

TECHNICAL JUDICIAL POLICE TELECOMMUNICATIONS SURVEY REPORT

September 1974



Office of Public Safety
Agency for International Development
Department of State
Washington, D.C. 20523

TECHNICAL JUDICIAL POLICE ..
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INTRODUCTION

In response to a request from the Technical Judicial Police (PTJ), Venezuela, and at Government of Venezuela (GOV) expense, a communications survey was conducted from June 20 to July 6, 1974 by Mr. Paul Katz, Chief Telecommunications Branch, Office of Public Safety, Agency for International Development, assisted by Mr. Alfred Naurocki. Local arrangements for the survey were completed through the U.S. Embassy in Caracas. As a result of an interim report provided the PTJ summarizing the findings of the survey Mr. Katz returned to Caracas August 12 to August 17, 1974 to discuss with PTJ officials those survey recommendations that could be implemented prior to the receipt of the complete engineering study.

The information contained herein was obtained as a result of field observations and discussions with concerned officials. Field inspection visits were made to the PTJ offices at Maracaibo, Barquisimeto and several Comisaria stations in the Caracas area.

The Sub-Director of the PTJ, Dr. Molina Gasperi gave freely of his time and made the necessary arrangements to allow a comprehensive on-site evaluation. The frank definition of communications problems on the part of this official formed the basis upon which the survey was conducted.

The excellent cooperation received from all ranks of the PTJ, especially Inspector Vargas Flores, Chief of Transmission facilitated the completion of the survey in the time allocated.

In addition to the above meetings took place with officials of National Telephone Company of Venezuela (CANTV). Discussions were held regarding PTJ requirements to obtain CANTV leased lines to selected PTJ field offices.

GENERAL INFORMATION

The Technical Judicial Police (PTJ) was organized in 1958, it has nationwide jurisdiction and is the investigative arm of the Ministry of Justice.

The PTJ is a non-uniformed police force with personnel totalling approximately 2,500. It has the primary responsibility of investigating general crimes, apprehension of criminals, gathering of evidence and preparation of cases for the courts. It also has the principal responsibility for narcotic law enforcement efforts throughout Venezuela.

In terms of police operations the PTJ is divided into Caracas and five zones consisting of some 43 field offices (delegations) and sub-delegations located throughout the country. The five zones are the Andean Zone with headquarters in San Cristobal, Western Zone with headquarters in Maracaibo, Central Western Zone with headquarters in Barquisimeto, Central Zone with headquarters in Maracay and Eastern Zone with headquarters in Maturin.

The Caracas area presents unique radio patrol car communication coverage problems; the city is located in a valley surrounded by mountains and is over 3,000 feet above sea level - Metropolitan Caracas extends throughout the valley and is expanding up the mountain slopes. It is an ultra-modern urban community with most of the city covered by multi-storied apartment houses and office buildings.

SUMMARY

By necessity this report includes an analysis of the deficiencies existing in the Technical Judicial Police (PTJ) communications networks and organization. However, it should be recognized that while the PTJ communications networks and organization are far from optimum they do reflect considerable effort on the part of the officials concerned to provide essential communications in support of their overall mission.

PTJ officials requested and received TDY U.S. technical assistance to identify their communications problem areas. Visits to PTJ communications facilities revealed deficiencies in planning, systems, organization, equipment and personnel. These deficiencies were brought to the attention of responsible PTJ officials who are exerting considerable effort to rectify this situation. They are requesting sufficient funds to modernize and expand their communications networks, replace old and obsolete equipment and pay for the services of a full time U.S. advisor to assist them develop a more effective communications capability.

A complete change in the PTJ radio networks and equipment, at this time, is not recommended. This is based on several factors, the major one being the lack of trained manpower within the PTJ organization to implement and support new country wide radio networks. Another is the cost, some 1.5 million dollars would be required to implement the recommended communications improvements contained in this report.

It is believed that the best course of action for the PTJ to follow which would substantially improve their communications capabilities is (1) to direct their efforts towards establishing a Telecommunications Division capable of providing the administration and technical supervision over their urban and national communications networks and facilities, (2) to undertake an intensive training program for PTJ personnel in concert with the proposed telecommunications system plan, (3) to implement the technical modifications recommended in this report so that existing communications equipment can be better utilized; and (4) budget sufficient funds to utilize recommended CANTV facilities.

In consideration of the large monetary investment needed and the necessity to first develop an improved telecommunications organization and technical capabilities, recommendations are proposed in several phases:

Phase I

1. Provides for the design and selection of the most appropriate communications system configuration to satisfy PTJ radio patrol car requirements throughout Venezuela. A proposed modification plan for the Caracas Radio Patrol Car Radio Network provides for more effective utilization of existing equipment to meet expanding PTJ operational needs. Approximately \$150,000 will be required to implement the modification plan.
2. Provides specifications and recommendations to assure that PTJ obtains additional needed mobile and portable transceivers which are compatible with the proposed communications systems design. Approximately \$437,000 would be required to obtain this equipment.
3. Provides for the PTJ to meet their immediate requirement for an administrative and operational telecommunications capability to provide rapid transmission of messages from Caracas to subordinate zone headquarters at Maracaibo, Barquisimeto, Maracay and San Cristobal as well as several other critical delegations (field offices). Approximately \$300,000 would be required to obtain the teletype and multiplex equipment. CANTV cost would be additional. These are estimated at 23,000 bolivares for installation and 42,000 bolivares for monthly rental of leased lines.
4. Provides for the establishment of an adequate PTJ maintenance facility in Caracas. Approximate cost for test equipment and tools is \$20,000.

Phase II

1. Provides for the expansion and modernization of the PTJ HF/SSB radio telegraph network. This would improve the reliability and message handling capability of the PTJ HF/SSB radio network and assure an adequate radio back-up system in the event of an outage on the CANTV leased microwave circuits or in time of emergency. Approximate cost of necessary HF/SSB radio equipment would be \$155,000.
2. Provides for the expansion and modernization of PTJ Radio Patrol Car Network in major cities other than Caracas. Although the need is urgent country-wide the implementation rate would be dependent upon GOV resources. Approximately \$68,000 would be required for equipment to cover one city.
3. Provides for standby electrical power equipment to operate the PTJ urban radio patrol car networks and the HF/SSB radio stations in the event of commercial power failure. Approximately \$9,500 would be required for equipment to service one city.
4. Provides for the establishment of an adequate PTJ maintenance facility in the PTJ zone headquarters at Maracaibo, Barquisimeto, Maracay, San Cristobal and Maturin. Approximate cost for test equipment and tools \$100,000.

OBSERVATIONS AND CONCLUSIONS

A. General

1. The Technical Judicial Police (PTJ) existing communications systems reflects an effort on the part of the officials concerned to provide essential communications in support of their overall police mission. To a large degree, however, these efforts have been dissipated because of problems dealing with planning, organization, operations, systems, equipment, and the lack of technical expertise.

2. The PTJ metropolitan communications systems throughout the country have not kept pace with their operational needs and has affected their capabilities to properly supervise and direct their personnel.

3. The PTJ National Radio Network has deteriorated to where numerous operational and administrative messages are delayed and must be passed via commercial telephone or telex.

4. PTJ officials recognize the above problems and are making efforts to modernize their radio communications systems. However, previous budgetary considerations and lack of planning resulted in PTJ making new equipment acquisitions on the basis of obtaining the maximum amount of radio equipment for the funds available, rather than a communications system which would best satisfy existing and future PTJ operational requirements.

(a) As an example UHF/FM radio equipment to cover the Metropolitan Caracas area was recently purchased from Motorola and has been in the process of installation by a local representative for the past year. The lack of proper planning on the part of PTJ and the inadequate technical support provided by Motorola's local representative seriously detracted from the effectiveness and reliability of this system.

(b) A PTJ plan to install an independent microwave system country-wide was reviewed during the course of the survey and found to be not compatible with PTJ capabilities nor did it offer the reliability needed to support PTJ operations.

B. PTJ Communications Network, Caracas

1. General

PTJ UHF/FM radio communications networks are shown in figure 1. The networks are intended to cover the entire metropolitan area of Caracas through the use of radio repeater equipment located at El Avila and El Volcan. All communications are conducted and controlled from the PTJ headquarters facility to their radio-equipped vehicles, hand-held portable radios, pocket pager units and radio base stations at the district headquarters (Comisarias).

2. Radio Patrol Car System

(a) The radio patrol car system was found to be technically inadequate. It did not provide the flexibility or reliability needed to meet PTJ operational requirements. Major problem areas identified were:

(1) The lack of a tone coded squelch capability which could reduce the amount of interference signals currently received from outside the PTJ system and increase the portable and mobile talk-back range; and

(2) The lack of an ability to communicate between vehicles and/or portables without a repeater.

(b) The complement of UHF/FM radio equipment is new, having been installed about one year ago, nevertheless reoccurring technical problems were found to exist which also inhibited the effectiveness of the PTJ radio patrol car system. These were as follows:

(1) Approximately forty percent of the transceivers in the patrol vehicles had defective mobile identifier (ID) units. This sophisticated mobile unit feature is believed of considerable value to efficient patrol operations, but its high failure rate prevented the PTJ from initiating uniform operating procedures and dispatch practices.

(2) Fifty-six percent of the hand-held portable units were out of service because the local representative lacked the technical expertise and necessary maintenance facilities to

TECHNICAL JUDICIAL POLICE COMMUNICATIONS NETWORK FOR CARACAS

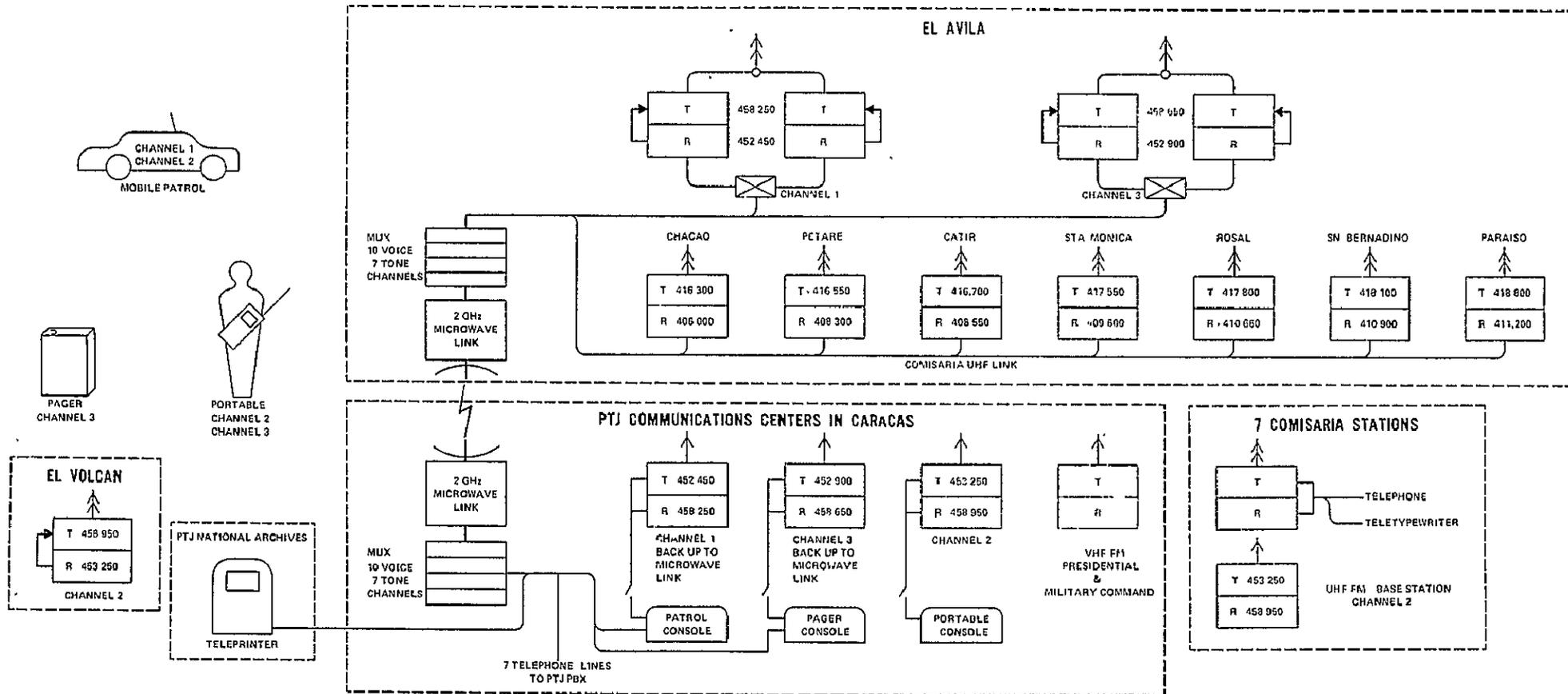


FIGURE 1

effect prompt repair. Fourteen of these new units had to be returned to the U.S. supplier's factory by the representative for the necessary repairs. These units were unavailable for PTJ operations for over three months.

(3) Within the PTJ Transmission Center, occasional noise which appeared to be caused by intermodulation (heterodynes) was heard over the mobile patrol radio network (channel one) which disrupted communications entirely. Personnel in the mobile patrol vehicles are also bothered with receipt of identification tones in their radios each time other vehicles transmitted messages. These tones are normally blocked from transmission in a well-designed radio system to prevent such annoyances.

(4) The new dictaphone multi-channel tape recorder for recording all radio and telephone messages in the PTJ Transmission Center was found to be partially defective and was consequently neglected as an operational tool. Further, the PTJ 3-digit citizen telephone complaint number (115) was not connected to this recorder as normal police control center practice requires.

