AFSPCGM2015-10-01

8 September 2015

MEMORANDUM FOR SEE DISTRIBUTION

FROM: HQ AFSPC/A2/3/6
150 Vandenberg Street, Suite 1105
Peterson AFB CO 80914-4170

SUBJECT: HQ AFSPC Guidance Memorandum (GM) 2015-10-01, *Combat Communications Employment Standards (CCES)*

RELEASABILITY: This publication has no releasability restrictions.

By Order of the Air Force Space Command Commander, this Guidance Memorandum immediately implements AFI 10-404, *Base Support and Expeditionay (BAS&E) Site Planning* and supersededs AFSPCGM2015-33-02, *HQ AFSPC Guidance Memorandum for Combat Communications Employment Standards*, dated 21 May 2014. Compliance with this memorandum is mandatory. To the extent its direction is inconsistent with other Air Force (or the issuing organization's) publications, the information herein prevails IAW AFI 33-360, *Publications and Forms Management*. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

In advance of publication of the appropriate Air Force Instruction (AFI), the attachments to this memorandum provide CCES guidance that is effective immediately.

The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, Table 1.1 for a description of the authorities associated with the Tier numbers. Submit request for waivers throught he chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items.

Ensure all records created as a result of processes prescribed in this Memorandum are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW the Air Force Records Information System (AFRIMS) Records Disposition Schedule (RDS) located on the Web at http://www.my.af.mil/afrims/afrims/afrims/rims.cfm.

Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, Recommendation for Change of Publication; route AF Forms 847 from the field through the appropriate functional chain of command.

The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication doeds not imply endorsement by the Air Force.

This memorandum becomes void after one-year has elapsed from the date of this memorandum, or upon publication of an Interim Change or rewrite of the affected publication, whichever is earlier.

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Attachment 1

COMBAT COMMUNICATIONS COMMAND AND CONTROL EMPLOYMENT INTRODUCTION

A1.1. Purpose. Expeditionary cyberspace operations are critical to the United States Air Force (USAF) and the entire Department of Defense (DoD). The networks that combat communicators provide enable an unprecedented amount of operational capability. The Air Force depends on, fights through, and actively defends these enclaves. This guidance memorandum applies to Headquarters Air Force Space Command (HQ AFSPC) and all HQ AFSPC owned and gained combat communications units. This instruction applies to Air National Guard (ANG) and Air Force Reserve Command (AFRC) units with combat communications responsibilities. This memorandum details the tactical communications capabilities available to the Combatant Commander. It also details expected employment timelines and standardizes mobility readiness requirements for Combat Communications personnel who operate or maintain expeditionary cyber systems.

A1.1.1. Objectives. The "Extend the Net" (ETN) function is assigned to Air Force's combat communications community for which HQ AFSPC is Lead Command. Combat Communications forces are the premiere experts at Establish the Base (ETB) and Close the Base (CTB) capabilities. This GM serves to outline the service thresholds that Combat Communications units will provide in support of the ETB and CTB mission. This memorandum outlines unit roles, responsibilities, and timelines to ensure communications systems and equipment are properly employed to meet mission requirements.

A1.1.1.1. Assumptions. This memorandum establishes standards applicable to all units supporting or conducting Combat Communications operations including the Small Communication Package (SCP), Medium Communications Package (MCP) and Large Communications Package (LCP). This GM provides employment standards and the information herein is assumed to apply solely to operations supporting the ETN mission only.

A1.1.1.2. Combat Communications will provide initial "ETN," voice, data, video, networking services and radio capabilities to a small contingency operation, scalable up to an Air Expeditionary Wing or equivalent large joint operation. All of the forces presented will be assigned and tasked as Unit Type Codes (UTC)s.

A1.1.1.3. Communications capabilities will be phased in gradually depending on mission requirements, available capabilities and airlift. The phases of Joint Task Force (JTF) operations, as per Joint Publication 6-0, *Joint Communications System* are pre-deployment, deployment, employment, sustainment, and transition/redeployment. The duration of each phase is mission-dependent. This memorandum focuses on the employment phase of Combat Communications.

A1.1.1.4. Employment. In this phase, the Combat Communications units arrive in the area of responsibility (AOR) incrementally or simultaneously to begin establishing services. A modular buildup of Combat Communications services provides increasing capability to the warfighter. The deployment/employment period normally lasts 120-180 days, but can last indefinitely depending on mission requirements. During this phase Combat Communications units focus work to increase the capability and redundancy of the deployed site. Once robust and reliable

communications are established, traditional communications squadrons may be tasked to provide sustainment, allowing the deployable communications units' personnel to redeploy.

A1.1.1.5. Service Activation Priorities. Initial command and control (C2) communications services (e.g. 6KTFK), will be available, if tasked, within the first two hours of the Combat Communications unit's arrival at a deployed location. Additionally, Theater Deployable Communications (TDC) core capabilities (e.g. TDC Core Capability, 6KTFB, 6KTFM) will be available within 48 hours of arrival with the base commander prioritizing the distribution of services. **(T-3).**

A1.1.1.6. Combat Communications units are tasked to provide the communications infrastructure and will not provide end-user devices except for a limited number of computers (in Cafe Non-Secure Internet Protocol Router (NIPR) and Secure Internet Protocol Router (SIPR) land mobile radio's (LMRs) and secure telephone devices. Other than these limited exceptions users will supply their own devices (subject to re-image based on AOR SPIN-C or latest Standard Desktop Configuration (SDC) if the device will be connected to the network) and have current hard copy Information Assurance (IA) system authorization IAW DoDI 8510.01, *Risk Management Framework (RMF) for DoD Information Technology (IT)* and AFI 33-210, *Air Force Certification and Accredidation (C&A) Program (AFCAP)*. Additionally, users of Combat Communications networks may require a re-format or re-image of their systems prior to connecting to the network to ensure the SDC or other theater defined compliancy level. Finally, users must provide unique software certification and valid system authorization documentation needed for their mission set. **(T-3).**

A1.1.1.7. Long haul communications transmission systems are not in the scope of this GM and may be addressed in future updates.

A1.1.2. Waiver Authority. Unless otherwise noted, the waiver authority for this instruction is HQ AFSPC/A2/3/6.

A1.2. Open the Air Base (AB). This force module provides the capabilities to open an AB. These forces will arrive first to survey/assess the site and then relay specific requirements for follow-on forces. There are no common user Cyber Support/Service capabilities in this module. Advanced Echelon (ADVON) provides initial on-site planning for Combat Communications bed-down. ADVON team size and composition is mission dependent. Under normal circumstances employment of an ADVON team should precede arrival of follow-on forces. **(T-3).**

A1.2.1. Setup & Activation. ADVON initial site planning timelines are dependent on the size of the site and complexity of the environment. **(T-3).**

A1.2.2. Reference **Attachment 3** for specific ADVON duties/requirements.

A1.3. Command and Control. This module provides initial C2 in support of the ongoing base buildup operations and in support of follow-on forces. This module is the basic building block of expeditionary communications capability providing initial core services within 48 hours of employment. Capabilities include satellite connectivity with a Defense Information Systems Network (DISN) to extend Secure Internet Protocol Router Network (SIPRNet), Non-Secure Internet Protocol Router Network (NIPRNet), and Defense Switched Network (DSN) to a small number of drops for user-provided instruments, providing connectivity for special circuits, Ultra-High Frequency (UHF)/Very High Frequency (VHF) line of sight ground-to-air radio

communications, UHF/Demand Assigned Multiple Access (DAMA) satellite access, and initial LMR infrastructure, and installation and maintenance of Giant Voice (GV). There is no standard GV system; equipment and installation vary with each MAJCOM. Each unit will establish reasonable setup and activation time lines. Command emphasis on deploying Engineering Installation (E&I) personnel with the Combat Communications or expeditionary communications personnel in this phase will facilitate future infrastructure planning and help ensure an interface with existing host nation systems. **(T-3).**

A1.3.1. Setup and Activation: Minimal initial C2 capability (NIPRNet/SIPRNet, DSN only) can be realized in two hours by 6KTFK. Within 48 hours, core capabilities will be provided through 6KTFB or 6KTFM, resulting in a base Network Control Center Deployed (NCC-D) supporting 50-150 users in a café environment (utilizing user provided instruments). This initial capability includes power production, satellite communications and NIPRNet/SIPRNet, Voice over Internet Protocol (VoIP), handheld radios and information assurance capability. **(T-3).**

A1.3.2. Reference: **Attachment 3** and **Attachment 7** for specific Unit Type Code (UTC) descriptions.

A1.4. Establish the AB. This module contains limited forces to bring the base to an initial operating capability. Expeditionary cyberspace forces in this module provide expansion of the base information infrastructure to support approximately 700 users, limited workgroup management services for base users, and an expeditionary communications squadron leadership structure. At this point, expeditionary cyberspace UTCs will provide additional SIPR, NIPR and telephone access points and special circuits as required. Including those from the earlier C2 module, a limited number of telephone instruments and LMRs are available for users. E&I management and engineering UTCs are employed in this phase to begin the transition to permanent infrastructure. Forces are dependent on the host unit for movement of equipment, refueling, feeding, force protection, billeting, and other support. **(T-3).**

A1.4.1. Setup and Activation Time. The UTC in this phase provides bridging for 6KTFB to 6KTFD and consists of switches, routers, Global Broadcast System (GBS), and transmission media necessary to compliment 6KTFD to expand the sites services. This UTC also consists of legacy equipment (e.g. Promina®, and Large Voice Module (LVM)) to support other possible TDC mission requirements. It also provides expanded handheld radios capabilities and additional manning to sustain continuous 24 hour support. Simultaneous setup of 6KTFC and an initial 6KTFD is required to provide expansion and distribution of services within 24 hours. The 24 hour expansion timeline builds upon the 6KTFB 48 hour activation time for a total of 72 hours. **(T-3).**

A1.4.2. Mission Capable (MISCAP) Dependencies. 6KTFC is dependent on 6KTFBs infrastructure to interface legacy equipment to the network (e.g., servers and Satellite Communications (SATCOM)). A separate 6KTFD must be tasked with 6KTFC to provide site expansion capability. Civil engineering support must be tasked separately to support this TDC expansion UTC (e.g., 6KLS1) if sufficient power and HVAC are not already in place. **(T-3).**

A1.5. Operate the AB. This module contains mission support forces needed to achieve full operational capability. Expeditionary cyber forces in this module provide wing information management and staff support, engineering and installation capability, and expansion of the base information infrastructure to support approximately 3,000 users. At this point, expeditionary cyber UTCs will provide a greater number of SIPRNet, NIPRNet, telephone access points, and

special circuits as required. These forces are dependent on the host unit for movement of equipment, refueling, feeding, force protection, billeting, and other support. Expeditionary cyber UTCs in this module provide an expeditionary network operations package that expands upon 6KTFB. It is designed to provide connectivity for voice and data at extended sites up to 16 kilometers from the NCC at expeditionary AB. It also provides expanded secure and non-secure voice and data services in increments of 600 users at 3:1 users to services ratio. Additionally, the UTC expands handheld radio capabilities by 20 handheld radios. **(T-3).**

A1.5.1. Setup and Activation Time. Simultaneous setup of 6KTFC and an initial 6KTFD is required to provide expansion/distribution of services within 24 hours. The 24 hour expansion timeline builds upon the 6KTFB 48 hour activation time for a total of 72 hours. Setup for each additional 6KTFD is 24 hours. **(T-3).**

A1.5.2. MISCAP Dependencies. SATCOM transmission system and Civil Engineer UTCs support 6KTFB. 6KTFD must be utilized in conjunction with 6KTFB and 6KTFC. Specify UTC 6KTFE with initial 6KTFD required. Specify subsequent 6KTFE with every third 6KTFD required. **(T-3).**

A1.6. Other Capabilities. The above modules do not incorporate all expeditionary cyber operations capabilities required to operate and sustain an air base in all cases. Several additional items are required, such as theater-level switching systems, terrestrial and troposphere communications systems, required E&I capabilities, above-wing-level cyber services, and sustainment forces. **(T-3).**

A1.7. Changes. Change authority for this GM resides with HQ AFSPC/A2/3/6C.

A1.7.1. Waivers. Due to unique local situations, units may request a waiver to the requirements of this instruction. HQ AFSPC/A2/3/6 is the waiver authority for this GM unless specifically stated otherwise. **(T-3).**

A1.7.1.1. Forward all waiver requests via official memorandum through 24 AF/OV to HQ AFSPC/A2/3/6 describing the specific requirement creating the problem and explaining why a waiver is needed. **(T-3)**

A1.7.1.2. If approved, waivers remain in effect for the life of the GM, unless HQ AFSPC/A2/3/6 specifies a shorter period of time, cancels in writing, or issues a change altering the basis for the waiver. **(T-3)**

A1.7.2. Clarifications. Process requests for clarification via memorandum through 24 AF to HQ AFSPC/A2/3/6 describing in sufficient detail the issue requiring clarification. The NAF will provide a 24 AF position prior to forwarding to HQ AFSPC/A2/3/6C, 150 Vandenberg St., Ste 1105, Peterson AFB CO, 80914- 4240 or afspc.a236cix.deployablecomm@us.af.mil. Provide information copies to HQ AFSPC/IGIOS, 125 East Ent Ave, Peterson AFB CO 80914-1281. **(T-3).**

A1.7.3. Electronic Data Storage. Units may use electronic database files for record keeping, trend analysis, printing of standard forms, etc. Groups will archive and inspect electronic files IAW AFI 33-322, *Records Management Program*. Units not using an electronic database will maintain hard-copy records as directed in this GM. **(T-3).**

Attachment 2

COMBAT COMMUNICATIONS COMMAND AND CONTROL EMPLOYMENT STANDARDS

A2.1. General. Combat Communications plays a pivotal role in supporting the full range of military operations in the AF and Joint environments. This role includes supporting communications requirements as well as linking C2 reach back at and above the tactical level for a variety of AF and Joint missions. One definition of C2 is "the process of military commanders identifying, prioritizing, and achieving strategic and tactical objectives by exercising authority and direction over human and material resources." C2 is not one individual, but a hierarchy of individuals with unique responsibilities that operate under the centralized control of the Commander or designated representative. Each individual in this hierarchy has a level of authority, but ultimate control and responsibility lies with the Commander. During contingencies the Communications Focal Point (CFP) serves as the C2 function for the deployed Combat Communications unit. During an incident the Unit Control Center (UCC) is activated within the CFP to perform Emergency Support Functions (ESF). It is important to make the distinction between the Senior Commander (Group/Wing Commander, joint/contingency commander or senior-most equivalent, hereafter referred to as the SCC) and the Combat Communications Squadron Commander (the senior ranking combat communicator, hereafter referred to as the CBCS/CC). Finally, the term Expeditionary Communications Squadron (ECS) is used to refer to the CBCS/CCs complement of Combat Communications assets assigned to him/her (despite the size, with respect to the fact that the site could be a very small contingency operation up to supporting a full Air Expeditionary Wing (AEW) with ECS support). **(T-3).**

A2.2. Primary Objectives. This guidance is intended to establish a Combat Communications baseline and provide each unit the flexibility to utilize their personnel differently, as long as the mission requirements are being met and the unit complies with all applicable directives. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained Combat Communications units. This guidance applies to Air National Guard (ANG) and Air Force Reserve Command (AFRC) units with combat communications responsibilities. **(T-3).**

A2.3. Roles and Responsibilities.

