INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

HIGH FREQUENCY MANAGEMENT GUIDANCE MATERIAL FOR THE SOUTH PACIFIC REGION

Version 1.0

(Adopted by APANPIRG/21 – September 2010)

Informal South Pacific Air Traffic Services Coordinating Group		***Reference:*** ***ICAO APAC Regional Guidance Material GM-AMS001-Part 1***

ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP

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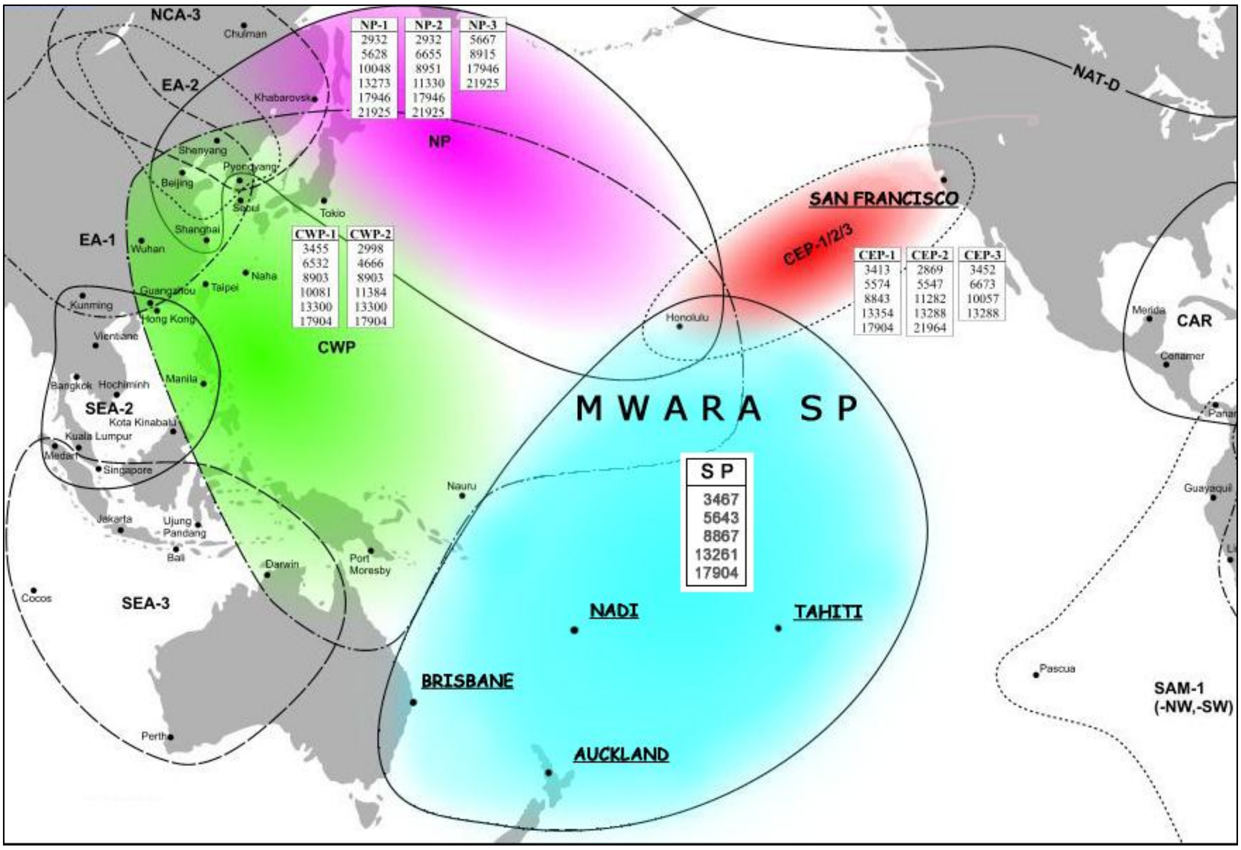

High Frequency Management Guidance Material For the South Pacific Region

Version 1.0 April 2010

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Change Record

This chart provides records of changes to Version 0.1 and forward.

	Paragraph(s)	**Explanation**
.Version 0.2	Document identification	Callahan instead of Callaha
	Document identification	HF Frequency Management Guidance Materiel for the South Pacific Region instead of HF Frequency Management Guidance Materiel
	Acknowled-gements	Acknowledgement instead of thank you
	1.1.1	South Pacific instead of North Atlantic
	2.3.2	SP 6 instead of SP
	3.1.4.1.1 figure 2	Appendix instead of appendic
	3.1.4.3.1 figure 4	New map of the sectors in the NZZO FIR
	3.1.4.6.1	Selected instead of choose
	3.1.4.4.1	HF frequencies datas move to paragraph 3.1.4.3.1
	4.2.1 figure 7	New map of New Zealand FIR
	4.3.1 figure 8	New map of Nadi FIR
	5.5.1	Web link from www.ips.gov.au for SFO station
	Appendix B1	Datas from Airservices Australia Added the SATCOM SHORT CODE Nr. : 45 03 02
	Appendix B.2	Country code for New Zealand Added the SATCOM SHORT CODE Nr. : 45 12 01
	Appendix B.5	Added the SATCOM SHORT CODE Nr. : 42 27 90
.Version 0.3	3.1.4.4.1	Added RDARA **9B**
	3.1.4.51	Changed “there is no RDARA activity in the KZAK FIR”, instead of “There isn’t a RDARA network in activity in the KZAK FIR”
	Appendix B.2	Changed shift managers Robin Lee instead of Julie Wagner
.Version 0.4	Appendix B.5	Tahiti Control instead of Tahiti Radio
.Version 0.5	3.1.5	Added Brisbane Volmet station
.Version 1.0	Appendix B.4	Corrections on frequencies , stations and duty manager

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The HF working group would like to acknowledge the OACI bureau of Paris and M. Cabral from the North Atlantic Systems Planning Group - Aeronautical Communications Group which accept that we re use part of the HF propagation theory published in the ICAO document NAT Doc 003 "*High Frequency Management Guidance Material For the North Atlantic Region*" and Mr. Hristo Hirvonen who autorize them to use his map of the SP MWARA in the first page of the document.

Preface

This Document is published by the Informal South Pacific ATS Co-ordination Group, and managed by the High Frequency Working Group, and is for guidance. Regulatory material relating to South Pacific communications procedures is contained in relevant ICAO Documents and Annexes. Annex 10 – Volume II, ITU Radio Regulations, Regional Supplementary Procedures (Doc. 7030), FASID, NAT OPS Manual, State AIP and current NOTAM's, which should be read in conjunction with the guidance material contained in this document.

To assist with the editing of this document and to ensure the currency and accuracy of future editions, comments and suggestions for possible amendments should be sent to the editor, to the contact information included in the document identification section.

List of Acronyms

ACARS	Aircraft Communication Addressing and Reporting System
ACC	Area Control Centre
ACG	Aeronautical Communications Group
ACID	Aircraft Identification
AIP	Aeronautical Information Publication
AFTN	Aeronautical Fixed Telecommunication Network
AMS	Aeronautical Mobile Service
ARINC	Aeronautical Radio INC.
ARP	Air Report Message
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSMP	Air Traffic Services Message Processor
ATSU	Air Traffic Services Unit
CAA	Civil Aviation Authority
CNS	Communications, Navigation and Surveillance
EMG	Emergency Message
FAP	Frequency Allotment Plan
FDPS	Flight Data Processing System
FIR	Flight Information Region
FMC	Flight Management Computer
FMS	Flight Management System
GP	General Purpose
GPS	Global Positioning System
HF	High Frequency (3 to 30 MHz)
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
ISPACG	Informal South Pacific ATS Coordinating Group
ITU	International Telecommunications Union
LDOC	Long Distance Operations Control
kHz	Kilohertz
LF	Low Frequency (30 to 300 kHz)
LUF	Lowest Usable Frequency
MET	Meteorological
MF	Medium Frequency (300 to 3000 kHz)
MHz	Megahertz
MUF	Maximum Usable Frequency
MWAR	Major World Air Route
MWARA	Major World Air Route Area
NAT	North Atlantic
NAT SPG	North Atlantic Systems Planning Group
NOTAM	Notice to Airmen
OCA	Oceanic Control Area
POS	ICAO Position Report Message
RDAR	Regional and Domestic Air Routes

RDARA	Regional and Domestic Air Route Area
R/T	Radio-Telephony
SARPS	Standards and Recommended Practices
SEAC - PF	Service d'Etat de l'Aviation Civile en Polynésie Française
SELCAL	Selective Calling System
SP	South Pacific
VHF	Very High Frequency (30 to 300 MHz)
VLF	Very Low Frequency (3 to 30 kHz)
WP	Waypoint Position
WPR	Waypoint Position Reporting

1 Introduction

1.1 Purpose of the document

1.1.1 The purpose of this document is to provide a guidance methodology for the utilisation of the Families and Frequencies employed by the Aeronautical Communication Stations on the South Pacific, to support a better management plan of the available families, frequencies and human resources, in order to increase the efficiency and capacity of the Communications Network.

1.1.2 It will also include information about HF frequencies for air-ground communications. In addition, it will contain contact information for Aeronautical Stations.

2 Operational concept

2.1 Overview

2.1.1 The Aeronautical Mobile Service is a service reserved for air-ground communications related with the safety and regularity of flights, flying primarily along national or international civil air routes.

2.1.2 In areas like the South Pacific, where VHF coverage is insufficient due to range limitation to cover all portions of the routes flown, the use of HF frequencies are necessary because they provide long range communications coverage, not only for air-ground voice communications, but also for the broadcast of ATS or Meteo information.

2.1.3 For various reasons, some technical, others economical, environmental, physical, natural, etc., coverage of a wide area by a single station with equipment located in a single place are impractical.

2.1.4 Taking these factors into account, the most practical option is to employ a number of stations sharing a range of frequencies and working as a network to provide the facilities and services required for the AMS.

2.1.5 To work as a network the AMS should follow appropriate principles of operation, in order to achieve the highest possible level of capacity and efficiency, otherwise, its purpose will not be achieved and the safety and regularity of flights will be affected.

2.2 HF medium characteristics

2.2.1 This section presents only a short description on the HF medium characteristics, a more detail description can be found in Appendix A.

2.2.2 As a general rule, radio signals travel in straight lines, that is, they follow great circle paths over the surface of the earth. Under certain circumstances, however, the path of a signal may change direction; this change of direction is called refraction. Refraction examples are coastal, atmospheric and ionospheric, and the amount of refraction varies considerably, depending on certain conditions. Those conditions could be a change in direction when a signal crosses a coastline (coastal refraction), a change in direction due to a variation in temperature, pressure and humidity, particularly at low altitude (atmospheric refraction), or a change in direction when the radio wave passes through an ionised layer (ionospheric refraction).

