ATTACHMENT D

TACAN REPLACEMENT SOP

18 pages

STANDARD OPERATING PROCEDURE FOR TACAN ANTENNA REPLACEMENT

INTRODUCTION.

This Standard Operating Procedure (SOP) applies to the removal and installation of the Low Power TACAN Antenna (LPTA) and the RTA-2 TACAN Antenna.

PURPOSE.

This Standard Operating Procedure (SOP) provides guidance for safe operations during the removal and installation of TACAN antennas. This procedure is divided according to crane coordination, pre-operation evaluation, work site preparation, removal, installation, and balancing (if required).

EQUIPMENT. Mobile Crane, Personnel Platform (if needed), and Ladders

Personal Protective Equipment (PPE) based on task:

1. Fall Restraint System with appropriately sized positioning lanyards
2. Foot Protection - Toe Clips or Steel Toed Shoes (for workers on ground who may drop equipment (or TACAN antenna) on their feet)
3. Head Protection – Hard hat required for ground support personnel. Climbing helmet required for personnel working on ladders at the TACAN antenna.
4. Hearing Protection – Assess the surrounding sound levels at airport locations
5. Foul Weather Gear (seasonal)

Tools and Supplies that are normally required*:

1. Materials to cordon off area, if necessary (e.g. caution tape, safety cones, work zone signs, etc.).
2. Appropriate lifting slings, properly labelled and load tested (i.e. TACAN Antenna, Crate, Suspended Work Platform). Diagrams of slings for TACAN antennas are available in Attachment 1.
3. 17-inch Flat Bar (for breaking TACAN Antenna free from top of mounting fixture).
4. Tag lines (one for each leg of the sling to facilitate placement of sling on the TACAN antenna and one for guiding the TACAN antenna as it is being moved).
5. Extra Rope for hoisting tools and equipment.
6. Tie downs with ratchet tightening device.
7. Tools needed for task, i.e., wrenches, sockets and ratchet drivers, screwdrivers, scrapers, caulking materials, etc.
8. Wasp spray, sunscreen, etc.
9. Type 1A Portable ladders: Number of ladders may vary, however, five ladders are recommended: one for access to the VOR roof and four for TACAN antenna replacement activities.

* Consult the applicable Technical Instruction (TI) for staffing, tool, and supply requirements.

The TI manuals are available on the FAA Intranet at http://evr.jccbi.gov/evr/technicalinstructionselection.asp. For the LPTA, type in 6820.3 at the TI/TO Number space and click Submit Query to access the TI manual. For the RTA-2, type in RTA-2 at Manual Title space and click Submit Query to access the TI manual.

SAFETY.

1. Stop work when a potentially unsafe condition is recognized.
2. Suspended work platforms and/or cranes should not be used in winds greater than 20 mph, thunderstorms, ice, sleet, or other adverse weather conditions that could affect the safety of personnel.
3. At a minimum, there must be at least one safety monitor in addition to the workers needed for installing/removing the TACAN antenna and/or using the tagline to position the antenna.
4. When moving up or down the ladder, ensure all tools are brought to working level via a tool belt or pulled up on a line.
5. For Doppler VORTACs, there is an additional hazard associated with the potential lack of strength of the wire mesh, which could allow an individual to fall through the counterpoise. Therefore, anyone working on the VOR roof must remain inside the ring of Doppler antennas unless accessing the roof. Personnel hoisting equipment from ground level to the VOR roof shall be restrained using a VOR Roof Restraint Kit or equivalent evaluated and approved by a Competent Person. Ensure the roof access hatch is closed while workers are on the roof, where applicable.
6. For Standard (Conventional) VORTACs, ensure that anyone working on the VOR roof follows applicable fall protection regulations using either the Safety Monitoring System or Warning Line System, or a combination of the two. Personnel hoisting equipment from ground level to the VOR roof shall be restrained using a VOR Roof Restraint Kit or equivalent that has been evaluated and approved by a Competent Person.
7. For Mountaintop VORTACs, follow the guidelines in this SOP, excluding the procedures regarding accessing the VOR roof.
8. For Freestanding TACAN antennas (not attached to the teepee atop the VOR) consult your SMO Safety and Environmental Compliance Manager (SECM) for proper safety procedures.
9. Limit the number of workers on the roof to the minimum amount required for the TACAN antenna replacement.

METHODOLOGY. The following procedures must be followed, in the order listed:

Crane Coordination. When coordinating with the local crane company verify:

1. That the crane operator has been trained in accordance with the National Commission for the Certification of Crane Operators (CCO) and request a copy of the certificate.
2. That the crane has received an annual inspection by an independent third party and that the certificate is on the crane.
3. That if a manbasket will be used the requirements in Attachment 2 are confirmed.

Powered Platform Coordination. (If Required)

When renting a powered platform; such as, an articulated boom lift or bucket truck, verify:

1. That the manufacturer of that equipment has trained the operator in accordance with the ANSI standards. Request a copy of the training certificate.

2. That if the operator is employed by the FAA, he has received the minimum 4 hour powered platform training as outlined in the ANSI standard.
3. That the lift has received an annual inspection by an independent third party and that the certificate is with the equipment.
4. If a boom lift or bucket truck will be used, all requirements and work practices in Attachment 3 must be followed.

Pre-Operation Evaluation.

1. Inspect all slings and other lifting hardware for cracks, deformation, gouges, galling, kinks, crushes, corrosion, pulled or cut stitching, and excessive wear.
2. Ensure the sling is marked with the name or trademark of the manufacturer, manufacturer's code or stock number, rated loads for the type of hitches used, and the type of synthetic web material.
3. Verify the weight of the load (antenna) is within the rated capacity of the sling.
4. Verify FAA personnel have been trained as a Fall Protection /Qualified Climber at a minimum or equivalent.
5. Inspect anchor points for cracks or abnormalities in the welds or bolts, if applicable.
6. Inspect fall protection equipment in accordance with the fall protection program and training.
7. Inspect the portable ladders for visible defects.
8. Ensure FAA and contractor personnel have required PPE prior to leaving base.
9. Ensure technicians know proper crane hand signals (see Attachment 4).
10. Ensure weather conditions are suitable for task as specified above.