A2.3.1. Command Element. The Command Element is responsible for overall management of the deployed unit or ECS. They manage all resources, to include personnel, equipment, and supplies. It may be deployed aligned under the 6KMJ6 or 6KMJ7 UTCs. **NOTE:** Units have the option to consider the Command Element to be part of the CFP while other units maintain it as a distinct and separate function. Either way, their role is the same. **(T-3).**

A2.3.1.1. Combat Communications Squadron Commander (CBCS/CC). The CBCS/CC directs and controls the site, system, circuit and services activation and sustainment. The CBCS/CC establishes priorities and monitors timelines to ensure service activation within required time frames in accordance with Operation Orders (OPORD), Battle Staff Directives, Special Instructions (SPINS), or other directives that establish communications requirements. At a minimum, the CBCS/CC will:

A2.3.1.1.1. Support the SCC and Communications Tasking Order requirements through ETN to the maximum extent possible. **(T-3).**

A2.3.1.1.2. Ensure safety directives compliance and validate that an active unit safety program is in place. **(T-3).**

A2.3.1.1.3. Ensure Technical Orders (T.O.) compliance. **(T-3).**

A2.1.1.1.4. Ensure Master Station Logs (MSL) are maintained by all work centers. **(T-3).**

A2.3.1.1.5. Ensure shift change briefings are conducted, during which updated status is passed to the oncoming shift. **(T-3).**

A2.3.1.1.6. Ensure active Operations Security (OPSEC) and Communications Security (COMSEC) programs are in place and comply with current directives. **(T-3).**

A2.3.1.1.7. Provide an update briefing to the SCC as required. This briefing will address the following, but is not limited to: personnel and facilities, communication service availabilities, capabilities, limitations, timelines, system restoral plan, wing communications support requirements and planned footprint, user service information (i.e. phone book, user info package, LMR operations and user guide, etc.) and recommending policies and guidance (i.e. morale calls, web use, etc.). **(T-3).**

A2.3.1.1.8. Review the Communications Status (COMSTAT) and Situation Report (SITREP) before submission to Higher Headquarters (HHQ) and ensure these reports are transmitted to HHQ within the required time constraints. **(T-3).**

A2.3.1.1.9. The CBCS/CC is not the "Comply to Connect" authority. The CBCS/CC must validate system authorization and SPINs before allowing users, workstations, applications, (et al.) on the deployed network. **(T-3).**

A2.3.1.2. Superintendent (Supt). If part of the Command Element, the Supt is responsible for overall unit management and works with the CBCS/CC to deliver the required operational capabilities while limiting operational interruptions. **(T-3).**

A2.3.1.3. Communications Focal Point (CFP). During periods of contingency tasking (simulated or actual), the CFP function assumes increased responsibility for C2 and the coordination effort with wing battle staff or other functions. Since the CFP collects data and tracks status of resources and services, it is very important to the CBCS/CC and SCC's ability to manage the C2 function. The CFP may be formed from a cross-section of Air Force Specialty Codes (AFSCs) in deployed UTCs and augmented by Client Services Technicians (CST) in the 6K0S0 UTC. Duties conducted by personnel assigned to the CFP should follow guidance provided by MPTO 00-33A-1001, *General Cyberspace Support Activities Management Procedures and Practice Requirements*, Chapter 3. **(T-3).**

A2.3.1.4. Material Control. The material control individual is part of the Command Element and is typically deployed as part of the 6KMJ6 and/or 6KMJ7 UTC. **(T-3).**

A2.3.1.4.1. Important and Recurring Duties:

A2.3.1.4.1.1. Shift Change: Provide a "shift change" briefing to counterparts during shift changeover highlighting major areas of importance. At a minimum, brief the CBCS/CC after shift change on the following: **(T-3).**

A2.3.1.4.1.1.1. Current status of all (Mission Capable Awaiting Parts (MICAP) supply orders. **(T-3).**

A2.3.1.4.1.1.2. Summary of items pulled from Mobility Readiness Spares Package (MRSP) kits during the previous shift. **(T-3).**

A2.3.1.4.1.2. Update on orders for equipment to replace previously pulled MRSP items. **(T-3)**.

A2.3.1.4.1.3. Ensure facilities adequately control and protect all supply assets, including positioning the MRSP on dunnage. **(T-3).**

A2.3.1.4.1.4. Perform supply liaison duties to support the ECS mission. **(T-3).**

A2.3.1.4.1.4.1. Process and track all supply requests. Update the open job status board and brief the CBCS/CC and UCC Chief on back order status. **(T-3).**

A2.3.1.4.1.4.2. Maintain copy of UCC's packing and load lists for all UTCs/facilities. **(T-3).**

A2.3.2. UCC. The UCC is activated, as directed by the SCC or Emergency Operations Center (EOC), in response to an incident or emergency (e.g. enemy attack). All functions related to the CFP will continue, as well as the new functions required by the UCC. **(T-3).**

A2.3.2.1. UCC Chief Responsibilities:

A2.3.2.1.1. Important and Recurring Duties:

A2.3.2.1.1.1. Shift Change: Provide a "shift change" briefing to counterparts during shift changeover highlighting major areas of importance. At a minimum, brief the CBCS/CC during shift change on the following:

A2.3.2.1.1.1.1. Status of all personnel. **(T-3).**

A2.3.2.1.1.1.2. AF Form 4006, *Unit Deployment Shortfalls/Reclama* personnel replacement status. **(T-3).**

A2.3.2.1.1.1.3. Items submitted to HHQ during the previous shift. **(T-3).**

A2.3.2.1.1.1.4. Responses received from HHQ during the previous shift. **(T-3).**

A2.3.2.1.1.1.5. Items still pending at HHQ and when they were originally submitted.

A2.3.2.1.2. Execute actions as specified in the Facility Survival Checklist for the AOR to which the unit is deployed. **(T-3).**

A2.3.2.1.3. As directed, assist CBCS/CC by completing a Battle Damage Assessment (BDA) of communications and information services. **(T-3).**

A2.3.2.1.4. Recommend courses of action to repair/recover services from attack damage. **(T-3).**

A2.3.2.1.5. In coordination with the Emergency Management (EM) Representative, determine appropriate response to situations and direct facility survival checklist execution. **(T-3).**

A2.3.2.1.6. Ensure facilities are notified of THREATCON/Force Protection Condition (FPCON)/Information Condition (INFOCON) changes. **(T-3).**

A2.3.2.1.7. Prepare the CBCS/CC for the SCC's Senior Staff meeting. Ensure he/she has accurate information, documents, charts, etc. (this generally involves ensuring the COMSTAT and SITREP are up-to-date and accurate). **(T-3).**

A2.3.2.1.8. Ensure all required host nation support memos are submitted on time and in the proper format. **(T-3).**

A2.3.2.1.9. Ensure emergency phone numbers are posted in each facility. **(T-3).**

A2.3.2.1.10. Maintain roster and status of all personnel. Complete casualty replacement letters and/or AF Form 4006s immediately upon notification of injury to assigned personnel. **(T-3).**

A2.3.3. Emergency Management. The EM function is primarily responsible for keeping the Commander and UCC Chief informed during an emergency or incident. This function also manages the deployment of Post Attack Response (PAR) teams after an attack. **(T-3).**

A2.3.3.1. Important and Recurring Duties.

A2.3.3.1.1. Shift Change: Provide a "shift change" briefing to counterparts during shift changeover highlighting major areas of importance. At a minimum, brief the CBCS/CC after shift change on the following:

A2.3.3.1.1.1. Current Alarm condition. **(T-3).**

A2.3.3.1.1.2. Current Mission Oriented Protective Posture (MOPP) condition. **(T-3).**

A2.3.3.1.1.3. Current FPCON level. **(T-3).**

A2.3.3.1.1.4. Current INFOCON. **(T-3).**

A2.3.3.1.1.5. Current Sign/Countersign and Duress word. **(T-3).**

A2.3.3.1.1.6. Intelligence updates received over the past 12 hours that may impact force protection. **(T-3).**

A2.3.3.1.1.7. Confirm number of personnel on site between ECP and on-shift schedule from Facility Chiefs. **(T-3).**

A2.3.3.1.2. Responsible for all emergency management and security measures. **(T-3).**

A2.3.3.1.3. Ensure critical weather information is disseminated to the deployed facilities. **(T-3).**

A2.3.3.1.4. Obtain the appropriate number of EM kits (from host base, before deployment), one EM kit for each facility/tent. **(T-3).**

A2.3.3.1.4.1. Distribute EM kits to each facility prior to deployment or immediately upon arrival.

A2.3.3.1.5. Document MSL with status updates. **(T-3).**

A1.3.3.1.6. Coordinate with the appropriate agencies to obtain a site layout map; annotate with appropriate EM and security information. **(T-3).**

A2.3.3.1.7. Assign responsibility to key UCC personnel for contacting UTC personnel; establish a process to disseminate information to all unit personnel. **(T-3).**

A2.3.3.1.8. Provide arriving personnel with the following information:

A2.3.3.1.8.1. Initial Security Briefing. **(T-3).**

A2.3.3.1.8.2. Results of Unexploded Ordnance (UXO) sweep. **(T-3).**

A2.3.3.1.8.3. Current ALARM, MOPP, FPCON, INFOCON. **(T-3).**

A2.3.3.1.8.4. Sign/Countersign will be distributed through Facility Chiefs. **(T-3).**

A2.3.3.1.8.5. Casualty collection point. **(T-3).**

A2.3.3.1.8.6. Entry Control Point (ECP)/Perimeter procedures. **(T-3).**

A2.3.3.1.8.7. Real-world emergency procedures. **(T-3).**

A2.3.3.1.9. Ensure safety information is available and posted. **(T-3).**

A2.3.3.1.10. Ensure emergency phone numbers are posted in each facility. **(T-3).**

A2.3.3.1.11. Ensure every facility has a First-Aid kit. **(T-3).**

A2.3.4. Other Duty Positions. Other important positions the CBCS/CC and UCC Chief need to understand, include:

A2.3.4.1. First Sergeant (may be an authorized position; if not, assign Additional Duty First Sergeant duties to a SNCO on a case-by-case basis). **(T-3).**

A2.3.4.2. Unit Emergency Operation Center (EOC) representatives. **(T-3).**

A2.3.4.3. Safety Non-Commissioned Officer (NCO). **(T-3).**

A2.3.4.4. Security Manager. **(T-3).**

A2.3.4.5. Telephone Control Officer (TCO). **(T-3).**

A2.3.4.6. Secure Voice Responsible Officer (SVRO). **(T-3).**

A2.3.4.7. Communications Security (COMSEC) Responsible Officer (CRO). **(T-3).**

A2.3.4.8. Weapons custodians/couriers, as applicable (primary and alternate, if bulk shipping). **(T-3).**

A2.3.4.9. Emission Security (EMSEC) NCO. **(T-3).**

A2.3.4.10. Equipment custodians for Equipment Authorization Inventory Data (EAID) and Information Technology (IT) assets (deployed). **(T-3).**

A2.3.4.11. Information Assurance Officer. **(T-3).**

A2.3.4.12. Hazardous cargo certifiers. **(T-3).**

A2.3.4.13. Records Custodian(s). **(T-3).**

A2.3.4.14. Frequency Manager POC. **(T-3).**

A2.3.4.15 Vehicle Control officer (VCO). **(T-3).**

A2.3.4.16 Technical Order Distribution Officer.

A2.3.5. Personnel Accountability.

A2.3.5.1. CFP/UCC will maintain accountability of all unit personnel. Each facility will be responsible for up-channeling their personnel numbers for accountability to the CFP/UCC.

A2.3.6. Combat Communications UCC Checklists. Combat Communications checklists are used primarily by the UCC and Facility Chiefs when performing command and control functions. Combat Communications checklists are not directive. When there are conflicts between Combat Communications checklist and AFIs, other Air Force publications, or DoD publications, the highest-level guidance takes precedence. Combat Communications checklists provide baseline recommended Tactics, Techniques and Procedures for successful initial deployment and/or deployed operations. The CBCS/CC retains the authority to modify

implementation of these checklists, when necessary, to account for factors outside the scope of this GM. **(T-3).**

Attachment 3

ADVON / EXPEDITIONARY ENGINEERING EMPLOYMENT STANDARDS

A3.1. General. The Advanced Echelon (ADVON) and Combat Communications Engineering teams are available to the commander for forward deployment to assess and engineer deployed communications networks. Team composition and size is mission dependent. They propose solutions to actual or potential technical problems that adversely affect the quality of deployed communications, and are designed to provide the systems expertise that will complement, not replace, traditional planning, operations, and maintenance functions. The ADVON emphasis is on a systems approach to improve planning, engineering, maintenance, and operational technical procedures. To provide the best possible engineering support during the deployed systems life cycle, these personnel must possess a high degree of deployable communications systems expertise. This expertise includes extensive knowledge of deployable communications fundamentals, equipment capabilities and limitations, and systems testing. Furthermore, these personnel must also possess a general knowledge of logistical life support (e.g., airflow, billeting, life support) so they can identify initial and follow on needs in various environments. **(T-3).**

A3.2. Primary Objectives. The primary objectives of the ADVON and Combat Communications Engineering teams are to engineer and prepare for initial Combat Communications bed-down and extension of services per user requirements. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained combat communications units. This guidance applies to ANG and AFRC units with combat communications responsibilities. **(T-3).**

A3.3. Roles and Responsibilities.

A3.3.1. ADVON/Combat Communications Engineer. The primary role of the ADVON team and Combat Communications Engineer is to assist the site commander in the management and bed-down of a combat communications unit while also providing technical planning and engineering solutions for the employment of expeditionary communications systems. **(T-3).**

A3.3.1.1. Liaise with lead agency to confirm site location, coordinate general bed-down support requirements (i.e. logistics for receiving equipment, forklift support, additional airflow, etc) and host nation support requirements. **(T-3).**

A3.3.1.2. Identify, investigate and resolve interface, equipment and site limitations. **(T-3).**

A3.3.1.3. Determine site layout and validate mission requirements. **(T-3)**.

A3.3.1.4. Provide focal point for dissemination of technical information to all interested agencies. **(T-3)**.

A3.3.1.5. Provide technical guidance and assistance to lateral units when necessary. **(T-3)**.

A3.3.1.6. Act as focal point to ensure engineering and operational maintenance requirements are met. **(T-3)**.

A3.3.1.7. Actively participate in the interchange of technical information with Defense Information Systems Agency (DISA), Standardized Tactical Entry Point (STEP) sites and theater

engineer. Determine who submits Satellite Access Requests (SAR), Gateway Access Requests (GAR) and frequency requests. **(T-3).**

A3.3.1.8. Conduct site surveys and produce appropriate metrics (e.g., measurements and calculations) to ensure equipment and site layouts will satisfy the tasking requirements. **(T-3).**

A3.3.1.9. Verify user requirements:

A3.3.1.9.1. Radio. **(T-3).**

A3.3.1.9.2. Voice (Secure/Non-secure:VoIP/SVoIP/VoSIP). **(T-3).**

A3.3.1.9.3. Data (Secure/Non-secure). **(T-3).**

A3.3.1.9.4. Special services (GBS, Giant Voice (GV), Joint Worldwide Intelligence Communications System (JWICS), etc.). **(T-3).**

A3.3.1.9.5. Validate requirements. **(T-3).**

A3.3.1.9.6. Validate IA accreditation package of any system requiring access to deployed network.

A3.4. Pre-deployment Considerations.

A3.4.1. Gather Critical Information. **(T-3).**

A3.4.1.1. Identify primary and alternate site locations by coordinating with site agencies and obtain maps and imagery of possible site locations and surrounding area. **(T-3).**

A3.4.1.2. Determine if existing site survey or other research data is available for projected sites. **(T-3).**

A3.4.1.3. Research availability of commercial or host nation communications equipment and infrastructure. **(T-3).**

A3.4.1.4. Locate existing power systems, grounding systems and underground obstacles. **(T-3).**

A3.4.1.4.1 Soil/ground composition should be considered during site survey (semi-soft soil/ground is preferable if possible).

A3.4.1.5. Determine site changes due to environmental impact. **(T-3).**

A3.4.1.6. Identify Terminal Instrument Procedures (TERPS) personnel who may need to conduct an airspace survey. Ensure airspace criteria are met. Ensure Air Traffic Control personnel record the position of any TERPS obstructions and prepare waivers for areas not in compliance with TERPS. **(T-3).**

A3.4.1.7. Coordinate with appropriate spectrum managers. **(T-3).**

A3.4.1.8. Ensure Radiation Hazard (RADHAZ) zone requirements are met. **(T-3).**

A3.4.1.9. Ensure site terrain has sufficient drainage. If not, take precautions to reduce impact of potential flooding. **(T-3).**

A3.4.2. Develop a Technical Data Package for the Mission. Include the following items if they are available and tailor the contents to sufficiently support the engineering effort:

A3.4.2.1. Site coordinates/map of area and, if available, photos of the area. **(T-3).**

A3.4.2.2. Azimuth and takeoff angles for SATCOM Links and, once available, Satellite Access Authorization (SAA) and Gateway Access Authorization (GAA). **(T-3).**

A3.4.2.3. Path Profiles, azimuths, elevations and distances for wideband and tropospheric scatter links. **(T-3).**

A3.4.2.4. Site layout map. **(T-3).**

A3.4.2.5. Ground resistance measurements and grounding log to be completed during employment. **(T-3).**

A3.4.2.6. Bubble charts and system diagrams for the overall connectivity, cut-sheets, voice and network diagrams, timing charts, multiplexer diagrams and emergency restoral plans if available from JTF TNCC/JNCC. **(T-3).**

A3.4.2.7. Ensure domain is registered through the 26th Network Operations Center. **(T-3).**

A3.4.2.8. Circuit listings, circuit channelization and circuit layout records if available from AOR/SYSCON. **(T-3).**

A3.4.2.9. Determine antenna type used for each radio link. **(T-3).**

A3.4.2.10. Contact AEW Civil Engineers to assess long term site power requirements (i.e. power pooling, converting to commercial power). **(T-3).**

A3.4.2.11. Secure necessary permits: ensure a digging permit, if required, was issued (cannot be accomplished until location of equipment is determined). **(T-3).**

A3.4.3. Prepare an Engineering Support Kit. Kit should contain equipment that might be needed to support the Site Verification Team (SVT). A detailed list of equipment is located in the Logistics Detail for the appropriate UTCs (currently 6KTFK and 6KNZ8). **(T-3).**

A3.4.4. Establish a SVT. Identify SVT members and tailor, as required, to include Airfield Operations personnel when applicable. Notional members and their AFSCs are identified in the appropriate UTC manpower details (currently 6KTFK and 6KNZ8). **(T-3).**

A3.4.5. Setup Transportation. Verify that transportation was requested for the site survey team and follow-on personnel. **(T-3).**

A3.5. Communications Systems Engineering. Accommodating user requirements requires sound communications systems engineering to enable proper communications planning and engineering. System engineering is an integration of the following basic concepts. **(T-3).**

A3.5.1. Engineering Support Function. This concept places communications engineering officers and communication technicians in Combat Communications units to directly support deployments. These personnel should:

A3.5.1.1. Perform troubleshooting and maintenance necessary to ensure equipment is operating in optimum condition. **(T-3).**

A3.5.1.2. Identify interface and equipment limitations and report them to the Program Management Office (PMO). **(T-3).**

A3.5.1.3. Provide a sound technical base for the unit training programs. **(T-3).**

A3.5.1.4. Provide a focal point or process for the dissemination of technical information. **(T-3).**

A3.5.1.5. Train and prepare engineers for world-wide deployment. **(T-3).**

A3.5.1.6. Assist engineers from Combat Communications mission squadrons, Air Force Forces (AFFOR) and HQ AFSPC planners with technical issues. **(T-3).**

A3.5.2. System Approach. The communicator should not consider the performance of individual facilities in the system without viewing the impact in user-to-user terms. While measurement of facility or even link performance is important, the total system performance is the overriding factor. **(T-3).**

A3.5.3. The Deployed System Operational Life Cycle. This cycle consists of planning, engineering, equipment readiness, deployment/employment and post-deployment.

