Agenda Item 17.3 RANET

RANET Report with a Short Term and Long Term Strategy

4th SPREP PMC, Honiara, Solomon Islands

H. Gingerlei Porter UH TASI

Edward H. Young, Jr., RANET Pacific Communications Coordinator

Presentation Overview

- Summary of RANET Systems Survey in the Pacific Region
  - Chatty Beetle
  - EMWIN
  - LRIT
  - HF Radio/Email
  - HimawariCast
- RANET Long and Short Term Strategy
- Establishment of an ad-hoc RANET Requirements Working Group
- Recommendations to the PMC

RANET Meeting
Edgewater Resort, Rarotonga, Cook Islands
29-30 June 2007

Back row: H Taiki (WMO) D Solofa (SPREP) A Titimaea (Samoa) H Diamond (US/NOAA) B Mitchell (BoM) P Eastwood (SOPAC) B Best (Guam)
3rd row: G Clarke (NZ) T Katea (Tuvalu) C Iroi (Solomon Is) C Shulz (SPREP)
2nd row: A Ngari (Cook Is) O Fa'anunu (Tonga) S Pulehetoa (Niue) M Landers (Guam) M Morrisey (Uni of Oklahoma) J Berdon (FSM)
1st row: M Virobi (PNG) E Young Jnr (NWS USA) M Power (SOPAC) R Prasad (Fiji) K Salesa (Vanuatu)

Chatty Beetle

Chatty Beetle

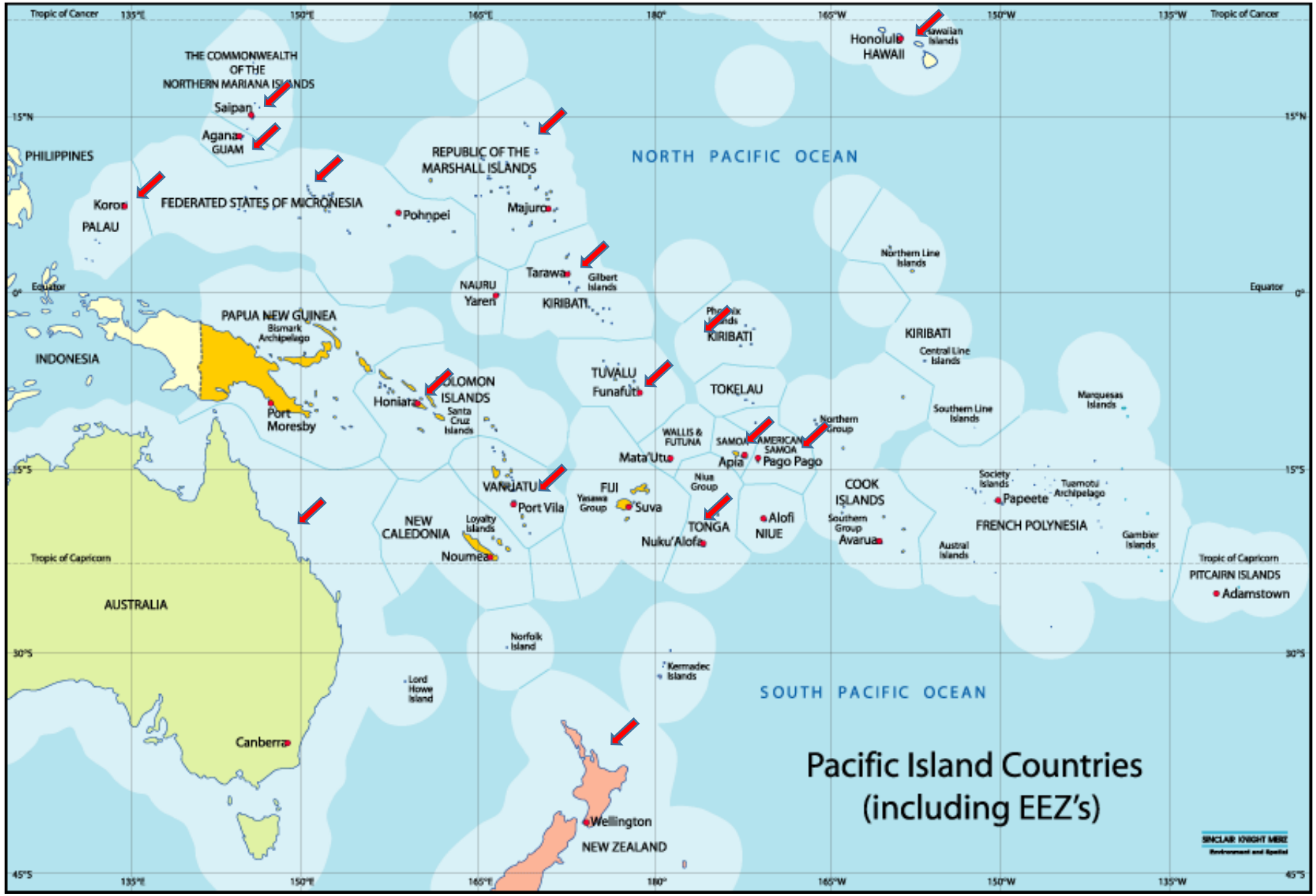
Technical Specifications

- 2-way Iridium satellite based
- Ruggedized for remote, high salt, high heat, high humidity areas, such as remote islands
- Operates with AT1621-142W or SAF5340A antennas
- 4V battery life – 36 hours / chargeable 100-240 volts
- 9602 or 9601 SBD LBT modem designed for Iridium Short Burst Data service
- Store up to 10 messages