Work Site Preparation. (See Attachment 5 for a picture of the safety tie-offs and ladder retainer)

1. Inspect the fully assembled lifting hardware; specifically the security of the attachments and attachment points to ensure accidental disengagement is not possible.
2. Identify overhead utility lines and verify that a safe approach distance can be maintained.
3. Ensure the **portable ladder accessing the roof** of the VOR extends at least 3 feet above the roof and is secured at the top. Securing the ladder at the top can be accomplished by either:
   a. Tying each side-rail of the ladder to a nearby component that will provide enough support to prevent the ladder from displacing in any direction; OR
   b. Installing two stainless steel eyebolts that are a minimum of 3/8-inch diameter with a minimum 1-inch eye on either side of where the ladder will be placed, so the ladder can be secured to them (e.g. preinstalled ladder supports).

   NOTE: Prior to climbing the ladder to secure at the VOR roof, the bottom of the ladder shall be supported either by someone holding the ladder or equivalent means.
4. Ensure work area is clear of vehicular and pedestrian traffic.
5. Ensure the crane operator conducts a pre-operational check of crane.
6. Ensure the crane operator conducts trial lifts without the antenna attached. Check for fluid leaks, abnormal operation, and unusual noises.
7. Ensure the **portable ladders on the VOR roof accessing the TACAN antenna** are properly secured at the bottom and at the top.
   a. Securing the bottom of the ladders used on the roof. Examples include:

i. Wrap a rope around the base of the teepee and tie to each leg of the ladder.

ii. Wedge something in between the feet of the ladder to Doppler antenna anchors.

b. There are three ways to secure the top of the ladders used to access the TACAN antenna and they are shown in Attachment 6, Options 1 through 3. These securing options can be accomplished by either:

Option 1: If ladder retainers are present, ensure the tops of the ladders are positioned inside the ladder retainers. The ladder should extend through and be tied to the retainer to prevent slippage.

Option 2: If safety tie-offs are available on the mounting fixture, but ladder retainers are not present, secure the top of each side rail to a safety tie-off with a rope, a strap with a ratcheting device or any other similar means, pulling the rope or strap tight to ensure the top of the ladder will not slide.

Option 3: If there are no safety tie-offs or ladder retainers on the top-mounting fixture where the ladder will be placed, use a rope or a strap with a ratcheting device to secure the ladder. Attach one end of the rope or strap to one side rail, encircle the top mounting fixture, and secure the opposite end of the rope or strap to the other side rail, pulling the rope or strap tight to ensure the top of the ladder will not slide. This method will require a second ladder installed on the opposite side of the teepee with another person assisting to secure both ladders.

NOTE: Prior to climbing the ladder to secure it at the top of the teepee, the bottom of the ladder shall be supported either by someone holding the ladder or as described in 7.a. above.

8. Ensure all site personnel are wearing the required PPE.
9. Prior to the lift, cordon off the work area to restrict non-workers from entering the work zone.

TACAN Antenna Preparation.

WARNING: Personnel are not permitted under a suspended load; this includes the worker's appendages; such as arms, hands, and fingers.

NOTE:

All personnel who will work under overhead hazards or will be working near the antenna shall wear a hard hat *or* climbing helmet.

Personnel that have the potential of dropping equipment on their feet shall have foot protection; such as, toe clips or steel toe shoes.

1. Ensure the sling is inspected for cracks, deformation, gouges, galling, kinks, crushes, corrosion, pulled or cut stitching, and excessive wear prior to the each use, which includes following each time it is under a load.
2. Each time an antenna is moved, attach tag lines to the lifting sling hardware to assist in the attachment of the sling to the antenna and ensure the sling is securely attached to the antenna.
3. Attach a separate tag line directly to the TACAN antenna to assist in the maneuvering of the TACAN antenna.
4. Stay a safe distance away while the crane operator moves the TACAN antenna into position.
5. Follow the instructions and procedures outlined in the applicable TI manual.

Removal of TACAN Antenna.

1. In accordance with the facility's Lockout/Tagout Program, de-energize and lockout any equipment that will be worked on during the procedure, including any convenience outlets.
2. It is recommended that personnel on ladders at the TACAN Antenna use work-positioning, utilizing the ladder retainers or eyebolts, as improvised anchors until rated anchors can be installed.
3. Follow procedures outlined in the applicable TI manual.
4. Use a rope to raise or lower the TACAN antenna access panels, tools, and any other materials from the ground to the roof and then to the TACAN antenna.
5. Attach the tag lines using appropriate material handling procedures.
6. The crane operator shall apply vertical tension on the TACAN antenna slightly more than the weight of the antenna. Personnel on the ladders shall use Flat Bars to break the antenna loose from the mounting fixture.
7. After breaking the antenna loose, but prior to removal of the TACAN antenna, ensure all personnel working on the ladders relocate out of the load transit area.

CAUTION: Personnel on the ladders shall descend ladders and relocate from the immediate lifting area prior to the crane operator removing the antenna.

Installation of TACAN Antenna.

WARNING: Personnel are not permitted under a suspended load; this includes the worker's appendages such as arms, hands, and fingers.

CAUTION: Personnel are not permitted to ascend the ladders until the antenna is within inches above the mounting fixture.

1. Inspect the sling and all hardware for cracks, deformation, gouges, galling, kinks, crushes, pulled or cut stitching.
2. Ensure the slings are properly attached to the designated lifting rings prior to lifting.
3. Slowly lift the antenna to the top of the mounting fixture and gently lower the antenna until it is about 1 inch above the final mounting position on the VOR.
4. Position personnel onto the ladders.
5. It is recommended that personnel on ladders secure themselves using work-positioning lanyards to eyebolts or ladder retainers until rated anchors can be installed.
6. Install the antenna as outlined in the applicable TI manual.
7. Use a rope to raise or lower the TACAN antenna access panels, tools, and any other materials from the ground to the roof and then to the TACAN antenna.