2.2.3 The ionosphere is still under investigation but it is known that several definite ionised layers exist within it. During daytime hours there are four main ionisation layers designated D, E, F_1 and F_2 in ascending order of height. At night, when the sun's radiation is absent, ionisation still persists but it is less intense, and fewer layers are found (D and F layers). Factors that affect the ionosphere layers is strength of the sun's radiation, since it varies with latitude causing that the structure of the ionosphere varies widely over the earth's surface, and the state of the sun, since sunspots affect the amount of ultra-violet radiation.

2.2.3.1 Maximum Usable Frequency (MUF) at night is much less than by day, because the intensity of ionisation in the layer is less so than lower frequencies have to be used to produce the same amount of refractive bending and give the same critical angle and skip distance as by day. However, the signal attenuation in the ionosphere is also much less at night so the lower frequency needed is still usable. Hence the night frequency for a given path is about half of the day frequency, and shorter distances can be worked at night than by day while still using a single reflection from the F layer.

2.2.3.2 The MUF not only varies with path length and between day and night, but also with season, meteor trails, sunspot state, and sudden ionospheric disturbances produced by eruptions on the sun. Because of the variations of MUF, HF transmitting stations have to use frequencies varying widely between about 2 and 20 MHz.

2.2.4 As consequence of this conditions, frequency band usage can be viewed in the following table:

Areas	Bands between: (MHz)	Sharing conditions
MWARA area	3 and 6.6	Night propagation
	9 and 11.3	Day propagation
	Higher than 13	Day propagation

Table 1: Frequency band usage (ref. ITU Appendix 27 Aer2)

2.3 Radiotelephony Network

2.3.1 Definition

2.3.1.1 A radiotelephony network is defined as a group of radiotelephony aeronautical stations which operate on and guard frequencies from the same family and which support each other in a defined manner to ensure maximum dependability of air-ground communications and dissemination of air-ground traffic

2.3.2 SP 6 Radiotelephony Network Composition

2.3.2.1 In the South Pacific 6 network there are five aeronautical stations, one per each of the Oceanic FIR's, responsible for the provision of air-ground communications as part of the Aeronautical Mobile Service.
They are:
Brisbane Radio (Australia, Brisbane ACC),
Auckland Radio (New Zealand, Auckland OACC),
Nadi Radio (Fiji, Nadi ACC),
San Francisco Radio (USA, Oackland OACC) and
Tahiti Radio (French Polynesia, Tahiti OACC).

2.3.2.2 To support the air-ground communications of the AMS in the South Pacific 6 network, five frequencies were allocated by the ITU (Appendix 27 Aer2), in different bands to ensure SP MWARA, continuous coverage.

2.3.2.3 To separate International and Domestics (Regionals) flights some states use their own RDARA network. (defined in paragraph 3.1.4)

2.3.3 Principles of Network Operation

2.3.3.1 The aeronautical stations of a radiotelephony network should assist each other in order to provide the air-ground communication service required of the network by aircraft flying on the air routes for which the network is responsible.

2.3.3.2 When the network comprises a large number of stations, network communications for flights on any individual route segment should be provided by selected stations, termed “regular stations” for that segment. In principle, the regular station will be those serving the locations immediately concerned with flights on that route segment, i.e. points of take-off and landing and appropriate flight information centres or area control centres.

2.3.3.3 In areas or on routes where radio conditions, length of flights or distance between aeronautical stations require additional measures to ensure continuity of air-ground communications throughout the route segment, the regular stations should share between them a responsibility of primary guard whereby each station will provide the primary guard for that portion of the flight during which the messages from the aircraft can be handled most effectively by that station.

2.3.3.4 During its tenure of primary guard, each regular station should, among other things:

a) be responsible for designating suitable primary and secondary frequencies for its communications with the aircraft;
b) receive all position reports and handle other messages from and to the aircraft essential to the safe conduct of the flight;
c) be responsible for the action required in case of failure of communication.

2.3.4 Frequencies to be used

2.3.4.1 Aircraft stations shall operate on the appropriate radio frequencies.

2.3.4.2 The air-ground radio station shall designate the frequency(ies) to be used under normal conditions by aircraft stations operating under its control.

2.3.4.3 In network operation, the initial designation of primary and secondary frequencies should be made by the network station with which the aircraft makes pre-flight check or its initial contact after take-off. This station should also ensure that other network stations are advised, as required, of the frequency(ies) designated.

2.3.4.4 An aeronautical station when designating frequencies, should take into account the appropriate propagation data and distance over which communications are required.

2.3.4.5 If a frequency designated by an aeronautical station proves to be unsuitable, the aircraft station should suggest an alternative frequency.

2.3.5 Establishment of communications

2.3.5.1 Aircraft stations shall, if possible, communicate directly with the air-ground control radio station appropriate to the area in which the aircraft are flying. If unable to do so, aircraft stations shall use any relay means available and appropriate to transmit messages to the air-ground control radio station.

2.3.5.2 When normal communications from an aeronautical station to an aircraft station cannot be established, the aeronautical station shall use any relay means available and appropriate to transmit messages to the aircraft station. If these efforts fail, the originator shall be advised.

2.3.5.3 When, in network operation, communication between an aircraft station and a regular station has not been established after calls on the primary and secondary frequencies, aid should be rendered by one of the other regular stations for that flight, either by calling the attention of the station first called or, in case of a call made by an aircraft station, by answering the call and taking the traffic.

2.3.5.4 Other stations of the network should render assistance by taking similar action only if attempts to establish communication by the regular stations have proved unsuccessful.

2.3.6 Transfer of communications

2.3.6.1 The transfer of primary guard from one station to the next will normally take place at the time of the traversing of flight information region or control area boundaries, this guard being provided at any time, as far as possible, by the station serving the flight information centre or area control centre in whose area the aircraft is flying.

2.3.6.2 An aircraft station should be advised by the appropriate aeronautical station to transfer from one radio frequency or network to another. In the absence of such advice, the aircraft station should notify the appropriate aeronautical station before such transfer takes place.

2.3.6.3 In the case of transfer from one network to another, the transfer should preferably take place while the aircraft is in communication with a station operating in both networks to ensure continuity of communications. If, however, the change of network must take place concurrently with the transfer of communication to another network station, the transfer should be co-ordinated by the two network stations prior to advising or authorizing the frequency change. The aircraft should also be advised of the primary and secondary frequencies to be used after the transfer.

2.3.7 Communications failure

2.3.7.1 When an aircraft station fails to establish contact with the aeronautical station on the designated frequency, it shall attempt to establish contact on another frequency appropriate to the route. If this attempt fails, the aircraft station shall attempt to establish communication with other aircraft or other aeronautical stations on frequencies appropriate to the route. In addition, an aircraft operating within a network shall monitor the appropriate VHF frequency for calls from nearby aircraft.

2.3.7.2 When an aeronautical station has been unable to establish contact with an aircraft station after calls on the frequencies on which the aircraft is believed to be listening, it shall:

a) Request other aeronautical stations to render assistance by calling the aircraft and relaying traffic, if necessary;
b) Request aircraft on the route to attempt to establish communication with the aircraft and relay traffic, if necessary.

2.3.7.3 The air-ground control radio station shall notify the appropriate air traffic services unit and the aircraft operating agency, as soon as possible, of any failure in air-ground communications.

2.4 SELCAL operation

2.4.1 With the selective calling system known as SELCAL, the voice call is replaced by the transmission of coded tones to the aircraft over the radiotelephony channels. A single selective call consists of a combination of four pre-selected audio tones whose transmission requires approximately two seconds. The tones are generated in the aeronautical station coder and are received by a decoder connected to the audio output of the airborne receiver. Receipt of the assigned tone code activates a cockpit call system in the form of light and/or chime signals.

3 SP6 Frequencies Allotment Plan

3.1 Frequency Allotment Plan for the Aeronautical Mobile Service (AMS)

3.1.1 The frequencies allocated for use in the South Pacific, are based on the Frequency Allotment Plan, for the MWARA - SP as defined on the "Appendix 27 Aer2 to the Radio Regulations – Frequency Allotment Plan for the Aeronautical Mobile (R) Service and Related Information".

3.1.2 Major World Air Route Area – South Pacific (MWARA - SP)

3.1.2.1 The MWARA - SP is an area defined as the area from the from the South Pole through the points 38° S 145° E, 00° 167° E, 00° 175° W, 22° N 158° W, 22° N 156° W, 00° 120° W to the South Pole, and can be viewed on Figure **1** (Ref. ITU Appendix 27 Aer2).

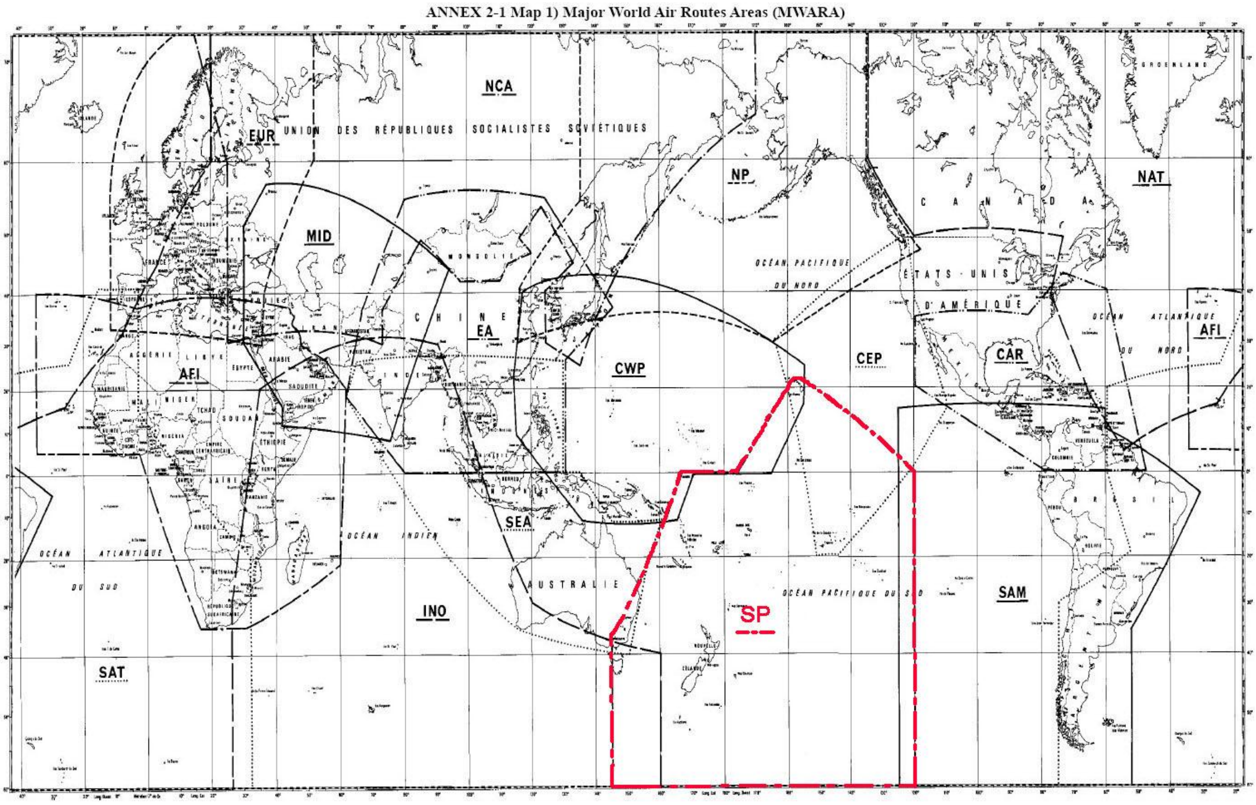

Figure 1 : MWARA – SP (Ref. ITU Appendix 27 Aer2)

3.1.3 MWARA – SP Frequencies

3.1.3.1 The frequencies allocated to the MWARA – SP includes a number of frequencies in a range of bands designed to provide twenty-four hour area coverage and are contained in Table **2**.