(5) The PTJ communication center emergency reporting telephone number (115) has been widely publicized for general public use in requesting police assistance. Many incoming telephone calls on this number are caused by misdialing. The telephone company's use of number 15 for claims information contributes to this problem.

(6) The microwave link to El Avila has no hot standby capability, consequently the failure of the microwave link will disrupt normal communications. This then will require the PTJ radio dispatcher to operate a base station through the repeater to pass messages into the radio patrol car system.

(7) At El Avila, UHF/FM standby repeaters are installed in the event of repeater failure. These standby repeaters, however, must be manually activated by the PTJ radio dispatcher to place them into service.

(c) Some of the problems identified in paragraph B. 2(b) above were resolved satisfactorily as a direct result of these survey findings being brought to the attention of the U.S. supplier.

3. Comisaria UHF/FM Wideband Base Stations

(a) Seven of the nine district (Comisaria) stations have point-to-point UHF/FM wideband base stations which provide the following:

(1) a dial telephone extension from the PBX switchboard at the PTJ headquarters.

(2) a teletype circuit from the National Archives building for the transmission of printed information.

(b) These UHF/FM wideband base stations transmit and receive information from a repeater site at El Avila where the UHF/FM circuits are terminated and connected to a ten channel microwave link for relay to the PTJ headquarters. From there, the teleprinter signals are connected by landline to a teleprinter at the PTJ Records and Identification Headquarters (National Archives Building). Only one teleprinter is available at the National Archives Building consequently a schedule must be arranged with each PTJ district station when information is to be transmitted or received.

(c) In two of the districts visited (Chacao and Rosal), the telephone circuits were discovered to be operative, while the teleprinter machines were found to be antiquated and out-of-service. Other districts were reported to have similar difficulties. The reasons noted were the antiquity of the teleprinter, the corresponding availability of spare parts and maintenance problems.

(d) UHF/FM wideband links were established without a hot standby capability and seriously detract from its overall reliability. The use of high-cost UHF/FM wideband links to provide the Comisarias with one telephone and one teleprinter channel are not believed fully warranted. Especially where commercial telephone lines could be leased for this purpose and offer similar or better reliability.

4. Standby Electrical Power

(a) The radio repeater building at El Avila does not have an emergency generator plant which, by its absence, could cause the entire equipment group to be inoperative should electrical power outages occur at this location.

(b) During a visit to the PTJ headquarters the electrical power failed disrupting all communications for several minutes. The PTJ communications center was also found to be without any standby electrical power under their direct control.

C. Departmental UHF/FM Radio Patrol Car Networks

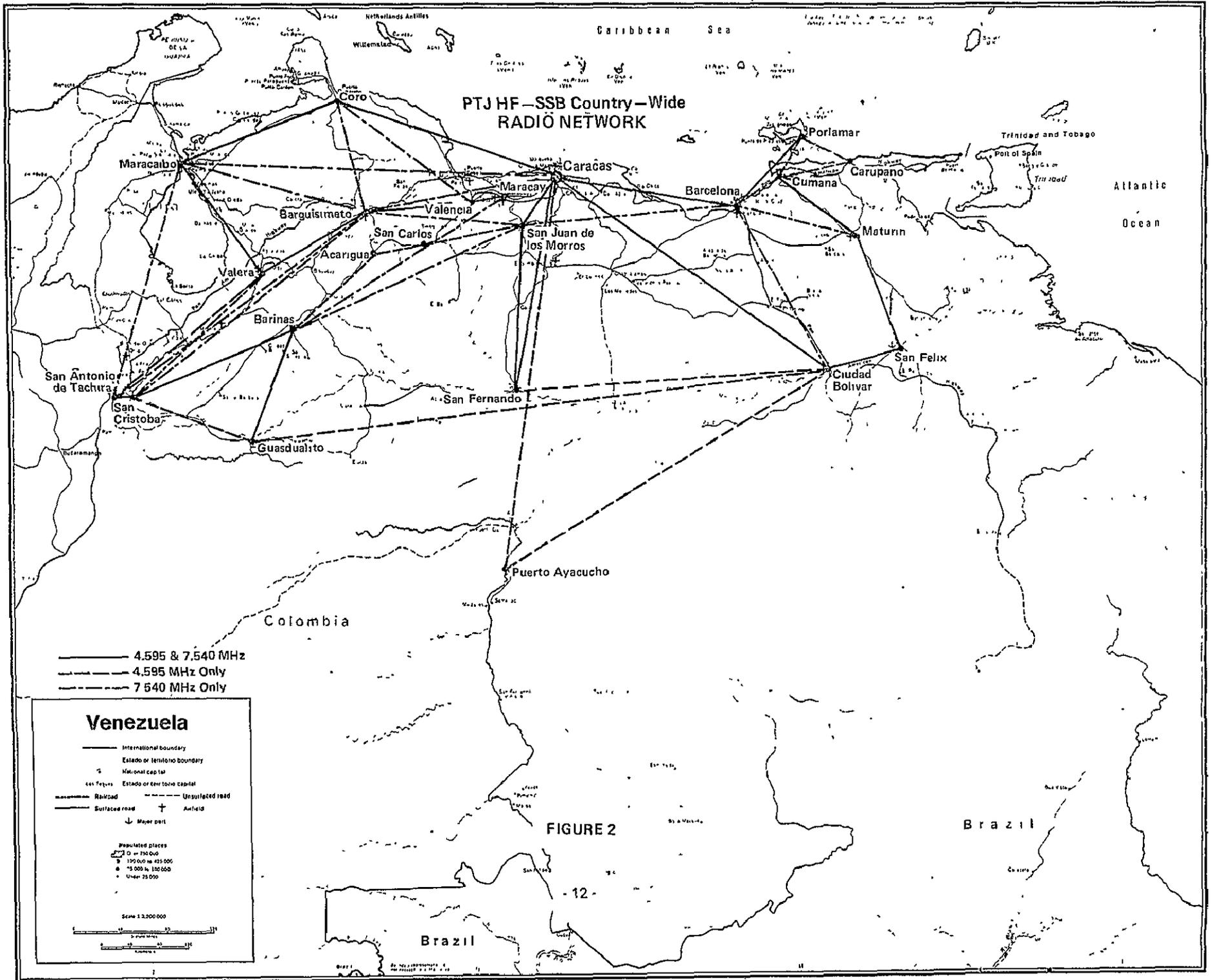
1. The PTJ operate token UHF/FM radio patrol car networks in only four of the major cities outside of Caracas. These are Maracaibo, Maracay, Valencia and Barquisimeto. The typical UHF/FM radio patrol car network is controlled from the PTJ Delegation headquarters of a city with additional radios placed in their surrounding sub-stations. In all cases, a radio repeater is used at a nearby mountain top location to extend local communications range. In these networks, the failure of the radio repeater equipment will render all mobile and base units inoperable throughout the local network.

2. The lack of an ability to use the base station in place of the repeater or a simplex channel prevents intercommunications between radio-patrol cars or base station-to-vehicle when the repeater is inoperative.

3. This condition was observed in the major cities of Maracaibo and Barquisimeto. The PTJ radio systems servicing Maracaibo, a city of over 1 million population, and Barquisimeto have been out of operation for several months seriously effecting the operational capabilities of the PTJ in these areas. Most of the equipment utilized in these systems was found to be antiquated and in poor condition. However, the basic problem is not believed that of equipment but the lack of technical support and inadequate systems design. The failure of the repeater at Maracaibo resulted in the disruption of communications throughout the entire system. This was also the case in Barquisimeto. Although several of the vehicles had functional radios, they could not communicate with their headquarters or other cars without the use of an operating repeater.

D. HF/SSB Country-Wide Radio Telegraph Network

1. The PTJ high frequency single sideband (HF/SSB) country-wide radio telegraph network shown in figure 2 provides communications from Caracas to the many PTJ field offices. The radio equipment is of a design several years old and consequently less efficient. It does not provide the communications reliability required to satisfy PTJ operational needs.



2. PTJ headquarters communications facilities do not include sufficient area for the construction of adequate HF antenna systems. The operation of transmitters and receivers at the same location presents severe operational limitations.

3. Country-wide communications over the PTJ radio telegraph network is presently limited to certain hours of the day. These hours of operation are dependent upon the following technical factors:

- a. Atmospheric and Ionospheric conditions
- b. Frequency selection
- c. Interference from neighboring countries

The only technical factor above which the PTJ have any control over is the selection of frequencies. The PTJ operate their system on only two frequencies both of which were assigned without regard to propagation conditions. As a result, the reliability of PTJ HF radio circuits is far less than that attainable.

4. In addition to the above technical factors, PTJ is also faced with the lack of sufficient qualified radio telegraph operators to allow 24-hour-a-day communications. The operators, while limited in number are well trained in Morse Code (CW) transmission practices which is used extensively during the normal daylight working hours. At other times, such as off-duty hours, weekends, and holidays, regular PTJ agents will assume operation of the same radio and transmit messages by standard voice techniques. Presently, three radio telegraph operators are assigned to Maracaibo and Maracay while 16 smaller field offices have only one or two men assigned.

5. Thousands of messages a month are passed over the HF circuits using Morse Code (CW) or voice. The transmission of long administrative messages over this media consumes an inordinate amount of air time and usually results in a considerable message backlog.

6. Because of the problems cited above, day-to-day administrative traffic must be handled by commercial telegrams (TELEX) which in most cases do not reach the intended PTJ field offices for several days.

7. Technical upgrading of the PTJ HF/SSB radio facilities would be necessary along with additional trained radio operators, to assure 24-hour-a-day service and the prompt and reliable receipt of operational messages from PTJ field offices throughout the country.

E. INTERPOL Radio Network

1. The PTJ are presently operating an INTERPOL radio station at their headquarters. The radio station is manned on a 24 hour basis by radio telegraphy operators, as all INTERPOL radio traffic is conducted in Morse Code (CW).

2. A HF/AM transmitter and receiver are installed at CANTV facilities and remotely controlled through leased lines provided by CANTV. Another receiver installed at PTJ headquarters is also used depending upon propagation of radio waves. This receiver utilizes a directional beam antenna. The antenna is currently orientated towards Buenos Aires, Argentina where the Federal Police of Argentina operate the INTERPOL Regional Central Radio Station for South America.

F. CANTV Facilities

1. CANTV commercial telephone facilities were examined as possible available supporting elements which could be utilized by PTJ. It was found that CANTV facilities have not been fully utilized and that the acquisition of leased channels over the CANTV country-wide microwave system could augment the PTJ HF/SSB radio telegraph network and thus alleviate their heavy administrative traffic.

2. Discussions were held with CANTV regarding the leasing of direct voice circuit from PTJ headquarters in Caracas to their field offices at Maracaibo, Maracay, Merida, Valera, Valencia Acariqua, Barquisimeto, San Cristobal, San Antonio and Cabinas. Also discussed was the provision of direct voice circuits to each of the PTJ Comasarias in the Caracas Metropolitan area. A quotation from CANTV to provide these circuits was obtained and is included in Annex I.

3. These leased voice circuits could be properly equipped at the terminal ends by PTJ to provide a direct dial (3 digit) telephone capability to and from PTJ headquarters telephone exchange (PABX) as well as simultaneous transmission of teletype messages.

G. Military Facilities

The possibility of utilizing the planned military microwave system was explored. It is believed that this system would not satisfy PTJ requirements for dedicated voice and teletype communications. This system utilizes automatic switching and would only provide the PTJ a telephone and telex service similar to that they are currently receiving from CANTV.

H. Organization

1. The Technical Judicial Police Communications Unit is called "Transmissions" and is established as a staff function under the Plans and Operations Division. The present organizational structure of the Transmissions Service is shown in figure 3.

2. This organizational diagram depicts the national network (HF/SSB country-wide radio network) and the INTERPOL network as major elements under the Chief of Transmissions. In actuality they are not, these networks are under the direction of a communications official solely concerned with operational responsibilities and does not report through the Chief of Transmissions. The Chief of Transmissions is responsible for the maintenance of all radio equipment country-wide and the operation of the metropolitan network (radio patrol car systems in Caracas).

3. The total strength of the Transmission Service is 42. Of this total, only 6 are technical personnel and these are assigned to the Caracas area. The lack of sufficient trained technical personnel prevents the PTJ from maintaining the necessary technical supervision over the metropolitan and national radio networks. The lack of a sufficient number of qualified radio repair technicians prevents optimum system performance.

4. The Transmissions Service has been assigned the responsibility to provide essential communications in support of PTJ activities. It has not, however, been given the necessary organization, authority or sufficient personnel to accomplish this task.

