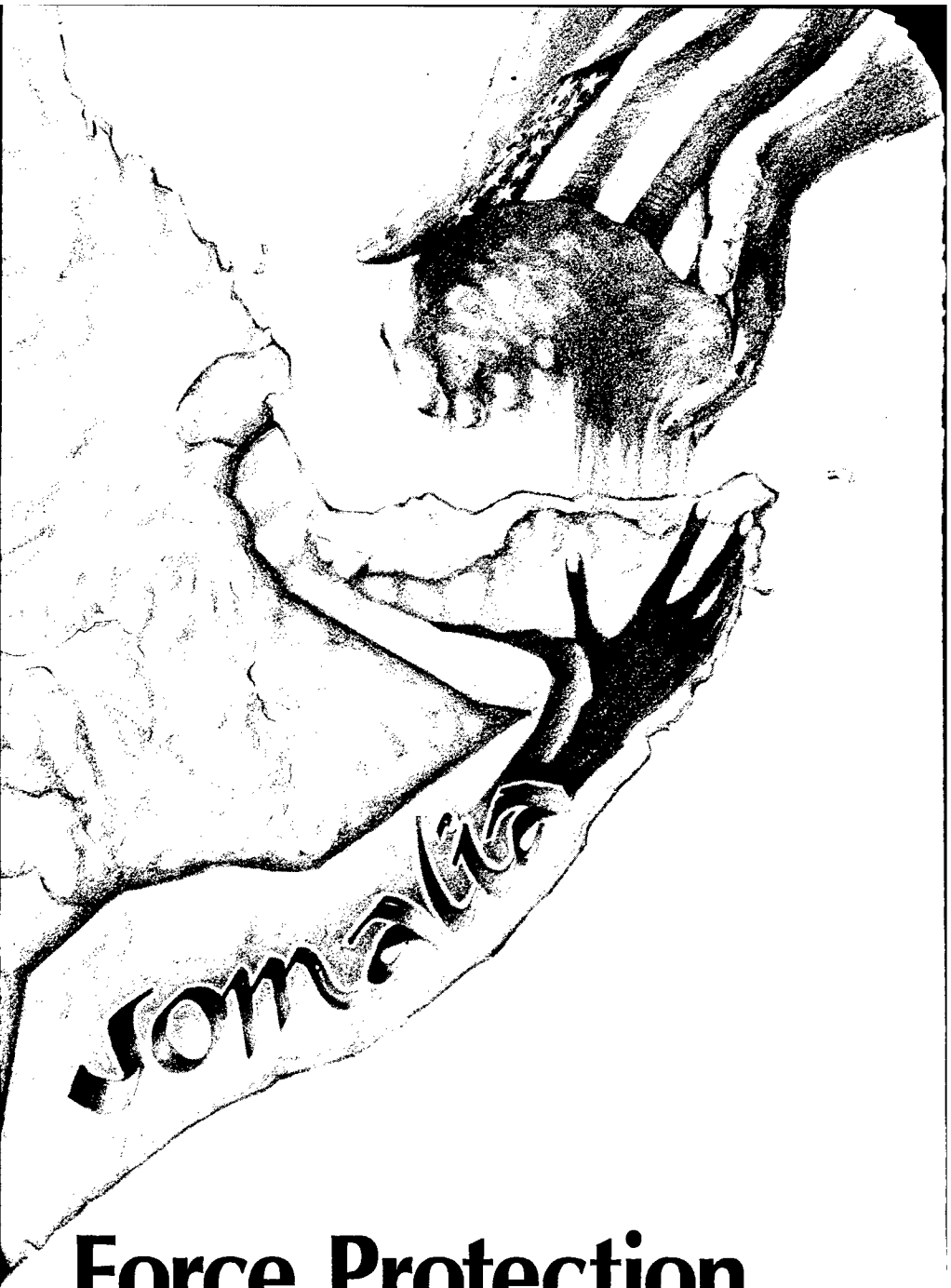


Force Protection Leader's Guide

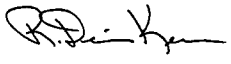
PAM 93-01

Foreword

In every operation, whether combat or humanitarian assistance, force protection is essential to success. Statistics show that during such operations, soldiers are more likely to be killed or injured from an accident than from any other cause. In World War II, 56 percent of the casualties were from accidents; in Korea, it was 44 percent; Vietnam was 55 percent; and, in Desert Shield/Storm, it was an alarming 75 percent. These are more than just numbers. They represent a serious loss in our ability to accomplish our mission. As such, they present a significant leadership challenge.

Accidents cause a serious drain on operational assets at a time when we can least afford to lose them, and we must strive to keep such losses from happening. It is imperative that force protection be integrated into every mission associated with Operation Restore Hope. To do this, leaders must continually monitor the readiness of their soldiers and leaders as well as the status of their training, equipment, and support. Leaders must also use the risk management process to identify and control hazards before they cause an accident. Lastly, leaders must ensure that soldiers know the standard for each task, that they have been trained to the standard, and that they perform to the standard.

This pamphlet is a quick reference intended to help unit leaders prevent accidents during Operation Restore Hope, thereby saving lives and preserving our combat assets.



R. DENNIS KERR
Brigadier General, USA
Director of Army Safety

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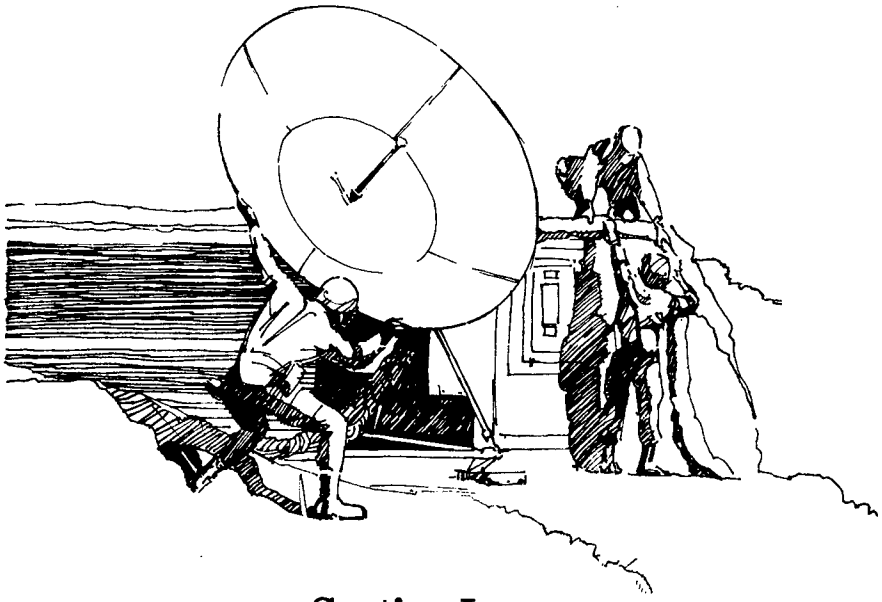


Section I

Safety Alerts

Our experience in Operation Desert Shield highlighted certain unsafe situations, some of which led to accidents. This section offers both general and specific suggestions on ways to eliminate these unsafe situations before they cause an accident in Operation Restore Hope.

Deployment

Situation: Individuals abandon safety in an effort to perform mission.

- If standards do not exist, establish them.
- Establish a command climate from the outset that promotes safety. Begin by establishing a safety network, designating safety personnel.
- Enforce standards; require all personnel to perform to standard in all operations.

Situation: Improper loading and reporting of loads.

- Train load teams to standard.
- Transportation officers and unit commanders must ensure

that secondary loads are secured to prevent motion-induced damage.

- Ensure vehicles have required tiedown shackles.
- Transportation officers and unit commanders at all levels must ensure that AUEL/LOGMARS data reflect actual "as shipped" weight, not "as published" weights.
- Shippers must provide accurate LOGMARS data and segregate hazardous cargo.

Situation: Personnel work in port without hardhats, back vehicles without ground guides, and speed in work areas.

- Enforce standards.

Situation: Use of chemical agent resistant coating (CARC) to repaint vehicles for deployment.

- Ensure that CARC painting is done in accordance with EPA requirements.
- Caution users that CARC is flammable.
- Caution users that CARC is toxic, and exposure can lead to respiratory problems.
- Ensure that users wear a respirator when painting.

Human factors

Situation: Air travel causes dehydration and fatigue.

- Ensure that arriving troops are given opportunity to rehydrate and rest before being assigned duties.

Situation: Lack of depth perception in desert environment.

- Stress that lack of contrast in terrain features reduces depth perception.
- Tell vehicle drivers that, when in doubt, they should use a ground guide.
- Tell aircrews to go slow when they go low.
- See "Depth perception at night" on page 16.

Situation: Soldiers perform strenuous manual labor.

- Remind soldiers to avoid strains and lifting injuries by lifting with their legs, not their backs.

For other human-factors tips and precautions, refer to U.S. Army

Research Institute of Environmental Medicine (USARIEM)
Technical Note 93-1, December 1992.

Aviation operations

Situation: Aviation units have problems maintaining standardization.

- Deploy standardization and safety personnel with the unit.
- Establish a deployment library and take essential maintenance, operational, and training regulations and safety publications.

Situation: NVG operations in desert environment.

- Operate according to the crawl-before-you-walk, walk-before-you-run philosophy, especially in an unfamiliar environment.
- Conduct detailed planning and mission briefings regardless of pilot experience.
- Establish all crewmember duties.
- Identify crew coordination requirements, especially during critical phases of mission.
- Remind crews that continuous scanning is a must and that the pilot on the controls must stay outside.
- Require that all crewmembers assist in obstacle clearance.
- Remind aircrews that airspeeds must be adjusted downward during low illumination and visibility conditions and in areas of little or no contrast (go low, go slow).

Situation: Failure to establish Emergency Helicopter Instrument Recovery Procedures (EHIRP).

- Establish EHIRP for area of operation.
- Include EHIRP in mission briefings (unit SOP).
- Spell out crew duties and crew coordination requirements.
- Conduct unannounced IMC during checkrides.

Situation: Failure to conduct area operation surveys.

- Survey area of operation, and establish hazard maps and restricted flight areas as first order of business.
- Brief hazards and obstacles for every mission.
- Brief all crewmembers on their responsibility for scanning to

detect hazards and obstacles and to inform pilot on controls.

Situation: Uncommanded launch of ordnance from aircraft.

- Ensure that aircraft are downloaded or in a safe area when performing inspections or maintenance on weapons systems.
- Ensure that weapons are oriented away from other aircraft, troops, and facilities.

Ground operations

Situation: Vehicle operations result in accidents.

- Caution soldiers to drive defensively.
- Remind drivers to clear all sides before turning.
- Caution drivers to use extra care when operating off improved roads; sand dunes drop off abruptly on the leeward side.
- Train soldiers on rollover procedures in the vehicles in which they operate; practice rollover drills.
- Enforce safety belt requirements.
- Remind drivers that driving too fast for conditions is a primary cause of accidents.
- Train drivers of M915 series vehicles in braking procedures.
- Train crews on vehicular fire drills; practice drills.
- Caution drivers that roads, bridges, and overpasses may not be posted with weight or height restrictions.
- Require safety briefings for senior occupants as well as vehicle drivers.
- Require the use of 10-foot inflator gauge for inflating and deflating split-rim tires.

Situation: Not enough attention to weapons safety.

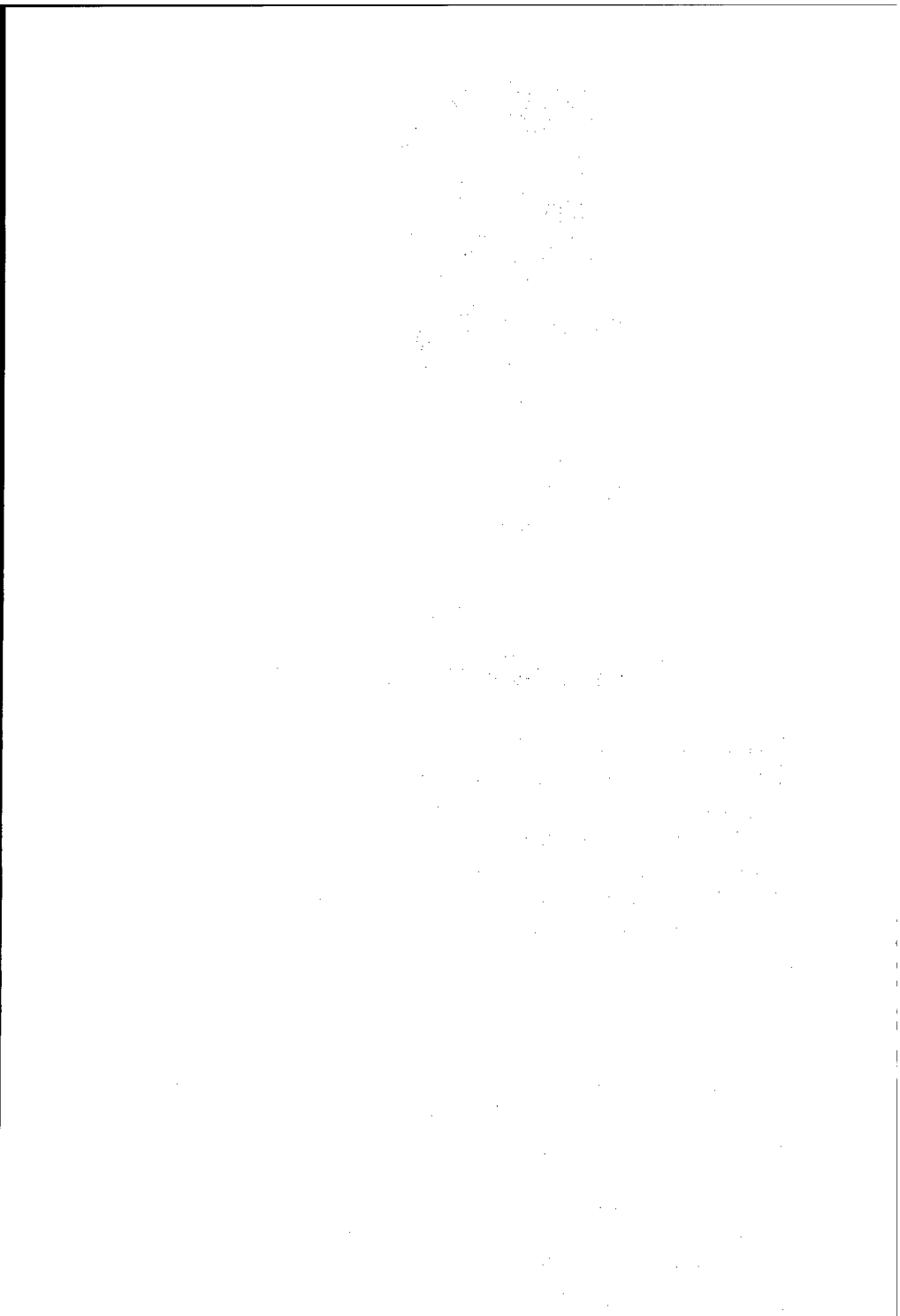
- Remind soldiers to handle all weapons as though loaded.
- Caution soldiers not to play with knives.
- Do not allow target practice and blank ammunition to be mixed.
- Ensure that M16A2 ammunition is not fired in the M16A1 rifle.
- Caution soldiers to handle ammo boxes with gloves and not to burn ammo boxes; some are treated with PCP.

