

**ARM Program Climate Research Facility (ACRF)
Tropical Western Pacific (TWP)**

Safety Plan

– Manus Facility –

Manus Island
Papua New Guinea

PRO(ESH)-003.010

May 2007

Tropical Western Pacific/ARM Mobile Facility Management Office (TWP/AMF-MO)
Los Alamos National Laboratory

www.twppo.lanl.gov

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Tropical Western Pacific (TWP) Safety Plan

– Manus Facility (ARCS-1) –

*Manus
Papua New Guinea*

I. Purpose:

This document describes the hazards and their mitigations associated with the operation of the TWP ARCS-1 Facility on Manus Island, Papua New Guinea.

II. Background:

The U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Program relies on climate research facilities to measure surface components of solar and terrestrial radiation, surface meteorology, cloud properties, and other atmospheric quantities in various locations throughout the world, which include the U.S. Southern Great Plains (SGP), the Tropical Western Pacific (TWP), and the North Slope of Alaska (NSA).

The operation of the TWP facility is the responsibility of the Tropical Western Pacific/ARM Mobile Facility Management Office (TWP/AMF-MO) at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

TWP/AMF-MO operates the TWP facility in collaboration with a host organization or government.

III. ES&H Policy:

Individuals working at or visiting the TWP facility on official ARM business, a specific Intensive Operational Period (IOP), or just for a casual visit, must notify TWP/AMF-MO of travel plans well in advance of departure and in sufficient time to comply with the following policies:

- All personnel who are at the TWP facility are required to act and work safely and not to jeopardize their own safety or that of others at the site.

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- All personnel who are at the TWP facility must perform work in such a manner that they do not jeopardize its operation.
- All visitors must read the Safety Plan and agree to comply with its recommendations and guidelines as per their specific authorization, and sign the visitor sheet acknowledging their personnel authorization and the work restrictions and precautions associated with that authorization.
- All visitors to the TWP facility from outside the host country should participate in a LANL-led ES&H briefing well before departing for the host country.
- All visitors to the site must also follow all applicable local regulations and codes. In general, new construction shall follow U.S. regulations, unless local regulations are more stringent.
- All visitors must submit an official ACRF Site Access Request (SAR) online at <http://www.db.arm.gov/SARS2/> and cannot go to the facility until they receive an approval.

IV. Scope and Document Ownership:

- This procedure applies to activities relating to TWP shelters and associated components within the TWP facility only. It does not cover work performed off site that is the responsibility of others. No work is authorized by LANL off the TWP facility unless specified in writing. If off-site work is proposed and funded by DOE, it should follow the *ARM Safety Policy* online at http://www.arm.gov/acrf/safety_policy.stm and the *DOE Integrated Safety Management* online at <http://www.eh.doe.gov/ism/diagram.html>.
- This document covers activities that normally occur in light electro-mechanical laboratories and activities common to mobile electro-optic laboratories with no chemical or wet-lab facilities.
- This procedure is to be implemented as of the date of publication, and continue in effect until superseded by a revision.
- The requirements of this document apply to all LANL employees, all U.S. subcontractors of LANL, and employees of collaborating U.S. organizations who visit the TWP facility. In addition, non-U.S. contractors, governments, and other organizations must follow the requirements outlined in this document.

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V. Procedure:

A. Emergency Contacts

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| Ambulance | 470-9055 |
| Police | 470-9193 |
| Fire | No fire department |
| Manus Provincial Government | 470-9062, 9088 |
| Maintenance Trouble Calls, PNG NWS | 470-9194 |
| Minor hazardous Material Spills | (1) 505-667-1186 |
| LANL ES&H Hotline | (1) 505-665-5010 |
| Mr. Larry Jones or Mr. Kim Nitschke | Phone: (1) 505-667-1186 |
| TWP/AMF Management office at LANL (24hour answering service) E-mail: ljones@lanl.gov | |

B. General Guidelines

1. On-Site ES&H:
 - All visitors report to the Officer-In-Charge (OIC) before beginning work each day.
 - All visitors to TWP facility who plan to perform work must read this document and sign in to acknowledge that they have reviewed and understood its contents. **Review the Hazard Control Matrix in section C that addresses types of site activity.**
 - All visitors shall also comply with all applicable rules and regulations established by the host organization.
2. Work on the facility shall comply not only with regulations outlined in this document but also with those of the host organization covered under any host permits.
3. All work performed at the facility must be approved by TWP/AMF-MO.