Area	**Frequency Bands**								
	3.5 kHz	**4.7 kHz**	**5.6 kHz**	**6.6 kHz**	**9 kHz**	**10 kHz**	**11.3 kHz**	**13.3 kHz**	**18 kHz**
SP	3467		5559 5643		8867	10084	11327	13300	17904

- Frequency 3467 shared with MWARAs AFI, MID ,RDARAs 10B and 13D
- Frequency 5559 shared with RDARAs 2A, 4A, 6G, 10E, 12G and 13J
- Frequency 5643 shared with RDARA 3C
- Frequency 8867 shared with RDARAs 6G, 10C, 13D and 13M
- Frequency 10084 shared with MWARA EUR , RDARAs 6E and 13D
- Frequency 11327 shared with RDARA 3B , 5 and 13C
- Frequency 13300 shared with MWARAs CEP, CWP, NP and RDARA 4
- Frequency 17904 shared with MWARAs CEP, CWP, NP and RDARA 4

Table 2 : Frequency bands of the MWARA – SP (Ref. ITU Appendix 27 Aer2)

3.1.3.2 The **SP 6 NETWORK** uses **13261 kHz** instead of **13300 kHz**. This change was endorsed by ICAO in 1987 (refer ASIA/PAC FASID Doc 9673, 2001 Appendix Chart CNS4). The ITU-R Radio Regulations AP27/213 (WRC 2000) will be updated to reflect this change.

3.1.3.3 The **SP 6 NETWORK** use the following frequencies in kHz :

3467	**5643**	**8867**	**13261**	**17904**

Table 3 : HF Frequencies SP6 NETWORK (in KHz)

3.1.4 RDARA networks in the South Pacific area

3.1.4.1 THE APPENDIX 27 (REV. WRC-03) FROM THE ITU RR :

3.1.4.1.1 The ITU gives the definition of the South Pacific's RDARA 9.

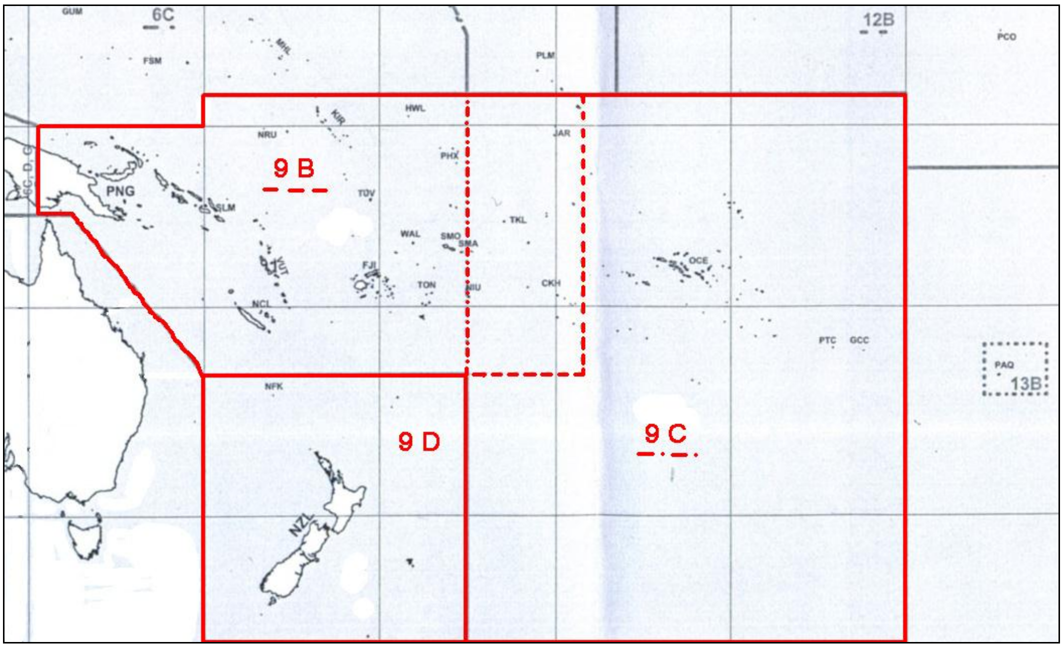

Figure 2 : RDARA Map - South Pacific (Appendix S27 ITU RR)

3.1.4.1.2 Regional and Domestic Air Route Area – 9 (RDARA-9)

From the South Pole along the 160° E meridian to 27° S. Then through the points 19° S 153° E, 10° S 145° E, 10° S 141° E, 00° 141° E, 00° 160° E, 03° 30' N 160° E, 03° 30' N 120° W. Then along the 120° W meridian to the South Pole.

3.1.4.1.3 Sub-Area 9B

From the point 00° 141° E through points 10° S 141° E, 10° S 145° E, 27° S 160° E, 27° S 157° W, 03° 30' N 157° W, 03° 30' N 160° E, 00° 160° E to the point 00° 141° E.

3.1.4.1.4 Sub-Area 9C

From the South Pole along the 170° W meridian to 03° 30' N. Then through the point 03° 30' N 120° W and along the 120° W meridian to the South Pole.

3.1.4.1.5 Sub-Area 9D

From the South Pole along the 160° E meridian to 27° S. Then through the point 27° S 170° W and along the 170° W meridian to the South Pole.

3.1.4.2 BRISBANE FIR (YBBB) :

3.1.4.2.1 The Australian RDARA network area n°14 is divided in three sub-area with 3 frequencies (in KHz) in use for each.

Sub-area 14C: NORTHWEST
<u>coordinates:</u> From the South Pole along the 110° E meridian to 19° S. Then through the points 19° S 118° E, 24° S 120° E, 24° S 137° E, 34° S 151° E, 34° S 160° E . Then along the 160° E meridian to the South Pole

3452	**6541**	**8843**

Sub-area 14B: NORTHEAST
<u>coordinates:</u> From the point 19° S 110° E to the point 10° S 110° E, 10° S 139° E, 16° S 139° E, 16° S 137° E, 24° S 137° E, , 24° S 120° E, 19° S 118° E to the point 19° S 110° E.

3452	**6610**	**8831**

Sub-area 14A: SOUTHERN
<u>coordinates :</u>From the point 24° S 137° E, 16° S 137° E, 16° S 139° E, 10° S 139° E, 10° S 145° E to the point 27° S 160° E, 34° S 160° E to the point 24° S 137° E.

3461	**6565**	**8822**

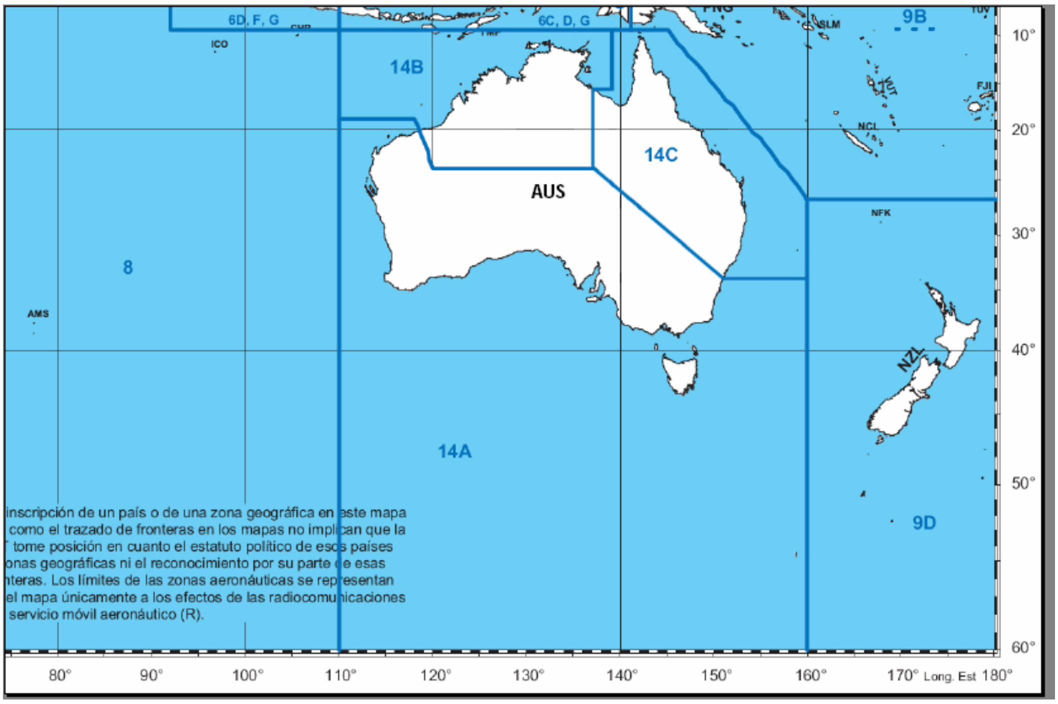

Figure 3 : Australian RDARA network

3.1.4.3 AUCKLAND FIR (NZZO):

3.1.4.3.1 New Zealand authorities don't implement a RDARA network in the NZZO FIR. However the following airports use HF frequencies from the RDARA 9B:

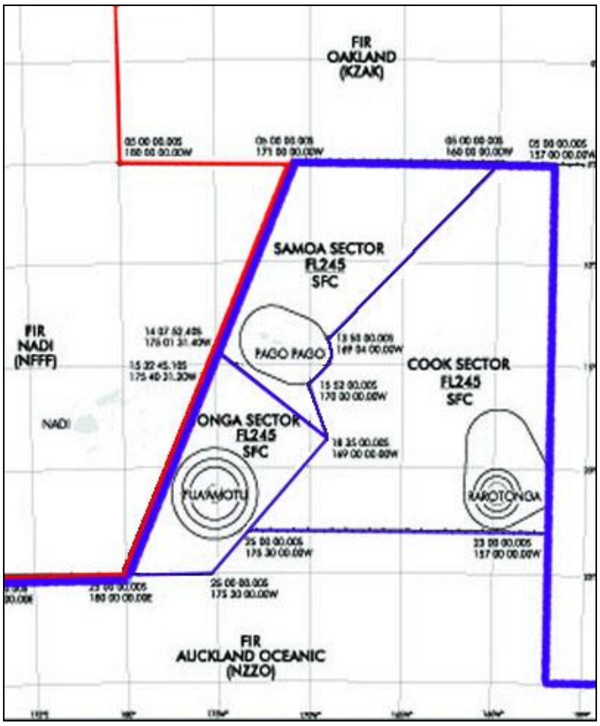

Figure 4 : Sectors in the NZZO FIR

- **Rarotonga (Cook sector) :**

3425	**6553**	**8846**	**11339**

- **Niue :**

6553	**8846**

- **Faleolo (Samoa sector):**

3425	**6553**	**8846**	**11339**

- **Fua'amotu (Tonga sector):**

3425	**6553**	**8846**	**11339**

3.1.4.4 NADI FIR (NFFF):

3.1.4.4.1 The following RDARA network (9B) is operational in the Nadi FIR.(see map chap 4.3.1)

- **Nadi :**

3425	**6553**	**8846**	**11339**

- **Funafuti:**

6553	**8846**	**11339**

3.1.4.5 OACKLAND FIR (KZAK):

3.1.4.5.1 There is no RDARA activity in the KZAK FIR.

3.1.4.6 TAHITI FIR (NTTT):

3.1.4.6.1 The French civil Aviation in the French Polynesia (SEAC-PF) will create a RDARA network with 3 HF frequencies in 2009. The frequencies are selected in RDARA 9C network from the ITU.