Situation: Unsafe fuel handling and burning.

- Use FM 21-10 for guidance on proper fuel mixtures.
- Ensure that fuel is not used as a substitute for cleaning solvents.
- Prohibit the burning of aerosol cans and unopened MRE packages; they will explode.
- Train soldiers in the process of burning human waste.

Situation: Eye exposure to sunlight reduces night vision.

- Enforce the wear of Ballistic Laser Protection System (BLPS). The sunglasses will reduce the adverse effects of sunlight on night vision. The sunglasses and clear lens will also protect against eye injury.
- If BLPS are not available, allow soldiers to wear sunglasses during the day to protect against night vision degradation.



Section II

Risk Management

Risk management is the *process* of making operations safer without compromising the mission. Accident experience shows that mission-stopper accidents occur when victims are ignorant of hazards and countermeasures or when *directed* countermeasures are ignored. The greatest effort should be in hazard identification and countermeasure enforcement. This section provides leaders guidance on integrating the risk management approach into unit operations.

Rules

Four rules guide the risk management process:

- **Integrate risk management into planning.** Risk management begins with planning and readily complements current Army processes.
- **Accept no unnecessary risks.** The leader who has the authority to accept a risk has the responsibility to protect his soldiers from unnecessary risks. An unnecessary risk is one that, if eliminated, still allows mission accomplishment.

• **Make risk decisions at the proper level.** Make risk decisions at a level consistent with the commander's guidance. The leader responsible for the mission should make the risk decisions.

• **Accept risks if benefits outweigh the costs.** Leaders must take necessary risks to accomplish the mission. Leaders must understand that risk-taking requires a decision-making process that balances mission benefits with costs.

Process

There are five steps to the risk-management process.

• **Identify the hazards.** The hazards are the potential sources of danger that could be encountered while performing a task or mission. For example, a river crossing is anticipated while conducting a foot patrol. Factors that determine hazards are water depth and current, hypothermia, fatigue, debris on and under water, change in conditions caused by weather, and swimming ability of the soldiers. There could be other, less obvious hazards that would become apparent during planning. Leaders should seek to identify all these hazards before the operation.

• **Assess the hazards.** Identified hazards must be assessed to determine their cumulative effect on the mission or objective. Each of the hazards is analyzed to determine the probability of its causing a problem and the severity of the consequences should such a problem occur. Exercising judgment on how to eliminate or reduce hazards to lessen the overall risk is inherent in the risk assessment process. This step concludes with a risk assessment that describes the impact of the combined hazards. The result is a statement that quantifies the risk associated with the operation: high, medium, or low.

• **Make a risk decision.** Leaders are expected to weigh the risk against the benefits of performing an operation; however, the mentality is more often mission-first. Keep in mind that unnecessary risk can be a hindrance to mission accomplishment. Risk decisions are made at a level of command that corresponds to the degree of risk. As such, guidance should be established as to who makes which risk decisions. For example, high-risk squad actions may be

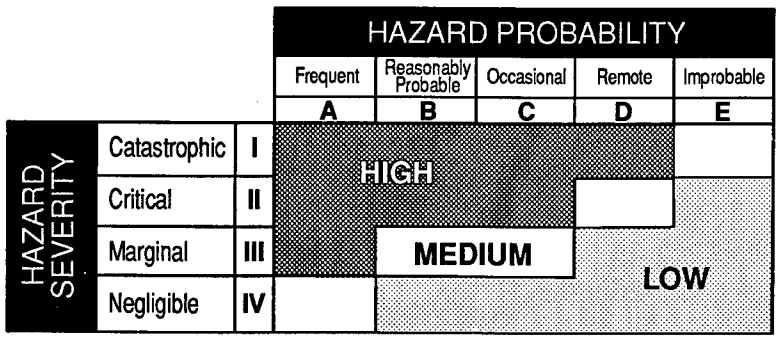
elevated to the company commander for acceptance or denial. A brigade commander may direct that company-level risk decisions be made by the company commander if the risk is low, battalion commander if the risk is medium, and brigade commander if the risk is high. In the case of battalion-level decisions, the chain may go from battalion to brigade to division.

- **Implement controls.** The controls established as a result of the first three steps are implemented in step four. Included is leader action to reduce or eliminate hazards. Integrate specific controls into plans, orders, SOPs, training performance standards, and rehearsals. Knowledge of controls down to the individual soldier is essential.
- **Supervise.** Supervision in this sense goes beyond ensuring that people do what is expected of them. It includes following up during and after an action to ensure that all went according to plan, reevaluating the plan or making adjustments as required to accommodate unforeseen issues, and incorporating lessons learned for future use.

Integration techniques

Two techniques are critical to maintaining unit battle focus:

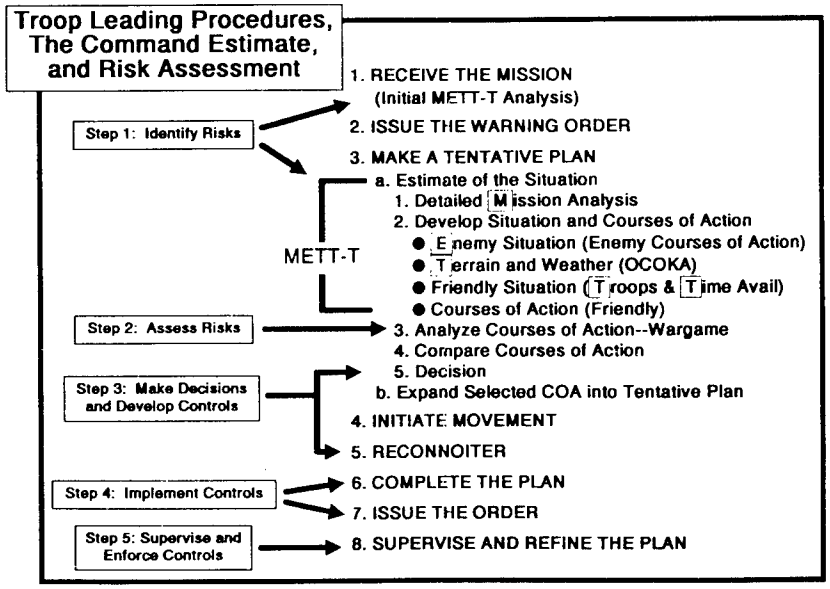
- **Individual/leader risk management** (focuses on individual through company-level command thought processes to recognize hazards and take action to reduce risk). Use FM 22-100: Military Leadership problem solving, decision making,



Hazard Risk Assessment Code	Risk Level
IA-ID, IIA-IIC, IIIA	HIGH
IE, IID, IIIB-IIIC, IVA	MEDIUM
IIE, IIID-IIIE, IVB-IVE	LOW

and planning process. Identify the problem (hazard), gather information, develop courses of action, analyze and compare actions, make a decision, make a plan, and implement the plan. Memory aids such as METT-T and checklists help promote consistency.

• **Command echelons risk management.** This technique uses the FM 101-5: Staff Organization and Operations Manual military decision-making process. This process integrates safety and risk assessment into operational decisions normally associated with battalion and higher planning and operations. The commander directs the staff to identify necessary risks and risk controls as "considerations affecting the possible courses of action." Staff officers use memory aids such as METT-T to promote consistency. The final commander's estimate and concept addresses significant risk acceptance, eliminations, and controls. Implement these decisions directly into applicable areas of OPLANS (ORDERS). Commanders must



METT-T: . . . the factors that must be considered during the planning or execution of a tactical operation.

--FM 101-5-1, Operational Terms and Symbols

ensure dissemination and enforcement of risk decisions and controls down to soldier level.

Basic METT-T hazards

The following METT-T hazards are provided to provoke thought about issues to consider in your risk management actions. They are not all-inclusive.

Mission

- East Africa contingency in support of Operation Restore Hope
- Accelerated mobilizations with short preparations
- Multinational, joint service, and combined force; language and standard operating procedure differences
- Command relationships
- Contingency mission assignments with mission orders
- Night operation emphasis
- Joint/coalition force missions; more complex
  - Boundaries/sectors
  - Communications
  - Coordination

Enemy

- Aggressive, determined, war-proven enemy leadership
- Seasoned/battle experienced/well equipped enemy
- Armed personnel, home ground advantage of area hazards and hazard utilization
- Probable terrorist threats
- Increased fratricide (friendly fire) threat due to—
  - Armed personal and multinational force use of like equipment
  - Long-range engagements due to favorable terrain
  - Heat shimmer/dust interference with foe identification
  - Enemy not easily identifiable (no uniforms, standard equipment)

Terrain

- Sub-Saharan
  - Flash floods possible

- Poor wheeled vehicle off-road mobility/stability
- Limited water sources
- Undefined trail boundaries
- No natural shade
- Snakes, scorpions

• Rocky, mountain deserts
- Poorly surfaced roads
- Off-road vehicle travel poor to impossible
- Limited water sources
- Mirage visibility degradation
- Snakes, scorpions
- Falling rocks

• Other areas
- Congested bivouac, port, and staging areas
- Strong religion-influenced cultural taboos and lifestyle differences
- Roads heavily used by pedestrians and beasts of burden
- Little civilian compliance with established driving procedures, and no defensive driving awareness
- High temperatures/humidity and intense light in coastal areas
- Thunderstorms with flash floods and extreme mud
- Petroleum facilities contain fire and poisonous fumes hazard
- Snakes, scorpions, centipedes, sea snakes, spiders, bugs

Troops

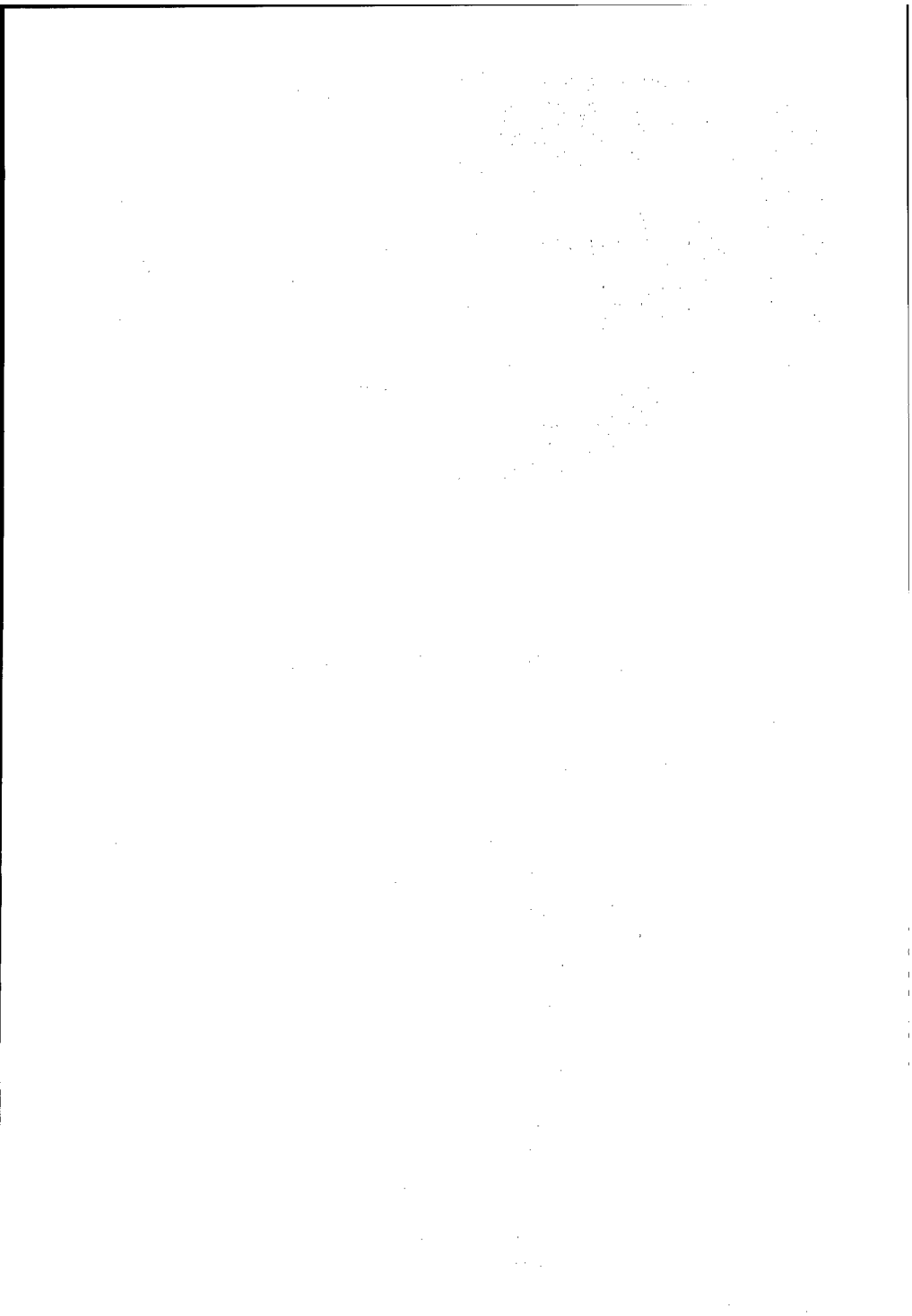
• Assessment of training proficiency on complex tasks involving:
- Field sanitation teams
- NBC training
- Climate
- Maintenance
- Heat-injury detection/prevention training
- Night operations training
- Physical fitness training
- Pilot/operator training on local conditions
- Leadership training