Balancing of the TACAN Antenna. (if required)

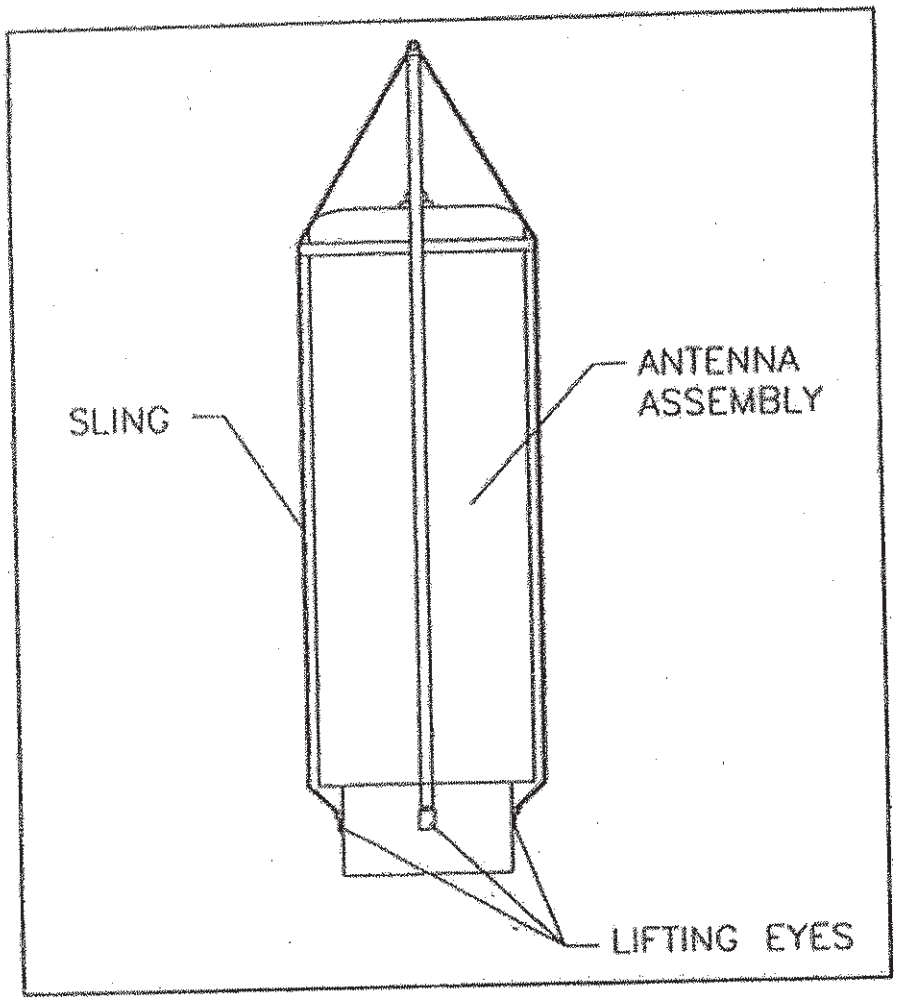
If balancing of the TACAN Antenna using a manbasket is required, the requirements in Attachment 2 must be followed.

REFERENCES

1. FAA Technical Instruction Manuals for the LPTA and the RTA-2 (available at http://evr.jccbi.gov/evr/technicalinstructionselection.asp)
2. 29 CFR 1926.550, *Cranes and Derricks*
3. 29 CFR 1926.500-503, *Fall Protection*
4. ASME B30.9.1996, *Slings*
5. ASME B30.10.1999, *Hooks*
6. ASME B30.23-1998, *Personnel Lifting Systems*
7. ANSI A10.28-1998, *Safety Requirements for Work Platforms Suspended from Cranes or Derricks – American National Standard for Construction and Demolition Operations*