PRESENT ORGANIZATIONAL STRUCTURE OF THE TECHNICAL JUDICIAL POLICE

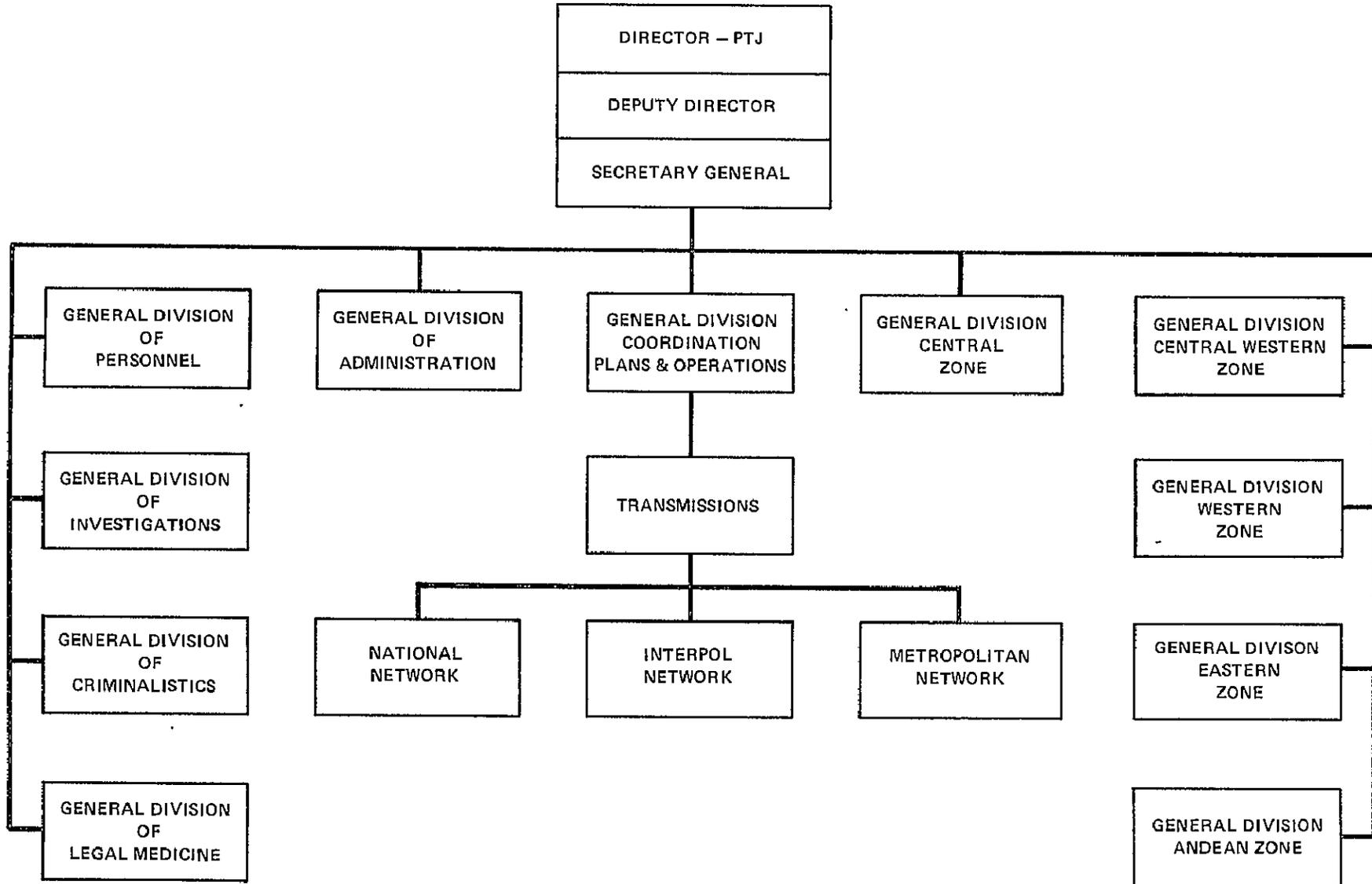


FIGURE 3

I. Maintenance

1. PTJ communications personnel are not capable of maintaining the numerous radio equipments in the national and metropolitan radio networks. The lack of proper test equipment, tools and maintenance facilities hinders the establishment of even a minimal maintenance capability.

2. The lack of qualified personnel, test equipment, tools and facilities has required PTJ to employ a combination contractor maintenance service as well as their own. In the Eastern Zone PTJ has contracted for the maintenance of their radio equipment and little problems have been experienced. The amount of equipment used in the Eastern Zone, however, is very little, when compared to Caracas and the Western Zone.

3. A large amount of new UHF/FM mobile, portable and base station equipment was purchased over a year ago for PTJ operations in Caracas and has been informally maintained by the local representative of the U.S. supplier (Motorola). PTJ has experienced numerous problems with the maintenance services provided by the United States supplier's local representative. The local representative, while desirous of correcting equipment failures, has demonstrated that he lacks the required expertise and repair facilities to expeditiously maintain defective mobile and portable radio sets. The PTJ Chief of Transmissions and his senior radio technician were given training at the supplier's U.S. factory prior to delivery of the equipment. Since their return to Venezuela, they have not been provided any on-the-job training to extend their basic knowledge regarding the new equipment. The local representative performed maintenance on the UHF/FM system without participation by PTJ personnel.

4. With the quantity and complexity of UHF/FM radio transceivers, microwave, teleprinter and telephone equipment utilized by the PTJ, it is essential that PTJ technicians possess thorough knowledge and experience in the long-term maintenance of these items. The PTJ communications personnel are presently not capable of performing the proposed modifications to the existing Caracas UHF/FM radio system or maintaining the numerous radio equipments in the system. An urgent requirement to procure additional mobile and portable radio equipment to satisfy current PTJ operational requirements would increase these maintenance problems.

5. The use of technicians other than PTJ personnel with access to critical areas such as the communications center and repeater sites presents security problems such as continual updating of contract technicians' security clearances.

J. Training

1. PTJ personnel have not been exposed to formal training in the management and administration of a Police Telecommunications System. With the proposed modernization of the National Network and Radio Patrol Car systems this type of training becomes of major importance to the successful implementation of an effective PTJ communications capability.

2. A wide variation exists in the technical skills of PTJ communications technicians. Only three PTJ technicians are currently deemed qualified and these need advanced training to properly service radio and teletype equipment. Several good technical schools are available for local training. One of them is the National Institute for Cooperative Education (INCE). On-the-job training is still required while local schools are available to assist in basic radio theory training, these resources cannot be relied upon to produce finished, competent radio technicians.

3. A comprehensive program of in-country maintenance training on all types of communications equipment used by the PTJ to permit reliable support for PTJ communications facilities is notably lacking.

K. Technical Assistance

1. There is a lack of trained manpower to properly organize the resources necessary to resolve the problems obstructing the development of an effective operational and administrative communications system for the PTJ.

2. PTJ personnel currently lack the in-depth knowledge and experience to develop and implement an effective operational communications system in support of PTJ activities. Given the proposed procurement of modern communication equipment and the development of more effective national and metropolitan radio networks and during the period that PTJ personnel are developing the necessary management and technical expertise technical assistance will be required. It is believed necessary that this assistance be from a source that is void of conflict of interests.

RECOMMENDATIONS

The planning and subsequent implementation efforts proposed in this report would represent a substantial improvement in the PTJ communications capabilities. In consideration of the large Government of Venezuela (GOV) monetary investment implementation should be in concert with GOV priorities. However, successful implementation of the proposed telecommunications plan is contingent upon definite measures to be undertaken by the PTJ. These are enumerated below.

A. Prerequisites to Develop an Effective Communications Capability

1. Organization

(a) PTJ efforts should be directed towards establishing a single telecommunications organization. A proposed organization structure deemed appropriate for modernizing the organizational effectiveness of the PTJ communications needs is given in Fig. 4. It delineates the basic functions of a professionally-oriented telecommunications organization which could be adapted to satisfy PTJ operational objectives.

(b) Reorganization of the Transmissions Service should include the responsibility, authority and technical resources to provide continuous technical and administrative supervision over urban and national communications networks country-wide.

(c) Communications planning should be an effort of all PTJ divisions, coordinated through the Chief of the proposed Telecommunications Division.

(d) Senior PTJ personnel assigned to the telecommunications Division should remain on the job for extended periods of time so that the expertise they develop is not lost.

2. CANTV and GOV Facilities

(a) PTJ should make use of available leased commercial and military communications channels country-wide to augment their existing HF/SSB radio telegraph network and alleviate heavy administrative traffic.

PROPOSED ORGANIZATIONAL PLAN FOR A TELECOMMUNICATIONS DIVISION IN THE TECHNICAL JUDICIAL POLICE

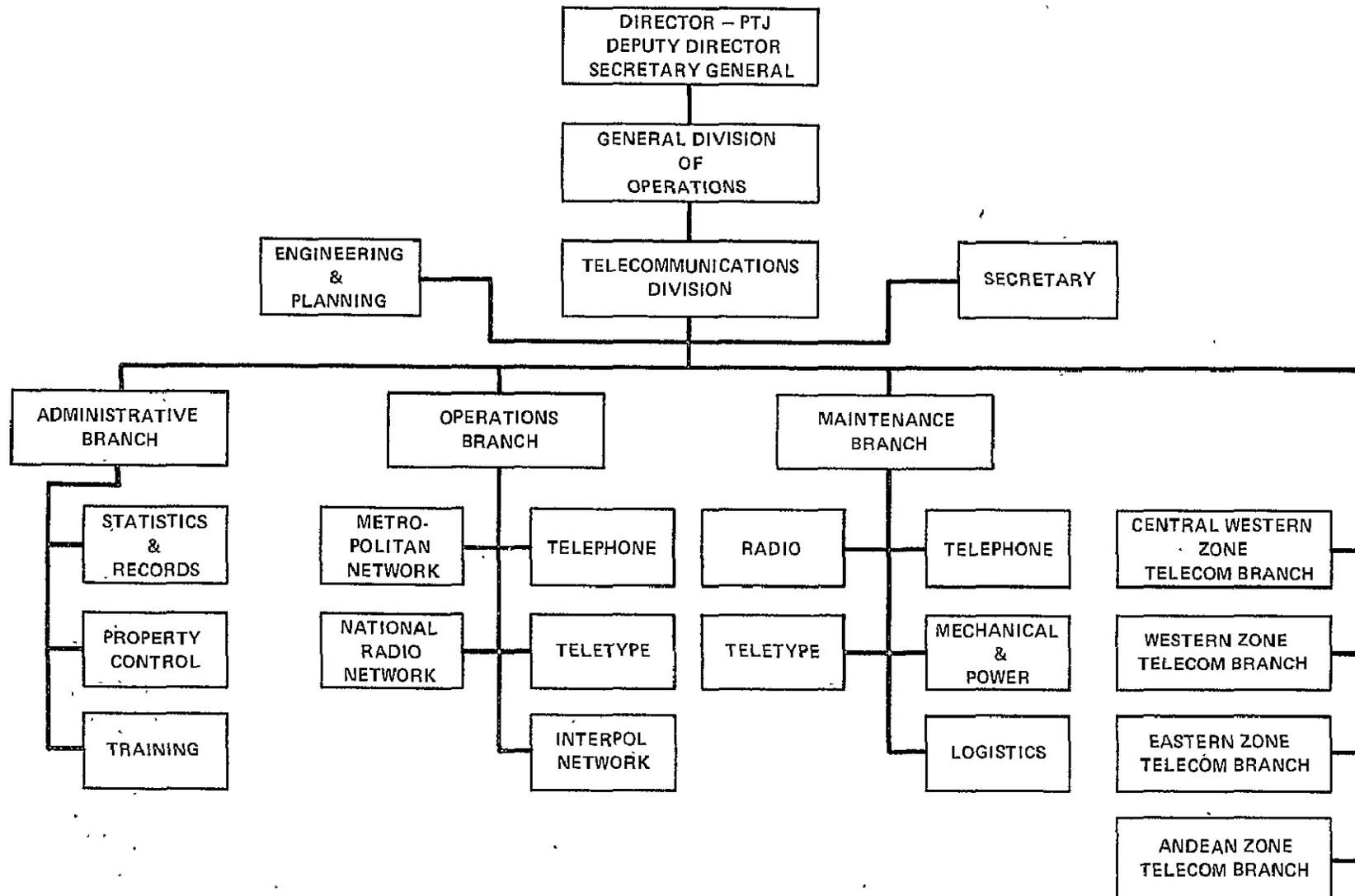


FIGURE 4

(b) PTJ should arrange, at this time for the leasing of necessary and available voice circuits from CANTV shown in figure 5. A quotation reflecting the monthly costs has been obtained from CANTV and is provided in Annex I.

3. Contract Services

(a) PTJ should negotiate a service contract with the manufacturer of the equipment utilized in the Caracas Radio Patrol Car System to modify the existing communications equipment in accordance with the systems engineering provided in this report.

(b) PTJ should negotiate a service contract with a competent company to maintain their UHF/FM equipment for a period of one year. A review of the contractor's technical expertise and facilities should be made as well as the contractor's capability to provide on-the-job training for PTJ technicians.

4. Training

(a) The selection and training of PTJ communications personnel will directly affect the performance of the communications system, consequently, consideration for these elements should receive as much care as the purchase and maintenance of the equipment.

(b) Formal training for selected PTJ officers in the management of urban and national telecommunications systems should be provided. Two PTJ officials should receive U.S. institutional training in telecommunications management. On returning these officers should be responsible for establishing a formal program of training. Other PTJ officers should be entered in the telecommunications school managed by CANTV.

(c) PTJ personnel demonstrating an interest in pursuing a career in communications should be offered advanced technical training at local schools as well as those in the U.S. Technician training in modern communications maintenance techniques such as that required is contracted for periodically by the International Police Academy, Office of Public Safety. This course, although given in the United States is, on occasion, conducted in the Spanish language for students from South America.