Functional Specifications

- 159 character text message system for notification of early warning hazard messages
- Used as a primary tool for collection of climate, met, and surf/inundation observations.
- Capable of sending messages to email or cellular phone

Chatty Beetles (Total Deployed: 90)



List of Sites:

- American Samoa (4)
- Chuuk (4)
- CNMI (6)
- Guam (3)
- Kiribati (8)
- Marshall Islands (19)
- Palau (2)
- Pohnpei (7)
- Samoa (3)
- Solomon Islands (3)
- Tuvalu (15)
- Tonga (10)
- Vanuatu (3)
- Yap (3)

Chatty Beetles	Units Issued (Pre-Survey)	New Request	Order Complete	Remaining Order	Total Deployed	Battery/ Power	Antenna	Modem	TOTAL DEFECTIVE	Installed/ Operational	To be Installed/ Spare	Lost/ Misplaced
American Samoa	4	0	0	0	4	0	0	0	**0**	2	0	2
Chuuk, FSM	4	7	0	7	4	6	1	0	**3**	1	0	0
CNMI (Red Cross)	6	0	0	0	6	12	0	0	**6**	2	0	0
Cook Islands	0	5	0	5	0	0	0	0	**0**	0	0	0
Fiji	0	9	0	9	0	0	0	0	**0**	0	0	0
French Polynesia	0	0	0	0	0	0	0	0	**0**	0	0	0
Guam	3	0	0	0	3	0	0	0	**0**	3	0	0
Kiribati	8	0	0	0	8	2	0	1	**2**	6	0	0
*Marshall Islands	19	24	0	24	19	6	0	5	**5**	6	8	0
Nauru	0	0	0	0	0	0	0	0	**0**	0	0	0
New Caledonia	0	0	0	0	0	0	0	0	**0**	0	0	0
Niue	0	3	0	3	0	0	0	0	**0**	0	0	0
**Palau	2	0	0	0	2	0	0	0	**0**	2	0	0
Papua New Guinea	0	30	0	30	0	0	0	0	**0**	0	0	0
Pohnpei and Kosrae, FSM	7	7	0	7	7	6	0	0	**3**	4	0	0
Samoa	3	0	0	0	3	0	0	0	**0**	3	0	0
***Solomon Islands	3	8	0	8	3	0	0	0	**0**	1	2	0
Tokelau	0	5	0	5	0	0	0	0	**0**	0	0	0
****Tonga	2	15	8	7	10	2	0	0	**1**	9	0	0
*****Tuvalu	0	15	15	0	15	0	0	0	**0**	15	0	0
Vanuatu	3	6	0	6	3	2	0	0	**1**	1	0	1
Yap, FSM	3	0	0	0	3	0	0	0	**0**	3	0	0
TOTAL	**67**	**134**	**23**	**111**	**90**	36	1	6	**21**	**58**	**10**	**3**

Emergency Managers Weather Information Network (EMWIN)

