

*FISHERMEN SAFETY AT SEA COMMUNICATION*

*NETWORK PROJECT*

*COMPLETION REPORT*

*Fisheries Division  
MAFFM  
Apia  
Samoa*

*July 1999*

## COMPLETION REPORT

### FISHERMEN SAFETY AT SEA COMMUNICATION NETWORK PROJECT

#### Introduction

1. The need to establish a Safety Communicating Network for Samoa Fishermen had long been considered by the Fisheries Division due to the expansion of its local fleet. This was prompted by the tendency of the fishermen to wander further offshore for better fishing ground and eliminate line entanglement. With this movement of the fleet, the fishermen seemed to neglect their safety and appropriate communication equipment and were not readily available on board should a problem come up.
2. In 1993, a project proposal was submitted to FFA through Foreign Affairs seeking possible funding under PDF funds. After a long string of communication, US\$175,780.00 was finally made available for the project implementation in mid 1994. The Minister of Agriculture, Forests, Fisheries and Meteorology and the Managing Director of the Pro Com System officially signed the Deed of Agreement for Construction. The work began in late 1996 and was completed by early 1997. The official handing over of the project was made in March 1997 and became fully operational mid year.

#### Distribution of Project Funds

3. The total Project Fund approved and transferred to the account with the Treasury Department by FFA was US\$175,780.00 (S\$407,270.00). First payment for the contract amounting to S\$264,968.55 tala (US\$114,257) was made on 16<sup>th</sup> December 1996. The second payment of S\$101,817 tala (US\$43,945) was made on the 14<sup>th</sup> March 1997, after the Fisheries received a Provisional Acceptance Certificate for Completion from the Post and Telecom Department. Final payment of the 10% (S\$40,700 or US\$17,578) Performance Bond was made on 27<sup>th</sup> March 1997.

#### Commissioning and the Launching of the project

4. The Fishermen's Radio Communication Net work was officially opened on Thursday 27<sup>th</sup> of March 1997 with a short service conducted by Rev. Setu Sami. The keynote address was delivered by the former Minister of Agriculture, Forests, Fisheries and Meteorology, Hon. Molio'o Teofilo Vaeluaga.

#### The System Setup

5. The system was set up in a way as to fully utilize the available resources. The specifications and the radio telephone- infrastructure plan are attached as Annex of this report.

### **Government Contribution**

- 6 The Fisheries Division now employs two permanent staff and two casual workers as full time operators for the radio communication network. The Network is providing a 24-hour service working throughout the weekends and holiday period. Since the installation of the Fisheries Communication Network, the Government has approved over the past years Fisheries Budget of which maintenance of the network system forms part of the operating expenses.
- 7 The government in its continuous effort to develop the fishing industries is also building a new office building at the Fisheries Headquarter to house the Radio Communication Network staff and other supporting staff of the Development Section. This new office building which is located along the wharf will make communication and monitoring of boats and fishermen alike much easier.

### **Training of Fisheries and Fishermen/Boatowners**

- 8 As part of the tender package requirement, the winning bid should also conduct training for the Fisheries staff as well as local fishermen/boatowners on the operation of the system and the use of the radios. Three newly recruited staff completed a one-week training workshop and more than 80 fishermen/boatowners attended four separate sessions conducted by the Pro Com System staffs.

### **Distribution of hand held Radios**

- 9 A total of 90 VHF hand held radios were distributed to the fishermen. Ten mobile radios were purchased and the Fisheries Division, for monitoring purposes, retained nine. The other one was installed on the Nafanua patrol boat for use during search and rescue mission.
- 10 Besides the radios provided under the project, other fishermen purchased their own and were allowed free access to the Communication Network. At the time of writing this report more than 300 fishing boats and boat owners are currently utilizing the system.
- 11 Fish has been Samoa's number one export commodity in the last 3 years. As a direct result of this, the local fleet has increased dramatically from around 80 boats in 1996 to close to 270 in 1998. There were 3 registered boats over 15 meters long. However, on any given day, an average of about 60 local fishing boats fished in the EEZ of Samoa.