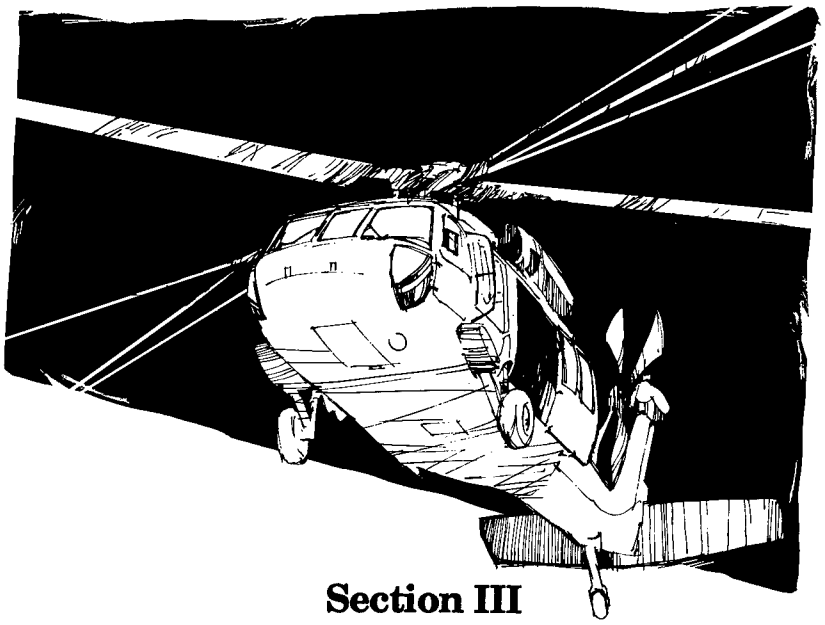
• Troop acclimatization
• Water availability

- Troop morale, stress, esprit, discipline
- Troop fatigue (quality and quantity of rest)
- Command climate and leadership quality
- Equipment status (increased maintenance requirements and long combat service support lines of communication)
- NBC equipment heat stress and visibility/mobility degradation
- Personal protective/safety equipment availability (goggles, work gloves, sunscreens, chapstick, eye ointment, canteens, helmets, flak jackets, ear protection, dust respirators, specialized equipment, and plastic bags to store individual clothing in for protection from bugs, etc.)

Time

- Little time for preparations (activations and mobilizations)
- Jet-lag effects
- Intense pace





Section III

Aviation Operations

This section addresses areas of concern in aviation operations. Listed under each area are actions to take to reduce the hazards.

Area operation survey

- Survey area of operation, and establish hazard maps and restricted flight areas as first order of business.
- Brief hazards and obstacles for every mission.
- Brief all crewmembers on their responsibility for scanning to detect hazards and obstacles and to inform pilot on controls.
- Develop an Aviator's Procedure Guide for the area of operation.
- Establish EHIRP for area of operation.
- Include EHIRP in mission briefings (unit SOP).
- Spell out crew duties and crew coordination requirements.

All aircraft

Maintenance

- Use caution when touching aircraft surfaces or metal tools that have been exposed to the sun. Wear gloves and use mats

or pads when practical to prevent burns and blisters.

- Inspect seals, tires, and such frequently for blisters and other signs of deterioration.
- Inspect vibration isolators frequently and replace where cracking or permanent set is excessive.
- Inspect and clean flaps, control hinges, pulleys, bearings, worm gears, cowl slides, and landing gear regularly to arrest corrosive action.
- Inspect dead air spaces in fuselage at regular intervals for accumulation of sand. Remove accumulated sand to prevent change in aircraft weight and balance.
- Clean instrument filters thoroughly at regular intervals. Replace wornout filters promptly.
- Leave canopy partly open, except during dust or rain storms, to permit circulation of air within the flight compartment.
- Install protective covers and dust excluder plugs on all engine openings, vents, air intakes, exhaust outlets, breathers, propeller hubs and feathering domes, cowls, and other vital openings to prevent entry of sand and dust. Keep aircraft pointed into wind when not being serviced or prepared for flight.
- Make all possible ground checks before starting engine. Inspect controls for freedom of movement to ensure no binding is caused by sand.
- Never use sand-encrusted tools on aircraft.
- Run up engines on a hard surface such as a landing mat or a sand- and dust-free area to prevent sandblasting.
- Flush engines more frequently in a dusty environment.

Depth perception at night

- Drop chem light stick on ground before landing to overcome illusion that aircraft is higher above ground than it actually is.
- Remind pilots that radar altimeters provide the only effective reference to properly gauge altitude over expanses of flat "mirror" desert during the day.
- Monitor shadows cast by near objects such as landing gear or skid shadows during hover.

• Keep windscreen and door windows clean of dust and sand.

• Survey flying area for areas of low contrast and definition, particularly where terrain rises and falls.

NVG operations

• Operate according to the crawl-before-you-walk, walk-before-you-run philosophy, especially in an unfamiliar environment.

• Conduct detailed planning and mission briefings regardless of pilot experience.

• Establish all crewmember duties.

• Identify crew coordination requirements, especially during critical phases of mission.

• Remind crews that continuous scanning is a must and that the pilot on the controls must stay outside.

• Require that all crewmembers assist in obstacle clearance.

• Remind aircrews that airspeeds must be adjusted downward during low illumination and visibility conditions and in areas of little or no contrast (go low, go slow).

Wire strikes

• PIC—Conduct thorough hazard and obstacle briefing before each mission.

• Aircrews—

❑ Conduct thorough, detailed mission planning as a crew.

❑ Wire strikes are more likely when crew becomes disoriented.

❑ Mark all known wires on hazard maps.

❑ Ensure maximum crew coordination in searching out and calling out wires.

❑ Go slow when you go low.

• Aviation safety officers—Promote wire strike prevention awareness in safety briefings.

Flying in MOPP gear

• Aircrews—

❑ In aircraft not equipped with environmental control units, keep doors, windows, and vents open to increase ventilation.

❑ If tactical situation permits, fly at higher altitudes, which yield cooler air.

❑ Because the M24 and M43 protective masks reduce visibility, constantly scan in all directions.

❑ Wearing the M24 mask for extended periods causes breathing resistance. Concentrate on breathing slowly.

• Commanders—Provide contamination-free areas where aircrews can rest.

Defensive measures during NBC operations

• Once chemical agents are employed or their employment is imminent, use M-9 paper or M-9 tape on windscreens, forward edges of stubby wings, etc., to detect chemical agents while in flight (FM 1-112, App E).

Survival equipment

• Check for presence and condition of desert survival kit (Hot Climate Individual Survival Kit, NSN 1680-00-973- 1861) before each mission. Kit should contain the following:

- ❑ Water (5 gallons), canned or in canteens.
- ❑ Shelter, parachute or canvas.
- ❑ Rations for 3 days.
- ❑ Waterproof matches.
- ❑ Compass.
- ❑ First-aid kit.
- ❑ Pocketknife.
- ❑ Emergency radio.
- ❑ Water purification tablets.
- ❑ Sunburn ointment.
- ❑ Day/night signal flares.
- ❑ Snakebite kit.
- ❑ Frying pan.
- ❑ Whistle.
- ❑ Headnet, insect.
- ❑ Signal mirror.

High intensity radio transmission area (HIRTA)

• Mission planning should include consideration of potential effects of an electromagnetic environment.

• Report suspected instances of electromagnetic interference.
• Review classified HIRTA guidance information (CDRAVSCOM message, AMSAV-E, 091845Z Jan 89).

Helicopters

Brownout; blowing dust/sand

• Ensure crews are familiar with procedures in aircraft operator's manual; chapter 2, FM 1-202: Environmental Flight; and TC 1-13, Hot Weather Flying Sense.
• As a minimum:
❑ *Taxiing.* Get helicopter airborne and through ETL as quickly as possible to minimize sand and dust intake by engines and danger of brownout.
❑ *Takeoff.* Running takeoff is preferred for wheel-type helicopter. Otherwise, maximum performance takeoff is recommended.
❑ *Flight and descent.* Avoid flying through sand or dust storms. Excessive dust and grit will cause damage to internal engine parts, excessive bearing wear, and erosion of rotor blades.
❑ *Landing.* Running landing when terrain permits with minimum touchdown roll. Approach to touchdown should be made using approach angle greater than angle used for normal approaches. Approach angle should be compatible with available power. Be prepared to go around if ground contact is lost.
❑ *Doors and windows.* Keep closed during takeoff and landing to help prevent sand from entering cockpit and cargo area.

Maintenance

• Keep aircraft clean, thus reducing wear and tear caused by a buildup of sand and dirt.
• Use protective covers between flights to protect aircraft from excess heat and to stop sand and dirt from getting into moving parts.
• Wipe oil and grease off engine decks and cowling-covered parts.
• Make sure all filters and air cleaners are inspected and cleaned daily.

• Cover radios and receivers with dust covers when possible. Clean ventilating ports and channels to stop overheating.

• Blow sand and dirt out of instrument panels, switches, flight controls, and cables.

• Tape all openings or seams around windows, chin bubbles, and access panels. Do not stop airflow that's needed to cool parts.

• Lubricate main and tail rotors after every flight or at least daily as per appropriate TM.

• Replace damaged sealant around windows, doors, and chin bubbles.

• Remove oil cooler compartment access panel daily, and clean caked dirt and sand off fan's inner lip.

• Keep windows clean and covered when aircraft are parked.

• Don't let covers touch windshield. Protect windows with styrofoam, newspaper, cardboard, or other nonabrasive material—then attach cover.

• Add oil and hydraulic fluid directly from original unopened containers to help stop sand and dirt from getting into helicopter's lubrication and hydraulic systems. Dispose of partially used containers.

• Wipe off excess grease every time lubricant is applied. Grease attracts sand and dirt, forming a paste that grinds and wears lubricated parts.

• Inspect blades after every flight. High winds combined with sand or dirt landing pads can sandblast paint off blades.

• Slow erosion by covering leading edge of main rotor blades with an erosion prevention tape applied in accordance with TB 1-1500-200-20-28: Rotor Blade Erosion Protection.

Pressure/density altitude; weight and balance; wind

• Compute density altitude (DA) before weight and balance.

• Always assume DA to be a little higher than calculated.

• Study DA tables in operator's manual.

• Remember that helicopter performance can be affected as soon as 1 hour after sunrise because of desert temperature extremes affecting DA.

• Consider the effect wind direction has on aircraft control during takeoff and landing.

• Fog may be prevalent throughout the area of operations due to large coastline.

Forward arming and refueling points (FARP)

• Ensure fuel and ammunition handlers are familiar with FM 10-68 and FM 1-104 procedures.

• Use extreme care when handling engine fuel at temperatures above 120°F to prevent possible sparks and explosion. Open gasoline drums with bronze or other nonsparking tools.

• Look for and correct improper grounding points, deteriorated or leaking hoses, leaking nozzles, incorrect sampling procedures, improper storing or dumping of waste POL products, lack of personal equipment for refueling personnel, no water at refueling site, unserviceable fire extinguishers, and no controlled access into/out of refuel points.

• Keep gasoline drums covered and, where possible, maintain storage temperature below 120°F.

• Remember that fuel expands in very hot temperatures.

• Ensure fuel does not become contaminated by dirty nozzles and other unclean equipment.

• Consider positive control of air traffic and ground traffic around refueling sites to reduce potential of midair/ground collisions.

• Keep camouflage materials (netting/foliage) as far from rotor blade systems as possible to prevent FOD.

Warning: High-frequency radios will not be operated within 100 feet of aircraft being armed and/or refueled.

Caution! At 111°F., white phosphorous (WP) tends to liquefy, affecting ballistics of WP rounds.

• Enforce requirement for at least two qualified personnel to arm an aircraft.

• Ensure weapons are on safe before arming.

• Ensure guns are oriented away from unit assets during rearming.

• Require frequent cleaning and lubrication of turret weapon

systems to prevent jamming due to sand.

- Require daily inspection of grounding/bonding systems.
- **Static electricity:** Desert environments are known static electricity hazard areas. Be aware of fire hazard possibility from static electricity and that connecting the nozzle bonding wire before opening the fuel cap will prevent a static arc from occurring in the presence of fuel vapor and significantly reduce the fire hazard.

Lasers

- When in doubt, require wearing of laser safety eyewear.
- Treat handheld laser devices as if they were a loaded weapon.
- Do not aim laser rangefinders or target designators at nontarget personnel, vehicles, or passing aircraft.
- Do not place hands in front of any laser device.
- When using binoculars or image magnification devices in area of lasers, ensure proper filter is being used.
- Do not perform maintenance work on laser systems until power is off and residual charge in any power supply capacitors has been bled off.
- When maintenance *must* be performed on "on line" laser systems, output must be blocked or enclosed.

APU starting procedures

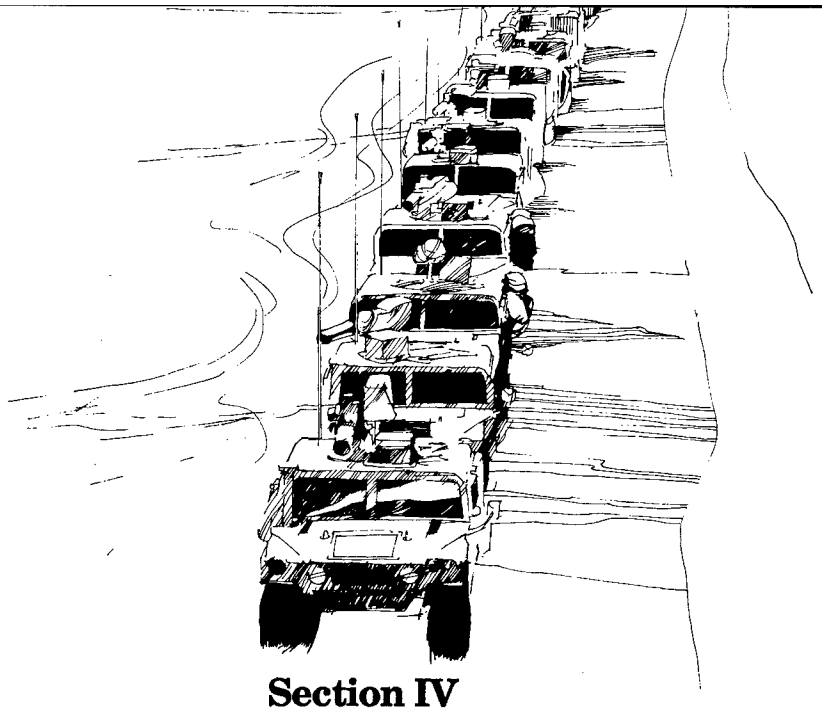
- Under normal operating conditions, start APU only when performing preflight cockpit equipment checks or during parking and shutdown sequence, as specified in the operator's manual.
- As APU is not flight certified, do not start in flight or during ground taxi, except in emergency.