EMWIN On GOES-N Series

Technical Specifications

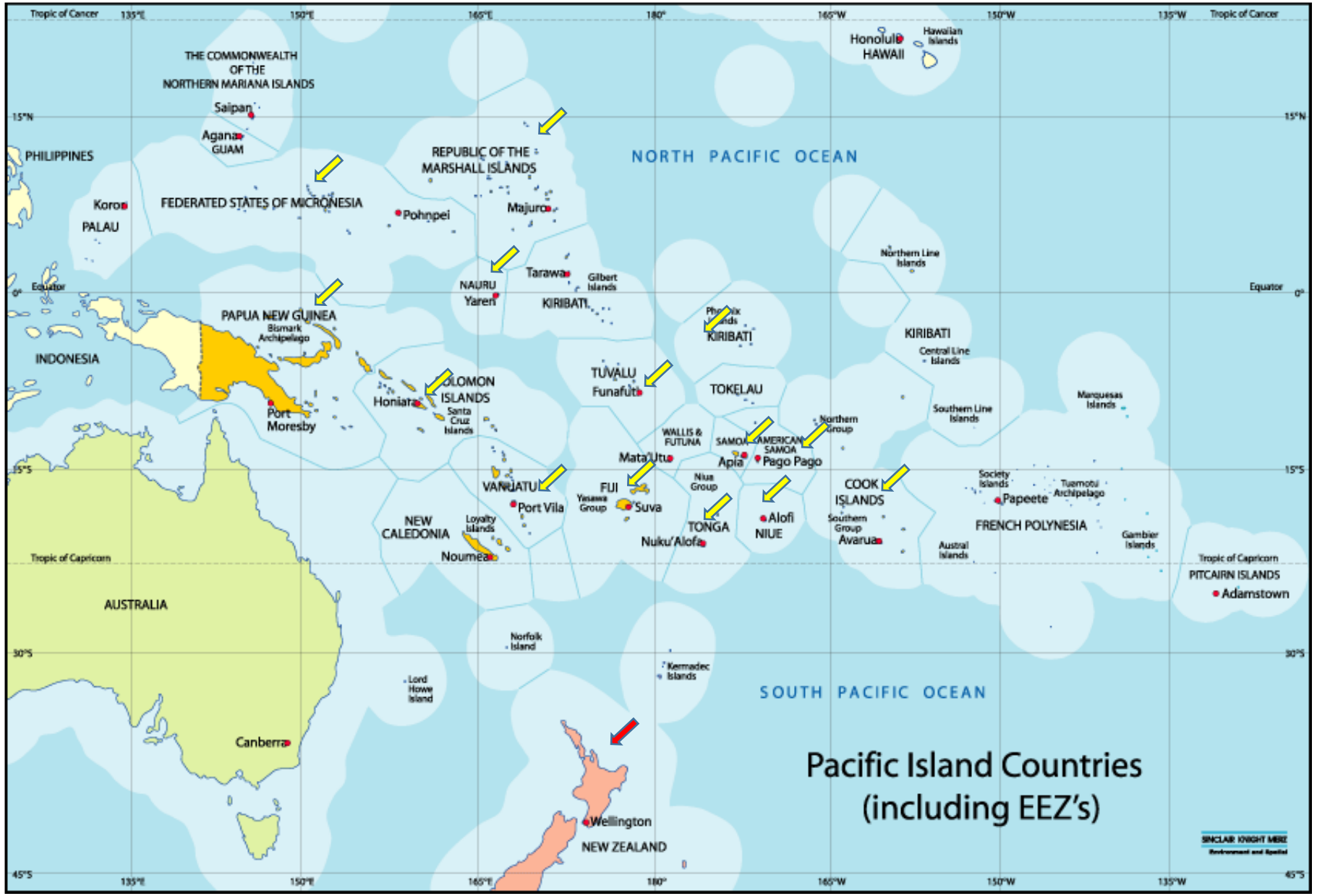
- Satellite broadcast : NESDIS GOES East and West Satellites
- Internet File Push: EMWIN ByteBlaster client/server file dissemination service
- Internet File Pull: EMWIN File Transfer Protocol (FTP) server
- 3 Hourly Full Disk; .5 hour NH?SH; follows GOES East/West Schedule. RSO Issue
- Broadcast Power: 44.8dBmi / Frequency: 1692.7 MHz (L-Band)
- Modulation OQPSK
- Data Rate: 19.2 Kbps
- Antenna Coverage (1 meter): Earth Coverage to 5 degrees
- GOES-N Imager (IR, VIS, WV)
- CDS Observations

EMWIN C-Band Dish Antenna at Met Office, Port Vila, Vanuatu

Functional Specifications

- Dissemination system providing timely watches, warning, forecasts other hydro-met products, graphics and satellite imagery
- Uses NOAA's GOES satellites and low cost user receive system
- Data content prioritized to needs of emergency managers
- Same bit stream available on Internet / Rebroadcast on VHF

EMWIN (Total Deployed: 30)



List of Sites:

- American Samoa (2)
- Cook Islands (2)
- Fiji (4)
- FSM (1)
- Kiribati (1)
- Marshall Islands (2)
- Nauru (1)
- Niue (1)
- Papua New Guinea (3)
- Samoa (2)
- Solomon Islands (3)
- Tokelau – Apia Office (1)
- Tonga (3)
- Tuvalu (2)
- Vanuatu (2)

EMWIN	Units Issued (Pre-Survey)	Requests	Received	Remaining	Installed/ Operational	Unserviceable/ Unknown	Downconverter	Antenna/ Transceiver	Location Changed	Adapter	PC Broken	TOTAL Defective	To Be Installed / Spare	Needs to be upgraded
*American Samoa	2	0	0	0	1	0	0	0	1	0	0	1	0	1
*Chuuk, FSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CNMI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*Cook Islands	2	0	0	0	1	1	0	0	0	0	1	1	0	0
*Fiji	4	0	0	0	0	1	0	2	1	0	0	4	0	0
French Polynesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guam	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*Kiribati	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Marshall Islands	2	0	0	0	1	0	0	0	0	0	0	0	0	0
*Nauru	1	1	0	1	0	1	0	0	0	0	0	1	0	0
New Caledonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Niue	1	0	0	0	1	0	0	0	0	0	0	0	0	0
*Palau	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*Papua New Guinea	3	0	0	0	0	2	0	1	0	0	0	3	0	0
*Pohnpei and Kosrae, FSM	1	0	0	0	0	1	0	0	0	0	0	1	0	0
*Samoa	2	0	0	0	0	3	0	0	0	0	0	3	0	0
*Solomon Islands	3	0	0	0	0	3	0	0	0	0	0	3	0	0
*Tokelau	1	0	0	0	0	0	0	0	0	0	0	0	0	0
*Tonga	3	1	0	1	1	1	1	0	0	0	0	2	0	0
*Tuvalu	2	0	0	0	1	0	2	0	0	0	0	2	0	0
*Vanuatu	2	1	0	1	0	0	0	2	0	0	0	2	0	0
*Yap, FSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**30**	**3**	**0**	**3**	**7**	**13**	**3**	**5**	**2**	**0**	**1**	**23**	**0**	**1**

