	TWR/SMC	1		§§§					
	APP-L	1			§§§				
SEATTLE BOEING FIELD/ King County Intl	TWR/SMC	1		§§§					
SPOKANE/Intl	TWR/SMC	1		§§§					
	APP-L	1			§§§				
ST.LOUIS/St.Louis Intl	TWR/SMC	1		§§§					
	APP-L	1			§§§				
STOCKTON/Metropolitan	TWR/SMC	1		§§§					
	APP-L	1			§§§				
SYRACUSE/Hancock Intl	TWR/SMC	1		§§§					
	APP-L	1			§§§				
TAMPA/Intl	TWR/SMC	1		§§§					
	APP-I	1				§§§			
TUCSON/Intl	TWR/SMC	1		§§§					
	APP-I				§§§				
WASHINGTON	ACC-L+U				§§§		§§§		
WASHINGTON/Dulles Intl	TWR/SMC			§§§					
	APP-L				§§§				
WEST PALM BEACH/ Palm Beach Intl	TWR			§§§					
	APP-I					§§§			
WINDSOR LOCKS/ Bradley Intl	TWR/SMC			§§§					
	APP-L				§§§				

* Above FL 180, VHF/UHF coverage is provided over virtually the entire U.S.
Sur tout le territoire des Etats-Unis, le service VHF/UHF est assuré au-dessus du niveau de vol 180.
Realmente, sobre todo el territorio de Estados Unidos se proporciona cobertura VHF/UHF por encima del nivel de vuelo 180.

LOCATION	FUNCTION	NO. OF CHANNELS	SERVICE RANGE	FREQUENCIES					REMARKS
				VHF				HF	
				S/T	L		U		
1	2	3	4	5	6	7	8	9	10
WAKE I. (United States)									
WAKE I/Wake	TWR APP-I			118.1		118.7			
ALLIS IS. (France)									
WALLIS	APP-I	1	150			118.3*		RDARA⨍ 6575 8924	* 118.1 ⨍ Note-Nota 2
WESTERN SAMOA									
APIA/Faleolo	TWR SMC	1 1	25 AD	118.1 121.9				SP-9 RDARA 3460 6575	

NOTES

Aeronautical stations may discontinue guard on discrete HF channels assigned to them if the expected seasonal propagation conditions indicate that their use will not be required for certain periods, provided prior co-ordination is effected between all aeronautical stations concerned and with the users. Such action should be promulgated by AIRAC NOTAM. Frequencies guarded at any time should be such as to permit communications with aircraft anywhere at that time within the area served. Annex 15 requires that the watch schedules be published in States' AIP.

1. Receiver watch to be provided on "SP" frequencies at Isla de Pascua and on SW-SAM frequencies at Tahiti. Use of these frequencies as indicated in this note is on a secondary basis.

2. RDARA frequencies provided to achieve satisfactory en-route communications for regional and domestic traffic in the South Pacific Area of RDARA 9 are given below:

FREQUENCIES kHz
3460
6575
8524
11319

3. For use on a secondary basis, i.e. its use shall be restricted to such areas and conditions that harmful interference cannot be caused to other authorized operations of stations in the aeronautical mobile service.

4. Frequency to be implemented only if a continued operational requirement arises.

5. The frequency 11303 kHz to be implemented on an experimental secondary basis (*see* Note 4) and provided A3H/A3J capability exists.

6. In accordance with Rec. 15/2 of the *EUM VI RAN Meeting*, the frequencies 3467, 5554, 6568, 8931 and 11303 kHz (formerly EUM Family B) have been made available for North Atlantic operations. The use of these frequencies will be co-ordinated between ICAO and the ITU.

7. The families of high frequencies alloted to the Major World Air Route Area – North Atlantic (MWARA-NA) are to be used according to the direction of the air traffic flow and the type of airborne radio equipment carried as follows:

	Allowed mode of transmission
Family A: 2931, 5610, 8945 and 13328 kHz	A3/A3H/A3J
Family B: 2987, 5673, 8889 and 13288 kHz	A3J
Family C: 2945, 5638, 8854 and 13288 kHz	A3J
Family D: 2868, 5624, 8910 and 13328 kHz	A3/A3H
Common Frequency: 17941 kHz	A3/A3H/A3J

	Route flown		
Designated for use by	*Southern*	*Central*	*Northern*
All SSB-equipped aircraft registered in the hemisphere West of 30°W	A	B	B
All SSB-equipped aircraft registered in the hemisphere East of 30°W	A	C	C
All DSB-equipped aircraft	A	D	D

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

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

In the event of overloading of a Family actually occurring, or being anticipated aircraft of one or more operators may be off-loaded from that Family to another appropriate Family, for the expected duration of the condition. The off-loading may be requested by any station, but Shannon and Gander will be responsible for taking a decision after co-ordination with all the NAT stations concerned.

APPENDIX B

ARINC DETAILED COMMUNICATIONS DATA

This appendix provides the detailed information describing coverage of ARINC services. Pages B-2 through B-38 provide frequency, location, and related information in the CONUS VHF Radiotelephone Network. Pages B-39 through B-44 provide guides for addressing frequency coverage, and locations for connections to ARINC air/ground networks and for HF/extended VHF enroute ARINC coverage. Pages B-45 through B-70 provide listings of airlines, other organizations, state name abbreviations and tables depicting frequency, location, and operating personnel of all ARINC stations.

FOREWORD

This publication contains a series of charts showing the ARINC Air-Ground VHF Radiotelephone Stations that are arranged as networks and operate 24 hours a day, seven days per week to satisfy the operational control communications requirements of the airlines and other organizations.

Each network is composed of favorably sited, unattended, remotely controlled VHF stations (transmitters and receivers), which are linked together by telephone lines extending from one or more ARINC Communication Centers. All network stations are interconnected so that all transmitters on a particular network can be activated simultaneously on a common frequency by the ARINC Communication Center(s) that control that network.

The VHF Networks operate on frequency assignments from the 128.85 to 132.0 megahertz band. The frequency assignments are staggered so that adjacent networks do not cause interference to one another.

National Weather Service aviation weather observations and forecasts are available at all ARINC Communication Centers and will be transmitted upon request.

A time signal (a tone one second long) is transmitted on the VHF networks twice each hour. The first time signal starts at 29 minutes, 59 seconds past the hour and ends at 30 minutes past the hour. The second time signal starts at 59 minutes, 59 seconds past the hour and ends exactly on the hour.

To guard against equipment damage and interference which could result if a transmitter operated continuously in a "carrier on" condition, each network transmitter is equipped with a time-out device which will turn the transmitter off after 90 seconds of continuous operation. The time-out device re-cycles to zero instantly when the ARINC operator releases his push-to-talk switch. Therefore, on long transmissions ARINC operators release the push-to-talk switch momentarily at 50 to 60 second intervals to reset the time-out device.

To facilitate the relay and delivery of air-ground messages, all ARINC Communication Centers have access to the ARINC Electronic Switching System, which provides automatic switching of teletype messages to other ARINC Communication Centers, airlines, and other offices.

THIS IS NOT A FLIGHT OPERATIONS MANUAL

AND THE INFORMATION CONTAINED HEREIN

MUST NOT BE RELIED UPON FOR FLIGHT SAFETY

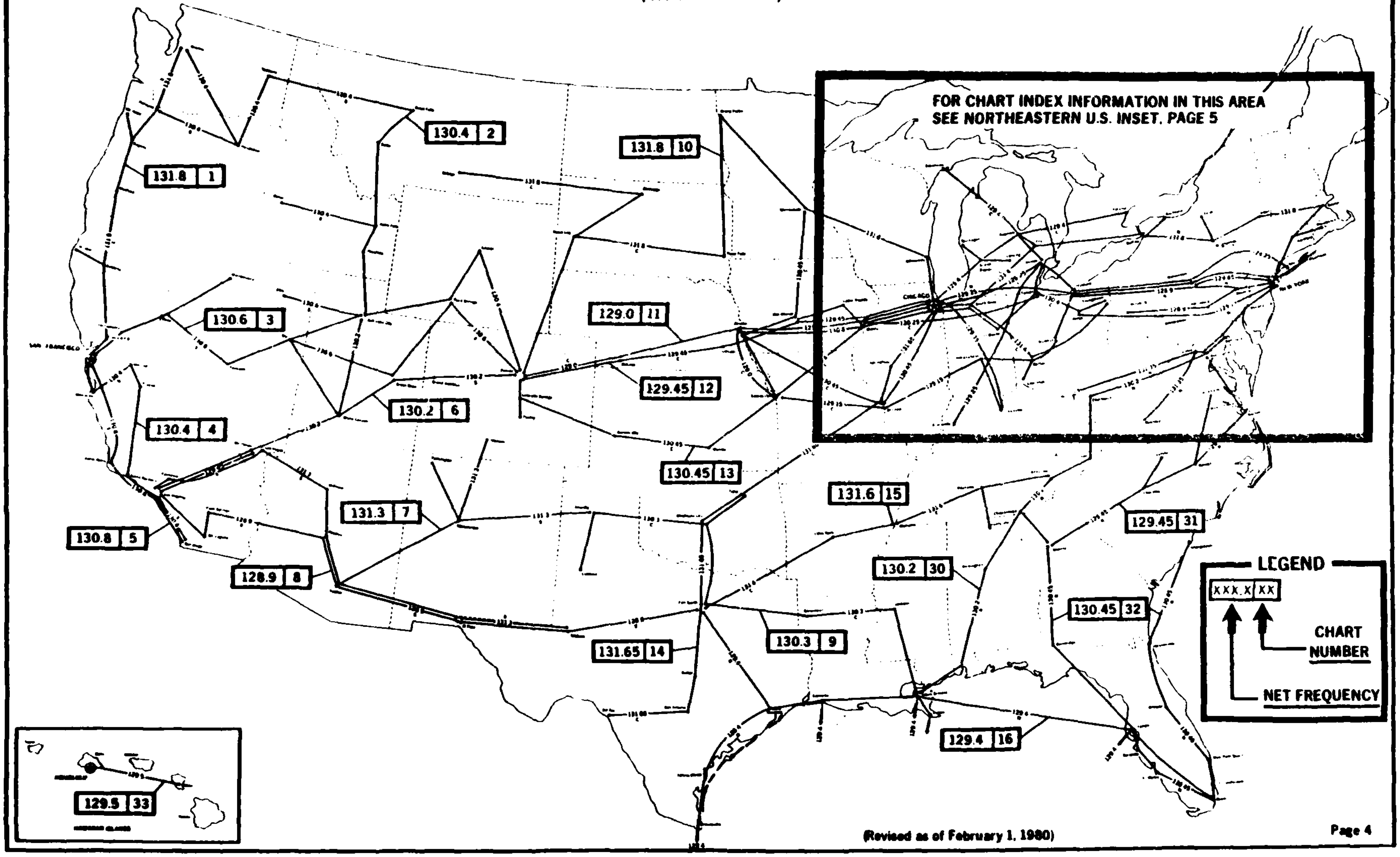
CAUTION

THE CHARTS IN THIS PUBLICATION

ARE NOT SUITABLE FOR NAVIGATIONAL PURPOSES

VHF NETWORK DIAGRAMS AND CHART INDEX

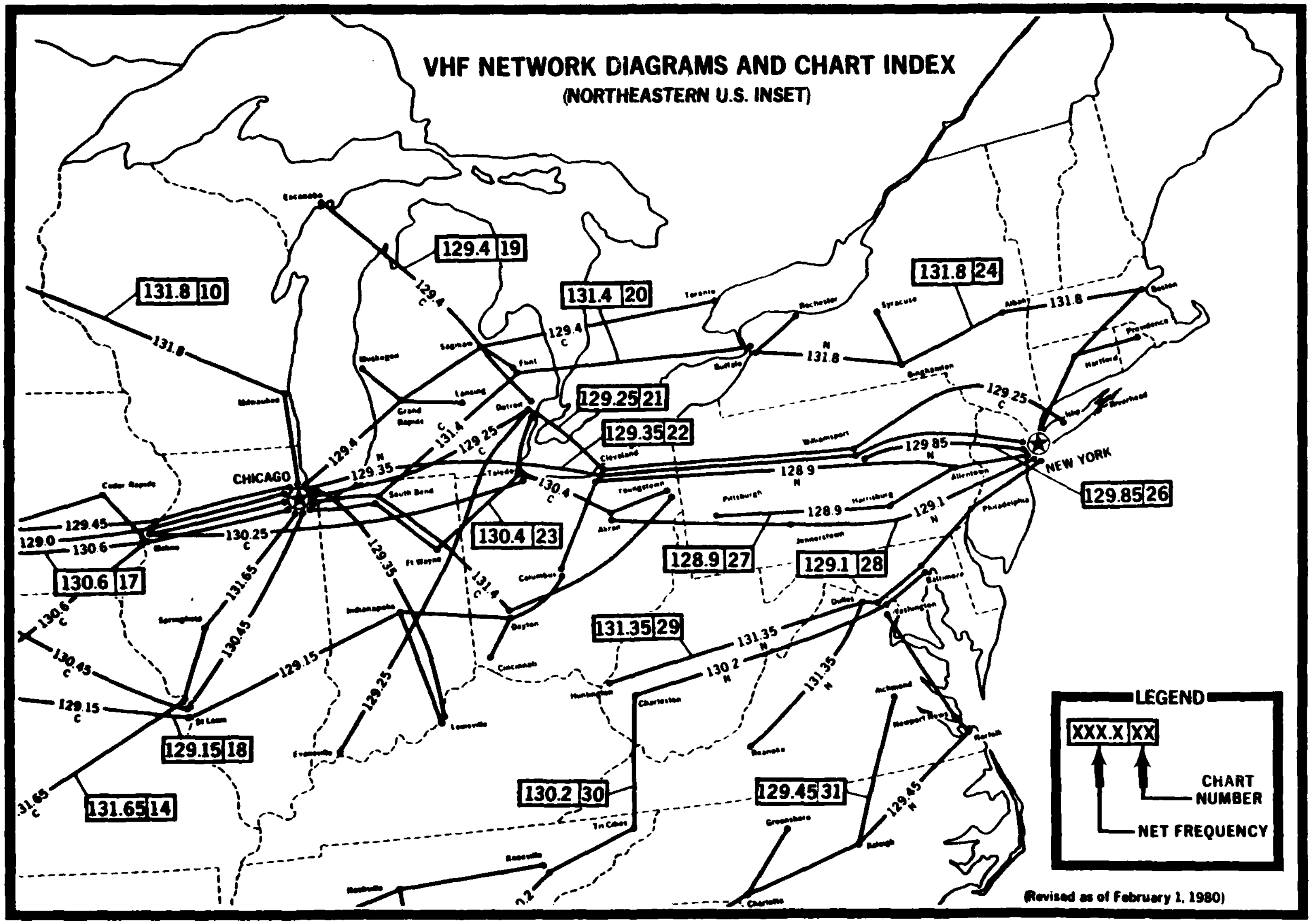
(UNITED STATES)



(Revised as of February 1, 1980)

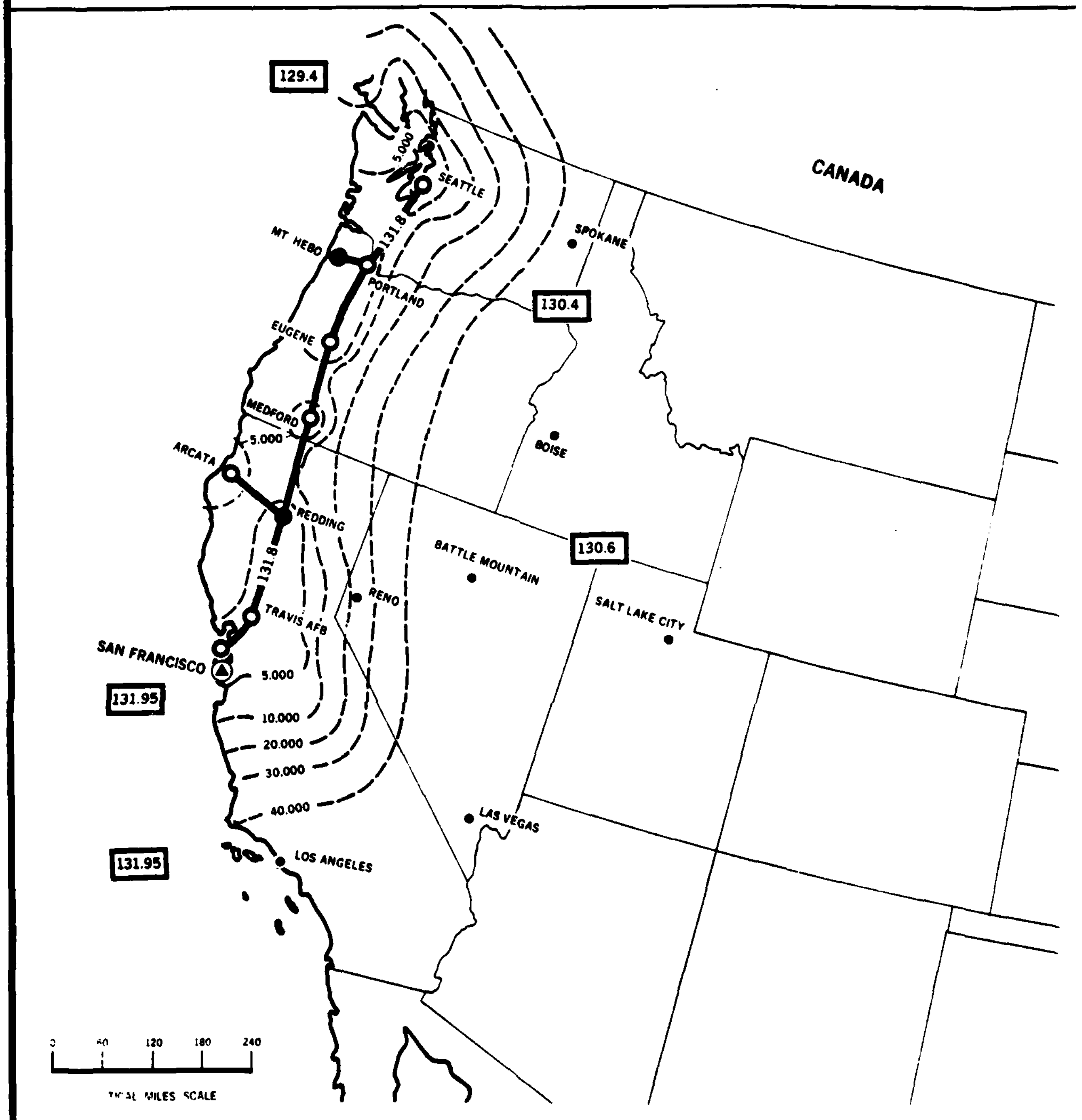
VHF NETWORK DIAGRAMS AND CHART INDEX

(NORTHEASTERN U.S. INSET)



(Revised as of February 1, 1980)

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

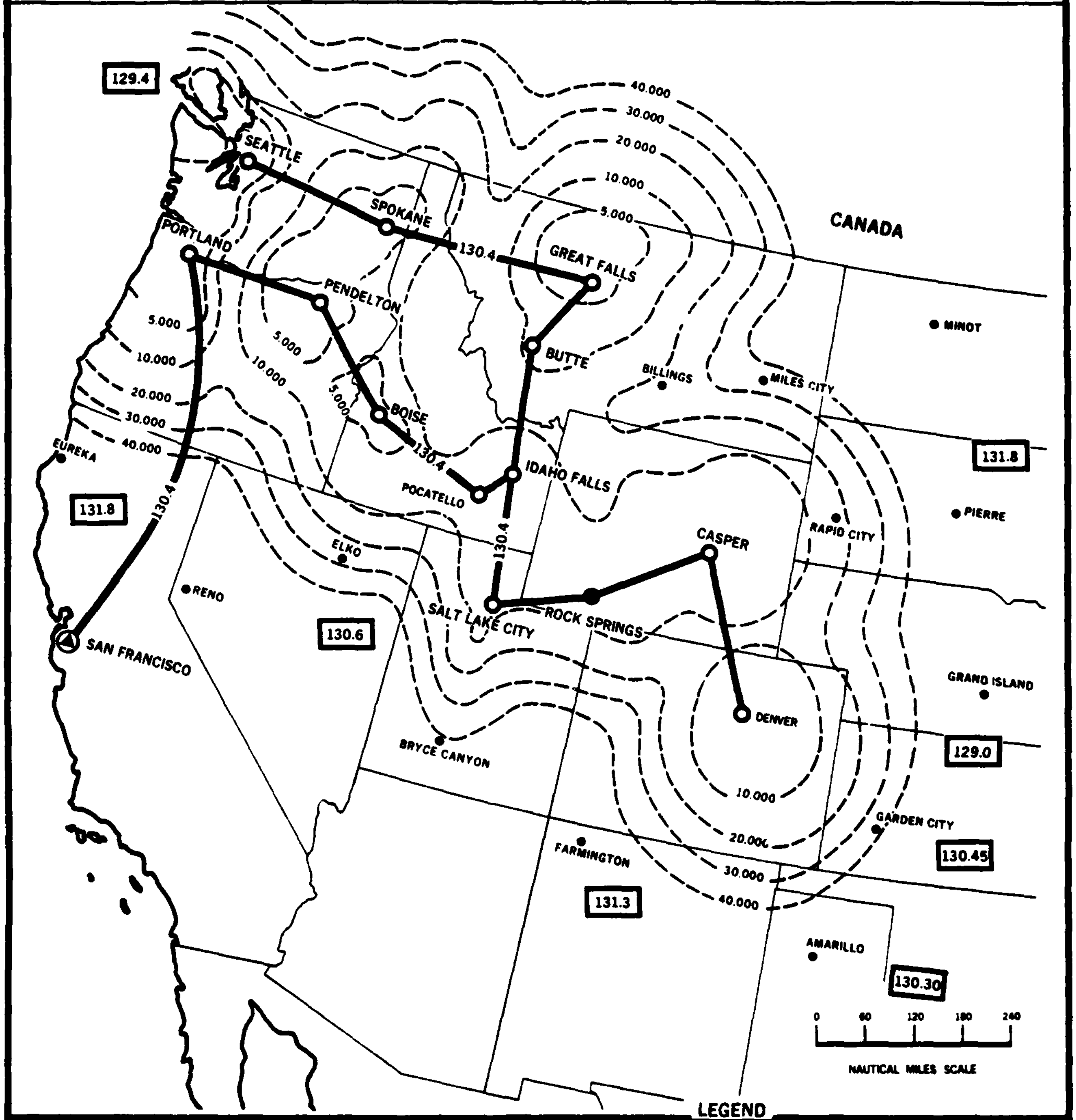
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE.	129.4	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- **REMOTE NETWORK STATION AT MT. HEBO, OR. ADDED AND REMOTE STATION AT SALEM, OR. DELETED.**

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
1 DR-2821		131.8 MHz	1
Date	Issue No.		
FEB. 1, 1980	8		

ARINC Aeronautical Enroute VHF Network Chart

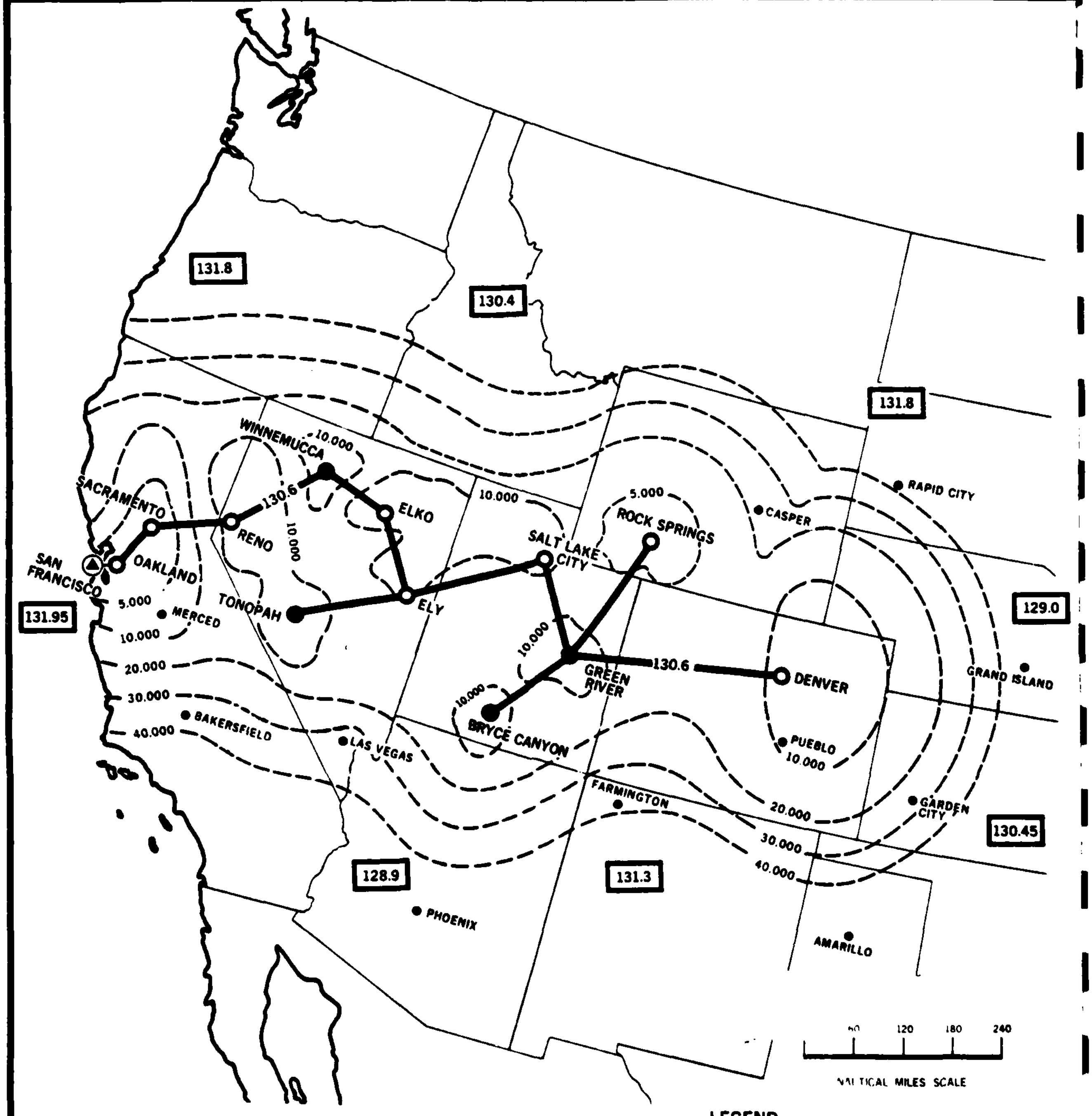


LEGEND

Changes included in this issue		
● NETWORK STATIONS AT HELENA, MT. AND CHEYENNE, WY. DELETED.	▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
	○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
	● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4 FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7037		130.4 MHz	2
Date	Issue No.		
FEB. 1, 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

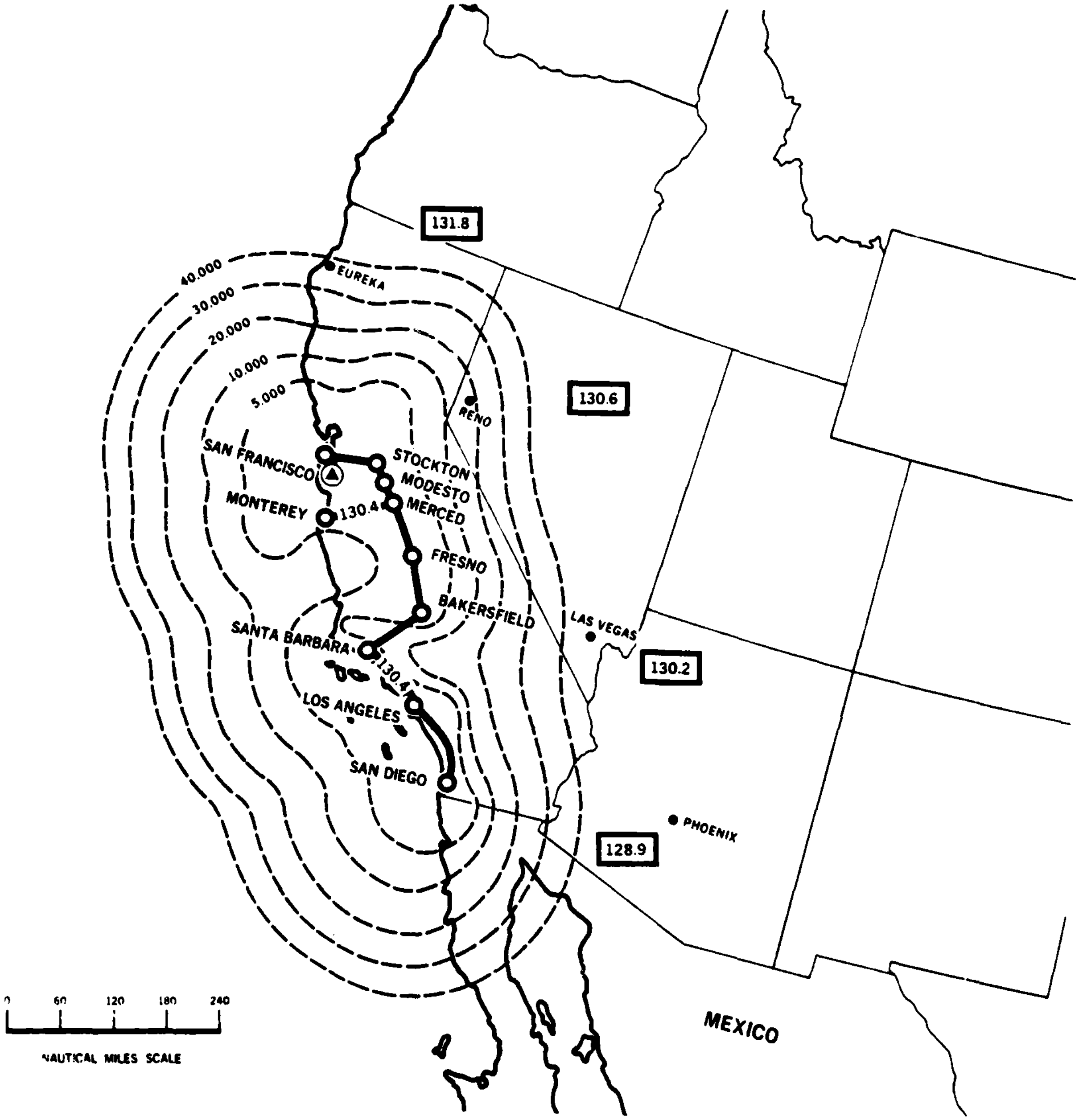
⚠	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK.	5.000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE.
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED.	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- **REMOTE NETWORK STATION AT McDERMITT DECOMMISSIONED.**
- **REMOTE NETWORK STATIONS AT WINNEMUCCA AND BRYCE CANYON ADDED.**

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7038		130.6 MHz	3
Date	**Issue No.**		
FEB. 1. 1980	8		

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED TO SERVE LOW ALTITUDE-SHORT HAUL FLIGHTS.

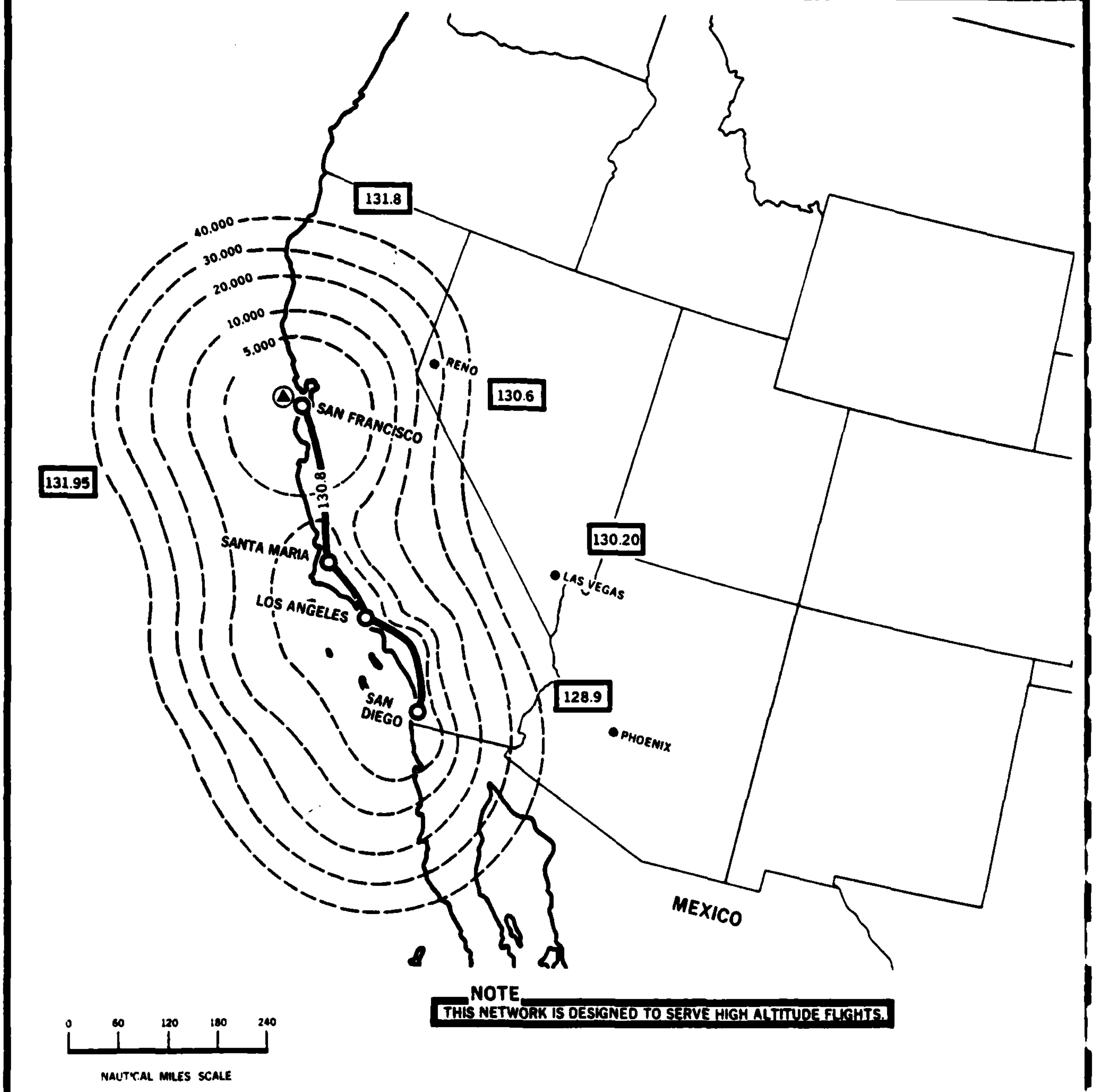
LEGEND

Ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
1 DR-2796		130.4 MHz	4
Date	Issue No.		
FEB. 1. 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED TO SERVE HIGH ALTITUDE FLIGHTS.