Visual scan

- Function as a total crew, exercising guidance in appropriate ATM.
- Do not stop scanning to channelize attention inside or outside aircraft. Scan stop of more than 3 seconds is risky. If pilot on controls must stop scanning, transfer controls; if pilot not on controls decides to stop scanning, announce decision.

Foreign object damage

- Ensure that bivouac areas are clear of aircraft approach paths, landing pads, and departure paths to prevent loose items from being affected by rotor wash and injuring personnel or damaging aircraft.
- Require that FOD checks be performed following maintenance to reduce the possibility of loose items being ingested by aircraft engines.
- Ensure that approach/hover/departure is high enough not to affect loose debris in damaged areas. Avoid areas littered with items such as metal roofing sheets or plywood, which could become airborne and fly through the rotor system or injure personnel in the area.
- Recon unimproved landing and pickup zones for FOD prior to use.



Section IV

Ground Operations

This section addresses areas of concern in ground operations. Listed under each area are actions leaders should take to reduce the hazards.

All vehicles

PMCS

- Stress that PMCS is especially critical in hot, dusty conditions.
- Ensure that operators know that, due to severe environmental conditions, they must perform daily PMCS even if equipment is not used.
- Stress that drivers must perform special requirements covered in the "Operating Under Unusual Conditions" section of their respective operators manual.
- Ensure that chock blocks are used as required.

Off-road driving

- Terrain: The northern part of Somalia is hilly, and in many places the altitude ranges between 3,000 and 7,000 feet above sea level. The central and southern areas are flat, with an

average altitude of less than 600 feet.

- Roads: Only 28 percent of the roads are paved; the rest are gravel or earth surfaces. About half of these are rudimentary dirt trails.
- Provide instruction about tire pressure and hands-on training in gear selection, crossing dunes, stopping in sand, and other sand-driving skills (FM 21-305 and FM 21-306).
- Ensure drivers refer to appropriate vehicle operators manual for "Operating Under Unusual Conditions."
- Provide instruction in vehicle control in strong wind and blowing sand conditions.
- Ensure that wheeled vehicle drivers receive hands-on training in driving in sand, mud, and rocky terrain to include the following:

❑ Reduce tire pressure for soft sand and dunes, and drive at low speed. Inflate tires to normal pressure as soon as situation permits. (Prolonged driving on partially deflated tires will overheat tires and break down sidewalls.)

❑ Select a gear or range that will start vehicle with a minimum of clutch slippage and wheel spinning.

❑ Maintain a steady, even rate of movement.

❑ Avoid unnecessary gear shifting. Keep automatic transmissions in low range.

❑ Approach dunes from the windward (most gradual) slope at a 90-degree angle after selecting gear or range to avoid shifting on slope. Maintain momentum during ascent.

❑ Make wide turns.

❑ Brake gradually or allow vehicle to roll to halt. Stop on downhill slope when possible. (Abrupt stops may cause vehicle to sink into loose sand and become stuck.)

❑ Cross shallow ditches by shifting into low gear or range and proceeding slowly.

❑ Enter ditches obliquely so that one wheel leaves the ditch as the other wheel on the same axle enters it.

❑ Do not attempt to straddle large boulders; they will damage axles and other low parts of the vehicle.

❑ Drive slowly in rocky terrain, and carry an extra spare tire if one is available.

❑ Remove stones between dual tires as often as possible to

prevent breaking sidewalls.

- ❑ Use low gear (or low range) to pull slowly out of mud.
- ❑ Increase traction in mud by placing boards, brush, or similar material under the wheels.
- ❑ When driving through mud, select a low gear, roll onto the soft area at a medium speed for the selected gear, and carefully maintain a steady throttle until reaching solid ground.
- ❑ FM 21-305 provides additional guidance.

• Ensure that tracked vehicle drivers receive hands-on training in driving in sand, to include the following:

- ❑ Do not make pivot turns.
- ❑ Do not straddle sand mounds or drive on sides of two sand mounds. (Loose sand will not support tracked vehicles on steep slopes.)
- ❑ Keep speed steady after reaching desired speed.
- ❑ Turn slowly on loose sand.
- ❑ Steer straight up and down hills if possible.
- ❑ Be wary of a lack of steering response, which indicates sand is building up between rear sprockets and treads. If allowed to continue, sand buildup will force the track off. "Shaking" the vehicle with the steering or backing up will throw off the sand.
- ❑ TC 21-306 provides additional guidance.

Built-up areas/local driving

• Provide instruction in local driving customs and practices. (Accident experience shows local drivers to be very unpredictable, often showing complete disregard of traffic signs and signals, turning left from the right lane or right from the left lane, and making U-turns in intersections.)

• Avoid areas of high civilian vehicle concentration.

• Stress need for constant alertness and to expect civilian vehicles to always do the unexpected.

• Ensure all drivers are aware of flash flood dangers: frequency of rainstorms, low areas, effect on roads and traffic.

Speed

• Establish and enforce safe speed limits for various road and environmental conditions.

Safety belts

- Enforce the use of safety belts.

Driver selection

- Pair an experienced driver with an inexperienced one to provide supervision and hands-on training.

Rollovers

- Practice rollover crew drills.
- Instruct drivers on conditions that can lead to rollovers: steep slopes, ditches, loose sand, etc.
- Enforce use of safety belts by crew and passengers.
- Ensure equipment is secure to prevent injury from falling equipment or cargo.
- Enforce posted and briefed speed limits.
- Remind drivers to slow down in limited visibility, on rough terrain, and during inclement weather.
- Caution drivers to avoid steep slopes and narrow trails. (Leaders must also keep this in mind when planning vehicle moves.)
- Remind drivers to give special care to tire, track, and suspension checks.
- Caution drivers to drive at moderate speed and make wide turns at slow speed to maintain vehicle control (especially critical in off-road driving).

Backing

- Ensure drivers properly use ground guides (see section on ground guiding).

Passengers/cargo transport

- Supervise cargo loading to ensure load is secured and weight is correctly distributed (especially when traveling over off-road terrain).
- Enforce wear of safety belts and helmets.
- Use fixed seating in truck cargo beds.
- In cargo beds without fixed seating, ensure passengers remain seated within truck body.

Crew coordination

- Stress importance of maintaining crew communication.
- Remind drivers and track commanders to warn crews and passengers when they are about to cross a ditch, climb an obstacle, or take any action likely to catch occupants off balance.

Tracked vehicles

Hatches and latches

- Make sure safety pins are present, operational, and used.
- Require daily PMCS checks to ensure hatches and doors are functioning correctly.
- Notify crew of hatches and doors that are unserviceable.
- Ensure helmets are worn.
- Ensure bad latches and pins are replaced immediately.
- Require crews to check hatch, latch, and pin function throughout the mission.

Turrets

- Remind crews to maintain proper communications between crewmembers at all times.
- Brief and train crewmembers and passengers about turret hazards.
- Advise crew and passengers on the tactical situation so they can anticipate turret movements.
- Stress importance of announcing "power" before traversing turret.
- Remind crews to turn turret power off before leaving turret station.

Fires

- Practice crew drills for emergency fire escape.
- Require complete electrical inspection (no loose connections, no frayed or worn wires, and no wires that run over hot or sharp objects) in accordance with appropriate operators manual.
- Ensure that fuel systems are inspected for leaks, and ensure lines do not run over sharp objects or rub, causing breaks or tears.

• Train/supervise crew activities involving ammunition.
• Require inspection of fire extinguisher bottles to ensure they have been tested/weighed and properly connected to discharge lines and external pull handles.
• Require inspection of fire extinguishers and refresher instruction for crewmembers in proper extinguisher operation.
• Ensure that fire detectors are cleaned every 4 hours in extremely dusty conditions.

General

• Ensure soldiers get help to mount/load heavy objects.
• Require that head protection be worn in and around vehicles.
• Stress hazards of slippery footgear and slippery vehicle surfaces.
• Emphasize use of gloves (protection from extremely hot surfaces) and maintaining three points of contact while moving about the vehicle/equipment.
• Do not allow soldiers to jump from vehicles.

Convoys

Traffic control points

• Perform route reconnaissance and brief drivers.
• Establish traffic control points during route recon.

Speed

• Establish and enforce safe convoy and catch-up speeds for expected road and environmental conditions. Include in pre-march briefing.
• Set speeds based on personnel, training, terrain, environment, and equipment (see section on night vision devices on page 37).

Rear-end collisions

• Provide adequate driver rest before starting.
• Establish speed and following distance guidelines. Increase following distance in bad weather and darkness. Include in pre-march briefing.
• In blackout conditions, ensure drivers watch the rear

blackout marker lights of the vehicle ahead. Ensure they know the distances different markers indicate. (When a driver sees one point of red light at each rear lamp of the vehicle ahead, he is more than 180 feet behind it; if he sees two points of light, he is following 60 to 180 feet behind it; if he sees four lights or two pairs of "cat's eyes," he is less than 60 feet behind it.)

- Establish speeds for blackout driving under different conditions, including blowing sand.
- Establish procedures for vehicle stops and breakdowns to warn approaching vehicles in blackout, sandstorm, and other restricted-visibility conditions.

Loss of control/rollovers

- Use experienced drivers in difficult terrain.
- For off-road movements, when possible conduct a physical reconnaissance of the route to avoid the worst terrain hazards. Mark unavoidable hazards on strip map and include them in the pre-march briefing.
- Check loads to ensure cargo is correctly secured. Stress even load distribution, especially when traveling over off-road terrain.

Clearance

- Recon the route for bridges or underpasses that may be too low for large vehicles.
- Recon routes for mountain passes or any sharp turn that might require special control measures.

Materiel failure

- Have all drivers perform PMCS before departure, during halts, and after completion.
- During halts, in addition to normal during-operation PMCS, emphasize tire/track pad condition and security of loads.
- During operation, have drivers pay particular attention to air cleaner indicator and water and transmission gauges.
- Ensure operators know proper cool-down procedures for their vehicles. Procedures are spelled out in appropriate operators manuals.
- Ensure vehicle basic issue items, pioneer tools, highway

warning devices, and fire extinguisher are present on every vehicle.

- Ensure that disabled vehicles are moved completely off the roadway.

Local driving practices

- Provide instruction in local driving customs and practices. Avoid areas of high civilian vehicle concentration. Stress staying alert and to expect civilian vehicles to do the unexpected. Include in pre-march briefing.

Passengers

- Enforce requirement to wear available safety belts and helmets.
- Use fixed seating in truck cargo beds.
- Ensure that tailgates and safety straps are secured.

General

- Do not place vehicles transporting troops, ammunition, or POL last in a serial or march unit.
- Ensure all prime movers and trailer brake systems are properly connected and fully operational.
- Reinforce braking and downhill driving procedures with all operators.

Combat soldiering

Parachuting

- Brief all jumpers on drop zone (DZ) conditions.
- Limit rucksack weight to jumper's capability; excess weight will increase the probability of a weak exit and a towed jumper.
- Ensure that jumpers who wear corrective lenses wear them while jumping.
- Review reserve parachute activation procedures and ensure jumpers know what method to use.
- Review procedures for jumping with weapons exposed.
- Ensure ONLY red cabin lights are used 30 minutes before and during night jumps. Use of white lights will destroy night vision.

• Rehearse actions on DZ.
• Review parachute landing fall techniques and emergency procedures.
• Conduct aircraft crash drills.
• Use door bundles for extra equipment and ammunition.
• Stress exit interval, door position, and correct exit procedures.
• Review crossloading plan.

Rappelling/fast rope

• Use trained rappellmaster.
• Conduct briefing with aircrew.
• Inspect all equipment.
• Keep rucksacks under 50 pounds.
• Require use of helmets and gloves.
• Prohibit cutting of ropes except in an emergency—and only after visual confirmation that rope is clear.

Landing zone selection

• When selecting helicopter landing sites, pick areas that minimize the amount of sand and dust that might be disturbed and that are clear of powerlines, trees, brush, or other obstacles. Mark unmovable obstacles.

Weapons

Handling

• Do not tolerate horseplay.
• Ensure weapons are kept on safe.
• Remind soldiers to consider weapons loaded at all times and to check chamber often.
• Instruct soldiers to load only on command or SOP.
• Remind soldiers to know their target and their allies. Train in target identification under "mirage" conditions.
• Control ammo.
• Highlight danger of "cookoffs."
• Rehearse immediate-action drills for misfire/weapons malfunction.
• Remind soldiers to clear for backblast when firing anti-armor weapons.

• Ensure that soldiers receive correct ammunition for the weapon system. Refer to the operator's manual when in doubt.

Maintenance

- Establish weapons lubrication policy.
- Require that weapons, ammo, and magazines be kept clean.
- Require that muzzles be covered to prevent clogging.
- Conduct headspace and timing in accordance with TM.

Caution soldiers not to rely on memory, to always verify.

Lasers

- Use only trained personnel to operate/handle lasers.
- Caution personnel to fire lasers only at designated targets and to never fire at specular surfaces such as glass, mirrors, and windows.
- Ensure laser safety filters are installed on binoculars and other optical devices when observing laser operations.
- Ensure eye protection is available and worn.
- Ensure laser safety procedures are established and implemented for each device being used.
- Conduct safety briefings on all Class II and higher lasers, specifying the needed eye protection and viewing limitations.