Low Rate Information Transmission (LRIT) System

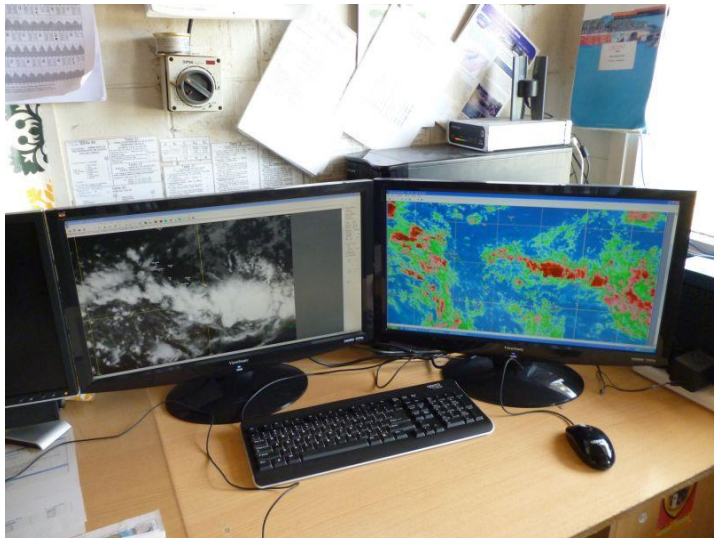
LRIT System

Technical Specifications

- Provide digital data, via a broadcast service, through its GOES East and GOES West geostationary satellites from the GOES N-P Series.
- Disseminate GOES data, GOES Data Collection System (DCS), the EMWIN and other meteorological products to users using the 1691.0 Megahertz GOES L band down-link frequency.

Functional Specifications

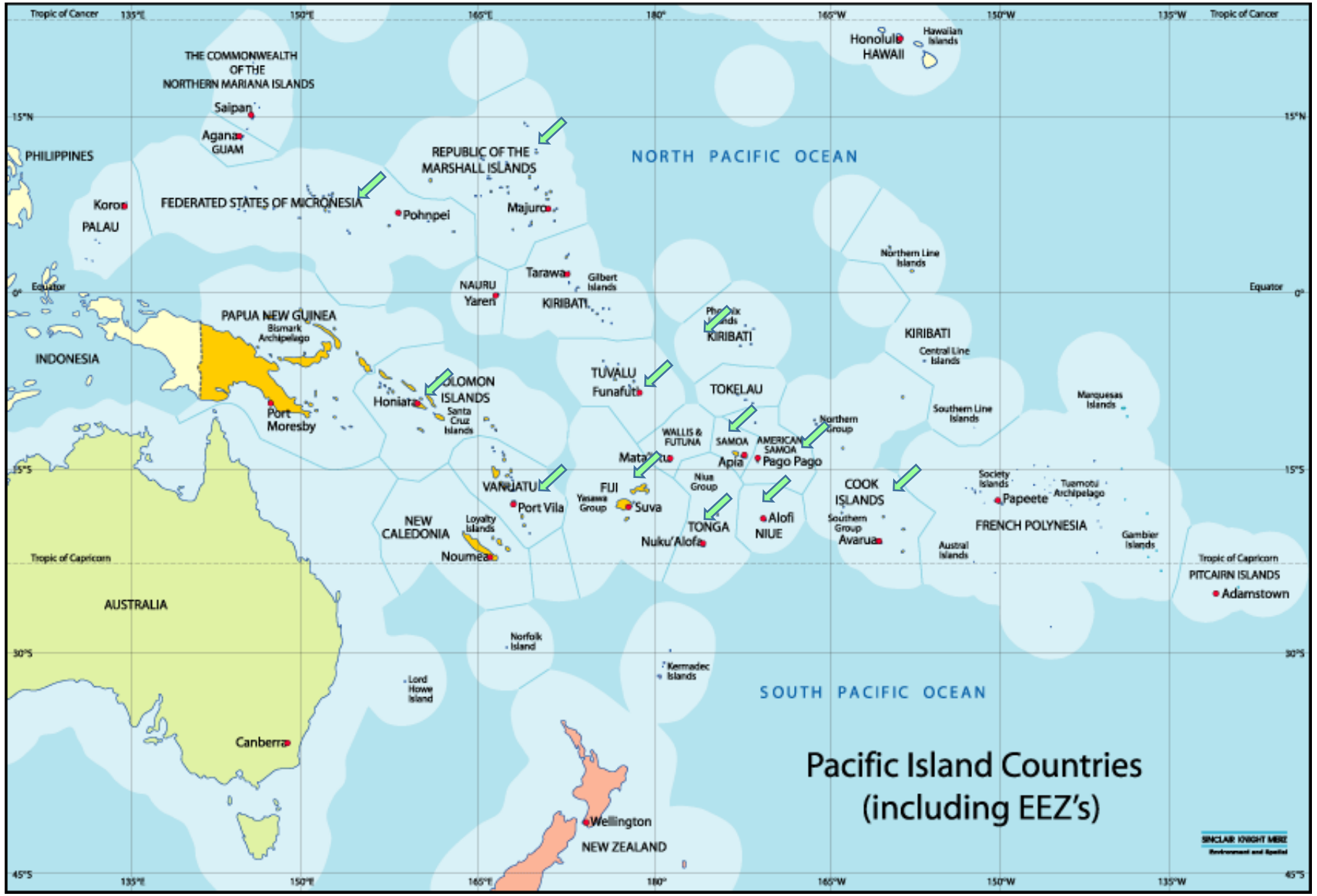
- LRIT 128 Kbps
- Earth Coverage to 5^{0}
- GOES-15 Imagery (IR,VIS,WV)
- Himawari Imagery
- Full Suite of Current Products
- Copy of DCS observations



