

ARM Tropical Western Pacific (TWP) Operations Management and Support: Securing ARM Data

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Introduction

The Tropical Western Pacific Office (TWPO)^(a) has been tasked with providing operational management and support for three^(b) climate station instrument facilities in the Tropical Western Pacific (TWP) locale. The TWPO has the distinctive purview in ensuring data availability from two remote Pacific Islands and Australia to support the continued national and international scientific collaboration that exemplifies the Atmospheric Radiation Measurement (ARM) Program. Data from the international sites have been made available through the utilization of bilateral partnerships with host countries, multi-cultural managerial methodologies, and the ability to overcome systemic and spontaneous challenges that are often endemic to the Pacific region. This paper attempts to draw attention to some of the unique challenges faced by the TWPO team and the techniques used in maintaining operations at these facilities and may assist in providing insight into the ongoing commitment and coordination to “secure ARM data.”

Challenges

Maintaining the operation of high order technological equipment to an acceptable quality standard and with minimal downtime is often a very complex and challenging task. This is exacerbated by the immense distances and unique infrastructure problems that remote Pacific island countries deal with daily. Reliable support and service are often taken for granted in the modern and well-equipped workplace; however, the TWPO is required to manage procedures normally considered routine, with additional diligence and attention. The TWPO has evolved its management methodologies to reflect the requirement for a flexible and often very patient approach while working within the confines of the

(a) Located at the Los Alamos National Laboratory.

(b) There is an additional temporary instrument site in Nauru to provide detailed analysis of the “Island Effect.” Refer paper by W. Porch, Los Alamos National Laboratory.

U.S. Department of Energy (DOE) policy and procedures. The TWPO has found this in itself a challenging undertaking.

Collaborative Partnerships

All three TWP Atmospheric Radiation and Cloud Stations (ARCS) are operated by indigenous staff. In Papua New Guinea (PNG), ARCS operations are performed by PNG National Weather Service (NWS) staff and in Nauru by contracted staff under the administration of the Nauru Department of Economic Development (DED). Contracts between Los Alamos National Laboratory (LANL) and the host countries sanction the operation of the stations and the day-to-day operation of ARM ARCS equipment. The support provided to the host countries through the contracts also provides additional benefits (e.g., by providing staff training and technical support, the ARM Program provides indirect assistance and opportunities for NWS development [see Figure 1.]



Figure 1. Papua New Guinea NWS Staff assist the Australian Bureau of Meteorology (BOM) maintenance team with surface meteorological instrumentation maintenance.

To aid the facilitation of the contracts and to provide advice on regional issues, assistance is obtained through the South Pacific Regional Environment Programme (SPREP). SPREP is a Pacific Region intergovernmental organization constituting 25 Pacific Island members including those of the United States, Australia, PNG, and Nauru. A project coordinator is available to assist the TWPO with any issue that necessitates the requirement for regional influence and Pacific Island awareness.

The Australian Bureau of Meteorology (BOM) assists the TWPO by executing the TWP maintenance contract and by providing a home for the third TWP ARCS in Darwin. The three technical officers provide professional maintenance support for the Nauru and Manus Island sites, and with their proximity to Nauru and PNG, it affords a timely response to urgent fault repairs. Under the direction of TWPO LANL staff, the Australian BOM collaborates with instrument mentors and other operational staff to enable in most instances, the repair of minor faults via telecommunications. However, when spare parts require replacement or recalibration, detailed maintenance planning and scheduling are required to minimize downtime and to make effective the expensive and time-consuming visits to the remote sites.

The effort required of the TWPO to manage the coordination of agencies, organizations and collaborative partnerships are demanding and complex.

Infrastructure

Of prime importance is the requirement for reliable and well-serviced infrastructure. While in most instances, the ARCS are located with this in mind, a situation exists where qualitative and quantitative infrastructure is often in a state of flux and requires considerable energy and expense to mitigate any detrimental effect on the ARM operations.