Fratricide

General

- Ensure *positive* target identification.
- Ensure task standards are followed (i.e., weapons handling, powder-charge preparation, fire and maneuver).
- Ensure warnings and reports are timely and accurate.
- Ensure soldiers are well trained in land navigation. Reconnoiter when possible.
- Anticipate the effects of stress and fatigue on soldiers.
- Anticipate the effects of battle (limited visibility, unsynchronized actions, chaos and confusion).

Mission

- Conduct rehearsals with leaders and soldiers.
- Know and physically identify all attachments.
- Know the commander's intent.

- Keep plans simple and synchronized.
- Conduct a fratricide risk assessment.

Enemy

- Know and be able to positively identify the enemy (uniforms, weapons, special markings).
- Know the effects of terrain and weather in offering advantages to enemy operations.
- Know enemy equipment capabilities.

Terrain and weather

- Know and use OCOKA factors.
- Know navigation obstacles and enhancements.
- Become familiar with the operational terrain; reconnoiter when possible.
- Identify battlefield hazards.
- Determine the impact of potential battlefield obscuration.
- Anticipate the effects of weather.

Troops and equipment

- Ensure that soldiers are physically fit and well conditioned.
- Ensure that soldiers are proficient in combat ID and ROE.
- Train in all collective and individual tasks.
- Determine readiness of attachments.
- Train to standard on NVGs and land navigation equipment.
- Ensure redundancy in communications equipment.
- Know weapons systems' capabilities.

Time

- Control the pace of the operation.
- Develop sleep/work plans for continuous operations.
- Provide sufficient preparation time.

Other prevention methods

- Conduct crew and battle drills.
- Enforce assembly area procedures.
- Use training devices when possible.
- Use distinctive/thermal markings when tactically sound.
- Use navigation aids.

NBC operations

MOPP

- Caution soldiers that protective masks will require more PMCS in a hot, sandy environment. (Sand will clog filters and cause valves to malfunction.)
- Remind soldiers that amyl acetate (banana oil) vapor is toxic and flammable. Checking the seal of the protective mask should be done in a well-ventilated area away from heat and flames.
- Increase WBGT by 10°F for operations in MOPP. Increase water consumption correspondingly.
- Practice drinking while wearing mask.
- Remind soldiers that command drinking policy is even more important when in MOPP.
- Plan additional time to conduct operations (up to 6 times longer). Rotate personnel more often.
- Allow personnel to loosen protective clothing as situation permits.
- Employ buddy system to check for heat injuries. Ensure leaders are included.
- Delegate tasks to subordinates to reduce stress and fatigue. (Experience shows that leaders are most likely to suffer adverse effects of operating in MOPP.)

M43 protective mask

- Do not expose blower or battery pack to temperatures above 160°F.
- Do not allow battery pack or blower to remain in contact with hot metal surfaces.
- Remind personnel that prong-type M17 mask inserts can cause injuries.

Power-driven decontaminating systems

- Ground the M12A1 decon system when refueling (see page 43).

Fires

- Store DS2 and STB separately.
- Do not spray DS2 on hot metal surfaces.

Chemical burns

- Store containers of DS2, STB, and the M13 decon apparatus out of direct sun to avoid overpressurization of containers and leaking.
- Remind users to wear rubber gloves when handling containers of decontaminants.

Night vision devices

Preparation for use

- Ensure soldiers get adequate rest and eat well-balanced meals.
- Advise soldiers to avoid use of tobacco, alcohol, and self-medication. (They impair night vision.)
- Remind users to avoid bright light, including sunlight, and to wear sunglasses when outside.

Driving

- Warn drivers against overconfidence and to avoid normal tendency to overdrive capabilities of goggles.
- Remind users to continuously use scanning technique.
- Remind users that effectiveness is greatly reduced in dust, haze, fog, smoke, and rain and during mirage effect. Slow down.
- Remind users to keep light sources outside the field of view of goggles.

Personnel

- Ensure eye guards are in place to prevent recoil injury.
- Caution soldiers that haste will cause accidents.

Equipment damage

- Ensure personnel are properly trained in maintenance and use.
- Remind users to avoid pointing goggles into the wind if possible.
- Ensure that users remove all dust and sand from goggles after use.
- Remind users to keep carrying case closed unless removing or replacing items.

• Remind users to protect optics from light sources, intense heat, direct sunlight, dust, and sand.

Ammunition and explosives

General precautions

• Expose only the minimum number of people and amount of equipment necessary to ammunition and explosives.

• Handle ammunition carefully. Containers must not be tumbled, dropped, thrown, rolled, or dragged (unless designed for dragging).

• Make provisions to evaluate and, if necessary, segregate damaged ammunition.

• Coordinate with QM laundry to wash clothing with an antistatic additive to reduce static electricity.

• Don't use sparking metallic tools on explosives; take precautions to reduce static electricity discharge.

• Determine if your area of operations is susceptible to electrical storms and establish lightning protection procedures.

• Do not allow soldiers to collect dud rounds for souvenirs.

• Monitor suspension/restriction notices. Suspended lots should be visibly marked and physically separated from serviceable unit basic load (UBL).

• Do not remove ammunition from its packaging until you have to. Ammunition containers provide protection from hazards such as moisture and static electricity.

• Wear leather gloves when working with banding materials or wooden boxes.

• Keep the area within 50 feet of ammunition clear of vegetation, refuse, empty packing materials, and other hazards that could cause a fire to spread to the ammunition.

• Keep water barrels/tubs at locations where WP/PWP ammunition is kept. These barrels/tubs are used to immerse leaking WP/PWP rounds and for first-aid for WP/PWP burns. Store ammunition in dugouts/depressions below ground level to reduce exposure to heat.

Unexploded ordnance (UXO)

• Brief soldiers on dangers of UXO.

• Establish procedures for marking and handling UXO.

• Do not allow soldiers to collect dud rounds, bomblets, or suspected UXO for souvenirs.

• Have NCOs perform shakedown inspections while in cantonment areas.

• Be a constant reminder to personnel that UXO can kill.

• Be alert while crossing terrain and areas where prior fighting or training may have taken place.

• Remind soldiers: If you don't know what it is, don't mess with it!

Fire precautions

• Keep all flammable materials and all flame- or spark-producing devices away from ammunition and explosives. This includes matches, lighted cigarettes, petroleum products, and vehicles with leaking fluids.

• Ensure fire extinguishers are present wherever ammunition is handled, stored, or transported.

• In case of fire, evacuate the area to a distance of at least 400 meters and take cover.

• Clearly post "Add no water" signs to ammunition containing materials (such as thermite or triethyl aluminum (TEA/TPA)) that react violently with water. These fires may be smothered with sand or earth.

Loading precautions

• Ensure vehicle brakes are set, engine is turned off, and at least one wheel is chocked during loading and unloading.

• Ensure ammunition weight is evenly distributed and the load is secured to prevent movement.

• Ensure vehicles and trailers loaded with ammunition are parked at least 50 feet from vehicles and trailers loaded with flammable liquids.

• Ensure tailgates and safety straps are secured.

Storage precautions

• Protect ammunition, particularly unpackaged ammunition, from direct sun. However, tarpaulins or other covers placed directly on ammunition could cause deterioration, so a ventilation space must be provided.

• Disperse ammunition to minimize loss in the event of fire, accidental explosion, or enemy action.

• Conform to quantity-distance standards for storage of ammunition and explosives.

• Ensure that ammunition of unknown origin and captured ammunition is examined, evaluated, and classified by qualified personnel and stored in a designated collection point.

• When storing ammunition, use sand dunes, barriers, buildings, and so forth to prevent propagation and to protect personnel and materiel from the effects of an explosion.

• Store ammunition containing white phosphorous (WP) in an upright position (WP liquifies at high temperatures and ballistics will be affected by horizontal storage).

Pyrotechnics

• Ensure your soldiers know that simulator flash powder ignites instantly and explosively and that simulators should not be exposed to intense heat and direct sunlight. Remind them never to cut open or hand-ignite these devices and to mark duds and seek EOD guidance for handling and disposal.

• Remind soldiers, while training, not to throw/detonate simulators, flares, or smoke devices near troops, tents, vehicles, or other flammable/combustible materials.

• Remind soldiers to roll down sleeves and wear gloves and helmets when using simulators.

• Warn soldiers not to drop or mishandle ATWESS or Hoffman device cartridges and to roll down sleeves and use gloves and helmets when loading them.

• Ensure all crew are in vehicle when using Hoffman and be sure to clear to the rear when using ATWESS.

• Remind soldiers to beware of missile hazards when simulators are used on rocky terrain.

Maintenance

Track checks

• Ensure proper PMCS is conducted.

• Ensure that vehicle suspension is checked for excessive wear and loose, broken, or missing bolts before, during, and after operation.

• Ensure that tracks are lubed often to flush out sand-grease mixture.

Tire checks

• Ensure that tires are checked often for cuts and wear.

• Remind drivers to check for rocks between duals and to check tire pressure often.

• Be aware that the combination of sand, heat, and rough ground shortens the life of tires.

Tire repair

• Insist that mechanics always use a tire cage.

• Remind mechanics to use proper tools, to keep hands out of cage while inflating, and to use an extension.

• Remind mechanics to use the buddy system when lifting, removing, and installing large tires.

Batteries

• Remind personnel to keep air vents on caps clean to allow gas release and avoid pressure buildup.

• Ensure that personnel check levels often. Battery electrolyte water evaporates faster in extremely hot weather.

• Ensure personnel adjust battery electrolyte levels during the day. (When batteries cool, levels will lower slightly and overflow will be avoided.)

• Require the use of slave cables. Only as a last resort should jumper cables be used. Remind personnel to beware of sparks as jumper cables are attached around the battery's gaseous vapors.

• Ensure mechanics adjust voltage regulators to lowest setting possible to avoid overcharging.

• Require use of face shields, goggles, and aprons when servicing batteries.

Recovery operations

• Remind recovery personnel to use a braking vehicle when required by TM and to always use correct hookup procedures.

• Ensure that all vehicles are equipped for self-recovery as appropriate (tow ropes/cables and rope ladders, pierced steel

planking or other traction material to place under tires).

- Caution soldiers to keep hands and clothing at least 5 feet from winch when rewinding cable after recovery operations.
- Enforce safe towing speeds.
- Match driver to mission.
- Fabricate ground support devices for outrigger support in soft soil.

Eye protection

- Require goggles for work under vehicles.
- Require that the right tool be used for every job.

POL

- Remind personnel to use extreme care when changing hot lubricants (they can burn).
- Take care to prevent sand/dust contamination of POL.

Radiators/coolant

- Remind personnel to use caution when removing radiator caps from hot vehicles and to check radiator fluids often to avoid overheating. (Use hand to remove cap only if cool to touch. Turn cap slowly to release pressure.)
- Remind personnel to keep radiators and airflow areas clean and free of debris to avoid rupture of radiators.
- Require that radiator caps be tested often. (Caps control radiator pressure.)

Grounding

- Ensure that portable electric power tools and power generation equipment are properly grounded (see section on grounding).

Communications

Antennas

- Remind personnel that, when erecting RC-292/OE254 antennas, they must stay *twice the distance from powerlines as the length of the antenna.*
- Stress that soldiers have been killed by falling antenna head sections.

• Require that personnel wear eye protection, head protection, and gloves when erecting antennas.

• Allow no substitutes for antenna mast sections (camouflage poles have been a fatal alternative).

• If, for any reason, an assembled antenna head must be left on the ground, ensure it is guarded to prevent others from walking into it. Tip protectors are a must.

Power lines

• Identify power lines in operational areas to *all soldiers.*

• Tie down antennas when in areas of power lines (antenna tip should be no lower than 7 feet to preclude eye injuries). Use tip protectors at all times.

• Warn soldiers never to throw WD1 over power lines.

Electrical storms

• If possible, do not operate radios, telephones, switchboards.

• Disconnect electrical equipment from power sources and antennas if the situation permits.

• If equipment *must* be used, converse as little as possible. Return call after storm.

Grounding

• Ensure that *all* electrical equipment is grounded (see section below).

Grounding

General

• Remind personnel that extra care must be given to preventing static electricity in hot, dry climates.

• Ensure that personnel know that desert soil requires special grounding procedures. (In accordance with FM 20-31, a mixture of 5 pounds of salt with 5 gallons of water buried with the grounding rod improves grounding conditions.)

• Instruct personnel to dig/drive ground rods to a depth of 6 feet.

• Remind personnel to keep soil moist around grounding rods to increase conductivity and to keep ground rods, straps, and connections free of paint or oils.

Fuel handling

General

- Establish a waste POL point.

Grounding and bonding

- Ensure proper grounding and bonding procedures are always used (see grounding section above).
- Remind personnel that hot, dry, dusty conditions contribute to the generation of static electricity.
- Remind personnel to ground themselves by touching a large metal object before handling fuel hoses and nozzles.
- Ensure that grounding and bonding equipment is inspected regularly.

Tank and pump units

- Remind personnel to—
  - ❑ Lubricate equipment more often.
  - ❑ Use light oil instead of grease.
  - ❑ Keep caps and covers on systems.
  - ❑ Keep pump engines clean.
  - ❑ Purge tanks, lines, and filter separators at the beginning and end of the day.
  - ❑ Recirculate all fuels to remove water.
  - ❑ Keep pressure relief valves clean (compressed air).
  - ❑ Watch for corrosion.

Fuel system supply point

- Remind personnel to—
  - ❑ Not fill collapsible bags to full capacity (allow for expansion).
  - ❑ Leave hose line valves slightly open to allow for fuel expansion into tankage.
  - ❑ Keep pump engines clean.
  - ❑ Lubricate pumps more often.
  - ❑ Use dust caps and plugs.

Refueling operation

- Ensure proper bonding and grounding procedures are used.
- Remind personnel to—

❑ Not fill vehicles to full capacity (allow for expansion).

❑ Keep tank truck hatches open during refueling to allow vapors to escape.

❑ Stay on the windward side to prevent being overcome by fuel vapors.

❑ Close hatches immediately after refueling.

❑ Use bottom load procedures when possible. (If top loading is used, use extreme caution and start the refueling procedure at a slow rate until the level of fuel has covered the hose. Thereafter, increase the flow rate slowly.)