### **Problems Encountered and Discussion**

- 12 Since the operation of the Communication Network, the following problems have been encountered by the Project.

### Limited Range of the Communication Network

- 13 With the success of the long line fishery, the industry has grown so rapidly in the last three years. As a result, fishing boats have gone way out into the open ocean where some went as far as 60 to 70 miles off shore making it very hard or in many cases impossible for them to contact the Fisheries Base. This range is the limitation of the marine VHF and it was never envisaged that the boat fleet would attempt such a long distance away from land. However the majority of the fleet operated within 35 – 50 miles

### Congestion of the channels in the Network System.

- 14 Communication to and from the main Base in the Fisheries Office is transmitted through four channels over land based repeaters. The four channels are not enough for a large fleet and a growing industry. As a result, competition for the usage of the line starts and the operator at the main base could not control from the console the free communication among the fishermen except by mere verbal advice. The abuse of the Communication Network by the fishermen is very common despite being advised repeatedly.

### Vandalism

- 15 One of the repeaters with a huge coverage has been removed from its site. The intruder removed the repeater and also disturbed the telephone system belonging to the Post and Telecommunication department. All repeaters were housed in the Post and Telecommunication complex. In realising the problem, the Fisheries Division built its own shelters to house the repeaters and allow only the maintenance team to have access to it.

### **Future Plan**

- 16 The Samoa Government, in recognition of the significant contribution by the Fishing Industries to its economy has approved the upgrading of the Fishermen Safety at Sea Communication Network. The upgrade will include the addition of more channels as well as the number of repeaters on new sites. It is also intended to have the base operator to have sole control of the communications by simply turning a switch on and off.

### **Conclusion**

- 17 The Fishermen Safety at Sea Communication Network project is one of the most useful undertakings the Fisheries added to its numerous achievements in the recent years. After its successful establishment in early 1997 it has been given a constant services to the fishing fleet and their owners. Although minor problems were encountered the project had achieved what it was designed for and had served its purposes. The funds that were earmarked for the project have all been accounted for.

Meanwhile, the Samoa government in recognition of the importance of the safety at sea continues to provide support through the provision in the Fisheries Division annual budget of staff salary and the general monthly maintenance for the whole network.

- 18 The boat owners and the fishers have now come to appreciate the services provided by the Communication Network, where it has contributed enormously not only to the safety of the Fishermen but also as a source of useful information's on the movement of the fishing fleet and fishing ground conditions. The assistance was evident in the reduction in the number (from 21 in 1997 to 4 in 1998) of fishermen lost at sea since the establishment of the network.
- 19 Before the network came into existence, boat owners were always crowded at the wharf from early evening and throughout the night waiting for their boats to return. However, things have really improved a lot ever since the establishment of the Network. The owners can now access all the information on their vessel activities throughout the duration of the trip till they finally arrive ashore if they contact the Fisheries Base.

#### **Acknowledgement**

20 Fisheries wishes to acknowledge the support from the following agencies:

- Foreign Affairs
- Post and Telecommunication
- Attorney Generals Office
- Treasury Department
- Forum Fisheries Agency

9. ANNEX.

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2) Specifications

1. The Proposed Network

1.1 Base Stations would be located at Mt Fiamoe, Lufilufi, Lalomanu and Afolau on Upolu and Lepiutai, Masamasa and Taga or Olomanu in Savaii.

COMPLIES: WHAT WE ARE PROPOSING - BASE STATION LOCATION ON UPOLU, MT FIAMOE, LUFILUFI, LALOMANU, AFOLAU, REPEATER LINKING OLEPUPU. LEPIUTAI, MASAMASA, TAGA ON SAVAII.

1.2 It is also expected that the bases would be configured for talk through operation which will allow vessel to vessel communications as well as communications to Apia. Talk-around operation will be used for short range communications.

COMPLIES

1.3 Where suitable propagation exists from Apia Control to the base stations, trigger bases can be used at the Control Station but where no such path exists then either Telephone channel or UHF linking may be employed.