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4. If you feel uncomfortable with the safety of any work you are asked to perform, **do not do it**; instead, contact the TWP/AMF-MO at (505) 667-1186.
5. ES&H Incidents:
 - Any team member or visitor to the TWP facility can recommend or order a work stoppage for ES&H concerns without reprisal. Work will not recommence until the incident is resolved.
 - Any team member who does not adhere to the ES&H guidelines outlined in this document will be asked to leave the site.
6. Awareness of Consequences:
 - Know hazards involved and safety equipment required to mitigate those hazards.
 - Identify potential waste and disposal methods to be followed.
 - Read operating manuals for test equipment or tools before using these devices. Observe manufacturer's safety recommendations.
 - Read the Material Safety Data Sheet (MSDS) for any chemical that may be used.
 - Personnel shall:
 - ⇒ Plan the work.
 - ⇒ Analyze the hazards.
 - ⇒ Develop and implement controls to mitigate the hazards.
 - ⇒ Perform the work safely after you have confirmed your readiness to do so.
 - ⇒ Identify improvements to further enhance the safety of the operation.
7. Follow the "Two-Man Rule" – Visitors are not allowed to work alone at the site.
8. Visitors are responsible for cleaning up areas they use.

C. Work Authorization, Personnel Limitations, and Hazard Control

Personnel authorization categories:

- All Personnel
- Casual visitors (anyone who visits without working)
- Temporary unskilled labor (LANL employees or personnel contracted by LANL)
- Local Observers (contracted by LANL)
- Australian Bureau of Meteorology (BOM) technicians (contracted by LANL)
- ARM system expert (contracted by LANL)
- Local service provider specialists (contracted by LANL or BOM)

Hazard Control Matrix:

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
|--------------------------------------|---|---|
| General Hazards | | |
| Emergency – injury, fire | <ul style="list-style-type: none"> ▪ Do not work alone on site. ▪ During routine operations when only one ARM person is on site, that person must instruct a local “buddy” to notify emergency contacts should emergency situation occur. ▪ First-aid kit and AED in E-Van. ▪ Emergency contacts inside E-Van door. ▪ Iridium phone in E-Van for on and off site. ▪ Fire extinguishers in each van. ▪ Emergency power shutoff in each van for electrical fires. ▪ Know signs of heat stroke – see ES&H briefing. ▪ ARM visitors to the site participate in a TWP/AMF-led Safety Briefing before departing their home countries for the site. | All personnel |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
|---------------------------|--|--|
| Casual visit to site | <ul style="list-style-type: none"> ▪ Escort by permanent on-site personnel. ▪ Visitors may be asked to clear any area during the movement of equipment or other operations. | All personnel |
| Lifting, dropping | <ul style="list-style-type: none"> ▪ Lifting of more than 50 lbs. per person prohibited. ▪ No open-toe shoes – slipover toe and metatarsal caps are available on site when a potential for a foot injury exists. ▪ Dollies are available for transporting heavy items. ▪ Work gloves are available. | All personnel |
| Tripping, falling | <ul style="list-style-type: none"> ▪ Flagging for guy wires and other exposed projections. ▪ Use of ladders above 6 feet prohibited. ▪ Use stairs accessing areas above 6 feet. ▪ Access to instrument stand platforms and atop transportainers with railings only. ▪ Cable covers are used for most cables, but during installation watch for cables running along ground. | All personnel |
| Electrical Hazards | | |
| Minor electrical work | <ul style="list-style-type: none"> ▪ Use Ground-Fault Interrupting (GFI) breakers for all extension cords, especially those placed outside. ▪ All electrical equipment should have a UL label, or another recognized testing laboratory to UL. ▪ Use UL-approved, three-wire electrical extension cords for short duration, temporary connections only. ▪ Extension cords may not be used in series. ▪ Extension cord shall be protected to avoid damage from sharp edges and routed so as not to create tripping hazards. ▪ Extension cords should be orange or yellow in color for high visibility. | All personnel except casual visitors |