ATTACHMENT 1

Picture 1: LPTA Sling



Picture 2: RTA-2 TACAN Antenna Sling

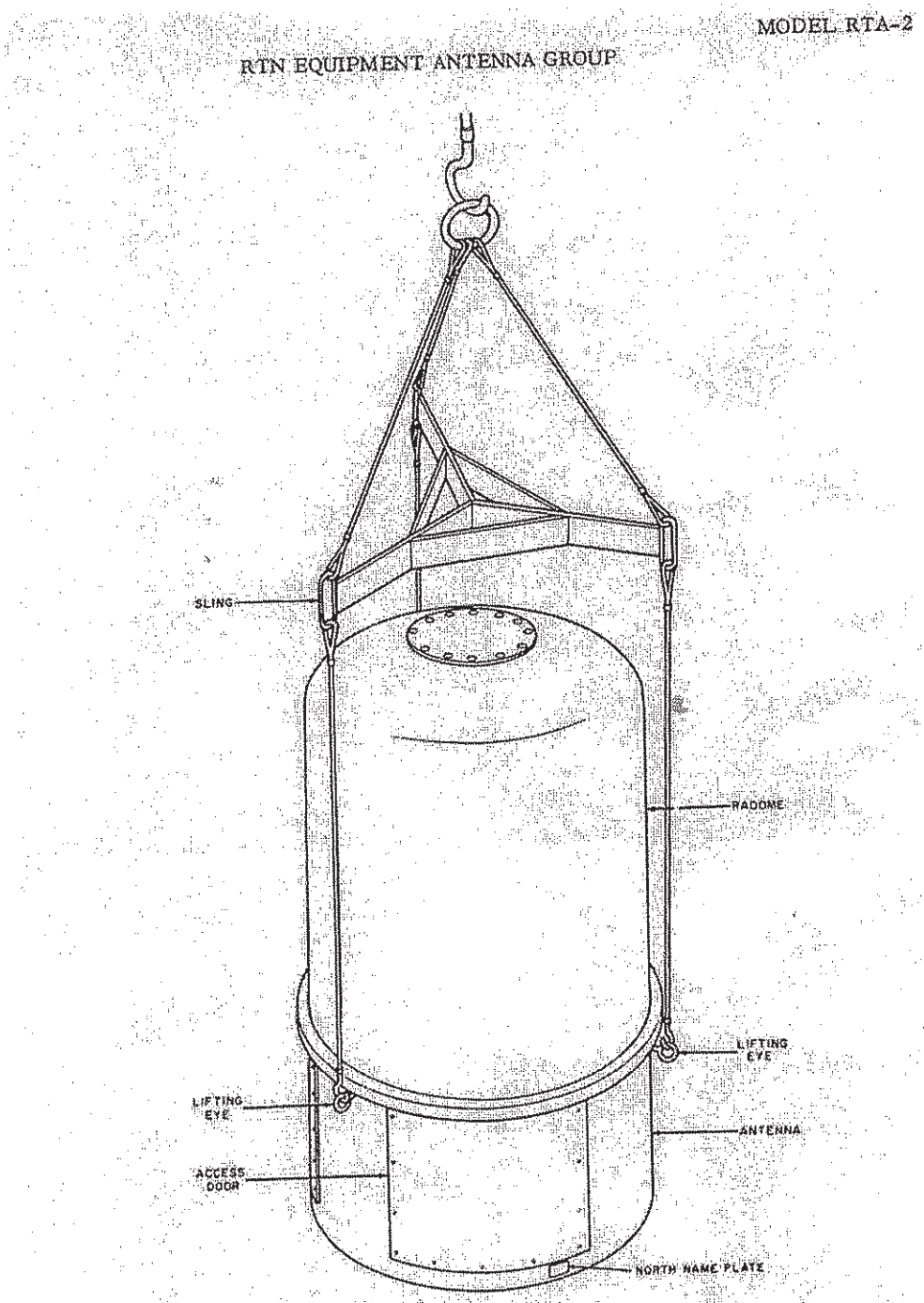


Figure 21. Antenna with Typical Sling for Hoisting

ATTACHMENT 2

REQUIREMENTS FOR MANBASKET USE

Manbasket Preparation.

WARNING. Personnel are not permitted under a suspended load.

NOTE.

All personnel shall wear a hard hat if bump or overhead hazards exist.

Personnel that have the potential of dropping equipment on their feet shall have foot protection; such as, toe clips or steel toe shoes.

1. Ensure the crane operator verified that the crane hook has a positive locking latch to prevent disengagement of the manbasket from the hook.
2. Inspect the suspended work platform and rigging for visible defects.
3. Ensure the suspended work platform bears a plate specifying its empty weight and the maximum number of persons and weight for which it is rated.
4. Verify that the work platform has a safe approach distance from electrical lines. Maintain a minimum of 15 feet of distance from energized parts, with 35 feet of distance recommended.
5. Conduct a pre-lift meeting. (All personnel involved with the lift shall review the written procedures including crane operations, emergency procedures, communication requirements, and special requirements including checklists and inspections requirements.)
6. Identify the tie off points within the manbasket for fall protection system.
7. Attach the suspended work platform and rigging to the crane. The crane hook must have a positive locking latch to ensure the manbasket does not disengage from the hook.
8. Attach the tag lines to the suspended work platform.
9. Conduct a trial lift with the unoccupied suspended work platform loaded to the anticipated lift weight from ground level to the TACAN antenna.
10. After the trial lift has been completed, raise the suspended work platform a few inches and inspect it to ensure it is secure and properly balanced.
11. Ensure the following conditions have been met prior to personnel being lifted:
    a. The hoist line is free of kinks.
    b. Multiple part lines are not twisted around each other.
    c. The primary attachment is centered over the platform.
    d. Sling has no slack.
    e. Inspect the mobile crane, rigging, and suspended work platform to determine if the trial lift has exposed any defects or produced any adverse effect upon any component or structure.
    f. Proof test the suspended work platform and rigging to 125 percent of the platform's rated capacity by holding it in a suspended position for five minutes with the test load evenly distributed on the platform (this may be done concurrently with the trial lift).
    g. After the proof test, inspect the platform and rigging, and correct any deficiencies. After deficiencies are corrected, conduct another proof test.

NOTE. Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.

Manbasket Use.

1. Following successful proof test, personnel using the manbasket must don a full body harness.

NOTE. Personnel occupying the suspended platform shall don a fall arrest system with a lanyard appropriately attached to the anchor point in the basket.

2. Personnel holding tag lines must be away from the load transit area.

ATTACHMENT 3

STANDARD OPERATING PROCEDURE FOR USING AERIAL LIFTS

(APPENDIX A FROM ASO AF ORDER 3900.28)

This Standard Operating Procedure (SOP) provides guidance for the safe operation of manlifts, bucket trucks and other personnel lifts and these procedures should be followed whenever operating these types of equipment. Manbaskets are addressed in a separate SOP. The procedures are divided according to pre-operation inspection, work site evaluation, and safe work practices.

All personnel shall receive appropriate training on the operation of the equipment prior to operating the equipment.

EQUIPMENT: Aerial Lifts, Manlift, Scissor Lift, and Bucket Truck

Personal Protective Equipment (PPE) based on task:

1. Fall Restraint System with appropriately sized lanyard.
2. Eye protection – safety glasses if there are any impact hazards, such as flying debris.
3. Hand protection – gloves specific to job task.
4. Safety shoes.
5. Head Protection – Hardhat.
6. Hearing protection.