❑ Perform weekly fuel sample checks.

Protective clothing and equipment

- Remind personnel not to wear nylon clothing. (Nylon will build up electrostatic charges.)
- Remind personnel to wear fuel-resistant or rubber gloves and protective clothing to keep fuel off the skin. (Skin is highly susceptible to drying, cracking, and peeling if it comes in contact with fuel in desert conditions.)
- Coordinate with QM laundry to wash clothing with an antistatic additive to reduce static electricity.

Bivouac

Sleeping locations

- Establish a designated sleeping area. If situation permits, mark perimeter with engineer tape or chem lights.
- Post unit perimeter security personnel equipped with lights for signaling. Ensure they have been thoroughly briefed on their duties and responsibilities.
- Ensure vehicles are not parked where they can roll toward sleeping personnel or on an incline without chocks.
- Brief all soldiers on correct driving/sleeping procedures during hours of darkness.

Dismount points

- Establish dismount points beyond which vehicles may not move without ground guides.

Ground guiding

- Require all vehicles to use ground guides, especially during periods of darkness and reduced visibility.
- Require tracked vehicles to use two ground guides when moving within or through an assembly area at any time.

Tents

- Ensure that all personnel fueling/operating tent stoves are properly trained.
- Ensure that stovepipes extend above the top of tents (spark arrestor is required).
- Ensure that stoves are not operated at full capacity.
- Ensure operable fire extinguishers are accessible and that operators are assigned and knowledgeable.
- Require that electrical circuits be routinely inspected for possible overload condition.
- Ensure that personnel prevent stove fuel from leaking and require immediate cleanup of any spills.
- Establish and enforce smoking areas.
- Use tent liners as added insulation from heat and cold.
- If rebar is used to stake tents, cover the stakes to protect personnel from being cut on the sharp edges. Overturned plastic water bottles are an excellent cover for the stakes.

Wind

- Ensure sufficient anchorage is provided for tents in sandy and high-wind conditions.

Mess operations

Sanitation

- Ensure all food waste is properly disposed of. If buried, do so daily and at least 30 meters from food preparation areas.
- Ensure food preparation area is at least 100 meters from latrines and 50 meters from incinerators.
- Ensure food is protected from contamination.
- Monitor food handlers and other soldiers to ensure sanitation standards are maintained.

Fire/explosion

- Ensure kitchen fuel storage area is at least 15 meters from working area and is marked as a hazard area.
- Ensure operable fire extinguishers are accessible (with designated operators) in mess-tent area and at stove-lighting and fuel-storage areas.
- Ensure all personnel fueling/operating stoves, immersion heaters, and burners are properly trained.
- Make operators aware that increased heat will add pressure to fuel tanks and fuel cans and that particular attention should be given M2 burners.
- Keep mess-tent exits clear of obstructions.

Cuts/burns

- Remind personnel to—
  - ❑ Keep knives sharp, and use the right knife for the job.
  - ❑ Not use knives or other sharp implements to open tray packs (use modified can opener and P38).
  - ❑ Tilt heated tray packs and cans to right or left when opening to prevent burns from squirting hot juices.

Materiel handling

Lift/carry procedures

- Enforce use of correct techniques—
  - ❑ Never carry a load heavier than can be managed with ease.
  - ❑ When in doubt, get assistance.
  - ❑ Bend from hips and knees, not just the waist.
  - ❑ Carry heavy objects close to body.
  - ❑ Avoid sudden movements; move slowly and deliberately.
  - ❑ Do not carry unbalanced loads.

Slips, trips, and falls

- Supervise operations.
- Ensure that areas are clear of obstructions and hazards, and remind personnel to use care when vision is obstructed by objects being carried.
- Caution personnel not to jump or step from cargo vehicles while carrying loads; tell them to use a ramp or get help.

• Remind personnel to use extreme care when carrying loads in loose sand or over rough surfaces.

Ground guiding

General

• Train drivers in the correct use of ground guides and all personnel in how to perform as ground guides.

• Stress importance of ground guides when traveling cross country during periods of limited visibility.

• Remind drivers to always use one or more ground guides while backing.

• Equip ground guides with suitable lights during periods of limited visibility/darkness.

• Caution personnel that loose sand can make ground guiding difficult.

Construction

Equipment operation

• Remind operators that construction equipment may be very unstable off road in sandy and rocky terrain.

• Ensure operators and supervisors check outriggers for stability. This is especially critical in sand or soil where a surface crust exists.

• Ensure safety belts are worn at all times when operating equipment.

• Ensure rollover protection systems are installed, and erect sun umbrellas on slow-speed equipment such as rollers and compactors.

• Establish operator/crew equipment rollover drills.

• Ensure ground guides are used at construction sites and in congested areas and bivouac locations.

• Ensure all prime movers and trailer brake systems are fully operational on equipment haulers and other M915 series vehicles.

• Rehearse braking and downhill driving procedures with all operators.

• Appoint a site safety supervisor for large earthwork or building construction sites.

- Ensure helmets or hardhats are worn on construction sites.
- Control vehicle, pedestrian, and troop access to sites.
- When excavating, ensure excavation walls are reinforced to prevent cave-ins.
- Ensure all personnel on the site know what to do in case of flash floods.
- Ensure all electrical equipment is grounded, and ground and bond when transfering fuel (see section on grounding).
- Ensure safety equipment (goggles, gloves, welding masks, aprons, dust respirators, etc.) is available and used.
- Ensure personnel do not shortcut safety procedures due to heat discomfort.
- Ensure personnel know precautions to take during a windstorm to prevent injury and equipment damage.
- Determine if site has windstorms and ensure this hazard is taken into account during both design and construction.
- Establish policies and procedures for recovery of equipment in sand.
- Protect electric wiring, hydraulics, and optics from abrasive effects of blowing sand.
- Protect hydraulics, fuel, and optics from sand/dust contamination.
- Ensure gloves are worn when working with metal tools and materials exposed to heat from the sun.
- Remind personnel to—
  - ❑ Check wire rope rigging and bolt torque specifications to minimize varying heat stress/strain effects.
  - ❑ Keep sawdust cleaned up in carpentry areas. Sawdust fires occur frequently in hot, dry climates.
  - ❑ Frequently inspect wooden items such as shovels, axes, and hammers for shrinkage from extreme heat and low humidity. Check and tighten as needed.
  - ❑ Protect flammables (flashpoint less than 100°F) and combustibles (flashpoint 100°F or greater) from extreme heat exposure.
- Emphasize need for spill control. Remind personnel to remove contaminated soil from operational areas at once because of extreme fire and vapor hazards in hot, dry conditions.

Combat engineer

Demolitions

- Ensure proper procedures and tools are used when working with demolitions (i.e., crimper, flak jacket, helmet, and nonsparking tools).
- Ensure that static electric charges are checked for and grounded and that anti-static laundry additives, anti-static sprays, and individual grounding are used on large metal surfaces/vehicles.
- Ensure demolitions are stored properly. Provide shade and ventilation, separate and sandbag-sensitive initiation components, and protect emplaced demolitions (especially blasting caps) from direct heat.
- When detonating explosives, make sure survivable safe distance or cover is used.
- Ensure that explosives are kept away from food and eyes and that personnel clean hands after handling explosives.

Landmines

- Ensure that only the AN/PSS-11/12 mine detector is used.
- Ensure that soldiers are aware of mines by improving their mine-recognition skills.
- Maintain dispersion between soldiers and vehicles.
- Remind all personnel that—
  - ❑ Sand can cause malfunctioning.
  - ❑ Moving sand and windstorms can cause mines to drift.
  - ❑ Pressure and tension release anti-handling devices must have firm bases/anchors.
- Ensure that static electric charges are checked for and grounded.
- Protect stored mines and fuses from direct heat (shade and ventilate).
- When detonating landmines, make sure the proper survivable distance or cover is used.

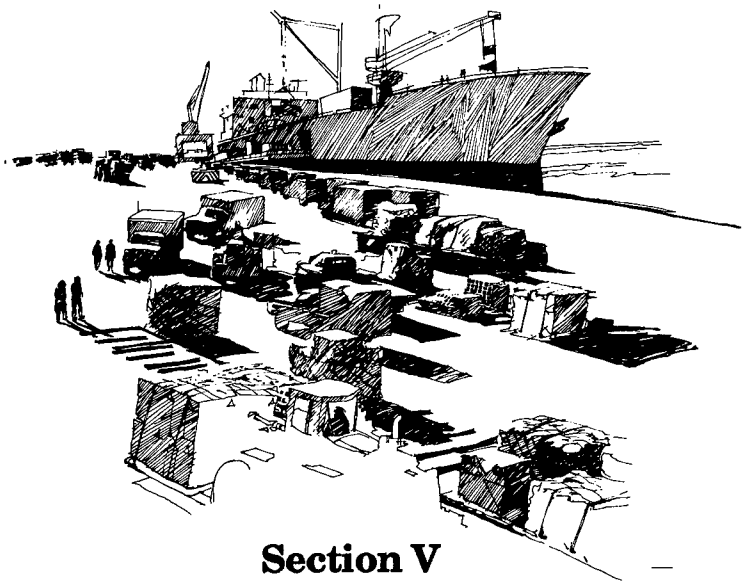
Wire obstacles

- Ensure proper equipment is used and proper clothing is worn (barbed-wire gloves, sleeves rolled down) when constructing wire obstacles.

Mines Known to be in Somalia

ANTIPERSONNEL		
Mine Nomenclature	**Country of Origin**	**Fuzing/Kill Mech**
P2-MK2	Pakistan	Nonmetal, blast
PMP-71	E. Germany	Pressure, blast frag
PP-M1-SR UI (M)	Czechoslovakia	Press/pull, bounding frag
PPM-2 (P)	E. Germany	Pressure, blast
PRB-M35	Belgium	Nonmetal, blast
V	Italy	Pressure, blast
M-14	U.S.	Pressure, blast
M-16A2 (A1)	U.S.	Pressure, trip wire, bounding frag
PMD-6, PMD-6M	USSR	Pressure, blast
PMN	USSR	Pressure, blast
POMZ-2, POMZ-2M	USSR	Trip wire, grenade
ANTITANK		
Mine Nomenclature	**Country of Origin**	**Fuzing/Kill Mech**
DM-11 (NM)	France/W. Germany	Pressure, blast
M/71 (M)	Egypt	Blast
M15	U.S.	Pressure, blast
P2-MK2	Pakistan	Nonmetal, blast
PT-MI-BA II (P)	Czechoslovakia	Pressure, blast
PT-MI-BA II(V) (M)	Czechoslovakia	Pressure, blast
Type 72	China	Nonmetal, blast
TM-62M	USSR	Pressure, blast
TM-57	USSR	Pressure, tilt rod, blast
TM-46	USSR	Pressure, tilt rod, blast
TMN-46	USSR	Pressure, tilt rod, blast

NOTE: Refer to Mine Recognition and Warfare Handbook, dated November 1990, for more detailed information and illustrations.



Section V

Port Operations

Before-departure preparations

Proper before-departure preparation of both troops and equipment is essential. The following lessons learned from other deployments show how the pressure to ship can overwhelm Army shipping performance and safety standards. Sound planning *now* can prevent similar occurrences.

Situation: Secondary loads not properly secured.
Secondary loads were piled, scattered, or haphazardly placed in vehicles. Loose cargo fell from the vehicles as they were being loaded on heavy-equipment transports after being offloaded from ships.

Recommendation: Transportation officers and unit commanders must ensure that secondary loads are secured to prevent motion-induced damage.

Situation: Secondary load weights not reflected in LOGMARS/AUEL data.
Logistics applications of marking and reading symbols

(LOGMARS) labels reflected only empty vehicle weights. Cargo trucks, ammunition carriers, and even combat vehicles were loaded with every conceivable secondary load, but none of these loads were reflected in the automated unit equipment list (AUEL). In some cases, 5-ton trailers were loaded with as much as 10 tons of cargo. Ammunition carriers were full of ammunition, fuel tankers were loaded above design capacity with fuel, and main battle tanks were stuffed with main rounds, .50-caliber ammunition, hand grenades, and other explosives and supplies. In numerous cases, the weight of the secondary loads exceeded the reported weight of the vehicle by three or four times.

Recommendation: Transportation officers and unit commanders at all levels must ensure that AUEL/LOGMARS data reflect actual "as shipped" weight, not "as published" weights.

Situation: Secondary loads of *hazardous materials* not reflected in LOGMARS data.

LOGMARS labels gave no indication that ammunition carriers were full of ammunition; maintenance trucks were loaded with oil, grease, and oxygen and acetylene tanks; or HMMWVs were carrying stinger missiles. Also, most tanks and personnel carriers were loaded with boxes of ammunition and other explosives. Some of these boxes were damaged to the extent that the ammunition and other explosives were scattered all over the interior of the vehicles. In some cases, full fuel cans were lying loose among the explosives. No attempt had been made to segregate hazardous materials. In addition, vehicles loaded with ammunition and other explosives were parked surrounded by fuel tankers. This was true both on the pier and in the ships.

This situation was due in large part to the lack of secondary load data. As a result of the lack of data, the automated systems could not be used to prepare dangerous-goods manifests. Also, stow planners and cargo supervisors were unable to maintain segregation of hazardous materials.

Recommendation: Shippers must provide accurate LOGMARS data and segregate hazardous cargo.

Preparation checklist

Use the following checklist to prepare for deployment:

- Start each day with a safety briefing to combat mission-itis and establish safety awareness.
- Establish a vehicle loading plan for sea shipment. Make sure nested vehicles (those carried in the backs of other vehicles) are included in the load plan. Include nested vehicles and blocking and bracing material requirements for all general cargo.
- Do not overgross prime mover carrying a nested vehicle. Make sure AUEL reflects the prime carrier and its nested vehicle or built-up actual height, length, and weight.
- Always block, brace, and tie down both nested vehicles and general cargo.
- Make sure nested vehicles have all lifting shackles in place in case they must be de-nested at the port.
- Inspect shackle support and supporting vehicle structure to make sure it is in good shape and that welds on shackle bracket are sound.
- Check each vehicle for condition of all lifting shackles, proper size of shackle, and proper size of shackle pin and cotter key.
- Always carry extra shackles for unit vehicles. (Shackles often disappear, and, without shackles, the vehicle may not be shipped.)
- Identify lifting shackles by painting the word "LIFT" next to them. Paint "TIEDOWN ONLY" next to tiedown shackles.
- Establish ammunition turn-in procedures and enforce penalties for violations.
- Turn in all ammo and munitions.
- Check each vehicle for loose rounds or pyrotechnics and for munitions tucked into storage compartments.
- Check pack pockets and gear pockets for loose rounds; turn them all in.
- Inspect unit gear to ensure no ammunition or other explosives are inadvertently packed away.
- Establish standard for inspections and retention of war souvenirs.
- Inspect each war souvenir for hazards and Department of Agriculture appropriateness.
- Check for critters in unit gear. Kill them.

