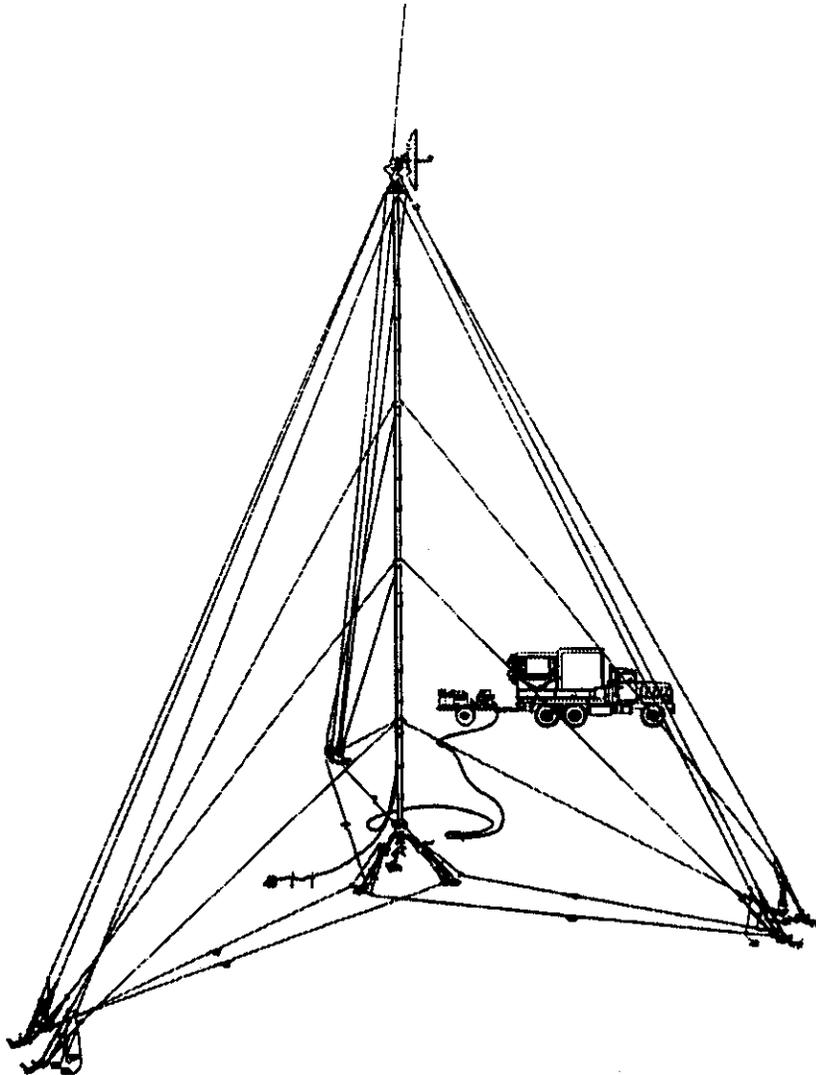

TECHNICAL BULLETIN

TECHNICAL ORDER



SAFETY REQUIREMENTS FOR USE OF ANTENNA AND MAST EQUIPMENT

Approved for public release; distribution is unlimited.

DEPARTMENTS OF THE ARMY, THE NAVY AND THE AIR FORCE

1 January 1994



5

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2

IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3

IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4

SEND FOR HELP AS SOON AS POSSIBLE

5

AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

**LOOK FOR WARNING SIGNS
INDICATING ELECTRICAL
HAZARDS BEFORE USING
EQUIPMENT!**



**TREAT ALL UNKNOWN LINES, WIRES AND CABLES
AS IF THEY WERE POWER LINES.**



WARNING

**ALWAYS USE EYE PROTECTION, SUCH AS
SAFETY GOGGLES, HELMET AND GLOVES
WHEN WORKING WITH ANTENNA AND MAST
EQUIPMENT.**

Technical Bulletin
 No. 43-0129
 Technical Manual Identification Number
 TMIN EE 015-AA-SAF-010/E120-SIG 291
 Technical Order
 TO 31P5-1-1

DEPARTMENTS OF THE ARMY,
 THE NAVY AND THE AIR FORCE

WASHINGTON, DC, 1 January 1994

SAFETY REQUIREMENTS FOR USE OF ANTENNA AND MAST EQUIPMENT

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this technical bulletin. If you find any mistakes or if you can improve the material, please let us know. Mail your comments in a letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or on DA Form 2028-2 located in the rear of this bulletin direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007. We will send you a reply whether or not we accept your suggestions.