Tools and Supplies that are normally required:

1. Chocks.
2. Tire Gauge.
3. Materials to cordon off area (e.g., caution tape, safety cones, work zone signs, etc.).
4. Pulley system.
5. Mechanical fluids.
6. Tools needed for task.
7. Radios, for communication between personnel.
8. Operator Manual
9. Wasp spray, sunscreen, etc.

WARNINGS:

1. Do not climb guardrails.
2. Do not use additional ladders, planks, or other materials, within the platform, to achieve additional height.
3. Do not come within 15 feet of electrical lines (basket is not insulated).
4. Do not put any part of the body outside the platform while raising and lowering.
5. Do not operate lift until outriggers, when present, are extended properly.
6. Do not operate in inclement weather, such as high winds, ice, snow, etc.
7. Do not operate a damaged unit.

8. Do not rely on hour meter for maintenance schedule.
9. Do not travel with boom too high as it can make the lift unstable.
10. Do not exceed maximum weight capacities for the lift. Signs with the maximum rated weight limits must be located on the equipment in obvious places where workers easily see them.
11. Do not exceed the manufacturer's occupancy limit for the basket or platform.
12. Do not drive lift unless worker is facing direction of travel.
13. Do not throw objects to or from the platform. Use a pulley and rope to raise and lower objects.
14. Do not work at height without properly attaching fall Restraint system to anchor point.
15. Do not tie fall restraint system onto an adjacent pole when working.
16. Do not use a lanyard other than the one specifically designed for use with the systems.

METHODOLOGY: The following procedures must be followed, as listed, prior to and during manlift, scissor lift, and bucket truck use:

Pre Operation Inspection:

1. Check all tires for leaks and for correct tire pressure
2. Check fuel, coolant, hydraulic fluid, and battery levels.
3. Inspect battery cables and connections for signs of damage.
4. Ensure the safe limit switch is operating properly.
5. Check all other connections for tightness and fitting.
6. Inspect pivot pins for signs of wear or damage and for security of locking device.
7. Inspect weld seams for cracks and aberrations, including attachment welds between activating cylinders and boom or pedestal.
8. Check guard rails for signs of wear or damage.
9. Inspect fall restraint anchor point for cracks or abnormalities in the welds or bolts.
10. Inspect fall restraint harness and lanyard according to fall protection program and training.
11. Conduct trial lifts with work platform empty and check for fluid leaks, abnormal operation, and unusual noises.

NOTE: Do not use unit if any part is defective.

Work Site Evaluation

1. Identify overhead lines and verify that a safe approach distance can be maintained.
2. Evaluate terrain and slope for area where manlift will be located.
3. Check surfaces for hazards such as: buried utilities, excavations, trenches, and susceptible collapses.
4. Evaluate work area for interference from vehicular and pedestrian traffic.

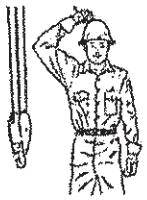
Safe Work Practices:

1. Always cordon off the work area to restrict non-workers from entering the work zone.
2. Verify that the lift has a safe approach distance from electrical lines. Keep a minimum of 15 feet of distance from energized parts, with 35 feet of distance recommended.
3. Verify outriggers will be on stable ground.
4. Conduct another trial lift with platform empty.

5. In accordance with the facility's Lockout/Tagout Program, de-energize and lockout any equipment that will be worked on during the lift.
6. Properly don a fall restraint system and attach lanyard to identified fall restraint anchor point. Maintain attachment entire time lift is at height.
7. Maintain good housekeeping practices on the platform to prevent falls and tripping hazards.
8. Prior to repositioning the vehicle, always lower the lift.
9. Verify that any workers in the vicinity of the lift don a hardhat.
10. Conduct annual safety inspection according to manufacturer's recommendations.

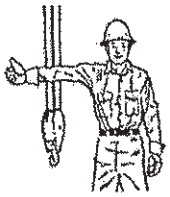
ATTACHMENT 4

USA Standard Crane Hand Signals

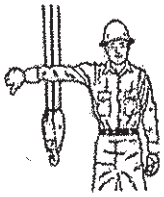


Use Main Hoist. Tap fist on head; then use regular signals.

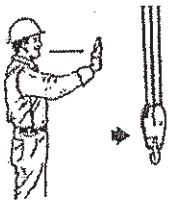
Use Whipline (Auxiliary Hoist). Tap elbow with one hand, then use regular signals.



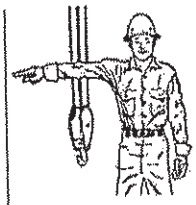
Raise Boom. Arm extended, fingers closed, thumb pointing upward.



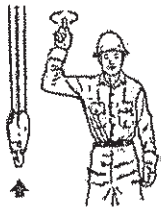
Lower Boom. Arm extended, fingers closed, thumb pointing downward.



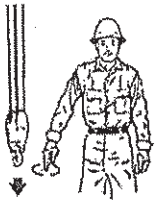
Travel. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.



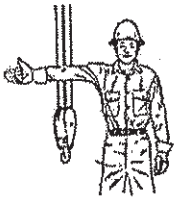
Swing. Arm extended, point with finger in direction of swing of boom.



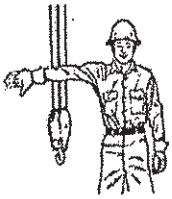
Hoist. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.



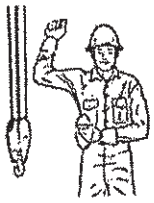
Lower. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



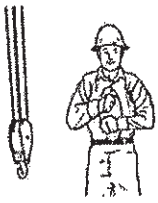
Raise the Boom and Lower the Load. With arm extended thumb pointing up, flex fingers in and out as long as load movement is desired.



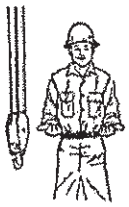
Lower the Boom and Raise the Load. With arm extended, thumb pointing down, flex fingers in and out as load movement is desired.



Travel. (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For crawler cranes only).