COMPLIES: TELEPHONE LINE LINKING LUFILUFI BASE STATION TO APIA CONTROL. AFOLAU UHF LINK TO FALEASIU, FALEASIU TO APIA OFFICE VIA TELEPHONE LINE. THE OTHER BASE STATIONS LINK TO APIA OFFICE VIA UHF.

1.4 Masamasa and Taga will need to be solar powered.

COMPLIES

1.5 The control station will be located at Fisheries HQ in Apia.

COMPLIES

1.6 ANI operation will be required as standard to allow rapid identification of users.

COMPLIES: ANI OPERATIONS ARE NOW STANDARD IN ALL TAIT RADIOS.

1.7 Bidders should quote as an option suitable equipment for automatic logging of all incoming ANI calls to allow a record of received calls to be produced at any time.

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COMPLIES: ANI ARE ALREADY BUILT IN IN TAIT RADIOS AUTOMATIC LOGGING, IS QUOTED AS OPTION.

- 1.8 All base stations will be fitted with CTCSS decoders to operate TTR function. Carrier control alone is not acceptable.

COMPLIES: T800 REPEATERS, CTCSS INCORPORATED  
T700 & T3000 CTCSS ALREADY BUILT IN

- 1.9 The equipment could be installed in Posts & Telecom buildings at all sites except Masamasa, Olomanu and Aleipata where a suitable container would be required.

COMPLIES: BASE LOCATIONS, SHELTERS AND TOWERS ARE ALL READILY AVAILABLE (TELECOM SITES). MASAMASA SITE - PRO-COM ALREADY HAVE SHELTER AND MAST. OLEPUPU - WE ARE PRESENTLY NEGOTIATING WITH TV SAMOA TO USE THEIR SHELTER AND MAST. PLEASE NOTE ALL BASE STATION EQUIPMENTS ARE ENCLOSED IN WEATHER PROOF CONTAINERS

## 2. Frequencies

- 2.1 All ship based equipment should be equipped with Marine channel 16 plus the relevant frequencies.

COMPLIES

- 2.2 The current intention is to use non-maritime frequencies for the network in the bank 157.5 TO 164mhz. Tx to Rx spacing would be 6 Mhz less 1/2 channel to reduce intermod with the base stations transmitting 157.5xx Mhz.

COMPLIES

- 2.3 Radios would also be fitted with simplex channels using the TTR transmit frequency to enable short range communications without disturbance to the main network and to provide a measure of privacy.

COMPLIES

- 2.4 A total of 4 duplex channels, 4 talk-around and CH16 will be required.

COMPLIES

Allocated frequencies are:

<u>CHANNEL</u>	<u>TTR TX</u>	<u>TTR TX</u>
1	157.525	163.5125
2	157.575	163.5625
3	157.625	163.6125
4	157.675	163.6625

COMPLIES

- 2.5 The recommended channeling for the handheld radios will be:

<u>CHANNEL</u>	<u>USE</u>
1	TTR 1
2	SIMPLEX 1
3	TTR 2
4	SIMPLEX 2
5	TTR 3
6	SIMPLEX 3
7	TTR 4
8	SIMPLEX 4
9	EMERGENCY MARINE CH16

COMPLIES

- 2.6 UHF linking frequencies will be allocated in the range 440 - 450Mhz.

COMPLIES

### 3. Recommended Equipment

- 3.1 It is essential that the equipment used on this project be of a type that has a proven reliability in similar conditions to Western Samoa and that service facilities are available within the region.

COMPLIES: Tait equipments dominate 80% of the Samoan market. Tait equipments also dominate 80% of the South Pacific Region. Pro-Com Systems is the local agent for Tait Electronics providing 100% support of all Tait equipments.



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- 3.2 The TTR equipment must have low power drain to allow it to be used on Solar powered sites.

COMPLIES: All remote base station, T700 repeaters are used. Standard Transmit output power 5 - 25 watts, standard current drain during transmit 1.5 amps - 5.5 amps. Receiver 450MA-750MA

- 3.3 Equipment used on vessels must be weatherproof, simple to use and be battery operated.

Where handheld transceivers are used these must meet IP54 and MIL-STD-810E standards and also be supplied with suitable weatherproof plastic containers for additional protection. The containers must permit operation of the handheld radios while in the container.