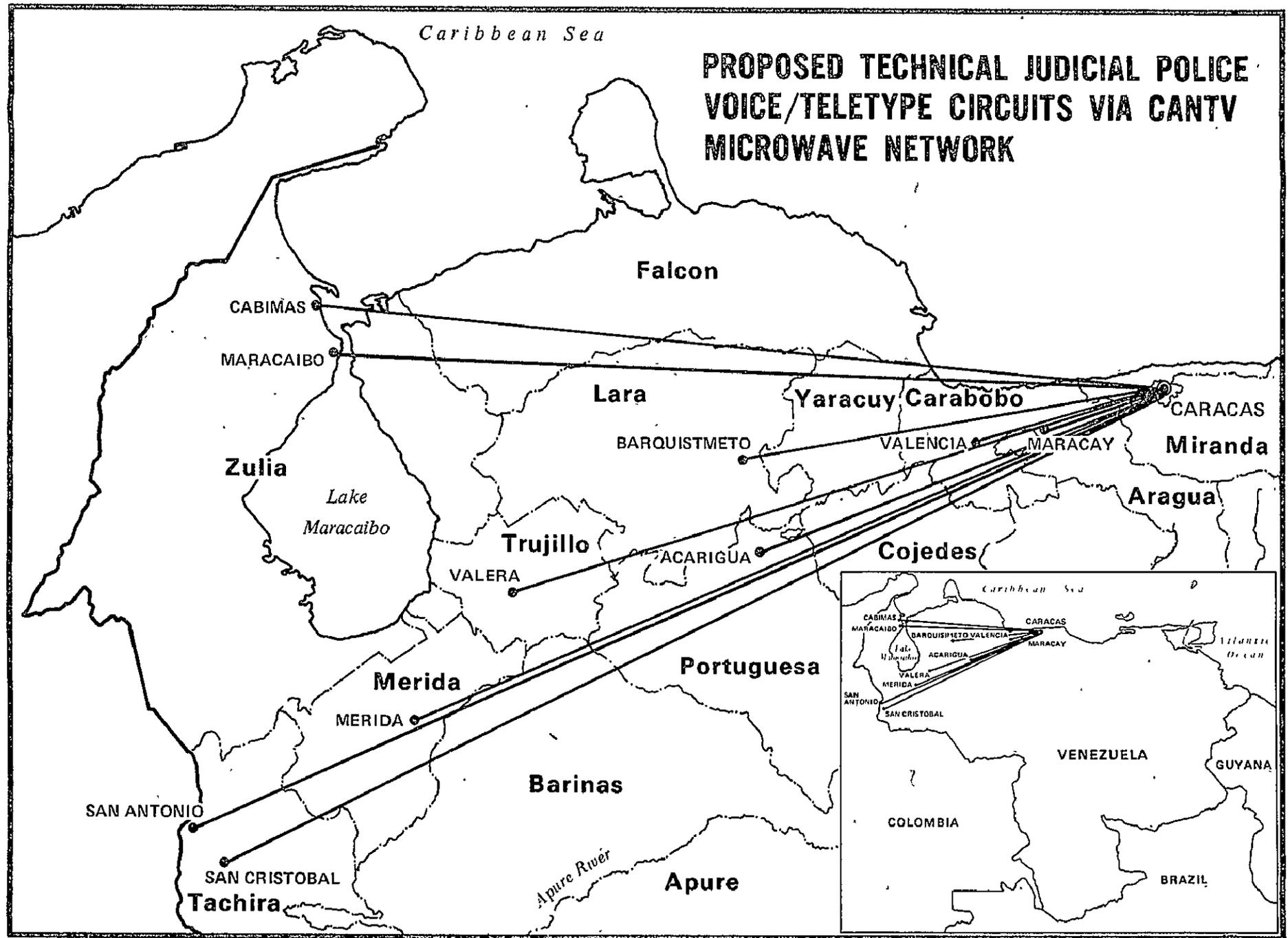


FIGURE 5

(d) In order to retain trained radio technicians, the PTJ should consider entering into a written agreement with individual personnel selected for this type of training wherein the individuals receiving this free training would be committed to remain in the PTJ service for three to five years or reimburse the PTJ for the funds expended on their training.

(e) A requirement to provide on-the-job training to selected PTJ personnel in the installation and maintenance of communications equipment should be included in any future maintenance contract awarded.

(f) PTJ communications personnel resources should be utilized more efficiently. PTJ personnel should be required to develop a range of skills rather than a single narrow specialty. Personnel should be trained in the duties of others and on a scheduled basis be given the experience in the different tasks. Dispatchers, switchboard operators, telephone complaint clerks teletype and where possible telegraph operators should learn each others jobs. The results of this kind of a training approach should enable the PTJ to operate their communications center more effectively when heavy demands are placed on its personnel during emergencies.

5. Maintenance

(a) It is recommended that the test equipment and tools specified in Annex II be purchased at an approximate cost of \$20,000, to improve PTJ maintenance capabilities in Caracas.

(b) Because of the distance between Caracas and many of the major field offices such as Maracaibo, repair facilities should be established in each of the five zones. The implementation of this recommendation, however, should be timed so that as technicians are trained and assigned to the zones proper facilities, test equipment and tools are then made available.

6. Technical Assistance

It is recommended that the PTJ obtain U.S. Government technical assistance to assure the effective planning and development of an improved communication capability. Technical assistance needed must be void of a conflict of interest

and should be provided at this time to assist in the proposed telecommunications systems development. A U.S. telecommunications engineer should assist PTJ to assure that the telecommunications systems and equipment which were specifically designed and recommended in this report to satisfy PTJ operations are properly installed and the necessary PTJ support capabilities, i.e., management and technical expertise developed.

B. Phase I of Recommended PTJ Telecommunications Plan

1. Proposed PTJ Caracas Radio Patrol Car System

(a) General

The radio patrol car system proposed in figure 6 will provide the PTJ unique flexibility for simultaneous operation over many channels throughout the Caracas area. The system includes both half duplex and simplex operation thus permitting portable-to-portable and mobile-to-mobile operation without dependence upon a repeater. It will provide more effective control of all field personnel during normal and emergency operations. The system also provides the PTJ Narcotics Division two independent channels (half duplex and simplex) which can be used country-wide to support their Narcotics enforcement activities.

(b) System Description

The system recommended will employ ten (10) frequencies on six channels and include tone coded squelch. It will necessitate a substantial modification to the existing equipment. Additional equipment is also recommended to improve systems reliability and provide a necessary backup capability in the event of primary equipment or power failure.

(1) Two additional 2 GHz microwave units and automatic transfer equipments are recommended for this purpose. In the event the microwave link or repeaters at El Avila are disabled, the emergency base station recommended for PTJ headquarters can be used to control the patrol cars by switching the base station to the repeater frequencies.

(2) It is recommended that the system include a capability to allow the radio dispatchers to override radio patrol car transmissions being relayed through a repeater. A repeater disable function capability is specified whereby the radio dispatcher presses a button on the control console to disable the repeater and operate it as a normal base station. This capability is especially necessary in the event that a mobile push-to-talk switch sticks in the "ON" position blocking the channel.

PROPOSED PTJ CARACAS UHF-FM RADIO SYSTEM

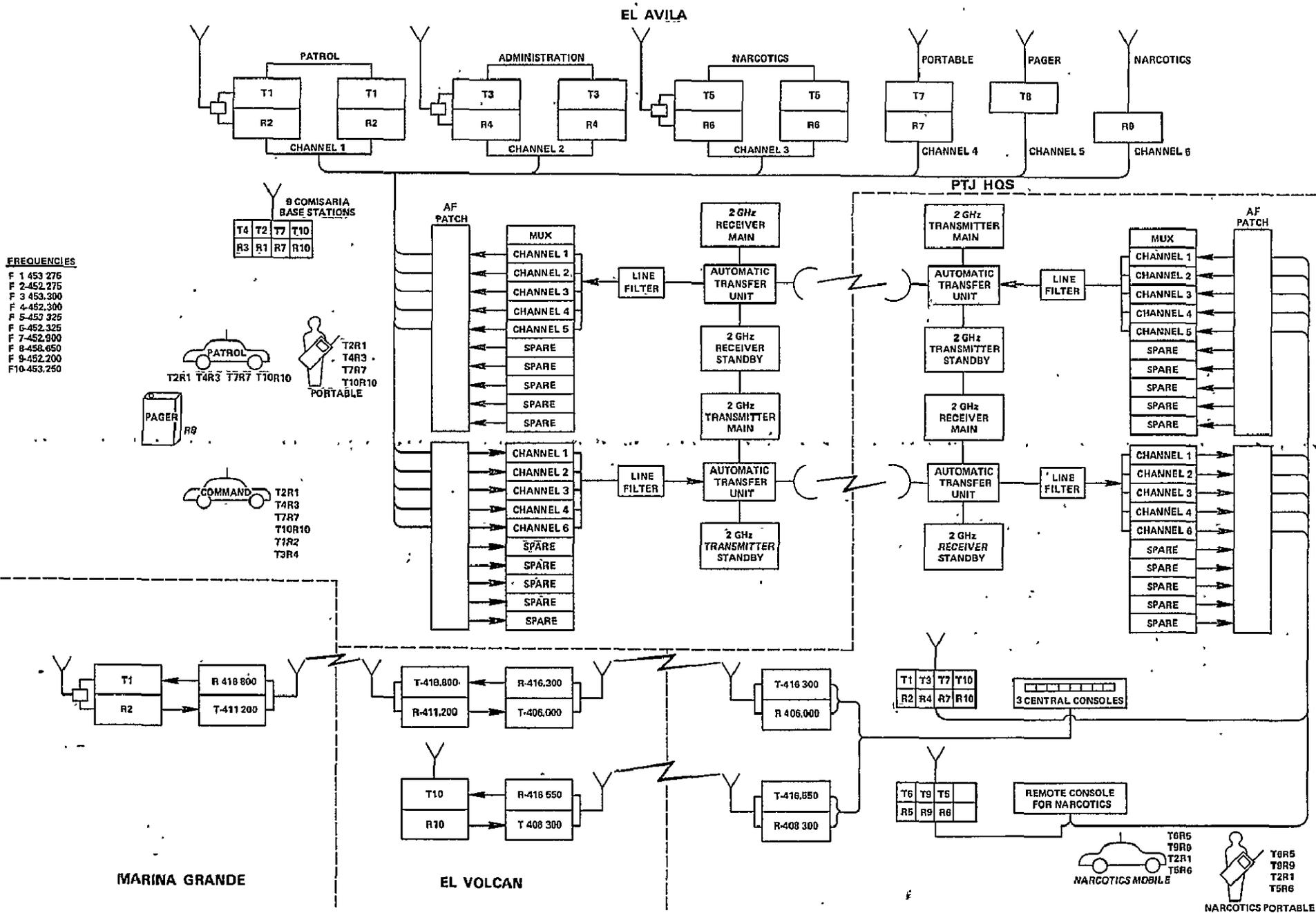


FIGURE 6

(3) An additional Channel 1 repeater is recommended for installation at Marina Grande to provide in-building coverage for personal portable radios used for PTJ operations in the airport area. A 12 or 25 watt transmitter located at Marina Grande will provide the necessary coverage.

(4) With the proposed use of CANTV leased lines for teletype operation, the UHF/FM wideband base stations currently connecting the Comisarias to El Avila are not required. It is recommended that four (4) of these units be used to link the PTJ headquarters with the Marina Grande repeater and two (2) be used to remotely control a base station at El Volcan (see figure 6).

(5) Base stations to allow the Comisarias to monitor and transmit on any of four channels is recommended. This will permit local control of subordinate portable units without interfering with city wide radio patrol car operations.

(6) The majority of the communications equipment recommended has a capability of four (4) channels. This number of channels is believed sufficient to satisfy most existing and near future PTJ operational needs. Six (6) channel mobile transceivers are only recommended for those vehicles employed by PTJ command personnel. The wide spread use of radio equipment with six (6) channels compounds the risk of PTJ personnel transmitting or monitoring on an incorrect channel and increases the cost of the equipment unnecessarily.

2. Modification of Existing Radio Patrol Car Network

The existing radio patrol car network should be modified and equipment replaced where necessary to assure a more effective PTJ communications capability. Approximately \$150,000 should be budgeted. This amount should cover the cost of the new equipment recommended, shipping charges and modification of existing equipment described below:

(a) Modification of the existing 20 personal portable transceivers (H 24FFN 1330) is not recommended because of the complexity involved. PTJ should trade in these personal portable transceivers to a manufacturer and purchase new units which include 4 channels with crystal elements installed, 4 watts RF power output, tone coded

squelch and encoder. Since PTJ has not used these units to any degree, it is believed that a large credit could be obtained. The credit is estimated at \$700. New transceivers should be identical to those 50 personal portables presently being purchased. (H 34FFN 3170 or equal) which allowing for the credit should cost approximately \$800 each - total \$16,000. Portables should be crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |

(b) 100 mobile transceivers (T64-MFT) Motrac's should be modified to include tone-coded squelch and encoder, and 4 channel crystal elements installed, estimated cost \$600 each - total \$60,000. Mobiles should be crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |

(c) Six repeaters modified to include duplexer, new crystal channel elements, tone-encoder/decoder, squelch gate and repeater disable function. In addition the repeater transmitter keying circuit should be modified to ensure that mobile ID codes received at the repeater are transmitted without actuating the repeater tone encoder. The tone encoder would be keyed following the mobile ID transmission opening the mobile tone coded squelch to all voice transmissions. Given this modification the PTJ radio patrol vehicles would no longer receive the annoying ID code tones; estimated cost \$3,400 each - total \$20,400. Repeaters should be crystallized to the following frequencies:

| | <u>Channel</u> | <u>Transmit</u> | <u>Receive</u> |
|--------|----------------|-----------------|----------------|
| 2 each | 1 | 453.275 | 452.275 |
| 2 each | 2 | 453.300 | 452.300 |
| 2 each | 3 | 453.325 | 452.325 |

(d) Ten base stations (new), one for narcotics control and 9 for Comisaria headquarters, to include 25 watt RF power output, 4 channel capability with crystal elements installed, tone-coded squelch and encoder; estimated cost \$1,862 each - total \$18,620. Units should be crystallized to the following frequencies:

| | <u>Transmit</u> | <u>Receive</u> |
|-----------|-----------------|----------------|
| 9 each | 452.300 | 453.300 |
| Comisaria | 452.275 | 453.275 |
| | 452.900 | 452.900 |
| | 453.250 | 453.250 |

| | <u>Transmit</u> | <u>Receive</u> |
|-----------|-----------------|----------------|
| 1 each | 452.325 | 453.325 |
| Narcotics | 452.200 | 452.200 |
| | 453.325 | 452.325 |

(e) One base station at PTJ headquarters to operate in event of emergency. Unit to include 90 watt RF power output, 4 channel capability with crystal elements installed, tone-coded squelch and encoder; estimated cost \$3,500 each - total \$3,500. Unit to be crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 453.275 | 452.275 |
| 453.300 | 452.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |

(f) Microwave terminals MR-200 to include automatic transfer function. In the event of failure will automatically turn on standby microwave transmitter and/or receiver. Requires one (1) at El Avila and one (1) at PTJ headquarters; estimated cost \$7,500 each - total \$15,000.