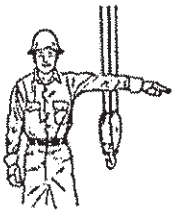


Travel (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel; forward or backward. (For crawler cranes only.)

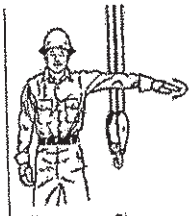


Extend Boom (Telescoping Booms). Both fists in front of body with thumbs pointing outward.

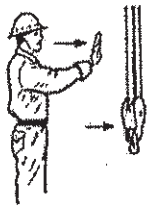
Retract Boom (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.



Stop. Arm extended, palm down, hold position rigidly.

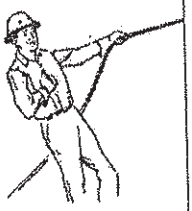


Emergency Stop. Arm extended, palm down, move hand rapidly right and left.

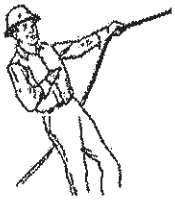


Bridge Travel. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.

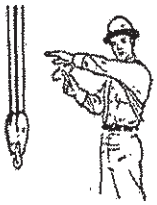
Trolley Travel. Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.



Extend Boom (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.

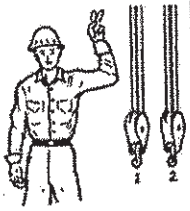


Retract Boom (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

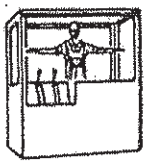


Move Slowly. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)

Dog Everything. Clasp hands in front of body.



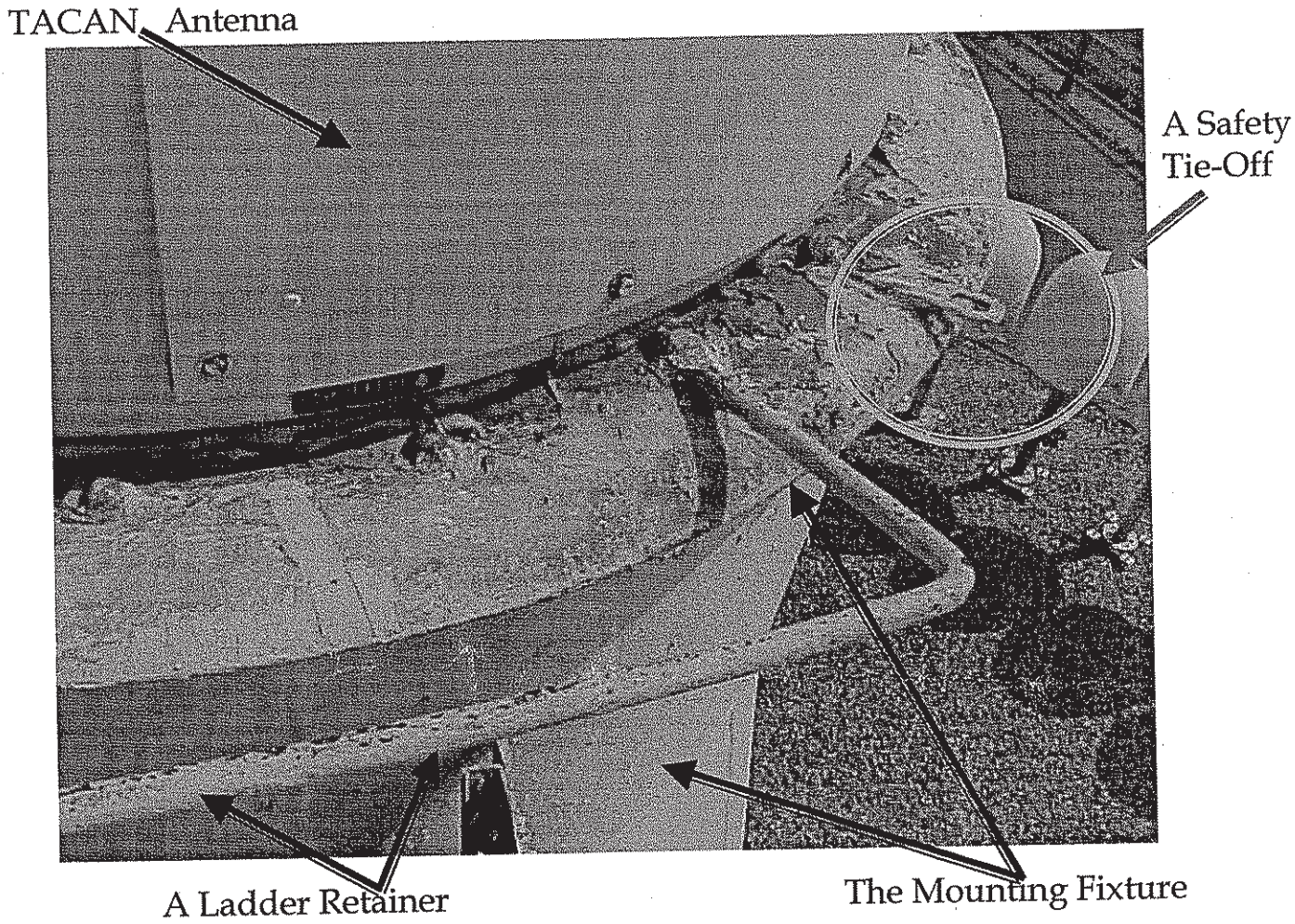
Multiple Trolleys. Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.