This future network will use the following frequencies (in KHz):

5481	**8873**	**11312 or 11279**

3.1.5 VOLMET Stations in the South Pacific.

VOLMET Stations broadcast meteorological bulletins in following HF frequencies (kHz):

3.1.5.1 Auckland VOLMET Station :

6679	**8828**	**13282**

3.1.5.2 Brisbane VOLMET Station :

6676	**11387**

3.2 Frequency allocation principles

3.2.1 Taking into account the characteristics of the HF medium, the general principles for frequency assignment used by radio station personnel is as outlined in 2.2.4 and contained in Table **4**.

Bands between: (MHz)	**Sharing conditions**
3 and 6.6	Night propagation
9 and 11.3	Day propagation
Higher than 13	Day propagation

Table 4 : General principles for frequency assigment

3.2.2 As a general rule, when assigning primary and secondary frequencies, radio station personnel should assign lower frequencies as primary and higher frequencies as secondary for aircraft flying away from the Station. Conversely, for aircraft routing towards the station, the higher frequencies should be assigned as primary and lower frequencies as secondary.

3.2.3 In circumstances were sunspot or solar flare activity is expected to affect propagation conditions, the radio station personnel should always inform the flight crews and in addition to assigning the primary and secondary frequencies, they should advise the highest frequencies in use at the station as a precautionary measure.

3.2.4 In accordance with the principles governing transfer of communications as defined in paragraph 2.3.6, stations sharing a common boundary should, whenever possible, assign common frequencies for the transfer of communications.

3.2.5 Aircraft routing along common boundaries, or flying a route or portion of a route within 60 NM of a common boundary, should be assigned frequencies common to the stations sharing those boundaries.

4 FIR coordinates and maps

4.1 BRISBANE FIR

4.1.1 The Brisbane FIR is an area from the South Pole through the points 38° S 145° E, 25°S 155° E 21° 163° E 00° 167° E, 00° 175° W, 22° N 158° W, 22° N 156° W, 00° 120° W to the South Pole.

Figure 5 : Map of Australian's FIR

4.1.2 The SP6 Network area is a part of the Brisbane FIR. The coordinates of this area are :

<u>Lateral limits :</u>

44 33 57S - 150 00 00E ; 45 00 00S -150 00 00E
45 00 00S - 163 00 00E ; 21 22 50S -163 00 00E
24 49 40S - 153 56 22E ; 24 59 04S -154 00 31E
then along the minor arc of a circle of 150.00 NM radius centred on 27 21 57S -153 08 21E (BN/DME) to 29 49 13S -153 42 58E
30 40 20S -153 08 21E ; 32 53 01S -152 26 31E
33 30 06S -151 54 31E;
then along the minor arc of a circle of 45.00 NM radius centred on 33 56 34S -151 10 51E (SY/DME) to 34 28 18S -151 49 23E
35 18 59S -152 55 50E;
then along the minor arc of a circle of 120.00 NM radius centred on 34 57 00S -150 32 00E (NWA/TAC) to 36 56 43S -150 45 03E
38 11 19S -150 19 14E ; 43 00 00S -151 00 00E
43 51 03S -150 39 53E ; 44 33 57S -150 00 00E

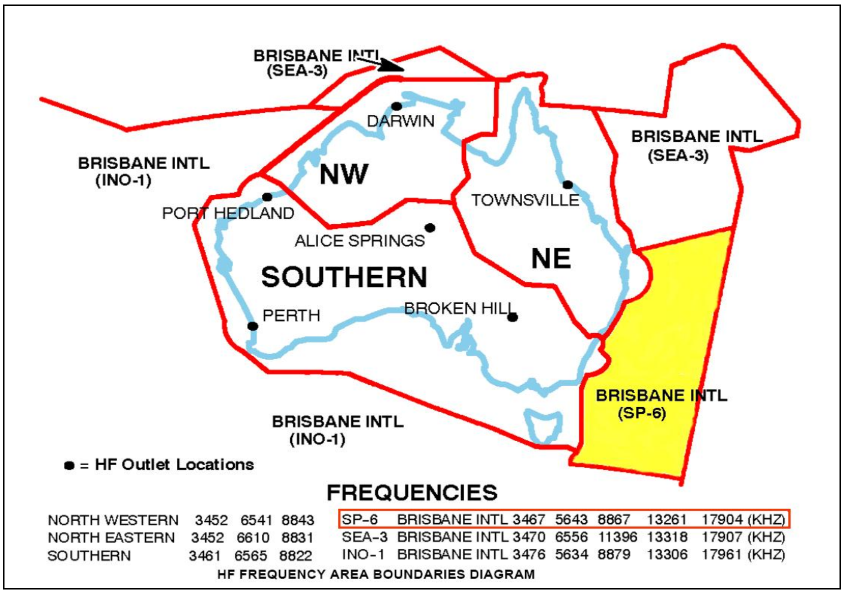

Figure 6 : Map of Australia - HF Frequencies Areas

4.2 AUCKLAND FIR

4.2.1 The Auckland Oceanic FIR is that airspace bounded on the west by meridian 16300E, on the east by meridian 13100W, and extending south to the South Pole, and on the north by a line joining 3000S 16300E, 2800S 16800E, 2500S 17125E, 2500S 18000E, 153245.1S 1754031.2W, 0500S 17100W, 0500S 15700W, 3000S 15700W, 3000S 13100W from surface to FL999 and excluding the New Zealand (Domestic) FIR

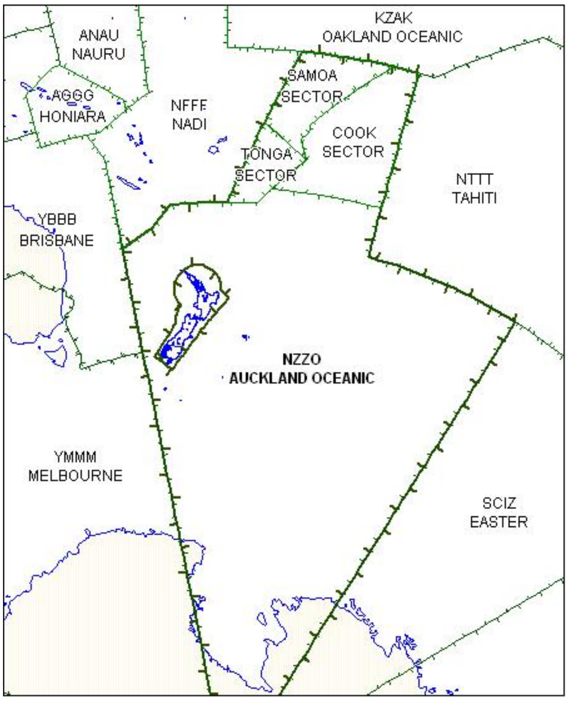

Figure 7 : map of the Auckland Oceancic FIR

4.3 NADI FIR

4.3.1 The coordinates of the Nadi FIR are shown in the table 5 :

Name	Horizontal imits	Vertical limits
Nadi Flight Information Region	N 03 30.0 - E 170 00.0 – N 03 30.0 - E 180 00.0 – S 05 00.0 - W 180 00.0 – S 05 00.0 - W 171 00.0 – S 25 00.0 - E 180 00.0 – S 25 00.0 - E 171 25.0 – S 28 00.0 - E 168 00.0 – S 30 00.0 - E 163 00.0 – S 17 40.0 - E 163 00.0 – S 14 00.0 - E 161 15.0 – S 14 00.0 - E 163 00.0 – S 10 00.0 - E 170 00.0 – N 03 30.0 - E 170 00.0	Surface to 9500 ft and above FL460
New Caledonia Sector	S 14 00.0 - E 165 15.0 – S 14 00.0 - E 163 00.0 – S 21 00.0 - E 170 30.0 – S 24 00.0 - E 170 30.0 – S 24 00.0 - E 163 00.0 – S 17 40.0 - E 163 00.0 – S 14 00.0 – E 163 00.0	Surface to FL245
Xport Vila Sector	S 14 00.0 - E 163 00.0 – S 13 00.0 - E 164 50.0 – S 13 00.0 - E 170 30.0 – S 21 00.0 - E 170 30.0 – S 14 00.0 - E 163 00.0	Surface to FL245
Vanua Sector	S 16 00.0 - E 176 40.0 – S 16 00.0 - E 178 10.0 – S 16 00.0 - W 178 00.0 – S19 20.0 - W 178 00.0 – S 19 20.0 - E 178 10.0 – S 19 20.0 - E 176 40.0 – S 16 00.0 - E 176 40.0	West pf E 178 10.0 outside Nadi CTR Surface to 5500ft East of E 178 10.0 outside Naurosi CTR Surface to 9500ft