Both domestic and international transportation (sea, air, and land) are often unreliable, irregular, and prone to disruptions that can last for weeks. This is perhaps the most difficult deficiency to address, as there are very few alternatives to utilizing available transportation services. To assist in alleviating the unforeseeable and detailed nature of customs and shipping, logistical support for consumables, spare parts and equipment changeovers are handled through ARM TWP logistics specialists and with in-country coordination assisted by contracted shipping agents (see Figures 2 and 3).

Land-based telecommunications has been proven to be unreliable and incapable of handling the quantity of data transferred from the ARCS. Both voice and data telecommunications problems have primarily been resolved with the procurement and installation of ARM's very small aperture terminal (VSAT) and Intelsat satellite communication systems. In some instances the ARM telecommunications network is the only working form of international telecommunications in the country. It has been necessary to introduce tight controls on phone availability to alleviate potential abuse by a multitude of users external to the ARM Program.

All ARCS are equipped with an emergency power generation unit that sees a more than originally anticipated usage rate. Unreliable power has necessitated the use of the generator sets and the provision of associated consumables such as distillate to such an extent that the sites are now equipped with enough fuel to support continuous generated power for a period of up to three weeks.



Figure 2. Manus Island Shipping Agent, Mr. Dick Pearse, at work in his office in Lorengau.

TWP SHIPPING FORM							
Ship To: INTERCONEX		Final Destination: SGP		Date: 2/17/2003			
Contact: Mae Chu		Contact: George Sawyer					
Company: INTERCONEX		Company:					
Address: INTERCONEX, INC. 17120 VALLEY VIEW AVENUE LA MIRADA, CA 90638-5828 USA		Address: ARM SGP 309600 EW 28 BILLINGS, OK 74630-2045 USA					
Phone: 1-800-522-6639 OR 562-921-0939		Phone: 580-388-4053					
From: NAURU (ARCS-2)				Dimensions (Inches): (L x W x H)			
Name: ARCS-2 Nauru Observer		Box 1 of 1 Weight: ? lbs.		?			
Address: ARM, TROPICAL WESTERN PACIFIC CLIMATE RESEARCH STATION 1000 OCEAN DRIVE REPUBLIC OF NAURU, CENTRAL PACIFIC		If receiving this shipment, please enter information in the 3 fields below					
		Name		Date		How Many Boxes Rec'd.	
		Mode of Shipment: DHL					
		Waybill No: 3450384696		Total Shipment Value \$:			
Phone: 674-444-3276							
System	ECCN NO.	QTY.	DESCRIPTION (if HD incl. Color and Letter)	MFG. NAME	M/N	S/N	Value
UVB	EAR99	1	UVB	Solar Light Company	501A V3	4433	4250USD
UVB	EAR99	1	UVB	Solar Light Company	501A V3	2867	4250USD
CEIL	EAR99	1	Compensation Fiber Cable	Vaisala	CT25015	NA	215USD
SMET	EAR99	1	TRH Sensor	Vaisala	HMP45D	W4630001	1000USD
MPL	EAR99	Misc	MPL Cables	?	?	NA	100USD
MPL	EAR99	1	MPL Controller	Spectra Physics	?	?	500USD
ACCESS	EAR99	1	Power Track Block	GE Fanuc	?	16391823	2400USD

Figure 3. The TWP shipping form.

Management Tools and Reporting Mechanisms

The successful operation of equipment in the remote Pacific is a collaborative effort of many parties. From Figure 4, it can be seen that interagency coordination is complex and requires tailored reporting, monitoring, and management mechanisms to ensure effective interaction and communication across the different sectors. Detailed documented procedures have been implemented to help ensure that up-to-date and historical operational status and tracking information is available to shipping agents, logistics personnel, equipment mentors, scientists, technicians, and operations management. These include:

- Site Health and Status Reports
- BCR – ARM Baseline Change Requests
- ECR - ARM Engineering Change Requests
- TTR – TWP Task Tracking System
- Weekly TWP Telephone Conference
- ARCS Operation and Calibration Manuals
- Personnel Tasking Lists
- Inventory Tracking and Database
- Shipping and Receiving Forms
- Contact Sheets
- System Event Logs
- Site Visit Requests
- Site Visit Reports
- Technical Maintenance Reports
- Observer Daily Rounds Reports
- Consumable Supplies Inventory
- Maintenance Scheduling
- DOE Export/Import Documentation
- USA Customs Documentation
- PNG Customs Documentation
- Nauru Customs Documentation
- Australian Customs Documentation.