(g) Three boom type microphones with foot switch for PTJ dispatch consoles; \$160 each - total \$480.

(h) One-half inch foam Heliac with connectors (100 ft.); 12 required estimated cost \$253 each - total \$1, 836.

(i) Antenna omni-directional 5 db gain; 12 required, estimated cost; \$115 each - total \$1, 380.

(j) Two single channel, 12 watt base stations at PTJ headquarters should be turned in to the manufacturer for an approximate credit of \$800. Two new 25 watt repeaters containing tone-coded squelch encoder and repeater transmitter keying circuit modification described in paragraph 2(c) above should be purchased and installed at Marina Grande and La Guaira; estimated cost \$2, 700 - total \$5, 400. Repeater should be crystallized to the following frequencies:

| | <u>Channel</u> | <u>Transmit</u> | <u>Receive</u> |
|---------------|----------------|-----------------|----------------|
| Marina Grande | 1 | 453.275 | 452.275 |
| La Guira | 2 | 453.300 | 452.300 |

3. Equipment on Order

The PTJ urgently requires and should obtain additional mobile and portable transceivers to meet their immediate operational needs. The PTJ have recently acquired 150 new vehicles and have budgeted some \$360,000 to purchase 150 mobile and 50 personal portable transceivers. This new equipment must be compatible with the systems concept described in paragraphs B and C. An additional \$77,000 will be needed to assure that the equipment on order will be compatible with the proposed Caracas Radio Patrol Car System and provide for additional radio identification units and necessary standby electrical power equipment. Approximately \$437,000 should be budgeted to accomplish this and should be expended as described below.

(a) 120 new mobile transceivers should include the following specifications: minimum of 40 watts RF power output, 4 channel capability with crystal elements installed, tone-coded squelch and encoder (Micor T44 RTA 3900K or equal) estimated cost \$1,677 each - total \$201,240. Mobile units should be crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 453.900 |
| 453.250 | 453.250 |

NOTE: The model numbers and communications equipment specified is available from Motorola Inc. Other major suppliers of such equipment are General Electric and Radio Corporation of America. Electrical power equipment identified is available from Onan Corp, other major suppliers are Universal Motors and Kohler Corp. All reference in equipment specifications to commercial brand names and/or model numbers are intended to be descriptive, not restrictive, and are cited only to indicate the quality and characteristics of products that would be acceptable on an "or equal" basis.

A number of these mobile transceivers will be used for narcotics activities and should be identified by the PTJ and crystallated to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.325 | 453.325 |
| 452.200 | 452.200 |
| 452.275 | 453.275 |
| 453.325 | 452.325 |

(b) 30 new mobile transceivers same as paragraph above; however, these units will be used for command purposes and should be capable of 12 channel operation with 6 channel crystal elements installed (Micor T44 RTA 3800K or equal) estimated cost \$1,932 each - total \$57,960. Mobile units assigned to PTJ officials should be crystallated to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |
| 453.275 | 452.275 |
| 453.300 | 452.300 |

(c) 50 new personal portable transceivers should include 4 watts RF power output, 4 channels with crystal elements installed, tone-coded squelch and encoder (H 33FFN 317OM or equal) estimated cost \$1,492 each - total \$74,600. Portable units should be crystallated to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |

A number of these personal portable transceivers will be used for narcotics activities and should be identified by the PTJ and crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.325 | 453.325 |
| 452.200 | 452.200 |
| 452.275 | 453.275 |
| 452.900 | 452.900 |

(d) Identification Equipment

(1) To assure that the new 150 mobile transceivers provided are compatible with the existing identification system (ID), a mobile identification option should be specified. The requirement to transmit status information in addition to ID is believed in excess of PTJ needs and would increase the cost of the equipment by approximately \$500. An ID option only is estimated at \$232 each - total \$34,800.

(2) Two additional Identification Decoder and Display units should be purchased. One unit to monitor the new portable channel and the other to monitor the new narcotics repeater channel, estimated cost \$2,630 each - total \$5,260.

(3) To discourage unauthorized transmissions by PTJ personnel utilizing personal portable transceivers, units should contain an identification capability and transmit an identification code each time the push-to-talk switch on the personal portable is depressed. Funds should be budgeted so that this option can be added to the 70 personal portable units when it is made available by the manufacturer; estimated cost \$200 each - total \$14,000.

(e) Standby Electrical Power Equipment

To achieve a more reliable radio system, standby electrical power equipment should be provided at El Avila and PTJ headquarters. These units should be of sufficient capacity to run all the communications equipment until commercial electrical power is restored. Voltage regulators are recommended to prevent the failure of radio equipment due to fluctuating voltages.

(1) 2 each Standby Electric Generator Plant, 6 kilowatt, 120/240 VAC, 60 Hz single-phase, 3-wire power output. Diesel fueled, air cooled 1800 RPM engine, electric start model. Equipped with charge-rate ammeter, running time meter, 12 volt battery, radio interference filter, low oil pressure cutout and automatic load transfer panel with time delay and low-voltage sensor. (Onan Corp. Model 6DJB-3CE/2236 or equal) Estimated cost \$3,750 each - total \$7,500.

(2) 2 each voltage regulator, automatic ferro resonant type, 5 KVA, 60 Hz single-phase sinusoidal type, 118/236 VAC \pm 1% regulated output voltage. (Sola Model 23-25-250 or equal) Estimated cost \$1,000 each - total 2,000.

4. Proposed PTJ Telephone and Teletype System

(a) General

(1) The telephone and teletype (TTY) systems proposed in figure 7 would provide the major PTJ field offices telephone extensions off the headquarters PBX in Caracas. The teletype facilities recommended would abolish current message backlogs and pass heavy administrative traffic with the speed and accuracy required in police operations. It would also provide a needed permanent written record of all messages received or sent.

(2) The telephone and teletype systems proposed should operate over dedicated leased CANTV microwave and landline circuits. Annual leasing charges for the CANTV circuits should be considered part of the systems' operating cost in addition to the equipment. The ten departmental cities shown in figure 5 will be independently connected on a dedicated-line basis directly to the PTJ Communications Center in Caracas. Both dial telephone extensions and teleprinter service will be simultaneously available over the same circuit at each station.

(3) The teletypewriter at each station will be directly connected to a like teletypewriter at the Caracas end without circuit switching. One additional teletype channel will be available at each multiplex equipment terminal for future expansion when desired. An identical teletypewriter channel plus a dial telephone extension will also be available over CANTV leased wireline circuits to each of the nine Comisaria District stations in metropolitan Caracas. all corresponding teletypewriter machines

PROPOSED TELETYPE SYSTEM FOR PTJ

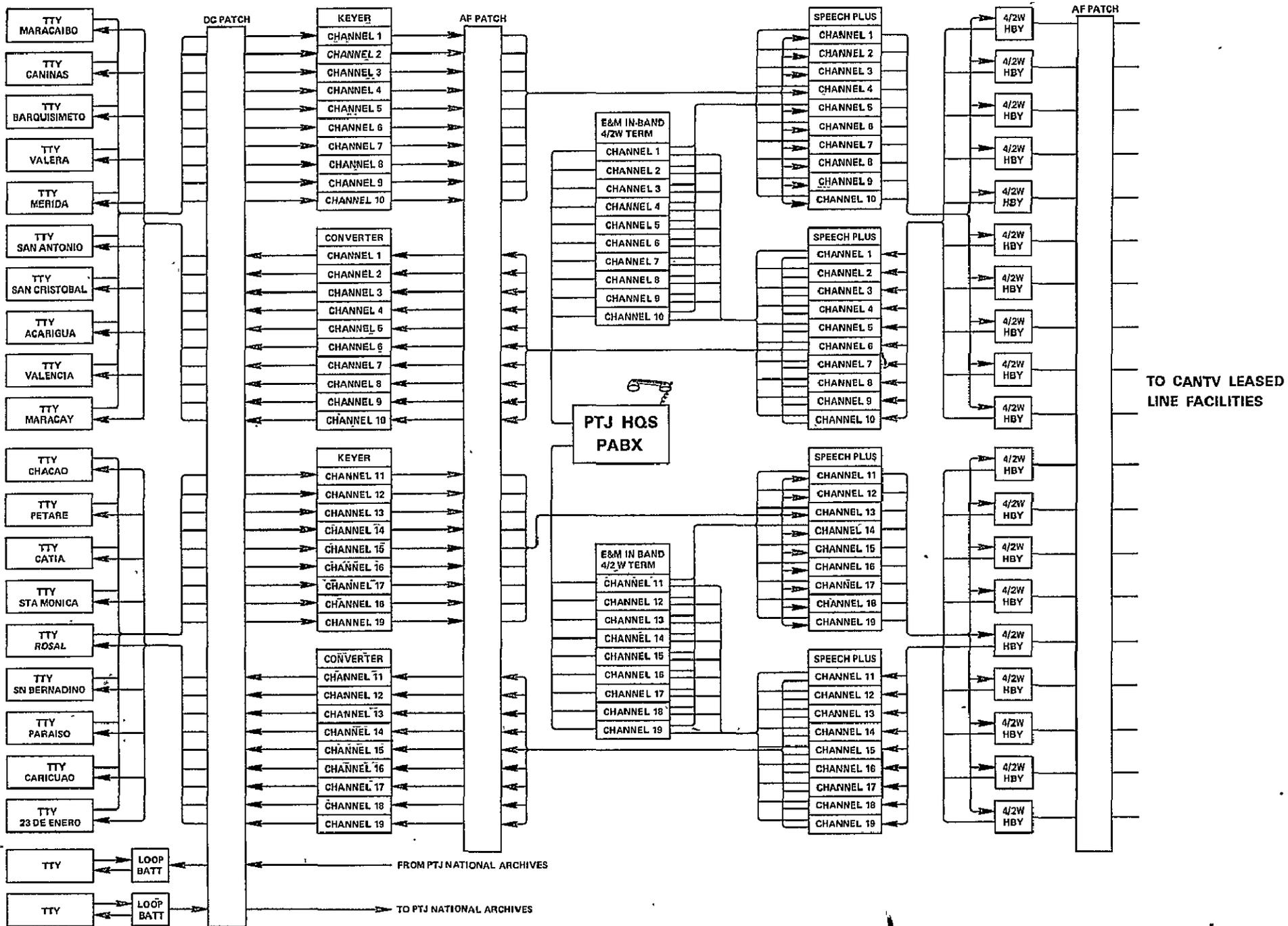


FIGURE 7

in the PTJ Communications Center are to be equipped with integral typing reperforators to permit incoming messages to be printed on the perforated tape as received from the field stations. The same unit is also used for transmitting punched tape messages to other teletype stations.

(4) Two independent circuits for teletypewriter message traffic are also to be established between the National Archives building and the PTJ Communications Center. Standard landline facilities will be used in this case without any tone multiplex or telephone equipment added.

(b) Systems

At each of the nineteen (19) stations (10 PTJ field offices and 9 Comisarias), subscriber terminal equipment would interconnect with the dedicated voice circuits (2-wire lines) leased from CANTV.

(1) Telephone

At PTJ headquarters in Caracas, all nineteen pairs of CANTV leased lines will be brought into the building and routed to the terminal equipment for distribution to the internal PABX switchboard and the teleprinter machines. The telephone instruments at the subscriber terminals in the PTJ field offices and the Comisaria's are operated as ordinary 3 digit extensions from the PABX at the PTJ headquarters in Caracas. The subscriber terminals will be equipped with loop dial E&M signaling feature using a 1600 Hz in-band signaling tone. A talk-battery and ringing generator will complement the telephone accessory group at each remote location. At the switchboard end in Caracas, compatible E&M to 20 Hz ringing converter will be utilized to access the switchboard and ring the appropriate telephone extension. Two-to-four wire termination hybrids will be employed with speech plus equipment at each terminal end to match the 4 wire channel units with the 2-wire CANTV lines.