LEGEND

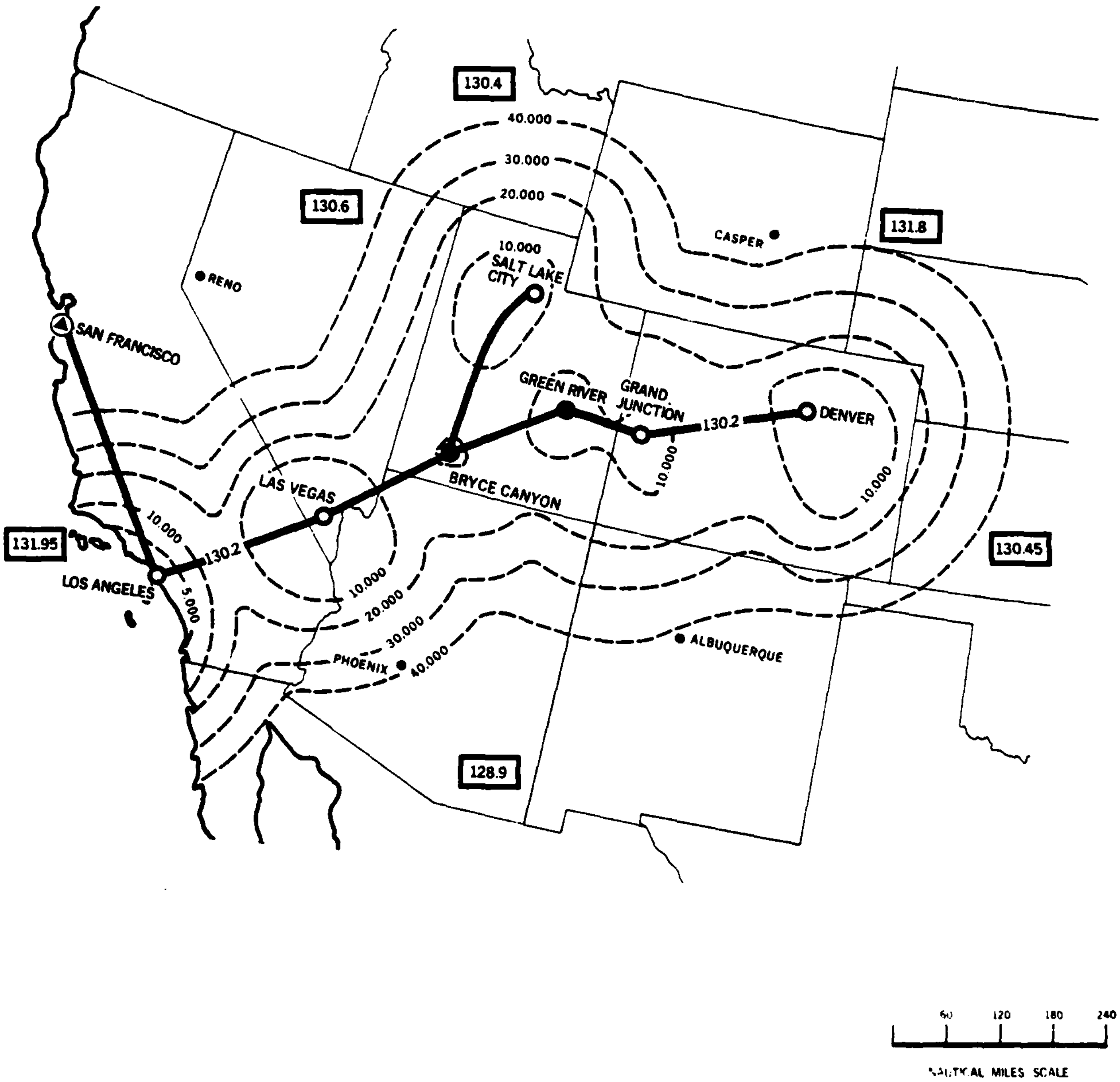
▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK.	5,000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE.
○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED.	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4 FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- REMOTE NETWORK STATION AT SANTA MARIA ADDED.

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
1 DR-2794		130.8 MHz	5
Date	Issue No.		
FEB. 1, 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

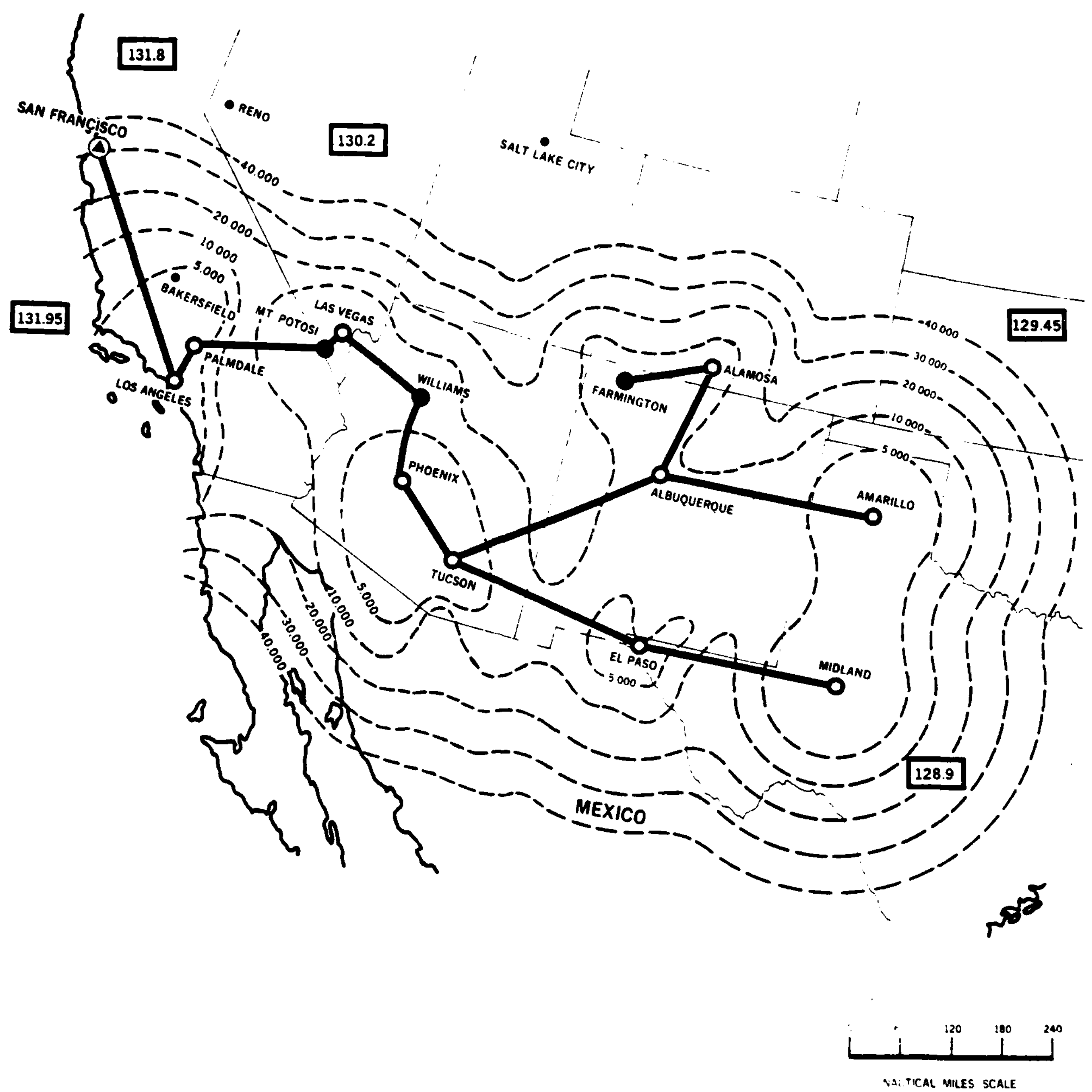
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK.	5.000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED.	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- MINOR CHANGE.

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7027			
Date	Issue No.		
FEB. 1. 1980	6	130.2 MHz	6

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

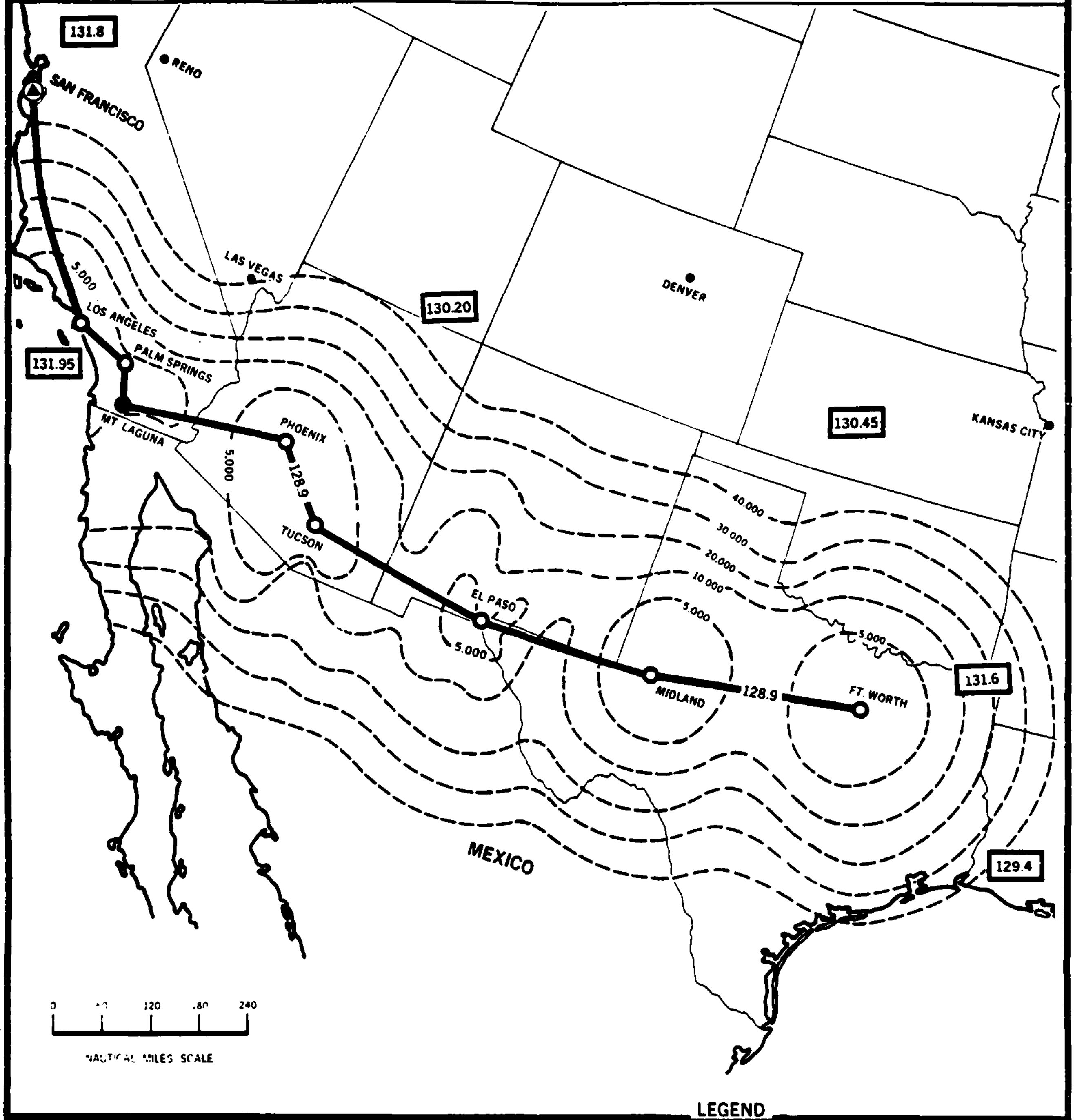
Changes included in this issue

- REMOTE STATIONS ADDED AT FARMINGTON, N. M., EL PASO, AND MIDLAND, TX, AND WILLIAMS, AZ.

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR-7048		131.30 MHz	7
Date	**Issue No.**		
FEB. 1, 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



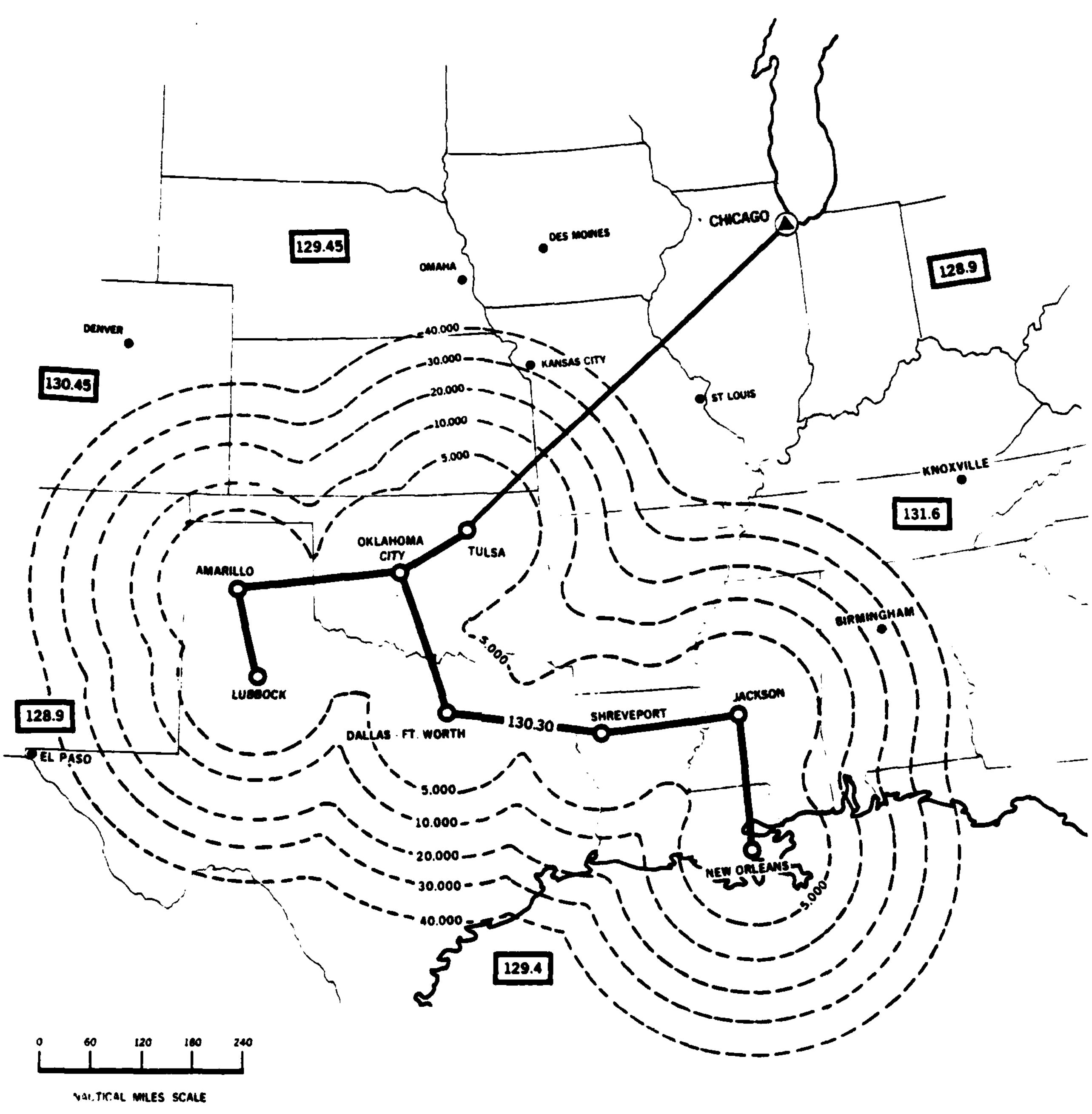
LEGEND

Changes included in this issue

- ▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
- ○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED
- ● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE
- 5,000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
- ↑ EXTENDED RANGE FACILITY
  ARROW INDICATES DIRECTION OF MAXIMUM RANGE
- 129.4 FREQUENCY OF ADJOINING NETWORK
  COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.	DR-7505
Date	FEB. 1. 1980
Issue No.	7
Network Frequency (Megahertz)	128.9 MHz
Chart No.	8

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

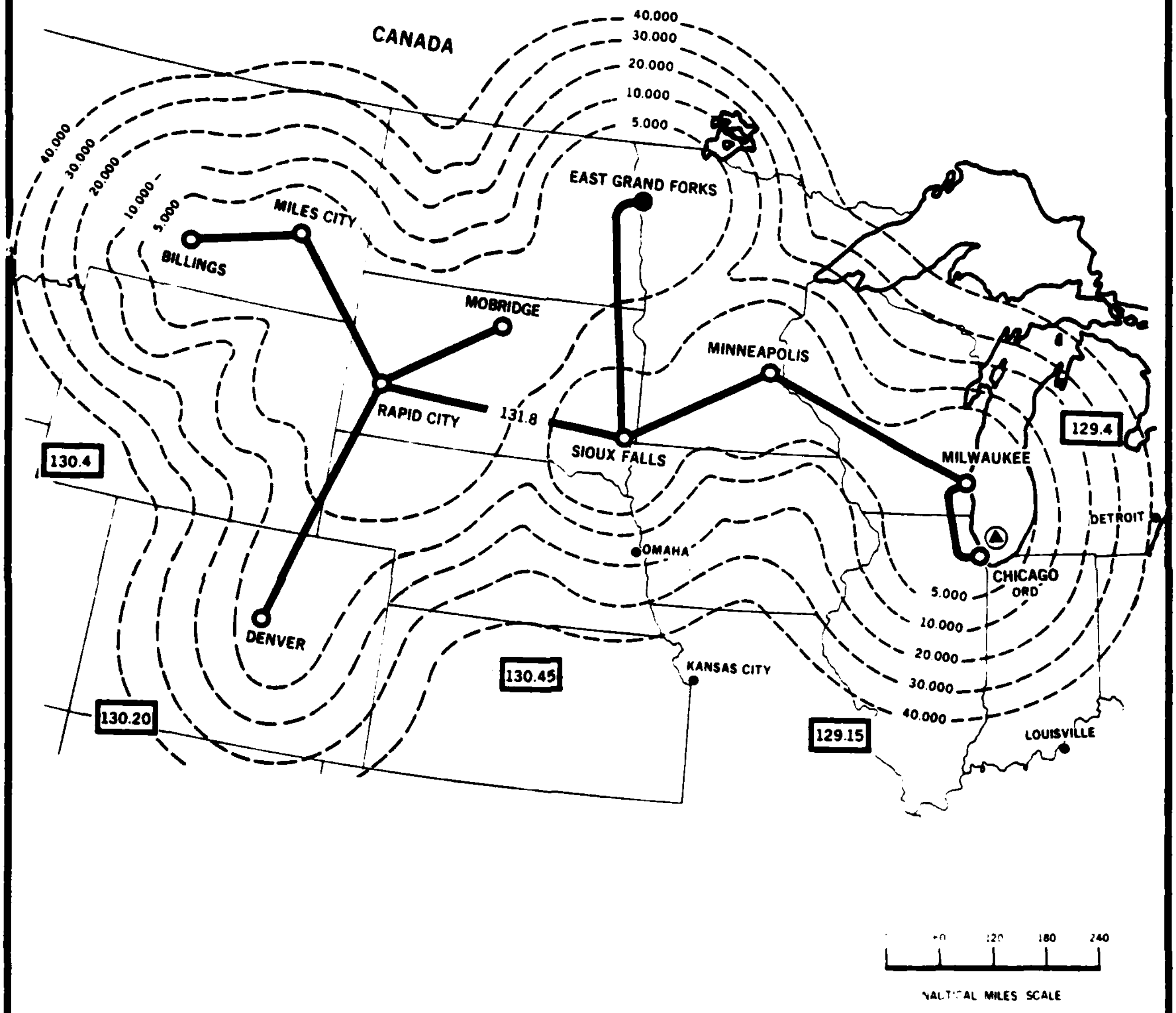
▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES IN FEET AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY
● NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	▭ FREQUENCY OF **ADJOINING NETWORK**

Changes included in this issue

- **REMOTE NETWORK STATION ADDED AT JACKSON, MS.**

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7326-71		130.30 MHz	9
Date	Issue No.		
FEB. 1, 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

Changes included in this issue

- REMOTE NETWORK STATION ADDED AT MOBRIDGE, SD.

▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK.

○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED

● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE

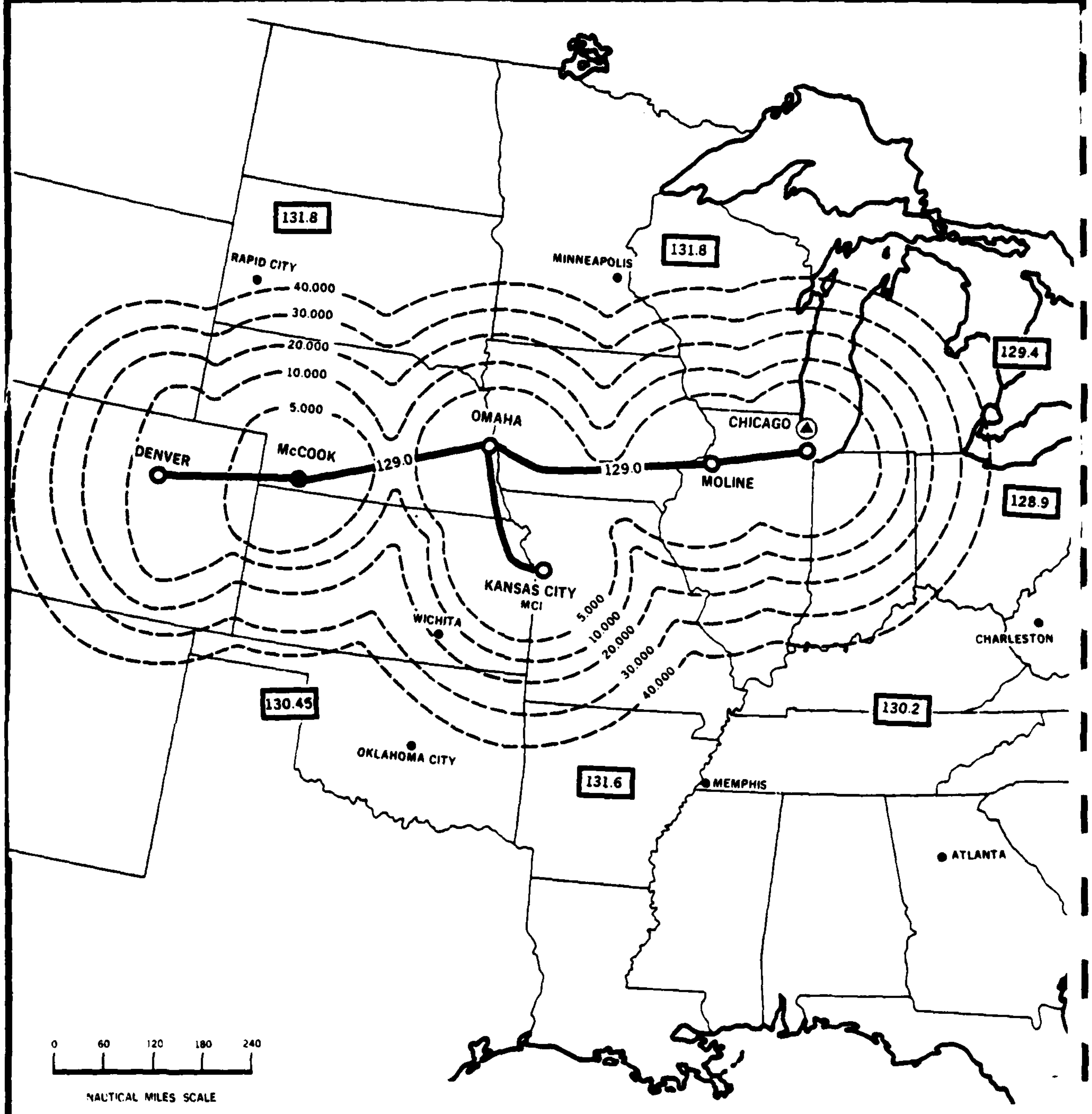
CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE

↑ EXTENDED RANGE FACILITY
ARROW INDICATES DIRECTION OF MAXIMUM RANGE

129.4 FREQUENCY OF OF ADJOINING NETWORK
COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR-7020			
Date	Issue No.	131.8 MHz	10
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



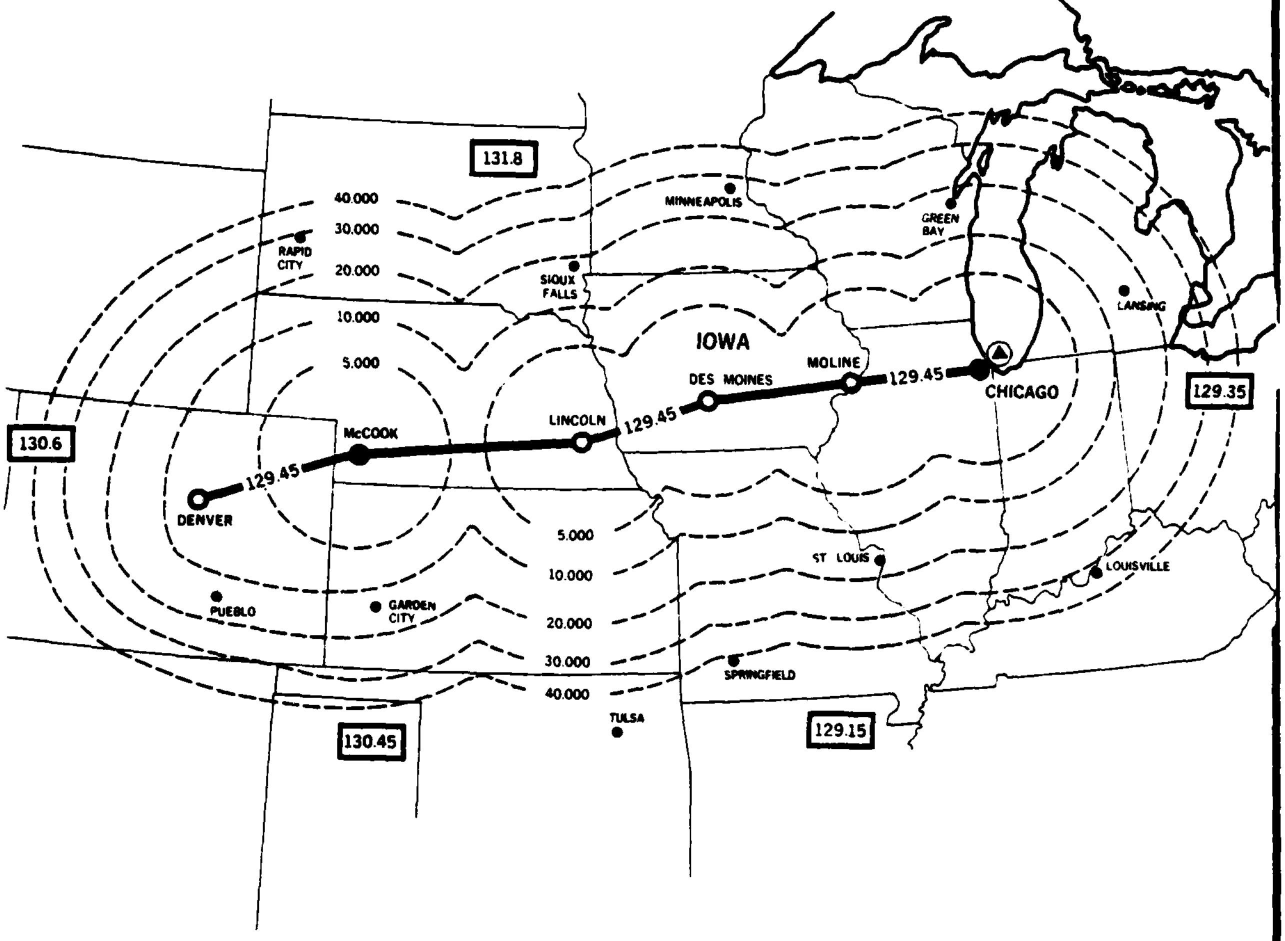
LEGEND

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE.	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR- 7044		129.0 MHz	11
Date	Issue No.		
FEB. 1, 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED TO SERVE HIGH ALTITUDE FLIGHTS.

60 120 180 240

NAUTICAL MILES SCALE

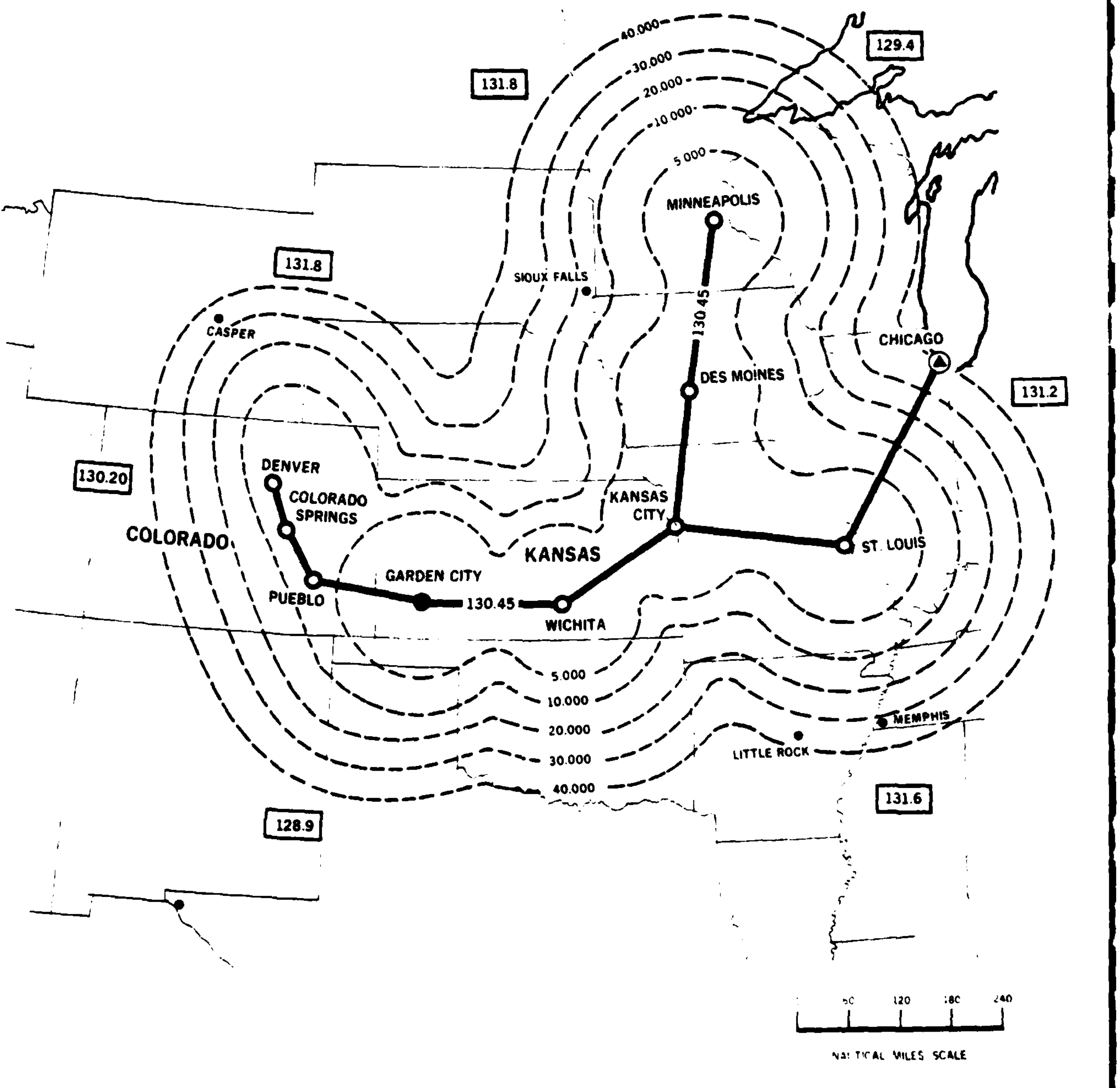
LEGEND

◬ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5.000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4 FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7025			
Date	Issue No.	129.45 MHz	12
FEB. 1, 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

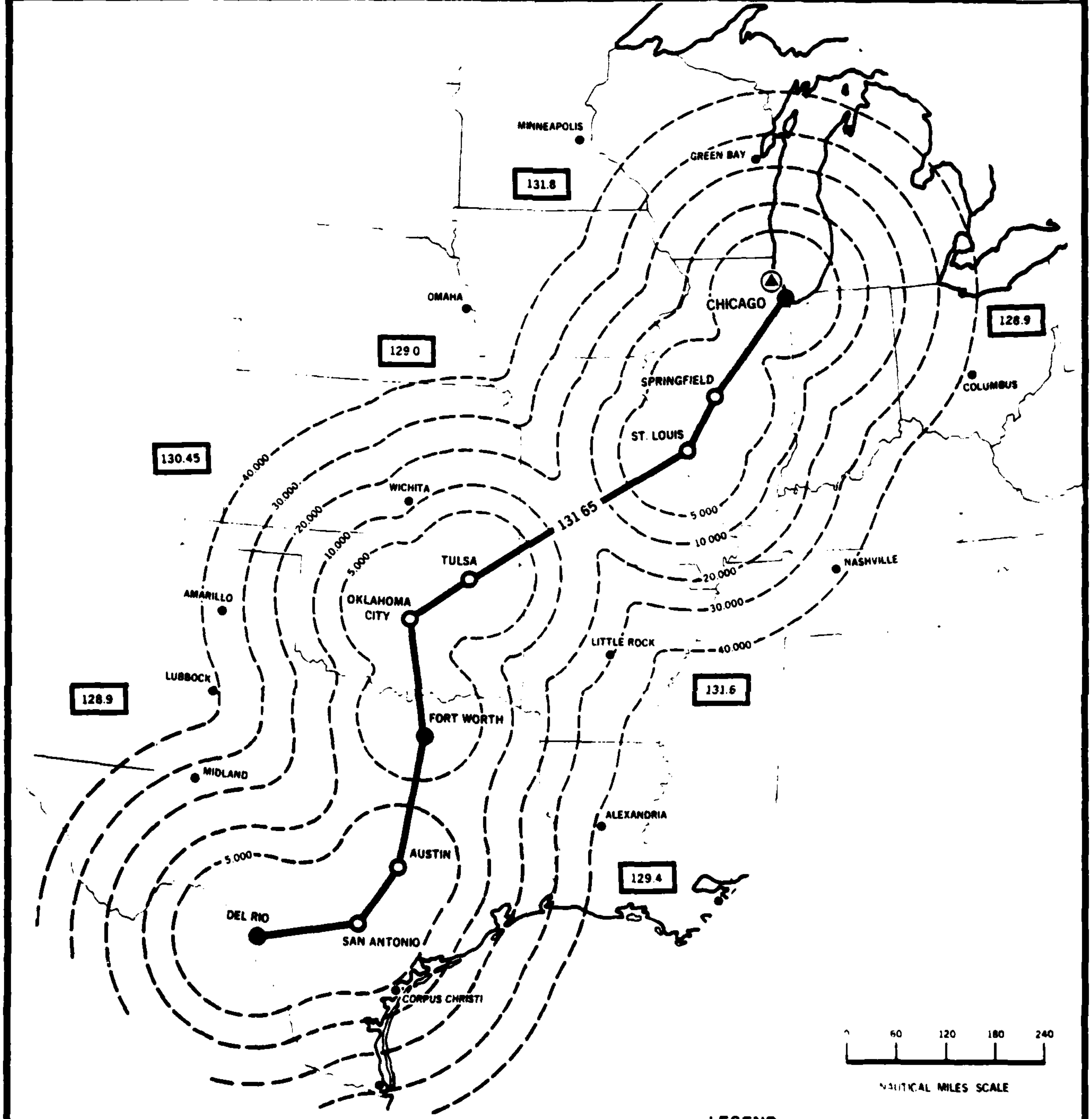
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	▭	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- **NETWORK STATIONS AT DES MOINES, ST. LOUIS AND MINNEAPOLIS ADDED.**

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
PLLC 20751		130.45 MHz	13
Date	Issue No.		
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart

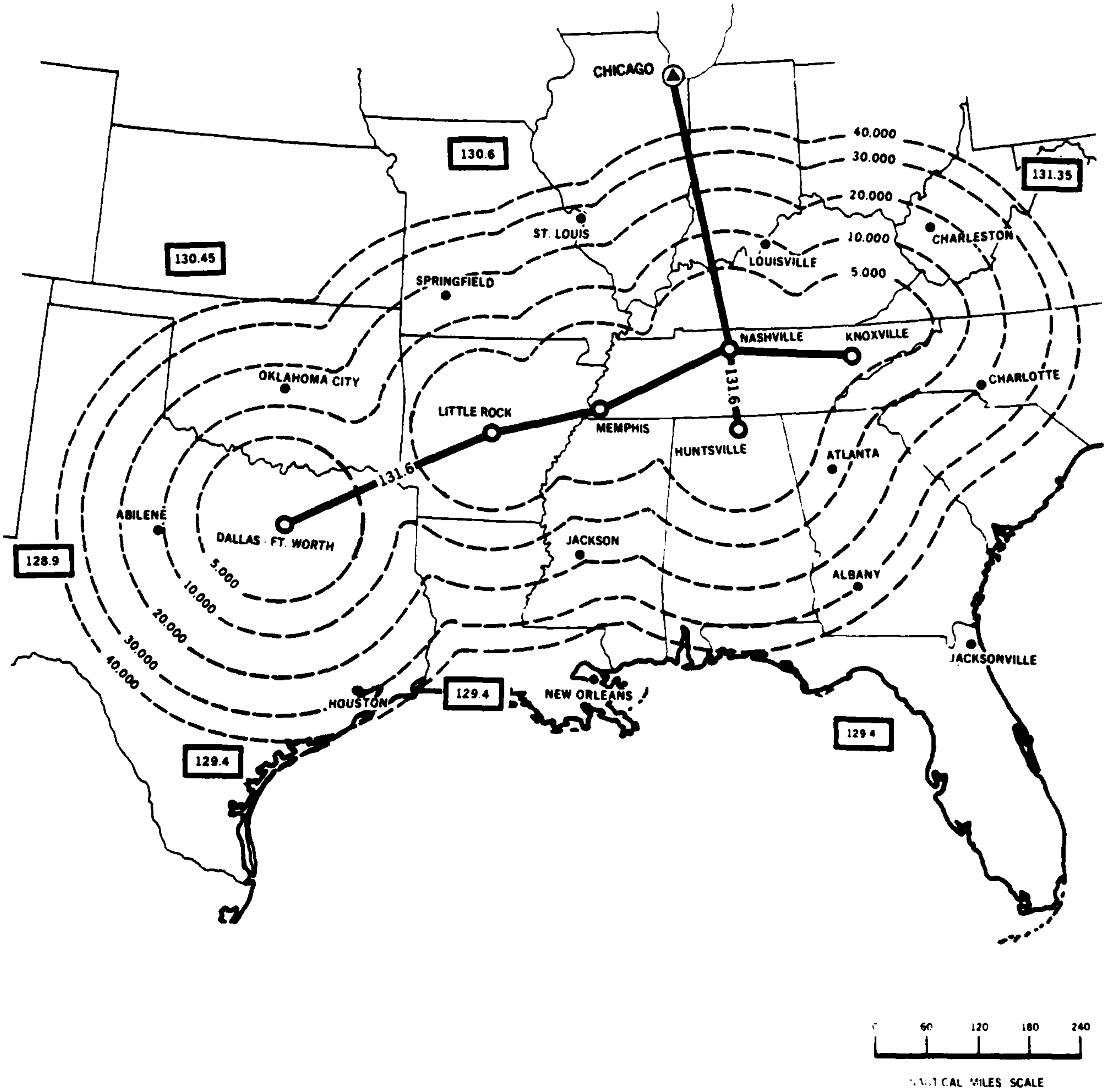


LEGEND

Changes included in this issue		
● REMOTE NETWORK STATIONS ADDED AT AUSTIN, DEL RIO AND SAN ANTONIO, TEXAS.	▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK.	5,000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
	○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
	● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	1.9.4 FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7045		131.65 MHz	14
Date	Issue No.		
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE.
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- NETWORK STATION AT ATLANTA DECOMMISSIONED.