LRIT Workstation Installed in Tuvalu

Cook Islands EMWIN & LRIT Systems

LRIT System (Total Deployed: 12)



List of Sites:

- Am. Samoa (1)
- Cook Islands (1)
- Fiji (1)
- Kiribati (1)
- Marshall Islands (1)
- Niue (1)
- Pohnpei (1)
- Samoa (1)
- Solomon Islands (1)
- Tonga (1)
- Tuvalu (1)
- Vanuatu (1)

LRIT	Issued	New Requests	Order Complete	Order Remaining	Installed/ Operational	Unserviceable/ Unknown	Antenna/ Transceiver	Mode Receiver	Adapter	PC Broken	TOTAL Defective	To Be Installed / Spare	Needs to be Upgraded
*American Samoa	1	0	0	0	0	1	0	0	0	0	1	0	0
Chuuk, FSM	0	0	0	0	0	0	0	0	0	0	0	0	0
CNMI	0	0	0	0	0	0	0	0	0	0	0	0	0
*Cook Islands	1	0	0	0	0	0	0	0	0	1	1	0	0
*Fiji	1	0	0	0	0	1	0	0	0	0	1	0	0
French Polynesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Guam	0	0	0	0	0	0	0	0	0	0	0	0	0
*Kiribati	1	0	0	0	0	1	0	0	0	0	1	0	0
Marshall Islands	1	0	0	0	1	0	0	0	0	0	0	0	0
Nauru	0	0	0	0	0	0	0	0	0	0	0	0	0
New Caledonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Niue	1	0	0	0	1	0	0	0	0	0	0	0	0
Palau	0	0	0	0	0	0	0	0	0	0	0	0	0
Papua New Guinea	0	0	0	0	0	0	0	0	0	0	0	0	0
*Pohnpei and Kosrae, FSM	1	0	0	0	0	0	0	0	0	0	0	0	1
Samoa	1	0	0	0	0	1	0	0	0	0	1	0	0
*Solomon Islands	1	0	0	0	0	1	0	0	0	0	1	0	0
Tokelau	0	0	0	0	0	0	0	0	0	0	0	0	0
*Tonga	1	0	0	0	0	1	0	0	0	0	1	0	0
*Tuvalu	1	0	0	0	0	0	0	0	0	1	1	0	0
*Vanuatu	1	0	0	0	0	1	0	0	0	0	1	0	0
*Yap, FSM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**12**	**0**	**0**	**0**	**2**	**7**	**0**	**0**	**0**	**2**	**9**	**0**	**1**

Transition from LRIT and EMWIN to HRIT/EMWIN

	LRIT / EMWIN On GOES –N Series	HRIT/EMWIN On GOES-R Series
Full Disk, NH, SH images	3 Hourly Full Disk; .5 hour NH/SH; follows GOES East/West Schedule. RSO issue	Variable but planned 3 Channels of Full Disk every 15 minutes
Modulation	LRIT BPSK EMWIN offset QPSK	BPSK
Receiver Center Frequency	LRIT 1691.0 MHz (L-Band) EMWIN 1692.7 MHz (L-Band)	1694.1 MHz (L-Band)
Data Rate	LRIT 128 Kbps EMWIN 19.2 Kbps	400 Kbps
Antenna Coverage	Earth Coverage to 5^0	Earth Coverage to 5^0
Imagery Data Sources	GOES-N Imager (IR,VIS,WV) MTSAT Imager	ABI (3 or more bands) HBI (3 bands hourly-GOES W
EMWIN Products	Full Suite of Current Products	Combined w/ LRIT Products
GOES DCS	Copy of DCS observations	Copy of observations

NOTES: GOES-R: HRIT = High Rate Information Transmission ~ 400 kbps (combined transmission rate)
GOES-N: LRIT = Low Rate Information Transmission ~ 128 kbps

Transitioning HRIT/EMWIN from GOES-N to GOES-R

Improved data products for hemispheric retransmission

- Faster full disk images: between 15 and 30 minutes
- Warnings, Watches, Tropical Storm Information
- Copy of GOES Data Collection System (GOES DCS)

Requires new antenna and receiver hardware

- Receiver frequency shift to 1694.1 MHz from:
- EMWIN 1692.7 MHz and LRIT 1691.0
- BPSK Modulation; EMWIN shift from Offset QPSK
- Data Rate to a combined 400 Kilobits per Second from: EMWIN: 19.2 Kbps and LRIT : 128 Kbps (combined 147.2)

HRIT/EMWIN Downlink Characteristics

Coding – BPSK

- Convolutional rate ½ code with constraint length 7 concatenated with Reed Solomon (255,223) with Interleave = 4
- Square Root Raised Cosine filtering using an Alpha factor of 0.3
- The resulting “Necessary Bandwidth” for this signal will be 1.205 MHz