A3.5.3.1. Planning Phase. This phase consists of the initial planning required to support the deployed mission, including the selection of feasible communications sites, sizing the requirement, selection of equipment and consideration of interface criteria. In this phase, planners must have an appreciation of the capabilities and limitations of available communications equipment, especially transmission and switching equipment. They should understand such issues as the effect terrain may have on take-off angles and transmission quality, as well as inputs necessary to prepare a database to support a telephone system. It is important to carefully match communications equipment to the total mission requirement to ensure the equipment selected will provide the quality and quantity of service required. Consideration of the actual deployment/employment phase, including operating standards, is essential. **(T-3).**

A3.5.3.2. Mission Planning. This phase consists of the detailed technical actions required to ensure the employment of a quality communications system. It includes site surveys, path profiles, wideband path calculations, wideband and satellite multiplexing schemes, base data and voice services preparation and Predicted Path Reliability (PPR) for transmission links. This phase also includes circuit engineering (interfacing needed for switching and terminal equipment), Internet Protocol (IP) addressing and subnet masking schemes, router and hub layout, client and server farms, system channelization, technical control configuration, completion of Circuit Layout Records (CLR), crew assignment sheets and cable cut sheets. Either technicians or engineers may accomplish the above actions. A central source will prepare, control and disseminate the network planning and multiplex schemes and oversee preparation and dissemination of crew assignment sheets. An engineer, if available, should conduct an overall assessment of the engineering results. **(T-3).**

A3.5.3.3. Deployment/Employment Phase. This phase consists of the actual deployment, installation, checkout, operational acceptance and operation of the communications system. Immediately upon installation, maintenance personnel should perform maintenance checks to ensure the equipment still meets TO/commercial manual specifications. **(T-3).**

A3.5.4. Phase Explanation. These phases are not necessarily chronologically distinct. The first three phases are normally pre-deployment activities; however, they may occur simultaneously with the actual deployment. For instance, the first echelon could be deployed from a unit while follow-on echelons are being planned. This cycle includes consideration of many factors that have an effect on the successful completion of the communication unit's mission. Base the phased approach on the philosophy that planning, engineering and equipment readiness phases precede the deployment/employment phase. With deployed equipment, it's usually too late to extensively plan the employment, engineer the Radio Frequency (RF) links and the

interfaces/protocols to subsystems and ensure that the equipment is operating in optimum condition. Accomplish these steps before deployment. Take action to ensure the system maintains optimum performance after employing a system. Finally, after mission completion, take action to ensure that what was learned in the previous four phases is applied to improving communications system performance in future deployments. The engineering function needs to be included in deployment planning and engineering phases to ensure a comprehensive effort has been made to design a system that meets mission requirements. **(T-3).**

A3.6. Planning and Engineering Phases. The main objectives of the planning and engineering phases are to plan, engineer, and define actions required to successfully support the user. The combat communications unit has limited assets available to provide communications support. These assets vary in configuration, capability, and interface compatibility. Coordinate with supported ACS/ACOMS to define and verify mission requirements. Recommended timelines are provided for scheduled exercises and should be significantly increased when supporting an ANG ACS. Contingencies and other short-notice missions will dictate an accelerated timeline. **(T-3).**

A3.6.1. Obtain the following information from the supported ACS/ACOMS at least 60 days in advance:

A3.6.1.1. Firewall exemptions; Internet ports and protocol requirements. **(T-3).**

A3.6.1.1.1. Employment bandwidth requirements. **(T-3).**

A3.6.1.1.1.1. Special service requirements (i.e., TBMCS, CENTRIX, JREAP, secure chat). **(T-3).**

A3.6.2. Obtain the following information from the supported ACS/ACOMS at least 30 days in advance:

A3.6.2.1. CRC Communications Plan (applicable to ACS). **(T-3).**

A3.6.2.1.1. Secure Telephone Equipment (STE), Voice over Internet Protocol (VoIP), and Voice over Secure Internet Protocol (VoSIP) requirements. **(T-3).**

A3.6.2.1.1.1. Analog telephone requirements; client laptop requirements. **(T-3).**

A3.6.2.1.1.1.1. Site power requirements (applicable to local exercise support). **(T-3).**

A3.6.3. Provide the following information to the supported ACS/ACOMS at least 30 days in advance:

A3.6.3.1. Life support requirements (i.e., tents, meals, fuel, water) (applicable to local exercise support). **(T-3).**

A3.6.4. Coordinate with supported ASOS to define and verify mission requirements. Timelines provided are for planned ACC exercises and should be increased to a 120-day lead time when supporting an ANG ASOS. Contingencies and other short-notice ASOC missions will dictate an accelerated timeline due to the dynamics associated with supporting Army Divisions. **(T-3)**.

A3.6.5. Obtain the following information from the supported ASOS at least 90 days in advance:

A3.6.5.1. Initial command and control communications requirements. **(T-3).**

A3.6.5.1.1. Firewall exemptions; Internet ports and protocol requirements. **(T-3).**

A3.6.5.1.1.1. Employment bandwidth requirements. **(T-3).**

A3.6.5.1.1.1.1. Special service requirements (i.e., TBMCS, CENTRIX, JREAP-C, mIRC, etc.). **(T-3).**

A3.6.6. Obtain the following information from the supported ASOS at least 60 days in advance:

A3.6.6.1. ASOC Communications Plan. **(T-3).**

A3.6.6.1.1. Site power requirements. **(T-3).**

A3.6.7. Provide the following information to the supported ASOS at least 60 days in advance:

A3.6.7.1. Life support requirements (i.e., tents, meals, fuel, water). **(T-3).**

A3.6.8. Pre-deployment Planning. The pre-deployment planning and designing effort is labor-intensive, consisting of a number of steps, but not limited to:

A3.6.8.1. Define mission requirements. **(T-3).**

A3.6.8.2. Formulate a tentative general system outline. **(T-3).**

A3.6.8.3. Coordinate with JTF TNCC/JNCC to develop switched network databases (voice and data) to include Internet Protocol/Autonomous System Numbers (IP/ASNs), subnet masking and protocols for routers, phone book for switched lines and nodal assignment for Promina's®. **(T-3).**

A3.6.8.4. Coordinate with JTF TNCC/JNCC to develop multiplexing plan and configuration sheets for assigned Legacy and Theater Deployable Communications/Integrated Communications Access Package (TDC/ICAP) systems. **(T-3).**

A3.6.8.5. Desktop map survey. **(T-3).**
A3.6.8.6. Site survey. **(T-3).**
A3.6.8.7. Path predictions. **(T-3).**
A3.6.8.8. System/node timing plan (need primary and alternate sources assigned). **(T-3).**
A3.6.8.9. Final site, equipment and route (propagation path) selections. **(T-3).**
A3.6.8.10. Preparation of final system layout documentation. **(T-3).**
A3.6.8.11. Engineering personnel should check and verify computations, database and communication architecture, accomplished and installed by various AFFOR planning and operations functions. By virtue of their system-level viewpoint, these personnel are in a position to discover inconsistencies in the overall system design not readily apparent to the technician working on individual elements of the system. By accomplishing specific critical system checks during the planning and engineering phases, the engineer/technician can discover and resolve problems which might become critical if left undetected until deployment. **(T-3).**
A3.6.9. Definition of Mission Requirements (chain of events). AFI 10-414, *Requesting and Employing Combat Communications Resources in Peacetime*, governs requests for AFSPC combat communications support. Air Force units can request AFSPC Combat Communications support for interim/emergency mission support requirements IAW T.O. 31-10-24, *Installation Practices*. Once the requirement for Combat Communications support is identified, the planning function must interpret the tasking to determine the specific number of personnel to be deployed, the types of equipment required and circuit configurations needed. These initial steps may require participation in an exercise planning conference and translate the basic communications need into a realistic and feasible definition of the system requirement. **(T-3).**

A3.6.10. General System Plan:
A3.6.10.1. When mission requirements are analyzed and defined, a system plan meeting the communications user needs is developed. Some considerations when establishing the plan are:
A3.6.10.2. Technical capabilities and limitations of available equipment. **(T-3).**
A3.6.3.10.3. Frequency limitations. **(T-3).**
A3.6.3.10.4. Real estate constraints. **(T-3).**
A3.6.3.10.5. Logistical constraints. **(T-3).**
A3.6.3.10.6. Traffic and interface requirements. **(T-3).**
A3.6.11. The system plan in early stages of the planning phase is very simple and depicts all known information in a system diagram. From the system plan and user requirements the planner can design a preliminary system trunking plan. This plan provides a layout of system channel requirements and terminal locations in line-diagram form. Develop a trunking plan from the activities requirement for Digital Trunk Groups (DTGs), data links, etc. Using either the total voice circuit or data rate requirements, determine potential traffic between various points to estimate total trunk requirements. **(T-3).**
A3.6.12. The next step in planning a communications system is to make a tentative selection of the equipment, operating locations, and transmission paths. A communications system has four major subsystems: terminal equipment, switch, transmission, and control. Circuits connecting terminals traverse switches, control points, and various transmission media. Signal levels, noise levels, Bit Error Rate (BER), interface requirements, circuit identification, and proper documentation, as a circuit passes from one subsystem to another, become the basic technical challenge encountered when designing a communications system. **(T-3).**
A3.6.13. When practical, use satellite systems and fiber for the highest quality beyond line-of-sight (BLOS) transmission media. The major deciding factors are data rates required, distance between facilities and terrain between these locations. **(T-3).**

A3.6.14. When using LOS, make sure adequate path clearance is available. **(T-3).**

A3.6.15. Consider "**Tropospheric scatter" (**aka. "troposcatter") mode when neither LOS is possible. When the troposcatter mode is predicted to have a significantly better Received Signal Level (RSL), use it rather than the LOS or diffraction mode (consult technical manual for ranges). **(T-3).**
A3.6.16. Satellite System Planning. Many users share the same transponder on a satellite; requiring each link be carefully configured in relation to the others. All terminals accessing the transponder must be controlled, with respect to time of access, frequency, bandwidth and uplink power, to ensure they do not interfere with each other. The communications planners should refer to published Defense Information Systems Agency (DISA) standard satellite access and control procedures. For Ground Mobile Forces (GMF) planning, refer to US Army Information Systems Command (USAISC) Operation and Control Procedures for the GMF SATCOM System, Volumes I and II. When leasing Satellite Communications (SATCOM) (e.g., Ku, Ka, or C-Band) services, careful adherence to the vendor's established procedures will produce the most satisfactory results. For satellite access, submit a SAR/GAR through JIST. **(T-3).**

A3.6.17. Wideband System Planning. With the addition of digital communications equipment to the Air Force inventory, factors such as BER, multipath delay spread and time availability of the link must be considered when planning usable data rates over transmission paths. It is especially important for multiple hops to plan for median RSL that provide sufficiently low noise. The performance of the AN/TRC-170 radio, with its adaptive modem, typically improves

as the delay spread increases; its performance is a function of path loss and multipath delay spread. The planning of a digital troposcatter radio transmission path requires estimates of both path loss and delay spread. Computer software (United States Marine Corps Systems Planning, Engineering and Evaluation Device) is available to assist in the path analysis of a TRC-170 link. **Note:** The TDC/ICAP systems use short-range microwave systems to monitor signal RSL and 257 BER using front panel controls and LinkView software to monitor Automatic Gain Control (AGC) levels. **(T-3).**

A3.6.18. International Maritime Satellite (INMARSAT) and Broadband Global Area Network (BGAN). Currently, AFSPC does not have reach back capability and requests should be submitted per HQ ACC/A6CS guidance. **(T-3).**

A3.6.19. Radio Frequency Requests. Include spectrum managers in the earliest stages of all planning activities as lead-time is required to complete coordination through national frequency management channels. **(T-3).**

A3.6.20. Preliminary Site Selection/Desktop Study for Troposcatter Links: **(T-3).**

A3.6.20.1. After establishing a general system outline, verify it by a thorough desktop map study (careful analysis of maps that provide reliable topographic data will save time and effort in the field). Use this study to identify tentative operating locations, verify proposed transmission paths and select sites that offer the most promising technical and logistical advantage. Select one or more alternate sites for each terminal or relay facility. Technical considerations should not override logistical considerations. For example: a site on top of a mountain may be the best site technically, but be unsupportable logistically. Make a tentative propagation prediction for each wideband path from each of the prospective sites; the desktop analysis will help to further narrow the selection of sites. **(T-3).**

A3.6.21. Site Selection:

A3.6.21.1. The site selected for placement of deployable communications systems is of major significance to the eventual operational performance of the deployed systems. Site selection may be considered the starting point for all further system engineering actions in that topography, soil characteristics, climatic factors, vegetation in the area and space limitation will affect both the installation of the particular facility and the operating characteristics of the system. Four items of primary importance in site selection are:

A3.6.21.1.1. Size of the employment area to support all facilities of the deployed complex. **(T-3).**

A3.6.21.1.2. The logistical supportability of each of the selected locations. **(T-3).**

A3.6.21.1.3. The adaptability of each site to sustain reliable communications. **(T-3).**

A3.6.21.2. These and other site factors, together with equipment selection, form the baseline from which to design the communications system for a given deployment. For these reasons, final site selection evolves through a reiterative process that involves preliminary site selection, field site survey and detailed propagation analysis. During the initial planning stages, it is the task of the system engineer to identify the preliminary sites and be able to evaluate their acceptability. In some cases, identifying specific site locations before the planning stage makes the task of site evaluation/selection far easier. Sometimes only general areas will be supplied. In either case, preliminary site review provides significant benefits. **(T-3).**

A3.6.21.3. Siting Technical Considerations. The following criteria for site location are applicable to radio installations. They relate only to optimum technical performance of the equipment.