COMPLIES: Tait T3000 handheld now meets IP54. Equipment is fully housed in the weatherproof plastic container. Fully key pad operation with container. Built-in is back lighting when operate in the dark.

- 3.4 Handheld equipment will require spare battery packs and battery chargers. Some units may require solar powered battery chargers.

COMPLIES

- 3.5 Fixed equipment on small vessels must be weatherproof and be solar powered. Suppliers are requested to propose an equipment suitable for these vessels.

COMPLIES: T2000 Radio will be housed in weatherproof containers.

- 3.6 Batteries must be types which require minimal maintenance.

COMPLIES: Batteries - Heavy duty maintenance free for 3 years.

- 3.7 Solar panels must be a type suitable for marine installations and be fitted with a regulator if required by the battery or charger.

COMPLIES: All exposed connectors would be sealed with rust proof materials and cover with 'Densil' tapes.

- 3.8 Particular care must be taken to ensure system reliability.

COMPLIES: Installation hardware include manual for hints to ensure performance and reliability of equipment.

Specification for Equipment

Line Controlled Talk Through Repeaters

4. General

4.1 A number of low power drain base stations with line control facilities are required.

COMPLIES: OUR T700 REPEATERS TRANSMIT POWER 5-25 WATTS  
CURRENT DRAIN TRANSMIT 1-5.5 AMPS. RECEIVER CURRENT  
DRAIN 450-750 MA.

4.2 These base stations will be located in remote locations and should be complete with necessary power supplies, backup batteries and antennas.

COMPLIES

4.3 Where the base stations are not directly accessible from trigger bases at the control station, line control or UHF linking may be required.

COMPLIES

4.4 The line interface to the base stations will be 4 wire with E & M signalling for PTT.

COMPLIES

4.5 The TTRs will be CTCSS controlled for the TTR operation and PTT controlled for operation from the remote base.

COMPLIES

4.6 Inbuilt antenna duplexers will be required to combine the TX and RX to a common antenna.

COMPLIES

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- 4.7 Each TTR will be fitted with all RF channels to allow rapid replacement in the event of failure. One complete spare unit will be required.

COMPLIES: ALL TTRs ARE PROGRAMMED TO ALL SAME CHANNEL FREQS. T700 REPEATERS ARE ALL SYNTHESIZED. CHANNEL FREQS RE-PROGRAMMED CAN BE FIELD OR ON SITE PROGRAMMED USING IBM COMPATIBLE LAP-TOP.

- 4.8 All specifications are to be measured as per NZ Spec RFS25 or RFS26 or better.

COMPLIES

4.9 Transmitter Specification

Frequency Band	156 - 164 MH
RF Channels	6 minimum synthesised
Channel Spacing	12.5 Khz
Operating Voltage	11 - 16 (13.6 Nominal)
Frequency Stability	2.5 PPM
Operating Temp Range	10 - 50 deg C
Power Output	5 - 25 watts adjustable
Duty Cycle	100% at 35 Deg C
Spurious Emissions	Better than 80 dBc at 10 watts
Modulation Type	Direct FM
Deviation	+/-5 Khz PEAK LIMITED
Audio Response	300-3.0 Khz with standard preemphasis 3Khz Deviation
Audio Input Level(line) (microphone)	-3 dBm 600 ohms for 3Khz deviation -50 dBm
Distortion	Less than 3% at 60% Deviation
Noise	Better than 50 dB S/N

COMPLIES: TTR Transmitter specifications

5.0 Receiver Specification

<u>Frequency Control</u>	Synthesised
Sensitivity	Better than 118dBm for 12 dB
Selectivity	90 dB
Intermod Response	80 dB
Spurious Resp Attenuation	better than 100 dB
Audio Response	+1 /-3 dB 300-3000 Hz with 6db/Octave de-emphasis
Audio Output (Line) (Speaker)	-3 dBm 600 ohms for 3KHz deviation Greater than 0.5 watt

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Distortion Less than 2%  
 S/N Ratio -50dBm RF in better than 50dB

COMPLIES: TTR RECEIVER SPECIFICATIONS

5.1 Duplexer Specification

Type	UHF Bandstop
Frequencies	440-450MHz Band 9.45MHz TX/RX spacing
Specifications	
TX Insertion Loss	less than 2dB
RX Insertion Loss	less than 3db

The final choice of Duplexer must ensure satisfactory operation of the TTR over the frequency range designated without retuning of the duplexer and without noticeable degradation of receiver performance when the TX is keyed.