Table 5 : Nadi FIR coordinates

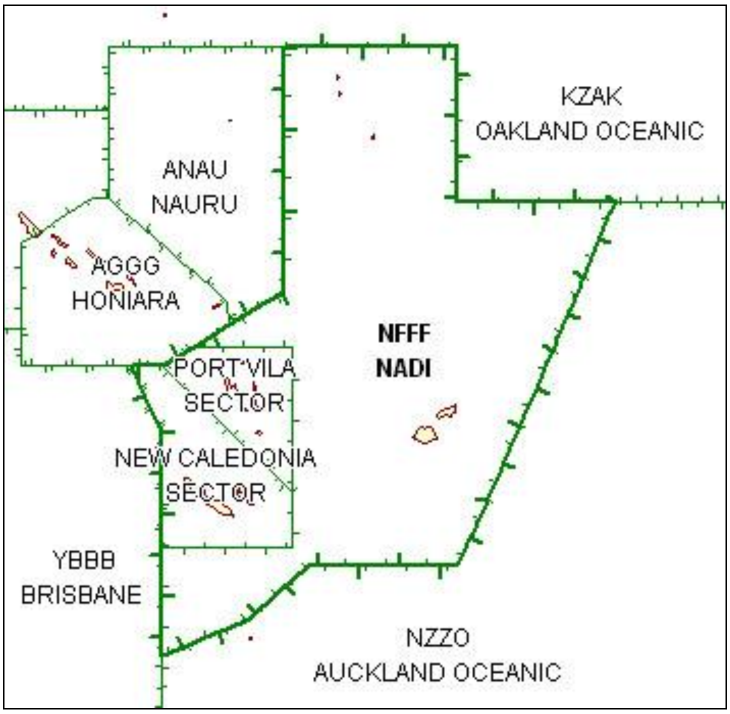

Figure 8 : Map of the NADI FIR

4.4 OAKLAND FIR

4.4.1 The coordinates of the OAKLAND FIR are:

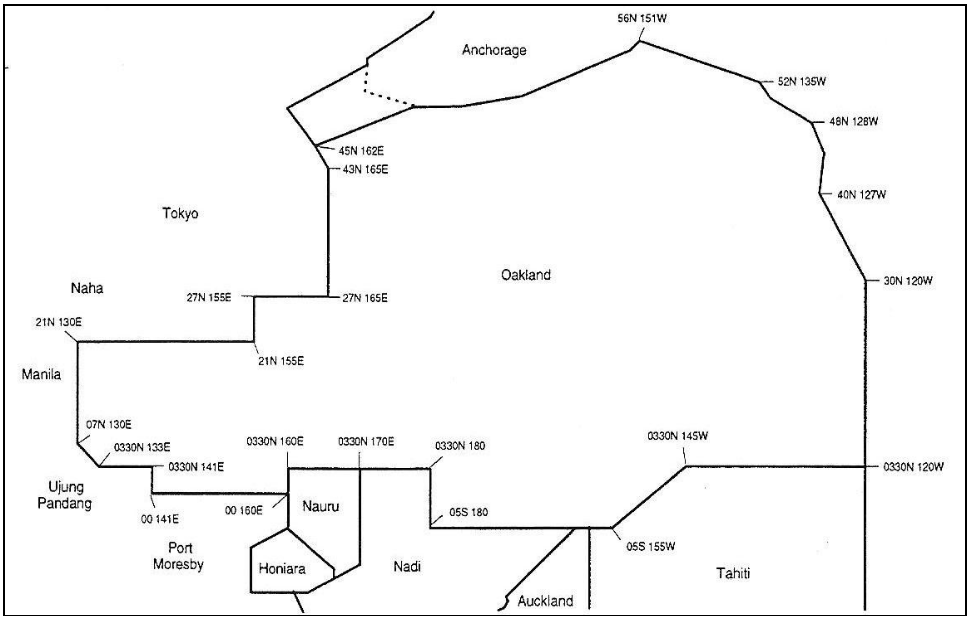

Figure 9 : Oakland FIR map with coordinates

4.4.2 The HF SP6 network is use in the sectors OC3 and OC4 from the Oakland FIR

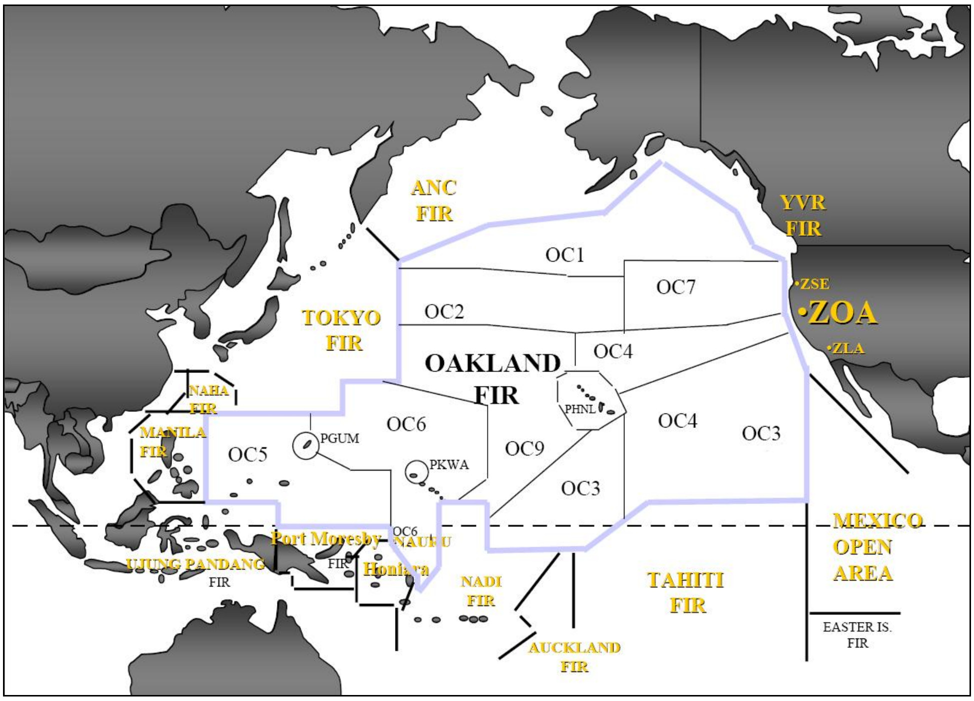

Figure 10 : Map of the OAKLAND FIR

4.5 TAHITI FIR

4.5.1 The TAHITI FIR's coordinates are:

03 30 00 N . 120 00 00 W – 30 00 00 S .120 00 00 W – 30 00 00 S . 157 00 00 W – 5 00 00 S . 157 00 00 W – 5 00 00 S . 155 00 00 W – 03 30 00 N . 145 00 00 W .

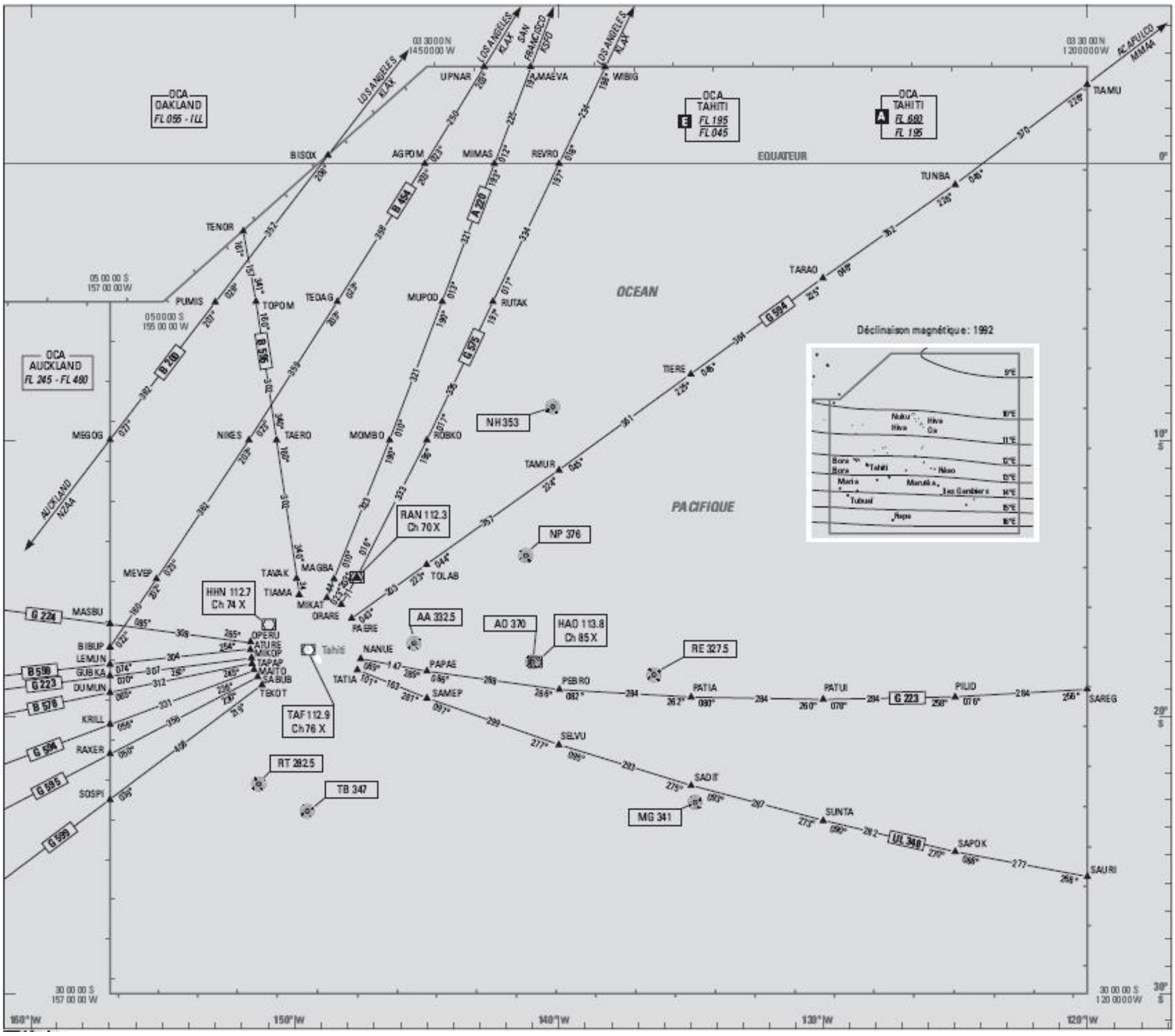

Figure 11 : Map of the TAHITI FIR

5 HF propagation prediction

5.1 AUSTRALIAN SPACE WEATHER AGENCY

5.1.1 The Australian Space Weather Agency provides in his Website : http://www.ips.gov.au predictions of HF propagation.

5.2 BRISBANE FIR

5.2.1 A special webpage was created for Airservices Australia: http://www.ips.gov.au/Products_and_Services/5/1

5.3 AUCKLAND FIR

5.3.1 After reaching this webpage http://www.ips.gov.au/HF_Systems/1/1/1 select the city of Auckland to get the map of the propagation conditions in the FIR.

5.4 NADI FIR

5.4.1 From this webpage http://www.ips.gov.au/HF_Systems/1/1/1 select the city of Nadi to get the map of the propagation conditions in the FIR.