Modem Required: predicted C/No is in the range of 63-67 dB

Maximum Demodulator Required is -

- Eb/No is 4.6 dB for a BER of $1x10^{-8}$ after decoding

Minimum Antenna System

- At 5 degree elevation, the minimum antenna is 1.2 meter.
- At 10 degrees or more elevation the minimum size is 1.0 meter
- Using a LNA or LNB with a system noise temperature of about 200 K will provide a G/T of 1.0 dB/K or -0.3 dB/K respectively

HRIT/EMWIN Summary

- HRIT/EMWIN will provide at least 3 channels of GOES-N and / or GOES-R imagery along with warnings, watches and forecast products along with a copy of the GOES-DCS (Data Collection System) observations

- New data rate, center frequency and modulation (EMWIN Users)

- Ground receive stations are Commercial Off-The-Shelf utilizing a 1 – 1.2 meter antenna

- Documents and updates to be posted on the GOES-R web site:
  - http://www.goes-r.gov/
  - http://www.goes-r.gov/users/hrit.html

HF Radio/Email

HF Radio/Email

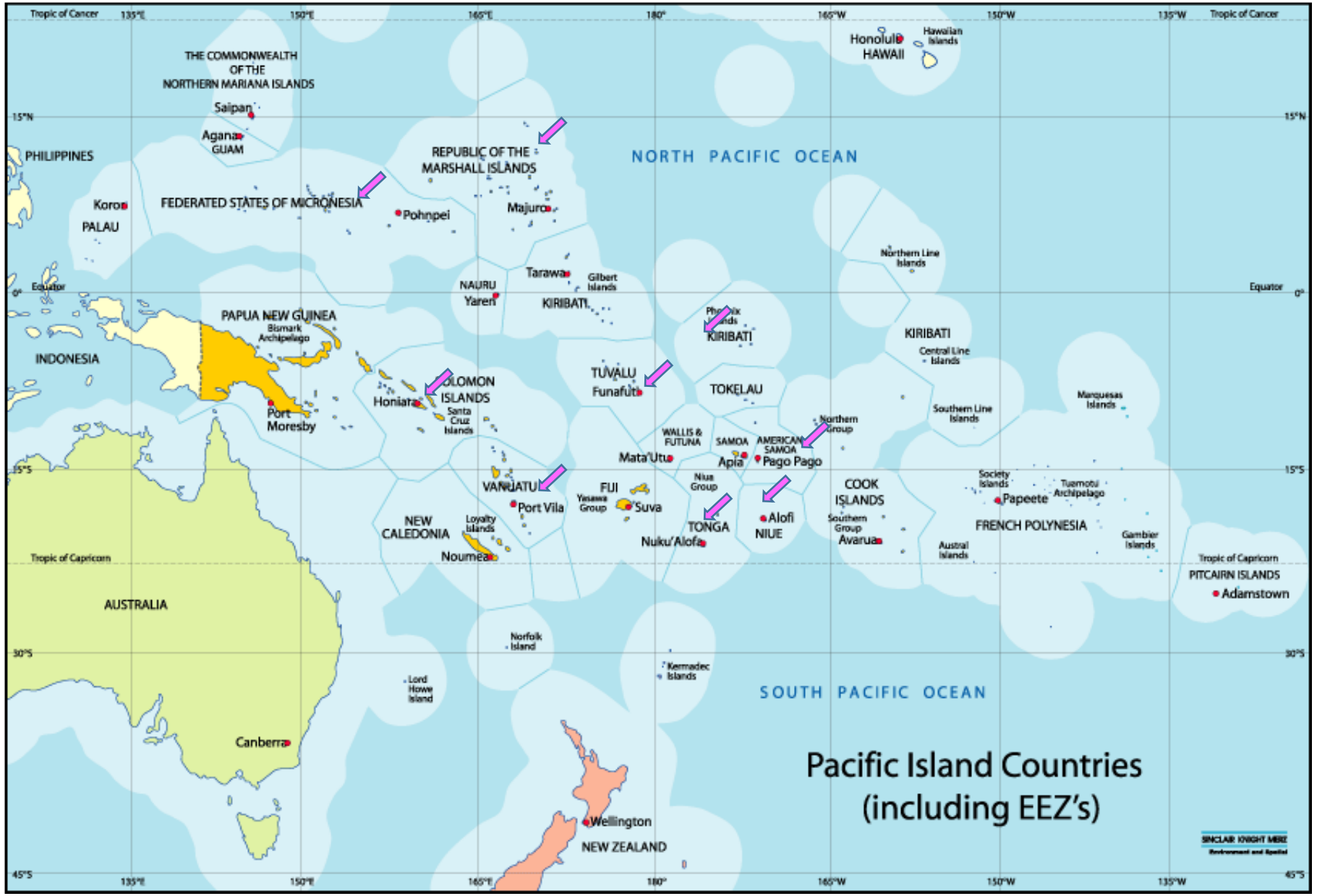
Technical Specifications

- 2-way radio for transmission of hazard warning messages (radio and email)
- Capable of communicating over 3000km

Functional Specifications

- Email received and sent via HF Radio transceiver
- Requires a special radio modem
- Modem interfaces to PC or laptop
- Software can interface with many application (e.