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This Technical Bulletin supersedes TB 43-0129, TMIN EE 015-AA-SAF-010/E120-SIG 291,
 TO 31P5, dated

Section 1. General Instructions

1-1. Purpose

The purpose of this bulletin is:

- a. To inform users of necessary safety precautions regarding antennas, masts and related items.
- b. To advise commanders and other supervisors of their safety responsibilities .

1-2. Scope

This bulletin provides general guidance for safety precautions when using antenna and mast equipment, and applies to all military, civilian and contractor personnel. Specific unit Standard Operating Procedure should include this guidance, but can be tailored to meet particular unit needs. Consult your supporting installation safety office for guidance when establishing safety policy.

1-3. Responsibilities

- a. Unit commanders must establish and enforce safety programs and precautions.
- b. Unit commanders must include safety considerations into realistic training.
- c. All supervisors must enforce safety precautions.
- d. Safety is everyone's responsibility. Lead by example – observe safety precautions.

Section 2. Safety Instructions

2-1. General

- a. Always familiarize yourself with all warnings and cautions from the equipment technical manual (TM). Review potentially hazardous procedures before starting your mission.
- b. Know your equipment. Conduct or participate in training before your mission to ensure that you are familiar with the equipment. Do the prescribed Preventive Maintenance Checks and Services before you need the equipment to perform the mission. If the system is subject to excessive stress during use or transportation (high winds, physical shock, inadvertent collapse, etc.) carefully inspect the system before placing it into operation. Damage from excessive stress may not be readily visible.
- c. Know your personnel. Know the weaknesses and limitations of the personnel who will operate the equipment. Know their level of training and familiarity with the equipment.
- d. Before placing any antenna or mast equipment into operation, carefully survey the area for power lines. Do not erect masts in the vicinity of power lines.

2-2. Instructions for Whip/Mobile Antennas – Electrical Factors

a. Never touch a whip antenna while the equipment is powered. Severe burns or electrical shock may result.

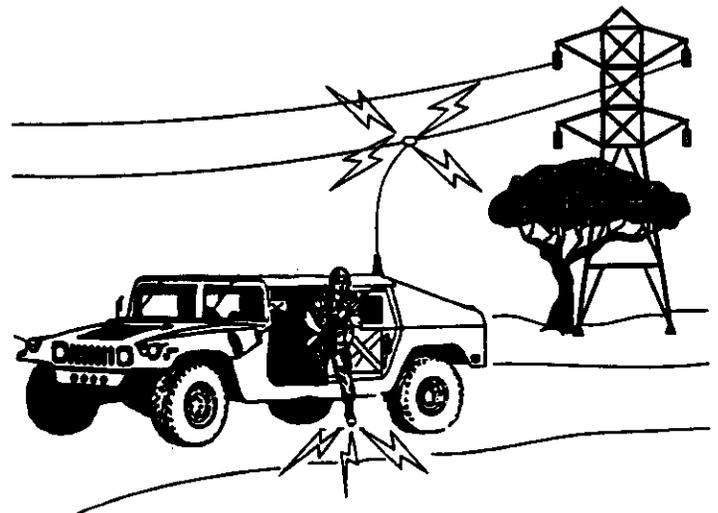
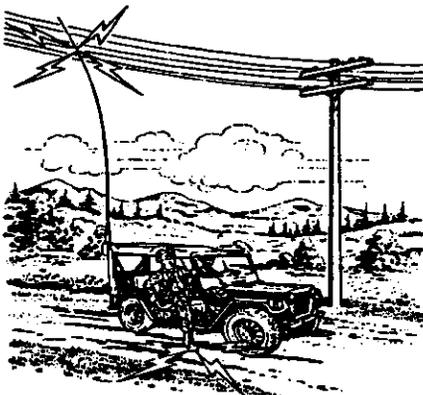
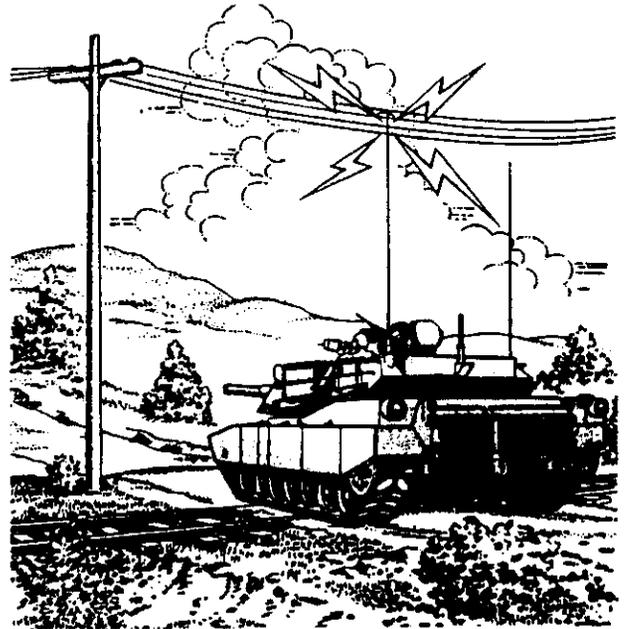
b. When mobile, never pass under power lines if there is any doubt about overhead clearance. Tie down the antennas while on the move whenever possible.