(2) Teletype

The teletype tone equipment will use CCITT (International Standard) correlated tone channels of 3120 Hz and 2880 Hz. The second tone channel will not initially be needed but will offer a reserve teletype channel for future expansion. Channel spacing will be 240 Hz with a \pm 60 Hz shift which will enable a

transmission speed up to 150 baud (the equivalent of 130 words per minute) with an 8 level teletypewriter. The nineteen teletypewriter machines will be automatic send receive (ASR) type and offer tape reader, keyboard and page printer, and printed tape cutter features. In the teletype room at the PTJ headquarters an additional two ASR type teletypewriter machines are to be used for direct hard wire access to two other machines located at the nearby PTJ Identification and Records Section in the National Archives building.

(c) Teletypewriters and Multiplex Terminals

A total of \$300,000 is estimated as the amount required to purchase the necessary teletypewriters and multiplex terminals to impose simultaneous teletype messages and telephone conversations on CANTV leased voice circuits. This budgetary figure includes the cost of transportation. The teletypewriters and accessory terminal equipment projected for use in departmental field offices and Caracas Comisaria stations are as follows:

(1) Ten Departmental Field Offices and Caracas Headquarters

20 each - Teletypewriter machines, 8-level code, 110 baud transmission rate, half-duplex operation; automatic send-receive console, complete with keyboard, page printer, tape reader and printed tape cutter. Teletype Corp. Model 35 ASR. Estimated cost \$3500 each - total \$70,000.

20 each - Multiplex Terminals consisting of 10 each subscriber terminals and 10 each PBX terminals for two independent CCITT tone channels, with speech filter for simultaneous dial telephone service and accessory talk battery, ringing supply, E&M in-band signaling modules, shelves and equipment rack. Total cost \$60,450.

(2) Nine (9) Comisarias and Caracas HQ:

18 each - Teletypewriter machines, Teletype Corp. Model 35 ASR. Estimated cost \$3,500 each - total \$63,000.

18 each - Multiplex Terminals consisting of 9 each subscriber terminals and 9 each PBX terminals. Total cost \$54,405.

(3) Multiplex Terminals

Terminal equipment is divided into two (2) categories - Subscriber Terminals and PBX Terminals. A more detailed list of the type of components which make up the multiplex terminals are as follows:

Subscriber Terminals

| | | |
|--------|----------|----------------------------------|
| 1 each | 760 | Dial Telephone Set |
| 1 each | 850 | Wescom Ring Generator |
| 1 each | 451-01 | SF In-band Signaling Transceiver |
| 1 each | 457 | Subscriber Interface |
| 1 each | 400-2 | Frame |
| 1 each | 8923-16 | Bracket |
| 1 each | QFA-53A | Dual Filter Assembly |
| 2 each | QT-70 | FSK Transmitter |
| 2 each | QR-70 | FSK Receiver |
| 2 each | 60T-3 | Transmitter TTY Interface |
| 2 each | 60R-3 | Receiver TTY Interface |
| 1 each | 60T-15 | Line Terminal |
| 1 each | QP-25 | Power Supply 12/24 VDC |
| 1 each | QP-150/2 | Loop Power Supply |
| 1 each | QTU-10 | Hybrid 4/2 Wire |
| 1 each | QC-113 | Cabinet Wall Mount |
| 1 each | QX-612 | Module Frame |
| 1 each | ST-1 | Jackfield |
| 1 each | ST-2 | Loop Panel |

Estimated Cost Per Subscriber Terminal \$3,100

PBX Terminals at PTJ Headquarters

| | | |
|--------|--------|--------------------------------|
| 1 each | 451-01 | SF In-band Signaling Generator |
| 1 each | 458 | Central Office Interface |
| 1 each | 400-2 | Frame |

NOTE: The model numbers and equipment specified is available from Quindar Electronics Inc. Other major suppliers of such equipment are Radio Frequency Laboratories (RFL) and Telesignal Inc. All references in equipment specifications to commercial brand names or model numbers are intended to be descriptive, not restrictive, and are cited only to indicate quality and characteristics of products that would be acceptable to an "or equal" basis.

| | | |
|--------|----------|---------------------------|
| 1 each | 8923-16 | Bracket |
| 1 each | QFA-53A | Dual Filter Assembly |
| 2 each | QT-70 | FSK Transmitter |
| 2 each | QR-70 | FSK Receiver |
| 2 each | 60T-3 | Transmitter TTY Interface |
| 2 each | 60R-3 | Receiver TTY Interface |
| 1 each | 60T-15 | Line Terminal |
| 1 each | QP-25 | Power Supply 12/24 VDC |
| 1 each | QP-150/2 | Loop Power Supply |
| 1 each | QTU-10 | Hybrid 4/2 Wire |
| 1 each | QC-113 | Cabinet Wall Mount |
| 1 each | QX-612 | Module Frame |
| 1 each | ST-1 | Jackfield |
| 1 each | ST-2 | Loop Panel |

Estimated Cost Per PBX Terminal \$2,945

(4) Two (2) Teletype Circuits Between National Archives Bldg. and PTJ Headquarters

4 each - Teletypewriter machines, Teletype Corp. Model 35 ASR. Estimated cost \$3,500 - total \$14,000.

2 each - Loop Battery Supply unit. Estimated cost \$300 - total \$600.

(5) PTJ Headquarters

21 each - Teletypewriter Printing Reperforator integrally mounted within Model 35 ASR Teletype machine. Chadless Tape Punch. Estimated cost \$300 each - total \$6,300.

1 each - Teletypewriter machine for standby service. Teletype Corp. Model 35 ASR \$3,500 each - total \$3,500.

C. Phase II of Recommended PTJ Telecommunications Plan

1. Proposed HF/SSB Country-Wide Radio Telegraph Network

(a) General

(1) To effect a complete change in the PTJ HF/SSB country-wide radio telegraph network at this time is not recommended. This recommendation is based on several technical factors, the major one being the lack of trained manpower within the PTJ organization to support such a communications system. At this time, additional new HF/SSB equipment will not increase the efficiency or effectiveness of the PTJ radio telegraph network other than provide extensions for rural field offices (delegations) not presently serviced. The basic problem is to increase the effectiveness of the present network by more effective utilization of existing equipment, facilities and personnel.

(2) It is recommended that with the development of the necessary technical support capabilities in PTJ the HF/SSB radio network be modernized and expanded. PTJ utilization of commercial (CANTV) and GOV facilities are recommended throughout this report; not from the viewpoint of trying to limit the PTJ HF/SSB radio network; but for the purpose of complementing it. The retention and modernization of the PTJ HF/SSB radio network is necessary to assure maximum back-up capability in time of emergency.

(b) Systems Concept

It is recommended that the HF/SSB country-wide radio telegraph network be changed to more effectively satisfy PTJ administrative and operational requirements. In this regard six (6) independent radio networks should be established as follows:

(1) Inter-Zone Radio Network

One duplex radio network which would allow zones in the net to monitor Caracas or to pass traffic between zones given permission from Caracas (net control). PTJ stations to be included in this net are as follows:

| | | |
|---------------|---|----------------------|
| Caracas | - | Headquarters |
| San Cristobol | - | Andean Zone |
| Maracay | - | Central Zone |
| Barquisimeto | - | Central Western Zone |
| Maracaibo | - | Western Zone |
| Maturin | - | Eastern Zone |

(2) Intra-Zone Radio Networks

These five independent radio networks connect each zone headquarters with their subordinate field offices. PTJ stations to be included in each net are as follows:

Andean Zone Radio Network

| | | |
|---------------|---|--------------|
| San Cristobol | - | Headquarters |
| Baunos | | |
| El Vigia | | |
| Guasualito | | |
| San Antonio | | |
| Valera | | |

Central Zone Radio Network

| | | |
|------------------------|---|--------------|
| Maracay | - | Headquarters |
| Altagraciade Orituco | | |
| Calabozo | | |
| Candelario | | |
| La Victoria | | |
| Puerto Cabello | | |
| San Fernando | | |
| San Juan de los Marros | | |
| Valencia | | |
| Valle de La Pascuo | | |

Central Western Zone Radio Network

| | | |
|-----------------------|---|--------------|
| Barquisimeto | - | Headquarters |
| Acarigua | | |
| Guanare | | |
| San Carlos de Cojedes | | |
| San Felipe | | |
| Carora | | |

Western Zone Radio Network

Maracaibo - Headquarters
Cabinos
Coro
Punto Fijo
Santa Barbera
Los Haticos

Oriental Zone Radio Network

Maturin - Headquarters
Barcelona
Caripito
Carupano
Cummana
Cuidad Bolivar
El Tigre
Porlamar
Puerto Ayacucho
San Felix
Tucupita

(c) Technical Considerations

(1) To operate a duplex radio network separate PTJ transmitter and receiver facilities are recommended for Caracas and each of the zone headquarters. Sites selected should have adequate areas for the installation of antennae.

(2) The HF/SSB receiver site should where possible be located at the headquarters facilities. The transmitters should be remotely controlled through CANTV leased lines where available. The UHF/FM wideband equipment which will become surplus to PTJ needs in Caracas should be employed to control the remote HF/SSB transmitters and serve as a back-up to the CANTV leased wire lines.

(3) To establish Intra-zone radio networks and obtain maximum reliability in the proposed Inter-zone radio networks, many new operating frequencies must be obtained. They should be selected in accordance with HF propagation predictions. Propagation predictions are theoretical and made on the basis of empirical information such as known transmitter RF power, type of antenna and

transmitter and receiver location to the nearest hundredth of a degree. These predictions will help determine the best operating frequency according to the time of day. These frequencies should be obtained as soon as possible and monitored for several weeks to determine whether they are clear of interference from other countries.

(d) HF/SSB Communications Equipment

A total of \$155,000 is estimated as the amount required to purchase the necessary HF/SSB communications equipment. This budgetary figure includes the cost of transportation. Equipment recommended to modernize and expand the PTJ HF/SSB country-wide radio stations are as follows:

(1) Intra-zone Radio Network Equipment

39 each radio transceivers HF single sideband base stations frequency range 3-15 MHz, RF power output 100 watts PEP. Four channel crystal controlled operation with temperature controlled oven. Voice push-to-talk operation on LSB, USB and AM. CW operation on LSB and USB. Solid state construction (only vacuum tubes permitted are in high power RF stages). Units to be provided with clarifier control and are to be supplied with individual antenna connectors (automatic internal or external switching) for connecting four dipole antennas shall be provided with desk type microphone, telegraph key, internal speaker and four dipole antennas cut to frequency. Electrical power requirements 115 volts 60Hz.

Estimated Cost: \$1,500.00

Total Cost: \$58,500

(2) Inter-zone Radio Network Equipment

7 each transmitter, HF single sideband remote controlled RF power output, 100 watts PEP, 4 channels, 2-18 MHZ, capable of push-to-talk operation in USB, LSB and AM (compatible) modes. Units to be equipped for CW operation and employ solid state tone system for remote control over 2 wire telephone lines. Each unit shall be provided with 4 dipole antennas cut to operating frequency, internal or external antenna switch to select proper antenna, transmitter crystals, remote control unit and desk type microphone. Electrical power requirements 115/230 V 60HZ.

Estimated Cost: \$10,500

Total Cost: \$73,500

7 each radio receiver, HF single sideband, 2-18 MHZ, six channel crystal controlled, channel crystal oven mounted, 100% transistorized double conversion superheterodyne circuitry, switch selectable USB, LSB, CW and AM (compatible or true), adjustable squelch, speech clarifier and RF gain controls. Units to be provided with dipole antenna, desk top cabinet. Units to operate from 115/230 volts 60HZ.

Estimated Cost: \$1,075.00

Total Cost: \$7,525.00

2. Proposed PTJ Departmental UHF/FM Radio Patrol Car Network

(a) General

(1) The PTJ should budget sufficient funds to expand and modernize their radio patrol car networks in each of the major cities. The implementation rate would be dependent upon the extent of GOV resources. However, until the PTJ develop the necessary country-wide technical support capabilities, contract services would

be required to assure that the new equipment is properly installed and maintained.

(2) Existing radio equipment should be redistributed in order to have similar manufacturers equipment concentrated in a specific area or city. A suitable standardization plan should be made for the gradual and systematic replacement of old and obsolete radio equipment.

(b) Network Description

(1) The UHF/FM radio patrol car network recommended for PTJ Departmental use will employ six frequencies on four (4) channels and is fully compatible with the Caracas UHF/FM radio patrol car network. The frequency assignment and network design will be in concert with that shown in figure 6.

(2) The Departmental network includes both half duplex and simplex operation thus permitting portable-to-portable and mobile-to-mobile operation without dependence upon a repeater. It will provide more effective control of all field personnel during normal and emergency operations. The system also provides the PTJ Narcotics Division two independent channels (half duplex and simplex) which can be used country-wide to support their Narcotics enforcement activities.

(c) Budgetary & Equipment Considerations

Equipment for a typical PTJ Departmental UHF/FM Radio Patrol Car Network is described below. This equipment, including shipping charges, would cost approximately \$68,000. This network which offers the PTJ a minimum communications capability could be expanded as their operational requirements demand.