A3.6.21.3.1. The area must be free of hills, cliffs, buildings and other stationary obstructions that would intrude into the LOS path in a sector requiring communications. Depressions, valleys and similar geographic features are poor locations for radio sites because the surrounding high ground screens large sections of operational air space. Operating the radio facility near steel bridges, towers, overpasses, power lines or power substations can result in weak or distorted signals in certain sectors. **(T-3).**

A3.6.21.3.2. If possible, choose a site on a hilltop or other high ground. Flat ground with good drainage at the site is desirable. If flat ground is not available, select a gentle sloping area to avoid shadowing effects. If adequate coverage cannot be obtained because of antenna hazard restrictions or local obstruction, choose an acceptable alternate site and remote the facility. **Note:** Although a facility may begin operation on a relatively small scale, the development of operations may require its expansion to a much larger facility. The possibility of expansion, from the standpoint of space requirements, is one of the fundamental criteria in the selection and acquisition of a proposed site. It is wise to select alternate sites in case the first selection is unusable. Siting criteria for individual equipment can be found in applicable equipment T.O.s. **(T-3).**

A3.6.22. Siting in Overseas Areas. In addition to the usual technical, logistical and administrative criteria, siting of facilities in overseas areas presents special challenges. Coordination with appropriate host nation agencies is necessary. Host nation approval is required for frequency assignments to be authorized and should be coordinated with AOR SYSCON. Design systems to be compatible with, or even to include, participation by coalition partners. Ensure the observance of Status of Forces Agreement (SOFA) and local policy. Compliance includes coordination with the US base commander, MAJCOM (for the Pacific AOR coordinate with the PACAF Spectrum Management Office), Military Assistance Advisory Group (MAAG) or US Embassy for the foreign policy on matters such as taking photographs (which may be necessary to complete the site survey), wearing the Air Force uniform, trespassing, right of entry, negotiating landing rights, connection approval, authorization to radiate and any other foreign policy or custom which, if violated, could neutralize mission success or embarrass the US. **(T-3).**

A3.6.22. Tentative Site Selection. The sum of the information collected, derived and predicted, as outlined in the foregoing paragraphs for each proposed site, should be sufficient to compare the capabilities and limitations of each site to permit ranking them in order of preference and establish which will be subject to site survey. **(T-3).**

A3.6.23. Site Selection. After identifying tentative sites and routes by desktop map study, field trips or site surveys are needed to gain first- hand information about the site and its likely impact on the actual operational capabilities of the proposed facility or system to be setup. **(T-3).**

A3.6. 24. Siting Equipment. Technical equipment required by the siting party to accomplish the siting mission may include: binoculars, cyclometer, Global Positioning System receiver, etc. A more detailed list of items can be found in the engineering support kit tasked in the appropriate UTC (currently 6KNZ8 Logistics Detail (LogDet)). **(T-3).**

A3.6.25. Wideband Siting Data:

A3.6.25.1. Document transit information pertinent to the siting of wideband antennas. This data is used during the detailed path propagation analysis to verify the data taken from the desktop map study and to determine the blocking or screening angles of near-field obstacles not identified on maps (such as buildings or trees). Haze and clouds may often obscure the distant horizon, so take care to ensure the correct distant horizon is sited. Because light waves will refract differently than radio waves, transit data for distant (greater than 3 miles) horizons may be inaccurate. Use map study as the basis for any takeoff angle computations when the horizon is greater than 3 miles away. Ignore obstacles such as wooden poles or isolated trees less than one-half degree in azimuth. **(T-3).**

A3.6.25.2. Take Theodolite and transit data from the proposed antenna location with data recorded for a minimum of 10 degrees (5 degrees on each side of the center-path azimuth). Reference the center path azimuth in the transit data to a natural or survey team placed marker that will appear in the skyline photographs. **(T-3).**

A3.6.25.3. Take panoramic skyline photographs or video recordings covering at least 25 degrees on each side of the center-path azimuth. **(T-3).**

A3.6.26. General Environmental Compatibility. Consider the suitability of the location; the physical and electrical environment of the proposed location can affect the operation of the radio facility. The factors to be considered include, but are not limited to:

A3.6.26.1. Metallic structures within LOS which may act as obstructions or reflectors. **(T-3).**

A3.6.26.2. Dense forests close enough and tall enough to obstruct the real horizon and attenuate the RF signals at low angles. **(T-3).**

A3.6.26.3. Proximity to heavy traffic areas such that ignition noise could be troublesome. **(T-3).**

A3.6.26.4. Proximity to industrial concentrations, or high-voltage power systems, which may produce significant RF noise levels. **(T-3).**

A3.6.26.5. Proximity to an active flightline/helicopter landing pad could cause interference. **(T-3).**

A3.6.26.6. Interference to, or from, other Communications-Electronics (C-E) equipment or facilities within LOS, whether military or civilian. An open lattice structure tower may be considered solid for screening calculations if the distance between connection points of the members is two wavelengths or less at the frequency of operation of the radio facility. If the distance between connection points is greater than this, ignore the structure as an obstruction. **(T-3).**

A3.6.27. Vegetation and Landscaping. The reflecting properties of the ground, for vertical polarization is considerably reduced by vegetation and low shrubs will reduce the random effects of rough, rocky terrain on the vertical antenna pattern from optimum. This is a general leveling effect and is preferred to bare or grass-covered rough ground. Clear vegetation between three and eight feet within the immediate area of the antenna. Trees form an obstacle to UHF/Super High Frequency (SHF) signals. A single, large, nearby tree may cause a drop in signal strength of several decibel (dB). Transmission measurements through a grove of trees 100-feet wide could cause losses of 20 to 30 dB for vertical polarization. If the grove is primarily deciduous, the seasonal changes will significantly affect these losses; therefore, UHF/SHF antennas should

be installed at such heights that groves of trees do not obstruct the horizon. Computing or predicting the effects of vegetation on antennas is often difficult, and expensive, due to the many variables involved. Because such computations in deciduous situations may become invalid after a short interval, it may be concluded that the rigorous analysis of antenna installation versus ground effects for operational sites is impractical. **(T-3).**

A3.6.28. Inter-Equipment/Facility Compatibility. Transmitting and receiving equipment in close proximity can cause severe interference problems. Depending on frequency assignments, radiated power, receiver sensitivity and selectivity, a close proximity can be anything from a few feet to LOS. Investigate the equipment within radio LOS of the proposed facility for potential compatibility. The types of incompatibilities, methods of analysis and critical levels used should be the same as those used to determine compatibility within the site. **(T-3).**

A3.6.29. Electromagnetic Compatibility Analysis Assistance. Work with local spectrum managers regarding the radio equipment to be used and the tentative site layout to mitigate any potential electromagnetic compatibility issues with the site. **(T-3).**

A3.6.30. Ground Anchor Requirements. Note the soil composition and expected wind conditions at the planned deployment site to plan appropriate ground anchoring of antennas or other structures. **(T-3).**

A3.6.31. Grounding. Refer to MIL-HDBK-419A, *Grounding, Bonding, and Shielding for Electronic Equipment and Facilities, Volume 2 of 2*. **(T-3).**

A3.6.32. Final Site Selection. When the information from the site surveys, detailed path propagation analysis and other sources are available, finalize the system. Identify primary sites, alternate sites, routing and specific items of equipment to be deployed. **(T-3).**

A3.6.33. System Layout Documentation. When the final site, equipment and route selections are determined, it is most important to document the entire system in sufficient detail for it to be effectively engineered, constructed, operated and maintained. **(T-3).**

A3.6.33.1. Use standard procedures for identifying circuits and for utilizing cable pairs. **(T-3).**

A3.6.33.2. Prepare system layout charts showing the overall system. Site diagrams show the detail of equipment placement at each location. **(T-3).**

A3.6.33.3. Prepare detailed documentation identifying circuit layout, routing information, and equipment configuration. Engineering personnel should make a practice of reviewing database and overall networking schemes for any inaccuracies, which might preclude proper switch functioning. **Note:** Those documents and procedures deemed appropriate for command wide standardization are described in the following paragraphs. **(T-3).**

A3.6.34. Standard Cable Pair Assignments. Preplanned distribution of signal cables (fiber optic, CAT-5, 26-pair, coaxial, red colored = classified, blue colored = unclassified, etc.) is a mandatory requirement. **(T-3).**

A3.6.35. Site Layout Plans. Use site survey data to form a preliminary site layout plan. It will indicate location of major communications or subscriber facilities, antenna configurations, cable runs and other such data appropriate for the particular deployment site. **(T-3).**

A3.6.36. Link and Circuit Identification. Refer to CJCSM 6231.01D, *Manual for Employing Joint Tactical Communications*. **(T-3).**

A3.6.37. System Layout Charts. Fully utilize the skills of technical control and maintenance technicians when planning the channelization of a system. When information flow requirements for a system are known, the planner will prepare a system layout chart. It depicts the entire proposed system, number of channels available on each link, interface points, whether the trunk is through-grouped or terminated and links to other services or agencies. Digital systems will include the data rate, signal format (diphase, dipulse, etc.), multiplex signal format (MSF) and coaxial cable run distances. From this chart, technical control and maintenance personnel will prepare circuit layout information to route each circuit from end to end. **(T-3).**

A3.6.38. Circuit Layout Records (CLR). CLRs (DD Form 1441, *Circuit Data*, or suitable substitute) provide information on all circuits and systems to ensure comprehensive data is available for planning/engineering processes and in the Technical Control Facility (TCF). Initially, CLRs may be somewhat vague until network configurations become more stable. This time frame varies, depending upon the situation, but is usually between 20 to 30 days. **(T-3).**

A3.6.38.1. Each circuit should be documented in a circuit layout record. Include a copy in the circuit history folder (normally established once configurations become stable). Circuits with the same information, such as a group of trunks from one expeditionary communications switch to another, need only one CLR with all circuit numbers listed on it. Include the completed CLR in the information distributed to the TCF and any other activity acting in place of the TCF. During the deployment, file a copy of the completed CLR for reference purposes. Retain the CLR for six months after deactivating the circuit. **(T-3).**

A3.6.38.2. The circuit layout remarks section will show circuit routing and all pertinent data for each leg of the circuit. A CLR provides a complete picture of the overall circuit configuration when used with other information. Use automated products when possible. **(T-3).**

A2.6.38.3. Initiate a Telecommunications Service Request (TSR) IAW DISA 310-130-1, *Submission of Telecommunications Service Requests,* when using commercial facilities. Request service from the demarcation point on the CLR and specify the signaling, levels, etc., at the demarcation. It is necessary that all conditions be specified, in detail, because commercial companies usually have no technical equipment data available. Use equipment nomenclature as a reference for a terminal point, but not as a substitute for specific data. **(T-3).**

A3.7. Deployment/Employment. During the deployment/employment phase, the expertise of the engineering support function provides assistance activating the system and recommends initial acceptance. **(T-3).**

A3.8. Installation. The verification team prescribes the site positioning, or siting, with concurrence of the site commander. **(T-3).**

A3.8.1. Facilities. All major communications facilities, once deployed, are installed and configured by maintenance work centers for initial acceptance by technical control. **(T-3).**

A3.8.1.1. During initial setup and activation, engineering support personnel augment maintenance/operations functions to provide specific technical expertise and advice. **Note:** They should be used when requested by NCC, or the site engineer, to support troubleshooting efforts of the various maintenance work centers when trouble appears to be caused by system-level, rather than facility-level, problems. **(T-3).**

A3.8.1.2. Accomplish grounding, power application and physical connection with interfacing end items. **(T-3).**

A3.8.1.3. Allow sufficient warm-up time to make accurate checks of basic parameters. **(T-3).**

A3.8.1.4. Promptly report installation completion to the CFP, applicable operations personnel and TCF (if interfaced with it). **(T-3).**

A3.8.1.5. Operations personnel will verify the installation by making operational checks and, where applicable, the TCF must perform subsystem operational acceptance checks. **Note:** Engineering personnel are available to provide integration expertise, thereby assisting in activation of the overall communications system. **(T-3).**

A3.9. Initial Operational Acceptance. To ensure optimum facility performance, NCC accepts the facility as operational after assuring the facility meets minimum performance standards for the specific deployment equipment used. **(T-3).**

A3.10. After Actions Reporting. Forward reports resulting from a specific tasking via AF Form 209, *Communications and Information Management After-Action Report*, to the Unit Commander, deploying unit Commander and any other units involved in the deployment. Intermediate headquarters will staff each submission and provide their assessment and recommended solution for each problem they want acted upon at higher levels. **(T-3).**

Attachment 4

COMBAT COMMUNICATIONS CIVIL ENGINEERING SUPPORT EMPLOYMENT STANDARDS

A4.1. Applicability. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained combat communications units. This guidance applies to ANG and AFRC units with combat communications responsibilities. **(T-3).**

A4.2. Power Production and HVAC Support. Provide power and environmental control unit support for tactical communications equipment and missions. Power production and heating, ventilation, and air-conditioning (HVAC) will support in accordance with all applicable T.O.s, Air Force Instructions (AFI)s, and other approved publications. **(T-3).**

A4.3. Responsibilities--Power Production Support. Units will provide serviceable generators. Personnel will provide continuous reliable generator power to facilities, and maintenance response to generator malfunctions. The following items will be utilized: Generator Management, Technical Ability, Preventative Maintenance Inspections (PMI), and Safety and Environmental Awareness. **(T-3).**

A4.3.1. Generator Management. Units must demonstrate proper generator management in accordance with the criteria outlined below, Engineering Technical Letter (ETL) 13-4, *Standby Generator Design, Maintenance, and Testing Criteria,* , AFI 32-1064, *Electrical Safe Practices*, and applicable T.O.s. Generator Management includes Emergency Generators, Record Keeping, Using Agency Training, Refueling, and Safety and Environmental Awareness. **(T-3).**

A4.3.1.1. Emergency Generators. Units must identify and prioritize all generators. Units will utilize generator priority listings to ensure electrical power is restored to critical base functions and facilities. All generators shall have detailed operating instructions for the facilities served as well as accurate and detailed single-line diagrams near the generator location. Generator assets shall be tracked at a minimum by: Priority, location/facility, serial or identification number, type of generator (MEP 806, MEP 7, etc.), kilo-watt rating, fuel capacity, date and time of last refuel, and status (on/off line, damaged, destroyed, etc). **(T-3).**

A4.3.1.2. Record Keeping. All required T.O.s and records (i.e., ETL 13-4, *Standby Generator Design, Maintenance, and Testing Criteria* or AFTO Form 244, *Industrial/Support Equipment Record*; AF IMT 719, *Historical Record-Diesel-Electric Generator and System*) shall be maintained at the deployed site. Units may reproduce AF IMT 719 and use copies in the field for the inspection. Emergency Generator Operating Log or AFTO Form 244 shall be kept near the generator or inside the CE Support facility for the 24-hour period the form covers. Any deviation must be approved by the commander. **(T-3).**

A4.3.1.3. Using Agency Training. Using agency personnel (i.e., facility user, facility manager) shall be trained to start/operate generators and restore or transfer power to facilities in the event of a power failure. Site specific training will be conducted within 48 hours of S hour for 100% of site personnel. Prior to starting a generator, the user must perform a pre-operational inspection as per AFI 32-1062, *Electrical Systems, Power Plants and Generators,* Attachment 2. Document training IAW AFI 36-2201, *Air Force Training Program* and AFI 36-2232, *Maintenance Training*. **(T-3).**

A4.3.1.4. Refueling. Unit shall establish a detailed refuel plan for all generators and shall execute the refuel plan during the inspection. The refuel plan shall include the order all generators will be refueled and any contingency plan(s) in case the primary plan is not able to be executed. Both primary and alternate refuel routes will be as direct as possible avoiding delay in case of site evacuation or emergency situations. Members will perform refueling functions of owned equipment and wear all required PPE to include apron, goggles, and rubber gloves. **(T-3).**

A4.3.2. Technical Ability. Technicians must demonstrate the capability to operate and repair generators, provide electrical support, establish electrical service when required, properly install grounding systems, correctly size conductors for all circuits, and properly phase-in conductors for facilities served**.** Technicians will demonstrate the use of T.O.s during all troubleshooting and maintenance procedures**. (T-3).**

A4.3.2.1. PMI. Preventative maintenance schedules shall be developed in accordance with applicable T.O.s, manufacturer's manuals or local guidance. In addition, units will perform PMIs as required. **(T-3).**

A4.3.2.2. Safety and Environmental Awareness. Units will safely operate and maintain generators. The unit shall provide containment for petroleum spills and clean up kits for mobile generators. Units will properly handle and dispose of petroleum waste. In addition, dry chemical fire extinguishers shall be located within 25 feet of generators. Lock Out Tag Out (LOTO) will be conducted IAW AFI 91-203, *AF Consolidated Occupational Safety Instruction* and training documented IAW AFI 36-2201, *Air Force Training Program* and AFI 36-2232, *Maintenance Training*. Electrostatic Discharge kits will be available for use and training documented on any approved method. Immediate use eye wash bottles will be available and reachable in 10 seconds or less during site set-up. Transition to permanent eye wash systems providing 15 minutes of continuous flow will occur after site set-up is complete and mission transforms to sustainment. ARC Flash Personal Protective Equipment (PPE) is required when working on live electrical systems above 50 VAC IAW UFC 3-560-01, *Electrical Safety Operations and Maintenance*. **(T-3).**

A4.3.3. HVAC/R Support. Units will provide continuous reliable Heating, Ventilation, Air Conditioning and Refrigeration to facilities IAW AFPAM32-7089, *Refrigeration Management Handbook*. HVAC Support includes Technical Ability, PMIs, Recordkeeping, and Safety and Environmental Awareness. **(T-3).**

A4.3.3.1. Technical Ability. Technicians must demonstrate ability to provide, operate, troubleshoot, repair HVAC/R or heating units, and to properly charge refrigeration systems. Technicians must have EPA certification cards on their persons. Units must also demonstrate the ability to utilize backup equipment if required. **(T-3).**

A4.3.3.2. PMI. Preventative maintenance schedules shall be developed and performed as required by applicable guidance. Technicians will demonstrate use of T.O.s/commercial manuals during all troubleshooting maintenance and set-up procedures. **(T-3).**

A4.3.3.3. Record Keeping. All required T.O.s/commercial manuals and records shall be maintained at the deployed site (i.e., historical records, scheduled maintenance list, work orders). **(T-3).**

A4.3.3.4. Safety and Environmental Awareness. Technicians must use PPE and properly handle refrigerant and compressed gasses. Refrigerants may be simulated in empty cylinders or recovery tanks for the purpose of inspections. **(T-3).**

Attachment 5

COMBAT COMMUNICATIONS TACTICAL GROUNDING EMPLOYMENT STANDARDS

A5.1. General. Use this attachment in conjunction with T.O. 31-10-24, *Installation Practices: Communications Systems Grounding, Bonding, and Shielding*, for grounding/fault protection, signal reference, and lightning protection subsystems for mobile Communications-Electronic (C-E) equipment at remote sites. This attachment also provides guidance for the construction and installation of remote site central and/or facility (stand-alone) earth electrode subsystems. It also assigns responsibilities for the installation, testing, inspection and maintenance of the remote site earth electrode subsystems. References used to create this instruction include the National Electric Code; National Fire Protection Association 780; MIL-HDBK-419A, *Military Handbook Grounding, Bonding, and Shielding for Electronic Equipment and Facilities*; MIL-STD-188-124, *Military Standards for Grounding, Bonding, and Shielding*; 29CFR§1910.268, *Occupational Safety and Health Standards, Telecommunications;* and T.O. 31-10-24. It is not necessary to modify equipment for the sole purpose of complying with this instruction or T.O. 31-10-24. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained combat communications units. This guidance applies to ANG and AFRC units with combat communications responsibilities. **(T-3).**

A5.2. Responsibilities.