Any change in equipment performance is closely monitored as are the procedures to ensure data uniformity and continuity. For instance, any proposed changes or repairs to unserviceable equipment necessitates the adherence to extensive and carefully managed procedures by most, if not all, personnel associated with the operation of the ARCS. There is therefore a need for scientific staff, equipment mentors, and other personnel involved in the ARCS operations, in particular those visiting the sites, to be mindful of the TWPO processes before undertaking any work that may influence operations. These procedures are critical to accurately track remote ARCS activity and to administer the interrelated operational support systems.

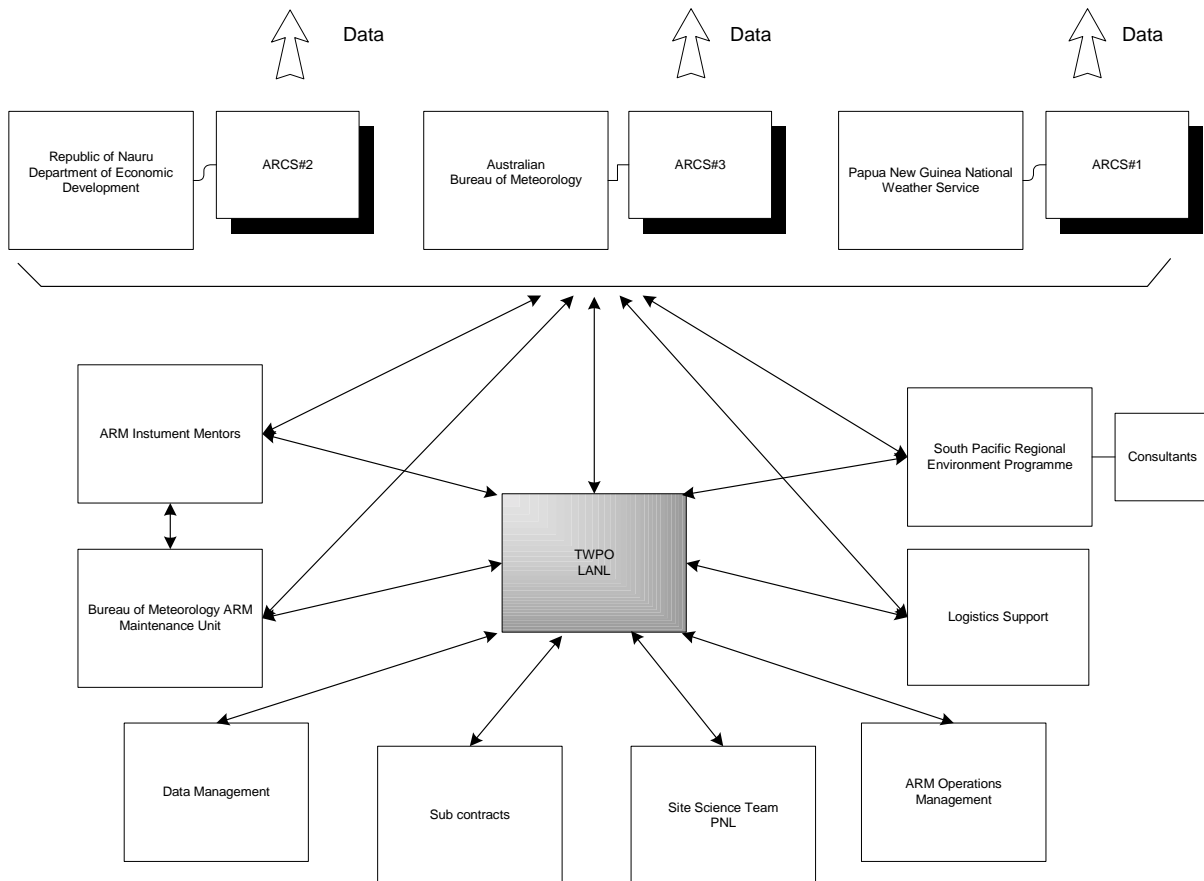


Figure 4. The multipartite approach in support of ARM operations in the TWP.