(1) Two repeaters to include 90 watt RF power output crystal channel element, tone-encoder/decoder and squelch gate; estimated cost \$3,500 each - total \$7,000.

| | <u>Channel</u> | <u>Transmit</u> | <u>Receive</u> |
|-----------|----------------|-----------------|----------------|
| 1 each | | | |
| Patrol | 1 | 453.275 | 452.275 |
| 1 each | 3 | 453.325 | 452.325 |
| Narcotics | | | |

- (2) Two base stations, 25 watt RF power output, 4 channel capability with crystal elements installed, tone-coded squelch and encoder; estimated cost \$1,900 each - total \$3,800. Units should be crystaled to the following frequencies:

| | <u>Transmit</u> | <u>Receive</u> |
|--------|-----------------|----------------|
| 1 each | 452.275 | 453.275 |
| Patrol | 453.300 | 452.300 |
| | 453.275 | 452.275 |
| | 452.900 | 452.900 |

| | <u>Transmit</u> | <u>Receive</u> |
|-----------|-----------------|----------------|
| 1 each | 453.325 | 452.325 |
| Narcotics | 452.325 | 453.325 |
| | 452.200 | 452.200 |
| | 452.900 | 452.900 |

- (3) 20 mobile transceivers should include the following specifications: minimum of 40 watts RF power output, 4 channel capability with crystal elements installed, tone-coded squelch and encoder - estimated cost \$1,700 each, total \$34,000. Mobile units should be crystaled to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 453.900 |
| 453.250 | 453.250 |

A number of these mobile transceivers will be used for narcotics activities and should be identified by the PTJ and crystaled to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.325 | 453.325 |
| 452.200 | 452.200 |
| 452.275 | 453.275 |
| 453.325 | 452.325 |

- (4) 10 personal portable transceivers should include 4 watts RF power output, 4 channels with crystal elements installed, tone-coded squelch and encoder - estimated cost \$1,500 each, total \$15,000. Portable units should be crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.275 | 453.275 |
| 452.300 | 453.300 |
| 452.900 | 452.900 |
| 453.250 | 453.250 |

A number of these personal portable transceivers will be used for narcotics activities and should be identified by the PTJ and crystallized to the following frequencies:

| <u>Transmit</u> | <u>Receive</u> |
|-----------------|----------------|
| 452.325 | 453.325 |
| 452.200 | 452.200 |
| 452.275 | 453.275 |
| 452.900 | 452.900 |

- (5) Two boom type microphones with foot switch for remote control consoles; \$160 each - total \$320.

- (6) One-half inch foam Heliac with connectors (100 ft.); 4 required estimated cost \$250 each - total \$1,000.

- (7) Antenna omni-directional 5 db gain; 4 required, estimated cost; \$115 each - total \$460.

3. Proposed Standby Electrical Power Equipment

The PTJ should budget approximately \$9,500 for standby electrical power equipment to assure maximum reliability. Standby electrical power equipment should be provided the PTJ headquarters and repeater site. These units should be of sufficient capacity to run all the communications equipment (including that used in the HF/SSB radio network) until commercial electrical power is restored. Voltage regulators are recommended to prevent the failure of radio equipment due to fluctuating voltages.

(a) 2 each Standby Electric Generator Plant, 6 kilowatt, 120/240 VAC, 60 Hz single-phase, 3-wire power output. Diesel fueled, air cooled 1800 RPM engine, electric start model. Equipped with charge-rate ammeter, running time meter, 12 volt battery, radio interference filter, low oil pressure cutout and automatic load transfer panel with time delay and low-voltage sensor. (Onan Corp. Model 6DJB-3E/2236 or equal) estimated cost \$3,750 each total \$7,500.

(b) 2 each voltage regulator, automatic ferro resonant type, 5KVA, 60 Hz single-phase sinusoidal type, 118/236 VAC \pm 1% regulated output voltage. (Sola Model 23-25-250 or equal) estimated cost \$1,000 each - total \$2,000.

ANNEX I

CANTV FACILITIES

A. CANTV Leased Private Microwave Circuits

Ten (10) Class I private microwave circuits between the PTJ headquarters in Caracas and their ten (10) field offices (Delegations).

1. The following are initial installation costs quoted by CANTV:

10 circuits at B's 1,000 each = B's 10,000.

2. The following are monthly rental costs quoted by CANTV for distance and terminal charges:

| | | |
|--------------------------------------|----|--------|
| (1) Caracas - Maracay (85 KM) | Bs | 3,400. |
| (2) Caracas - Valencia (130 KM) | Bs | 4,425. |
| (3) Caracas - Barquisimeto (275 KM) | Bs | 6,600. |
| (4) Caracas - Acarigua (276 KM) | Bs | 6,315. |
| (5) Caracas - Valera (431 KM) | Bs | 7,985. |
| (6) Caracas - Cabimos (504 KM) | Bs | 8,695. |
| (7) Caracas - Merida (513 KM) | Bs | 8,740. |
| (8) Caracas - Maracaibo (521 KM) | Bs | 9,080. |
| (9) Caracas - San Cristobal (660 KM) | Bs | 9,775. |
| (10) Caracas - San Antonia (680 KM) | Bs | 9,575. |

TOTAL Bs 74,590.

Less 33% Discount to GOB Bs 24,615.

Total Monthly Costs Bs 49,975.

B. CANTV Leased Lines

Nine (9) Class I urban private circuits between the principal PTJ office and its different Comisarias in Caracas.

1. The following are initial installation costs quoted by CANTV:

(a) Subscription rights
9 circuits Bs 1,200 each Bs 10,800

(b) Installation Costs
9 circuits Bs 250 each Bs 2,250

Total Installation Cost Bs 13,050

2. The following are the monthly rental costs quoted by CANTV:

(a) Charge per terminal end
9 circuits Bs 30 Bs 540

(b) Charges per trunk

| | | |
|---|-----|--------|
| (1) Headquarters to Comisaria North | 1TK | Bs 50 |
| (2) Headquarters to Comisaria South | 1TK | Bs 50 |
| (3) Headquarters to Comisaria East | 2TK | Bs 100 |
| (4) Headquarters to Comisaria West | 2TK | Bs 100 |
| (5) Headquarters to Comisaria Sta Monica | 1TK | Bs 50 |
| (6) Headquarters to Comisaria El Rosal | 2TK | Bs 100 |
| (7) Headquarters to Comisaria Petare | 3TK | Bs 150 |
| (8) Headquarters to Comisaria Caricuoo | 3TK | Bs 150 |
| (9) Headquarters to Comisaria 23 Enero | 2TK | Bs 100 |

Total Monthly Payment Bs 1,390

ANNEX II

TEST EQUIPMENT AND HAND TOOLS PROPOSED TO IMPROVE THE
TECHNICAL JUDICIAL POLICE MAINTENANCE CAPABILITY

A. Test Equipment

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|--|-----------------------|
| 1 | 1 each | <p>Service Monitor, incorporating the following features and specifications:</p> <p>a. Signal Generator, RF: Range - 1 MHz to 990 MHz, continuous; output level - 0.1 microvolt to millivolts; accuracy - $\pm .00002\%$; - 7 digit.</p> <p>b. Signal Generator, IF/AF: Range - 100 KHz to 90 MHz; modulation - 1 KHz (internal), 60 KHz to 8 KHz (external); output level - 0 to 1 volt into 50 ohms.</p> <p>c. Frequency Meter: Range - 450 MHz to 512 MHz; sensitivity - better than 20 microvolts.</p> <p>d. Additional Frequency Meter; 406 MHz - 420 MHz - RF Preselector Plug-in. SLN-6369A.</p> <p>e. Deviation Meter, oscilloscope: Range - 1.5 KHz to 15 KHz; frequency response - 50 KHz; sensitivity - 1 millivolt/division.</p> <p>f. Wattmeter, RF: Range - 150 MHz to 175 MHz. Power rating - 60 watts w/SLN-1009A and SLN 6376B.</p> <p>g. Power Source: 120 volts, 60 Hz.</p> <p>h. Motorola Model S-1327 BCE.</p> | \$7,100 |

Test Equipment (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 2 | 1 each | <p>Signal Generator, FM, with the following specifications:</p> <p>a. Frequency Range, RF: 25 MHz to 960 MHz.</p> <p>b. Modulation Frequency: Internal - 1 KHz (sine), 20 Hz (sawtooth). External - DC to 20 KHz.</p> <p>c. Frequency Stability: 0.001%.</p> <p>d. RF Output Voltage: .1 microvolt to 100,000 microvolts (2,000 microvolts at 900 MHz) continuously variable into 50 ohm load.</p> <p>e. Deviation Range: ± 16 KHz.</p> <p>f. Motorola Model PK-585, Measurements Model 800.</p> | \$1,100 |
| 3 | 1 each | <p>Multimeter, digital, with the following specifications:</p> <p>a. Voltage Range: AC/DC - 200 microvolts to 1,000 volts.</p> <p>b. Resistance Range: 200 ohms to 20 megohms.</p> <p>c. Ampere Range: AC/DC - 200 microamperes to 1 ampere.</p> <p>d. Display: 3-$\frac{1}{2}$ digit readout.</p> <p>e. Power Source: Self-contained rechargeable nickel cadmium batteries.</p> <p>f. Simpson Model 460, Triplet Model 8035 Heath/Schlumberger Model SM-4440.</p> | 420 |

Test Equipment (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 4 | 2 each | Multimeter, VOM and carrying case with the following specifications: a. Sensitivity: 20,000 ohms per volt DC, 5,000 ohms per volt AC. b. Voltage Range: DC - 0 to 250 millivolts; DC/AC - 1 to 1,000 volts. c. Resistance Range: 0 to 20 megohms. d. Ampere Range: DC - 0 to 50 microamperes, 0 to 500 milliamperes, 0 to 10 amperes. e. Simpson Model 260, Triplet Model 630. | \$ 210 |
| 5 | 2 each | Wattmeter, RF, thru-line type, with the following plug-in elements: a. ST-1019, ST-1022, ST-1023, ST-1003. b. Bird Model 43. | 500 |
| 6 | 1 each | Wattmeter, RF, termination type, with the following specifications: a. Frequency Range: 30 MHz to 500 MHz. b. Power Rating: 0 to 150 watts. c. Bird Model 6154, Sierra Model T1024A. | 300 |

Test Equipment (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 7 | 1 each | <p>Power Supply, DC, with the following specifications:</p> <p>a. Output Voltage: 1 volt to 40 volts DC.</p> <p>b. Current Rating: 20 amperes continuous, 40 amperes intermittent.</p> <p>c. Meters: Voltage and current.</p> <p>d. Regulation: $\pm 1\%$.</p> <p>e. Ripple: 10 millivolts nominal to 20 amperes.</p> <p>f. Power Source: 117 volts, 60 Hz.</p> <p>g. Motorola Model S-1305A, Lapp Model 84.</p> | \$ 530 |
| 8 | 1 each | <p>Transistor Tester, in or out of circuit with the following specifications:</p> <p>a. AC beta: 1 - 500.</p> <p>b. Power (I_{cbo}): 0-5,000 microamperes.</p> <p>c. Mutual Conductance (G_m) -0-50,000 microhms.</p> <p>d. Leakage (gate): 0 - 5,000 microamperes.</p> <p>e. Current (I_{pss}) drain (zero bias test for matching FET's).</p> <p>f. Sencore Model TF-151.</p> | 125 |

Test Equipment (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|---|-----------------|---|-----------------------|
| 9 | 1 each | Frequency Counter, Digital Readout with the following specifications: a. Frequency Range: RF 20 Hz to 500 MHz. b. Display: Direct reading, 8 unit indicators. c. Power Source: 115 VAC, 60 Hz. d. El Dorado Model 1650; Heath/Schlumberger SM-110C. | \$1,850 |
| 10 | 1 each | DC Electronic Voltmeter Motorola Model S1063A. | 364 |
| 11 | 1 each | AC-High Impedance Millivoltmeter Motorola Model S1053C. | 310 |
| 12 | 1 each | VTVM-General Use Type w/case Simpson Model 312. | 140 |
| 13 | 1 each | Audio Signal Generator 5 Hz to 600 KHz Frequency Range Hewlett Packard Model 200 CD. | 350 |
| 14 | 1 each | HF Signal Generator, 50 KHz to 65 MHz Frequency Range Hewlett Packard Model 606A. | \$1,830 |
| 15 | 1 each | Oscilloscope; DC coupled; 5" screen; Industrial Type Simpson Model 459. | 425 |
| 16 | 1 each | Teletypewriter Universal Tool Kit; Teletype P.N. 113778. | 185 |
| Estimated Total Cost (Caracas Maintenance Center) | | | \$15,739 |

B. Hand Tools

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 1 | 1 each | Soldering Iron, 20 W, 1/8 in. tip. American Beauty 3108. | \$ 5.15 |
| 2 | 1 each | Soldering Iron, 100 W, 3/8 in. tip. American Beauty 3138. | \$ 10.35 |
| 3 | 1 each | Soldering Gun, 100 W, Weller 8200. | \$ 9.60 |
| 4 | 1 each | Desoldering Tool. Ungar 7800. | \$ 12.95 |
| 5 | 1 set | Desoldering Tips, Ungar 7806, 7812, 7813. | \$ 3.00 |
| 6 | 1 set | Soldering Tool. Klein 51, 51B, 51C. | \$ 3.10 |
| 7 | 1 each | Heat Sink, 2 in. Hunter 51F. | \$ 1.00 |
| 8 | 1 each | Magnifier, Illuminated. Luxo LFM-1. | \$ 42.00 |
| 9 | 1 each | Magnifier, Illuminated. Newark 35F1182. | \$ 8.95 |
| 10 | 1 each | Vise, Swivel. Vacu 1800. | \$ 6.95 |
| 11 | 1 each | Tool Box. Simmonds 16CS. | \$ 5.85 |
| 12 | 1 each | Cabinet, 36 Drawer. Amro-Mills 17-136. | \$ 15.00 |
| 13 | 1 each | Power Drill, 3/8 in., variable speed. SKIL 451. | \$ 37.00 |
| 14 | 1 each | Grinder, Bench. SKIL 291 | \$ 69.00 |