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| <p>Work & associated hazards</p> | <p>Work controls, tools</p> | <p>Personnel exposed to hazard or authorized for indicated work</p> |
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| <p>Equipment installation using outlets</p> | <ul style="list-style-type: none"> ▪ Reset breakers. | <p>BOM technicians & ARM system expert & Local service provider specialists</p> |
| <p>Electrical work on DC systems</p> | | <p>All personnel <u>except</u> casual visitors & temporary labor</p> |
| <p>Electrical work on AC systems, wiring, transformers, UPS systems, power panels</p> | <ul style="list-style-type: none"> ▪ Work on 220 VAC, 3-phase or 110 VAC, 1-phase exposed connectors by trained personnel only. ▪ Only certified electricians are authorized to work on 220 VAC or 110 VAC systems. ▪ Only qualified electricians are allowed to open AC distribution, control cabinets, or enclosures when power is applied. ▪ All electrical loads must be disconnected and locked out before connecting or disconnecting the main AC power cables to any enclosure or van. ▪ All energized electrical work, other than diagnostics and testing, shall be performed de-energized whenever possible. TWP/AMF-MO may approve procedures for energized electrical R&D work when the following items have been addressed: <ol style="list-style-type: none"> 1) Potential hazards associated with the task 2) Minimum work clearances required 3) What barricades are required and their placement 4) What personal protective equipment is required 5) Test instruments to be used 6) Proper instructions for safety using test instruments | <p>Local service provider specialists (electrician)</p> |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| | <ul style="list-style-type: none"> 7) Minimum number of workers required to do the task 8) Description of the duties of each worker 9) Sequence of steps which affect safety 10) Lockout/Tagout required for all work on energized systems ▪ All electrical maintenance or repair of electrically powered equipment or electrical supply systems shall be done as follows: <ul style="list-style-type: none"> 1) Maintenance procedures shall not be performed by a lone person where a dangerous or lethal hazard exists. Two knowledgeable persons shall be present, one of whom is clear of the hazard. Whenever possible, troubleshooting of energized equipment should be avoided. 2) Before starting work, de-energize all voltage sources and provide a positive method of ensuring that voltage will stay off. Lockout/tag out procedures must be used. 3) When working on energized equipment, personnel shall work with one hand whenever possible. <u>Note: Use rubber mats or other insulating material that will keep the operator isolated from ground.</u> 4) When using an oscilloscope or other test equipment, probes shall be connected to oscilloscope or other test equipment before being connected to the equipment under test and shall remain connected to the oscilloscope or other test equipment throughout the test. | |

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| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| Electrical work on grid power systems | <ul style="list-style-type: none"> ▪ Only local utility power company technicians are allowed to work on 416 VAC, 3-phase site power supply. | Local service provider specialists (local power company) |
| Hazardous Materials | | |
| Lubricants, cleaning agents, adhesives, and other chemicals | <ul style="list-style-type: none"> ▪ Small amounts of lubricants, cleaning agents, adhesives, and other chemicals will be occasionally required at the TWP facility. In general they should be limited to less than 1 kg each. ▪ Read the Material Safety Data Sheet (MSDS) for any chemical that is to be used. ▪ Chemicals shall be used, stored and disposed of properly. ▪ Battery acid shall be stored in secondary containment pan. | All personnel <u>except</u> casual visitors |
| Fuel | <ul style="list-style-type: none"> ▪ Gasoline (essence) shall not be stored at the site unless in approved safety containers. ▪ Diesel fuel is handled by <u>local suppliers only</u> in most cases. Fuel can be hand-pumped from tank to tank by on-site Observers. | All personnel <u>except</u> casual visitors |
| Soldering operations | <ul style="list-style-type: none"> ▪ Soldering must be performed in designated work areas only. ▪ Soldering equipment shall be turned off at the end of work shifts or when personnel leave the site for times exceeding one hour. ▪ Solder and related equipment shall be stored in labeled drawers or lockers. | BOM technicians & ARM system experts |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| Chemical or oil spills | <ul style="list-style-type: none"> ▪ Contact the local representatives (if listed herein) for major spills; this may include any chemicals, cleaner, solvent, or oil. ▪ Minor spills are to be cleaned using absorbent, disposable towels and then placed in a hazardous waste receptacle. | All personnel except casual visitors |
| Radiant Energy | | |
| MPL and Ceilometer lasers, and MMCR | <ul style="list-style-type: none"> ▪ Ceilometer's laser light is eye safe as installed in a sealed container. ▪ MPL laser is eye safe in normal operating conditions; however, <u>when opened for maintenance, pump diode is Class-4 laser and therefore eye hazard.</u> ▪ MMCR is low energy and not a hazard. | Repair work by system-specific trained BOM technicians & ARM system expert |
| Equipment/Instruments | | |
| Hand tools | <ul style="list-style-type: none"> ▪ Hand tools are to be used as per manufacture's recommendations. ▪ Inspect hand tools for defects before use. Any defective tool shall be removed from service. ▪ Use tools for their designed purpose only. ▪ Wear safety glasses and work gloves (available on site) when using tools. ▪ Always cut away from your body when using sharp tools. | All personnel except casual visitors |
| Power tools, shop equipment, hatches, doors, ports | <ul style="list-style-type: none"> ▪ Inspect portable electric tools prior to use. With the exception of double-insulated tools, all portable electrical tools requiring 60-Hz power shall be equipped with three conductor cables and grounded plugs. ▪ Any tool with frayed cords, exposed wiring, missing ground plugs, etc., shall be removed from service. ▪ Keep body parts away from cutting parts of power tools. | BOM technicians & ARM system experts |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| | <ul style="list-style-type: none"> ▪ Electrical equipment and tools used at the TWP facility shall have UL approval ratings where possible. ▪ Electric heaters and fans shall have UL approval ratings. ▪ Equipment owned and furnished by other organizations (non-LANL/PNNL) and agencies shall be provided with appropriate safe operating procedures. These procedures must be observed by all personnel working at or visiting the TWP facility. ▪ Operate all equipment as per site procedures and manufacturer's recommendations. ▪ Lockout/Tagout: Any equipment tagged with a "Lockout/Tagout" indicator may not be operated. | |
| Large or heavy equipment, air conditioning units | <ul style="list-style-type: none"> ▪ Follow all electrical controls listed. | BOM technicians & Local service provider specialists |
| Cranes, hoist, slings, rigging, and forklift operations for moving the vans and their components | <ul style="list-style-type: none"> ▪ Any work requiring a forklift or crane will be performed by owner/operators of the equipment. <u>No untrained team member is authorized to operate equipment owned by local service providers.</u> ▪ If any crane or forklift work is to be performed on the site, all team members, visitors and colleagues must be warned of the work and asked to clear a suitable wide area around the work. | Local service provider specialists |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| <p>Diesel Generator noise, battery chemicals, mechanical parts, fuel</p> | <ul style="list-style-type: none"> ▪ Use headset ear protection. ▪ Work on generator is as per maintenance schedule. ▪ Refer to <i>PRO(GEN)-004</i>, <i>PRO(GEN)-012</i>. | <p>All but casual visitors can enter Generator van. Work can only be performed by Local service provider specialists.</p> |
| <p>Hydrogen Generator and Remote Balloon Launcher (RBL)</p> | <ul style="list-style-type: none"> ▪ Fill balloons for launching with hydrogen as per procedure <i>PRO(BBSS)-002</i>. ▪ Emergency shower for use in case caustic materials contact eyes or skin. | <p>Only local Observers and specially trained technicians are authorized to fill balloons with hydrogen. Only trained BOM technicians can perform maintenance and repair on Hydrogen Generator (HOGEN).</p> |
| <p>Pressurized Gasses</p> | | |
| <p>Pressurized gasses such as low-pressure compressor for shutter operations, portable air compressor for tools, dry air compressor.</p> | <ul style="list-style-type: none"> ▪ Use compressed gases as per manufacturer recommendations. ▪ Dolly on site for moving gas cylinders. | <p>BOM technicians & ARM system experts</p> |