•Identify "sensitive class" unit cargo and make sure AUEL reflects this status.

•Identify hazardous classes of cargo, and eliminate compatibility problems. Make sure unit AUEL accurately reflects which vehicles contain sensitive or hazardous cargo.

•Do not leave loose items in vehicle cabs. During a long, rough sea voyage, items could beat themselves and the inside of the vehicle to pieces.

•Be mindful that your vehicle may be loaded on deck and not down in a dry hold. The best way to check your load plan is to ask yourself, "If this truck were under a constant stream of sea water, would my load plan still be okay?"

•Block and brace equipment in the back of trucks to the maximum extent possible. Ships ramps sometimes exceed 45 degrees. Loose gear will tumble out.

•Tie down, block, and brace all cargo. A sea voyage is twice as rough as a road march; so don't pack for a road march.

•Use plastic to wrap radios in racks located inside vehicles and tracks.

•Adjust vehicle fuel loads so that vehicles arrive at port with tanks no more than three-quarters full. Always check with the departure port Army terminal unit for the latest in-county standards for fuel tank levels and 5-gallon fuel-can levels. Drain fuel from generator sets before packing.

•If fuel tankers must be purged, make sure that all hoses are also drained.

•Do not drain POL tanks and hoses onto ground. Use proper fuel drain cans and dispose of drainings per unit SOP.

•Ensure that vehicles containing compressed gas cylinders (other than a fire extinguisher) are placarded on both sides of the vehicle with standard hazardous cargo placards (available from division/corps transportation officer).

•Remove oxygen and acetylene cylinders from wreckers and maintenance vehicles. Build bottle racks in a trailer, and secure all battalion acetylene bottles in the racks. *CAUTION:* Do not overgross the trailer. Stencil unit designation on each bottle. Properly placard the trailer.

•Make sure gas cylinder bottles have caps and that caps are secured.

•Inspect all vehicles for fuel, oil, and other leaks. Correct them.

•Ensure that any vehicle with a brake problem has a big steering wheel placard stating "CAUTION, NO BRAKES. DO NOT DRIVE. MOVE WITH TOW BAR ONLY."

•At the start of each day, go over standard ground-guide safety procedures and hand and arm signals. Stress ground guide use in the motor pool and vehicle preparation areas.

•Ensure drinking water is available in vehicle preparation areas.

Movement to port

Movement liaison team

Experience during deployment shows that the transition from field to port is more effectively accomplished if a liaison team is created to perform the following functions:

•Ensure the safe and timely processing of unit assets from field assembly areas through marshalling areas to the port in accordance with the port-call message. Allow for adequate driver rest.

•Set the tone for the move by emphasizing the commander's safety standards at each phase of the movement sequence.

•Perform risk assessment of movement operations, and present command group with options to eliminate movement to port risks.

•Provide a single point of contact for all safety and operational questions concerning equipment preparation standards for sea shipment.

•Maintain liaison with port operating elements regarding equipment preparation, U.S. Customs, Department of Agriculture standards, and the port-call message.

•Resolve movement to port problems before departure to port.

•Provide a seaport element to make final vehicle shipment decisions; for example, with one space left on the ship, do you send the A Company or the B Company vehicle?

•Keep the command group and participating units informed.

•Establish controlled environments in which soldiers are cared for and accounted for from start point through their time at the seaport of debarkation (SPOD).

•Maintain unit integrity of personnel at SPOD.

•Organize maintenance assets to assist Port Support Activity (PSA) in fixing vehicles in the marshalling and port areas to ensure serviceability and readiness for sea shipment.

The movement liaison team should consist of a team leader, an assistant team leader, an NCOIC, and an administrative NCO. For communication, the team will require—

•Hand-held brick-style radios.

•Secure fax.

•Published FM frequency.

•Dedicated phone line at base and port.

•Dedicated utility helicopter reserved for maintenance/parts flights or command and control missions.

The liaison team leader should be located at the assembly area during vehicle preparation and at the port during the movement to port phase. The liaison team should develop a marshalling area plan that covers—

•Receiving convoys.

•Refueling and/or defueling vehicles to Coast Guard limit. Arrange for excess fuel storage.

•Performing unit/direct support maintenance before staging.

•Providing final technical inspection to ensure that all vehicles are ready for sea shipment.

•Pre-staging vehicles by unit or by type.

•Messing and sleeping areas as required.

•Latrine facilities.

•Administrative support.

•Personnel control so the area does not become a giant parts/supply opportunity.

•Quick spot-check by port personnel of vehicle preparation and LOGMARS labels to make sure that if any last-minute problems are found, they can be corrected in the assembly or marshalling area.

Convoy checklists

Following are detailed checklists that commanders, liaison team members, convoy planners, and unit safety personnel can use to ensure that convoys to the seaport of debarkation are professionally and safely planned.

Route selection

Ask the convoy commander or convoy planner these questions.

- Has map reconnaissance been completed?
- Has a physical reconnaissance been made of the entire route?
- Can all vehicles clear bridges, underpasses, tunnels, and other clearance and weight limits? If not, have alternate routes been selected?
- Can all vehicles maintain minimum speed limits? If not, have alternate routes been selected?
- Have urban or potentially congested areas been identified?
- To avoid congestion, have alternate routes been selected?
- Has convoy movement been planned to avoid peak traffic periods?
- Have alternate routes been selected for vehicles transporting oxygen, acetylene, or other compressed gases?
- Have strip maps of the entire route been prepared?
- Does each convoy vehicle have a strip map?
- Have traffic control points been established at hazardous locations?

Start and release points

Ask the convoy commander or convoy planner at battalion level these questions.

- Is adequate space available for vehicle organization and lineup at start point?
- Is sufficient space available for maneuvering of vehicles, sequential lineup of vehicles, and march units and serials?
- Has arrival time at release point been established?
- Is adequate space available for safe vehicle release?

Controlled-access highways

If convoy movement will take place on controlled-access highways (those where entry and exit is permitted only at specific points), ask the convoy commander or convoy planner these questions.

- Have halt areas been identified along the route?
- Has a 15-minute halt been scheduled after the first hour, and 10-minute halts every 2 hours thereafter?

- Are all halts planned in designated rest areas?
- Have all halt areas been physically reconned to ensure sufficient capacity?
- Are halt areas shown on strip maps?
- Are halts scheduled to avoid overloading of halt areas?
- Do areas for meal halts contain the following?
  - ❑ Sufficient areas for cooking and eating?
  - ❑ Waste disposal facilities?
  - ❑ Latrines?
- Do bivouac sites contain the following?
  - ❑ Sufficient area for cooking, eating, and sleeping?
  - ❑ Waste disposal facilities?
  - ❑ Latrines?
  - ❑ Area for vehicle maintenance?
  - ❑ Security for cargo?

Conventional highways

Ask the convoy commander or convoy planner these questions.

- Have halt areas been identified along the route?
- Has a 15-minute halt been scheduled after the first hour, and 10-minute halts every 2 hours thereafter?
- Are halt times adjusted to permit halts at safe locations?
  - ❑ Location is away from urban or heavily congested areas.
  - ❑ Terrain permits vehicles to completely clear highway traffic lanes.
  - ❑ Location avoids curves or reverse sides of hills (blind spots from approaching vehicles).
  - ❑ Location permits minimum of 3 feet between parked vehicles.
- Are halt areas shown on strip maps?

Convoy organization

Ask the convoy commander or convoy planner these questions.

- Are convoys of more than 20 vehicles separated into serials?
- Are serials divided into march units if required?
- Is convoy element size based on capacity of halt/bivouac areas?
- Have the following personnel been designated and briefed?
  - ❑ Commanders for each serial and march unit.

- ❑ Pace setter.
- ❑ Trail party.
- ❑ Claims officer.
- ❑ Drivers and assistant drivers.

• Are vehicles transporting troops not the last vehicle in a serial or march unit?

• Are empty vehicles or those carrying general cargo used as buffers (i.e., last vehicle in convoy)?

• Are recovery and medical vehicles near the rear of the convoy?

• Is the convoy organized initially with 5 minutes between march units and 10 minutes between serials?

• Have adjustments to time gaps been identified and planned for?

• Are convoy and convoy element commanders positioned for best convoy control?

• Has convoy operation during periods of darkness been avoided?

• Are the following proper vehicle intervals planned?
  - ❑ Controlled access highway: 220 yards.
  - ❑ Rural conventional highway: 150 yards.
  - ❑ Urban conventional highway: 50 yards.

• Does each driver have a strip map?

• Is the convoy commander checklist completed?

Convoy ID and communications

Ask the convoy commander or convoy planner these questions.

• Are lead, rear, and element commander vehicles correctly identified?

• Are flags and signs correctly mounted on each vehicle?

• Is each convoy identified by a convoy clearance number?

• Has method of communication been decided?

• Has radio equipment (ideally, 2-way radio in first and last vehicle of each serial and unit) been checked and assigned to vehicles?

• Have signal operating instructions been provided to vehicles with radios and the liaison team?

• Have personnel been briefed on visual and audio signals?

•Have road signs and messages been constructed and placed as required?

Logistical support

Ask the convoy commander or convoy planner these questions.

•Are medical personnel scheduled and posted in rear of convoy?

•Are sufficient food and mess personnel and facilities available?

•Do all personnel have proper clothing and equipment?

•Has weather briefing been obtained for duration of convoy operation?

•Have provisions been made for obtaining weather updates?

•Is special equipment available based on weather requirements?

•Have weather effects been determined and planned for on halts, meals, and bivouacs?

Convoy personnel briefing

Ask **ONLY** the convoy commander whether leaders have given drivers the following instructions.

•Permit emergency halts only on roadside of controlled access highways.

•Permit only guards and maintenance personnel on traffic side of convoy during halts on conventional highways.

•Drivers and assistant drivers perform vehicle operator maintenance and check cargo security at every stop.

•Have guards stand 50 yards behind departing convoy to warn traffic on conventional highways.

• Assistant drivers will remain awake *and* alert.

•Reflectors and warning devices must be in place before beginning maintenance.

•Warning lights are used during periods of darkness or low visibility.

•Convoy begins only at convoy commander's signal.

•In case of accident, main column does not stop to provide assistance. Next following vehicle provides immediate assistance to accident vehicle.

•If an accident occurs to vehicle ahead, make maximum effort

to clear traffic lanes.

- First officer or NCO at accident scene takes charge.

Refueling and maintenance halts

Ask the convoy planner these questions.

- Are sufficient supplies of diesel, mogas, and oil available for refueling?
- Are refueling halts planned for bivouacs?
- If not, is refueling planned for noon meal halt?
- Have vehicle operator maintenance checks been scheduled for every halt? Who inspects the drivers for signs of fatigue? What is the plan for driver changes?
- Are sufficient maintenance vehicles and equipment available in rear of convoy?
- Are spare vehicles available for emergencies?
- Are all vehicle refuelers properly equipped and trained?

Vehicle preparation

Ask the convoy planner these questions.

- Have participating units been notified as much in advance as possible?
- Have all vehicles been inspected in vehicle assembly area?
- Have all spot corrections been made on vehicles?
- Does the loading and unloading plan include—
  - ❑ Designation of persons to execute plan?
  - ❑ Times and locations for loading and unloading?
  - ❑ Orders not to load troops in vehicles with motor fuel or hazardous cargo?

Driver preparation

Ask the unit or convoy commander these questions.

- Are all drivers qualified in assigned vehicles?
- Are drivers and assistant drivers assigned to each vehicle?
- Do all drivers have government drivers license OF 346?
- If not, have arrangements been made to test drivers or obtain alternate drivers?
- Are experienced drivers being used to the maximum extent possible?
- If not, are less-experienced drivers scheduled for training?

• Have drivers and assistant drivers been scheduled to split driving periods?

• Have all drivers received adequate rest prior to departure?

General precautions and procedures

Check these items yourself or ask the convoy commander.

• Are warning lights on first and last vehicle?

• Is a basic convoy warning kit in each vehicle?

• Are fire extinguishers and first aid kits in vehicles?

• Are vehicles carrying hazardous material marked?

• Do road guards have safety warning equipment?

• Are maintenance, wrecker, and recovery vehicles marked?

• Are accident procedures for the convoy established, to include—

❑ Trail officer designated to supervise care of injured and disposition of damaged vehicles?

❑ Notification of convoy commander, safety officer, and civilian police of accidents?

❑ Reporting of accidents IAW AR 385-40?

Arrival at port

Seaports are traditionally busy, congested, and confusing places. As the unit's vehicles arrive at the seaport, port personnel will give them a quick visual inspection to identify those with obvious problems. The LOGMARS label will be scanned, and all hazardous and sensitive cargo will be separated out of the main vehicle flow and sent to hazardous and sensitive vehicle staging areas. The remaining vehicles will be sent to other vehicle staging areas, where port personnel will again check vehicles and scan LOGMARS labels. Drivers and assistant drivers will be sent out of the staging areas to an assembly area for transport off terminal.

It is important that vehicles arrive precisely at the time specified in the port-call message and that everyone knows what to do upon arrival. The following checklists should help.

Leader checklist

• Carry enough water for your troops. Estimate one day on terminal, although actual time should be less.

• Explain the unit's terminal control plan to the driving and supervisory teams, to include—

- ❑ Where drivers and other unit personnel should assemble after parking their vehicles.
- ❑ Water point location.
- ❑ Latrine locations.
- ❑ Trashcan locations for MRE packages, etc.

• Stress unit integrity, NCO control, "don't wander around" philosophy.