A5.2.1. The deployed site commander, or designated representative will appoint a grounding team consisting of one supervisor and at least two members to ensure compliance with T.O. 31-10-24 and this GM for all deployed situations. When there are fewer than four people at a site, the site personnel will be the grounding team with the ranking individual being the supervisor. **(T-3).**

A5.2.2. The deployed site commander or designated representative will consider work hours, materials, location, mission requirements etc. to determine the type of ground system required for the situation and a realistic resistance value for the site central or facility ground(s). **(T-3).**

A5.2.2.1. Grounding for a sustaining site should be designed with the anticipation of connecting the site to a central ground grid developed by the site Civil Engineer. Example grounding configurations are shown in **Figures A5.1** through **A5.5. (T-3).**

Figure A5.1. Communications Site with Central Ground.

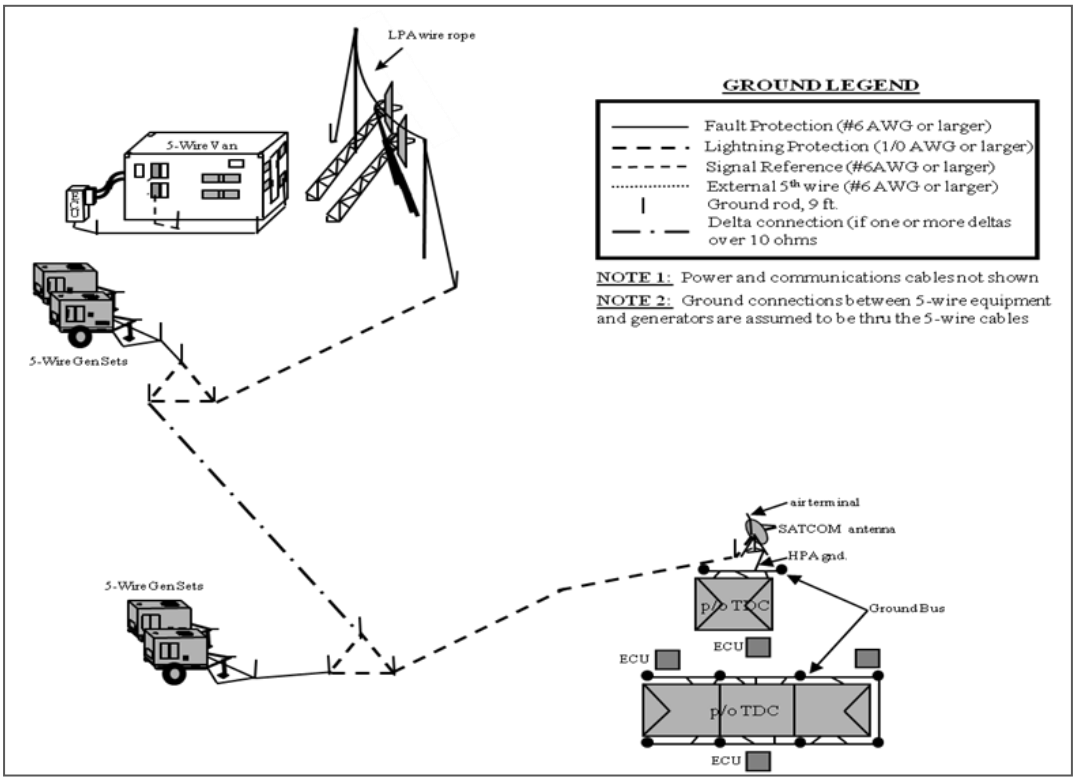


Figure A5.2. Communications Squadron and TDC/ICAP with a central ground grid bus and power pooled generator sets.

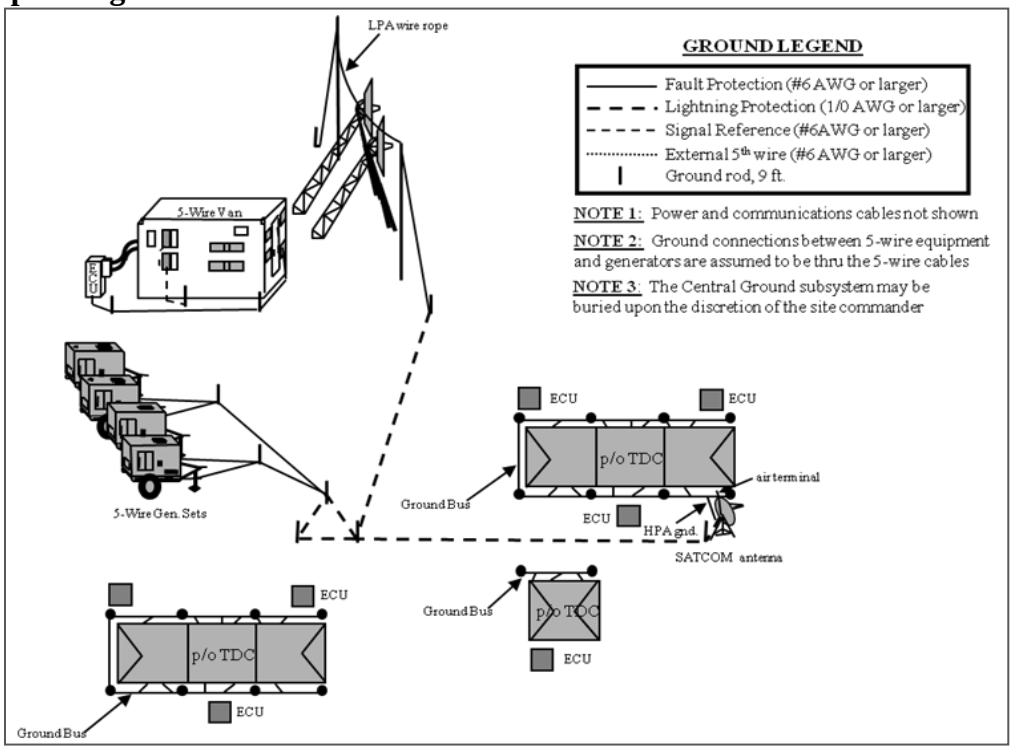


Figure A5.3. Air Control Squadron with a Central Ground.

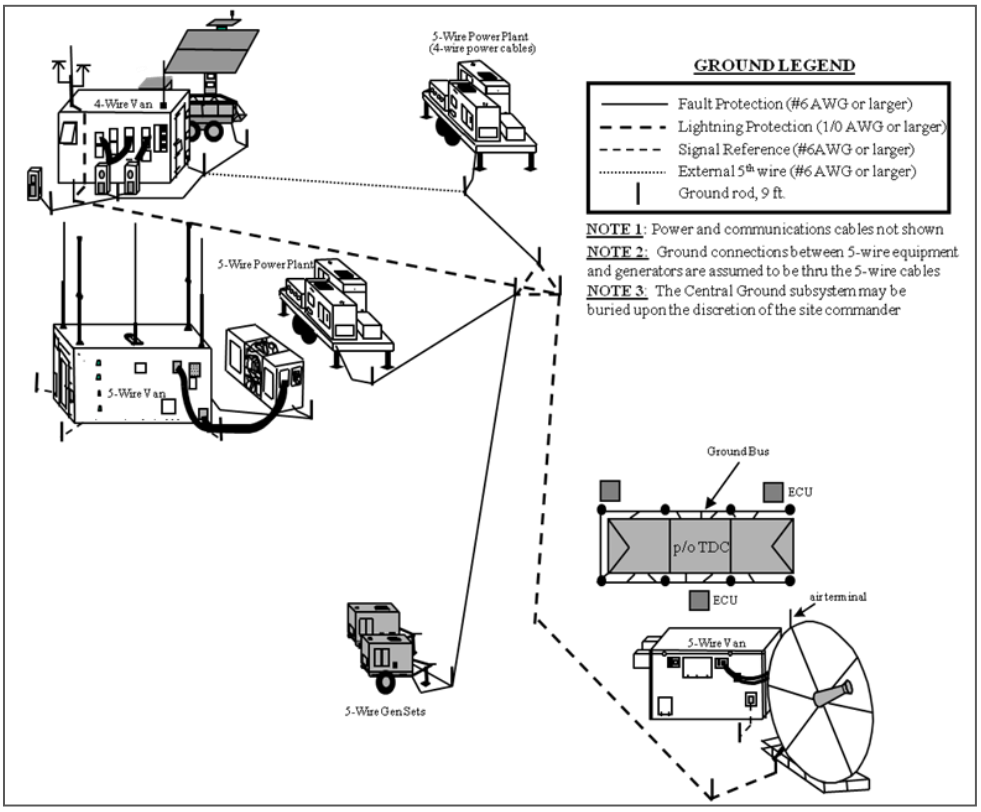


Figure A5.4. Air Control Squadron with Multiple Facility Grids.

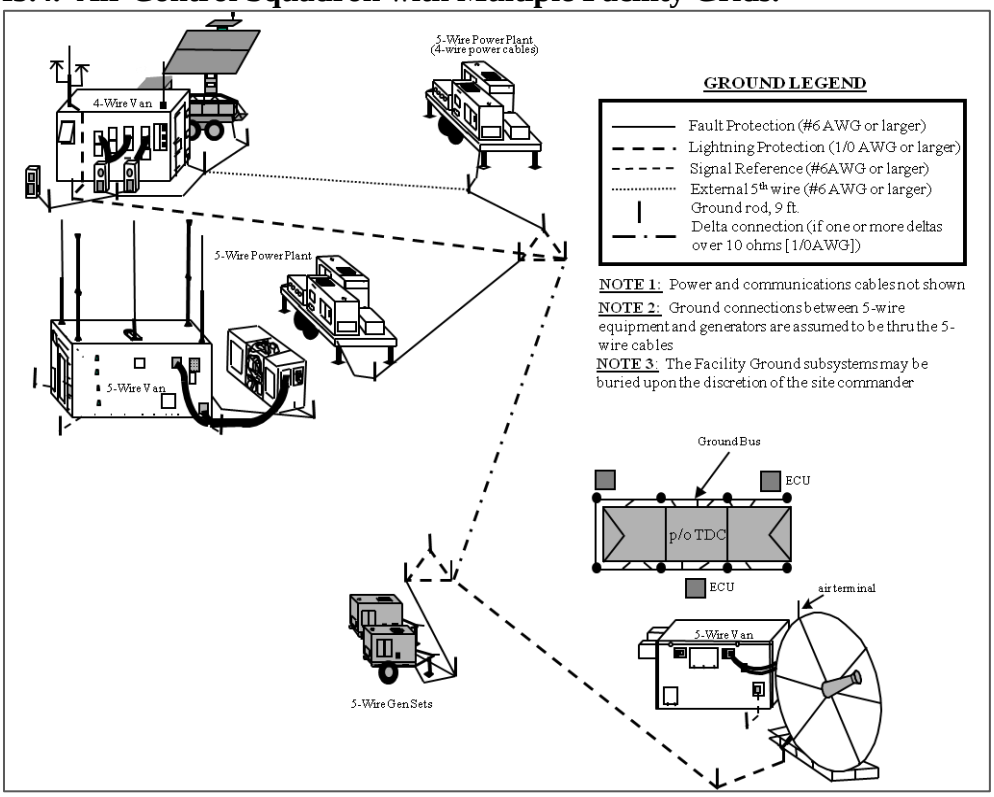
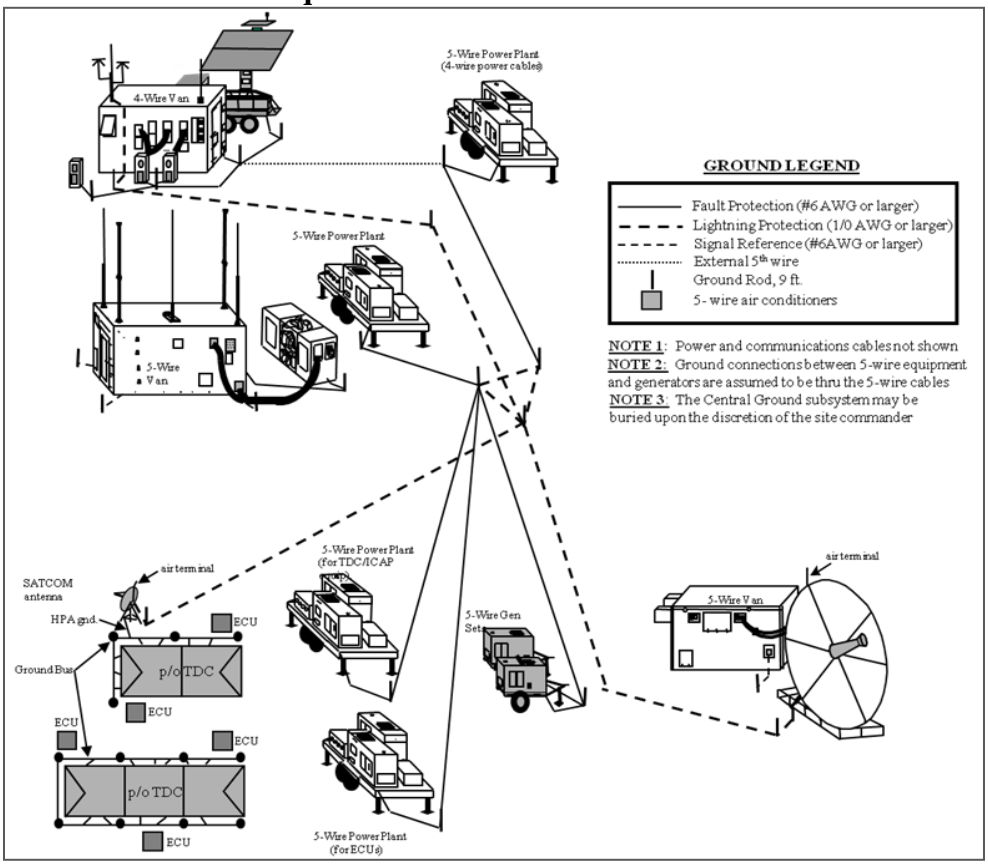


Figure A5.5. Air Control Squadron and TDC/ICAP With Central Ground and Bus.



A5.2.3. The Grounding Team Supervisor will:

A5.2.3.1. Ensure the grounding plan is included with the site layout. **(T-3).**

A5.2.3.2. Ensure site central ground subsystem or facility ground subsystems are installed at the deployed location prior to applying power to C-E equipment. Once site central ground subsystem or facility ground subsystems are in place construct a three-five foot safety cordon around the perimeter of the system. Central or facility ground grids will be identified prior to energizing connected circuits with a sign indicating resistance value, date tested, site commander or designated representatives signature seen in Figure A5.6:

Figure A5.6: Grounding Identification Sign.

"CENTRAL/FACILITY GROUND - DO NOT DISCONNECT
WITHOUT APPROVAL OF THE COMMANDER."

Date: Value: CC/Rep Signature Block:

A5.2.3.3. Establish a site grounding log. This log will show the site ground layout, ohm value(s), equipment checked, date of readings and equipment added to or deleted from the site central/facility ground system. **(T-3).**

A5.2.3.4. Ensure signal cables (except for fiber optic cables) and power cables/ground wires in parallel runs are separated by at least 18 inches. When signal cables must cross power cables or ground wires, they should do so at a 90 degree angle. **(T-3).**

A5.2.4. The Grounding Team will:

A5.2.4.1. Install and test the deployed site central or facility grounds (earth electrode subsystem) as shown in site examples **Attachment 4** through **Attachment 8**. The central/facility ground(s) will be tested using a fall-of-potential ground tester (e.g., Vibroground® Test Set, or other equipment specifically designed to test ground resistance). The design objective is a resistance of 10 ohms or less. If 10 ohms of resistance cannot be obtained, for one or more of the grids in a multi-grid system, the grids should be interconnected with 1/0 American Wire Gauge (AWG) ground wire. If 10 ohms still cannot be achieved, the grounding team chief will notify the site commander, engineer, or designated representative. They will consider facts to determine a solution for the situation and a realistic resistance value for the site central/facility ground(s). Lowering the resistance can in some cases be aided by soil modification, e.g. adding rock salt or magnesium sulfate and water in small trenches around the ground rods. **(T-3).**

A5.2.4.2. Ensure all equipment, as applicable, is properly connected to the site central or facility ground system. **(T-3).**

A5.3. General Procedures for Ground Installation.