COMPLIES

5.2 Output Connectors 50 ohm type "N"

COMPLIES

6. Control Station Antennas

Suitable Yagi antennas will be provided to access the TTR base stations.

These will be constructed of corrosion resistant materials to accepted standards.

Antenna gain will be sufficient to ensure adequate system performance with transmitter powers not exceeding 10 watts.

COMPLIES

7. Shelters

Where suitable building space is not already available a pole or ground mounted shelter will be required. These should be quoted as part of the package.

The shelters will be of such construction to exclude rain, insects and other harmful elements from the installed radio equipment. The shelter shall be designed to limit the maximum internal temperature to not more than 35 degrees C to safeguard the radio equipment.

The shelter shall be large enough to house all equipment including batteries and power supplies.

All cable entries shall be provided with adequate sealing devices to render them water and insect proof.

COMPLIES: ALL BASE STATION SITES, SHELTERS AND MASTS ARE READILY AVAILABLE. BASE EQUIPMENTS ARE ALL HOUSED IN WEATHER-PROOF CONTAINERS. BUT IF EVER SHELTERS AND MASTS ARE STILL REQUIRED COSTS ARE INCLUDED IN PRICING.

#### 8. General System Design Notes

8.1 The network design proposed in this document is an outline only and alternate designs maybe submitted which will result in equal or better performance being obtained.

COMPLIES: INFRASTRUCTURE THAT WE ARE PROPOSING WOULD PROVIDE THE BEST PERFORMANCE.

8.2 All sites to be used must be readily accessible by road if possible.

COMPLIES: ALL SITES ARE READILY ACCESSIBLE AND ARE OFTENLY VISITED.

8.3 All equipment shelters and antenna structures must be designed to withstand windspeeds of up to 55m/s likely to be experienced in cyclonic conditions.

COMPLIES

8.4 Battery backup will be required on all sites with a minimum of 48 hours normal use.

COMPLIES

8.5 The prospective tenderer must indicate in his bid the expected coverage from the system proposed. This should be in the form of maps of suitable scale showing expected coverage.

COMPLIES: OUR PORPOSED RADIO INFRASTRUCTURE COVERS ALL AREAS.

9. Antenna Specifications

Suitable antennas for the base stations will be of robust construction to withstand high wind speeds and resist corrosion.

Gain not less than 10 dBd.

COMPLIES

10. Control Station

10.1 The control station will be situated at Fisheries Headquarters in Apia City.

COMPLIES

10.2 Trigger bases will be required to access those base stations within line of sight of the Control Station.

COMPLIES

10.3 For those base stations not within line of sight to Apia, line control will be required either by dedicated 4 wire telephone channels by VHF/UHF links.

COMPLIES

10.4 A suitable Control Console will be required which integrates the trigger bases and line control systems into a neat package.

COMPLIES

10.5 ANI Displays will be required for all incoming calls.

COMPLIES

10.6 It is expected that a self supporting mast of 30 metres height will be required at the control station to provide mountings for the trigger base antennas.

DEVIATES: A WOODEN POLE OF 18" IN DIAMETER, 20 METERS HEIGHT WOULD BE SUFFICIENT AT APIA CONTROL OFFICE SIMILAR TO THOSE USE BY ELECTRIC POWER CORP. FOR THEIR POWER LINES.

18.

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10.7 All incoming lines from dedicated 4 wire plus E & M telephone channels will be 600 ohm - 3 dBm Tx & Rx nominal levels. 6 wires will be used.

COMPLIES

## 11. Trigger Bases Specifications

These will have a performance not less than that specified for the Base radio (TTR) equipment.