5.5 OAKLAND FIR

5.5.1 The daily and hourly prediction of propagation are available on the IPS website : http://www.ips.gov.au/Products_and_Services/5/12

5.6 TAHITI FIR

5.6.1 The IPS Web site provide for the FIR of Tahiti this link : http://www.ips.gov.au/HF_Systems/1/1/2

5.6.2 Using theses informations the SEAC-PF has developped this website used by the ATC controllers daily.

http://pro.hilaire.org/hf/
login: prophf
passwd: 2M3H0Z

6 General notes

6.1 Hours of service

6.1.1 Each station of the SP 6 network works 24/24 and 7/7.

6.2 Points of contact

6.2.1 Contact details of the station managers and watch supervisors for each radio station are contained in the Annexes section as follows: Appendix B-1 (Brisbane), Appendix B-2 (Auckland), Appendix B-3 (Nadi), Appendix B-4 (San Francisco) and Appendix B-5 (Tahiti)

6.3 Coordination principles

6.3.1 For routine day-to-day operations such as inter-station tactical co-ordination of frequency assignments, network co-operation and support, etc., contact should be made with the duty supervisor/watch manager using the contact means specified in Appendixes B-1, 2, 3, 4 and 5.

6.3.2 When the coordination between stations involves subjects such as procedures, institutional issues, or issues affecting the Network as a whole, etc., the contact to the station or stations should be made to the station manager through the points of contact defined in Appendixes B-1, 2, 3, 4 and 5.

6.4 Poor HF propagation conditions

6.4.1 Whenever a radio station duty supervisor/watch manager have access to information or warnings regarding poor HF propagation conditions or high levels of solar activities, that will affect the normal HF operations, he should notify the on duty Supervisor of the ATC unit in which the station provide the service.

6.5 HF operator

6.5.1 The FIR of Nadi, Brisbane, Auckland and Oakland use an Air Ground Operator.

6.5.2 In the FIR of Tahiti, the Air Traffic Controler is also the Air Ground Operator.

Appendices

Appendix A - HF medium characteristics

1.1 The term frequency is used to state the number of cycles occurring in one second, taking into account that cycle means a complete oscillation of the alternating current. The distance travelled by a radio signal during the transmission of one cycle is called wavelength. Wavelength is inversely proportional to frequency, so that if frequency is increased the wavelength will decrease.

1.2 If an alternating current of suitably high frequency is fed to a transmitting aerial, the energy is not confined to the metal of the aerial but radiates out into space in the form of electro-magnetic waves (radio waves). This radiation of energy through space comprises alternating and magnetic fields at right angles to each other.

1.3 As a general rule, radio signals travel in straight lines, that is, they follow great circle paths over the surface of the earth. Under certain circumstances, however, the path of a signal may change direction, this change of direction is called refraction. Refraction examples are coastal, atmospheric and ionospheric, and the amount of refraction varies considerably, depending on certain conditions. Those conditions could be a change in direction when a signal crosses a coastline (coastal refraction), a change in direction due to a variation in temperature, pressure and humidity, particularly at low altitude (atmospheric refraction), or a change in direction when the radio wave passes through an ionised layer (ionospheric refraction).

1.4 The path of a radio wave from a transmitter to a receiver many miles away is not necessarily direct, and in many cases, the signal may be reaching the receiver by more than one path at the same time. Because of the different path lengths there will be phase differences between the signals, and this fact will affect the resultant signal strength, phenomenon known as fading.

1.5 The main propagation paths between a transmitter and a receiver are, direct wave, ground-reflected wave, space wave, surface wave, ground wave and sky wave.

1.5.1 When a signal travels in a straight line between the transmitter and receiver it is called direct wave and its use is limited because of the earth curvature. If the radio wave arrive to the receiver after reflection at the earth's surface it is called ground-reflected wave. These two waves are jointly known as the space wave and under normal conditions it's the only propagation path for frequencies above 30 Mhz.

1.5.2 When a signal follows the curvature of the earth, this path is called surface wave, and is normally caused by a phenomenon called diffraction. Diffraction occurs for all types of wave motion, and allows the wave to pass round earth obstacles and depends on the wavelength in relation to the radius of the earth. The range of surface wave depends on the wavelengths, with longer wavelengths (lower frequencies) the diffraction effect becomes more pronounced with consequently improved surface wave range, the type of surface, because different surfaces absorb different amounts of radio energy resulting in different rates of attenuation, being higher over land than over sea, and the frequency used, with lower frequencies suffering less attenuation along the surface and therefore providing better surface wave range.

1.5.3 The combination of direct, ground-reflected and surface waves can be described has the ground wave. However, not all of those types of waves have to be necessarily present together.

1.5.4 When signals are reflected or refracted down from ionised layers above the earth the path is called sky waves, also sometimes called ionosphere waves.

1.6 Electron density Ultra-violet light from the sun can cause electrons to become separated from their parent atoms of the gases in the atmosphere. The atoms are left with resultant positive charges and are then known as ions. The intensity of the ionisation depends on the strength of the ultra-violet radiation and the density of the air.

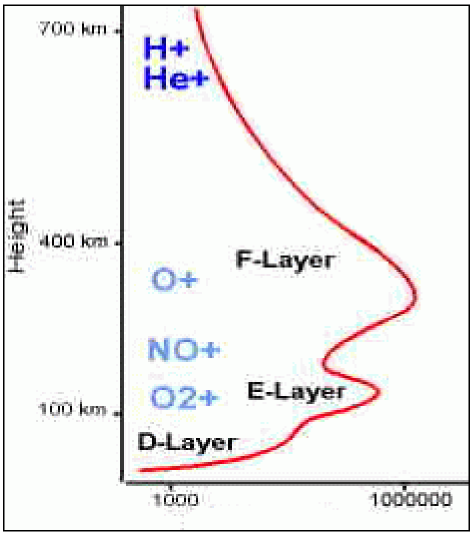

Figure 12 : Electron density (El/m^3)

The part of the atmosphere in which this process occurs is called the ionosphere, extending from about 50 Km to as high as 500 Km above the earth's surface. When a radio wave enters such a layer, refraction occurs causing the wave to be bent away from its straight path. The amount of refraction depends on the frequency, the angle at which the wave enters the layer, and the intensity of ionisation.

1.7 The ionosphere is still under investigation but is known that several definite ionised layers exist within it. During daytime hours there are four main ionisation layers designated D, E, F_1 and F_2 in ascending order of height. At night, when the sun's radiation is absent, ionisation still persists but it is less intense, and fewer layers are found (D and F layers). Factors that affect the ionosphere layers is strength of the sun's radiation, since it varies with latitude causing that the structure of the ionosphere varies widely over the earth's surface, and the state of the sun, since sunspots affect the amount of ultra-violet radiation.

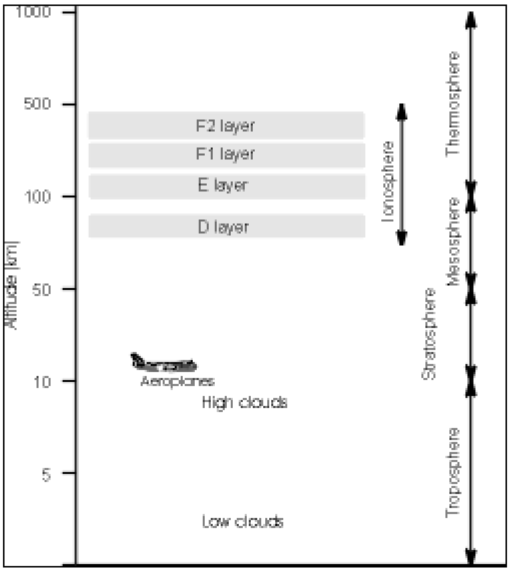

Figure 13 : Description of the Atmosphere

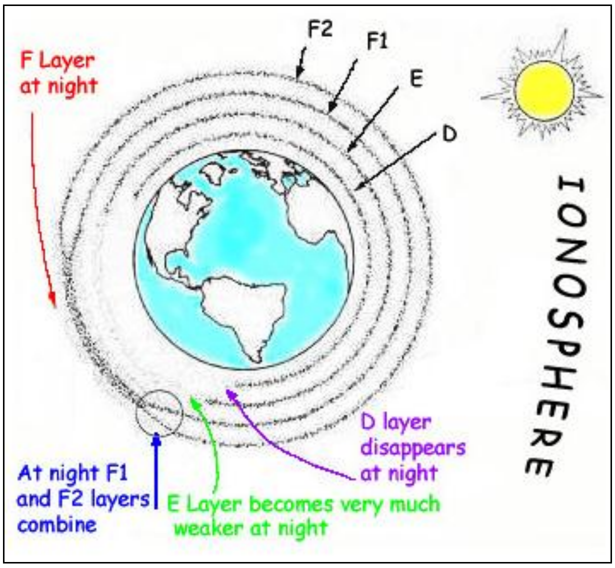

Figure 14 : Layers around the Earth

1.7.1 The D layer is only significant during daylight hours, dispersing soon after sunset. It is the lowest layer and its intensity of ionisation is not great, in which VLF waves are reflected from the base of the layer, LF and MF waves enter the layer and are severely attenuated without being appreciably refracted, and higher frequency signals pass through the layer with less attenuation.

1.7.2 The E layer is strong ionised by day and remains weakly ionised by night, producing strong sky waves in the LF and MF bands by night, but during the daytime due to the attenuation caused by the D layer the sky waves produced are too weak to used in these bands. Usable HF sky waves may be produced by this layer during nigh and day, and VHF signals usually pass through this layer, and if refraction exist it is insufficient to generate sky waves, unless under “freak” conditions, duct (or super-refraction) and scatter (or sporadic-E reflections) propagation. Ionospheric refraction is negligible with UHF, SHF and EHF signals and sky waves do not occur in these bands.

1.7.3 The F layer is the highest and more intensely ionised layer. At night there is only one F layer, but during the daytime is divided into two layers, the F_1 and F_2. Strong sky waves are produced in the LF, MF and HF bands at night but only the HF band has usable F layer sky waves by day. Signals in the VHF and higher bands escape through the F layer into space with, normally, no sky waves produced.

1.8 Sky wave propagation in the HF band (3 to 30 MHz) is complicated, because there are many variable factors, which decide whether or not there is a propagation path open between transmitter and receiver for long-range radiotelephony.

1.8.1 For a given frequency and state of the ionosphere, the amount of refractive "bending" of the wave will depend on the angle at which the wave penetrates the layer. Waves travelling nearly vertically may escape through a layer, but may be returned to earth if a higher more intensely ionised layer exists.