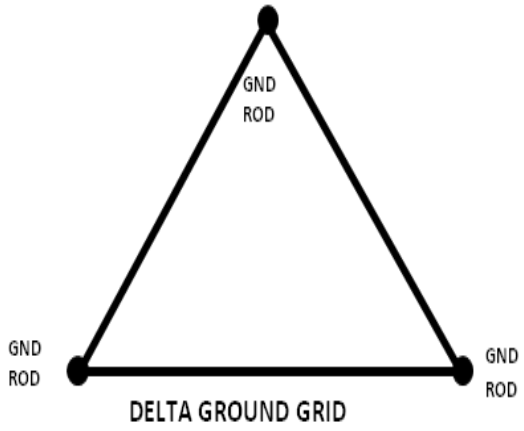
A5.3.1. General Instructions.

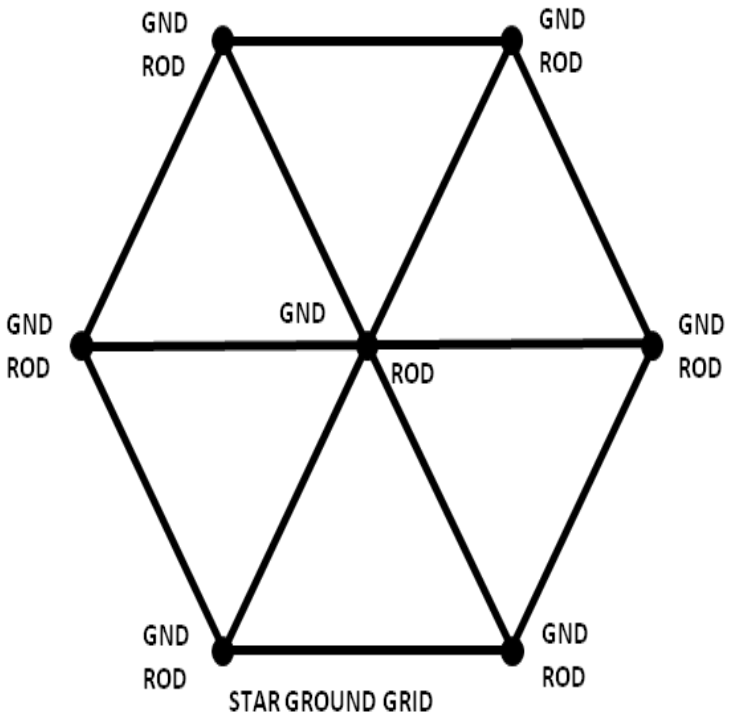
A5.3.1.1. For the purposes of this instruction the term "single ground rod," as applied to its use as the central/facility grounding point, is defined as a single or multi-sectioned ground rod with a minimum diameter of 5/8 inch and a minimum length of nine (9) ft., to allow approximately 8 ft. of the rod to come in contact with the earth. If the ground rods cannot be driven vertically due to bedrock, the rods may be driven at an angle not to exceed 45 degrees. They may be buried in a trench at least 2 ½ ft. deep with the upper end flush or below ground level, unless the wire connection can be protected. In areas of extremely rocky soils, additional ground rods, in a star formation, driven to lesser depth may be required. Individual equipment ground rods will follow the T.O. requirements, if stated, or the above criteria for diameter, recommended length and amount of earth contact. Ground Rod Grid configurations and specifications are shown in

Figure A5.7. (T-3).

"CENTRAL GROUND-DO NOT DISCONNECT
WITHOUT APPROVAL OF THE COMMANDER." **(T-3)**

Figure A5.7. Multiple Ground Rod Grid Configurations.





INTERCONNECTING WIRE: # 1/0 AWG

GROUND RODS: 9 FT. (3 x 3 ft sections)

DISTANCE BETWEEN RODS: 1.5 - 2 Times Rod Length Example:
Rod length – 9 ft Distance: 9 x
(1.5 – 2) = 13.5 ft - 18 ft

A5.3.1.2. Ground clamps must be the proper size for the ground rod in use and must provide surface-to-surface contact between the ground wire and the ground rod. Alligator clips will not be utilized unless specifically required by equipment T.O.'s or manuals. **(T-3).**

A5.3.1.3. Unless not feasible, all ground connections will be connected from top to bottom with the terminating end of the wire pointing down. This orientation will prevent the possibility of loose connections falling out of the ground rod connections. **(T-3).**

A5.3.1.4. Ensure all ground rods and clamps are free of paint, dirt, grease and oxidation. Protect ground connections by coating with No-Ox. **(T-3).**

A5.3.1.5. Locate ground rods approximately two-six ft from the equipment to be grounded and as close to the ground connection as possible. **(T-3).**

A5.3.1.6. Avoid positioning ground rods and stringing ground wire in front of entrance ways or across high traffic areas. **(T-3).**

A5.3.1.7. Do not allow the ground wire to form coils as it is laid between ground connections. **(T-3).**

A5.3.1.8. Multiple systems or C-E equipment may be connected to a single ground rod provided you use a separate clamp per connection. There is no specific limit to the number of connections to a single ground rod. **(T-3).**

A5.3.1.9. Unless otherwise specified in this instruction, T.O. 31-10-24, or the equipment T.O., the ground wire may be solid or stranded and bare or insulated. **(T-3).**

A5.3.1.10. Ground wires from equipment to ground rods will be as straight as possible with no bends sharper than 90 degrees or a bend radius of less than 8 inches. **(T-3).**

A5.3.1.11. If the site central or facility subsystem is to be installed for an extended period of time it is recommended the subsystem be buried. The determination to bury the system will be the responsibility of the site commander or the designated representative with the consultation of the Grounding Team Chief. The determining factors include but are not limited to availability/type of grounding installation equipment, manpower, and/or environmental conditions. When a below ground install is recommended it will be constructed using the following procedures. Recommendation for above ground installation will be completed in the same fashion with the exception of burring the connecting cable**. (T-3).**

A5.3.1.11.1. Dig a hole approximately 12 inches deep with sufficient circumference to allow connections to be made to the ground rod. Drive the ground rods so they are approximately 6 inches below the top of the hole and 6 inches above the bottom soil of the hole. **(T-3).**

A5.3.1.11.2. Connect the rods with #1/0 AWG bare stranded copper wire. **(T-3).**

A5.3.1.11.3. Bury the connecting #1/0 AWG cable in a 10-12 inch trench with the exception being the points at which the power systems/lightning protection will connect to the earth electrode. All other points will be backfilled. **(T-3).**

A5.3.1.11.4. When feasible, separate site facility ground grids will be connected using #1/0 AWG wire if the equipment grounded to the grids are interconnected with wire communications cables and the resistance of one or more of the grids exceeds the design value of 10 ohms. This

standard will ensure all grids are at the same potential when high resistance soil types are encountered. **(T-3).**

A5.3.1.11.5. A 3 ft. section or longer ground rod will be placed every 100 ft. on long ground runs for discharge of static build-up in the long runs. **(T-3).**

A5.3.1.11.6. If a long ground wire run needs splicing, drive a single ground rod and connect the ends with a separate clamp for each end of the splice. For this connection, a single three-foot section of rod may be used since it is for support of the connection and not the primary ground source. **(T-3).**

A5.3.1.11.7. For equipment collocated in tents (i.e., TDC/ICAP equipment) a ground bus system may be constructed around the outside perimeter of the tent. Interconnect at least one nine ft. ground rod with other rods located at intervals along the side(s) to anchor the ground wire. Using ground clamps, connect a continuous #6 AWG wire to each ground rod. The number of ground rods needed and the length of the system depends on tent size and equipment location. Use enough ground rods to securely anchor the ground wire. If the wire crosses a tent entrance, install a cable trough or bury the wire at the entrance to eliminate a tripping hazard. Equipment in the tent may be grounded, as required, to any point on the bus. Due to the use of the five wire system the ground bus will not need to be connected to the MSG. **(T-3).**

A5.3.1.11.8. If two or more sets of generators, prime and back-up/technical and mechanical, are co-located they may utilize one nine foot common ground rod. Each pair will be connected directly to the site central ground grid with #6 AWG or larger. **(T-3).**

A5.3.2. Earth Electrode Subsystem (EES).

A5.3.2.1. To form the facility or central ground system, the fault protection, signal reference and lightning protection subsystems will be established IAW equipment T.O.s and connected to the EES. **(T-3).**

A5.3.2.2. The EES may consist of a single ground rod or interconnected ground rods in a multi-rod configuration. The type of subsystem selected will depend on site design and/or soil type/resistance. The multi-rod configurations recommended are the delta for normal soils, or the star arrangement for rocky or other problem soils (see **Figure A5.1**). **(T-3).**

A5.3.2.3. The distance the rods are to be spaced in multi-rod configurations will be 1½ to 2 times the length of the longest ground rod in the system. For example, if the longest rod in a system is nine ft, then the spacing for the rods will be 13.5 to 18 ft. (see **Figure A5.1**). **(T-3).**

A5.3.2.4. The inter-connecting wires in a ground grid will be stranded #1/0 bare AWG. **(T-3).**

A5.3.3. Fault Protection Subsystem (FPS). **(T-3).**

A5.3.3.1. Ensure generators are properly connected to earth electrode subsystem. Measure generator chassis-to-earth electrode subsystem resistance with an ohmmeter to ensure ground terminal connections between the equipment chassis and ground rod are not loose or corroded. The reading should be less than one ohm. If greater resistance is indicated, take the necessary actions to correct the problem before connecting power cables or starting generator. **(T-3).**

A5.3.3.2. Power distribution boxes and other equipment with power connections that include separate ground and neutral conductors (e.g. 208-volt/3-phase/5-wire, 120-volt/1-phase/3-wire) are connected to the fault protection subsystem through the five wire power cable. They do not

require a separate fault protection ground cable unless the equipment T.O. specifically requires an additional connection. The neutral power connection of other configurations may not be used as a fault protection ground. **(T-3)**

A5.3.3.3. For other equipment, before connecting signal or power cables to the equipment, FIRST connect a ground wire from the power panel ground terminal to the equipment ground rod as per the equipment T.O. The size of the ground wire from the power panel ground connection of the van, shelter or other equipment to the earth electrode system will be #6 AWG or larger. **(T-3).**

A5.3.3.3.1. Check for AC and DC voltage difference between the ground grid and ground wire of equipment to be added. If voltage difference greater than 50 volts is indicated, troubleshoot to determine and eliminate electrical source and recheck for voltage difference. If less than two volts difference is indicated, connect ground wire. If the voltage difference is between two and 50 volts, use one end of an insulated jumper cable to the ground rod and the other end to the equipment ground wire, connect the ground wire to the ground rod, and remove the jumper. **(T-3).**

A5.3.3.3.2. On four-wire equipment, when using a four-to-five-wire adapter, connect an external fault protection ground wire from the power panel ground terminal of the equipment through a clamp on the equipment ground rod, to the ground terminal of the adapter. From the adapter to the generator set, the connection is made within the power cable. **(T-3).**

A5.3.3.3.3. On four-wire equipment, when a four-to-five-wire adapter is not used, the fault protection ground wire must be run from the power panel ground terminal of the equipment to the ground terminal of the generator set. This wire must be continuous with no breaks or splices and cannot be terminated at a power distribution box. The recommended method of connection is to route the wire from the equipment power panel ground terminal, through a clamp on the equipment ground rod, through a clamp on the generator ground rod, to the ground terminal on the generator set. If the external fault protection ground wire is physically attached to the power cable it is considered part of the cable and will be green insulated or green insulated with yellow stripes. Attach the wire to the power cable using black tie straps, or green or black duct tape at least 1/4" wide. Allow approximately 12" between securing points. **(T-3).**

A5.3.3.3.4. Stand-alone, four-wire air conditioners and heat exchangers may have their own ground rod, however, the ground terminals or rods of these units will be connected to the ground rod of their power source (i.e., shelter or generator set). Co-located units may share a common ground rod as long as a separate clamp is used for each connection. **(T-3).**

A5.3.3.3.5. To remove equipment from the ground grid, turn off equipment to be removed and disconnect from power source. Next, connect insulated jumper wire between ground rod and ground wire to be disconnected. Disconnect ground wire and remove jumper wire LAST. **(T-3).**

A5.3.3.3.6. For small communications equipment (e.g., personal computers, ground radios, TSSRs, etc.), the third wire contained within the power cord provides a sufficient connection to ground, provided the generator set is properly grounded--unless the equipment T.O. specifically requires an additional ground. **(T-3).**

A5.3.4. Lightning Protection Subsystem (LPS).

A5.3.4.1. Lightning protection devices will be installed IAW equipment T.O.s. **(T-3).**

A5.3.4.2. The air terminal or lightning protection device ground rod will be connected DIRECTLY to the site earth electrode subsystem using #1/0 AWG or larger ground wire. This ground wire will be as short as possible, with no coils or sharp turns and unless otherwise specified located within two-six feet from the equipment being protected. **(T-3).**

A5.3.4.3. The wire used in the earth electrode subsystem grid to which a lightning protection device is connected must be #1/0 AWG bare stranded wire. These connections will be at different ground rods than the Fault Protection Subsystem or Signal Reference Subsystem. **(T-3).**

A5.3.5. Signal Reference Subsystem (SRS).

A5.3.5.1. The signal reference subsystem provides a means to reduce system noise by providing a common reference between sources and loads. **(T-3).**

A5.3.5.2. In shelterized systems, the SRS is normally connected to the FPS at the shelter ground lug. Where a separate SRS is required by equipment technical directives, it should be installed after the equipment is connected to the FPS. Multiple signal panel ground terminals located on collocated equipment may be "daisy chained" with a continuous run of #6 AWG wire. **(T-3).**

A5.3.5.3. The SRS will be isolated from the fault protection system and lightning protection system, and connected to the EES at a single point using #6 AWG wire or larger at a different ground rod than the FPS and LPS. Equipment connected by wired connections (e.g. not via RF or fiber optic) should be connected to a common EES. **(T-3).**

A5.4. Procedures for Ground Installation While in Garrison. An in-garrison facility ground will be coordinated with base civil engineers. If the facility ground was installed by the unit, maintenance and certification of the facility ground will be reviewed by base civil engineering. The unit, not base civil engineers, are responsible for an annual inspection, test of the facility grounds, and documentation in the facility manager's files. The central grounding point will be identified with a danger sign, which will be presented as seen in **Figure A5.7**:

Figure A5.7. Danger Sign for Central Grounding Point.

"CENTRAL GROUND-DO NOT DISCONNECT
WITHOUT APPROVAL OF THE COMMANDER." **(T-3)**

A5.5. Bulk Fuel Storage Grounding.

A5.5.1. Refueling equipment, while parked/stored (e.g., fuel trucks, trailers, and drums) containing Class I fuel (e.g., Motor Gasoline and Jet Propellant Fuel - 4(JP-4)) will be grounded with a separate static ground. This ground will not be connected to site power, signal, equipment fault protection, lightning protection, or any other grounds. **(T-3).**

A5.5.2. It is recommended, but not required, that the procedures in **paragraph 5.1** also be applied to parked/stored refueling equipment containing Class II fuels, (e.g., diesel and JP-8). **(T-3).**

A5.5.3. During refueling of ground support equipment and vehicles, a ground strap will be used between the equipment being fueled and the refueling equipment. **(T-3).**

A5.6. Grounding Kits.

A5.6.1. Each unit should establish a kit for installing a grounding system when deployed. Suggested kit contents are listed in **Table A5.1.** Quantities may be tailored to meet mission requirements for all systems requiring grounding, but not limited to existing systems. The kit or kits may provide for contingencies such as leap concept, whereby a portion of the unit stays in-place while another part re-deploys to establish a new site. **(T-3).**

A5.6.2. The Grounding Kit items should be maintained in sufficient quantities to meet mobility requirements. All materials should be kept in-garrison in a "hands-off" status ready for deployment. Work centers should maintain an adequate supply of grounding materials for its individual equipment needs. **(T-3).**

Table A5.1. Grounding Kit.

ITEM	CBCS/ACS	
#1/0 AWG (bare ; stranded)	300 ft.	
#6 AWG (bare or insulated; solid or stranded)	600 ft.	
Rod, grounding (each rod is composed of 3 sections, 5/8" diameter) Total: 9 ft	10	
Slide hammer or Impact Driver/Punjar	1	
Clamp grounding:		
S53505 Slip-Joint Nut	10	
VTA-4 Splice	10	
¾ in. Clamp	100	
Safety goggles	1 pair per team member	
Hammer, sledge	2	
Box wrench set	2	
File, flat bastard, w/handle	2	
Tape measure: 100ft	2	
Wire brush	2	
Flagging Tape	4 rolls	
Emery paper	8 sheets	
Magnesium sulfate (Epsom salts)*	20 lbs.	
Fall-of-potential test set (Vibroground® or equiv.)	1	
Water	As needed	
Sign: "CENTRAL/FACILITY GROUND - DO NOT DISCONNECT WITHOUT APPROVAL OF THE COMMANDER"	As needed per delta/facility ground installed.	
Other items as determined by unit		

Note:
1. The above items are suggestions. Adjust quantities and composition as mission requirements dictate.

***** With guidance from the environmental compliance officer the site commander or designated representative will determine the proper use of magnesium sulfate to decrease earth electrode subsystem resistance.