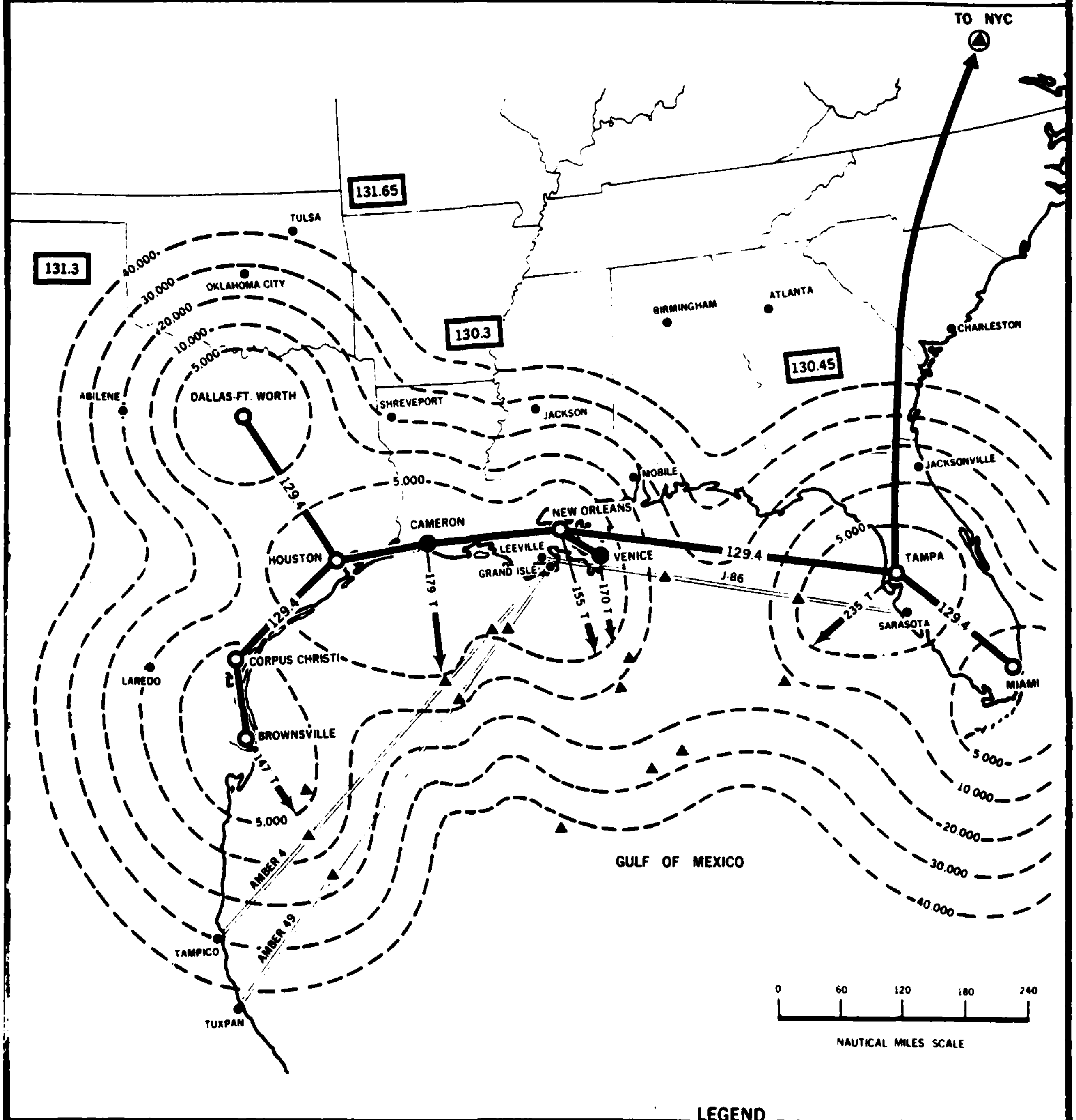
Telephone Co. Circuit No.
DR-6152

Date	Issue No.
FEB. 1, 1980	7

Network Frequency (Megahertz)
131.6MHz

Chart No.
15

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

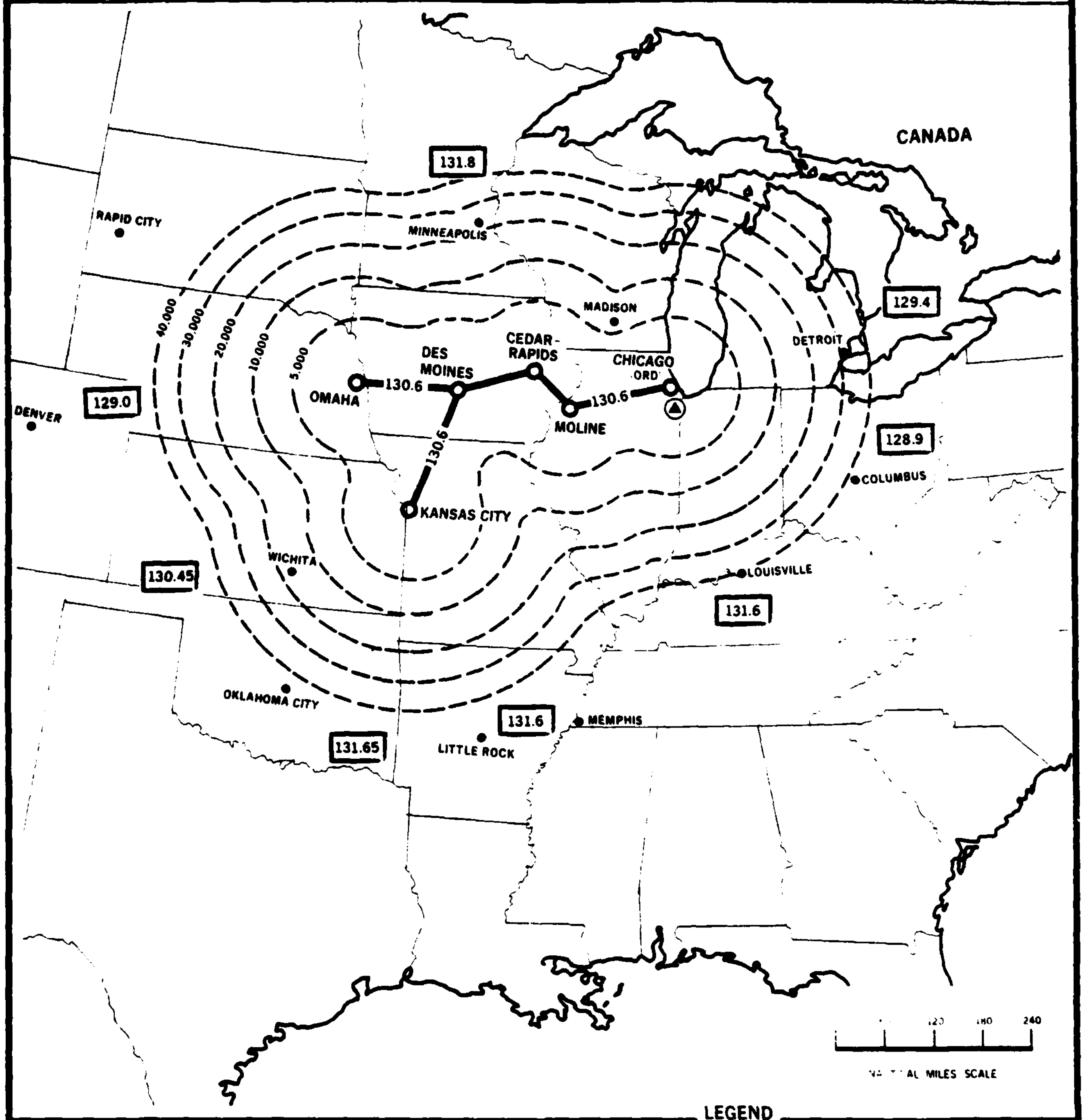
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE
5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
⬚	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- **REMOTE NETWORK STATIONS AT JACKSON, MS., AUSTIN, DEL RIO AND SAN ANTONIO, TX DECOMMISSIONED.**
- **STATION AT CAMERON, LA. ADDED.**

Telephone Co. Circuit No.	DR-7042-67
Date	FEB. 1, 1980
Issue No.	7
Network Frequency (Megahertz)	129.4 MHz
Chart No.	16

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

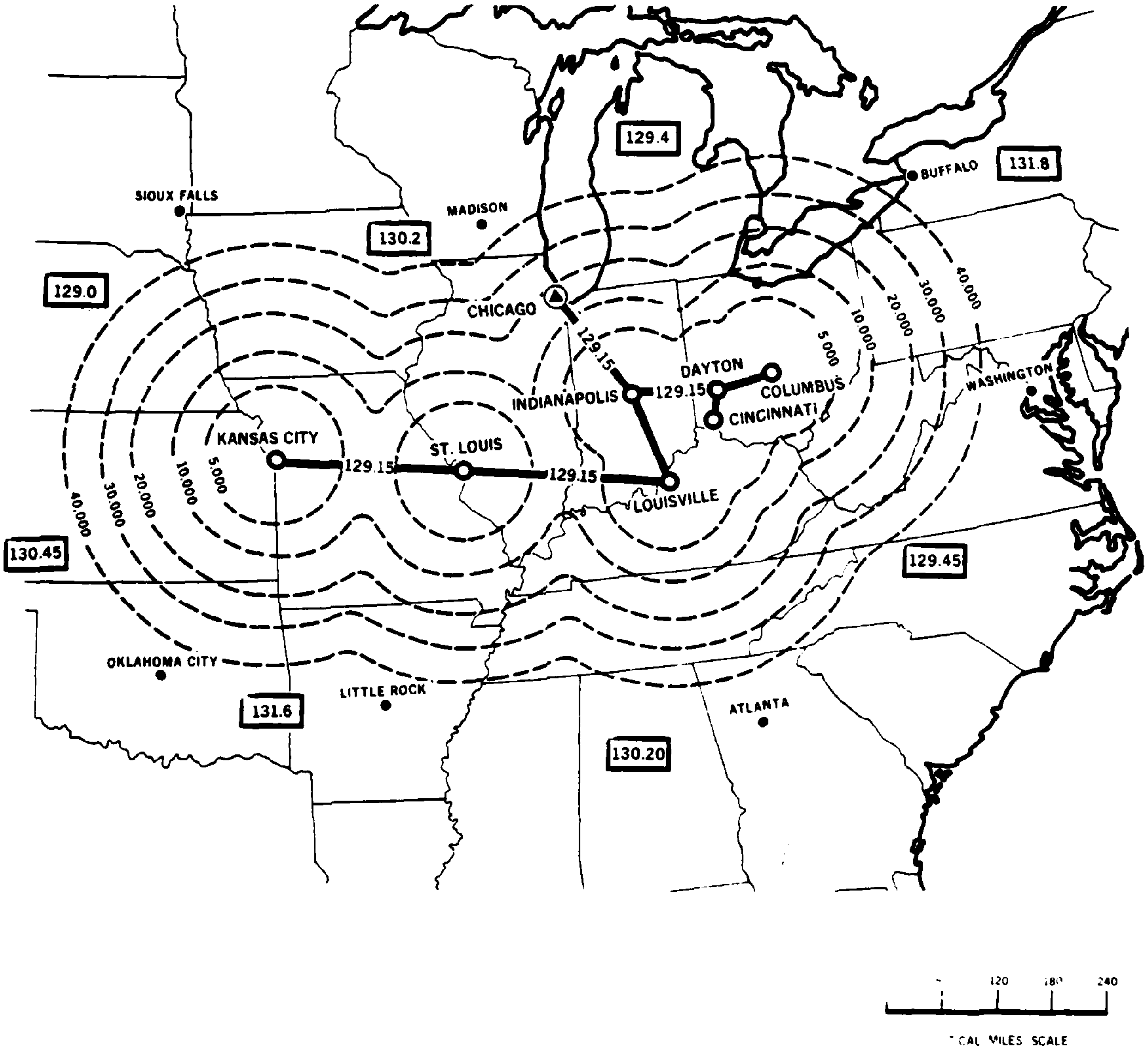
ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- MINOR CHANGE

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7024		130.6 MHz	17
Date	Issue No.		
FEB. 1, 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



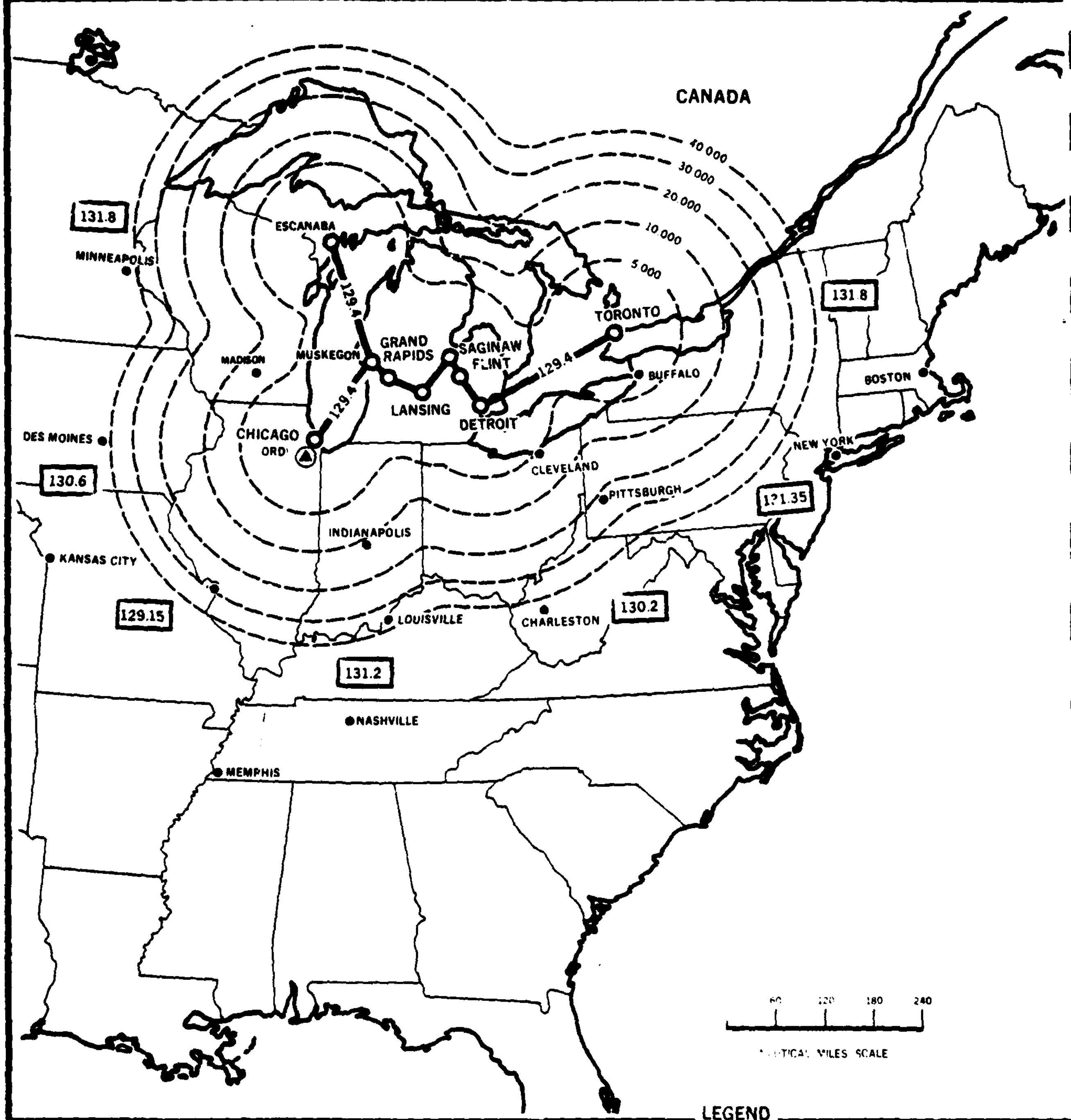
LEGEND

▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-7504		129.15 MHz	18
Date	Issue No.		
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



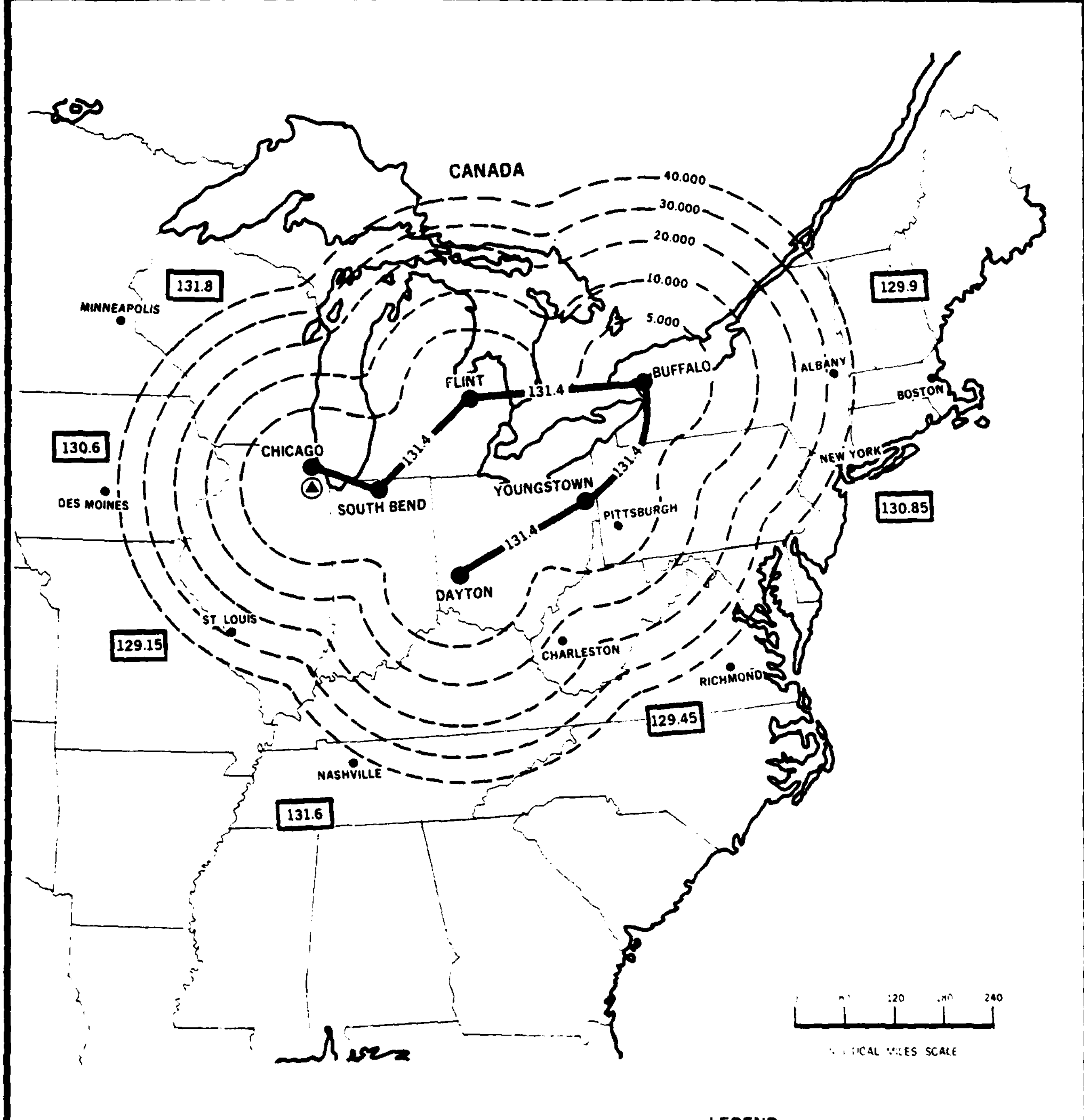
LEGEND

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	⁝	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
OR-7043		129.4 MHz	19
Date	Issue No.		
FEB. 1. 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

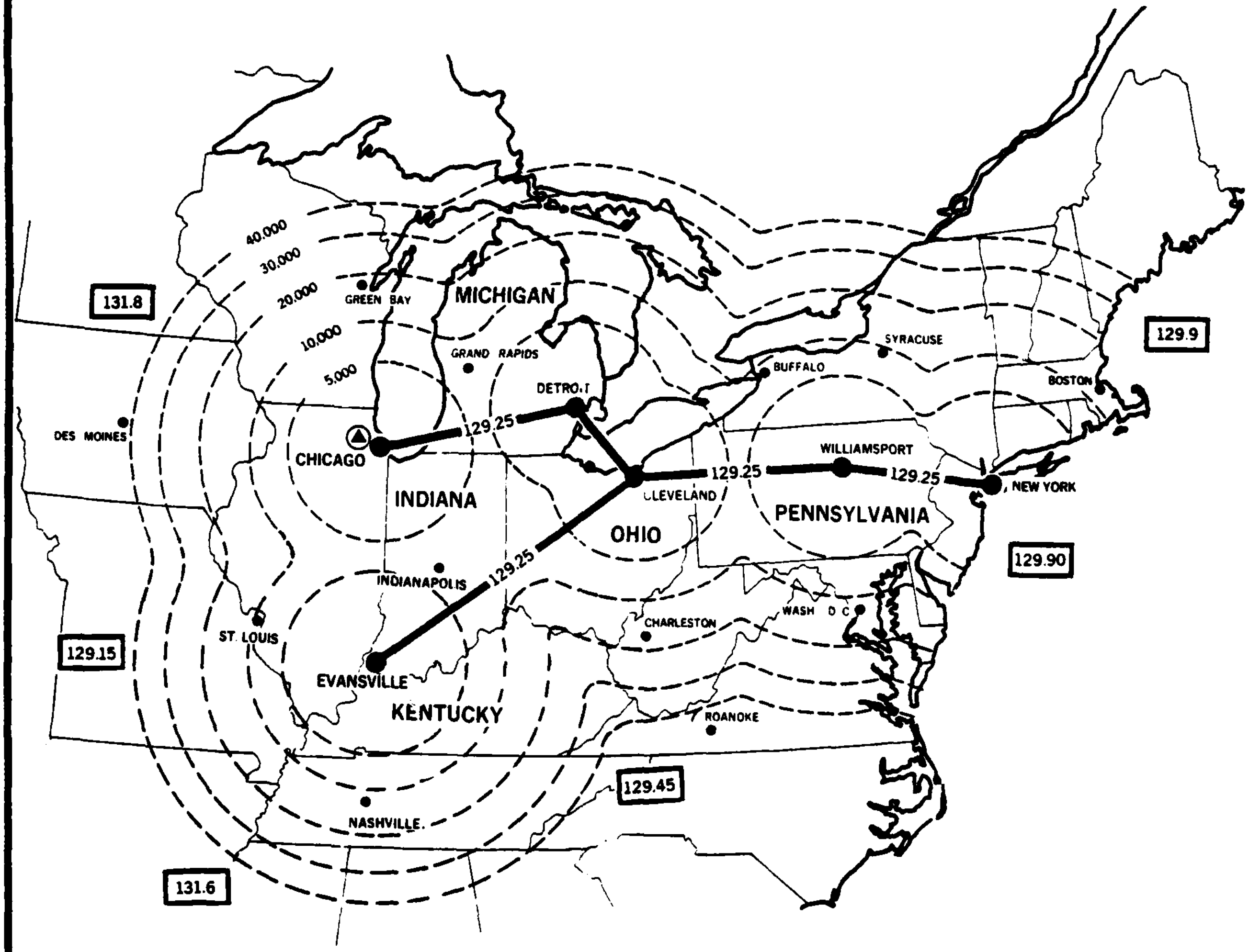
Changes included in this issue

- **MINOR CHANGE**

(▲) *ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK*	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE *AIRPORT INDICATED*	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency (Megahertz	Chart No.
DR- 7049		**131.4 MHz**	**20**
Date	Issue No.		
FEB. 1. 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED TO SERVE HIGH ALTITUDE FLIGHTS.

60 120 180 240

NAUTICAL MILES SCALE

LEGEND

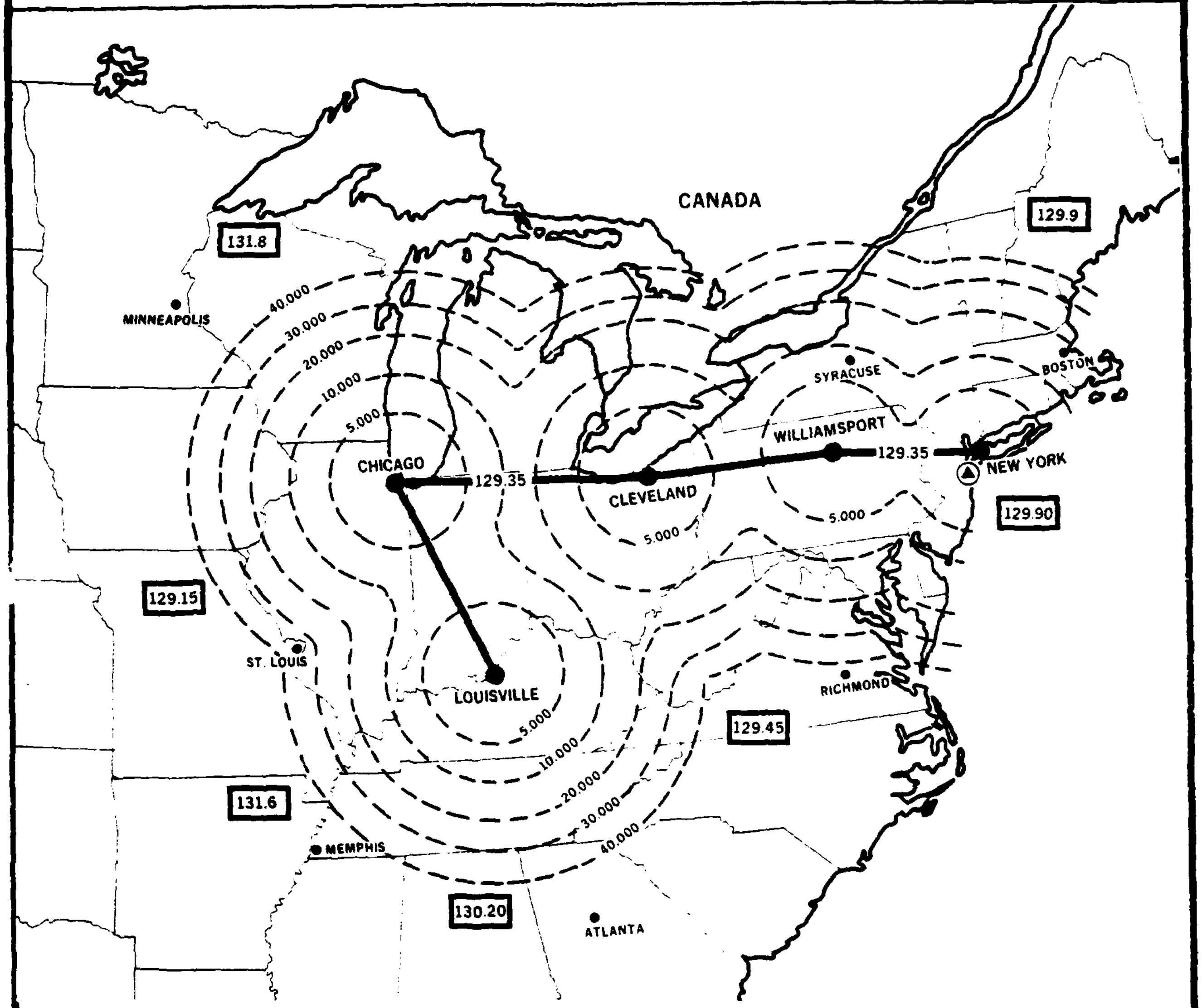
▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000 CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE.	129.4 FREQUENCY OF OF ADJOINING NETWORK. COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- **MINOR CHANGE**

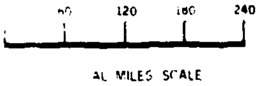
Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-60106		129.25 MHz	21
Date	Issue No.		
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED TO SERVE HIGH ALTITUDE FLIGHTS.