For additional information on TWPO operational procedures please visit the ARM TWPO Website: <http://www.twppo.lanl.gov>

Cultural and Socioeconomic Relations

The TWP has equipped itself with an assortment of informal management knowledge to assist in working with the cultural, organizational, and economic differences between the ARM TWP and the differing host countries (e.g., a situation managed in one particular way in Nauru may not be acceptable in PNG). Being aware of the cultural differences and sensitivities is an extremely important aspect of TWPO work and one that all TWP staff interacting with the ARCS operational staff and local communities is made well aware of. All Pacific Island sites are located in areas subject to land ownership issues that extend far beyond a singular contract with the recognized statutory owner. In the case of the Nauru Island Effects Site (NIES), permission from some 80 signatories was required before the utilization of a 10 ft x 10 ft block of land. The time required to gain these signatures was stretched even further because some signatures were required from overseas.

The economic disparity between host countries is yet another fact that needs to be taken into consideration. Although often reflected by the standard of available infrastructure, economic inequity often manifests at the personnel level. Although the TWPO makes every attempt to ensure acceptable standards of conditions and service for employees within the confines of the ARCS sites, the TWPO often finds that personnel working under the administration of the host organizations are faced with the reality of immense national economic difficulties. Some Pacific Island personnel are not paid for weeks, sometimes months and staff accommodation is often in need of urgent repair. Banks often cease to operate and using cash is typically the only way to obtain services. Subsequently there is a significant effort required to ensure that whilst working in the confines of DOE regulatory processes, payments can be made to government agencies, services and receipts can be reconciled and appropriate audit paper trails that cross half the globe can be maintained. The finance section of the TWPO, in dealing with a number of international agencies and project contact points, has the difficult task of ensuring that accounting practices are closely monitored to negate any possible creative accounting practices.

The very visible economic disparity between the host countries and the perceived unlimited wealth of the United States often initiates opportunistic dialogue on ARM's ability to provide broader financial support that is strictly not in the purview of the ARM Program. For example; requests range from the purchase of small office equipment for use by local community groups, to the provision of a building to put them in. In the interests of maintaining some form of equitable relations and remembering that we try to work as a team, TWPO management often finds itself in an awkward and challenging position.

If not for the dedication of Pacific Island personnel to the ARM Program, the TWPO would find staff motivation and the subsequent lack of operational continuity a formidable task.

Governmental Policy and Protocol

Two of the three ARCS sites are located in politically sensitive and economically vulnerable countries. The TWPO team is very aware of governmental sensitivities and changes that may occur in policy and governance without prior warning. Subsequently there is a requirement for the TWPO to remain detached, but be well enough attuned to the political environments so as to dispense appropriate protocol when negotiating extensions or modifications to existing contracts and terms of reference. There is a requirement to ensure clear and thorough communication to minimize any misunderstanding, particularly with differing cultural, contractual, and work methodologies.

Personnel Issues and Staff Management

The ARCS are not without their share of personnel issues. The TWPO plays an integral function in providing support for human resource management. The TWPO remains committed in providing staff development including safety and technical training to host organizations. Staff rotations, subsequent retraining, and ongoing personnel advice, although secondary to the operations of the ARCS, are not inconsequential. The TWPO takes the opportunity to discuss with staff, training requirements and personnel issues during Site Evaluation Team (SET) visits (Figure 5). The ARCS operate 24 hours, seven days a week and as such, operational staff is fostered to ensure occupation of the site at all times (Figure 6). Security guards are engaged to provide additional security measures during night shifts.