COMPLIES

## 12. Receiver Specification

COMPLIES

## 13. Duplexer Specification

COMPLIES

## 14. Antenna Specifications

14.1 Suitable antennas for the base stations will be of robust construction to withstand high wind speeds and resist corrosion.

COMPLIES

14.2 Antennas will be heavy duty shrouded dipoles suitably spaced from the mounting pole to give the appropriate sectoral radiation pattern.

COMPLIES

14.3 All fittings and mounting hardware will be corrosion resistant materials. Stainless steel is preferred.

COMPLIES

14.4 The preferred antenna is a phased array of 2 DELTEC SD100

COMPLIES

# PRO - COM

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- 14.5 Particular care must be taken to ensure waterproof cable joints.

NOTED

## 15. Antenna Feeder Cables

- 15.1 All TTR antenna feeder cables will be ANDREW LDF 4-50 cable or equivalent fitted with approved "N" type connectors.

COMPLIES

- 15.2 Cables will be mounted to the towers or support structures with approved mounting hardware at intervals not exceeding 1 metre.

NOTED

- 15.3 All connectors will be waterproofed with Denso Tape covered with an outer layer of protective tape.

NOTED

- 15.4 Particular care must be taken to ensure that all joints are waterproof.

NOTED

- 15.5 All feeder cables must be earthed at the point where they leave the tower towards the building. Approved earthing materials will be used.

NOTED

## 16. Handheld Radio Specifications

- 16.1 The handheld radios to be supplied must be of proven design for use in tropical climates and be splashproof.

COMPLIES: T3000 Handheld has proved its perfect operation in



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Samoa It is now IP54 standard together with weatherproof container specially designed for the sea users.

16.2 All radios must be fitted with CTCSS and ANI encoders and be capable of operation of 9 channels.

COMPLIES: T3000 IS 9CHANNEL UNIT. CTCSS & ANI HAVE ITS STANDARD FEATURES BUILT IN.

16.3 Mains battery chargers will be required and the type of charger selected will be one which ensures maximum battery life with a minimum of care from the user.

COMPLIES: T3000 HAS A LOW BATTERY SENSOR, THE CHARGER HAS AN OVER CHARGE PROTECT FACILITY. OUR T3002 - CONDITIONER WOULD MAINTAIN MAXIMUM PERFORMANCE OF NICAD BATTERIES.

16.4 Some radios may require Solar Powered chargers and these should be offered as an option.

NOTED.

### 17. Specifications Construction

17.1 The handheld radios must meet international standards IP54 and MIL-STD-810E for rugged construction.

COMPLIES

~~17.2 The radio will be constructed on a rugged diecast or similar chassis with a tough Noryl or similar casing.~~

COMPLIES

17.3 Suitable plastic containers to provide waterproof protection are required. These will be of a design which allows the transceiver to be operated while in the container. The sealing of the container will be adequate to prevent water entering if it is accidentally immersed in water.

COMPLIES.

# PRO - COM

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17.4 Channel and volume controls should preferably be implemented by UP/DOWN buttons or keys to reduce likelihood of accidental damage and provide ease of use.

COMPLIES

17.5 A backlit LCD display will give a clear indication of operating channel, and other relevant data.

COMPLIES

17.6 A large easily operated PTT Key will be provided on the side of the radio.

COMPLIES

17.7 All transmitter and receiver specifications will be verified using NZRFS25 or 26.

COMPLIES

17.8 All radios will carry a current type approval issued in Australia and/or New Zealand.

COMPLIES

## 18. General Details

COMPLIES

## 19. Transmitter

FULLY COMPLIES

## 20. Receiver

FULLY COMPLIES

## 21. Antennas

21.1 The handheld radios must be fitted with a flexible whip type antenna of maximum possible efficiency.

COMPLIES

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22.