c. Never stop your vehicle under power lines. This increases the chance that an antenna will contact the power lines and conduct current into the vehicle. Severe injury or death can result.

d. Check to make sure that the antenna is not in contact with power lines before dismounting the vehicle. When dismounting you can complete an electrical circuit in which the power will flow through you to ground. Serious shock or death can result.

e. Never extend limbs from the vehicle while moving. Contact with wet foliage could complete an electrical circuit if the antenna comes into contact with power lines. Severe injury or death can result.

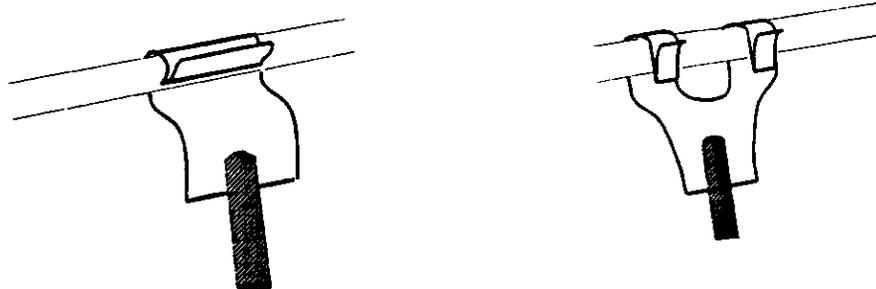
f. Never make unauthorized modifications to the equipment. Equipment must be used as specified in its TM. Any modifications can make the equipment unsafe for operation.



Never stop your vehicle under power lines

2-3. Instructions for Whip/Mobile Antennas – Mechanical Factors

a. Always use the authorized antenna tie-down clamps. Keep the antenna tied down whenever possible. Place the antenna under the clamp, as illustrated. Keep the antenna from whipping rapidly upward when releasing the it from the clamp. Turn the equipment off. Hold the antenna (use a glove) and raise it slowly to the upright position. Ensure no personnel are nearby.



Always use tie-down clamps

b. Ensure that an antenna ball (NSN: 5985-00-930-7223) is placed on the end of the antenna and secured with tape. Periodically check to make sure that it is secure. The antenna tip can cause serious injury and death by penetrating the skull through an eye. If an antenna ball is not immediately available, use a tennis ball or something that is blunt and greater than 1.75 inches in diameter.



Always use antenna ball

c. Some antennas require a restraining device to protect vehicle crew from forward antenna rebound. Refer to the vehicle and equipment TMs to determine whether such a device is necessary.

2-4. Instructions for Masts – Electrical Factors

a. Never deploy a mast near power lines. Keep the mast a distance equal to or greater than twice its height away from power lines.

b. Keep guy wires away from power lines to eliminate the possibility of a power line falling on a guy wire.

c. Never touch a mast or structure that you suspect may be accidentally energized electrically. If you suspect a mast or structure is energized, post guards to keep personnel away and inform your chain of command.

d. Never work with a mast or related structure during electrical storm activity.

e. Always ground the mast or structure in accordance with the instructions in the technical manual.