Attachment 6

COMBAT COMMUNICATIONS RF TRANSMISSION SYSTEMS EMPLOYMENT STANDARDS

A6.1. General. This addendum pertains to Radio Frequency (RF) Transmission Systems employed by Combat Communications Squadrons. This addendum should be utilized as a general employment guide with expected UTC setup times. The overall intent of this document is to standardize RF Transmission Systems employment practices across the Combat Communications community. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained combat communications units. This guidance applies to ANG and AFRC units with combat communications responsibilities. **(T-3).**

A6.2. Combat Communications RF Transmissions Systems. Combat Communications Squadrons utilize RF Transmission UTC's supporting TDC packages and other specifically tailored missions. RF transmission systems will be setup in accordance with applicable T.O.s, AFIs, COTS manuals, Satellite Access Authorizations (SAA), Army Forces Strategic Command Circular 1 (ASC-1), DISA circulars and other approved publications. **(T-3).**

A6.3. Combat Communications RF Transmissions Systems Proficiencies. Units demonstrate the ability to setup, operate and maintain RF Transmission Systems to include: Transportable Satellite Systems, Wideband Systems, Manpack radios, Satellite phone packages (International Maritime Satellite (INMARSAT), Broadband Global Area Network (BGAN) and Iridium satellite phones). Units will provide continuous reliable data links and maintenance response to RF transmission systems. **(T-3).**

A6.3.1. Typical 3D1X3 proficiencies: Satellite Access, Link Activation, Link Testing, Technical Ability and Record Keeping. **(T-3).**

A6.3.1.1. Satellite Access. Technicians must demonstrate proper satellite access procedures using Replacement Frequency Modulation Order Wire (RFMOW) in accordance with ASC-1 for DSCS satellites and commercial satellite access procedures for commercial Ka, Ku and C band satellites. **(T-3).**

A6.3.1.2. Link Activation. Technicians must demonstrate proficiency in trouble shooting equipment and configurations to establish a testable RF link. **(T-3).**

A6.3.1.3. Link Testing. The technician must demonstrate black side (unencrypted modem to modem) link testing IAW DISA Circular 300-175-9, *Standards* if utilizing X-band in legacy configurations. If utilizing Internet Protocol Modems, (iDirect® in ICEv3) the link will be suitably tested for reliability. **(T-3).**

A6.3.1.4. Technical Ability. 3D1X3s must demonstrate proficiency in the following areas:

A6.3.1.4.1. Adherence to T.O.s and commercial manuals at all times. **(T-3).**

A6.3.1.4.2. Antenna erection. **(T-3).**

A6.3.1.4.3. Antenna system anchoring. **(T-3).**

A6.3.1.4.4. Installation of associated grounding systems. **(T-3).**

A6.3.1.4.5. Installation of associated lightning protection systems. **(T-3).**

A6.3.1.4.6. Electronic and mechanical trouble shooting. **(T-3).**

A6.3.1.4.7. System operations. **(T-3).**

A6.3.1.4.8. System maintenance. **(T-3).**

A6.3.1.5. Record Keeping. Technicians will maintain maintenance records MSL, Ground Mobile Forces (GMF) status reporting log (if RFMOW is not operational) and maintenance data documentation). **(T-3).**

A6.4. RF Transmission Systems Employment Guides. ***Note**: All listed UTC setup times are general and can be affected by many things such as weather, terrain, equipment, technician's proficiency, equipment pre-configuration, hub spoke configuration and DISA required test times. **(T-3).**

A6.4.1. AN/USC-60A TRI-BAND SATCOM or suitable commercial VSAT terminal. **(T-3).**

A6.4.1.1. UTC 6KAMG, TRI-BAND SATCOM can be setup in four hours after initial site power is available. **(T-3).**

A6.4.1.2. Ensure equipment is located in an area identified by ADVON team or site engineer. **(T-3).**

A6.4.1.3. Conduct Initial Safety Briefing and document on MSL with start time of site setup. **(T-3).**

A6.4.1.3.1. Ensure all personnel are properly using required PPE when installing equipment (gloves, hard hat, hearing protection and safety glasses). **(T-3).**

A6.4.1.4. Document initial setup on AFTO 349, *Air Force Maintenance Data Collection Record*. Obtain Job Control Number (JCN) from CFP. **(T-3).**

A6.4.1.5. Begin setup of AN/USC-60A IAW AN/USC-60A Technical Manual DN3190, *Operation and Unit Level Maintenance Manual, Flyaway Triband Satellite Terminal,* Vol. I, Chapter 2. **(T-3).**

A6.4.1.6. Document time of antenna erection completion and electronics cases setup on MSL. **(T-3).**

A6.4.1.7. Before power is applied ensure the antenna, lightning protection and electronics cases are grounded IAW T.O. 31-10-24, AN/USC-60A Technical Manual DN3190 ,Vol. I, and Addendum D. Antenna lightning protection must be connected to the site master station ground. **(T-3)**.

A6.4.1.8. Program electronics cases IAW SAA or commercial cut sheet (if utilizing Ku or C band) and mission requirements. **(T-3).**

A6.4.1.9. Locate the satellite using SAA azimuth, elevation and frequency data if utilizing X band or commercial cut sheet (if utilizing Ku or C band). **(T-3).**

A6.4.1.9.1. If operational, the beacon tracking system must be used on military X band satellites. **(T-3).**

A6.4.1.10. Strap and load RFMOW encryption device IAW RFMOW Manual TM 11-5895-1780-13&P Rev 1, *Replacement Frequency Modulated Orderwire Operators Manual*, appendix

C and Technical Data Package (TDP) (if utilizing military X band). If utilizing Ku or C band, skip to step **A6.4.1.12. (T-3)**

A6.4.1.11. Access the satellite IAW ASC-1 Volume 1, Version 5, Sections 7.9, Army Space Circular-1,. and 8.2 if utilizing X band. Access the satellite IAW commercial satellite service providers instructions if utilizing Ku or C band. **(T-3).**

A6.4.1.12. Document satellite acquisition time on MSL. **(T-3).**

A6.4.1.13. If ICEv3 is utilized, skip to **A6.4.2. (T-3).**

A6.4.1.14. If a legacy network will be utilized (Enhanced Tactical Satellite Signal Processing (ETSSP) and or Promina®), perform a black end to end circuit test (modem to modem) with the Fireberd® test set IAW DISA Circular 300-175-9, Chapter 3.4.1.1. **(T-3).**

A6.4.1.15. Document black end to end test on MSL. **(T-3).**

A6.4.1.16. If an ETSSP is utilized, program IAW TDP and connect modem to the Tactical Satellite Signal Processor. **(T-3).**

A6.4.1.17. Document ETSSP lock on MSL. **(T-3).**

A6.4.1.18. Hand over circuit actions to tech control. **(T-3).**

A6.4.1.19. If ICEv3 is utilized, load option file and integrate L-band IF to iDirect® modem. **(T-3).**

A6.4.1.20. Perform an appropriate link test (ping through the distant end IP modem) and then hand over circuit actions to tech control. **(T-3).**

A6.4.1.21. Close job on AFTO 349 and notify chain of command of equipment status. **(T-3).**

A6.4.2. AN/TSC-179 Ground Multi-band Terminal (GMT). **(T-3).**

A6.4.2.1. UTC 6KJA1, GMT can be setup in 4-12 hours after initial site power is available depending on configuration. **(T-3).**

A6.4.2.2. Ensure equipment is located in area identified by the ADVON team or site engineer. **(T-3).**

A6.4.2.3. Conduct Initial Safety Briefing and document on MSL with start time of site setup. **(T-3).**

A6.4.2.3.1. Ensure all personnel are properly using required PPE when installing equipment (gloves, hard hat, hearing protection and safety glasses). **(T-3).**

A6.4.2.4. Document initial setup on AFTO 349. Obtain Job Control Number (JCN) from maintenance control. **(T-3).**

A6.4.2.5. Start setup of GMT IAW TO 31R2-2TSC179-1, *Operation and Unit Level Maintenance Manual, AN/TSC-179, Ground Multi-Band Terminal (GMT),* Chapter 2. **(T-3).**

A6.4.2.6. Document time of antenna erection completion and electronics cases setup on MSL. **(T-3).**

A6.4.2.7. Before applying power, ensure the antenna, lightning protection and electronics cases are grounded IAW TO 31R2-2TSC179-1 and Addendum D. Antenna lightning protection must be connected to the site master station ground. **(T-3).**

A6.4.2.8. Program electronics cases IAW SAA, military X/Ka band or commercial cut sheet (if utilizing Ka, Ku or C band), and mission requirements. **(T-3).**

A6.4.2.9. Strap and load RFMOW encryption device IAW RFMOW Manual TM 11-5895-1780-13&P Rev 1, *Replacement Frequency Modulated Orderwire Operators Manual,* Appendix C and TDP (if utilizing military X band). **(T-3).**

A6.4.2.10. Access the satellite IAW ASC-1 Volume 1, Version 5, Sections 7.9 and 8.2 if utilizing X/Ka band and commercial satellite service providers instructions if utilizing Ka, Ku or C band. **(T-3).**

A6.4.2.11. Document satellite acquisition time on MSL. **(T-3).**

A6.4.2.12. If ICEv3 is utilized, skip to **A6.4.2.18. (T-3).**

A6.4.2.13. If a legacy network will be utilized (ETSSP and or Promina®), perform a black end to end circuit test (modem to modem) with the Fireberd® test set IAW DISA Circular 300-175-9 Chapter 3.4.1.1. **(T-3).**

A6.4.2.14. Document black end to end test on MSL. **(T-3).**

A6.4.2.15. If an ETSSP is utilized, program IAW TDP and connect modem to TSSP. **(T-3).**

A6.4.2.16. Document ETSSP lock on the MSL. **(T-3).**

A6.4.2.17. Hand over circuit actions to tech control. **(T-3).**

A6.4.2.18. If ICEv3 is utilized, load option file and integrate L-band IF to iDirect® modem at this time. **(T-3).**

A6.4.2.19. Perform an appropriate link test (ping through the distant end IP modem) and then hand over circuit actions to tech control. **(T-3).**

A6.4.2.20. Close job on AFTO 349 and notify chain of command of equipment status. **(T-3).**

A6.4.3. OE-593F Quadband Large Aperture Antenna (QLAA).

A6.4.3.1. UTC 6KABS can be set up in four hours after initial site power (S+7). **(T-3).**

A6.4.3.2. Ensure equipment is located in area identified by the ADVON team or site engineer. **(T-3).**

A6.4.3.3. Conduct Initial Safety Briefing and document on MSL with start time of site setup. **(T-3).**

A6.4.3.3.1. Ensure all personnel are properly using required PPE when moving or installing equipment (gloves, hard hat, hearing protection and safety glasses). **(T-3).**

A6.4.3.4. Document initial setup on AFTO 349. Obtain Job Control Number (JCN) from deployed maintenance control. **(T-3).**

A6.4.3.5. Start setup of QLAA IAW L3 Commercial Manual DN4005 Rev 5, Section 5, paragraph 2-5. **(T-3).**

A6.4.3.6. Ensure QLAA is grounded IAW L3 Commercial Manual DN4005 Rev 5 and Addendum D. **(T-3).**

A6.4.3.7. Document time of completed antenna erection on MSL. **(T-3).**

A6.4.3.8. Access the satellite IAW ASC-1 Volume 1, *Army Space Circular-1*,Version 5, Sections 7.9 and 8.2 if utilizing X/Ka band and commercial satellite service providers instructions if utilizing Ku or C band. **(T-3).**

A6.4.3.9. Document satellite acquisition time on MSL. **(T-3).**

A6.4.3.10. Perform a black end to end circuit test with Fireberd® test set IAW DISA Circular 300-175-9 Chapter 3.4.1.1. (if using serial SATCOM). **(T-3).**

A6.4.3.11. Document test on MSL. **(T-3).**

A6.4.3.12. After initial setup procedures are completed, and a successful black end to end test is accomplished, pass data to technical control and close job with maintenance control. **(T-3).**

A6.4.4. N-TSC-198V1 TRI-BAND SATCOM TERMINAL.

A6.4.4.1. UTC 6KJAL, TRI-BAND SATCOM can be setup in one hour after initial site power is available.

A6.4.4.1.1. Ensure equipment is located in an area identified by ADVON team or site engineer.

A6.4.4.2. Conduct Initial Safety Briefing and document on MSL with start time of site setup.

A6.4.4.2.1. Ensure all personnel are properly using required PPE when installing equipment (gloves, hard hat, hearing protection and safety glasses).

A6.4.4.3. Document initial setup on AFTO 349, *Air Force Maintenance Data Collection Record*. Obtain Job Control Number (JCN) from CFP.

A6.4.4.4. Begin setup of AN/TSC-198V1 IAW Commercial Manual 55-001053-01 Ver. C

A6.4.4.5. Document time of antenna erection completion and electronics cases setup on MSL.

A6.4.4.6. Program electronics cases IAW SAA or commercial cut sheet (if utilizing Ku band) and mission requirements.

A6.4.4.7. Locate the satellite using SAA azimuth, elevation and frequency data if utilizing X band or commercial cut sheet (if utilizing Ku).

A6.4.4.8. If operational, the beacon tracking system must be used on military X band satellites.

A6.4.4.9. Access the satellite IAW ASC-1 Volume 1, Version 5, Sections 7.9, Army Space Circular-1, and 8.2 if utilizing X or Ka band. Access the satellite IAW commercial satellite service providers instructions if utilizing Ku.

A6.4.4.10. Document satellite acquisition time on MSL.

A6.4.4.11. Load option file and integrate L-band IF to iDirect modem.

A6.4.4.12. Perform an appropriate link test (ping through the distant end IP modem) and then hand over circuit actions to tech control.

A6.4.4.13. Close job on AFTO 349 and notify chain of command of equipment status.

A6.4.5.1. GEN 5 PANTHER DUAL-BAND SATCOM TERMINAL.

A6.4.5.1.2. UTC 6KRAP, TRI-BAND SATCOM can be setup in one hour after initial site power is available.

A6.4.5.1.3. Ensure equipment is located in an area identified by ADVON team or site engineer.

A6.4.5.2. Conduct Initial Safety Briefing and document on MSL with start time of site setup.

A6.4.5.2.1. Ensure all personnel are properly using required PPE when installing equipment (gloves, hard hat, hearing protection and safety glasses).

A6.4.5.3. Document initial setup on AFTO 349, *Air Force Maintenance Data Collection Record*. Obtain Job Control Number (JCN) from CFP.

A6.4.5.4. Begin setup of GEN 5 PANTHER IAW Commercial Manual 0170-0150-02 Rev A.

A6.4.5.5. Document time of antenna erection completion and electronics cases setup on MSL.

A6.4.5.6. Program electronics cases IAW SAA or commercial cut sheet (if utilizing Ku band) and mission requirements.

A6.4.5.7. Locate the satellite using SAA azimuth, elevation and frequency data if utilizing X band or commercial cut sheet (if utilizing Ku).

A6.4.5.8. If operational, the beacon tracking system must be used on military X band satellites.

A6.4.5.9. Access the satellite IAW ASC-1 Volume 1, Version 5, Sections 7.9, Army Space Circular-1, and 8.2 if utilizing X band. Access the satellite IAW commercial satellite service providers instructions if utilizing Ku.

A6.4.5.10. Document satellite acquisition time on MSL.

A6.4.5.11. Load option file and integrate L-band IF to iDirect modem.

A6.4.5.12. Perform an appropriate link test (ping through the distant end IP modem) and then continue with backend equipment setup.

A6.4.5.13. Close job on AFTO 349 and notify chain of command of equipment status.

A6.4.6. SWE-DISH CCT-120 KU-BAND SATCOM TERMINAL.

A6.4.6.1. UTC 6KABV, KU-BAND SATCOM can be setup in one hour after initial site power is available.

A6.4.6.1.1. Ensure equipment is located in an area identified by ADVON team or site engineer.

A6.4.6.2. Conduct Initial Safety Briefing and document on MSL with start time of site setup.

A6.4.6.2.1. Ensure all personnel are properly using required PPE when installing equipment (gloves, hard hat, hearing protection and safety glasses).

A6.4.6.3. Document initial setup on AFTO 349, *Air Force Maintenance Data Collection Record*. Obtain Job Control Number (JCN) from CFP.

A6.4.6.4. Begin setup of SWEDISH CCT-120 IAW Commercial Manual CCT-INSTRU-026 Rev 2.6.

A6.4.6.5. Document time of antenna erection completion and electronics cases setup on MSL.

A6.4.6.6. Program electronics cases IAW commercial cut sheet and mission requirements.

A6.4.6.7. Locate the satellite using SAA azimuth, elevation and frequency data if utilizing commercial cut sheet.

A6.4.6.8. Access the satellite IAW commercial satellite service providers.

A6.4.6.9. Document satellite acquisition time on MSL.

A6.4.6.10. Load option file and integrate L-band IF to iDirect modem.

A6.4.6.11. Perform an appropriate link test (ping through the distant end IP modem) and then continue with backend equipment setup.

A6.4.6.12. Close job on AFTO 349 and notify chain of command of equipment status.