Figure 5. SET discussion with the Nauru DED staff. From Left to Right: OIC, Nicolas Duburiya; Manager of Projects, Tyrone Deiyee; Observer, Henry Harris; ARM Administration Officer, Andrew Kaierua; Observer, Megan Aliklik; Observer, Franklin Teimitsi; and TWPO Site Manager, Larry Jones.



Figure 6. Site Scientist, Chuck Long (Pacific Northwest National Laboratory), demonstrates maintenance techniques to Nauru observations personnel at the NIES.

Health and Safety

Health and safety is paramount not only for operational ARCS staff but for all those visiting the ARCS sites.

Because of a deficiency of in-country occupational health and safety policy and subsequent education, extensive ESH briefings including electrical and general workplace safety are held with all operational staff during each SET visit by TWPO management. Instructional video presentations and site safety inspections have become routine practice in aiding ESH awareness and implementation.

Considerably different living and working conditions and a greater exposure to potentially dangerous situations necessitate the need for staff traveling to the ARCS to follow a prepared set of guidelines before during and after traveling. Issues such as what to do in case of a motor vehicle accident, where to go for medical assistance, and possible legal implications may be well structured in the United States but are highly variable in Pacific island countries. Malaria, denghi fever, ciguatera poisoning, and crocodile attacks are very much something to be aware of and all staff are encouraged to either use prophylactic medication or undertake preventative measures.

Community Interaction

The ARCS has a significant impact at the community level. The locations of the ARCS are in remote areas where the science and technology of the ARCS installation have raised considerable curiosity and interest by the local communities. A function of the ARM TWP is to assist in providing the local community with information relating to the ARM Program and in conjunction with the ARM Education Unit and their work with the ARM Education Outreach Program, disseminate information and course/curriculum guidelines to local schools and teachers. The ARM Education Outreach Program that operates separately from the TWPO, sponsors teacher workshops in both Manus and PNG (Figure 7).

The ARM Program provides the community with wider reaching benefits. There are opportunities for employment through subcontracts including civil works contracts, fuel supply contracts, car leasing and rentals, and security guard services (Figure 8). This interaction is carefully managed to ensure equability and integrity.

The TWPO is mindful of the importance of fostering good relationships with local government, business, airport, and hotel personnel and with anyone whom ARM interact. The work and the conditions, although challenging at times, have offered ARM personnel a rewarding and accommodating environment in which to work. It is of no surprise that the ARM Program continues to espouse a positive collaboration and partnership between the United States and Pacific island countries.



Figure 7. Larry Jones, TWPO Site Manager, discusses school exchange activities between Manus and New Mexico elementary schools with the principal and teaching staff of the Los Negros Island School, Naringal.



Figure 8. Manus Island electrical contractor attends to a faulty air conditioning unit.

Summary

Over the years, the TWPO has recognized that there are a number of issues that require close attention to ensure the successful continued operations of the ARCS at remote locations. The most important of these include the following requirements:

- reliable and effective communications
- contribution of dedicated personnel
- flexible and patient management approach
- long lead planning.

Reliable and frequent communications between the operational staff and the TWPO is essential in ensuring operational continuity. Daily feedback and status reporting either via phone, fax, email, and mail from operational staff provide the TWPO with a means of forecasting any potential disruption to data availability. The dedication of operational staff in the ARM Program and the ability of staff to adapt to highly variable conditions provide the backbone for the TWPO.

Given Pacific Island circumstances, a flexible and adaptive approach in all aspects of management has facilitated the high availability of quality data derived from the TWP locale. The TWPO is committed to ensure that the operations of the ARCS remain reliable and that the data made available continue to contribute to the overall ARM Program goals.

The overall management of the ARCS sites in the TWP requires a unique approach. The need for long term planning is essential as is the ability to remain flexible enough to accommodate the idiosyncrasies that make working in the pacific region challenging and subsequently rewarding. We take pleasure in securing ARM data.