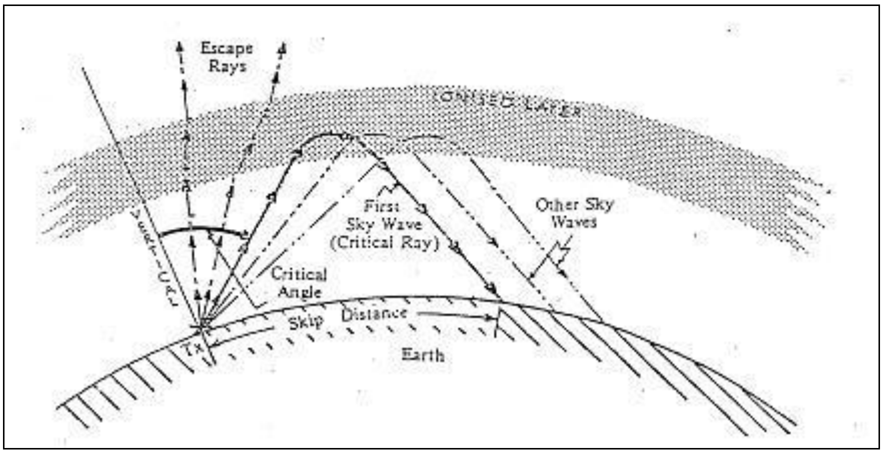

Figure 15 : Critical angle (HF band)

1.8.2 As can be seen on Figure **15**, waves ascending with an increased angle with the vertical, the amount of bending is greater and when the angle with the vertical is increased to the critical angle, the path is bent enough for the wave to return to earth as the first sky wave. Waves making an angle with the vertical greater than the critical angle will also produce sky waves, coming down to earth at greater ranges than that of the first sky wave. The range from the transmitter and the first sky wave for a given frequency and set of conditions is called the skip distance. If the surface wave from a HF transmitter become completely attenuated at a shorter range than that at which the first sky wave returns to earth, leaves an area in which neither ground wave nor sky waves are received and which is none as dead space (Figure **16**).

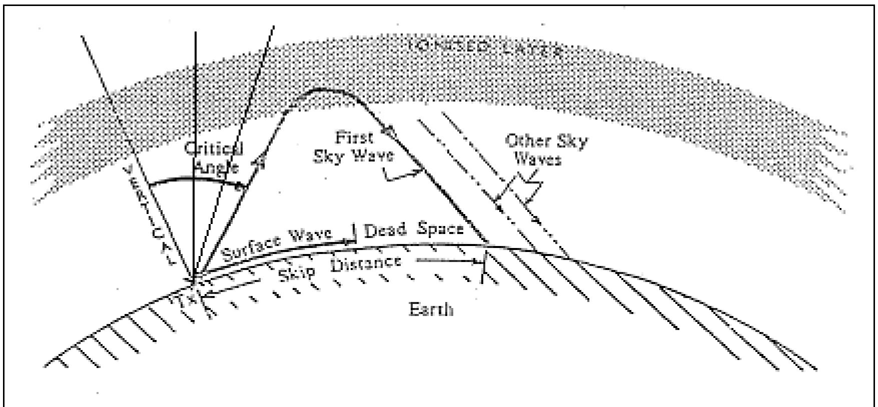

Figure 16 : Dead space (HF band)

1.8.3 Critical angle depends largely on the frequency, the higher the frequency the greater the critical angle, therefore, if skip distance is to be reduced, a lower frequency has to be used. This is most significant when choosing the optimum frequencies for HF communications and ensuring that the skip distance is less than the range of the distant receiver.

1.8.4 For good long-range HF R/T reception a frequency must be chosen which will not suffer too much attenuation. If a relatively high frequency is used, for example 29 MHz, most of the energy will pass through the E layer and be reflected from the more intensely ionised F layer. The higher the frequency, the greater degree of ionisation is required to give reflection. As frequency is reduced and attenuation of the E layer reflections increases, a limit is reached called the “Lowest Usable Frequency (LUF)”, and bellow this frequency the attenuation is too great for the signal to be usable.

1.8.5 Thus for least attenuation, and so the highest received signal strength for a given transmitter power, a frequency is chosen which is as high as possible without exceeding the MUF (Maximum Usable Frequency) for the path between the transmitter and distant receiver. The MUF is that frequency, for the prevailing conditions, which produces a skip zone extending just short of the distant receiver. Any higher frequency would give a higher critical angle and a greater skip distance exceeding beyond the receiver, which would then loose that sky wave contact with the transmitter.

1.8.6 MUF at night is much less than by day, because the intensity of ionisation in the layer is less so than lower frequencies have to be used to produce the same amount of refractive bending and give the same critical angle and skip distance as by day. However, the signal attenuation in the ionosphere in the ionosphere is also much less at night so the lower frequency needed is still usable. Hence the night frequency for a given path is about half of the day frequency, and shorter distances can be worked at night than by day while still using a single reflection from the F layer.

1.8.7 The MUF not only varies with path length and between day and night, but also with season, meteor trails, sunspot state, and sudden ionospheric disturbances produced by eruptions on the sun. Because of the variations of MUF, HF transmitting stations have to use frequencies varying widely between about 2 and 20 MHz.

1.9 The theoretical range for HF frequencies varies, depending on the propagation path used, ground or sky waves. Ground waves usually can reach up to 100 nm and sky waves longer distances, however, sky waves will not be received within the skip distance (probably several hundred miles from the transmitter). The theoretical maximum range obtained by means of a single reflection from the E layer is about 1 300 nm, and from the F layer about 2 500 nm. This theoretical maximum range is achieved with the transmitted signal leaving the earth’s surface tangentially. Ranges of 8 000 nm or more may be achieved by means of multiple reflections, mainly from the F layer, being the signal alternately refracted down from the layer and reflected up again from the earth’s surface until it becomes too weak to use.

Appendix B-1 - Brisbane Radio Station Information

Station Name:	**Brisbane Radio**
Country: Australia	**State: Queensland**
City: Brisbane	**Geographic Location: S27.23.0 E153.07.1**
AFTN Address: YBBBYINTL	**Aircraft in Flight Address: YBBB**
SATCOM SHORT CODE Nr. : 450 302	

Facilities

Transmitter site(s)	**Receiver site(s)**
Location and equipment:	**Location and equipment:**
Cape Pallarenda (Townsville) – 19.12.05.8S 146.46.05.3E 4 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SP6 & 2 X SEA3 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Cape Clevedon (Townsville)** – 19.21.03.8S 147.01.06.5E 18 X Cubic LCR-2000 HF receivers, comprising 9 X SP6 & 9 X SEA3 1 X Andrew Model 3005 Dual Mode Low Profile Spira-Cone HF antenna
Broken Hill – 31.55.38.7S 141.28.57.4E 2 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SP6 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Broken Hill** – 32.00.22.4S 141.28.26.1E 9 X Cubic LCR-2000 HF receivers, comprising 9 X SP6 1 X Andrew Model 3005 Dual Low Profile Spira-Cone HF antenna
Knuckeys Lagoon (Darwin) – 12.25.52.0S 130.57.51.5E 2 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SEA3 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Shoal Bay (Darwin)** – 12.22.49.5S 130.58.26.2E 9 X Cubic LCR-2000 HF receivers, comprising 9 X SEA3 1 X Andrew Model 3005 Dual Low Profile Spira-Cone HF antenna
Class of Emission: J3E	**SELCAL:** selcal-coder

Frequencies

Family	**Frequency bands**								
	3 MHz	**3.5 MHz**	**4 MHz**	**5 MHz**	**6 MHz**	**8 MHz**	**11 MHz**	**13 MHz**	**17 MHz**
SP6	3.467			5.643		8.867		13.261	17.904
SEA-3	3.470				6.556		11.396	13.318	17.907
Volmet					6.676		11.387		

<table>
<tr><td>Station Manager *</td><td>Supervisor</td></tr>
<tr><td>Name: Mr Ian Harding</td><td>Name: Duty Operations Supervisor</td></tr>
<tr><td>Post Address: Locked Bag 747
Eagle Farm
Brisbane
Australia 4009

Phone: + 61 7 38663544
Fax: + 61 7 38663742
Email: ian.harding @airservicesaustralia.com</td><td>Post Address:
The Australian Flight Information Centre
Locked Bag 747
Eagle Farm
Brisbane
Australia 4009

Phone: + 61 7 38663429
Fax: + 61 7 38663553
Email: ausfic@airservicesaustralia.com</td></tr>
<tr><td colspan="2">Remarks:

Brisbane Radio also provides international HF communications for Australian Air Traffic Control within the contracted airspace of the Honiara and Naru FIR’s

Brisbane Radio provides communication services from Perth and Port Hedland sites that cover the INO-1 MWARA</td></tr>
</table>

Appendix B-2 - Auckland Radio Station Information

Station Name:	**Auckland Radio**
Country: New Zealand	**State**
City: Auckland	**Geog. Location: 370017S1744849E**
AFTN Address: NZAAYSYX	**Aircraft in Flight Address:** NZZO
SATCOM SHORT CODE Nr. : 451 201	
Facilities	
Transmitter site	**Receiver site**
Location: Wiroa Island	**Location:** Seagrove
Equipment	**Equipment**
Transmitters 8 x Marconi ST-5000/NZ 5 KW HF Transmitters comprising 2 x Air Ground 3 x VOLMET 1 x METFAX 1 x Air New Zealand 1 x Spare Aerials 5 x Civil Aviation (NZ) RM 88 Wideband 2–30 MHz 1 x Marconi R7070 wideband 2–30 MHz (Air New Zealand only) 4 x Marconi R7080 wideband 2-30 MHz	Receivers 16 x Eddystone 6100 HF receivers comprising:- 5 x MWARA 3 x ODF 2 x Spare 6 x OCC (Air New Zealand only) 2 x Eddystone 1771 receiver remote controllers Aerials 3 x Civil Aviation (NZ) RM 88 Wideband 2–30 MHz 1 x Creative Design sector coverage log-periodic dipole antenna Type 230HF-2D (Air New Zealand only)
Class of Emission: USB/AM	**SELCAL:**

Frequencies

Family	Frequency bands								
	3 MHz	3.5 MHz	4.7 MHz	5.6 MHz	6.6 MHz	9 MHz	11.3 MHz	13.3 MHz	18 MHz
A	3467			5643		8867		13261	17904
LDOCC	3007				6637		10072	1333	17940
SAR									
VOLMET					6679	8828		13282	

Station Manager	On Duty Supervisor
Name: Mark Goodall	**Post Address:** Airways New Zealand Limited. Fred Ladd Way. Auckland International Airport.
Post Address: Airways New Zealand Limited. Fred Ladd Way. Auckland International Airport. **Phone:** + 64 9 2753109 **Fax:** + 64 9 2753106 **Email:** Goodallm@airways.co.nz **AFTN/SITA Address:** NZZOZQZF	**Phone:** + 64 9 2568071 **Fax:** + 64 9 2753627 **Email:** tim.halpin@airways.co.nz **AFTN/SITA Address:** NZAAYSYX
Remarks: By international agreement Auckland Radio provides communications services for the Auckland OCA. The associated OACC is located at Auckland, New Zealand.	