HF Radio/Email (Total Deployed: 176)



List of Sites:

- Am. Samoa (1)
- FSM (134)
- Kiribati (5)
- Marshall Islands (9)
- Niue (1)
- Solomon Islands (1)
- Tonga (10)
- Tuvalu (1)
- Vanuatu (8)

HF/VHF Radios	# Pre Survey	RANET Requested	Received	Remaining	Installed/ Operational	Battery/ Power	Antenna/ Transmission	Physical Device	TOTAL DEFECTIVE	To Be Installed / Spare	Lost/ Misplaced
American Samoa	1	0	0	0	1	0	0	0	0	0	0
FSM	134	7	0	7	131	0	0	0	2	1	0
CNMI	0	0	0	0	0	0	0	0	0	0	0
Cook Islands	0	0	0	0	0	0	0	0	0	0	0
Fiji	0	0	0	0	0	0	0	0	0	0	0
French Polynesia	0	0	0	0	0	0	0	0	0	0	0
Guam	0	0	0	0	0	0	0	0	0	0	0
Kiribati	5	0	0	0	1	0	2	2	4	0	0
Marshall Islands	9	0	0	0	8	0	1	0	1	0	0
Nauru	0	0	0	0	0	0	0	0	0	0	0
New Caledonia	0	0	0	0	0	0	0	0	0	0	0
Niue	1	0	0	0	1	0	0	0	0	0	0
Palau	0	0	0	0	0	0	0	0	0	0	0
Papua New Guinea	0	0	0	0	0	0	0	0	0	0	0
Samoa	0	0	0	0	0	0	0	0	0	0	0
Solomon Islands	7	6	0	6	1	0	0	6	6	0	0
*Tokelau	0	5	0	5	0	0	0	0	0	0	0
**Tonga	10	0	0	0	10	0	0	0	0	0	0
Tuvalu	1	0	0	0	1	0	0	0	0	0	0
Vanuatu	8	0	0	0	8	0	0	0	0	0	0
Yap, FSM	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**176**	**18**	**0**	**18**	**162**	0	3	8	**13**	**1**	**0**

HF Radio/Email

Recommendations

- It would be counterproductive to resurrect the existing RANET SW Pacific HF Email network
- The technology is 20 years old, not user friendly
- Two (2) vendors, Codan and Barrett produce HF Radio Transceivers
- Colin Schulz chose the Barret HF systems for the Tuvalu UNDP MAPA Project. This would allow building a new south Pacific HF digital network easier, and goes beyond serving Met Services.
- Fiji Met Service has informally expressed interest in being a regional host. Need to follow-up
- Bruce Best is submitting what is needed to sustain the HF digital e-mail network in the north Pacific (Micronesian) islands.