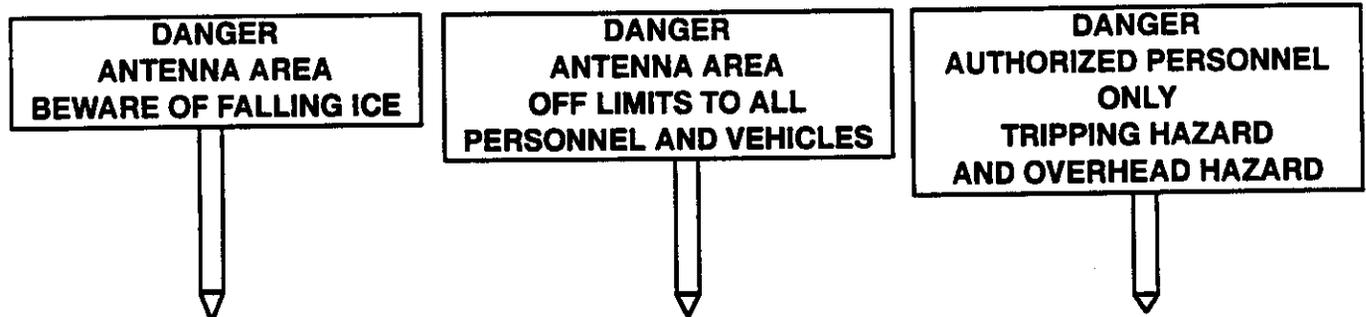
2-5. Instructions for Masts – Guy Wires & Supports

- a. Inspect all guy wires and fasteners for wear or damage before performing your mission or using the equipment. Serious injury or death may occur if a guy wire failure causes a mast to fall.
- b. Before leaving to perform your mission, ensure that the proper safety equipment, including signs, streamers, extra guy wires and stakes are available for use.
- c. Never use fewer guy wires than the technical manual prescribes. Follow the instructions in the technical manual.
- d. Mark guy wires clearly to prevent personnel from tripping over them. Personnel who trip may suffer injury and may also pull up the guy wires and cause the mast to fall.
- e. To keep from falling if you must leave the area quickly, avoid standing on, or becoming entangled in, excess rope or wire on the ground.
- f. Keep hands as far away as possible from winch drums and related equipment.
- g. Monitor the tension of the guy wires to ensure proper tension.
- h. Ensure that stakes and anchors are secure in the ground before attaching guy wires. Use the prescribed equipment and procedures for anchoring, especially in sandy or loose soil.
- i. Never fasten guy wires over a sharp edge or in a manner that causes abrasion. This may cause guy wire failure. Pad any contacting surfaces if necessary.
- j. Do not install guy wires across roadways or other paths of travel. Always clearly mark guy wires.
- k. Ensure that guy wires are clear of branches or other obstructions.
- l. If deployment operations are suspended, ensure that enough guy wires are installed to safely support the mast.
- m. Use only authorized parts. Unapproved substitutes may not be strong enough for the equipment, which could result in failure.
- n. Periodically inspect the mast to ensure that it remains structurally sound and properly installed during operation.
- o. Ensure that the wind speed is not excessive during deployment/retraction operations. Maximum safe wind speeds are given in the technical manual Use this chart to determine approximate wind speed:

OBSERVATION	WIND SPEED	
	KM/HR	MPH
SMOKE RISES VERTICALLY	< 1	< 1
WIND DIRECTION SHOWN BY SMOKE	1-6	1-3
WIND FELT ON FACE, LEAVES RUSTLE	7-12	4-7
LEAVES/TWIGS IN CONSTANT MOTION, WIND EXTENDS LIGHT FLAG	13-18	8-11
DUST AND LOOSE PAPER BLOWN FREELY, SMALL BRANCHES MOVED	19-26	12-16
SMALL TREES BEGIN TO SWAY	27-35	17-22
LARGE BRANCHES IN MOTION, WIND WHISTLES THROUGH WIRES	36-44	23-27
WHOLE TREES IN MOTION	45-55	28-34