22.2 Spare antennas should be readily fitted in case of accidental damage.

NOTED

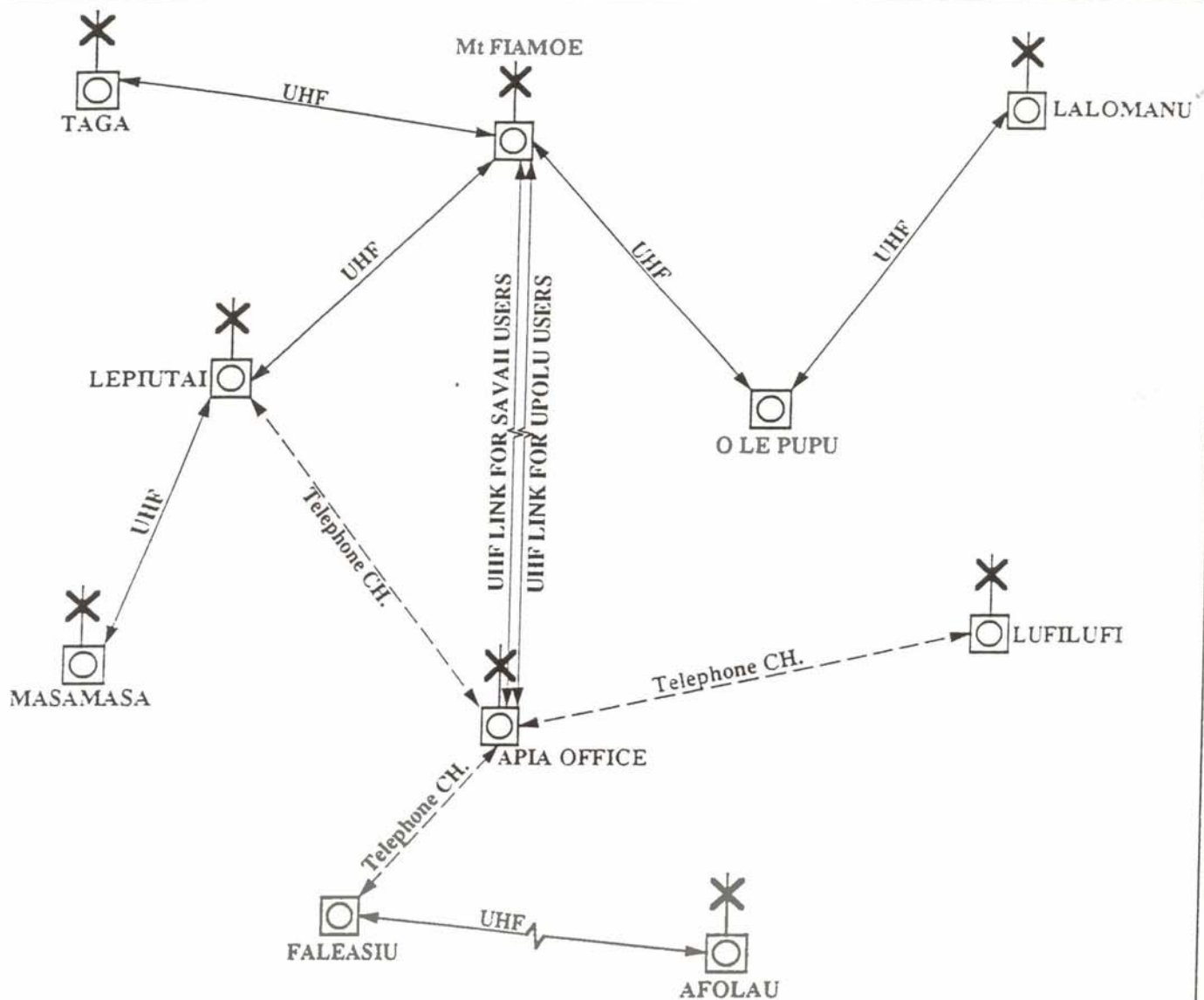
23. UHF Linking Equipment

COMPLIES

24. Transmitter Specification

FULLY COMPLIES".