HimawariCast

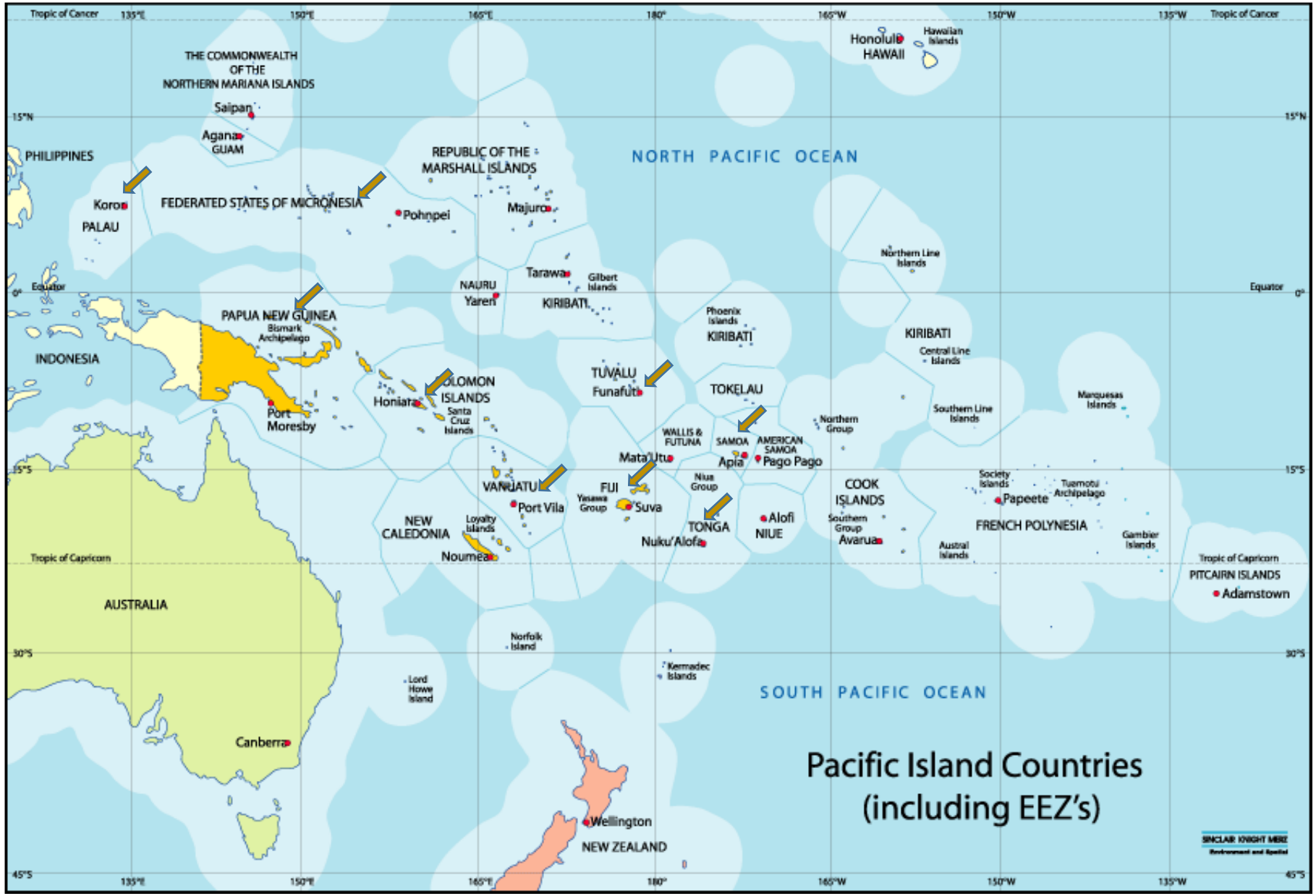
HimawariCast

Technical Specifications

- 140 degrees east, observing East Asia and Western Pacific
- Baseline for Imagery Dissemination in cloud products, atmospheric motion vectors/clear sky radiances and aerosol/volcanic ash
- 14 bans (1 VIS and 13 IR) every 10 minutes for Full Disk
- Spatial Resolution same as MTSAT HRIT compatible
  - 1km →0.5km for a VIS band
  - 4km → 2km for IR bands
- Temporal
  - 1 hr → 10 min for “full disk” / 2.5min for limited areas
- Processed into sectored images in JPEG
- Maximum File Size 15MB
- Real-time basis with animation in the last 24

HimawariCast installed at Papua New Guinea National Weather Service

HimawariCast (Total Deployed: 9)



List of Sites:

- Chuuk (1)
- Fiji (1)
- Palau (1)
- Papua New Guinea (1)
- Solomon Islands (1)
- Samoa (1)
- Tonga (1)
- Tuvalu (1)
- Vanuatu (1)

HIMAWARI	Non-RANET Issued	Requests	Received	Remaining	Installed/ Operational	TOTAL DEFECTIVE
American Samoa	0	0	0	0	0	0
Chuuk, FSM	1	0	0	0	0	1
CNMI	0	0	0	0	0	0
Cook Islands	0	0	0	0	0	0
Fiji	1	0	0	0	1	0
French Polynesia	0	0	0	0	0	0
Guam	0	0	0	0	0	0
Kiribati	0	0	0	0	0	0
Marshall Islands	0	0	0	0	0	0
Nauru	0	0	0	0	0	0
New Caledonia	0	0	0	0	0	0
Niue	0	0	0	0	0	0
Palau	1	0	0	0	1	0
Papua New Guinea	1	0	0	0	1	0
Pohnpei and Kosrae, FSM	0	0	0	0	0	0
Samoa	1	0	0	0	1	0
Solomon Islands	1	0	0	0	1	0
Tokelau	0	0	0	0	0	0
Tonga	1	0	0	0	1	0
Tuvalu	1	0	0	0	1	0
Vanuatu	1	0	0	0	1	0
Yap, FSM	0	0	0	0	0	0
TOTAL	**9**	**0**	**0**	**0**	**8**	**1**

RANET Long and Short Term Summary

- In early June 2017, the U.S., WMO RA-V and SPREP representatives met to develop a plan to move forward on repairing and updating the communication and early warning systems by the U.S sponsors in the Pacific. The long-term goal for this program is transition of the management and support to a WMO designated sponsor nation within WMO Region V (South-west Pacific) or a Voluntary Cooperation Program Donor Nation for WMO Region V.

- A notification letter will be sent from NOAA to the UNESCO/IOC Tsunami Unit, regarding the re-establishment of the Tsunami SMS Alert Watcher Pilot Project, and providing instructions to authorized PTWC National Tsunami officials on how to subscribe to this service.

- It was decided that the Chatty Beetle, AlertWatcher, UHF/VHF Internet and Voice will continue to be supported. It was also decided that the EMWIN, LRIT and GEONETCAST systems in the Pacific will be replaced with a HimawariCast Receiving Station that can receive satellite imagery from both the HimawariCast and GOES-S broadcasts.

Recommendation

1. The Meeting is invited to:

- **Note:** The considerable effort undertaken to upgrade the backbone infrastructure that supports RANET systems, and contribution provided by COMET/UCAR/NOAA to help establish the SPREP PICI Panel and support its ability to meet.
- **Note:** The completion of the RANET Pacific Systems Inventory and the valuable role these systems play as a backup communications and dissemination tool to obtain meteorological data.
- **Request:** To be kept updated on NOAA's plans to launch a new Geostationary satellite in 2018
- **Endorse**.....The establishment of an adhoc RANET Requirements Group to help develop a transition strategy of RANET systems to within the Pacific region (WMO RA V).

•