LEGEND

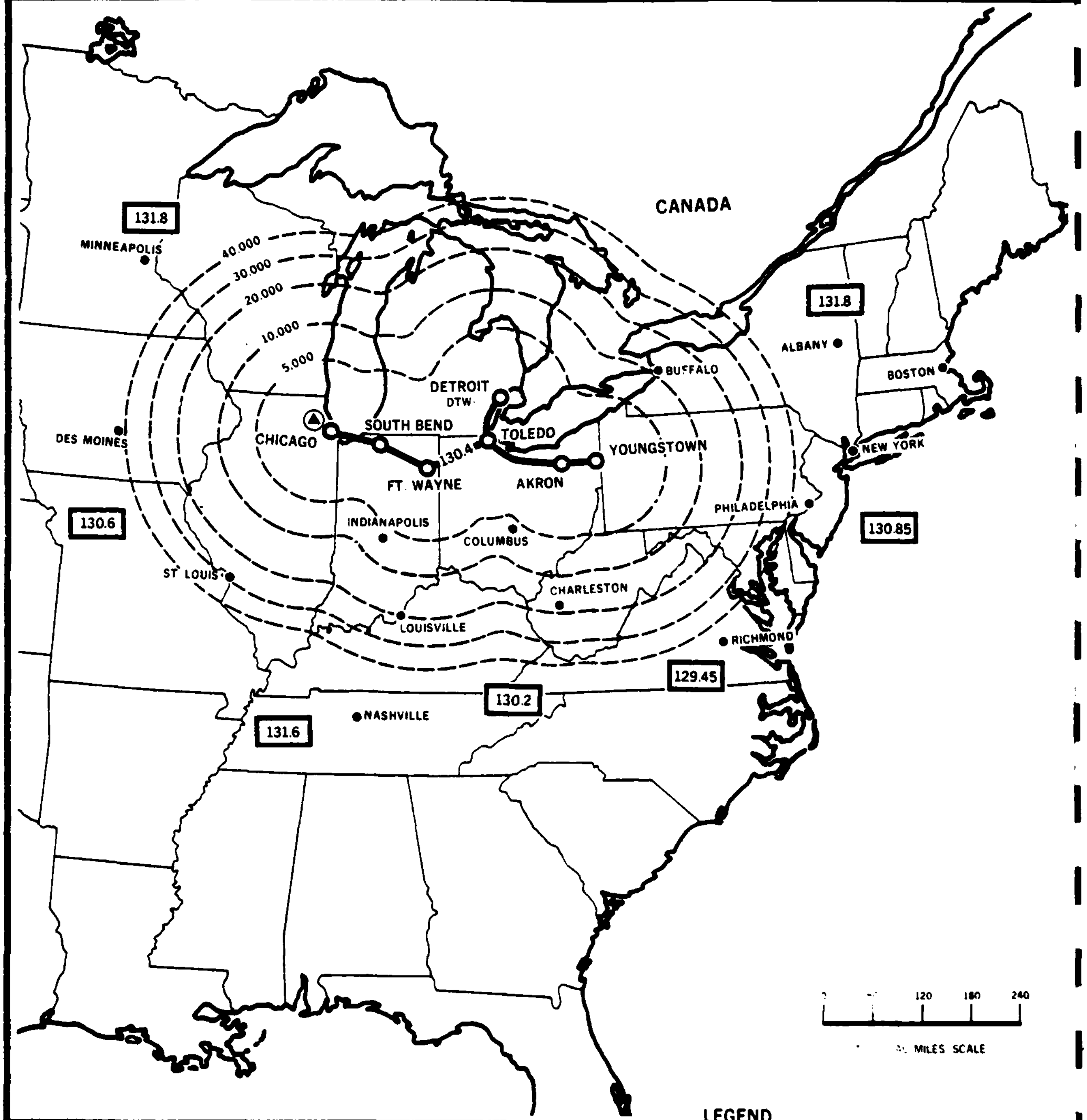
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED
●	*NETWORK REMOTE STATION WITHOUT* ON-THE-GROUND COVERAGE
(XXX)	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE.
↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- *MINOR CHANGE*

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-18086		129.35 MHz	22
Date	Issue No.		
FEB. 1, 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



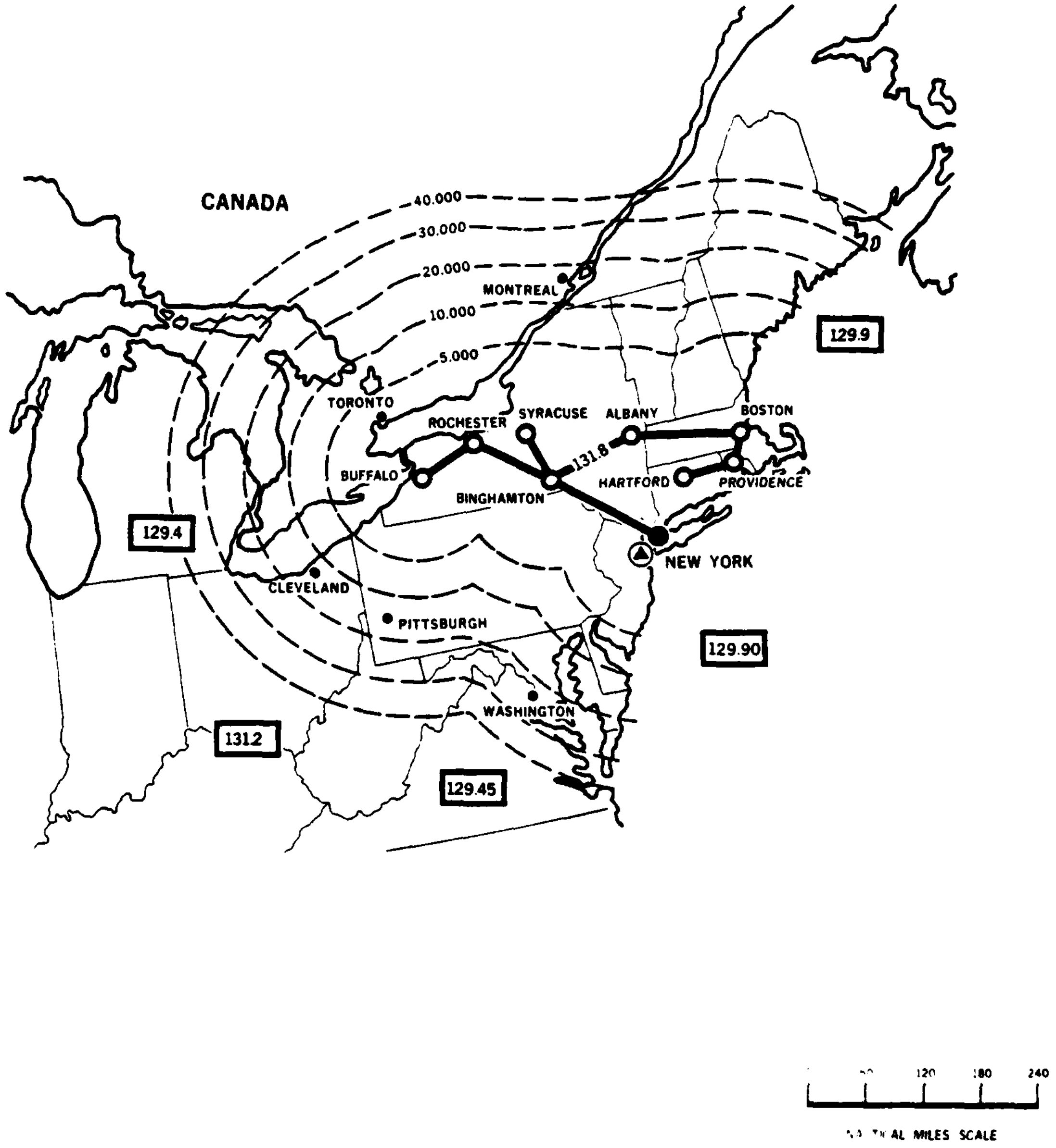
LEGEND

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE
5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR-7023			
Date	Issue No.	130.4 MHz	23
FEB. 1. 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

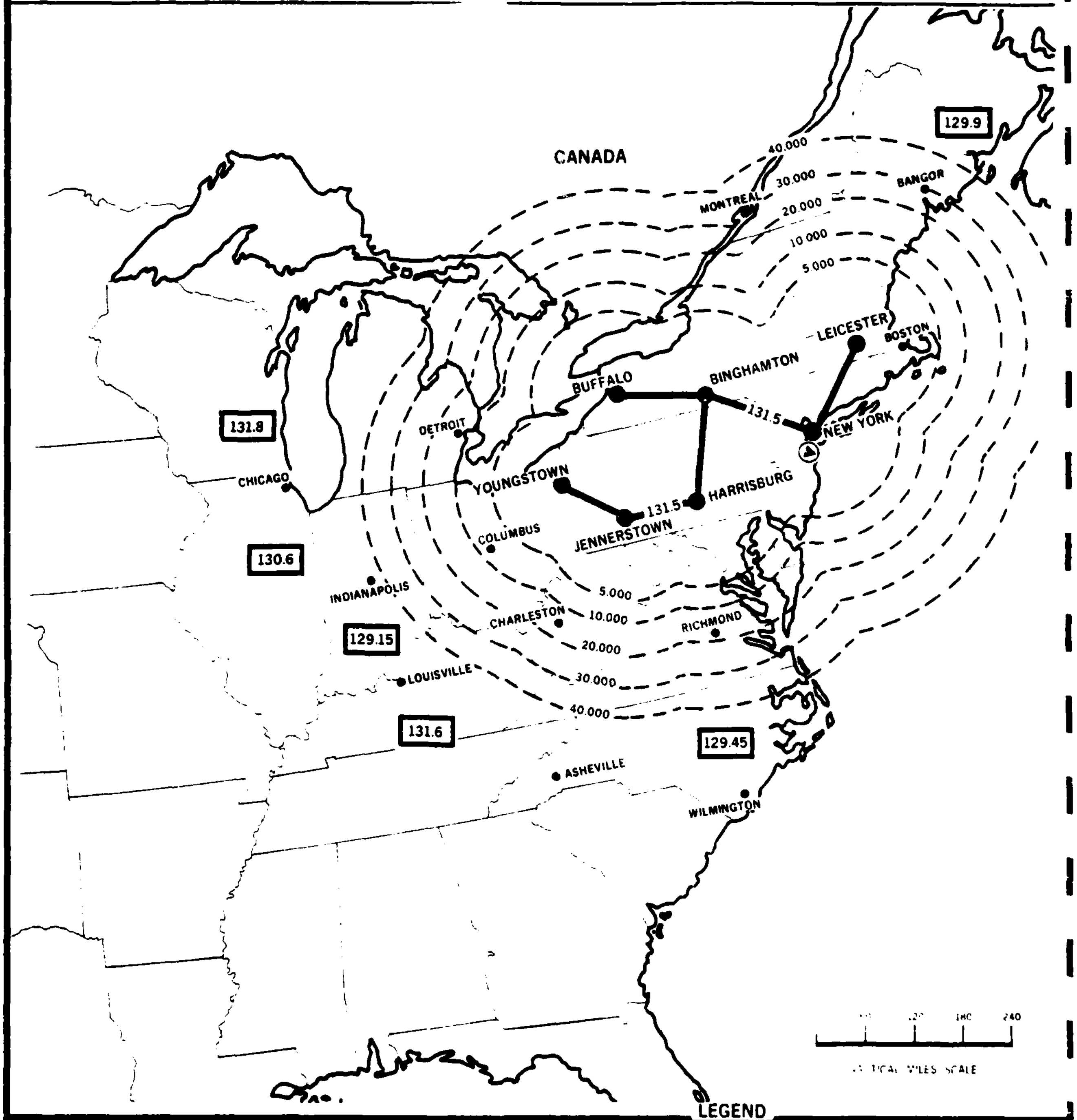
ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- SYRACUSE, NY ADDED.

Telephone Co. Circuit No.	DR- 17908
Date	FEB. 1, 1980
Issue No.	7
Network Frequency (Megahertz)	131.8 MHz
Chart No.	24

ARINC Aeronautical Enroute VHF Network Chart

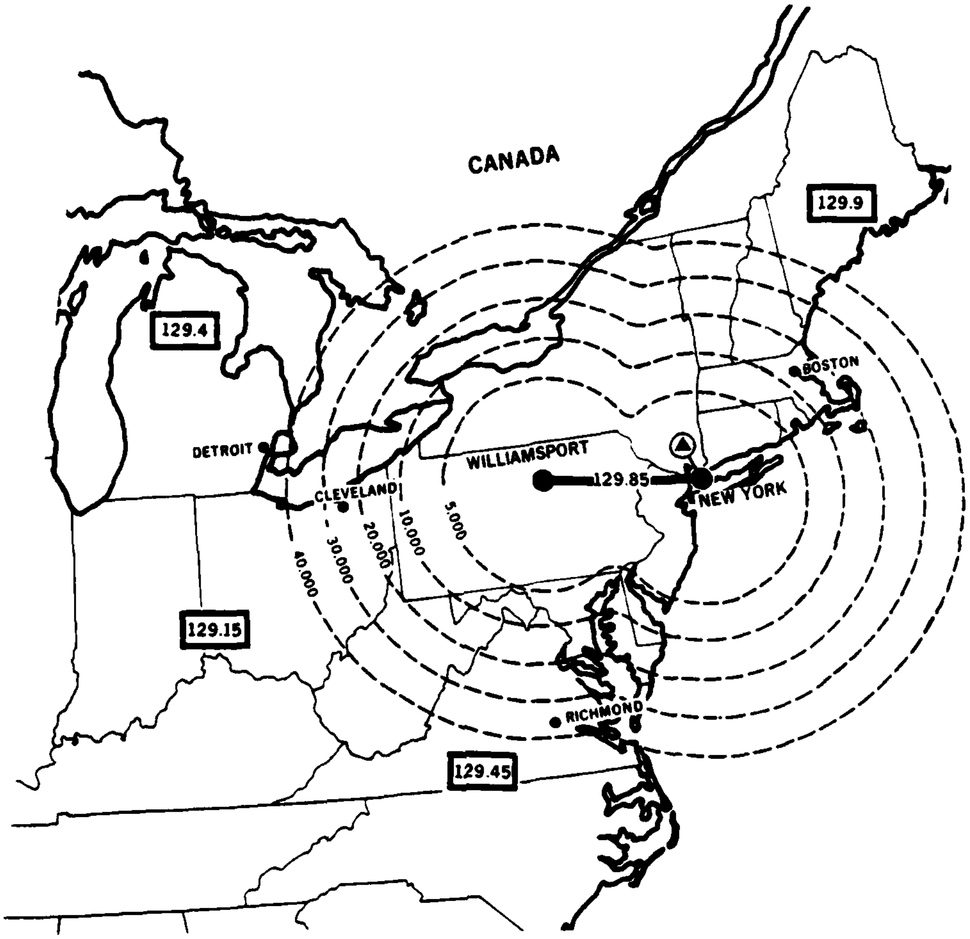


LEGEND

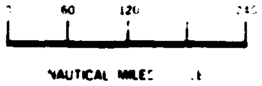
▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	☐ FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY SERVES AT THE HIGHER ALTITUDES

Changes included in this issue	Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
	DR-22803			
	Date	Issue No.	131.5 MHz	25
	FEB. 1. 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



NOTE
THIS NETWORK IS DESIGNED FOR PILOT-DISPATCHER CALLS. OTHER NETWORKS SHOULD BE USED FOR POSITION REPORTS AND OTHER ROUTINE MESSAGES.



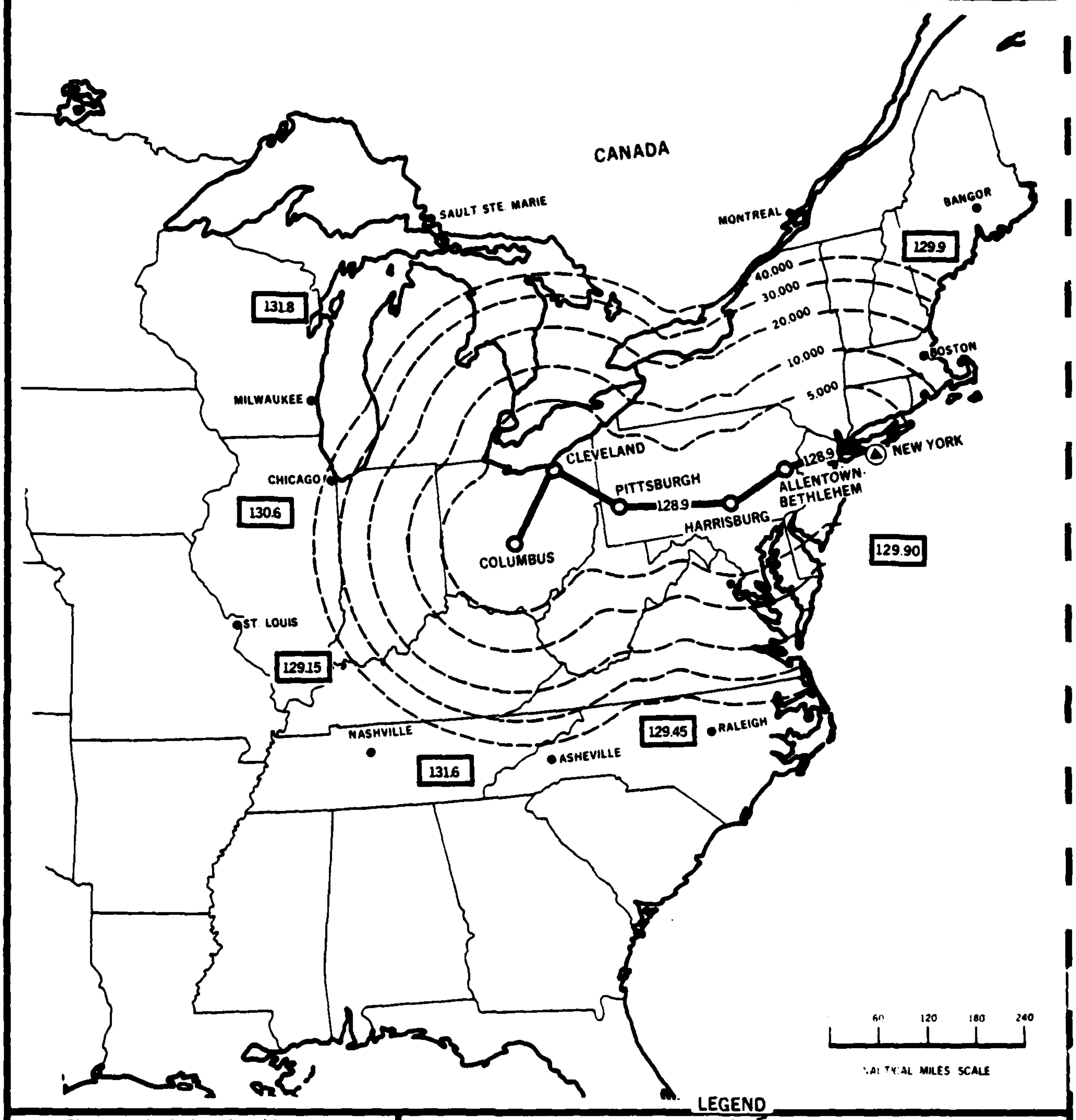
LEGEND

◉ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
● NETWORK REMOTE STATION WITHOUT ON THE-GROUND COVERAGE	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR-26274			
Date	Issue No.		
FEB. 1, 1980	5	129.85 MHz	26

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

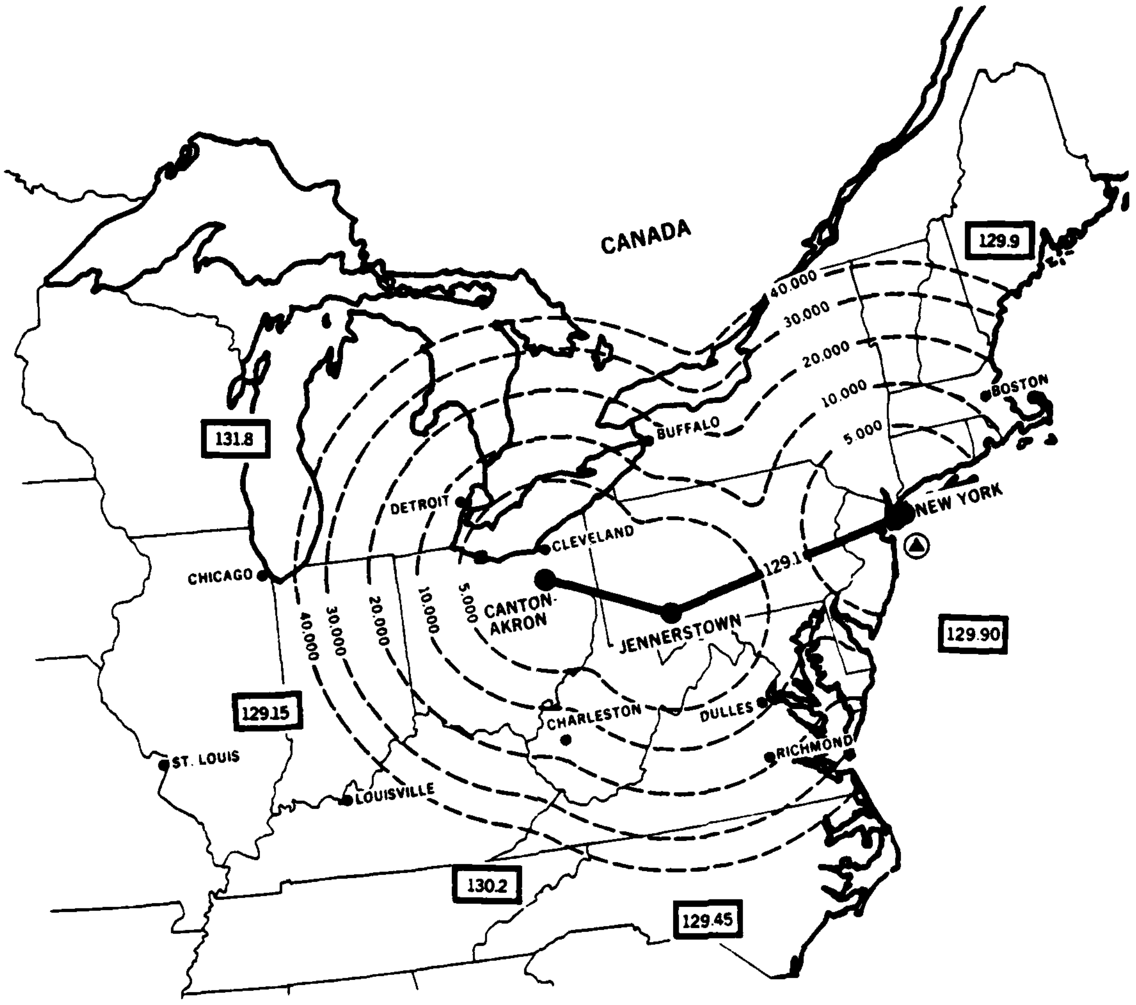
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	▭	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- MINOR CHANGES

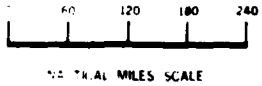
Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR-17010			
Date	Issue No.		
FEB. 1, 1980	6	128.9 MHz	27

ARINC Aeronautical Enroute VHF Network Chart



NOTE

THIS NETWORK IS DESIGNED FOR PILOT- DISPATCH CALLS. OTHER NETWORKS SHOULD BE USED FOR POSITION REPORTS AND OTHER ROUTINE MESSAGES.



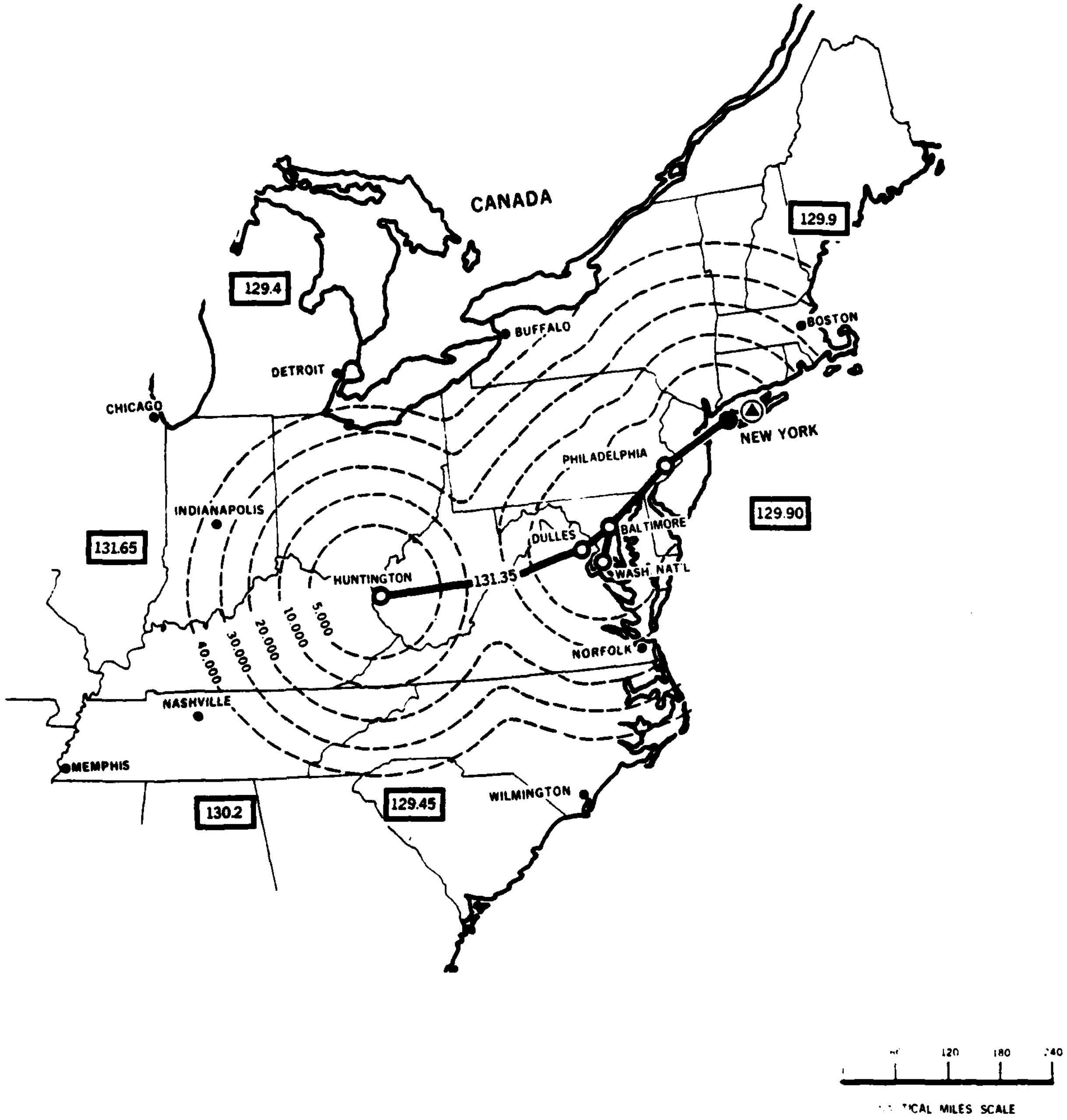
LEGEND

▲ ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○ NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑ EXTENDED RANGE FACILITY [illegible]
● NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	☐ FREQUENCY OF OF ADJOINING NETWORK [illegible]

Changes included in this issue
● MINOR CHANGE

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR- 21119		129.1 MHz	28
Date	Issue No.		
FEB. 1, 1980	5		

ARINC Aeronautical Enroute VHF Network Chart



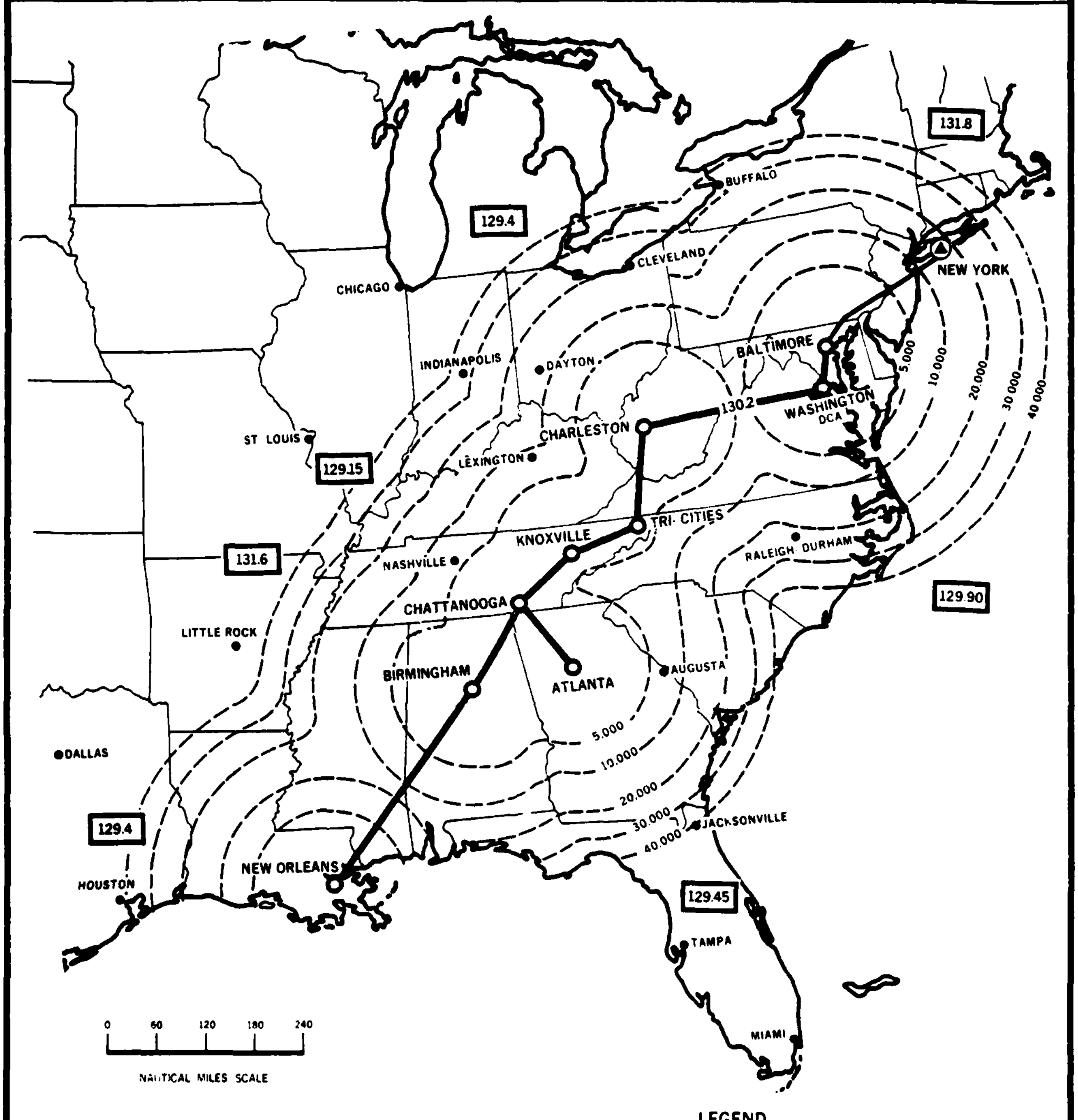
LEGEND

Changes included in this issue
● MINOR CHANGE

- ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
- ○ NETWORK REMOTE STATION PROVIDING ON-THE GROUND COVERAGE AT THE *AIRPORT INDICATED*
- ● NETWORK REMOTE STATION WITHOUT ON-THE GROUND COVERAGE
- CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
- EXTENDED RANGE FACILITY
  ARROW INDICATES DIRECTION OF MAXIMUM RANGE
- FREQUENCY OF ADJOINING NETWORK
  COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR- 11205		131.35 MHz	29
Date	Issue No.		
FEB. 1, 1980	6		

ARINC Aeronautical Enroute VHF Network Chart



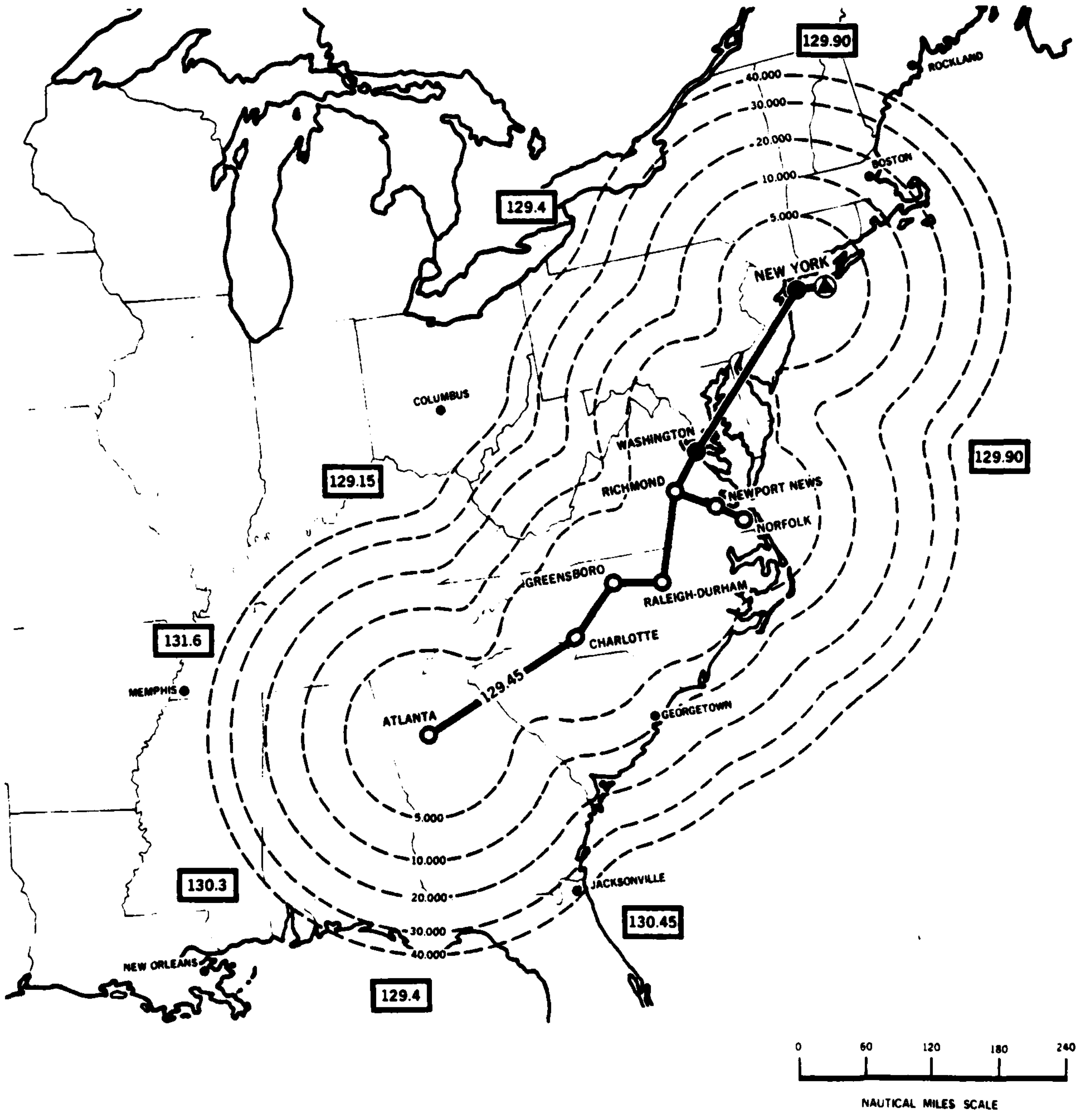
Changes included in this issue
● NETWORK REMOTE STATION AT MOBILE, AL. DELETED.

LEGEND

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	(	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY [illegible]
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	☐	FREQUENCY OF OF ADJOINING NETWORK [illegible]

Telephone Co. Circuit No.		Network Frequency Megahertz	Chart No.
DR-3005		130.2 MHz	30
Date	Issue No.		
FEB. 1. 1980	7		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

Ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE
5,000	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
▭	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- ● NETWORK STATION AT ASHEVILLE DECOMMISSIONED.