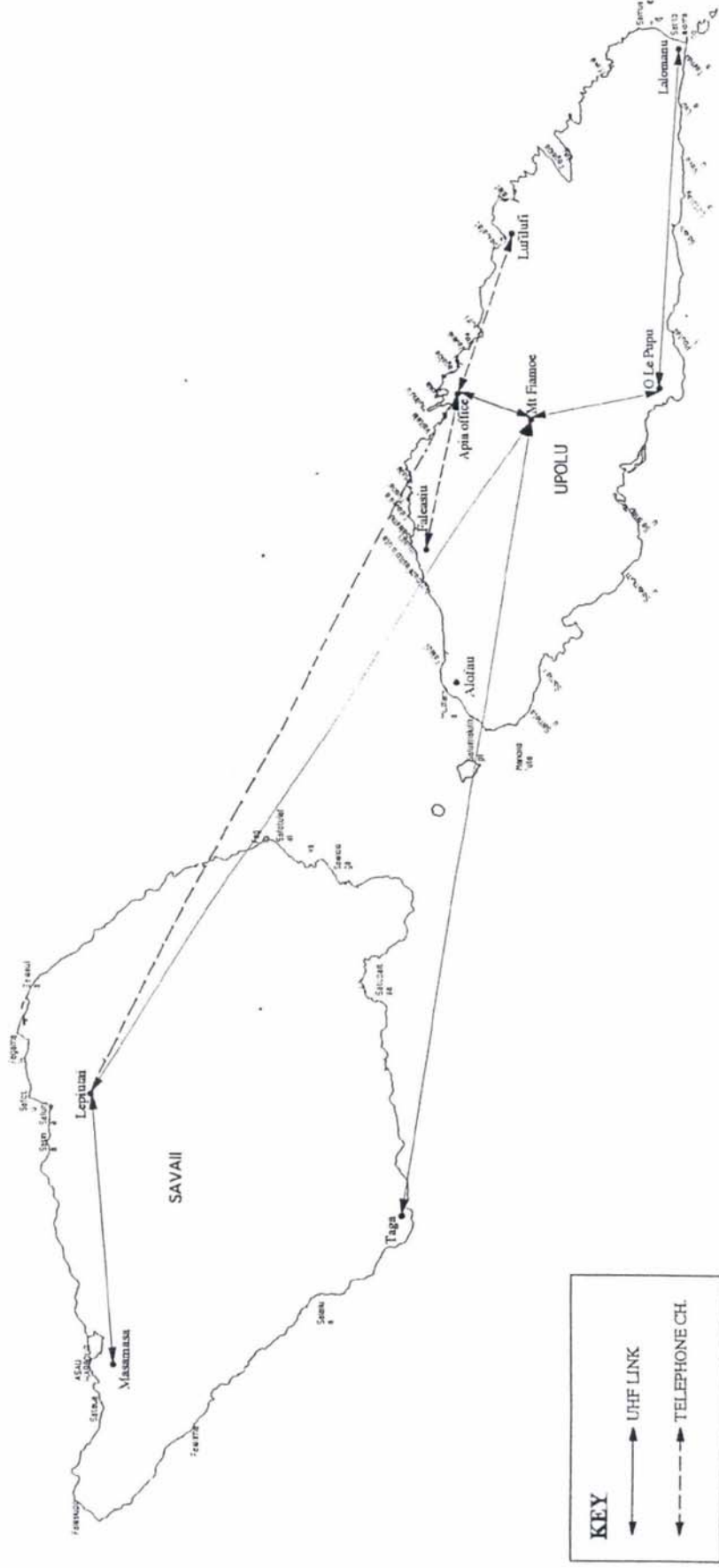
# W.S. FISHERIES RADIO TELEPHONE - INFRASTRUCTURE



## NO. NOTE:

- 1 ALL TTRS 4 CHANNELS.
- 2 MASAMASA, TAGA, LEPIUTAI, ARE ON SAVAII ISLAND.
- 3 SAVAII TTRS ON ONE SYSTEM, UPOLU TTRS ON THE OTHER.
- 4 APLA OFFICE CAN MONITOR BOTH.
- 5 A BOAT IN SAVAII REQUEST TO COMMUNICATE WITH ANOTHER IN UPOLU, APLA OFFICE MANUALLY CONNECT.

# W.S. FISHERIES RADIO TELEPHONE - INFRASTRUCTURE



## MAP OF WESTERN SAMOA