2-6. Instructions for Masts – Working Area Considerations

- a. Always use the safety equipment prescribed by the technical manual. Most injuries with antennas and masts would have been prevented by the use of safety equipment.
- b. Never attempt mast deployment or retraction with fewer than the number of trained personnel prescribed in the technical manual. Doing so might cause an accident resulting in serious injury or death.
- c. Never use unauthorized components (such as camouflage netting poles) in masts or structures. Never mix components from other systems to construct an unauthorized mast. Such actions have caused serious accidents in the past.
- d. Do not allow non-essential personnel near the mast during deployment or retraction.
- e. Avoid standing directly beneath the mast or structure during deployment or retraction.
- f. Never overload the mast or structure. Use only the equipment and ancillary items in the proper quantities authorized by the technical manual. Do not use unauthorized equipment or modifications.
- g. BE CAUTIOUS of ice that may form on the antenna/mast. The area surrounding the antenna/mast should be marked and roped off to avoid falling ice. Special care must be taken when retracting the mast or structure to avoid falling ice. Use the procedures and safety equipment prescribed in the technical manual.
- h. Use additional support, such as extra guy wires for the mast, if heavy ice loading is anticipated.
- i. Leaders should plan the installation of the system to minimize hazardous operations.
- j. NEVER leave mast and antenna components improperly stowed. When not in use, antenna and mast components should be stowed. Assembled antennas left on the ground can cause fatalities.
- k. Mark the working area surrounding the mast to warn personnel of the potential hazards, as the mission permits. Use engineer tape, lights and/or signs. Ensure that you have adequate warning signs, etc., before you leave your base.



2-7. Instructions for Masts – Aviation Safety Considerations

- a. Antenna masts pose a hazard to aircraft conducting nap-of-the-earth missions using Night Vision Devices. A warning device/beacon may be required for the antenna masts, depending on the deployment location. Flashlights or chemlights are usually suitable. It is the responsibility of the operator/supervisor to determine what specific requirements apply prior to erection of the mast. Check with the local Aviation Safety Officer (ASO) to determine specific requirements at your location, before your mission. The local requirements should then become part of your unit Standard Operating Procedures (SOP).

b. Prior to erecting the mast, the operator should first inform the local ASO of the proposed mast location so that pilots can be briefed to avoid the mast. Any required warning light will be attached to/raised to the top of the mast.

c. When mission permits, all antenna masts should be deployed at locations as far away from airfields as possible. TM 5-803-4 contains requirements for deployment near military airfields.

Section 3. Radiofrequency Hazards Associated with Antennas

3-1. Radiofrequency Hazards – General Information

a. Antennas attached to transmitting equipment produce electromagnetic radiation. This radiation is nonionizing and is not the same as x-rays or radiation produced by radioactive materials. The primary hazard from this type of radiation is internal heating, like the heating produced by a microwave oven. Several radar and communications equipments are powerful enough to be hazardous to unsuspecting personnel. The radiofrequency (RF) hazard symbol is illustrated below.



b. This warning can be found in the equipment technical manual or on the equipment itself. Follow the warnings and cautions prescribed in the technical manual regarding any possible RF hazard.

3-2. Instructions for Avoidance of Radiofrequency Hazards

Radar equipment and transmitting dish antennas can produce RF hazards. Follow these precautions:

a. Do not position yourself in the path of a dish antenna. Ensure that the equipment is not energized before performing maintenance. Ensure equipment energization is prevented by lock-outs, tags, or other means. Refer to the technical manual.

b. If you feel suddenly hot near a dish antenna, move away as rapidly as possible.

c. Don't touch whip antennas while the equipment is powered.

d. Ensure that any waveguides on your equipment are properly connected and intact. Replace damaged waveguides in accordance with the instructions in the technical manual.

e. The RF hazard area must be marked with the RF warning signs as shown in the technical manual. Ensure enough warning signs are available to clearly mark your equipment.

f. Familiarize yourself with your equipment and any local unit policies or SOPs for the operation or maintenance of RF emitters. Refer to TB MED 523, Control of Hazards to Health from Microwave and Radiofrequency Radiation and Ultrasound, for more detailed information.

Section 4. Hazards Associated with Electrical Storms and Lightning

The electrical energy in electrical storms and lightning is enough to cause serious injury or death. Avoidance of electrical storms and lightning is the best course of action, but not always possible in tactical operations. This section is designed to provide some simple facts and rules to reduce the likelihood of your becoming a victim of an electrical storm or lightning.