Telephone Co. Circuit No.	
DR-6163	
Date	**Issue No.**
FEB. 1, 1980	6

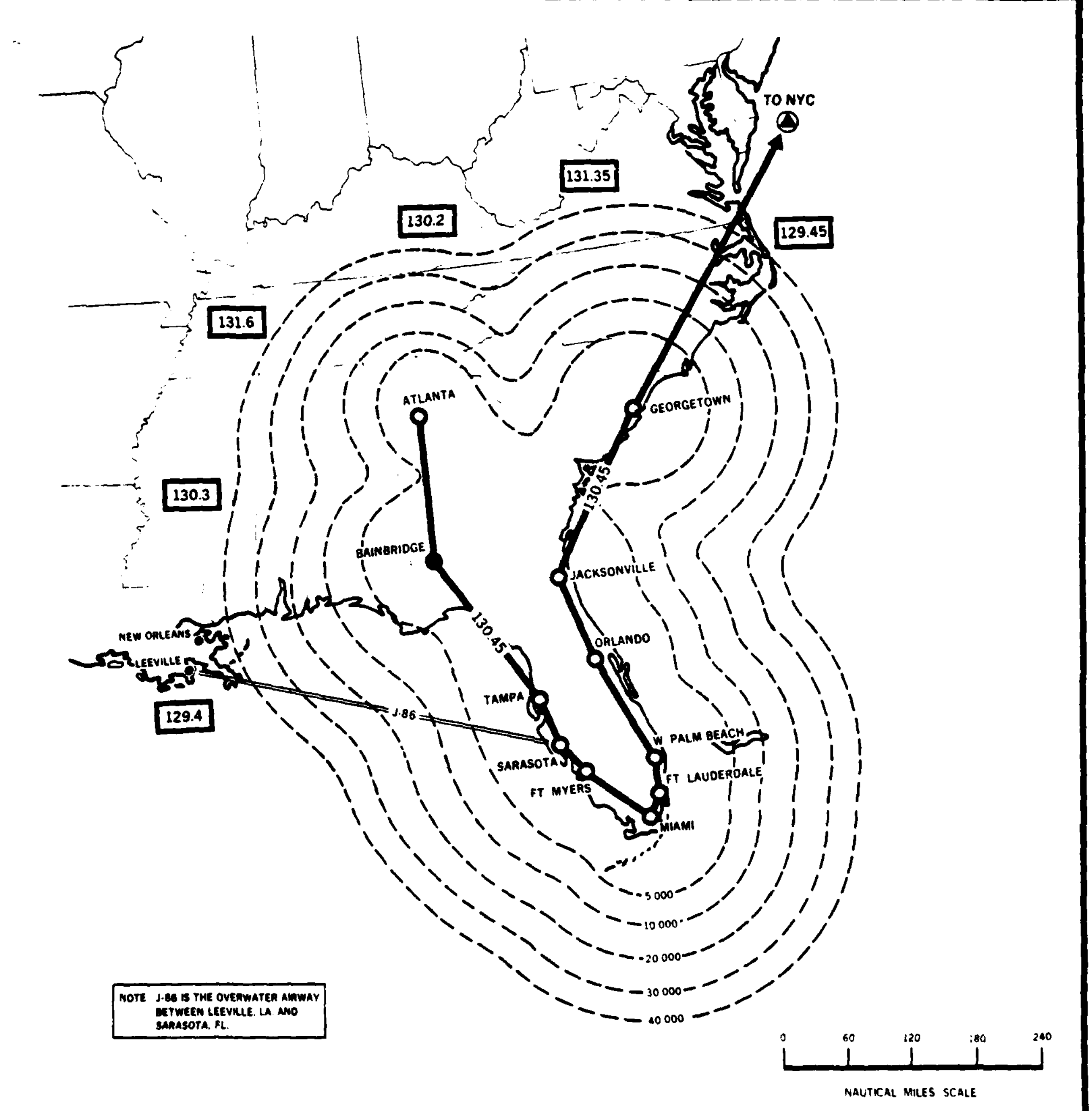
Network Frequency (Megahertz)

129.45 MHz

Chart No.

31

ARINC Aeronautical Enroute VHF Network Chart



NOTE J-86 IS THE OVERWATER AIRWAY BETWEEN LEEVILLE, LA AND SARASOTA, FL.

Changes included in this issue

- FT. MYERS AND SARASOTA, FL. ADDED.

LEGEND

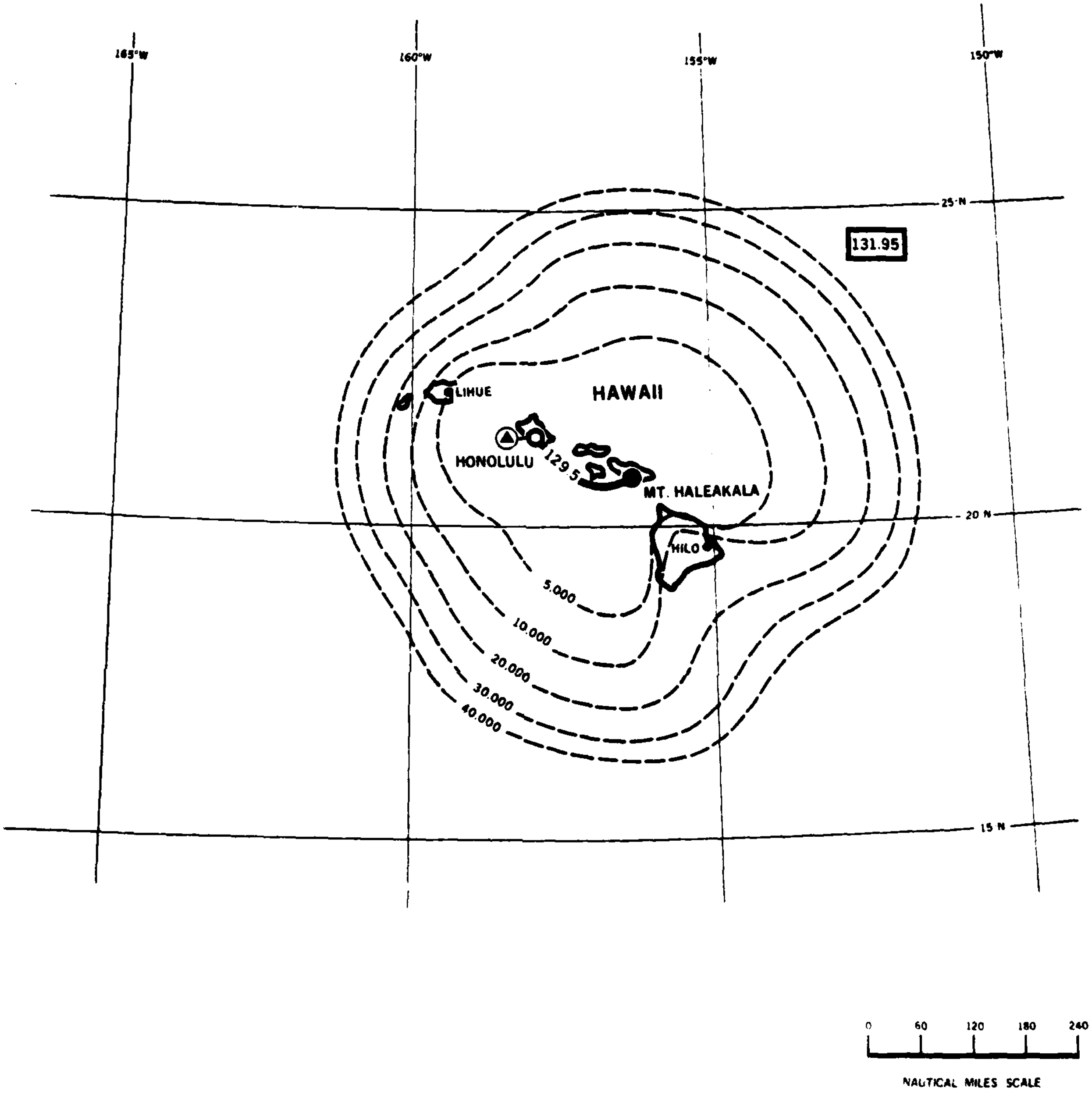
▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE
- - -	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES in feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
↑	EXTENDED RANGE FACILITY (ARROW INDICATES DIRECTION OF MAXIMUM RANGE)
☐	FREQUENCY OF ADJOINING NETWORK (COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES)

Telephone Co. Circuit No	
PLLC 20751	
Date	Issue No.
FEB. 1, 1980	6

Network Frequency (Megahertz): 130.45

Chart No. 32

ARINC Aeronautical Enroute VHF Network Chart

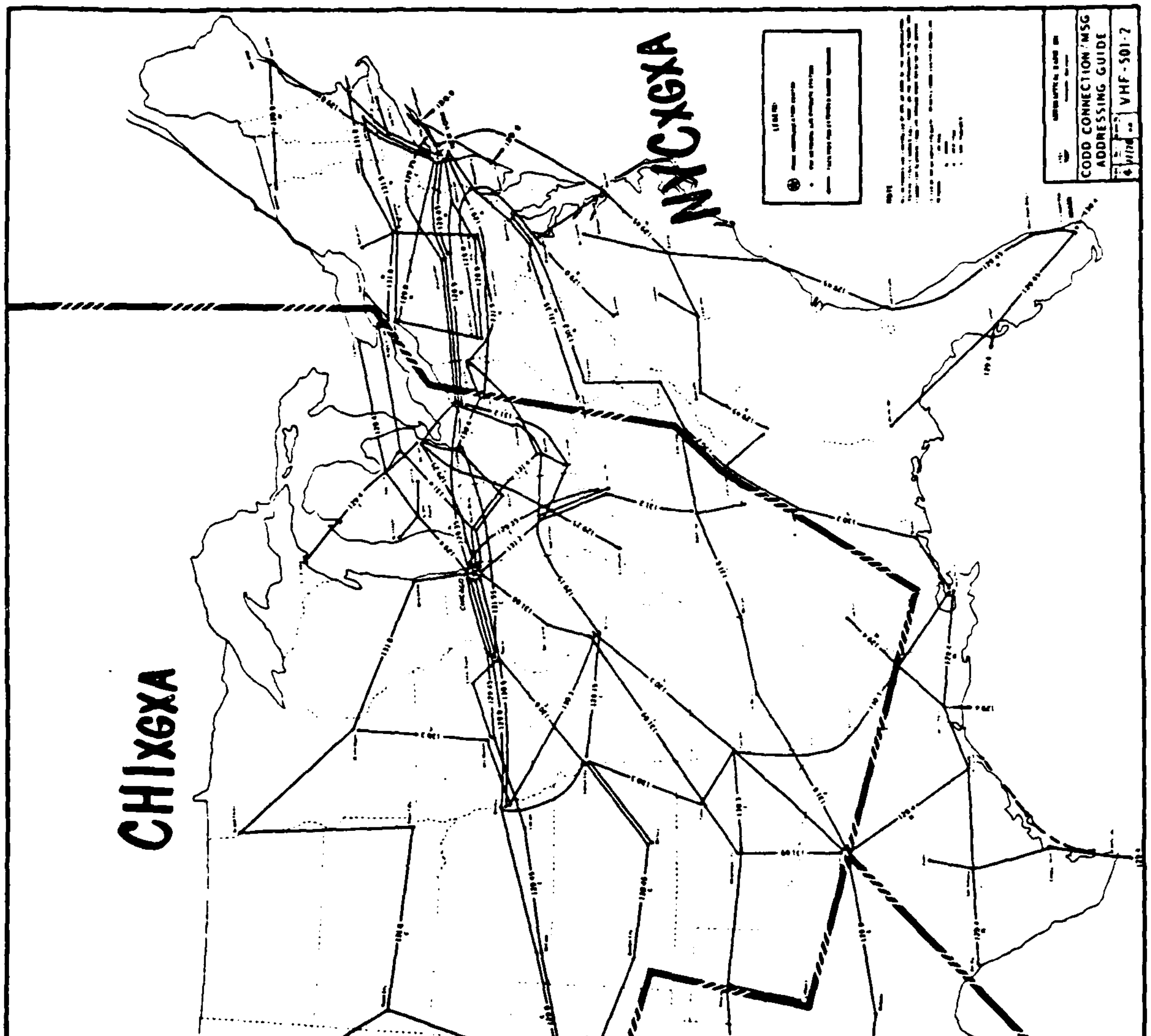


LEGEND

▲	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK		CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY (ARROW INDICATES DIRECTION OF MAXIMUM RANGE)
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK (COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES)

Changes included in this issue

Telephone Co. Circuit No.	NONE
Date	FEB. 1. 1980
Issue No.	5
Network Frequency (Megahertz)	129.5 MHz
Chart No.	33

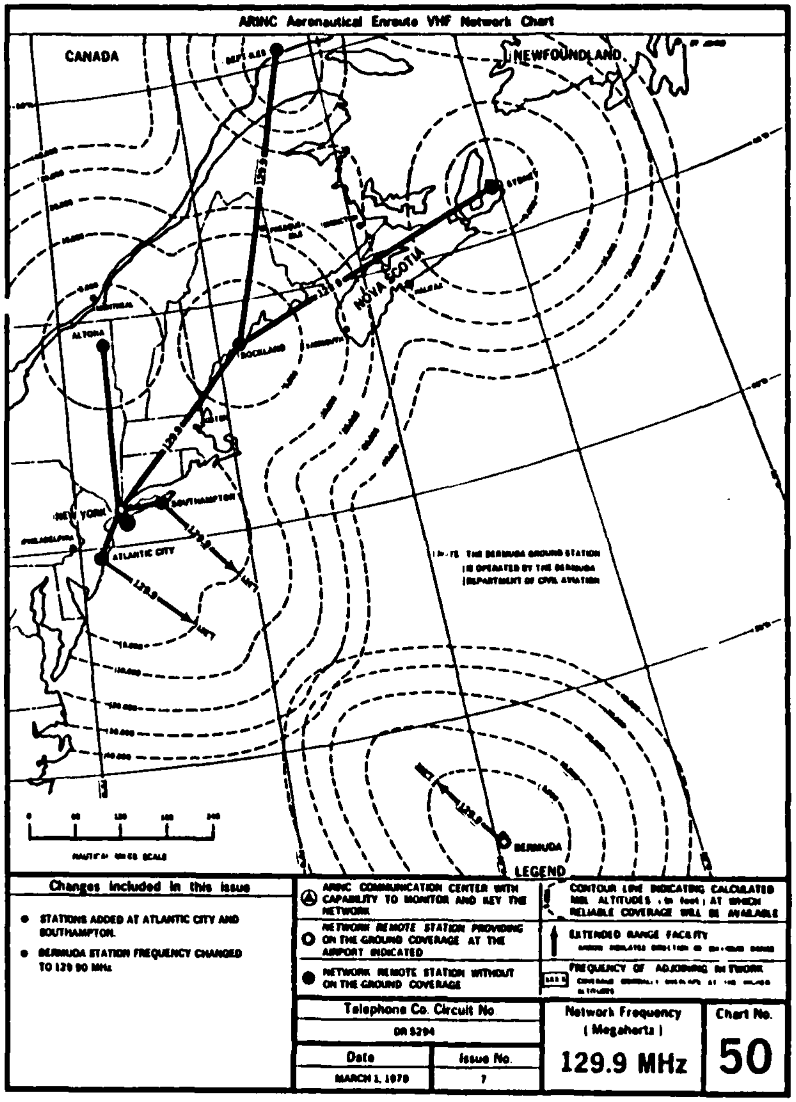

CHIxGXA
SFOxGXA
NYCXGXA
CODD CONNECTION/MSG
ADDRESSING GUIDE
VHF-501-2

STATION LOCATION AND CALL SIGN	FREQUENCIES (HF-kHz VHF-MHz)		TYPE OF EMISSION	MAJOR WORLD AIR ROUTE AREA (MWARA) SERVED OR REMARKS
CHICAGO (See Remarks)	2931, 3467, 5554 5610, 8931, 8945	kHz	3A3H or 3A3J	For pre-flight checks of aircraft HF equipment. Call on VHF to arrange HF checks.
GUAM	131.90	MHz	6A3	Local Use
HONOLULU	3467, 5554, 5603 8875, 8931 13312, 13336 17909	kHz	3A3H or 3A3J	Central East Pacific
	2896, 5505, 8854 11303, 13296 17909	kHz	3A3H or 3A3J	Central West Pacific
	2945, 5638, 8847 13304, 17909	kHz	3A3H or 3A3J	South Pacific
	6526, 10093 13356, 17941 21996	kHz	3A3J only	World Wide. Operational Control. (Phone Patch Service Available.)
	131.95	MHz	6A3	Extended range VHF. Coverage area includes tracks to mainland extending outward from HNL to approximately 400 NM, range on other tracks is approximately 300 NM. See Chart No. 56.
HOUSTON	6526, 10093 13356, 1794 21996	kHz	3A3J only	World Wide. Operational Control. (Phone Patch Service Available.)
LOS ANGELES (See Remarks)	5603	kHz	3A3H or 3A3J	For pre-flight checks of aircraft HF equipment. Call "San Francisco" for radio checks.
NEW YORK	2931, 5610, 8945 13328	kHz	3A3H or 3A3J	North Atlantic Family A (See Note 1, page 8.)
	2987, 5673, 8889 13288	kHz	3A3H or 3A3J	North Atlantic Family B (See Note 1, page 8.)
	2952, 5484, 6540 8959, 11367 17925	kHz	3A3H or 3A3J	Eastern Caribbean

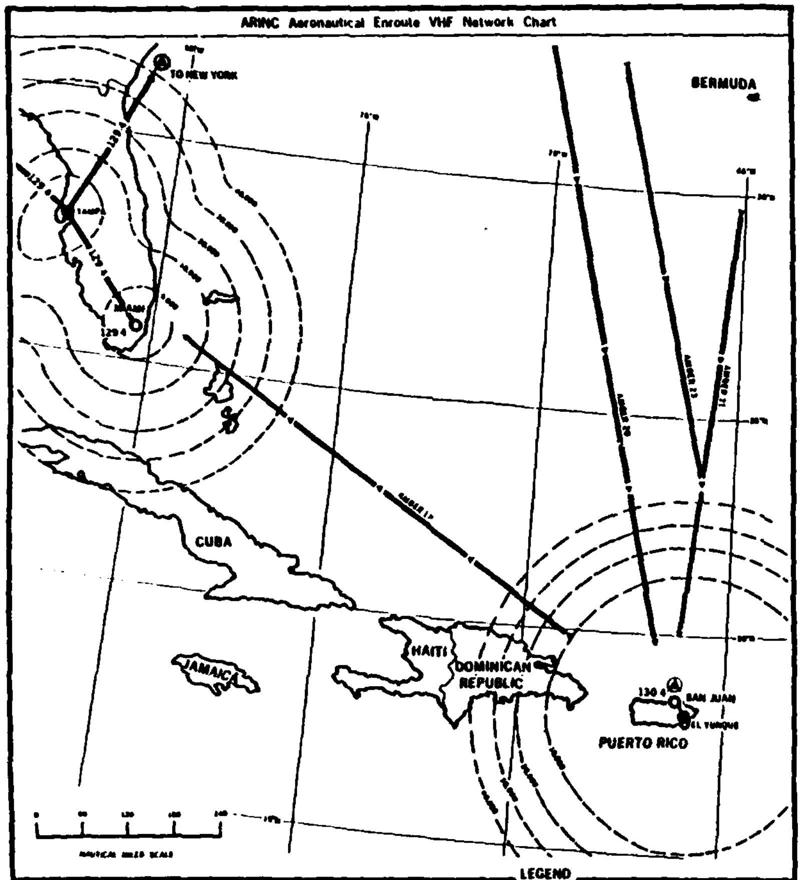
STATION LOCATION AND CALL SIGN	FREQUENCIES (HF-kHz VHF-MHz)		TYPE OF EMISSION	MAJOR WORLD AIR ROUTE AREA (MWARA) SERVED OR REMARKS
NEW YORK (Continued)	5568, 8640, 10017 13320, 17925	kHz	3A3H or 3A3J	Western Caribbean
	6526, 10093 13356, 17941 21996	kHz	3A3J only	World Wide. Operational Control. (Phone Patch Service Available.)
	129.90	MHz	6A3	Coverage area includes Canadian Maritime Provinces and oceanic routes to Bermuda and the Caribbean from the Boston, New York and Washington areas to approximately 36° N. Lat. See Chart No. 50.
	129.40	MHz	6A3	Extended range VHF. Coverage area includes MSY/TAM and MSY/TUX high altitude routes. See Chart No. 52.
PAGO PAGO	131.40	MHz	6A3	Local Use
SAN FRANCISCO	3467, 5554, 5603 6975, 8931 13312, 13336 17909	kHz	3A3H or 3A3J	Central East Pacific
	6526, 10093 13356, 17941 21996	kHz	3A3J only	World Wide. Operational Control. (Phone Patch Service Available.)
	131.95	MHz	6A3	Extended range VHF. Coverage area includes tracks to HNL from SFO and LAX out to approximately 128° W. Long. See Chart No. 54.
	129.40	MHz	6A3	For enroute communications for aircraft operating on Seattle/Anchorage/Kodiak routes. See Chart No. 53.
SAN JUAN	2952, 5484, 6540 8959, 11367 17925	kHz	3A3H or 3A3J	Eastern Caribbean

STATION LOCATION AND CALL SIGN	FREQUENCIES (HF-kHz VHF-MHz)		TYPE OF EMISSION	MAJOR WORLD AIR ROUTE AREA (MWARA) SERVED OR REMARKS
SAN JUAN (Continued)	2931, 5610, 8945 13328	kHz	3A3H or 3A3J	North Atlantic Family A (See Note 1, below.)
	6526, 10093 13356, 17941 21996	kHz	3A3J only	World Wide. Operational Control. (Phone Patch Service Available.)
	130.40	MHz	6A3	Coverage area includes oceanic tracks outward from SJU to approximately 23° N. Lat. and out to approximately 70° W. Long. on the SJU/MIA track. See Chart No. 51.
SEATTLE (See Remarks)	5454	kHz	3A3H or 3A3J	For pre-flight checks of aircraft HF equipment. Call "San Francisco" on VHF to arrange HF checks.

NOTE: All users of the North Atlantic HF MWARA services should consult International NOTAM's and ICAO Regional Supplementary Procedures, Document 7030, for current procedures concerning the operational use of the North Atlantic HF families.



ARINC Aeronautical Enroute VHF Network Chart



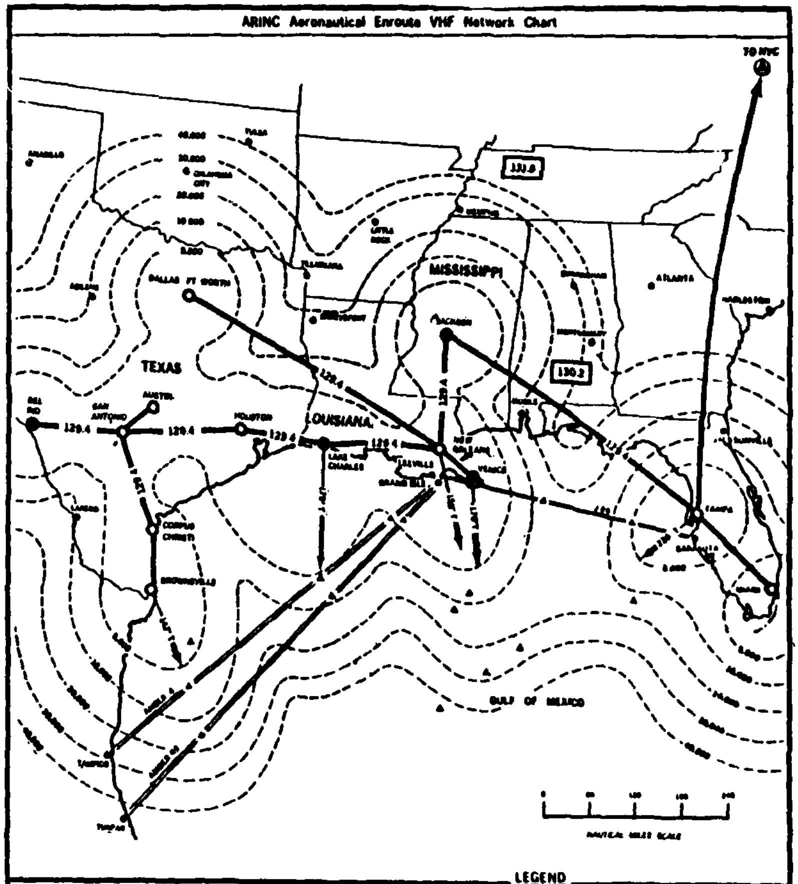
LEGEND

Changes included in this issue
• STATION ADDED AT MIAMI ON 129 40 MHz

Ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	⁞	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES (In feet) AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	129.4	FREQUENCY OF OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No
DR 7042 67 (129 40 MHz)		129.4 & 130.4 MHz	51
Date	Issue No.		
MARCH 1, 1979	7		

ARINC Aeronautical Enroute VHF Network Chart



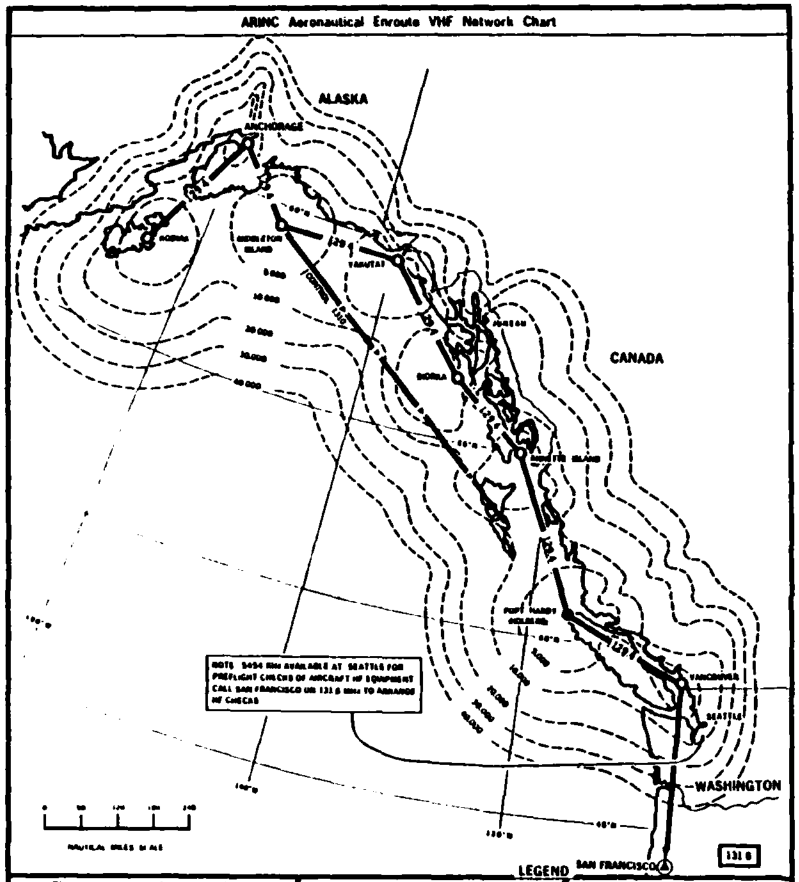
LEGEND

Changes included in this issue
• EXTENDED RANGE STATION AT VENICE, LA. ADDED
• CONTROL POINT CHANGED TO NEW YORK
• STATION ADDED AT MIAMI

Ⓐ	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	⁞	CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES (In feet) AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE	129.4	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Telephone Co. Circuit No		Network Frequency (Megahertz)	Chart No
DR 7042 67		129.4 MHz	52
Date	Issue No.		
MARCH 1, 1979	8		

ARINC Aeronautical Enroute VHF Network Chart



Changes included in this issue

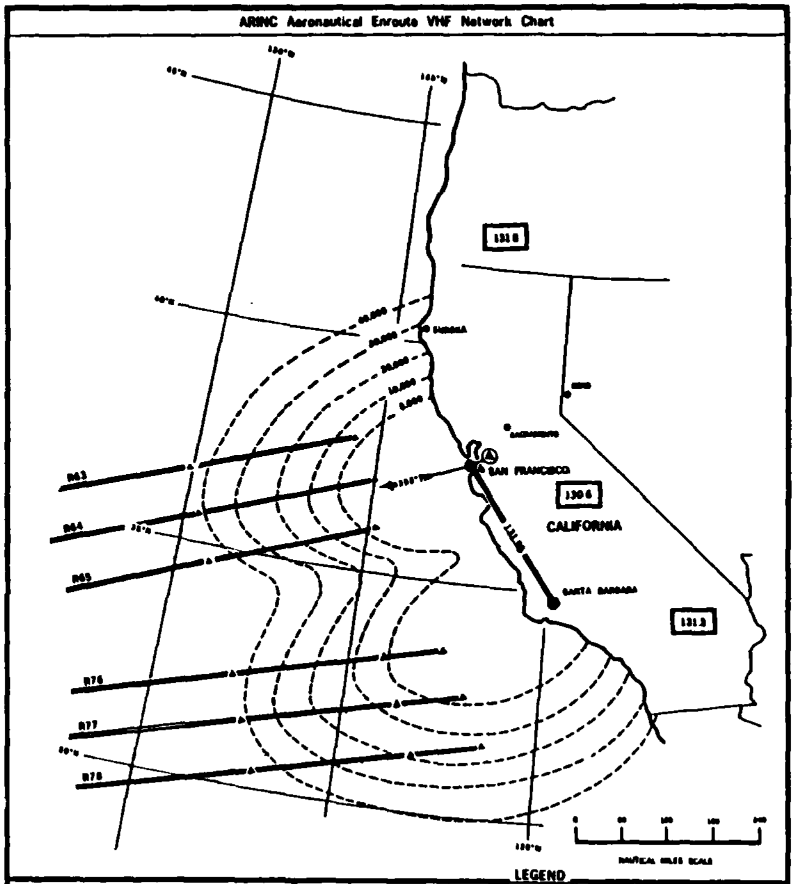
- MINOR CHANGE

LEGEND

- ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
- NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED
- NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE
- CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES (in feet) AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
- EXTENDED RANGE FACILITY
- FREQUENCY OF ADJOINING NETWORK

Telephone Co Circuit No		Network Frequency (Megahertz)	Chart No
DR 7510		129.4 MHz	53
Date	**Issue No**		
MARCH 1 1979	8		

ARINC Aeronautical Enroute VHF Network Chart



Changes included in this issue

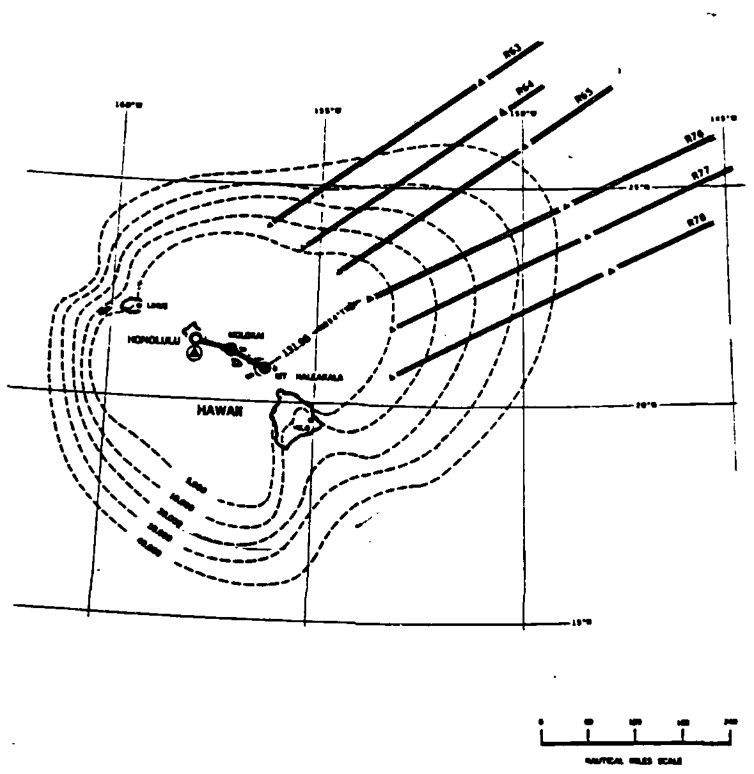
- MINOR CHANGE

LEGEND

- ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK
- NETWORK REMOTE STATION PROVIDING ON THE GROUND COVERAGE AT THE AIRPORT INDICATED
- NETWORK REMOTE STATION WITHOUT ON THE GROUND COVERAGE
- CONTOUR LINE INDICATING CALCULATED MSL ALTITUDES (in feet) AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
- EXTENDED RANGE FACILITY
- FREQUENCY OF ADJOINING NETWORK

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
DR 7041		131.95 MHz	54
Date	**Issue No.**		
MARCH 1, 1979	8		

ARINC Aeronautical Enroute VHF Network Chart



LEGEND

◬	ARINC COMMUNICATION CENTER WITH CAPABILITY TO MONITOR AND KEY THE NETWORK	⋮	CONTOUR LINE INDICATING CA LATED MSL ALTITUDES In feet AT WHICH RELIABLE COVERAGE WILL BE AVAILABLE
○	NETWORK REMOTE STATION PROVIDING ON-THE-GROUND COVERAGE AT THE AIRPORT INDICATED	↑	EXTENDED RANGE FACILITY ARROW INDICATES DIRECTION OF MAXIMUM RANGE
●	NETWORK REMOTE STATION WITHOUT ON-THE-GROUND COVERAGE	129.0	FREQUENCY OF ADJOINING NETWORK COVERAGE NORMALLY OVERLAPS AT THE HIGHER ALTITUDES

Changes included in this issue

- ● MINOR CHANGE

Telephone Co. Circuit No.		Network Frequency (Megahertz)	Chart No.
NONE		131.95 MHz	55
Date	Issue No.		
MARCH 1, 1979	6		

EXPLANATION OF THE FORMAT

The data in this publication are arranged in six columns; an explanation of the information contained in each column is as follows:

STATION NAME: The radio stations listed herein are named after the city, town, or geographical location in which they are situated.

STATE: The states are listed by their two letter abbreviation. Other geographical areas are also shown in this column by a two letter designator. A key for the abbreviations used in this column appears on page 12.

FREQUENCY: The operating frequencies of ARINC facilities available at each location are listed in this column. All frequencies are expressed in megahertz.

RADIO CALL IF OTHER THAN STATION NAME: Some of the facilities listed in this document are remotely controlled from a central location by the organization staffing the station. In those cases, it is necessary to use the radio call listed in this column rather than the station name.

STATION STAFFED BY: The airline or other organizations staffing the station is shown by a two or three letter designator. A key to the designators used in this column appears on pages 6 thru 11.

TWO AND THREE LETTER DESIGNATORS USED TO IDENTIFY AIRLINE OR OTHER ORGANIZATIONS

CAUTION: Many of the designators listed are applicable for use in this document only.