Appendix B-3 - Nadi Radio Station Information

Station Name:	**Nadi Radio**
Country: Fiji	**State**
City: Nadi	**Geog. Location:** 17° 45′ 19″ S, 177° 26′ 36″ E
AFTN Address: NFFNYFYX	**Aircraft in Flight Address:** NFFNZZZX
SATCOM SHORT CODE Nr. : + 679 6724174	
Facilities	
Transmitter site	**Receiver site**
Location: Enamanu Transmission station	**Location:** Nadi Airport
Equipment (see below)	**Equipment** (see below)
Transmitters JRC JRS-714 10 KW x4 JRC JRS-753 5 KW x2 JRC JRS-752 500 W x2 Antenna Patch §unit NKZ – 93 x1 Modems : NHH 62 modems frames x2 CNM 199 TV x6 Aerials Conifans – 600 Ohms 2-30 MHz x1 Mono pole – 75 Ohms 2-30 MHz x1 Marconipoles – 50 Ohms 2-30 MHz x5 VoiceSwitch: GAREX VCSS 220	Receivers : JRC NRD 840A All wave receiver x 36 JRC NRD 302A Tunable receiver x 9 Antenna Multicoupleurs NAJ -110B x3 Receiver Controller Unit NJC-536B x8 Modems NMC – 207 x16 Antenna System: TFD – Terminated folded dipole x3 2-30 Mhz Range
Class of Emission: J3E	**SELCAL: Baumberger Electronics** **BEW 783 -200 X 3 units**

Frequencies									
Family	**Frequency bands**								
	3 MHz	**3.5 MHz**	**4.7 MHz**	**5.6 MHz**	**6.6 MHz**	**9 MHz**	**11.3 MHz**	**13.3 MHz**	**18 MHz**
A	3467			5643		8867		13261	17904
RDARA	3425					8846	11339		
SAR	3023			5680					

Station Manager	**On Duty Supervisor**
Name: MR Vula SERU	**Post Address:** Airport Fiji Limited. Private Mail Bag. Nadi Airport. Fiji
Post Address: . Airport Fiji Limited. Private Mail Bag. Nadi Airport. Fiji **Phone:** + 679 6725777 Ext 4514 **Fax:** + 679 6725161 **Email:** vulas@afl.com.fj **AFTN/SITA Address:** NANCDYA	**Phone:** **Fax:** **Email** **AFTN/SITA Address:**
Remarks:.	

Appendix B-4 - San Francisco Radio Station Information

Station Name:	SAN FRANCISCO Radio Station Information
Country: United States of America	**State:** California
City: Livermore	**Geographic Location:** 37.70 N 121.72 W
AFTN Address: KSFOXAAG	**Aircraft in Flight Address:** KSFOZZZX
SATCOM SHORT CODE Nr. : 436625	
Facilities	
Transmitter site See below	**Receiver site See below**

Transmitters	Receivers
<u>Dixon (38. 22.46.7 N 121.45. 50.9 W)</u> **(D)** 2 TCI 532-N Log-Periodic (3-30 MHz) 2 TCI 530 log-periodic OMNI (3-30 MHz) 4 AERCOM 1330 (5KW) 1 Cubic CTX-1000 (1KW) standby **<u>Moloka'i, Hawaii</u>** **<u>(21.10.33.5N 157.10.38.9 W)</u>** **(M)** 3 TCI 527-B Log-Periodic (6.2-30 MHz) -NP2 Direction: 346 deg., 6.2-30 MHz -NP3 Direction: 346 deg., 6.2-30 MHz 2 TCI 527-3-28 Log-periodic (6.2-30 MHz) -CWP2 275 deg., 6.2-30 MHz -CWP1 183.5 deg., 6.2-30 MHz 3 TCI 532-4-28 Log-Periodic. (3-30 MHz) -CEP Direction: N - 51 deg., 3-30 MHz -CEP Direction: S - 57 deg., 3-30 MHz -SP Direction: 188 deg., 3-30 MHz 2 TCI 530-4-28 Log-Periodic OMNI (3-30 MHz) 7 CUBIC CTX-5000 (5KW) **Standby transmitter** 1 Cubic CTX-5000 (5KW) **<u>Oahu, Hawaii (21.22.30.6 N 158.5.5.1 W)</u>** Auxiliary transceiver 1 TCI 530 Log-Periodic (3-30 MHz) 1 Cubic CTX-1000 (1KW) **<u>Barrow, Alaska</u>** **<u>(71.15.30.9 N 156. 34.38.9 W</u>** **(B)** 1 TCI 530 Omni (3-30 MHz) 1 CTX-1000 (1KW) **<u>Mt. Barragada, Guam</u>** **<u>13.19.17 N 144.49.30 E</u>** 1 Fan Dipole Antenna 7 TenTec transmitters **<u>Hat Yai, Thailand</u>** **<u>06.56.10.84N 100.23.18.12E</u>** <u>Antenna 06.56.12.79N100.23.19.41E</u> 1 TCI 530-05 (2.8-30MHz) 1 Cubic TCX 1000	**<u>Half Moon Bay (37.39. 00 N 122. 41. 00 W)</u>** 2 TCI 532-B log-periodic (3-30 MHz) -North Direction W 278 degrees -West Direction SW 222 degrees 1 TCI 530 log-periodic OMNI (3-30 MHz) 1 TCI 527B log-periodic (3-30 MHz) -Direction S – 135 degrees 5 TenTec RX331 (CEP2) 14 TenTec RX330 **<u>Moloka'i, Hawaii (21.12.23 N 157.12.30 W)</u>** 1 TCI 532-4 Log-Periodic (3-30 MHz) -CEP Direction: 051 deg. 1 TCI 527-3 Log-Periodic (6.2-30 MHz) -WP Direction: 283.5 deg. 2 TCI 527-B Log-Periodic (6.2-30 MHz) NP Direction: 346 deg. SP Direction: 188 deg. 38 LCR-2000 **Moloka'I standby receiver** 7 Cubic LCR-2000 **<u>Oahu, Hawaii 21.22.30.6 N 158.5.5.1 W</u>** Oahu Auxiliary transceivers 7 TenTec RX330B **<u>Barrow, Alaska 71.15.30.9 N 156.34.38.9 W</u>** TCI 530-6 7 Cubic LCR-2000 **<u>Pulantat, Guam 13.25.00 N 144.44.47 E</u>** 1 HF Braodband dipole (2 MHz-30 MHz) TCI-535 (3-30 MHz) 1 TCI Conical Monopole Antenna (LDOC) 4 CDR-3250 6 TenTec RX331 (LDOCF) 7 TenTec RX331 (CWP) **<u>Hat Yai, Thailand</u>** **<u>06.56.24.71N 100.24.47.28E</u>** <u>Antenna 06.56.25.03N 100.24.49.84E</u> TCI 530-05 (2.8-30MHz) 7 Cubic LCR 2000 1 Cubic LCR 2000 (Spare)
Class of Emission: 1K40H2B/2K80J3E	**SELCAL: 17 FREQUENTIS Units**

Frequencies

Family	Frequency bands								
	2-3 MHz	**4 MHz**	**5 MHz**	**6 MHz**	**8 MHz**	**10-11 MHz**	**13 MHz**	**17 MHz**	**21 MHz**
(D)CEP1	3413		5574		8843		13354		
(D)CEP2	2869		5547			11282	13288		21964
(D)CEP3	3452			6673		10057	13288		
(M) SP	3467		5643		8867		13261	17904	
(M)CWP1	2998 / 3455	4666		6532		11384	13300	17904	
(M)CWP2	2998		5652	6532	8903	11384		17904	21985
Guam CWP	2998 / 3455	4666	5652	6532	8903	11384			
(M) NP1			5628	6655	8915	10048	13339	17946	21925
(M) NP2	2932		5667	6655	8951	11330	13273	17946	
(B) NP			5628	6655	8915	10048	13339	17946	21925
(M) CEP1	3413		5574		8843		13354		
(M) CEP2	2869		5547		8867	11282	13288		
(M) SP	3467		5643		8867		13261	17904	
(G/M/D/B) LDOCF	3494			6640	8933	11342	13348	17925	21964
(HDY) LDOCF	3494			6640		11342	13348	17925	21964

Station Operations Manager:	**On Duty Manager:** Andrew Colombana, Robin Lee, Lynn Sallady, Leigh-Lu Prasse or Swami Nand (Shift Managers)
Name: Tammy J. Callahan **Post Address:** 6011 Industrial Way Livermore, California, USA 94550 **Phone: + 1** 925-519-0792 **Fax: + 1** 925-294-9597 **Email:** tcallaha@arinc.com **AFTN/SITA Address:** KSFOTCXA	**Post Address:** 6011 Industrial Way Livermore, California, USA 94550 **Phone: + 1** 800-799-7847 **Fax: + 1** 925-294-9597 **Email:** sfomgr@arinc.com **AFTN/SITA Address:** KSFOSMXA

Remarks: : PHNL-PMKK VHF 131.95 (HA)
PGUM VHF 191.95 (GA)

Appendix B-5 - TAHITI Control Station Information

Station Name:	**TAHITI Control**
Country: France	**State:** French Polynesia
City: FAAA	**Geographic Location:** 17° 33 20S 148° 36 60W
AFTN Address: NTTTZQZX	**Aircraft in Flight Address:** NTTTZZZX
SATCOM SHORT CODE Nr. : 42 27 90	

Facilities

Transmitter site	**Receiver site**
Location: FAAA (17° 33 20S 148° 36 60W)	**Location:** FAAA (LA HUNA) (17° 33 20S 148° 36 60W)
Equipment	**Equipment**
<u>Antennas</u> 2 Biconics (Fuseau) 1 Spiracone Andrew 3002 <u>Transmitters</u> **2* Nardeux T166 1KW** **<u>Backup station:</u>** Antennas 1 Volubilis 1 Hormi (THX) 1 Spiracone Andrew 3002 <u>Transmitters</u> 1 * Rhode &Schwarz XK 2900 1 KW	20 I2E receivers 1 Biconic antenna BCI3-30 1 Spiracone Andrew 3002 (1 low angle (long-medium range)) (1 high angle (short- range)) <u>Backup station</u> 6 * I2E receivers 1 * ASD 2-30 semi delta
Class of Emission: 2K80J3E /	**SELCAL:** 5 DANKS RADIO SC9100

Frequencies

Family	**Frequency bands**								
	3 MHz	**3.5 MHz**	**4.7 MHz**	**5.6 MHz**	**6.6 MHz**	**9 MHz**	**11.3 MHz**	**13.3 MHz**	**18 MHz**
SP		3467		5643		8867		13261	17904
9C(*project*)									
Fix				5066.5	6801	9116		12166.5	
SAR				5680					

Station Manager	**On Duty Supervisor**
Name: Eric LIEUTAUD **Post Address:** Service Navigation Aerienne Division technique BP 6011 FAAA 98702 FAAA TAHITI – French Polynesia **Phone:** + 689 86 10 30 **Fax:** + 689 86 10 39 **Email:** Lieutaud_Eric@seac.pf **AFTN/SITA Address:** NTAA	**Post Address:** Service Navigation Aerienne Division technique BP 6011 FAAA 98702 FAAA TAHITI – French Polynesia **Phone:** + 689 86 11 33 **Fax:** + 689 86 10 39 **Email:** na.tec@seac.pf **AFTN/SITA Address:** NTAAYSYX
Remarks: TAHITI radio is collocated and is a department within TAHITI OACC Backup receiver site is also located in the vicinity of TAHITI OACC	

LIST OF FIGURES

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