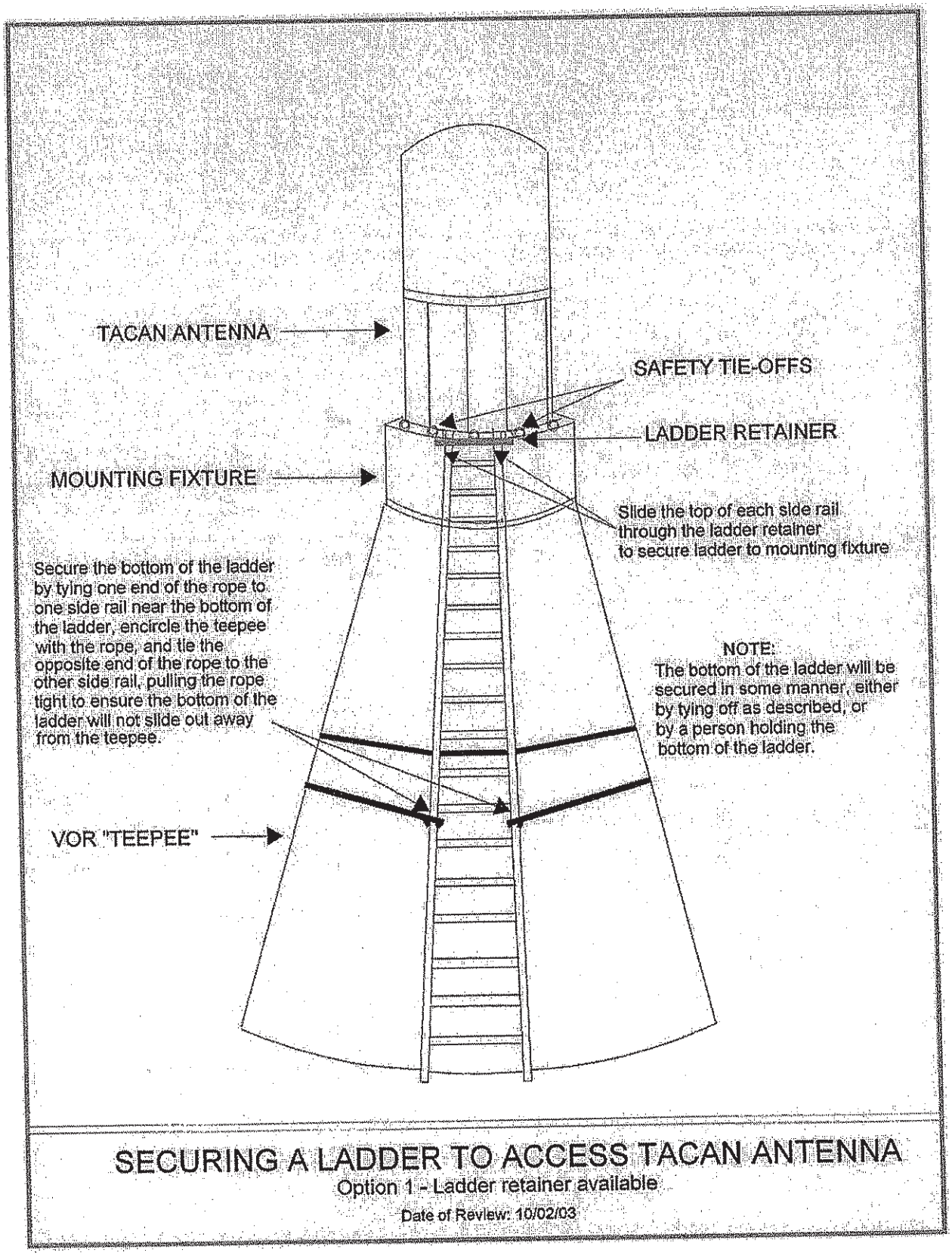
Magnet is Disconnected. Crane Operator spreads both hands apart palms up.