AA	AMERICAN AIRLINES, INC.
AC	AIR CANADA
ACI	AIRCRAFT SERVICES INTERNATIONAL, INC.
ACY	AMERICAN CYANAMID
AEO	AERO SERVICES
AF	AIR FRANCE
AFB	AERO FACILITIES CORPORATION
AFM	A.F.M. CORPORATION
AIM	AIR MARINE, INC.
AIN	AIR INTERNATIONAL
AIR	AIRESEARCH AVIATION COMPANY
AK	ALTAIR AIRLINES, INC.
AL	ALLEGHENY AIRLINES, INC.
ALI	AIR LOGISTICS, INC.
AM	AEROMEXICO
AMI	AERO MECH, INC.
AP	ASPEN AIRWAYS, INC.
ARC	ATLANTIC RICHFIELD COMPANY, THE
AS	ALASKA AIRLINES, INC.
ATC	ATLANTIC CITY AIRLINES
AUT	AUTO AIR CARGO, INC.
AV	AEROVIAS NACIONALES DE COLOMBIA
BA	BRITISH AIRWAYS
BAI	BROWER AIRWAYS
BEA	BEACON AVIATION, INC.
BEC	BECKETT AVIATION CORPORATION
BEN	BENDIX CORPORATION, THE
BN	BRANIFF AIRWAYS INCORPORATED
BSC	BETHLEHEM STEEL CORPORATION
CAI	CROWN AIRWAYS, INC.
CCC	CONTINENTAL CAN COMPANY
CH	CHICAGO HELICOPTER AIRWAYS, INC.
CHU	CHAUTAUQUA AIRLINES, INC.
CI	CHINA AIRLINES
CJ	COLGAN AIRWAYS CORPORATION

CL	CAPITOL INTERNATIONAL AIRWAYS, INC.
CL[illegible]	CLARK AVIATION CORPORATION
CO	CONTINENTAL AIRLINES, INC.
CCB	CITY OF BANGOR
CO[illegible]	COCA-COLA COMPANY, THE
COP	COPTERS, INC.
CG[illegible]	CORNING GLASS WORKS
CP	CANADIAN PACIFIC AIR LINES, LTD.
CRA	CORPORATE AIR, INC.
CRY	CRYDERMAN AIR SERVICE
CSG	COASTAL STATES GAS PRODUCING COMPANY
CYC	CHRYSLER CORPORATION
CZ	CASCADE AIRWAYS, INC.
DD	COMMAND AIRWAYS, INC.
DEC	DIGITAL EQUIPMENT CORPORATION
DIS	DISPATCH SERVICES, INC.
DL	DELTA AIR LINES, INC.
DN	SKYSTREAM AIRLINES, INC.
DP	COCHISE AIRLINES
DRI	DRESSER INDUSTRIES, INC.
DVI	DUNCAN AVIATION, INC.
EA	EASTERN AIR LINES, INC.
EAF	EXECUTIVE AIR FLEET CORPORATION
EAI	EAGLE AVIATION, INC.
EJ	EXECUTIVE JET AVIATION, INC.
ED	AERO AMERICA, INC.
FE	FLORIDA AIRLINES, INC.
FEC	FEDERAL EXPRESS CORPORATION
FFI	FARMINGDALE FLYERS, INC.
FJC	FALCON JET CORPORATION
FL	FRONTIER AIRLINES, INC.
FOC	FORD MOTOR COMPANY
FS	SUN VALLEY KEY AIRLINES
FSH	FISCHER BROTHERS AVIATION
FT	FLYING TIGER LINE INC., THE
FW	WRIGHT AIR LINES, INC.
GAP	GRAHAM AIRMOTIVE
GMC	GENERAL MOTORS RESEARCH CORP.
GRA	GRAF, INC., ROBERT
GSI	GROUND SERVICES, INC.
GW	GOLDEN WEST AIRLINES, INC.
GYT	GOODYEAR TIRE AND RUBBER CO., THE
HA	HAWAIIAN AIRLINES, INC.
HAL	HALLIBURTON SERVICES
HAW	HAWTHORNE AVIATION, INC.
HLH	HI-LIFT HELICOPTERS, INC.
HNS	HENSON AVIATION, INC.
HOI	HANGAR ONE, INC.
HP	APOLLO AIRWAYS
HX	VIRGINIA AIR CARGO CO., INC.
HY	METROFLIGHT, INC.
IB	LINEAS AEREAS DE ESPANA (IBERIA)
IBM	INTERNATIONAL BUSINESS MACHINES
ICF	INTERNATIONAL CHARTER FLIGHT OPERATION
IU	MIDSTATE AIR COMMUTER
JC	ROCKY MOUNTAIN AIRWAYS
JL	JAPAN AIR LINES CO., LTD.
JWC	JERSEY WEATHER CENTER
KE	KOREAN AIR LINES, INC.
KQ	AIR SOUTH, INC.
KS	SATURN AIRWAYS, INC.
LH	LUFTHANSA GERMAN AIRLINES
LKN	LUKENS STEEL COMPANY
LLY	LILLY AND COMPANY, ELI
LWG	LTV JET FLEET CORPORATION
MAC	MILITARY AIRLIFT COMMAND
MAJ	MAJOR TRANSPORT INC.
MAS	MID-COAST AVIATION SERVICES
MCL	MC CULLOCH INTERNATIONAL AIRLINES
MCT	MACK TRUCKS, INC.
MDC	MC DONNELL DOUGLAS CORPORATION
MPO	OFFICE OF ADMINISTRATION (STATE OF MISSOURI)
MI	MACKEY INTERNATIONAL AIRLINES
MIA	MIAMI AVIATION CORPORATION
MIW	MIDWEST AIR CHARTER, INC.
MNA	MARIN AVIATION
MTA	METROPOLITAN TRANSPORTATION AUTHORITY
MUO	IMCO SERVICES
NA	NATIONAL AIRLINES, INC.
NC	NORTH CENTRAL AIRLINES, INC.
NE	AIR NEW ENGLAND, INC.
NEA	NEW ENGLAND AIRLINES, INC.
NW	NORTHWEST AIRLINES, INC.
NWX	NATIONAL WEATHER CORPORATION
NY	NEW YORK AIRWAYS, INC.
OC	AIR CALIFORNIA
OH	SFO HELICOPTER AIRLINES, INC.
OPC	OCCIDENTAL PETROLEUM CORPORATION
OV	OVERSEAS NATIONAL AIRWAYS
OY	AIR NORTH, INC.
OZ	OZARK AIR LINES, INC.
PA	PAN AMERICAN WORLD AIRWAYS, INC.
PAG	PAGE AIRWAYS, INC.
PHC	PHILLIPS PETROLEUM COMPANY
PHI	PETROLEUM HELICOPTERS, INC.
PI	PIEDMONT AVIATION, INC.
PIC	PRUDENTIAL INSURANCE COMPANY OF AMERICA, THE
PM	PILGRIM AIRLINES, INC.
PNY	PORT AUTHORITY OF NEW YORK AND NEW JERSEY, THE
POC	POCONO AIRLINES, INC.
PQ	PUERTO RICO INTERNATIONAL AIRLINES, INC.
PS	PACIFIC SOUTHWEST AIRLINES
PZC	PENNZOIL PRODUCING COMPANY
QH	AIR FLORIDA
QO	BAR HARBOR AIRLINES, INC.
QM	LOS ANGELES HELICOPTER AIRLINES
QX	AIR ILLINOIS
RAI	RICHMOR AVIATION, INC.
RAL	RALSTON PURINA COMPANY
RDA	RALEIGH DURHAM AVIATION
RG	VARIG AIRLINES
RI	TRICON INTERNATIONAL AIRLINES, INC.
RNS	RANSOME AIRLINES
ROR	RORER-AMCHEM, INC.
RPA	PUBLIC AVIATION, INC.
RW	HUGHES AIR CORPORATION (AIRWEST)
RX	CAPITOL AIR SERVICE, INC.
SAW	SAWYER AVIATION
SCA	SOUTH CAROLINA AERONAUTICS COMMISSION
SEN	SENTRY INSURANCE COMPANY
SLD	SOUTHLAND CORPORATION, THE
SLN	SKYLANE INC.
SO	SOUTHERN AIRWAYS, INC.
SPA	SPAN EAST AIRLINES
SPG	SPRAGUE AVIATION COMPANY
SR	SWISS AIR TRANSPORT COMPANY LIMITED
SS	SHAWNEE AIRLINES, INC.
STA	SAINT PETE AIR WORLD, INC.
STS	SEATTLE-TACOMA FLIGHT SERVICE, INC.
SVC	SERVAIR CALIFORNIA, INC.
SVR	SERVAIR INC.
SWA	CHANNEL ISLAND AVIATION
SWT	ESPARK, INC.
SZ	SIERRA PACIFIC AIRLINES

TA	TACA INTERNATIONAL AIRLINES, S. A.
TAS	TETERBORO AIRCRAFT SERVICE
TI	TEXAS INTERNATIONAL AIRLINES, INC.
TS	ALOHA AIRLINES, INC.
TV	TRANS INTERNATIONAL AIRLINES
TW	TRANS WORLD AIRLINES, INC.
TXI	TEXACO, INC.
UA	UNITED AIR LINES, INC.
UH	MAC HELICOPTERS, INC.
UPJ	UPJOHN COMPANY, THE
USS	UNITED STATES STEEL COMMUNICATIONS COMPANY
UWS	UNIVERSAL AVIATION, INC.
VA	VENEZOLANA INTERNACIONAL DE AVIACION, S. A. (VIASA)
VAV	VITEK AVIATION, INC.
VCA	VERCOA AIR SERVICE, INC.
VDA	VAN DUSEN AIR, INC.
VO	VIKING INTERNATIONAL AIRFREIGHT, INC.
WA	WESTERN AIR LINES, INC.
WLC	WARNER LAMBERT COMPANY
WN	SOUTHWEST AIRLINES COMPANY
WO	WORLD AIRWAYS
WRL	WHIRLPOOL CORPORATION
WSC	WESTERN COMMANDER, INC.
XO	RIO AIRWAYS
XV	MISSISSIPPI VALLEY AIRWAYS, INC.
YR	SCENIC AIR LINES, INC.
ZAN	ZANTOP INTERNATIONAL AIRLINES, INC.
ZK	DAVIS AIRLINES
ZN	WINNIPESAUKEE AVIATION, INC.
ZV	AIR MIDWEST, INC.
ZW	AIR WISCONSIN, INC.
ZY	SKYWAY AVIATION, INC.

TWO LETTER STATE ABBREVIATIONS

AK - Alaska
AL - Alabama
AR - Arkansas
AZ - Arizona
CA - California
CO - Colorado
CT - Connecticut
DC - District of Columbia
DE - Delaware
FL - Florida
GA - Georgia
HI - Hawaii
IA - Iowa
ID - Idaho
IL - Illinois
IN - Indiana
KS - Kansas
KY - Kentucky
LA - Louisiana
MI - Michigan
MD - Maryland
ME - Maine
MS - Mississippi
MN - Minnesota
MO - Missouri
MA - Massachusetts
MT - Montana
NE - Nebraska
NC - North Carolina
ND - North Dakota
NH - New Hampshire
NJ - New Jersey
NM - New Mexico
NV - Nevada
NY - New York
OH - Ohio
OK - Oklahoma
OR - Oregon
PA - Pennsylvania
RI - Rhode Island
SC - South Carolina
SD - South Dakota
TN - Tennessee
TX - Texas
UT - Utah
VT - Vermont
VA - Virginia
WA - Washington
WI - Wisconsin
WV - West Virginia
WY - Wyoming

TWO LETTER ABBREVIATIONS FOR OTHER GEOGRAPHICAL AREAS

AS - American Samoa
GU - Guam
PR - Puerto Rico
VI - Virgin Islands

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
ABERDEEN	SD	131.[illegible]5 R		MC	
ABILENE	TX	129.46 R		TI	
AGANA	GU	130.95 R 131.03 R 131.90 R		CO JL PA	
AGUADILLA	PR	131.30 R		SPA	
AIKEN	SC	129.95 R		EAA	
AKRON	OH	130.25 R 130.10 R 130.95 R 130.75 R		AL AL AL EA	
ALAMOGORDO	NM	129.35 R		PL	
ALAMOSA	CO	129.25 R		PL	
ALBANY	GA	131.79 R		SO	
ALBANY	NY	130.35 R 130.[illegible]5 R 130.[illegible]5 R		AL AL AL	
ALBUQUERQUE	NM	129.20 R 129.35 R 129.45 R 129.40 R 130.90 R	 ATLANTA 	TW PL DL TI CO	
ALBUQUERQUE	NM	130.95 R	ATLANTA	EA	
ALEXANDRIA	LA	129.40 R 131.25 R	 ATLANTA	TI DL	
ALEXANDRIA	VA	131.00 R	ATLANTA	EA	
ALLENTOWN	PA	130.05 R 130.10 R 130.70 R 131.99 R 132.30 R		AL AL EA MCT BSC	
ALLIANCE	NE	129.30 R		PL	
ALPENA	MI	131.25 R		NC	
ALTON	IL	132.00 R		OZ	
ALTOONA	PA	130.10 R		CCR	
AMARILLO	TX	129.65 R 129.80 R 130.30 R 130.10 R 130.55 R 130.90 R 130.95 R	 ATLANTA	DL TI PL TT BN CO EA	
[illegible]	CA	130.95 R		PWC	
ANCHORAGE	AK	129.30 R 131.20 R 131.40 R		AP & LW PT JL	
ANCHORAGE	AK	132.30 R		SWA	
ANNISTON	AL	131.79 R		SO	
APPLETON	WI	130.[illegible] R		ZN	
ARCATA	CA	130.70 R		PU	
ARLINGTON (SERVES WASHINGTON NATIONAL AIRPORT)	VA	128.[illegible] R 129.20 R 129.10 R 129.60 R 130.05 R 130.20 R 130.[illegible]0 R 130.35 R 130.55 R 131.20 R 131.40 R 131.65 R 131.70 R 131.90 R	 MINNEAPOLIS 	WA TW UA PI AL AL BC NO BN AA EA SEE NOTE 7, Pg. 78 NW DL	
ASHEVILLE	NC	129.75 R		PI	
ASHLAND	WI	131.90 R		IU	
ASPEN	CO	129.[illegible] R 132.30 R		JC AP	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
ATHENS	GA	131.75 R		SO	
ATLANTA	GA	129.30 R		DL	
		129.35 R		DL	
		129.40 R		DL	
ATLANTA	GA	129.65 R		DL	
		129.75 R		PI	
		130.15 R		EA	
		130.35 R	MINNEAPOLIS	NW	
		130.45 R		[illegible]	
		131.40 R		EA	
		131.45 R		DL	
		131.75 R		SO	
		131.85 R		DL	
		131.95 R		DL	
		132.00 R		[illegible]	
ATLANTIC CITY	NJ	130.00 R		ATC	
AUGUSTA	GA	129.65 R	ATLANTA	DL	
		129.75 R		PI	
		130.70 R		EA	
AUGUSTA	ME	131.15 R		NE	
AUSTIN	TX	129.80 R		TI	
		130.55 R		BN	
		130.90 R		CO	
BAKER	MT	131.70 R	MINNEAPOLIS	NW	
BAKERSFIELD	CA	[illegible] R		[illegible]	
		130.70 R		AW	
		131.10 R		[illegible]	
		131.70 R		OPC	
BALDWIN	MI	132.00 R		ARC	(STATION OPEN JAN THRU NOV ONLY)
BALTIMORE	MD	129.30 R		UA	
		130.05 R		AL	
		130.10 R		AL	
BALTIMORE	MD	130.40 R	NEW YORK	EA	
		130.50 R		AL	
		130.70 R		EA	
		130.80 R		AA	
		131.20 R		AA	
		131.25 R	MIAMI	NA	
		131.45 R		DL	
BANGOR	ME	129.55 R		BO	
		129.45 R	NEW YORK	PA	
		131.30 R	NEW YORK	SEE NOTE 1, Pg. 73	
		131.35 R	NEW YORK	[illegible]	
		131.90 R	ATLANTA	DL	
		132.00 R		CO	
BARTLESVILLE	OK	131.15 R		PHC	
BATON ROUGE	LA	129.80 R		TI	
		131.75 R		SO	
		131.85 R	ATLANTA	DL	
BATTLE CREEK	MI	[illegible] R		[illegible]	
BEAUMONT	TX	129.80 R		TI	
		131.95 R		[illegible]	
BECKLEY	WV	129.80 R		PI	
BELLE CHASSE	LA	131.35 R		AIR	
BEMIDJI	MN	131.25 R		NC	
BENTON HARBOR	MI	131.25 R		NC	
		132.00 R		ARC	(STATION OPEN DEC TI MAY ONLY)
BILLINGS	MT	129.30 R		PL	
BILLINGS	MT	[illegible] R		[illegible]	
		131.70 R	MINNEAPOLIS	NW	
BINGHAMTON	NY	[illegible] R		AL	
		130.95 R		[illegible]	
BIRMINGHAM	AL	129.35 R	ATLANTA	DL	
		130.70 R		EA	
		131.75 R		SO	
		131.90 R		DL	
BISMARCK	ND	129.30 R		PL	
		131.70 R	MINNEAPOLIS	NW	
BLK [illegible] SHIP SHOAL	LA	[illegible] R		PHI	
		129.10 R		PHI	
		[illegible] R		PHI	
		132.00 R		PHI	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
[illegible]	CA	131.[illegible] R		[illegible]	
BLOOMINGTON	IL	129.45 R		OZ	
BLUEFIELD	WV	129.[illegible] R		PI	
BLYTHE	CA	130.70 R		RW	
		131.10 R		RW	
BOISE	ID	129.46 R		[illegible]	
BOSTON	MA	129.25 R		[illegible]	
		129.40 R		TW	
		129.70 R		PA	
		130.35 R		AL	
		131.00 R	ATLANTA	EA	
BOSTON	MA	130.10 R		AL	
		130.75 R		EA & FT	
		130.95 R		[illegible]	
		131.10 R		VOA	
		131.15 R		NE	
		131.25 R	MIAMI	NA	
		131.40 R		EA	
		131.45 R	MINNEAPOLIS	NW	
		131.65 R		OL	
		131.90 R	Atlanta	OL	
BOZEMAN	MT	129.30 R		FL	
		131.[illegible] R		NW	
		131.90 R	MINNEAPOLIS	NW	
BRADFORD	PA	130.[illegible] R		AL	
		130.10 R		AL	
BRAINERD	MN	131.25 R		NC	
BRIDGEPORT	CT	130.[illegible] R		NE	
BRISTOL	TN	129.75 R		PI	
		131.75 R		SO	
BROOKINGS	SD	131.25 R		NC	
BROWNSVILLE	TX	130.[illegible] R		[illegible]	
		130.95 R	ATLANTA	EA	
BROWNWOOD	TX	129.[illegible] R		TI	
BRUNSWICK	GA	131.[illegible] R		[illegible]	
BRYCE CANYON	UT	129.35 R	ATLANTA	[illegible]	
BUFFALO	NY	129.20 R		AA	
BUFFALO	NY	129.30 R		UA	
		130.05 R		AL	
		130.70 R		EA	
BURBANK	CA	129.30 R		UA	
		129.75 R		XX	
		129.85 R		ARC	
		130.10 R		WA	
		130.70 R		RW	
		130.30 R		PS	
		130.30 R		[illegible]	
BURLINGTON	IA	129.90 R		OZ	
BURLINGTON	VT	130.00 R		AL	
		131.15 R		NE	
		131.65 R		OV	
		131.90 R	ATLANTA	OL	
BUTTE	MT	130.10 R		WA	
		131.90 R	MINNEAPOLIS	NW	
CAMERON	LA	129.95 R		PHI	
		129.15 R		PHI	
		130.50 R		PHI	
		131.00 R		PHI	
CAPE GIRARDEAU	MO	129.45 R		OZ	
		131.[illegible] R		[illegible]	
CARBONDALE	IL	131.00 R		OZ	
CARLSBAD	NM	129.[illegible] R		TI	
CASPER	WY	129.30 R		FL	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
CASPER	WY	130.10 R		UA	
CEDAR CITY	UT	129.60 R		RW	
		130.70 R		RW	
		131.10 R		RW	
CEDAR RAPIDS	IA	129.90 R		OZ	
CHADRON	NE	129.30 R		FL	
CHAMPAIGN	IL	129.85 R		OZ	
CHANTILLY	VA	129.20 R	DULLES	TW	
(SERVES DULLES		129.30 R	"	UA	
INT'L AIRPORT)		129.55 R	"	OZ	
		129.70 R	"	PA	
		129.80 R	"	PI	
		130.35 R	"	BN	
		130.90 R	"	EA	
		131.70 R	MINNEAPOLIS	NW	
		131.75 R	DULLES	SO	
		131.95 R	"	NA	
CHARLESTON	SC	129.65 R	ATLANTA	DL	
		130.60 R	MIAMI	NA	
		130.65 R		MAC (SERVES CHARLESTON AFB)	
		130.70 R		EA	
		131.10 R	ATLANTA	EA	
		131.75 R		SO	
CHARLESTON	WV	129.20 R		AA	
		129.80 R		PI	
		130.50 R		AL	
		130.90 R	ATLANTA	EA	
CHARLOTTE	NC	129.50 R	ATLANTA	DL	
CHARLOTTE	NC	129.75 R		PI	
		130.45 R		EA	
		131.95 R		NA	
CHARLOTTESVILLE	VA	129.80 R		PI	
		129.95 R		EAL	
		131.95 R		NA	
CHATTANOOGA	TN	129.60 R	ATLANTA	DL	
		130.75 R	ATLANTA	EA	
		131.75 R		SO	
CHESTERFIELD	MO	130.95 R		AAL	
CHEYENNE	WY	129.30 R		FL	
		130.10 R		UA	
CHICAGO	IL	128.85 R		EA	
		129.10 R		TW	
(SERVES O'HARE		129.20 R		AA	
INT'L AIRPORT		129.30 R		UA	
UNLESS OTHERWISE		129.30 R		UA	MDW
INDICATED)		129.50 R	ATLANTA	DL	
		129.60 R		NC	
		129.70 R		CH	
		129.75 R		TCF	
		129.95 R		NW	
		130.05 R		AL	
		130.10 R		NC	
		130.20 R		ZW & ZV	
		130.30 R		NC	
		130.35 R		BN	
		130.75 R	ATLANTA	EA	
		130.85 R		CO	
		130.90 R		NC	
		131.05 R	NEW YORK	PA	
		131.10 R		NC	
		131.15 R		BN	CGX
CHICAGO	IL	131.30 R		UA	
		131.50 R		IU	
		131.75 R		SO	
		131.90 R	MINNEAPOLIS	NW	
		131.95 R		OSC	MDW
		131.95 R		SWT	MDW
		132.00 R		UA	CGX
CHICO	CA	129.60 R		RW	
		130.70 R		RW	
		131.10 R		RW	
CINCINNATI (SEE COVINGTON, KY)					
CLARKSBURG	WV	130.30 R		AL	
CLARKSVILLE	TN	129.65 R		OZ	
CLEAR LAKE CITY	TX	131.95 R		WV	
CLEVELAND	OH	129.30 R		UA	
		129.70 R		PA	
		130.05 R		AL	
		130.10 R		AL	
		130.60 R		AA	
		130.70 R		EA & PI	
		131.10 R		AC	
		131.25 R		NC	
		131.70 R	MINNEAPOLIS	NW	
		131.90 R	ATLANTA	DL	
		131.95 R		OSC	
CLINTON	IA	[illegible] R		IV	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
CLOVIS	NM	129.60 R		TI	
COATESVILLE	PA	132.00 R		CAN	
CODY	WY	129.30 R		FL	
COLLEGE STATION	TX	131.90 R		ZK	
COLORADO SPRINGS	CO	129.30 R		FL	
		130.35 R		BN	
		130.90 R		CO	
COLUMBIA	MO	129.45 R		OZ	
COLUMBIA	SC	129.45 R	ATLANTA	DL	
		129.75 R		PI	
		129.95 R		EAI	
		130.70 R		EA	
		131.75 R		SO	
		131.80 R		SCA	
COLUMBUS	GA	129.85 R	ATLANTA	DL	
		131.75 R		SO	
COLUMBUS	MS	131.75 R		SO	
COLUMBUS	NE	129.30 R		FL	
COLUMBUS	OH	129.20 R		TW	
		129.40 R	ATLANTA	DL	
		129.80 R		PI	
		129.90 R		EA	
		130.05 R		AL	
		130.10 R		AL	
		130.30 R		AL	
		130.75 R		EA	
		131.25 R		NC	
		132.00 R		CJ	
CORNWELLS HEIGHTS	PA	131.45 R		ANG	
CORPUS CHRISTI	TX	129.40 R		TI	
		131.10 R		TI	
		131.35 R		BN	
		131.70 R		EA	
CORTEZ	CO	129.30 R		FL	
COVINGTON (SERVES GREATER CINCINNATI AIRPORT)	KY	129.10 R		TW	
		129.20 R		EA	
		129.40 R	ATLANTA	DL	
		129.80 R		PI	
		130.05 R		AL	
		130.10 R		AL	
		130.30 R		AL	
		131.25 R		NC	
		131.95 R		DL	
DALLAS (LOVE FIELD)	TX	129.25 R		BN	
		131.15 R		SLB	
		131.35 R		SW	
		131.10 R		BN	
		131.15 R		DGS	
		131.20 R		DRI	
		131.40 R		[illegible]	
		131.50 R		LAB	
		131.95 R		MV	
DALLAS-FT. WORTH (REGIONAL AIRPORT)	TX	129.00 R		AA	
		129.10 R		BT	
		129.20 R		AA	
		129.30 R		DC	
		129.40 R	ATLANTA	DL	
		129.50 R		TI	
		129.85 R		OZ	
		130.00 R		FL	
		130.10 R		TI	
		130.90 R		CO	
		130.95 R	ATLANTA	EA	
DALLAS-FT. WORTH (REGIONAL AIRPORT)	TX	131.35 R		BN	
		131.90 R		ZE	
		132.30 R		SO	
DANVILLE	IL	130.30 R		VGA	
DANVILLE	VA	129.75 R		PI	
DAYTON	OH	129.20 R		TW	
		130.05 R		AL	
		130.10 R		AL	
		130.30 R		AL	
		131.25 R		NC	
DAYTONA BEACH	FL	129.85 R		EA	
		130.25 R	MIAMI	NA	
		131.20 R	ATLANTA	EA	
DECATUR	IL	129.85 R		OZ	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
DENVER	CO	129.20 R		TW	
		129.30 R		FL	
		129.30 R		UA	
		129.80 R		TI	
		129.85 R		OZ	
		129.95 R		JC	
		130.10 R		WA	
		130.35 R		BN	
		130.90 R		CO	
		131.25 R		NC	
		131.35 R		UA	
		131.30 R		AP	
DES MOINES	IA	129.30 R		UA	
		129.90 R		OZ	
		130.35 R		BN	
DETROIT	MI	129.10 R		TW	
DETROIT (ALSO SEE YPSILANTI, MI)	MI	129.25 R		AA	
		129.30 R		UA	
		129.30 R		DL	
		129.40 R	ATLANTA	DL	
		129.65 R		EA	
		129.95 R		PAG	
		130.20 R		AL	
		130.25 R		AL	
		130.10 R		AL	
		130.30 R		FOB	
		130.35 R		BN	
		130.85 R		NW	
		130.95 R		NP	
		131.05 R	NEW YORK	PA	
		131.25 R		NC	
		131.30 R		BEN	
		131.45 R	MINNEAPOLIS	NW	
		131.70 R	MINNEAPOLIS	NW	
		130.[illegible] R		ZV	
DEVILS LAKE	ND	131.25 R		NC	
DODGE CITY	KS	130.00 R		ZV	
DOTHAN	AL	131.75 R		SO	
DOVER	DE	130.65 R		MAC	(SERVES DOVER AFB)
DUBOIS	PA	130.10 R		CAI	
DUBUQUE	IA	129.90 R		OZ	
		131.95 R		RV	
DULUTH	MN	129.30 R		NC	
DUNCAN	OK	131.90 R		HAL	
DURANGO	CO	129.30 R		FL	
EAGLE	CO	129.95 R		JC	
EAU CLAIRE	WI	129.80 R		NC	
		131.50 R		IU	
EL DORADO	AR	129.80 R		TI	
EL PASO	TX	129.20 R		AA	
		129.30 R		FL	
		129.35 R	ATLANTA	DL	
		129.80 R		TI	
		130.90 R		CO	
EL YUNQUE	PR	130.70 R		EA	
ELKHART	IN	130.30 R		ZN	
ELKINS	WV	130.30 R		[illegible]	
ELKO	NV	129.50 R		UA	
ELLSWORTH	ME	129.35 R		[illegible]	
ELMIRA	NY	130.00 R		AL	
		131.95 R		COM	
ELY	NV	129.50 R		UA	
ELYRIA	OH	129.85 R		[illegible]	
ENID	OK	130.00 R		FL	
ERIE	PA	129.05 R		AL	
		130.10 R		AL	
ESCANABA	MI	129.80 R		NC	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
EUGENE	OR	129.50 R 130.70 R 131.10 R		UA RW NW	
EUGENE IS. BLK 330A	LA	130.45 R		ALI	
EVANSTON	WY	131.70 R	MINNEAPOLIS	NW	
EVANSVILLE	IN	129.50 R 130.35 R 130.40 R 130.35 R 130.50 R 130.70 R	ATLANTA MINNEAPOLIS 	DL AL AL NW AL EA	
FAIRBANKS	AK	129.30 R		PA	
FAIRFIELD	CA	129.25 R 130.65 R 131.85 R		TV, AS, WO & JL MAC (SERVES TRAVIS AFB) FT	
FAIRMONT	MN	131.25 R		NC	
FARGO	ND	131.25 R 131.70 R	 MINNEAPOLIS	NC NW	
FARMINGDALE	NY	130.50 R		FFI	
FARMINGTON	NM	129.30 R		FL	
FAYETTEVILLE	AR	130.30 R		FL	
FAYETTEVILLE	NC	129.75 R 130.60 R	 MIAMI	PI NA	
FLAGSTAFF	AZ	129.30 R 129.65 R 130.95 R	 ATLANTA ATLANTA	FL DL EA	
FLINT	MI	131.25 R		NC	
FLORENCE	SC	129.75 R		PI	
FRANKLIN	PA	130.10 R		CAI	
FREEPORT	TX	130.85 R 130.95 R 131.65 R	 ATLANTA 	ALI EA ALI	
FRESNO	CA	129.35 R 129.40 R 130.70 R 130.90 R 131.10 R	SANTA ANA 	OC RW TW PS NW	
FT DIX	NJ	130.40 R 130.65 R		PA & CA (SERVES MCGUIRE AFB) MAC	
FT DODGE	IA	129.90 R		OZ	
FT LAUDERDALE	FL	129.30 R 130.10 R 130.25 R 130.35 R 130.55 R 130.95 R 131.30 R	 MIAMI MINNEAPOLIS 	UA NDT & MF NA NW TW EA SEE NOTE 2, PG. 73	
FT LEONARD WOOD	MO	129.45 R 130.20 R		OZ FL	
FT MADISON	IA	129.70 R		BBI	
FT MYERS	FL	131.25 R 131.40 R	MIAMI 	NA PQ	
FT SMITH	AR	130.30 R 130.55 R		FL GA	
FT WASHINGTON	PA	131.95 R		RGN	
FT WAYNE	IN	129.50 R	ATLANTA	DL	
FT WORTH	TX	129.20 R		AA	
GADSDEN	AL	131.75 R		SO	
GAINESVILLE	FL	130.70 R 131.40 R		EA PQ	
GALESBURG	IL	129.90 R		OZ	
GALION	OH	130.90 R		FSM	

AD-A098 642 ARINC RESEARCH CORP ANNAPOLIS MD F/G 17/2
WORLDWIDE CRISIS ALERTING NETWORK, PHASE II. TASK 2. IDENTIFICA--ETC(U)
APR 80 H P HIMPLER, J F HOLMES, G K PRUITT DCA100-80-C-0010
UNCLASSIFIED 1377-01-TR-2167 NL

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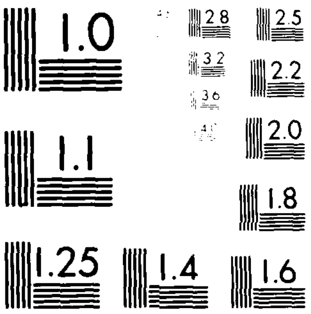