Attachment 7

COMBAT COMMUNICATIONS NETWORK OPERATIONS EMPLOYMENT STANDARDS

A7.1. General. The following UTCs are the core of Combat Communications TDC. They are designed to provide initial activation of core voice (Secure/Non secure), data services (NIPRNet, SIPRNet), and radio (LMR) to support contingency operations. These services are provided by the deployment of specific UTCs: 6KTFB, 6KTFC, and 6KTFD and 6KTFM. This guidance applies to HQ AFSPC and all HQ AFSPC owned and gained combat communications units. This guidance applies to ANG and AFRC units with combat communications responsibilities. **(T-3).**

A7.2. Network Employment UTCs.

A7.2.1. TDC Core Capability (6KTFB and 6KTFM). This core capabilities UTC is intended to establish a base Network Control Center (NCC) and will support a base population of 50-150 users within a 100 meter radius with user provided IA compliant instruments. The UTC provides 8 SIPRNet, 8 NIPRNet and 8 voice capability for users in a communications café and can support an additional 40 SIPRNet, 40 NIPRNet, and 40 VoIP connections**. (T-3).**

A7.2.1.1. ACS/ACOMS Network Employment Standards:

A7.2.1.1.1. CRCs typically require up to 40 SIPRNet, NIPRNet, and voice drops supporting up to 150 users. Deployed ACOMS require up to 15 drops for a like number of users. **(T-3).**

A7.2.1.2. ASOC Network Employment Standards.

A7.2.1.2.1. ASOCs typically require rapidly deployable, lightweight, and agile communications systems providing 5MB (up/down) bandwidth for SIPRNet, NIPRNet, and CENTRIX connectivity to execute tactical control of air assets and integration in support of land component commanders. ASOCs also require digital secure voice and analog nonsecure voice capabilities. **(T-3).**

A7.2.1.3. This UTC is dependent on several factors for employment. Satellite communications must be established to provide reach-back capability. The transmission media must be a separately tasked UTC (e.g. 6KAMG (AN/USC-60A), 6KJA1 (AN/TSC-179, GMT)). Test equipment must also be added to validate network connectivity to the site if the UTC is deployed as a standalone UTC. **(T-3).**

A7.2.1.4. Personnel requirements to support this UTC consist of eight personnel. One each of the following AFSCs are required: 17DXX, 3D1X2, 3D1X1, 3E0X2, 3D0X2, and 3D0X3. Force provider may substitute a 3D100 for 17DXX.

A7.2.1.4.1 For 3E personnel, all electrical work must be performed in accordance with AFI 32-1064. Use of two-person operations is not subject to waiver, even in a non-permissive environment. Electrically trained, non-3EXXX personnel may assist 3E072 members as secondary safety when no additional 3E0XX or 3E1XX personnel are available. 3E072 members are responsible for all secondary safety personnel supervision and training in accordance with AFI 32-1064 para 2. Document all required training on AF Form 55, *Employee Safety and Health Record* and mandate that all members executing electrical safety duties properly utilize protective equipment. **(T-3).**

A7.2.1.5. This UTC may also be used in operations outside of the force module construct, such as for a small Forward Operating Location (FOL) or during base draw down. When used in this capacity it provides a standalone capability designed for use in situations where scalability is not required (e.g. eight SIPRNet, eight NIPRNet, and eight Voice). **(T-3).**

A7.2.1.6. Information Assurance In-Garrison actions require all Information Assurance Officers (IAOs) must be fully trained, certified and appointed in writing, by their squadron commander. All mission systems will be scanned and checked for vulnerabilities and patches. All systems, laptops and external hard drives will be properly marked with the classification labels as appropriate; i.e. SF 710, *Unclassified Label for ADP Media in SCI Facilities* for Unclassified machines, SF 707, *Secret ADP Media Classification Label* for Secret machines. Systems will be regularly checked by IAOs and Server Administrators for vulnerabilities; the results will be maintained by IAOs and the status of systems will be reported to the appropriate communications squadron commander for asset availability. IAOs will comply with AFI 33-200, *Information Assurance (IA) Management* for all other IA concerns. **(T-3).**

A7.2.1.7. Information Assurance while deployed requires, in addition to in-garrison requirements, IAOs to utilize the Designated Approval Authority's (DAA) Trusted Facility Manual for the AOR the unit will be serving in. If a DAA is not assigned, or if a Trusted Facility Manual does not exist, the Special Instructions for Communicators (SPIN-C) will be used to determine how IA procedures will proceed. The SPIN-C (having specific details tailored to the AOR) will be used in conjunction with AFI 33-200. If there are any discrepancies on policies/procedures between the Trusted Facility Manual for TDC, SPIN-C or AFI 33-200, the A6 or joint equivalent will make the final determination on how to proceed. **(T-3).**

A7.2.2. TDC Expansion (6KTFC). This UTC provides bridging for 6KTFB to 6KTFD and consists of switches, routers, GBS, and transmission media necessary to compliment 6KTFD to expand the sites services. This UTC also consists of legacy equipment e.g. Promina®, Basic Access Module (BAM), and Large Voice Module (LVM) to support other possible TDC mission requirements. It also provides expanded LMR capabilities and additional manning to sustain continuous 24 hour operations. **(T-3).**

A7.2.2.1. 6KTFC is dependent on 6KTFBs infrastructure to interface legacy equipment to the network e.g. servers and SATCOM. A separate 6KTFD must be tasked with 6KTFC to provide site expansion capability. Civil engineering support must be tasked separately to support this TDC expansion UTC e.g. 6KLS1. **(T-3).**

A7.2.2.2. Personnel requirements to support this UTC consist of nine personnel. One each of the following AFSCs: 3D190, 3D053 and 3D073. Two each of the following AFSCs: 3D152, 3D153 and 3D052. Force provider may substitute a 3D17X (MSgt) or 3D090 for 3D190. **(T-3).**

A7.2.2.3. Simultaneous setup of 6KTFC and an initial 6KTFD is required to provide expansion/distribution of services. **(T-3).**

A7.2.3. TDC Distribution Equipment (6KTFD). This UTC provides a deployable network operations package to expand upon 6KTFB. It is designed to provide connectivity for voice and data at extended sites up to 16 kilometers from the NCC at expeditionary airbases. It also provides expanded secure and non-secure voice and data services in increments of 600 users at

3:1 users to services ratio. Additionally, the UTC expands LMR capabilities by 20 LMRs. **(T-3).**

A7.2.3.1. This communications UTC is intended to utilize Radio Frequency Kit's (RF K), Red Data Module's (RDM), and LAN kits to extend services up to 16 kilometers from the NCC. **(T-3).**

A7.2.3.2. 6KTFD must be utilized in conjunction with 6KTFB and 6KTFC.

A7.2.3.3. Every third 6KTFD requires additional manning by separately tasking UTC 6KTFE. **(T-3).**

A7.2.4. TDC Medium Communications Package (6KTFM). This reduced footprint package provides activation of voice & data services to support contingencies, initializing or terminating communications support at expeditionary airbases, ASOC, ACS, or JTF missions. Provides 8 each SIPRNet, NIPRNet, secure & non secure voice devices at initial node. Provides 24/7 capability and support for up to 40 each SIPRNet, NIPRNet, and voice lines with deployment of user-provided instruments at one node (limited to approximately 100m radius) for site population of 50-150. Includes initial network control center core services (email, data Storage Area Network, etc.), information assurance, 15 PRC-152's, 2 MEP-806B generators, 2 ECU's, and limited ECS organic support.

A7.2.4.1. This UTC is dependent on several factors for employment. Satellite communications must be established to provide reach-back capability. The transmission media must be a separately tasked UTC e.g. 6KJA1 (AN/TSC-179, GMT), 6KJAL (TSC-198v1). If required to support hub spoke or Promina-based missions (eg. ACS missions), separately task 6KTFL or like UTC for required equipment.

A7.2.4.2. Personnel requirements to support this UTC consist of eight personnel. The following AFSCs are required: (1) 3DX7X (MSgt), (2) 3D152, (1) 3D151, (1) 3E072, (1) 3E151), (1) 3D072, and (1) 3D073. Force provider may substitute a 3D0X2 for 3D073.

A7.2.4.2.1. All electrical work must be performed in accordance with AFI 32-1064 (ELECTRICAL SAFE PRACTICES). Use of two-person operations is not subject to waiver, even in a non-permissive environment. Electrically trained, non-3EXXX personnel may assist 3E072 members as secondary safety when no additional 3E0XX or 3E1XX personnel are available. 3E072 members are responsible for all secondary safety personnel supervision and training in accordance with AFI 32-1064 para 2. Document all required training on AF Form 55 and mandate that all members executing electrical safety duties properly utilize protective equipment.

A7.2.4.3. Information Assurance in-garrison prerequisites require all Information Assurance Officers (IAOs) to be fully trained, and appointed in writing, by their squadron commander. All systems, laptops and external hard drives will be properly marked with the classification labels as appropriate; i.e. SF 710, *Unclassified Label for ADP Media in SCI Facilities* for Unclassified machines, SF 707, *Secret ADP Media Classification Label* for Secret machines. Systems will be regularly checked by IAOs and Server Administrators for vulnerabilities; the results will be maintained by IAOs and the status of systems will be reported to the appropriate communications squadron commander. IAOs will comply with AFI 33-200, *Information Assurance (IA) Management* for all other IA concerns.

A7.2.4.4. Information Assurance requirements while deployed requires, in addition to in-garrison requirements, IAOs to utilize the Designated Approval Authority's (DAA) Trusted Facility Manual for the AOR the unit will be serving in. If a DAA is not assigned, or if a Trusted Facility Manual does not exist, the Special Instructions for Communicators (SPIN-C) will be used to determine how IA procedures will proceed. The SPIN-C (having specific details tailored to the AOR) will be used in conjunction with AFI 33-200. If there are any discrepancies on policies/procedures between the Trusted Facility Manual for TDC, SPIN-C or AFI 33-200, the A6 or joint equivalent will make the final determination on how to proceed.

A7.2.4.5. This UTC may also be used in operations outside of the force module construct, such as for a small Forward Operating Location (FOL) or during base draw down. When used in this capacity it provides a standalone capability designed for use in situations where scalability is not required (e.g. eight SIPRNet, eight NIPRNet, and eight Voice).

A7.3. Activation Timelines. This section will provide the approximate timelines for each Network Employment UTC to be considered fully operational. **(T-3).**

A7.3.1. ACS/ACOMS Activation Timelines: ACS/ACOMs require core services (SIPRNet, NIPRNet, voice) within 48 hours of employment site arrival. **(T-3).**

A7.3.2. ASOC Activation Timelines.

A7.3.2.1. ASOCs require the following capabilities within 48 hours of employment site arrival:

A7.3.2.1.1. 15 SIPRNet/VoSIP drops. **(T-3).**

A7.3.2.1.1.1. 15 NIPRNet/VoIP drops. **(T-3).**

A7.3.2.1.1.1.1. 5 analog nonsecure voice drops. **(T-3).**

A7.3.3. ASOCs may require SIPRNet/VoSIP, STE (10), and/or NIPRNet/VoIP connectivity for additional workstations (overall total not to exceed 40) within 48 hours of employment site arrival. **(T-3).** *__Note__: All listed UTC setup times are general and can be affected by many factors including weather, terrain, equipment, technician's proficiency, equipment pre-configuration, hub spoke configuration and DISA required test times.

A7.3.4. TDC Core Capability (6KTFB and 6KTFM). Initial core capability communications services can be established in 48 hours. The preferred method is to pre-configure/program all components prior to deployment IAW GAA and Technical Data Package (TDP). ***Note:** All 6KTFB and 6KTFM components must be configured IAW applicable AFIs, TOs, DISA publications, commercial manuals, TDC Trusted Facility Manual, Field Change Orders, Notices to Airmen, Time Compliance Network Orders, and Time Compliance Technical Orders. All work centers will document completion of each set-up milestone on the MSL. **(T-3).**

A7.3.4.1. Physical configurations complete (S+6 hrs). **(T-3).**

A7.3.4.1.1. Pallet breakdown. **(T-3).**

A7.3.4.1.2. Tent set-up. **(T-3).**

A7.3.4.1.3. Physical placement of equipment. **(T-3).**

A7.3.4.1.4. Initial cable runs. **(T-3).**

A7.3.4.1.5. Equipment grounding. **(T-3).**

A7.3.4.2. Begin all component configurations. **(T-3).**

A7.3.4.3. All component configurations complete (S+24 hrs). **(T-3).**

A7.3.4.3.1. Cryptographic devices. **(T-3).**

A7.3.4.3.2. Servers (i.e. domain controllers, exchange). **(T-3).**

A7.3.4.3.3. Boundary protection (i.e. proxy and firewall). **(T-3).**

A7.3.4.3.4. Routers and switches (External/internal). **(T-3).**

A7.3.4.3.5. Voice/VOIP. **(T-3).**

A7.3.4.4. Begin validation and certification of Network Operations circuits, trunks, and services. Any communications link, trunk, or circuit that interfaces with the Global Information Grid (GIG) must meet the parameters outlined in DISAC 300-175-9. Testing is described in DISAC 310-70-1. At a minimum SATCOM/Defense Red Switch Network will be bit error rate tested for 2 hrs with all others being tested for at least 30 minutes prior to activation. **(T-3).**

A7.3.4.4.1. Bit Error Rate Tester (BERT) testing (red/back). **(T-3).**

A7.3.4.4.2. Café user verification. **(T-3).**

A7.3.4.4.3. Server backups. **(T-3).**

A7.3.4.4.4. Antivirus updates/security protocols/FCO compliance. **(T-3).**

A7.3.4.4.5. Uninterrupted Power Supply (UPS) Load test. **(T-3).**

A7.3.4.5. Initial communications UTC fully operational and IA compliant (S+48 hrs). **(T-3)**.

A7.3.5. TDC Expansion / Distribution (6KTFC/6KTFD). Simultaneous setup of 6KTFC and an initial 6KTFD is required to provide expansion/distribution of services within approximately 24 hours. The 24 hour expansion timeline builds upon the 6KTFB 48 hour activation time for a total of 72 hours. Setup for each additional 6KTFD is 24 hours. Preferred method is to pre-configure/program all components prior to deployment. **(T-3).**

A7.3.5.1. Expansion services will be fully operational 24 hours after arrival of expansion UTCs (6KTFC/6KTFD). **(T-3).**

A7.3.5.1.1. Legacy services (if tasked/required). **(T-3).**

A7.3.5.1.2. Bridge equipment for 6KTFB to 6KTFD. **(T-3).**

A7.3.5.1.3. Test equipment. **(T-3).**

A7.3.5.1.4. Transmission media expansion. **Note:** All 6KTFC/6KTFD component configurations are IAW applicable AFIs, T.O.s, DISA publications, commercial manuals, TDC Trusted Facility Manual, FCOs, NOTAMs, TCNOs, and TCTOs. Time to extend services outside of the NCC area varies depending on complexity of the Cyber Tasking Order. **(T-3).**

A7.3.6. TDC Medium Communications Package (6KTFM). Initial core capability communications services can be established in 48 hours. The preferred method is to pre-configure/program all components prior to deployment IAW GAA and Technical Data Package (TDP). ***Note:** MCP initial power timelines could be impacted by SATCOM UTC manning, as this will determine the available personnel to be assigned to initial power/grounding teams IAW **Attachment 5**. ****Note:** All 6KTFM components must be configured IAW applicable AFIs,

TOs, DISA publications, commercial manuals, TDC Trusted Facility Manual, FCOs, NOTAMs, TCNOs, and TCTOs. All work centers will document completion of each set-up milestone on the MSL.

A7.3.6.1. Initial Power/master station ground complete (with 6KJAL S+3 hrs) (with 6KJA1 S+5) (with 6KJA1 & 6KABS, as required for ACS missions S+6).

A7.3.6.2. Physical configurations complete (S+6 hrs).

A7.3.6.2.1. Pallet breakdown.

A7.3.6.2.2. Tent set-up.

A7.3.6.2.3. Physical placement of equipment.

A7.3.6.2.4. Initial cable runs.

A7.3.6.2.5. Equipment grounding.

A7.3.6.3. Begin all component configurations.

A7.3.6.4. All component configurations complete (S+24 hrs).

A7.3.6.4.1. Cryptographic devices.

A7.3.6.4.2. Servers (i.e. domain controllers, exchange).

A7.3.6.4.3. Boundary protection (i.e. proxy and firewall).

A7.3.6.4.4. Routers and switches (External/internal).

A7.3.6.4.5. Secure/Non-secure Voice.

A7.3.6.5. Begin validation and certification of Network Operations circuits, trunks, and services. Any communications link, trunk, or circuit that interfaces with the Global Information Grid (GIG) must meet the parameters outlined in DISAC 300-175-9. Testing is described in DISAC 310-70-1. At a minimum SATCOM/DRSN will be bit error rate tested for 2 hrs with all others being tested for at least 30 minutes prior to activation.

A7.3.6.5.1. Bit Error Rate Tester (BERT) testing (red/back).

A7.3.6.5.2. User verification.

A7.3.6.5.3. Server backups.

A7.3.6.5.4. Antivirus updates/security protocols/FCO compliance.

A7.3.6.5.5. Uninterrupted Power Supply (UPS) Load test.

A7.3.6.6. Initial communications UTC fully operational and IA compliant (S+48 hrs).