ATTACHMENT 5

Picture of Mounting Fixture



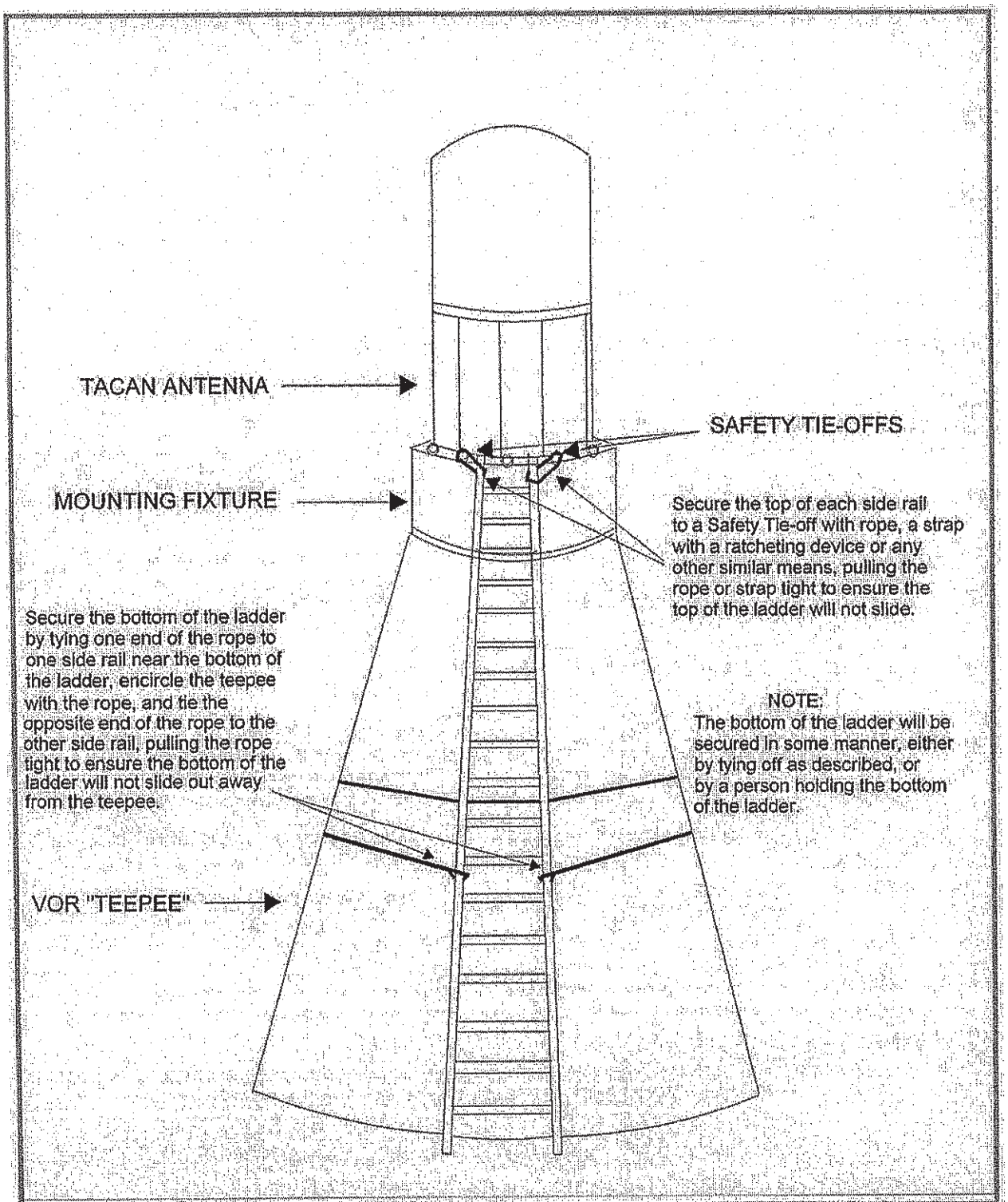
ATTACHMENT 6



SECURING A LADDER TO ACCESS TACAN ANTENNA

Option 1 - Ladder retainer available

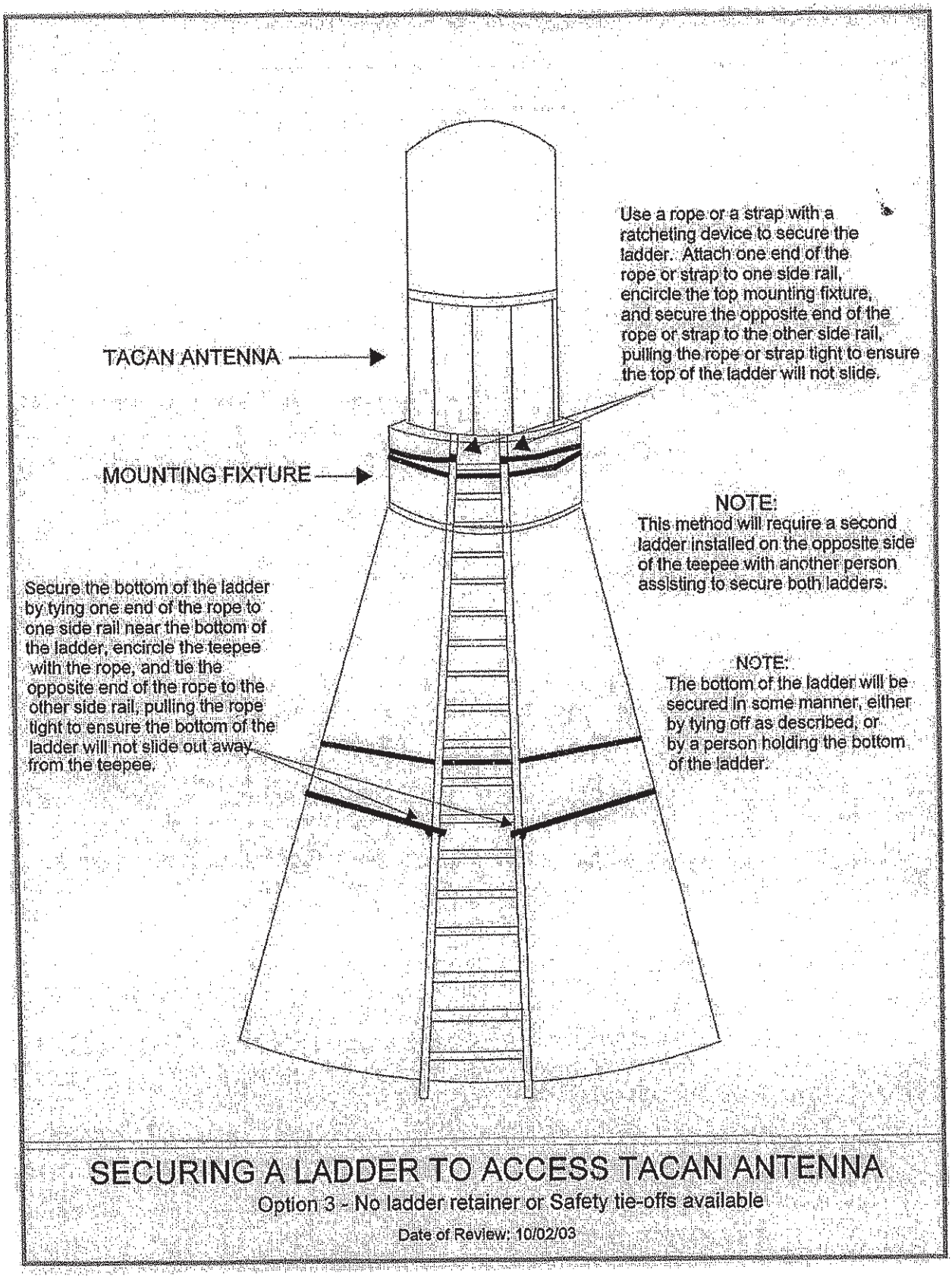
Date of Review: 10/02/03



SECURING A LADDER TO ACCESS TACAN ANTENNA

Option 2 - No ladder retainer, Safety tie-offs available

Date of Review: 10/02/03



SECURING A LADDER TO ACCESS TACAN ANTENNA

Option 3 - No ladder retainer or Safety tie-offs available

Date of Review: 10/02/03