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
GALLUP	NM	120.30 R		FL	
GALVESTON	TX	120.95 R		PNI	
		129.10 R		PNI	
		130.30 R		PNI	
		131.05 R		ALI	
		131.95 R		HY	
		132.00 R		PNI	
GARDEN CITY	KS	130.00 R		FL	
[illegible]	CA	132.00 R		[illegible]	
[illegible]	GA	120.55 R	ATLANTA	BL	
[illegible]	GA	129.35 R	ATLANTA	BL	
GLASGOW	MT	120.30 R		FL	
GLENDIVE	MT	120.30 R		FL	
GLENS FALLS	NY	130.00 R		AL	
GOODLAND	KS	130.00 R		FL	
GRAND CANYON	AZ	131.10 R		[illegible]	
		131.10 R		[illegible]	
GRAND CHENIER	LA	130.05 R		ALI	
		131.05 R		ALI	
GRAND FORKS	ND	131.25 R		MC	
GRAND FORKS	ND	131.75 R		ND	
GRAND ISLAND	NE	120.30 R		FL	
GRAND JUNCTION	CO	120.30 R		FL	
GRAND RAPIDS	MI	131.25 R		MC	
GREAT BEND	KS	132.30 R		CY	
GREAT FALLS	MT	120.30 R		FL	
		131.90 R	MINNEAPOLIS	ND	
GREEN BAY	WI	120.00 R		MC	
GREENSBORO	NC	120.75 R		PI	
		130.70 R		EA	
GREENVILLE	MS	131.75 R		SB	
GREENWOOD	MS	131.75 R		SB	
GREER	SC	120.05 R		EA	
		120.75 R		PI	
		130.90 R	ATLANTA	EA	
		131.75 R		SB	
GRETNA	LA	130.05 R	NEW ORLEANS	ALI	
		131.05 R		ALI	
GROTON	CT	130.95 R		[illegible]	
		131.05 R		[illegible]	
GULFPORT	MS	131.75 R		SB	
GUNNISON	CO	120.30 R		FL	
HAILEY	ID	132.00 R		FS	
HARLINGEN	TX	120.25 R		[illegible]	
		120.80 R		TI	
HARRISBURG	PA	130.80 R		AE	
HARRISON	AR	130.00 R		FL	
HARTFORD (ALSO SEE WINDSOR LOCKS, CT)	CT	130.15 R		CHS	(SERVES [illegible])
		130.70 R		EA	(SERVES BDL)
HASTINGS	NE	120.30 R		FL	
HAVRE	MT	120.30 R		FL	
HAYDEN	CO	120.30 R		FL	
HAYS	KS	120.55 R	ATLANTA	BL	
		130.00 R		FL	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
HAYWARD	WI	131.30 R		IU	
HAZLETON	PA	130.[illegible] R		[illegible]	
HELENA	MT	131.90 R	MINNEAPOLIS	[illegible]	
HIBBING	MN	129.[illegible] R		NC	
HICKORY	NC	129.75 R		PI	
HIGH ISLAND	LA	128.99 R		PHI	
		129.10 R		PHI	
		129.35 R		PHI	
		130.38 R		PHI	
		132.00 R		PHI	
HILO	HI	129.30 R		[illegible]	
		129.30 R		HA	
		129.90 R		TS	
		130.30 R		UA	
		130.90 R		CO	
HILTON HEAD ISLAND	SC	132.00 R		[illegible]	
HOBBS	NM	129.80 R		TI	
HONOLULU	HI	129.00 R		CP	
		129.50 R		HA	
		129.30 R		TS	
		129.90 R		TS	
		130.90 R		CO	
		131.20 R		[illegible]	
		131.40 R		UA & CI	
		131.[illegible] R		[illegible]	
		131.80 R		JL	
HOT SPRINGS	AR	129.80 R		TI	
		130.00 R		FL	
HOT SPRINGS	VA	129.20 R		PI	
HOUGHTON	MI	129.80 R		NC	
HOUMA	LA	130.35 R		[illegible]	
		131.05 R		[illegible]	
HOUSTON (SERVES HOUSTON INTERCONTINENTAL AIRPORT UNLESS OTHERWISE INDICATED)	TX	128.25 R		ES	
		129.20 R		AA	
		129.25 R		[illegible]	HOU
		129.30 R		DL	
		129.70 R		[illegible]	
		129.75 R		[illegible]	
		129.80 R		TI	
		129.90 R		[illegible]	
		129.95 R		[illegible]	HOU
		130.05 R		[illegible]	HOU
		130.10 R		TI	HOU
		130.35 R		[illegible]	
		130.90 R		CO	
		131.10 R		[illegible]	HOU
		131.25 R	MIAMI	EA	
		131.85 R	ATLANTA	DL	
		131.90 R		[illegible]	
		132.00 R		[illegible]	
		130.15 R		[illegible]	HOU
HUDSON	NY	130.30 R		[illegible]	
HUNTINGTON	WV	129.80 R		PI	
		130.05 R		AL	
		130.30 R		AL	
HUNTSVILLE	AL	130.70 R		EA	
		131.75 R		SO	
HURON	SD	131.25 R		NC	
HYANNIS	MA	131.15 R		NE	
IDAHO FALLS	ID	129.60 R		[illegible]	
		130.10 R		WA	
		130.70 R		[illegible]	
		131.10 R		[illegible]	
IMPERIAL	CA	129.40 R		[illegible]	
		130.70 R		[illegible]	
		131.10 R		[illegible]	
INDIANAPOLIS	IN	129.50 R	ATLANTA	DL	
		129.35 R		[illegible]	
		129.85 R		[illegible]	
		129.90 R		[illegible]	
		130.05 R		AL	
		130.10 R		AL	
		130.13 R		EA & TW	
		130.30 R		AL	
		130.73 R	ATLANTA	EA	
		130.55 R		[illegible]	
INTERNATIONAL FALLS	MN	129.80 R		NC	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
INTRACOASTAL CITY	LA	120.95 R		PHI	
		129.10 R		PHI	
		129.35 R		PHI	
		130.35 R		PHI	
		132.00 R		PHI	
INVERNESS	CA	130.00 R		[illegible]	
IRON MOUNTAIN	MI	129.60 R		NC	
IRONWOOD	MI	129.00 R		NC	
ISLIP	NY	130.05 R		AL	
		135.85 R		AL	
ISLIP	NY	130.10 R		AL	
		131.45 R		AIR	
ITHACA	NY	130.00 R		AL	
JACKSON	MI	131.25 R		NC	
JACKSON	MS	129.35 R	ATLANTA	DL	
		129.60 R		DL	
		129.80 R		TI	
		131.75 R		SB	
		131.85 R	ATLANTA	DL	
JACKSON	TN	131.75 R		SB	
JACKSON	WY	129.20 R		FL	
JACKSONVILLE	FL	129.90 R	ATLANTA	DL	
		130.00 R		NA	
		130.25 R	MIAMI	NA	
		130.50 R	MIAMI	NA	
		130.70 R		EA	
		131.65 R		DL	
		131.75 R		SB	
		131.90 R	ATLANTA	DL	
JACKSONVILLE	NC	129.75 R		PI	
JAMESTOWN	ND	131.70 R		NW	
JAMESTOWN	NY	130.85 R		CHQ	
		130.25 R		CHQ	
		130.90 R		CHQ	
JANESVILLE	WI	130.90 R		NC	
JEFFERSON CITY	MO	129.95 R		[illegible]	
JOHNSTOWN	PA	130.10 R		CLR	
JONESBORO	AR	129.80 R		TI	
JOPLIN	MO	129.65 R		OZ	
		130.00 R		FL	
KAHULUI	HI	129.30 R		HA	
		129.50 R		HA	
		129.90 R		TS	
KAISER	MO	129.85 R		OZ	SEASONAL STATION. CLOSED DURING WINTE
KALAMAZOO	MI	130.95 R		UPJ	
		131.25 R		NC	
KALISPELL	MT	129.40 R		RW	
		130.70 R		NW	
		131.10 R		RW	
KAMUELA	HI	129.30 R		HA	
		129.50 R		HA	
KANSAS CITY (SERVES KANSAS CITY INT'L AIRPORT)	MO	129.00 R		TW	
		129.20 R		TW	
		129.35 R		FL	
		129.90 R		OZ	
		130.00 R		FL	
		130.35 R		BN	
		130.90 R		CO	
		131.25 R		NC	
KANSAS CITY (SERVES KANSAS CITY INT'L AIRPORT)	MO	131.65 R		DL	
		131.65 R	ATLANTA	DL	
		132.00 R		[illegible]	
KEAHOLE	HI	129.30 R		HA	
		129.50 R		HA	
KEARNEY	NE	129.30 R		FL	
KEENE	NH	131.15 R		[illegible]	
KILLEEN	TX	132.00 R		XO	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
KINSTON	NC	129.75 R		PI	
KIRKSVILLE	MO	129.90 R		OZ	
KLAMATH FALLS	OR	129.40 R		RW	
		130.70 R		AW	
		131.20 R		[illegible]	
KNOXVILLE	TN	129.20 R		AA	
		129.40 R	ATLANTA	DL	
		129.75 R		PI	
		131.45 R		DL	
		131.75 R		SO	
KOKOMO	IN	130.20 R		ZV	
LACONIA	NH	129.95 R		[illegible]	
LACROSSE	WI	131.80 R		[illegible]	
		131.95 R		ZV	
LAFAYETTE	IN	130.20 R		ZV	
LAFAYETTE	LA	[illegible] R		PHI	
		129.40 R		TI	
		131.30 R		PHI	
		131.35 R		AIR	
		132.30 R		PHI	
LAKE CHARLES	LA	129.40 R		TI	
		131.25 R	[illegible]	[illegible]	
LAKE HAVASU CITY	AZ	129.00 R		HCL	
LAKE JACKSON	TX	131.95 R		HV	
LAMAR	CO	122.00 R		FL	
LANAI	HI	129.30 R		HA	
		129.50 R		HG	
LANSING	MI	131.25 R		NC	
LARAMIE	WY	129.30 R		FL	
LAREDO	TX	129.80 R		TI	
LAS VEGAS	NV	129.30 R		FL	
		129.30 R		UL, TI & [illegible]	
		129.60 R		RW	
		129.85 R	ATLANTA	DL	
		132.10 R		WA	
		130.70 R		[illegible]	
		131.10 R		RW	
		131.45 R		DL	
		132.00 R		[illegible]	
LAUREL-HATTIESBURG	MS	131.75 R		SO	
LAWTON	OK	130.00 R		FL	
		130.90 R		CO	
LEESVILLE	LA	130.95 R		PHI	
		130.30 R		PHI	
		132.00 R		PHI	
LEWISBURG	WV	129.20 R		PI	
LEWISTON	ID	129.40 R		RW	
		130.70 R		RW	
		131.10 R		RW	
LEWISTON	ME	131.25 R		NE	
LEWISTOWN	MT	129.20 R		FL	
LEXINGTON	KY	129.20 R	ATLANTA	DL	
		129.75 R		PI	
		130.30 R		AL	
		130.60 R		AA	
		130.10 R		AL	
		130.75 R	ATLANTA	EA	
LIBERAL	KS	130.20 R		FL	
LIMA	OH	129.30 R		AG	
		129.30 R		NC	
		129.90 R		TI	
LINCOLN	NE	129.20 R		FL	
LINCOLN	NE	129.30 R		UA	
		130.20 R		ZV	
[illegible]	[illegible]	[illegible] R		[illegible]	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
LITTLE ROCK	AR	129.65 R	ATLANTA	DL	
		129.80 R		TI	
		130.00 R		PL	
		130.10 R		TI	
		130.35 R		BN	
		131.65 R	ATLANTA	DL	
LONDON	KY	129.75 R		PI	
LONG BEACH	CA	129.00 R		NCL	
		130.90 R		PS	
		131.00 R		VR	
LONGVIEW	TX	129.80 R		TI	
		131.05 R		HW	
LOS ANGELES	CA	129.15 R		BA	
		129.20 R		AA 5 NM	
		129.25 R		CO	
		129.40 R		UA	
		129.30 R		UA	
		129.35 R	ATLANTA	DL	
		129.60 R		JW	
		129.70 R		PA	
		129.80 R		TI	
		129.90 R		TW	
		130.00 R		CO	
		130.10 R		WA	
		130.35 R		CC	
		130.70 R		RW	
		130.95 R	ATLANTA	EA	
		131.10 R		RW	
LOS ANGELES	CA	131.15 R		PS	
		131.25 R		HA	
		131.45 R		UC	
		131.65 R		UNG	
		131.75 R		PT	
		131.80 R		TW	
LOUISVILLE	KY	129.25 R		AA	
		129.40 R	ATLANTA	DL	
		129.75 R		PI	
		129.85 R		OZ	
		130.30 R		AL	
		130.70 R		EA	
LUBBOCK	TX	129.80 R		TI	
		130.55 R		BN	
		130.90 R		CO	
LYNCHBURG	VA	129.50 R	ATLANTA	DL	
		129.85 R		PI	
MACON	GA	129.65 R	ATLANTA	DL	
		131.20 R	[illegible]	EA	
MADISON	WI	129.85 R		OZ	
		130.90 R		NC	
		131.00 R	MINNEAPOLIS	NW	
MAMMOTH LAKES	CA	129.75 R		SX	
MANASSAS	VA	129.40 R		CJ	
MANHATTAN	KS	130.00 R		FL	
MANISTEE	MI	131.20 R		NC	
MANITOWOC	WI	129.85 R		NC	
MANKATO	MN	131.25 R		NC	
MARION	IL	129.85 R		TZ	
MARQUETTE	MI	129.80 R		NC	
MARSHFIELD	WI	131.30 R		TW	
MARTHAS VINEYARD	MA	131.12 R		NE	
MASON CITY	IA	129.90 R		OZ	
MATTOON	IL	129.85 R		OZ	
MAYAGUEZ	PR	129.10 R		PQ	
MC FARLAND	CA	131.90 R		SW	
MCALESTER	OK	130.00 R		FL	
MCALLEN	TX	129.80 R		TI	
MCCOOK	NE	129.30 R		FL	
MEDFORD	OR	129.60 R		SW	
		130.70 R		WS	
		131.10 R		RW	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
MELBOURNE	FL	129.35 R		NA	
		130.25 R	MIAMI	NA	
		130.70 R		EA	
MELROSE	MA	131.15 R	BOSTON	NE	
MEMPHIS	TN	129.20 R		AA	
		129.30 R	ATLANTA	DL	
		129.40 R		DL	
		129.75 R		PI	
		129.80 R		TI	
		130.00 R		FL	
		130.05 R		AL	
		130.30 R		AA	
		130.35 R		BN	
		130.40 R		FED	
		130.95 R	ATLANTA	EA	
		131.75 R		SO	
		131.85 R	ATLANTA	DL	
MENOMINEE	MI	129.40 R		NC	
MERCED	CA	129.30 R		UA	
MERIDIAN	MS	129.35 R	ATLANTA	DL	
		131.75 R		SO	
MERRIFIELD	VA	130.60 R	MIAMI	NA	
		131.25 R	MIAMI	NA	
MIAMI	FL	128.90 R		ON	
		128.95 R		SN	
		129.05 R		AIR	
		129.15 R		EA	
		129.20 R		BIS	
MIAMI	FL	129.30 R		UA	
		129.30 R		DL	
		129.35 R		NA	
		129.45 R		NA	
		129.50 R	ATLANTA	DL	
		130.05 R		PA	
		130.25 R		NA	
		130.35 R	MINNEAPOLIS	NW	
		130.35 R		BN	
		130.75 R		EA	
		130.80 R		SFB	
		130.90 R		TS	
		131.10 R	ATLANTA	EA	
		131.25 R		NA	
		131.35 R		CO	
		131.30 R		AC	
		131.40 R		APO	
		131.65 R		NW	
		131.75 R		SO	
		132.30 R		GVT	
MIAMI SPRINGS	FL	129.40 R	MIAMI	PA	
MIDDLETOWN	PA	130.05 R		AL	
		130.10 R		AA	
		130.20 R		CLR	
		130.30 R		AA	
MIDLAND	TX	129.35 R	ATLANTA	DL	
		129.40 R		TI	
		130.10 R		TI	
		131.90 R		CO	
MILES CITY	MT	129.30 R		FL	
MILWAUKEE	WI	129.30 R		UA	
		129.35 R		NW	
		129.45 R		OZ	
MILWAUKEE	WI	130.70 R		TW	
		130.90 R		NC	
		131.65 R	MINNEAPOLIS	NW	
		131.90 R	MINNEAPOLIS	NW	
MINNEAPOLIS	MN	129.30 R		NW	
		129.50 R		UA	
		129.80 R		NC	
		129.90 R		OZ	
		130.10 R		WA	
		130.55 R		BN	
		130.75 R	ATLANTA	TI	
		131.25 R		NC	
		131.45 R		NW	
		131.30 R		IW	
		131.70 R		NS	
		131.90 R		NW	
		130.20 R		[illegible]	
MINOT	ND	131.45 R		NC	
MISSOULA	MT	129.30 R		FL	
		131.90 R	MINNEAPOLIS	NW	
MITCHELL	SD	131.25 R		NC	
MOAB	UT	129.30 R		FL	
MOBILE	AL	130.65 R		SOA	
		130.95 R	ATLANTA	EA	
		131.25 R	MIAMI	NA	
		131.75 R		SO	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
MODESTO	CA	129.30 R		UA	
MOLINE	IL	129.90 R		OZ	
MOLOKAI	HI	129.30 R		TS	
		129.50 R		TS	
MONROE	LA	129.80 R		TI	
		130.95 R	ATLANTA	SA	
		131.75 R		SC	
		131.85 R	ATLANTA	DL	
MONTEREY	CA	129.40 R		[illegible]	
		130.70 R		[illegible]	
		131.10 R		[illegible]	
MONTGOMERY	AL	129.55 R	ATLANTA	DL	
		130.95 R	ATLANTA	TA	
		131.75 R		SO	
MONTPELIER	VT	131.15 R		NE	
MONTROSE	CO	129.30 R		FL	
MORGANTOWN	WV	130.25 R		AL	
		130.50 R		AL	
MORRISTOWN	NJ	129.85 R		ULC	
		130.15 R		CCC	
		130.50 R		JUC	
MOSINEE	WI	129.90 R		NC	
MOULTRIE	GA	131.75 R		SO	
MT. PALOMAR	CA	129.55 R	ATLANTA	DL	
MT. VERNON	IL	129.85 R		OZ	
MUSCLE SHOALS	AL	131.75 R		SC	
MUSKEGON	MI	131.25 R		NC	
MUSKOGEE	OK	130.40 R		FL	
MUSTANG ISLAND	TX	128.95 R		PHI	
		129.10 R		PHI	
		130.30 R		PHI	
		131.00 R		PHI	
MYRTLE BEACH	SC	129.75 R		PI	
NANTUCKET	MA	131.15 R		NE	
NASHVILLE	TN	129.20 R		SA	
		129.40 R	ATLANTA	DL	
		129.75 R		PI	
		129.85 R		OZ	
		130.05 R		AL	
		130.50 R		AL	
		130.55 R		[illegible]	
		130.70 R		EA	
		131.75 R		SO	
NEW BEDFORD	MA	131.15 R		NE	
NEW BERN	NC	129.75 R		PI	
NEW HAVEN	CT	130.05 R		AL	
NEW HAVEN	CT	130.10 R		AL	
NEW IBERIA	LA	130.85 R		ALI	
		131.85 R		ALI	
NEW ORLEANS	LA	128.95 R		PHI	
		129.30 R		UA	
		129.55 R	ATLANTA	DL	
		129.40 R		TI	
		130.10 R		TI	
		130.35 R		[illegible]	
		130.70 R		EA	
		130.90 R		CO	
		130.95 R	ATLANTA	EA	
		131.25 R	[illegible]	NO	
		131.45 R		DL	
		131.75 R		SO	
		131.85 R	ATLANTA	DL	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
NEW YORK	NY	128.35 R		NA	
(SERVES JOHN F. KENNEDY INT'L AIRPORT UNLESS OTHERWISE INDICATED)		128.95 R		NW	
		129.05 R		PI	
		129.10 R		TW	
		129.15 R		BA	
		129.20 R		AA	LGA
		129.30 R		UA	LGA & JFK
		129.45 R		PA	
		129.70 R		[illegible]	
		129.75 R		NA	
		129.80 R		PA	
		129.95 R		NY	
		[illegible] R		AA	
		130.00 R		AA	LGA
		130.05 R		[illegible]	
		130.05 R		AA	LGA
		130.10 R		AL	
		130.10 R		AA	LGA
		130.40 R		EA	
		130.45 R		SEE NOTE 8, Pg. 76	
		[illegible] R		[illegible]	
		130.60 R	MIAMI	NA	
NEW YORK	NY	130.75 R		EA	LGA
(SERVES JOHN F. KENNEDY INT'L AIRPORT UNLESS OTHERWISE INDICATED)		130.95 R		[illegible]	
		130.95 R		[illegible]	LGA
		131.00 R	ATLANTA	EA	
		131.05 R		TW	
		131.15 R		[illegible]	LGA
		131.20 R		NY	
		131.25 R	MIAMI	NA	
		131.30 R		SEE NOTE 1, Pg. 73	
		131.40 R		EA	
		131.45 R	MINNEAPOLIS	NW	
		131.55 R		SEE NOTE 3, Pg. 73	
		131.75 R		[illegible]	LGA
		131.85 R		DL	
		131.90 R	ATLANTA	DL	
		131.95 R		[illegible]	
NEWARK	NJ	128.85 R		NA	
		129.35 R		PI	
		129.05 R		PIE	
		129.25 R		EA	
		129.50 R	ATLANTA	DL	
		129.55 R		UA	
		130.00 R		AA	
		130.05 R		[illegible]	
		130.10 R		AL	
		130.35 R		[illegible]	
		130.45 R		[illegible]	
		130.85 R		[illegible]	
		131.00 R	ATLANTA	EA	
		131.20 R		NY	
		131.25 R	MIAMI	NA	
		131.45 R	MINNEAPOLIS	NW	
		131.85 R		DL	
NEWBURGH	NY	131.20 R		NYR	
NEWPORT BEACH	CA	129.35 R	SANTA ANA	OC	
NEWPORT NEWS	VA	129.80 R		PI	
NEWPORT NEWS	VA	[illegible] R		AL	
		[illegible] R		AL	
		[illegible] R		PI	
		[illegible] R	MIAMI	NA	
NORFOLK	NE	[illegible] R		[illegible]	
NORFOLK	VA	129.30 R		UA	
		129.80 R		PI	
		130.30 R		NA	
		[illegible] R		AL	
		[illegible] R		AL	
		[illegible] R	MIAMI	NA	
NORTH ADAMS	MA	[illegible] R		SPG	
NORTH BEND	OR	[illegible] R		[illegible]	
		[illegible] R		[illegible]	
		[illegible] R		[illegible]	
NORTH PLATTE	NE	[illegible] R		[illegible]	
NOVATO	CA	[illegible] R		[illegible]	
OAKLAND	CA	[illegible] R		[illegible]	
		[illegible] R		[illegible]	
		[illegible] R	SANTA ANA	OC	
		[illegible] R		[illegible]	
		[illegible] R		UA	
		[illegible] R		UA	
		[illegible] R		SVC	
		[illegible] R		[illegible]	
		[illegible] R		[illegible]	
		[illegible] R		[illegible]	
OCALA	FL	[illegible] R		[illegible]	
OKLAHOMA CITY	OK	[illegible] R		EA	
		[illegible] R	ATLANTA	DL	
		[illegible] R		FL	
		[illegible] R		[illegible]	
		[illegible] R		[illegible]	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
OMAHA	NE	129.30 R		PL	
		129.35 N		UA	
		129.90 R		OZ	
		130.35 R		[illegible]	
		130.75 R	ATLANTA	EA	
		131.25 N		NC	
ONTARIO	CA	129.20 R		AA	
		129.35 N	SANTA ANA	OC	
		129.50 R		UA	
		129.60 R		[illegible]	
		130.10 N		[illegible]	
		130.70 R		RW	
		130.90 N		PS	
		131.10 R		RW	
		131.60 R		TW	
OPA LOCKA	FL	131.06 R		MIA	
ORLANDO	FL	129.30 N		DL	
		129.90 R	ATLANTA	DL	
		130.00 R		NA	
		130.25 R	MIAMI	NA	
		130.70 N		CS	
		131.35 R		NAJ	
		131.75 N		SO	
OSHKOSH	WI	129.80 N		NC	
OTTUMWA	IA	129.90 N		OZ	
OXFORD	MS	131.75 N		SO	
OXNARD	CA	129.10 R		SWA	
PADUCAH	KY	129.85 N		OZ	
PAGE	AZ	129.60 R		RW	
		130.70 N		RW	
		131.10 R		RW	
PAGO PAGO	AS	131.40 R		PA	
PALM SPRINGS	CA	129.20 R		AA	
		129.60 N		RW	
		130.10 R		UA	
		130.70 N		[illegible]	
		131.10 R		RW	
PALMDALE	CA	130.00 N		[illegible]	
PANAMA CITY	FL	129.90 R	ATLANTA	DL	
		131.25 N	MIAMI	NA	
		131.75 R		SO	
PARIS	TX	130.00 N		PL	
PARKERSBURG	WV	129.00 R		PT	
		130.35 N		AL	
		130.10 R		AL	
PARSONS	KS	130.00 N		PL	
PASCO	WA	129.60 R		RW	
		130.70 N		RW	
		131.10 R		RW	
		131.35 N		CA	
PATTERSON	LA	130.00 R		ALI	
		131.05 N		ALI	
		131.35 R		AIR	
PELLSTON	MI	131.25 N		NC	
PENDLETON	OR	129.50 R		UA	
PENSACOLA	FL	128.95 N		[illegible]	
		130.70 R		EA	
		131.25 N	MIAMI	NA	
PEORIA	IL	129.05 R		OZ	
		129.90 N		OZ	
PHILADELPHIA	PA	129.05 R		PT	
		129.20 N		TW	
		129.30 R		UA	
		129.50 N	ATLANTA	DL	
		129.70 R		PA	
		130.00 N		[illegible]	
		130.05 R		AL	
		130.20 N		AL	
		130.15 R		ESI	
		130.60 N	MIAMI	NA	
		130.90 R		AE	
		131.10 N		EA	
		131.20 R		AA	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
PHILADELPHIA	PA	131.25 R	MIAMI	EA	
		131.45 R		COP	
		131.65 R		[illegible]	
		131.72 R	MINNEAPOLIS	NW	
		131.85 R		DL	
PHILIPSBURG	PA	130.12 R		CLK	
		131.45 R	MINNEAPOLIS	NW	
PHOENIX	AZ	128.85 R		OP	
		[illegible]		[illegible]	
		129.30 R		FL	
		129.33 R	ATLANTA	DL	
		129.60 R		[illegible]	
		129.75 R		[illegible]	
		130.15 R		WA	
		130.75 R		[illegible]	
		130.90 R		CB	
		131.15 R		[illegible]	
		131.80 R		TW	
		[illegible]		[illegible]	
PIERRE	SD	130.15 R		WA	
		131.25 R		[illegible]	
		131.70 R	MINNEAPOLIS	NW	
PINE BLUFF	AR	129.65 R		TI	
PITTSBURGH	PA	129.20 R		TW	
		129.35 R		UA	
		130.00 R		AL	
		[illegible]		[illegible]	
		130.10 R		AL	
		130.30 R		[illegible]	
		130.50 R		AL	
		130.70 R		EA	
		130.90 R	ATLANTA	EA	
		131.70 R	MINNEAPOLIS	NW	
		131.90 R		[illegible]	
PLYMOUTH	MI	130.95 R		[illegible]	
POCATELLO	ID	129.40 R		RW	
		130.10 R		WA	
		130.70 R		RW	
		131.10 R		RW	
PONCA CITY	OK	130.00 R		FL	
PONCE	PR	129.10 R		[illegible]	
		130.70 R		EA	
PONTIAC	MI	[illegible]		[illegible]	
POPLAR HEIGHTS	VA	130.45 R	WASHINGTON	EA	
PORTLAND	ME	129.30 R	ATLANTA	DL	
		129.55 R		[illegible]	
		131.25 R		NE	
PORTLAND	OR	129.00 R		UA	
		129.30 R		[illegible]	
		129.50 R		UA	
		129.80 R		[illegible]	
		130.10 R		UA	
		130.35 R		[illegible]	
		130.70 R		[illegible]	
		130.95 R		[illegible]	
		131.00 R		EA	
		131.20 R		[illegible]	
		131.90 R	MINNEAPOLIS	NW	
POUGHKEEPSIE	NY	[illegible]		[illegible]	
PRESQUE ISLE	ME	131.90 R	ATLANTA	DL	
PROVIDENCE	RI	130.00 R		AL	
		130.35 R		AL	
		131.10 R		AL	
		130.70 R		EA	
		131.25 R	MIAMI	EA	
PUEBLO	CO	129.30 R		FL	
PULLMAN	WA	131.35 R		[illegible]	
QUINCY	IL	129.45 R		OZ	
		[illegible]		[illegible]	
RALEIGH	NC	129.30 R	ATLANTA	DL	
		129.75 R		PI	
		130.70 R		EA	
		131.00 R	ATLANTA	EA	
		131.15 R		[illegible]	
RAPID CITY	SD	129.30 R		FL	
		131.25 R		NC	
READING	PA	129.35 R		[illegible]	
REDDING	CA	129.00 R		RW	
		130.70 R		[illegible]	
		131.10 R		RW	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
RENO	NV	129.30 R		UA	
		129.60 R		RW	
RENO	NV	130.10 R		WA	
		130.70 R		FW	
		131.10 R		[illegible]	
RHINELANDER	WI	129.80 R		NC	
RICHMOND	VA	129.40 R		[illegible]	
		129.80 R		PI	
		130.70 R		EA	
		130.60 R		AL	
RIVERTON	WY	129.30 R		FL	
ROANOKE	VA	129.60 R		PI	
ROCHESTER	MN	129.90 R		OZ	
		131.25 R		NC	
		131.90 R	MINNEAPOLIS	NW	
ROCHESTER	NY	129.20 R		AA	
		129.30 R		UA	
		130.00 R		AL	
		131.90 R	ATLANTA	DL	
ROCK SPRINGS	WY	129.30 R		FL	
ROCKFORD	IL	129.35 R		OZ	
ROCKY MOUNT	NC	129.75 R		PI	
ROSWELL	NM	129.80 R		TI	
SACRAMENTO	CA	129.35 R	SANTA ANA	OC	
SACRAMENTO	CA	129.30 R		UA	
		130.10 R		WA	
		130.70 R		RW	
		130.90 R		PS	
SAGINAW	MI	131.25 R		NC	
SALINA	KS	130.30 R		FL	
SALISBURY	MD	131.50 R		[illegible]	
SALT LAKE CITY	UT	129.30 R		FL	
		129.30 R		UA	
		129.60 R		RW	
		129.80 R		TI	
		130.10 R		WA	
		130.70 R		[illegible]	
		131.10 R		RW	
SAN ANGELO	TX	129.80 R		TI	
SAN ANTONIO	TX	129.20 R		AA	
		129.25 R		BN	
		129.35 R	ATLANTA	DL	
		129.80 R		TI	
		130.55 R		BN	
		130.65 R		MAC	(SERVES KELLY AFB)
		130.90 R		CO	
		130.95 R	ATLANTA	EA	
SAN BERNARDINO	CA	130.65 R		MAC	(SERVES NORTON AFB)
SAN DIEGO	CA	129.20 R		AA	
		129.30 R		UA	
		129.60 R		RW	
		130.10 R		WA	
SAN DIEGO	CA	130.70 R		RW	
		130.90 R		PS	
		131.10 R		[illegible]	
		131.45 R		DL	
SAN FRANCISCO	CA	129.20 R		CP	
		129.05 R		PT	
		129.10 R		UA	
		129.20 R		AA	
		129.30 R		[illegible]	
		129.30 R		UA	
		129.35 R	ATLANTA	DL	
		129.60 R		RW	
		129.70 R		PA	
		130.00 R		[illegible]	
		130.10 R		WA	
		130.70 R		[illegible]	
		131.10 R		RW	
		131.25 R		PA	
		131.45 R		DL	
		131.30 R		AC	
SAN JOSE	CA	129.35 R	SANTA ANA	OC	
		129.30 R		UA	
		130.10 R		WA	
		130.30 R		CO	
		130.70 R		RW	
		130.90 R		PS	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
SAN JUAN	PR	129.00 R		IB	
		129.10 R		AA	
		130.75 R		EA	
		131.40 R		PB	
SANTA ANA	CA	129.40 R		RW	
		130.70 R		AA	
		131.10 R		RW	
SANTA BARBARA	CA	130.70 R		RW	
SANTA MARIA	CA	130.70 R		RW	
SARASOTA	FL	130.15 R		EA	
		131.25 R	MIAMI	NA	
SAULT ST. MARIE	MI	131.25 R		NC	
SAVANNAH	GA	129.45 R	ATLANTA	DL	
		130.60 R	MIAMI	NA	
SCOTTS BLUFF	NE	129.30 R		FL	
SEATTLE	WA	129.00 R		UA	
		129.10 R		PA	
(SERVES SEATTLE-		129.30 R		UA	
TACOMA INT'L AIRPORT		129.40 R		RW	
UNLESS OTHERWISE INDICATED)		130.10 R		WA	
		130.45 R		SW	
		130.55 R		BN	
		130.70 R		RW	
		130.95 R		CO	
		131.00 R		EA	
		131.10 R		TW	
		131.20 R		AS	
		131.70 R		WA	
		131.85 R		FT	
		131.90 R	MINNEAPOLIS	NW	
		132.00 R		STS	
SHEBOYGAN FALLS	WI	131.30 R		TU	
SHERIDAN	WY	130.10 R		WA	
SHREVEPORT	LA	129.20 R		DL	
		129.40 R		TI	
		130.35 R		NA	
		131.85 R	ATLANTA	CL	
SIDNEY	MT	129.30 R		FL	
SIDNEY	NE	129.30 R		FL	
SILVER CITY	NM	129.30 R		FL	
SIOUX CITY	IA	129.90 R		OZ	
		131.25 R		NC	
		132.00 R		SAM	
SIOUX FALLS	SD	129.90 R		OZ	
		130.10 R		WA	
		131.25 R		NC	
SMYRNA	TN	132.00 R		CL	
SOUTH BEND	IN	131.15 R		[illegible]	
		131.25 R		NC	
SOUTH LAKE TAHOE	CA	129.35 R	SANTA ANA	CE	
		130.70 R		RW	
SOUTH MARSH ISLAND	LA	128.95 R		PHI	
		129.10 R		PHI	
		129.25 R		PHI	
		130.50 R		PHI	
		132.30 R		PHI	
SPOKANE	WA	129.55 R		WO	
[illegible]	[illegible]	129.40 R		RW	
		130.70 R		RW	
		130.85 R		WO	
		131.10 R		RW	
		131.90 R	MINNEAPOLIS	NW	
SPRINGFIELD	IL	129.85 R		OZ	
		130.30 R		CE	
SPRINGFIELD	MO	129.85 R		OZ	
		131.35 R	ATLANTA	DL	
ST CROIX	VI	129.10 R		AA	
		130.70 R		EA	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
ST LOUIS	MO	126.85 R		EA	
		129.10 R		TW	
		129.20 R		AA	
		129.50 R	ATLANTA	DL	
		129.65 R		OL	
		129.95 R		OZ	
		130.00 R		FL	
		130.35 R		AA	
		130.50 R		AL	
		130.55 R		BN	
		130.75 R	ATLANTA	EA	
		131.05 R		PAS	
		131.75 R		SO	
		132.00 R		ZV	
		132.05 R		OZ	
ST PETERSBURG	FL	130.30 R		STA	
ST THOMAS	VI	129.10 R		AA	
		130.70 R		EA	
STAUNTON	VA	129.00 R		PI	
STEAMBOAT SPRINGS	CO	129.95 R		JC	
STERLING ROCK FALLS	IL	129.85 R		OZ	
STEVENS POINT	WI	129.65 R		SEN	
		131.50 R		IU	
STILLWATER	OK	130.00 R		FL	
STOCKTON	CA	129.60 R		RW	
		130.70 R		AW	
		130.90 R		PS	
		131.10 R		RW	
STURGEON BAY	WI	131.50 R		IU	
SYRACUSE	NY	130.[illegible] R		AL	
		130.70 R		EA	
		130.90 R		BA	
TACOMA	WA	130.65 R		MAC (SERVES MC CHORD AFB)	
TALLAHASSEE	FL	130.45 R	MINNEAPOLIS	NW	
		131.10 R	ATLANTA	EA	
		131.25 R		NA	
		131.75 R		SO	
TAMPA	FL	128.85 R		EI	
		128.90 R		BN	
		129.30 R		UA	
		129.70 R		PA	
		129.90 R	ATLANTA	DL	
		130.00 R		NA	
TAMPA	FL	130.35 R	MINNEAPOLIS	NW	
		130.55 R		PW	
		131.10 R	ATLANTA	EA	
		131.15 R	MIAMI	AC	
		131.25 R	MIAMI	NA	
		131.90 R		DL	
TEMPLE	TX	129.60 R		TI	
TETERBORO	NJ	130.15 R		TAS & ACT	
		130.65 R		TXI	
		133.05 R		EAF	
		130.95 R		AEC	
		131.95 R		DWV	
		132.36 R		PJE	
TEXARKANA	AR	129.60 R		TI	
THIEF RIVER FALLS	MN	131.25 R		NC	
TOLEDO	OH	130.05 R		AL	
		130.30 R		AC	
		130.70 R		EA	
[illegible]	TX	131.30 R		MOB	
TONOPAH	NV	129.55 R	ATLANTA	DL	
TOPEKA	KS	129.85 R		PA	
		130.00 R		FL	
TRAVERSE CITY	MI	131.25 R		NC	
TRENTON	NJ	131.05 R		NWS	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
TUCSON	AZ	128.35 R		[illegible]	
		129.20 R		AA	
		129.30 R		FL	
		129.35 R	ATLANTA	DL	
		129.50 R		[illegible]	
		129.60 R		RW	
		130.70 R		[illegible]	
		130.90 R		CO	
		131.20 R		[illegible]	
TULSA	OK	129.20 R		[illegible]	
		129.20 R		AA	
		129.85 R		OZ	
		130.00 R		FL	
		130.35 R		[illegible]	
		130.90 R		CO	
TOPEKA	KS	131.75 R		[illegible]	
TUSCALOOSA	AL	131.75 R		SO	
TWIN FALLS	ID	129.80 R		[illegible]	
		130.70 R		RW	
		131.20 R		[illegible]	
TYLER	TX	131.95 R		[illegible]	
UTICA	NY	130.00 R		AL	
VALDOSTA	GA	131.75 R		SO	
VALPARAISO	FL	131.75 R		SO	
VENICE	LA	128.95 R		PHI	
		129.10 R		PHI	
		129.35 R		PHI	
		130.55 R		PHI	
		131.45 R		ALI	
		131.45 R		ALI	
		132.00 R		PHI	
VERMILION BLK 267A	LA	131.35 R		ALI	
VERMILION 265-A	LA	131.30 R		PHI	
VERNAL	UT	129.30 R		FL	
VICTORIA	TX	131.95 R		[illegible]	
VISALIA	CA	129.30 R		[illegible]	
WACO	TX	129.40 R		TI	
WALLA WALLA	WA	131.35 R		CZ	
WASHINGTON	DC				(SEE ARLINGTON & CHANTILLY, VA.)
WATERLOO	IA	129.90 R		CZ	
WATERTOWN	SD	131.25 R		NC	
WATERVILLE	ME	132.15 R		NE	
WAYCROSS	GA	131.30 R		SO	
WENATCHEE	WA	131.35 R		CZ	
WEST DELTA BLK 133A	LA	130.85 R		ALI	
		131.45 R		ALI	
WEST PALM BEACH	FL	129.30 R		[illegible]	
		130.25 R	MIAMI	NA	
		130.45 R		EA	
WEST TRENTON	NJ	130.30 R		USS	
WEST YELLOWSTONE	MT	130.20 R		FL & [illegible], SEE NOTE 4, PG. 72	
WESTERLY	RI	129.35 R		[illegible]	
WESTFIELD	MA	131.35 R		[illegible]	
WHITE PLAINS	NY	130.00 R		AL	
		130.55 R		UA	
		132.30 R		SEE NOTE 8, PG. 74	
WICHITA	KS	130.00 R		FL	
		130.55 R		TW	
		130.90 R		CO	
		131.00 R		[illegible]	

STATION NAME	STATE	FREQUENCY	RADIO CALL IF OTHER THAN STATION NAME	STAFFED BY	REMARKS
WICHITA FALLS	TX	129.80 R		TT	
		130.90 R		CO	
WILLCOX	AZ	130.20 R		[illegible]	
WILKES-BARRE	PA	130.05 R		AL	
		130.10 R		AL	
		130.50 R		AL	
WILLIAMSPORT	PA	130.05 R		AL	
		130.10 R		AL	
		131.80 R		AK	
WILLISTON	ND	129.30 R		FL	
WILMINGTON	DE	130.40 R		AL	
WILMINGTON	NC	129.65 R	ATLANTA	DL	
		129.75 R		PI	
WILMINGTON	OH	131.20 R		EV	
WINDSOR LOCKS (ALSO SEE HARTFORD, CT)	CT	130.05 R		AL	
		130.90 R	ATLANTA	DL	
		130.20 R		PN	
WINONA	MN	131.95 R		EV	
WINSLOW	AZ	129.30 R		FL	
WINSTON-SALEM	NC	129.75 R		PI	
		129.80 R		PI	
WISCONSIN RAPIDS	WI	130.30 R		[illegible]	
WOLF POINT	MT	129.30 R		FL	
WORCESTER	MA	130.35 R		YAV	
WORLAND	WY	129.30 R		FL	
WORTHINGTON	MN	131.25 R		NC	
YAKIMA	WA	129.60 R		RW	
		130.70 R		RW	
		131.10 R		RW	
YANKTON	SD	131.25 R		NC	
YOUNGSTOWN	OH	130.05 R		AL	
		130.10 R		AL	
		131.95 R		[illegible]	
YPSILANTI (WILLOW RUN AIRPORT)	MI	129.25 R		[illegible]	
		129.80 R		[illegible]	
		130.45 R		CVC	
		131.70 R		[illegible]	
		132.30 R		[illegible]	
YUMA	AZ	129.60 R		RW	
		130.70 R		RW	
		131.10 R		RW	

SPECIAL NOTES

Note 1: The New York, New York, 131.30 MHz station is staffed by:

Capitol International Airways
Saturn Airways
Seaboard World Airways
Swiss Air Transport Company Limited
Trans International Airlines

This facility has a remote station at Bangor, Maine that is keyed simultaneously with the station at JFK.