| Work & associated hazards | Work controls, tools | Personnel exposed to hazard or authorized for indicated work |
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| Compressed helium (He), and nitrogen (N) gases | <ul style="list-style-type: none"> ▪ Refer to <i>PRO(OPS)-031</i>. | All personnel except casual visitors |
| Others | | |
| Rain, wind, dust, lightning | <ul style="list-style-type: none"> ▪ Extreme temperatures may necessitate the use of special clothing. ▪ Dust masks available on site. | All personnel |
| Personal health – disease, respiration, sun, overheating | <ul style="list-style-type: none"> ▪ Obtain recommended vaccinations and medicines. ▪ <u>Malaria is prevalent!</u> ▪ Dust masks available on site. ▪ Take precautions for sunburn. ▪ Purchase bottled water and stay hydrated. ▪ Know your own personal limits for fatigue. Take a break or stop work when you need rest. Go inside to cool down. | All personnel |
| Plant and animal/insect life | <ul style="list-style-type: none"> ▪ Do not handle rodents, living or dead, found at the site. ▪ Beware of poisonous snakes. | All personnel |
| Off-site activity, driving, recreation, tours, pedestrians on the road | <ul style="list-style-type: none"> ▪ Use common sense and take precautions when off site. ▪ If driving, be extremely careful and absolutely do not drink and drive. ▪ Beware of livestock and pedestrian on roads. ▪ Use reputable tour organizations. ▪ When on tour, beware of lions, snakes, and crocodiles. ▪ Always travel in pairs. ▪ If boating, use life jackets (available on site) | All personnel |
| Theft, vandalism, violence | <ul style="list-style-type: none"> ▪ Lock doors of transportainers when leaving site. ▪ Report unauthorized personnel on site to TWP/AMF-MO. | All personnel |

| <p>Work & associated hazards</p> | <p>Work controls, tools</p> | <p>Personnel exposed to hazard or authorized for indicated work</p> |
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| <p>Threat to ARM staff (Action dependent on severity of threat)</p> | <ul style="list-style-type: none"> ▪ Contact U.S. Embassy. ▪ Notify co-workers, Observers, and TWP/AMF-MO. ▪ Return to hotel/residence. ▪ Arrange for increased security for facility. ▪ ARM personnel fly home if advised by TWP/AMF-MO or U.S. Embassy. ▪ Follow up assessment with U.S. Embassy to plan next steps – resumption of operations or pack up and ship out. | <p>All Personnel</p> |

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VI. References:

TWP/AMF Operations procedures – see TWP/AMF-MO web site at www.twppo.lanl.gov.

VII. Attachments:

1. TWP Visitor Sign-in Sheet