Hand Tools (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 15 | 1 set | Drill Bit Set, 1/16 - 1/2 in., 1/4 in. shank. Newark 35F2650. | \$ 24.00 |
| 16 | 1 each | Wire Stripper. Miller 106 | \$ 1.50 |
| 17 | 1 set | Wrench, Open-end Set, 7/16 - 3/4 in. Newark 35F2603 | \$ 2.35 |
| 18 | 1 set | Wrench Box-end Set, 7/16 - 7/8 in. Newark 35F2605. | \$ 4.50 |
| 19 | 1 set | Wrench, Drive Set, 1/4 in., 3/16 - 1/2 in. Newark 34F248. | \$ 17.50 |
| 20 | 1 each | Wrench, Lever Jaw. Newark 35F2600. | \$ 3.30 |
| 21 | 1 each | Pliers, Curved Nose, 6 1/2 in. Klein D-3Q2-6. | \$ 4.10 |
| 22 | 1 each | Pliers, Leverage, 8 1/2 in. Klein D-213-8NE. | \$ 6.00 |
| 23 | 1 each | Pliers, Semi-flush Cutter, 4 3/16 in. Klein D-257-4C. | \$ 3.60 |
| 24 | 1 each | Pliers, Long Nose, 8 in. Klein D-314-8. | \$ 4.25 |
| 25 | 1 each | Pliers, Pump, 10 in. Klein D-502-10. | \$ 3.60 |
| 26 | 1 each | Hammer, Soft Face. Allied 50N161. | \$ 2.75 |
| 27 | 1 each | Hammer, Claw. Klein 806-18. | \$ 6.50 |
| 28 | 1 each | Hack Saw, 12 in. Newark 34F108. | \$ 4.40 |
| 29 | 1 set | Hack Saw Blades, 12 in. Newark 34F185. | \$ 1.00 |

Hand Tools (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|-------------|-----------------|---|-----------------------|
| 30 | 1 each | Scissors, 5 in. Klein 2100-5. | \$ 3.50 |
| 31 | 1 each | Seizers, Straight Nose, 6 in. Xcelite 424. | \$ 4.60 |
| 32 | 1 each | Seizers, Curved Nose, 6 in. Xcelite 434. | \$ 4.70 |
| 33 | 1 each | Tweezers, Straight, 4 1/4 in. Newark 35F2600. | \$ 1.60 |
| 34 | 1 each | Knife, Electricians. Newark 34F022. | \$ 2.40 |
| 35 | 1 each | Tape Rule, 12 ft. Newark 34F188. | \$ 3.75 |
| 36 | 1 set | Punch Set, Chassis, 1/2 - 1 1/4 in. Newark 33F750. | \$ 12.25 |
| 37 | 1 set | Screwdriver Set, Subminiature. Hunter XK24B13. | \$ 3.25 |
| 38 | 2 each | Screwdriver, Phillips, size 0. Xcelite XST-100. | \$ 1.40 |
| 39 | 2 each | Screwdriver, Phillips, size 1. Xcelite XST-101. | \$ 2.00 |
| 40 | 2 each | Screwdriver, Phillips, size 2. Xcelite XST-102. | \$ 2.50 |
| 41 | 2 each | Screwdriver, Standard Blade, 1/8 x 8 in. Vaco K-28. | \$ 3.50 |
| 42 | 2 each | Screwdriver, Standard Blade, 3/16 x 6 in. Vaco K-36. | \$ 4.30 |
| 43 | 2 each | Screwdriver, Standard Blade, 1/4 x 6 in. Vaco K-46. | \$ 4.60 |
| 44 | 2 each | Screwdriver, Standard Blade, 1/4 x 4 in. Newark 34F104. | \$ 2.80 |

Hand Tools (cont.)

| <u>Item</u> | <u>Quantity</u> | <u>Description</u> | <u>Estimated Cost</u> |
|----------------------|-----------------|---|-----------------------|
| 45 | 2 each | Screwdriver, Standard Blade, 5/16 x 6 in. Newark 34F105. | \$ 2.80 |
| 46 | 2 each | Screwdriver, Standard Blade, 3/8 x 8 in. Newark 34F106. | \$ 3.60 |
| 47 | 2 each | Screwdriver, Standard Blade, 3/16 x 6 in. Newark 34F108. | \$ 2.10 |
| 48 | 1 set | Nutdriver Set, 3/16 - 9/16 in. Newark 34F367. | \$ 7.65 |
| 49 | 1 set | Nutdriver Set, 1/4 - 1/2 in. Newark 34F368. | \$ 9.00 |
| Estimated Total Cost | | | \$398.75 |
| 3 Tool Sets Cost | | | \$1,196.25 |

ANNEX III

Inventory of Technical Judicial Police Communications Equipment

| <u>Manufacturer</u> | <u>Model</u> | <u>Type</u> | <u>Quantity</u> | <u>Approximate Yr.</u> |
|--------------------------------|--------------|-----------------|-----------------|------------------------|
| <u>A. Point-to-Point Radio</u> | | | | |
| <u>Motorola</u> | MR-200 | 2 GHz Microwave | 2 | 1972 |
| | MR-46 | UHF-FM Base-WB | 14 | 1972 |
| | MC-300 | Multiplex | 48 | 1972 |
| | MA-364A | Order Wire | 2 | 1972 |
| | | TOTAL | 66 | |
| <u>B. Portable/Pager</u> | | | | |
| <u>Motorola</u> | H24 FFN 1330 | Portable | 20 | 1972 |
| " | H04 BNC1102 | Pager | 50 | 1972 |
| " | LOB | Encoder | 1 | 1972 |
| | | TOTAL | 71 | |
| <u>C. FM Base</u> | | | | |
| <u>Motorola</u> | C 34 MSB | Base | 2 | 1972 |
| " | B 94 MSY | Repeater | 6 | 1972 |
| " | T 1366 | Console | 1 | 1972 |
| " | T 1605 | Console W/ID | 1 | 1972 |
| G.E. | VO-48 | Repeater | 4 | 1962 |
| " | 4EP3A1 | Base | 1 | 1962 |
| RCA | CC-30 | Base | 2 | 1967 |
| Aerocom | 1046 | Base | 1 | 1967 |
| Comco | 450-F6 | Base | 2 | 1959 |
| " | 582-TR | Base | 3 | 1959 |
| G.E. | - | Base | 1 | 1969 |
| G.E. | - | Base | 21 | 1962 |
| RCA | CSK7LJA | Receiver | 2 | 1967 |
| | | TOTAL | 47 | |
| <u>D. FM-Mobile</u> | | | | |
| <u>Motorola</u> | T64MFT | Mobile | 100 | 1972 |
| Comco | - | Mobile | 2 | 1959 |
| G. E. | - | Mobile | 65 | 1962 |
| | | TOTAL | 167 | |

E. HF/SSB

| | | | | |
|------------|--------|--------------|----------|------|
| RCA | SBA-1K | Linear Ampl. | 2 | 1967 |
| RCA | SSB-1 | Base | 2 | 1967 |
| " | SSB-5 | Base | 1 | 1967 |
| Hammarlund | HQ-100 | Receiver | 1 | 1966 |
| Collins | 515 | Receiver | 2 | 1967 |
| RCA | - | Base | 6 | 1965 |
| Comco | - | Base | 32 | 1959 |
| Aerotron | - | Base | <u>4</u> | 1966 |
| | | TOTAL | 50 | |

ANNEX IV

GLOSSARY

BAUD

The unit of signaling speed equal to one code element per second.

BASE STATION

A radio station at a fixed location which is used primarily for communicating with mobile and/or portable units.

CHANNEL

A certain single portion of the radio spectrum assigned to a user of two-way communications.

CIRCUIT

A means of both-way communication between two points comprising associated "go" and "return" channels.

COMMUNICATIONS CENTER

The complex of equipment and personnel from which all communication activity in a particular system is controlled.

CONTROL CONSOLE

A desk-mounted enclosed panel which contains a number of controls used to operate a radio station.

DUPLEX OPERATION

A type of operation in which simultaneous two-way conversations, messages, or information may be passed between any two or more given points.

EXTENSION LINE

A line from the PABX which terminates at a telephone instrument.

HALF-DUPLEX

A circuit designed for duplex operation, but which on account of the nature of the terminal equipments (2-wire) can be operated alternately only.

HIGH FREQUENCY (HF)

Frequencies from 3-30 megahertz. Used for long distance communications.

INTERMODULATION

The combination of two or more signals at closely spaced frequencies to yield a signal at a new frequency which is close to the first two frequencies.

LINK

A transmitter - receiver system and transmission medium forming a two-way path for transmission of information.

MOBILE (VEHICLE) TRANSCEIVER

A two-way radio station in the mobile service intended to be used while in motion or during halts at unspecified points.

MODULATION, AMPLITUDE (AM)

The form of modulation in which the amplitude of the carrier is varied in accordance with the instantaneous value of the modulating signal.

MODULATION, CONTINUOUS WAVE (CW)

Interrupting the carrier at precise intervals permits the use of Morse Code, a telegraphic alphabet or code consisting of dots, dashes, and spaces. The transmitting wave contains a fixed carrier with no intelligence and no sidebands.

MODULATION, FREQUENCY (FM)

A method of modulating a carrier-frequency signal by causing the frequency to vary above and below the unmodulated value in accordance with the intelligence signal to be transmitted. The amount of deviation in frequency above and below the resting frequency is at each instant proportional to the amplitude of the intelligence signal

being transmitted. The number of complete deviations per second above and below the resting frequency corresponds at each instant to the frequency of the intelligence signal being transmitted.

MULTIPLEX

A multiplex system combining a number of voice channels for instantaneous transmission over a wide-band system.

PERSONAL PORTABLE

A small portable transceiver intended to be carried by hand or on the person of the user.

PORTABLE TRANSCEIVER

A completely self-contained battery-operated radio which may be moved from one position to another.

PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)

Telephone switchboard requiring no operator. Provides automatic dial service for incoming and outgoing telephone calls.

PROPAGATION (ELECTROMAGNETIC)

The travel of electromagnetic waves through a medium or the travel of a sudden electric disturbance along a transmission line. Also called wave propagation.

RADIO IDENTIFICATION

A method whereby an identification code (intelligence) is automatically transmitted each time the push-to-talk button is depressed on the mobile or portable. The radio identification code is then displayed at the control console.

RADIO NETWORK

A number of radio stations fixed and/or mobile in a given geographical area which communicate with each other by sharing the same radio channels.

RECEIVER

An instrument which amplifies radio frequency (RF) signals, separates the intelligence signal from the RF carrier, amplifies the intelligence signal additionally, in most cases, then converts the intelligence signal back into its original form.

REMOTE CONTROL

Control of a base station at a distance, through a telephone line or a radio link.

REPEATER

An operational fixed station established for the automatic retransmission of radio communications received from any station in the Mobile Service. Used to increase mobile/portable-to-mobile/portable and mobile/portable-to-base communications range and extend the range of a VHF or UHF radio system over greater distances and obstructions such as mountains, buildings, etc.

SIGNAL

The form or variation of a wave with time, serving to convey the information, message, effect, or other desired intelligence in communications.

SIGNALING, INBAND

Signaling which utilized frequencies within the voice or intelligence band of a channel.

SIGNALING, OUT-of-BAND

Signaling which utilizes frequencies within the guard band between channels. This term is also used to indicate the use of a portion of the channel bandwidth provided by the medium such as the carrier channel, but denied to the speech or intelligence path by filters.

SIGNALING, RINGDOWN

The application of signal to the line for the purpose of bringing a line signal or supervisory signal at a switchboard or ringing a users instrument.

SIMPLEX

A method of radio operation in which communication between two stations takes place in only one direction at a time. This includes ordinary transmit-receive operation, press-to-talk operation, voice-operated carrier, and other forms of manual or automatic switching from transmit to receive. Also called simplex. (Compare with "duplex operation.")

SINGLE SIDEBAND (SSB)

That method of communications in which the frequencies produced by the process of amplitude modulation on one side of the carrier are transmitted and those on the other side are suppressed. The carrier frequency may be either transmitted or suppressed.

SPEECH - PLUS

A method of operation in which speech and telegraph are transmitted simultaneously over the same radio channel.

SQUELCH CONTROL

A manual control in a receiver that can be adjusted to render the receiver inoperative when no signal is present.

TELEPRINTER

Is used to designate a device with receive only capabilities as opposed to a teletypewriter which can send as well as receive.

TELETYPE

A system of communication in which the teletype, a trademark applied to a kind of teletypewriter is used.

TELETYPEWRITER

An electromechanical device, similar to a typewriter, wherein messages typed on the keyboard of the transmitter unit are converted into electrical signals. These signals are then conveyed to a receiver unit where they are transferred to print out on paper.

TONE SQUELCH

A feature where no transmissions are heard at the receiver unless accompanied by a subaudible tone or preceded by an audible tone.

TRANSCEIVER

A transmitter and receiver with common circuits constructed in such a manner as to form one complete mobile, portable or base station.

TRANSMITTER

A radio frequency power source which generates radio waves for transmission through space.

ULTRA HIGH FREQUENCY (UHF)

Frequencies from 300 to 3000 Megahertz, used for line-of-sight communications.

VERY HIGH FREQUENCY (VHF)

Frequencies from 30 to 300 Megahertz, used for line-of-sight communications.

WIDEBAND SYSTEM

A system with a multi-channel bandwidth of 20 kilohertz or more.

4/2 WIRE HYBRID

Terminal unit for connecting a telephone to a radio or carrier circuit. Permits patch of circuit to switchboard for extension to telephone lines.