4-1. Nature of Electrical Storm and Lightning Hazards

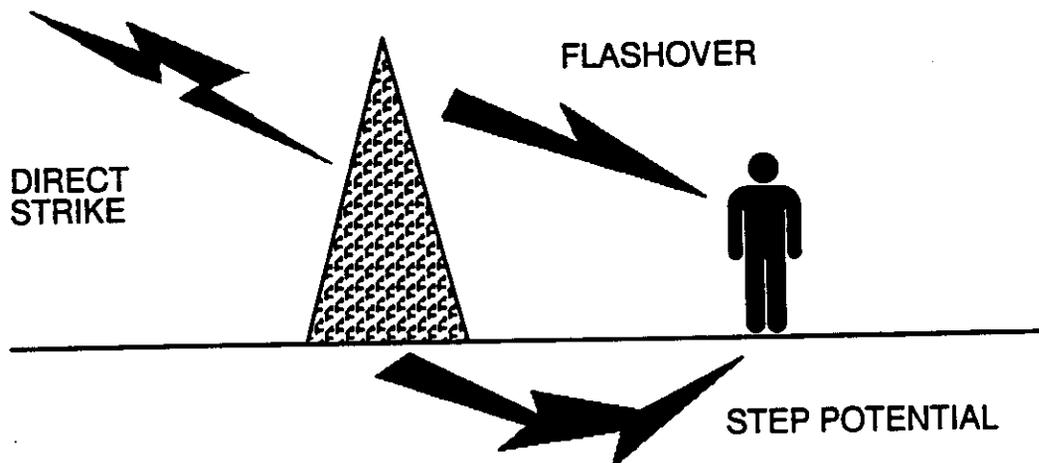
Contrary to common belief, most lightning accidents do not come from direct lightning strikes. There are several ways that lightning can injure you:

a. "Step potential" is a potentially hazardous voltage that can exist on the ground – like stepping on a live wire. This results from electrical energy diverted into the ground from lightning striking nearby. It is the most common injury-causing lightning effect.

b. Flashover is when lightning strikes a nearby object and then jumps to another nearby object. This is usually what injures people standing under trees in an electrical storm.

c. Point discharge current is when an antenna acts as an electrical collector during electrical storm activity. It has nothing to do with lightning. This effect can energize disconnected signal wires, causing an electrical shock if touched. At least one accident in the field has been recorded from this effect.

d. Direct lightning strike is the most obvious of electrical storm hazards.



4-2. Instructions for Avoidance of Electrical Storm and Lightning Hazards

- a.* Keep away from antennas, masts, guy wires and all grounding and lightning protection equipment, including ground rods, during electrical storm activity.
- b.* Seek shelter in an enclosed vehicle, a grounded shelter, or permanent structure.
- c.* If the mission permits, disconnect the signal inputs before the storm. Do not attempt this during the storm, even if lightning is not nearby! Do not touch the disconnected signal inputs.
- d.* Use the appropriate lightning protection equipment and follow the grounding instructions in the technical manual.

Section 5. References

For more detailed information, reading the following documents is encouraged.

TB MED 523, Control of Hazards to Health from Microwave and Radiofrequency Radiation and Ultrasound, US Army Environmental Health Agency, Aberdeen Proving Ground, MD.

TB 385-4, Safety Requirements for Maintenance of Electrical and Electronic Equipment, US Army Communications-Electronics Command, Fort Monmouth, NJ.

TM 5-803-4, Planning of Army Aviation Facilities, Headquarters, Department of the Army, Washington, DC

USACECOM Technical Report 93-1, Lightning Protection System Design, Applications for Tactical Communications Systems, US Army Communications-Electronics Command, Fort Monmouth, NJ.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?



THEN ... JOT DOWN THE INFO ON THIS FORM AND DROP IT IN THE MAIL.

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703-5007

DATE SENT 4 July 1993

PUBLICATION NUMBER

TM 11-5840-340-12

PUBLICATION DATE

23 Jan 74

PUBLICATION TITLE

Radio Set AN/PRC-76

BE EXACT ... PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
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2-25	2-28		
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3-10	3-3		3-1
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5-6	5-8		
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FO-3

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Functional column. Change "2 dB" to "3 dB".

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 dB (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC" to "+5 VDC".

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SSG I. M. DeSpirito DSN 999-1776

SIGN HERE

SSG I. M. DeSpirito

DA FORM 2028-2
1 JUL 79

PREVIOUS EDITIONS ARE OBSOLETE.

P.S. - IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION, MAKE A COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG DOTTED LINE

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

Four horizontal lines for address entry.

OFFICIAL BUSINESS

PLEASE
AFFIX
CORRECT
POSTAGE
HERE

SAMPLE

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TEAR ALONG DOTTED LINE