Note 2: The Fort Lauderdale, Florida, 132.0 MHz station is staffed by:

Business Air Center
Hansa Jet Corporation
Robert Graf, Inc.
Sunny South Aircraft Service

Note 3: This facility has a remote station at Bangor, Maine that is keyed simultaneously with the station at JFK.

Note 4: The West Yellowstone, Mt., 130.10 MHz station is operational only from June to October each year; the station is closed the rest of the year.

Note 5: The White Plains, New York, 132.0 MHz station is staffed by:

General Electric Co. (Operations & Maintenance)
International Aviation Services of New York
National Weather Service
Rockwell International Corporation
Panorama Air Tours
United Skyport Corporation
Universal Aviation, Inc.

Note 6: The New York, New York station on 130.45 MHz serves JFK and is staffed by:

Irish International Airlines
Japan Air Lines
Scandinavian Airlines System

Note 7: The Washington National Airport station (131.65 MHz) is staffed by:

Fairways Corporation
Henson Aviation, Inc.
Pennsylvania Commuter Airlines
Ransome Airlines
Suburban Airlines

APPENDIX C

SOCIETE INTERNATIONALE de TELECOMMUNICATIONS AERONAUTIQUES (SITA) DETAILED TELECOMMUNICATIONS DATA

This Appendix contains excerpts from the SITA Telecommunications Manual. Pages C-2 through C-19 in the Stations Routing Responsibility List containing names (and authorized abbreviations) of countries and airlines, class of service, reforwarding directions (if applicable) and tariff data (where applicable). This list is restricted to those members of NATO countries only. Pages C-21 through C-24 are excerpts from the Routing Index which supplements the foregoing by adding location aides and relaying instructions. These lists have a high degree of commonality.

STATIONS ROUTING RESPONSIBILITY LIST

LISTE DES RESPONSABILITES D'ACHEMINEMENT DES CENTRES

1. The abbreviations in the 5th column indicate the facility to which telegrams are to be transferred for onward transmission.

RTA	means:	Relay via the	AFTN
RTC	"	" "	Private Cable Company
RTP	"	" "	Public Telegraph Network
RTX	"	" "	Public Telex Network

2. In the 6th column

   Telex rates indicated are for 3 minutes period unless otherwise indicated.

   PTN rates indicated are the ordinary rates per word, URGENT rate is the double of the ordinary rate, LT rate is the half of the ordinary rate for a minimum of 22 words.

STATIONS ROUTING RESPONSIBILITY LIST

LISTE DES RESPONSABILITES D'ACHEMINEMENT DES CENTRES

ADDRESS/*ADRESSE*					
COUNTRY OF DESTINATION *PAYS DE DESTINATION*	Locations *Lieux d'emplacement*	AIRLINE ADDRESSED *COMPAGNIE DESTINATAIRE*	Class of telegrams *Classe de télégrammes*	Reforwarded via *Retransmis via*	APPLICABLE TARIFFS *TARIFS APPLICABLES*
(1)	(2)	(3)	(4)	(5)	(6)
AMMAN AMM					
Jordan	all	all airlines			
AMSTERDAM AMS					
Netherlands	all	all airlines			
ANKARA ANK					
Turkey					
- Area Ankara	ANK	all airlines			
ATHENS ATH					
Greece	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
Congo (Democratic Republic of)					
- Area Kinshasa	FIH FKI FMI KLY LLB	all airlines except QC SN	A B1	RTA	
			B2	RTX	AFR 240.00
- Area Lubumbashi	FBM	all airlines except QC SN	A B1	RTA	
			B2	RTX	AFR 840.00
Rwanda	KGL	all airlines except EC QC SN	A B1	RTA	
			B2	RTP	AFR 50.00
BRUSSELS BRH					
Belgium	all	all airlines			
Burundi	all	EC QC SN		Priv Nw	
Congo (Democratic Republic of)					
- Area Kinshasa	FIH FKI FMI KLY LLB	QC SN		Priv Nw	
- Area Lubumbashi	FBM	QC SN		Priv Nw RTX	
Rwanda	all	EC QC SN		Priv Nw	
BUCHAREST BUH					
Roumania	all	all airlines			
BUDAPEST BUD					
Hungary	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
COPENHAGEN CPH					
Denmark	all	all airlines			
Faeroe Islands	all	all airlines		RTX	DKR 10.50
Greenland	all	all airlines		RTX	DKR 33.00
Sweden	only MMA	all airlines		RTX	DKR 0.25
COTONOU COO					
Dahomey	all	all airlines			
Togo	LFW	all airlines except KL LH			
CURACAO CUR					
El Salvador	SAL	LM TO VA			
Honduras	TGU	LM VA			
Netherlands Antilles	all	IB KL LM PR VA			
Nicaragua	MGA	LM VA			
Panama and Panama Canal Zone	BLB PTY	IB KL LM VA			
Suriname	all	IB KL LM PR VA			
DAKAR DKR					
Mauritania	all	all airlines	A B1	RTA	
			B2	RTP or RTX	AFR 20.00 AFR 30.00 each 10 seconds
Senegal	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
ENTEBBE EBB					
Uganda					
- Area Entebbe	EBB	all airlines			
FORT LAMY FTL					
Tchad Republic	all	all airlines			
	FTR	RK		RTX	AFR 11.375 p/20 sec
FRANKFURT FRA					
German Federal Rep.	all *	all airlines			
*(Certain BER addresses are under the responsibility of SXF)					
FREETOWN FNA					
Sierra Leone	all	all airlines			
GENEVA GVA					
Switzerland					
- Area Geneva	GVA only	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
ISTANBUL IST					
Turkey					
- Area Istanbul	all except ANK	all airlines			
JEDDAH JED					
Saudi Arabia					
- Area Jeddah	JED	all airlines			
JOHANNESBURG JNB					
Angola	all	all airlines except SA TP		RTC	SAR 0.17
Botswana	all	all airlines except TP		RTX RTC	SAR 0.125 SAR 0.03 min. 12 w
Lesotho	all	all airlines except TP		RTX RTC	SAR 0.20 SAR 0.03
Malawi	all	all airlines except TP		RTX RTC	SAR 0.81 SAR 0.04 min. 12 w
Mozambique	all	all airlines except TP		RTC	SAR 0.03 min. 12 w
Rhodesia	all	all airlines except TP		RTX RTC	SAR 0.75 SAR 0.03
South Africa	all	all airlines except TP			
South West Africa	all	all airlines except TP		RTX RTC	SAR 0.75 SAR 0.02 min. 14 w
Swaziland	all	all airlines		RTX	SAR 0.375
Zambia	all	all airlines except QZ TP		RTX RTC	SAR 0.90 SAR 0.12 min. 7 w

(1)	(2)	(3)	(4)	(5)	(6)
LISBON LIS					
Angola	all	SA TP		Priv Nw	
Azores	all	all airlines	A B1	RTA	
			B2	RTP	ESP 1.00
Botswana	all	TP		Priv Nw	
Cape Verde Islands	all	all airlines	A B1	RTA	
			B2	RTP	ESP 5.00
Lesotho	all	TP		Priv Nw	
Madeira Islands	FNC	all airlines	A B1	RTA	
			B2	RTP	ESP 1.00
Malawi	all	TP		Priv Nw	
Mozambique	all	TP		Priv Nw	
Portugal	all	all airlines			
Portuguese Guinea	BXO	all airlines	A B1	RTA	
			B2	RTP	ESP 5.00
Portuguese Timor	DIL	all airlines	A B1	RTA	
			B2	RTP	ESP 5.00
Principe Islands	PCP	all airlines	A B1	RTA	
			B2	RTP	ESP 5.00
Rhodesia	all	TP		Priv Nw	
S. Tome Islands	TMS	all airlines	A B1	RTA	
			B2	RTP	ESP 5.00
South Africa	all	TP		Priv Nw	
South West Africa	all	TP		Priv Nw	

(1)	(2)	(3)	(4)	(5)	(6)
LONDON LON					
British Honduras	all	all airlines except IB KL LH LM PR VA		RTP	UK£ 0. 1. 5
Iceland	all	all airlines except LL		RTX	UK£ 0.15. 0
India	all	AZ JL		Priv Nw	
Japan	all	JL OA		Priv Nw	
Malta	all	BE		Priv Nw	
		other airlines		RTP	UK£ 0. 0. 8
United Kingdom	all	all airlines			
LUXEMBURG LUX					
Iceland	all	LL		Priv Nw	
Luxemburg	all	all airlines			
MADRID MAD					
Equatorial Guinea	all	all airlines		RTC	SPP 6.00
Spain					
- Area Madrid and all Spanish locations not listed under other Spanish areas		all airlines			
Spanish Sahara	EUN	all airlines		RTC	SPP 3.00

(1)	(2)	(3)	(4)	(5)	(6)
MALAGA AGP					
Spain - Area Malaga	AGP	all airlines			
MANILA MNL					
American Samoa	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
British Solomon Islands	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
Brunei	BTN	all airlines	A	RTA	
			B1 B2	RTA RTC	PHP 0.55 p/10 w PHP 2.61
China (Taiwan)	TPE	all airlines except CI CX FT KE VN	A	RTA	
			B1 B2	RTA RTC RTX	PHP 0.55 p/10 w PHP 1.25 PHP 54.00
Cocos Islands	CCK	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
Guam (Mariana Isl.)	GUM	all airlines	A	RTA	
			B1 B2	RTA RTC RTX	PHP 0.55 p/10 w PHP 1.15 PHP 54.00
India	all	KL		Priv Nw	
Japan	all	all airlines except AZ CI CP CX FT GA IB JL KE KL LH OA RG SB SK SN SR TG TV VN	A	RTA	
			B1 B2	RTA or RTC or RTX	PHP 0.55 p/10 w PHP 1.21 PHP 18.00 p/minute

(1)	(2)	(3)	(4)	(5)	(6)
Korea (North)	all	all airlines except CI CX SK SR TG		RTC	PHP 1.51
Korea (South)	all	all airlines except CI CP CX FT KE KL LH SK SR TG	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
				or RTC	PHP 1.21
				or RTX	PHP 72.00
Marshall Islands	all	all airlines	A	RTA	
			B1	RTA	PHP 0.55 p/10 w
			B2	RTC	PHP 1.52
New Guinea	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
North Borneo/ Malaysia	LBU SDK	all airlines except CX	A	RTA	
			B1	RTA	PHP 0.55 p/10 w
			B2	RTC	PHP 0.92
	BKI	all airlines except CX	A	RTA	
			B1	RTA	PHP 0.55 p/10 w
			B2	RTC	PHP 0.56
Philippines	all	all airlines			
Ryukyu Islands	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
				or RTC	PHP 1.21
				or RTX	PHP 54.00
Tonga Islands	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
Vietnam (North)	all	all airlines		RTC	PHP 1.61
Wake Islands	AWK	all airlines	A	RTA	
			B1	RTA	PHP 0.55 p/10 w
			B2	RTC	PHP 1.63

(1)	(2)	(3)	(4)	(5)	(6)
Western Samoa	all	all airlines	A	RTA	
			B1 B2	RTA	PHP 0.55 p/10 w
MILAN MIL					
Italy					
- Area Milan	GOA LIN MIL MXP TRN VRN	all airlines			
MOMBASA MBA					
Kenya					
- Area Mombasa	MBA	all airlines			
MONROVIA MLW					
Liberia	all	all airlines			
MONTEVIDEO MVD					
Uruguay	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
MOSCOW MOW					
Mongolia	all	all airlines			
Union of Soviet Socialist Rep.	all	all airlines			
NAIROBI NBO					
Kenya					
- Area Nairobi	NBO	all airlines			
Somali Republic (Except MGQ)	BBO HGA	all airlines		RTC	EAS 1.30
Zambia	all	QZ		Priv Nw	
NEW DELHI NDH					
India					
- Area New Delhi	all except BOM CCU	all airlines except AF AZ JL KL LH PK			
NEW YORK NYC					
Bahamas Islands	all	all airlines			
Bermuda	all	all airlines			
British Honduras	all	IB KL LH LM PR VA		Priv Nw	
Canada	all	all airlines			
Costa Rica	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
El Salvador	all	all airlines except LM TO VA			
French Antilles - Area Guadeloupe	PTP	IB KL LH LM PR VA		Priv Nw	
French Guiana	all	IB KL LH LM PR VA		Priv Nw	
Guatemala	all	all airlines			
Guiana	all	BA IB KL LH LM PR VA		Priv Nw	
Haiti	all	all airlines			
Honduras	all	all airlines except LM VA			
Mexico	all	all airlines			
Nicaragua	all	all airlines except LM VA			
Panama	all	all airlines except IB KL LM VA			
Panama Canal Zone	all	all airlines except IB KL LM VA			
Puerto Rico	all	all airlines			
Suriname	all	LH		Priv Nw	
United States of America	all	all airlines			
Venezuela	all	BA EP IB JL KL LH LM PR RG VA		Priv Nw	
Virgin Islands	all	all airlines			
West Indies Federation (Jamaica only)	all	all airlines			
West Indies Federation (except Jamaica)	ANU	AC AF BA IB KL LH LM PR VA		Priv Nw	
	BGI POS SJH SKB SVD	AC BA IB KL LH LM PR VA		Priv Nw	

(1)	(2)	(3)	(4)	(5)	(6)
/NIAMEY NIM/					
Niger Republic	all	all airlines			
/NICOSIA NIC/					
Cyprus	all	all airlines			
/NOUMEA NOU/					
New Caledonia	all	all airlines			
New Hebrides	all	all airlines		RTP	PFR 8.82
Wallis Islands	all	all airlines		RTP	PFR 8.82
/OSLO OSL/					
Norway	all	all airlines			
/OUAGADOUGOU OUA/					
Volta Republic	all	all airlines			
/PALMA PMI/					
Spain					
- Area Palma	IBZ MAH	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
/PAPEETE PPT/					
French Polynesia	all	all airlines			
/PARIS PAR/					
France	all	all airlines			
French Territory of AFARS and ISSAS	JIB	AF		Priv Nw	
India	all	AF		Priv Nw	
/PHNOM-PENH PNH/					
Cambodia					
- Area Phnom-Penh	PNH	all airlines			
China (The Peoples Republic of)	all	AF		RTA	
/POINTE A PITRE PTP/					
French Antilles					
- Area Martinique	FDF	all airlines			
- Area Guadeloupe	PTP	all airlines except IB KL LH LM PR VA			
French Guiana	all	all airlines except IB KL LH LM PR VA		RTA	
Guiana	all	all airlines except BA IB KL LH LM PR VA		RTA	

(1)	(2)	(3)	(4)	(5)	(6)
Netherlands Antilles	all	all airlines except IB KL LM PR VA		RTA	
Suriname	all	all airlines except IB KL LH LM PR VA		RTA	
Venezuela	all	all airlines except AZ BA EP IB JL KL LH LM PR RG VA			
West Indies Federation (except Jamaica)	ANU	all airlines except AC AF BA IB KL LH LM PR VA			
	BGI POS SJH SKB SVD	all airlines except AC BA IB KL LH LM PR VA			
/PRAGUE PRG/					
Czechoslovakia	all	all airlines			
/QUITO UIO/					
Ecuador	all	all airlines			
/RANGOON RGN/					
Burma	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
RIO DE JANEIRO RIO					
Brazil	all	all airlines			
ROME ROM					
Albania	TIA	all airlines except PK	A	RTA	
			B1 B2	RTA RTP RTC	LIR 77.70
Italy - Area Rome and all locations not mentioned in Milan Area		all airlines			
Somali Republic	MGQ only	all airlines		RTC	LIR 202.02
Venezuela	all	AZ		Priv Nw	
SAIGON SGN					
Vietnam (South)	all	all airlines			
SANTIAGO DE CHILE SCL					
Chile	all	all airlines			

(1)	(2)	(3)	(4)	(5)	(6)
French Territory of AFARS and ISSAS	JIB	all airlines except AF	A B1	RTA	
			B2	RTP	FMG 64.80
Malagasy Republic	TNR	all airlines			
	TMM	all airlines	A B1	RTA	
			B2	RTX or RTP	FMG 240.00 FMG 15.00
	MJN	all airlines	A B1	RTA	
			B2	RTX or RTP	FMG 300.00 FMG 15.00
	others	all airlines	A B1	RTA	
			B2	RTP	FMG 15.00
Mauritius Island	MRU	all airlines	A B1	RTA	
			B2	RTP	FMG 92.34
Reunion Island	REU	all airlines	A B1	RTA	
			B2	RTP	FMG 24.30
TANGA TGT					
Tanzania					
- Area Tanga	TGT	all airlines			
TEHERAN THR					
Iran	all	all airlines			

ROUTING INDEX

REPERTOIRE D'ACHEMINEMENT

ADDRESS / *ADRESSE*			Responsible centre *Centre responsable*	Relayed through *Relayé par*	
COUNTRY of DESTINATION *PAYS de DESTINATION*	Locations *Lieux d'emplacement*	AIRLINE ADDRESSED *COMPAGNIE DESTINATAIRE*			
(1)	(2)	(3)	(4)	(5)	(6)
Aden (See Yemen - People's Republic of Southern -)					
Afghanistan	KBL KDH		KHI		
Albania	TIA	PK all other airlines	BEG ROM	FRA	
Algeria	all		ALG	PAR	
American Samoa	all		MNL		
Angola	all	SA TP all other airlines	LIS JNB		
Antigua (See West Indies Federation (2)).					
Argentina	all		BUE		

(1)	(2)	(3)	(4)	(5)	(6)
Australia (Incl. Tasmania)	all		SYD		
Austria	all		VIE	FRA	
Azores	SMA		LIS		
Bahamas Islands	GGT NAS		NYC		
Bahrein	BAH		BAH	BEY	
Barbados (See West Indies Federation (2))					
Belgium	all		BRH		
Bermuda	all		NYC		
Bolivia	CBB CEP LPB SJS SRZ		LIM		

(1)	(2)	(3)	(4)	(5)	(6)
Botswana	all	TP	LIS		
		all other airlines	JNB		
Brazil	all		RIO		
British Honduras	BZE	IB KL LH LM PR VA	NYC		
		all other airlines	LON		
British Solomon Islands	HIR VEV YND		MNL		
British West Indies (See West Indies Federation)					
Brunei	BTN		MNL		
Bulgaria	SOF		SOF		
Burma	AKY MDL RGN		RGN	HKG	
Burundi	BJM	EC QC SN	BRH		
		all other airlines	BZV	DLA	

(1)	(2)	(3)	(4)	(5)	(6)
Cambodia					
- Area Phnom Penh	PNH		PNH	HKG	
- Area Siem Reap	REP		REP	HKG/PNH	
Cameroons	DLA GOU MVR NGE OUR YAO		DLA		
Canada	all		NYC		
Canary Islands	LPA TCI		LPA	MAD	
Cape Verde Islands	SID RAI VXE		LIS		
Central African Republic	BBT BGF BOP		BGF	DLA	
Ceylon	CMB JAF		CMB	HKG	
Chile	ANF ARI LSC PUQ SCL		SCL		

(1)	(2)	(3)	(4)	(5)	(6)
Costa Rica	OCO SJO		NYC		
Cuba	HAV SCU TND		NYC		
Cyprus	NIC		NIC	ATH	
Czechoslovakia	all		PRG		
Dahomey	COO		COO	ABJ	
Denmark (incl. MMA in Sweden)	all		CPH	FRA	
Dominican Republic	SDQ		NYC		
Ecuador	GYE UIO		UIO		
Egypt (See United Arab Republic)					

(1)	(2)	(3)	(4)	(5)	(6)
Eire					
- Area Shannon	SNN		SNN	LON	
- Area Dublin	DUB		DUB	LON/ Dub	
	ORK				
	LMK				
El Salvador	SAL	LM [illegible] VA	CUR	NYC	
		all other airlines	NYC		
Equatorial Guinea	SSG		MAD		
Ethiopia	ADD ASA ASM DIR		ADD		
Faeroe Islands	VAG		CPH	FRA	
Fiji Islands	LBS LTK NAN SUV		AKL	SYD	
Finland	all		HEL	FRA	
Formosa (See China/Taiwan)					
France	all		PAR		

(1)	(2)	(3)	(4)	(5)	(6)
French Antilles					
- Area Martinique	FDF		PTP		
- Area Guadeloupe	PTP	IB KL LH LM PR VA	NYC		
		all other airlines	PTP		
French Guiana	CAY	IB KL LH LM PR VA	NYC		
		all other airlines	PTP		
French Polynesia	BOB PPT RFP		PPT		
French Territory of AFARS and ISSAS	all	AF	PAR		
		all other airlines	TNR	PAR	
Gabon Republic	BMM LBV POG		LBV	DLA	
Gambia	BTH	To be served by originator directly via AFTN or PTT according to category or according to special instructions issued by airline Head Offices			
German Democratic Republic	BER	Certain BER addresses only	SXF		
	BAT DRS ERF KME LEJ SXF	all airlines	SXF		

(1)	(2)	(3)	(4)	(5)	(6)
German Federal Republic	all	Including certain BER addresses	FRA		
Ghana	ACC TKD		ACC		
Gibraltar	GIB		GIB	MAD/ AGP	
Greece	ATH RHO SKG		ATH		
Greenland	SFJ THU		CPH	FRA	
Guadeloupe (See French Antilles)					
Guam (Mariana Islands)	GUM		MNL		
Guatemala	GUA		NYC		
Guiana	GEO	BA IB KL LH LM PR VA	NYC		
		all other airlines	PTP		

(1)	(2)	(3)	(4)	(5)	(6)
Guinea	CKY		CKY	DKR	
Haiti	PAP		NYC		
Honduras	TGU	LM VA	CUR	NYC	
		all other airlines	NYC		
Hong Kong	HKG		HKG		
Hungary	BUD		BUD		
Iceland	KEF	LL	LUX	BRH	
	REK	all other airlines	LON		
India					
- Area Bombay	BOM	AF	PAR		
		KL	MNL		
		AZ JL	LON		
		PK	KHI		
		LH	HKG		
		all other airlines	BOM*		
- Area Calcutta	CCU	AF	PAR		
		KL	MNL		
		AZ JL	LON		
		PK	KHI		
		LH	HKG		
		all other airlines	CCU*		
- Area New Delhi		AF	PAR		
(All Indian locations		KL	MNL		
not yet listed in the		AZ JL	LON		
other Indian Areas)	C28	PK	KHI		
		LH	HKG		
		all other airlines	NDH*		

*- On the Network/Routing Chart these areas are indicated as INDIA XS

(1)	(2)	(3)	(4)	(5)	(6)
Indonesia	all		JKT	HKG	
Iran	all		THR		
Iraq	all		BGW	BEY	
Israel	all		TLV	ROM	
Italy					
- Area Milan	GOA LIN MIL MXP TRN VRN		MIL	ROM	
- Area Rome All other Italian locations not listed in the Milan Area	ROM		ROM		
Ivory Coast	ABJ BYK		ABJ		
Jamaica (See West Indies Federation (1))					

(1)	(2)	(3)	(4)	(5)	(6)
Liberia	MLW ROB		MLW	ABJ	
Libya	BEN TIP		TIP		
Luxemburg	LUX		LUX	BRH	
Madeira Island (Portugal)	FNC		LIS		
Malagasy Republic	DIE MJN TNR		TNR	PAR	
Malawi	all	TP all other airlines	LIS JNB		
Malaysia	KUL PEN		SIN	HKG	
Malaysia (see Borneo/North)					
Mali Republic	BKO		BKO	ABJ	

(1)	(2)	(3)	(4)	(5)	(6)
Muscat Oman	MCT		BAH	BEY	
Nepal	KTM		KHI		
Netherlands	all		AMS		
Netherlands Antilles	AUA BON CUR SXM	IB KL LM PR VA all other airlines	CUR PTP	NYC	
New Caledonia	NOU		NOU		
New Guinea	FIN LAE MAG POM RAB WWK		MNL		
New Hebrides	SON VLI		NOU		
New Zealand	all		AKL	SYD	
Nicaragua	MGA	LM VA all other airlines	CUR NYC	NYC	

(1)	(2)	(3)	(4)	(5)	(6)
Niger Republic	NIM		NIM	ABJ	
Nigeria					
- Area Lagos	ENU JOS KAD LOS MIU PHC		LOS		
- Area Kano	KAN		KAN	LOS	
Norway	all		OSL	FRA	
Pakistan	CGP DAC KHI LHE PEW RWP		KHI		
Panama and Panama Canal Zone	BLB PTY	IB KL LM VA	CUR	NYC	
		all other airlines	NYC		
Paraguay	ASU		BUE		
Peru	all		LIM		

(1)	(2)	(3)	(4)	(5)	(6)
Philippines	all		MNL		
Poland	all		WAW		
Portugal	all		LIS		
Portuguese Guinea	BXO		LIS		
Portuguese Timor	DIL		LIS		
Principe Islands	PCP		LIS		
Puerto Rico	SJU		NYC		
Qatar	DOH		BAH	BEY	
Reunion Island	REU		TNR	PAR	
Rhodesia	SAY	TP all other airlines	LIS JNB		

(1)	(2)	(3)	(4)	(5)	(6)
Union of Soviet Socialist Republics	all		MOW		
United Arab Republic					
- Area Alexandria	ALY		ALY	CAI	
- Area Cairo	CAI		CAI		
United Kingdom (England, North Ireland, Scotland, Wales)	all		LON		
United States of America	all		NYC		
Uruguay	MVD PDP STY		MVD	BUE	
Venezuela	CCS MAR MIQ	AZ BA EP IB JL KL LH LM PR RG VA all other airlines	ROM NYC PTP		
Vietnam (North)	HAN		MNL		
Vietnam (South)	SGN		SGN		
Virgin Islands	STX		NYC		

APPENDIX D

OFFSHORE PETROLEUM INDUSTRY

LISTING OF MAJOR PRODUCERS AND DRILL COMPANIES

MAJOR PRODUCERS

Amoco International Oil Co.
200 E. Randolph Drive
Chicago, IL 60601

Chevron Overseas
P.O. Box 7643
San Francisco, CA 94120

Conoco
P.O. Box 1267
Ponca City, OK 74601

Gulf Oil Corporation
P.O. Box 2227
Houston, TX 77001

Marathon Oil Company
539 S. Main Street
Findlay, OH 45840

Pennzoil Company
P.O. Box 2967
Houston, TX 77001

Sun Gas Company
P.O. Box 20
Dallas, TX 75221

Texaco Inc.
2000 Westchester Avenue
White Plaines, NY 10650

Union Texas Petroleum
P.O. Box 2120
Houston, TX 77001

Arco International Oil & Gas Div.
515 Flower Street
Los Angeles, CA 90071

Cities Service Company
Box 300
Tulsa, OK 74102

Exxon Company, USA
P.O. Box 2180
Houston, TX 77001

Kerr-McGee Corporation
Box 25861
Oklahoma City, OK 73125

Mobil Oil Corporation
150 E. 42nd Street
New York, NY 10017

Shell Oil Company
P.O. Box 2463, 1 Shell Plaza
Houston, TX 77001

Tenneco Inc.
1010 Milam
Houston, TX 77001

Union Oil Co. of California
P.O. Box 7600
Los Angeles, CA 90051

APPENDIX D (con't)

MAJOR DRILL COMPANIES

Atwood Oceonics Inc.
10565 Katy Freeway
Houston, TX 77024

Cactus Drilling Corp. of Texas
P.O. Box 2704
Morgan City, LA 70380

Crowley Maritime Corporation
1 Market Plaza
San Francisco, CA 94105

Diamond M Company
2121 Sage Road
Houston, TX 77027

Dixilyn-Field Drilling Co.
5005 Riverway or P.O. Box 4251
Houston, TX 77210

Nicklas Oil & Gas Co., Inc.
P.O. Box 752
Eunice, LA 70535

Noble Drilling Corporation
1924 S. Utica
Tulsa, OK 74104

Offshore Company
3411 Richmond Avenue
Houston, Texas 77001

Pool International
2077 S. Gessner
Houston, TX 77063

Pool Offshore
5913 Edison Drive
Oxnard, CA 93030

Pool Offshore
3640 Peters Rd.
Harvey, LA

Reading Bates Offshore Drilling
3800 First Pl.
Tulsa, OK 74103

Rowan Drilling Companies, Inc.
1900 Post Oak Tower Building
5051 Westheimer Street
Houston, TX 77056

Santa Fe International Corp.
505 S. Main Street
Orange, CA 92668

Zapata Corporation
P.O. Box 4240
Houston, TX 77001

APPENDIX E

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ACCHAN	Allied Command, Channel
ACE	Allied Command, Europe
ACLANT	Allied Command, Atlantic
AEEC	Airlines Electronic Engineering Committee
AFCENT	Allied Forces, Central
AFNORTH	Allied Forces, North
AFS	Aeronautical Fixed Services
AFSOUTH	Allied Forces, South
AFTN	Aeronautical Fixed Telecommunications Network
AM	Amplitude Modulation
AMVER	Automated Mutual-Assistance Vessel Rescue
ANP	Air Navigation Plan
ANSI	American National Standards Institute
API	American Petroleum Institute
ARINC	Aeronautical Radio Incorporated
ARQ	Automatic Request for Repetition
ASCII	American Standard Code for Information Interchange
ATA	Air Transport Association (Of America)
AUTODIN	Automatic Digital Network
AUTOVON	Automatic Voice Network
bps	Bits per Second
C-E	Communications-Electronics
CCGD	Commander, Coast Guard District
CCIR	International Radiotelephone Consultative Committee
CCITT	Comite Consultif Internationale Telegraphique
CINCHAN	Commander-in-Chief, Channel
CIP	Communications Improvement Program
COA	Central Operating Authority
CONUS	Continental United States
CW	Continuous Wave (as in Morse Radiotelegraphy)
DCA	Defense Communications Agency
DCS	Defense Communications System
DEB	Digital European Backbone
DOS	U.S. Department of State
DOT	U.S. Department of Transportation
DSCS	Defense Satellite Communications System

APPENDIX E (con't)

ESS	Electronic Switching System
EUR	Europe
FAA	Federal Aviation Administration
FAX	Facsimile
FCC	Federal Communications Commission
FEC	Forward Error Correction
FM	Frequency Modulation
FTS	Federal Telephone System
HF	High Frequency
Hz	Hertz (cycles per second)
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IVSN	Initial Voice Switched Network
Kbps	Kilobits (thousands of bits) per second
KHz	Kilohertz (thousands of cycles per second)
LCO	Local Control Organization
MARISAT	Maritime Satellite System (owned by COMSAT General Corp.)
MDC	Message Distribution Center
MF	Medium Frequency
MOU	Memorandum of Understanding
NAMSA	Nato Maintenance and Supply Agency
NATO	North Atlantic Treaty Organization
NICS	NATO Integrated Communications System
NICSMA	NICS Management Agency
NNCS	NICS Network Control System
PABX	Private Automatic Branch Exchange
PM	Phase Modulation
PSVP	Pilot Secure Voice Project
PTT	Postal Telegraph and Telephone
ROC	Regional Operating Center
SACEUR	Supreme Allied Commander, Durope
SACLANT	Supreme Allied Commander, Atlantic
SATCOM	Satellite Communications

APPENDIX E (con't)

SELCAL	Selective Calling System (4-tone identifier code)
SHAPE	Supreme Headquarters, Allied Powers Europe
SHF	Super High Frequency
SITA	Societe Internationale de Telecommunications Aeronautiques
SITOR	Simplex Teleprinting Over Radio
SSB	Single Side Band (modulation)
SSIP	Sub-System Integration Project
STANAG	Standard NATO Agreement
TARE	Telegraph Automatic Relay Equipment
TCF	Technical Control Facility
TELEX	Teletypewriter Exchange Service (domestic and international)
TTY	Teletypewriter
TWX	Teletypewriter Exchange Service
UHF	Ultra High Frequency
USCG	United States Coast Guard
VHF	Very High Frequency
wpm	Words Per Minute