• Unit key control officer must make prior coordination with port operators on availability and location of key control NCO/officer. If possible, get a radio from Transportation Terminal Unit to ensure common communications and quick response by key control team.

• Explain how troops will depart the terminal and when and where they will be transported.

• Have a final check team go through the unit's vehicles after all the troops are assembled to check for mistakes, oversights, items left behind, shackles, lights or radios left on, etc.

• Before departing the terminal, perform a rollcall accountability check.

• Allow only essential personnel to enter staging areas while staging areas are filling.

• Do not allow drivers to fill out forms in vehicle staging areas during in-flow of vehicles. Doing so keeps drivers and assistant drivers in these areas while port personnel are trying to flow cargo rapidly into the same area. This mass of troops presents both a safety and a control problem.

• Do not plan to do nesting at the port. Any nesting should be accomplished at the assembly area in the field or at the marshalling area.

• Milvans and conexes must be certified as either hazardous or nonhazardous. This is usually done at the pack-out in the assembly area, where the certifications are put on the conexes and milvans. En route to the port, the certifications sometimes blow off. So, have the unit transportation officer/NCO at port to replace certificates. Otherwise, port personnel will have to open the conex/milvan to determine its classification.

• Personnel who will go aboard the ship during the load-out

will need the following equipment:

- ❑ Pre-boarding ship safety briefing
- ❑ Helmet or hardhat
- ❑ Hearing protection (earmuffs or earplugs)
- ❑ Canteen

Driver checklist

- Keep an alert heads-up focus.
- Turn on driving lights in terminal.
- Use ground guide for all tracked vehicles and when backing vehicles 2½ tons and larger and any other vehicles in which visibility dictates the need. Ground guides should not walk backwards when guiding any vehicle.
- Keep proper distances between vehicles.
- Keep vehicles free from hanging materials such as chains or ropes that could snag on a cleat or tiedown fitting and yank cargo off a truck.
- Report vehicles with maintenance problems to port reception personnel.
- Secure radio whip antennas upon entering terminal. Remove antennas from tracked vehicles and store inside hull.
- Put main gun of tanks and fighting vehicles in travel lock position.
- Obey terminal speed limit (normally 15 mph, or about the speed of a brisk walk).
- Don't leave personal or military items in your vehicle.
- Anything left in the vehicle cab should be wrapped, blocked, and braced inside the cab. Make sure vehicle windows are rolled up.
- Make sure all vehicle locks are locked.
- When driving in the vicinity of the port helipad—
  - ❑ Remember, aircraft have right of way.
  - ❑ Make sure your antenna is down.
  - ❑ Look for ground direction from air traffic control (ATC) personnel.
  - ❑ Proceed only when ATC personnel wave you forward.
  - ❑ Dim your lights.

Supercargos

Supercargos are teams of soldiers who accompany, supervise, guard, and maintain unit equipment aboard the ship. An essential part of their job is to monitor and correct equipment lashings and tiedowns for security. They also provide key control, note items that cannot be repaired en route, and brief the port commander at the Seaport of Debarkation (SPOD) on vehicle conditions and any peculiar aspects of the cargo.

The size of the supercargo team dedicated to a ship must be consistent with the team's role in guarding and maintaining the equipment en route, the resources available on the ship, and the additional costs required to equip and sustain the team en route. FM 55-65: Strategic Deployment by Surface Transportation is a good reference for supercargo team composition, function, planning, and operations.

The following rules are intended to help supercargos do their job safely and effectively:

Rule #1: The Captain is the ultimate authority on the ship. His or her word is absolute law and must be obeyed by every individual.

Rule #2: The First Mate is the Captain's right-hand man. If you have a problem, go to the First Mate. Before the ship sails, the First Mate should brief supercargo officers and NCOs on the following:

- General safety requirements.
- Fire and lifeboat drill and stations.
- Life preserver requirements.
- Restricted deck areas.
- Situations requiring immediate notification of the ship's crew (fire, ship taking water, etc.) and what to do in such cases.
- Layout of ship, including emergency escape hatches.
- Whistle signals and their meaning (collision warning whistle, abandon ship whistle, etc.).
- Ship's policy on alcohol.
- Chain of command.
- Call signs for ship's officers (for use when ship's brick-style radios are issued to supercargos).

Supercargo OIC/NCOIC

The following guidance will enable you to perform your job as supercargo OIC/NCOIC safely and efficiently.

- Provide the First Mate a manifest of the supercargo team (full name, rank, SSN, unit, place of birth, and citizenship). Also leave a copy with the Division G1.
- Check with mate before ship sails to verify if additional information is required.
- If the supercargo team has brick-style radios, ensure that there is no frequency interference with the ship's brick-style radios.
- Provide team call signs to mate.
- Ask the mate for the ship's normal schedule for meals and when and where he wants the team to eat.
- Publish a daily, by-name roster of duties and specific locations where the duties will be performed. If a team member does not show up for lunch, you will know where to start looking.
- Start each morning with a safety briefing based on lessons learned from the previous day's activities. Be sure to call on each team member and solicit comments. Encourage the reporting of specific problems (oil or anti-freeze on decks, sharp projections, etc.) or potential problems so corrective action can be taken.
- Brief team members on expected weather conditions for the next 24 hours so they can dress appropriately.
- Establish a buddy system for hold checking and make sure each team going into a hold has a radio and checks into and out of the hold on the supercargo radio net. Record reported discrepancies for next day's briefing and planning of proper corrective actions. DO NOT let supercargo team members go into holds alone without a radio. If the member falls and is injured, he will not be missed until the next team accountability time (breakfast, lunch, supper, etc.).
- Decks in holds are always greasy and slippery. Boots pick up this oil and distribute it on ladders and walkways. Require team members to periodically wash the soles of their boots to remove accumulated grease and oil. In addition, ask the mate if work boots must be removed in crew quarters and mess areas (make sure supercargo team has clean sneakers).
- An essential part of your duties is to check aircraft and vehicle

lashings to make sure they are properly tightened *but not over-tightened.* Find out what the First Mate's standards are, then ask him for a class on how to properly break and tighten the various types of chain tiedowns.

- Make sure you have the correct shipping TM for the aircraft on board and the latest TWX messages on aircraft tiedown procedures.
- Drill your supercargo team on lifeboat and abandon-ship procedures.
- Before boarding the ship, determine which team members can swim. Take only supercargos who can swim.
- Absolutely forbid and ruthlessly suppress horseplay.
- There are many locations on a vessel from which it is easy to fall overboard. Identify these areas through team feedback and soliciting information from the crew.
- As soon as the ship's blowers are turned off, you will hear vehicles running in each hold. (Longshoremen often forget to shut vehicles off during the loading rush.) It is imperative to check all the holds for running vehicles because—
  - ❑ They fill the hold with carbon monoxide.
  - ❑ They will eventually run out of fuel and cause delays during offloading.
  - ❑ Vehicle ignition sparks and hot exhaust could ignite fumes from another vehicle.
- Pay special attention to vehicles loaded on ramps and on the deck. Not only are the walking areas in these locations treacherous, but also loose lashings and missing chocks could result in losing a vehicle over the side, or having the vehicle break loose on the ramp and hit the ship's watertight doors at the bottom of the ramps.
- Get team members to stow all supercargo gear as soon as possible after consultation with the First Mate.

Abandoning ship

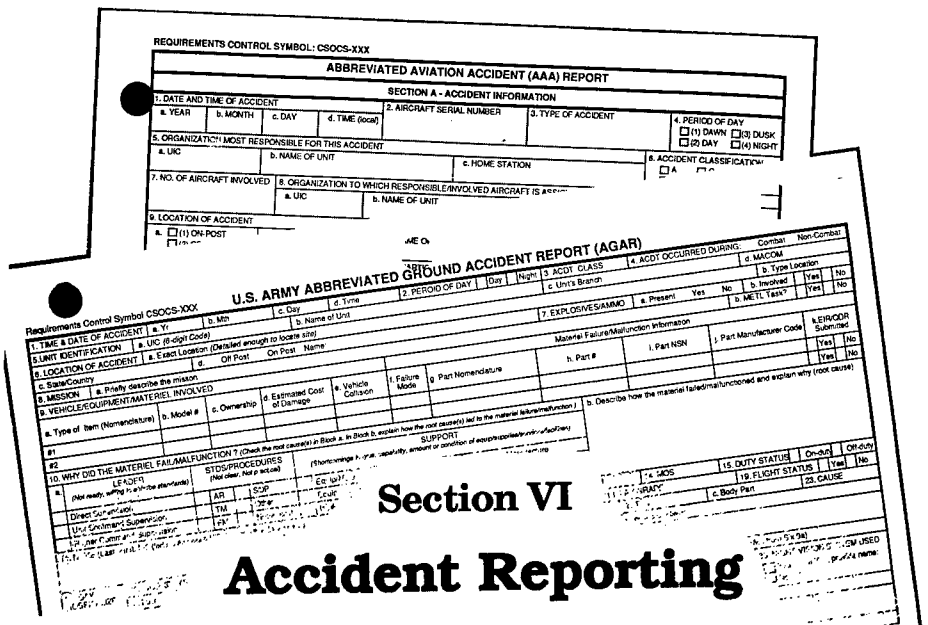
Nobody likes the idea of abandoning ship, but it is sometimes necessary. Preplanned survival procedures increase the chances for successful rescue. Records show that, even in the worst cases, it takes at least 15 to 30 minutes for a sinking ship to fully submerge. This affords valuable time for preparation.

The following pointers should be remembered:

- Wear as much warm clothing as possible. Cover head, neck, hands, and feet.
- Put immersion suit on, if you have one, over warm clothing.
- If prone to seasickness, take preventive medicine in a dose recommended by the manufacturer. Vomiting removes body fluids and makes you more prone to hypothermia.
- If possible, avoid jumping into the water. Climb aboard a davit-launched raft or boat on the embarkation deck. If this is not possible, use pilot ladders or lower yourself into the water by a rope or fire hose.
- If possible, do not jump from higher than 16 feet into the water. Minimize the shock of sudden cold immersion by lowering yourself gradually into the water. If jumping into the water cannot be avoided, keep your elbows at your sides, and cover your nose and mouth with one hand while holding your wrist or elbow firmly with the other hand.
- Once in the water, locate lifeboats, liferafts, survivors, or floating objects. Violent shivering and pain are natural body reflexes, but not dangerous. However, you must take action as quickly as possible before you lose full use of your hands. Be sure to take precautions such as buttoning up clothing, turning on signal lights, and locating the whistle on your life jacket.
- Swim only to reach a nearby craft, a fellow survivor, or a floating object. Swimming increases the rate of body-heat loss by pumping out warm water between your body and the layers of clothing. Regardless of the intensity of the pain, remain as still as possible. Pain will not kill you, but heat loss can.
- Body position in the water is very important in conserving heat. Float as still as possible with your legs together, elbows close to your side and arms folded across the front of your life jacket. Keep your head and neck out of the water. Huddle closely with other survivors.
- Board a raft or a floating platform as soon as possible. You lose body heat faster in water than in air. Avoid wind chill by huddling close to other occupants.
- Certain drown-proofing techniques (relaxing in the water and allowing your head to submerge between breaths) should

not be used in *cold* water. If you are in cold water and are not wearing a life jacket, tread water only as much as necessary to keep your head out of the water.

• Keep a positive attitude about your survival and rescue. The will to live *does* make a difference.


REQUIREMENTS CONTROL SYMBOL: CSOCS-XXX

ABBREVIATED AVIATION ACCIDENT (AAA) REPORT

SECTION A - ACCIDENT INFORMATION

1. DATE AND TIME OF ACCIDENT | a. YEAR | b. MONTH | c. DAY | d. TIME (local) | 2. AIRCRAFT SERIAL NUMBER | 3. TYPE OF ACCIDENT | 4. PERIOD OF DAY

5. ORGANIZATION MOST RESPONSIBLE FOR THIS ACCIDENT | a. UIC | b. NAME OF UNIT | c. HOME STATION | 6. ACCIDENT CLASSIFICATION

7. NO. OF AIRCRAFT INVOLVED | 8. ORGANIZATION TO WHICH RESPONSIBLE/INVOLVED AIRCRAFT IS ASSIGNED | a. UIC | b. NAME OF UNIT

9. LOCATION OF ACCIDENT

U.S. ARMY ABBREVIATED GROUND ACCIDENT REPORT (AGAR)

Requirements Control Symbol CSOCS-XXX

Section VI

Accident Reporting

Normal accident notification, investigation, and reporting have been waived for Operation Restore Hope. Abbreviated accident report forms (Abbreviated Aviation Accident Report (AAA Report) and Abbreviated Ground Accident Report (AGAR)) will be used as indicated below. These forms can be obtained from your command safety office forward.

Notification and reporting summary

Aviation accidents/incidents

Accident Class	Telephonic Notification	Abbreviated Aviation Accident Report (AAA Report)
A & B	Immediate—to USASC or Safety Rep Forward. Serves as PRAM; no hardcopy followup required	Only when Commander determines DA Form 2397 investigation/report not feasible. Submit as soon as conditions/ situation permits—do not exceed 30 calendar days.
C	Immediate—to USASC or Safety Rep Forward. Serves as PRAM; no hardcopy followup required.	AAA Report replaces DA Form 2397 as report form. Submit as soon as conditions/situation permits—do not exceed 30 calendar days.
D, E, & FOD	Not applicable (unless safety-of-flight issue involved/ suspected).	AAA Report replaces PRAM as report form. Submit as soon as practical—do not exceed 10 calendar days.

Ground accidents

Accident Class	Telephonic Notification	Abbreviated Ground Accident Report (AGAR)
A & B	Immediate—to USASC or Safety Rep Forward.	**On duty:** Only when Commander determines DA Form 285 investigation/ report not feasible. Submit as time permits—do not exceed 30 calendar days. **Off duty:** AGAR replaces DA Form 285 as report form. Submit as time permits—do not exceed 30 calendar days.
C & D	Not applicable.	AGAR replaces DA Form 285 as report form. Submit as time permits—do not exceed 30 calendar days.

Telephonic notification

• Notification will be immediate, through the chain of command, to the immediate commander of all personnel involved and to the U.S. Army Safety Center (USASC) or the USASC-designated point of contact (Safety Rep Forward).

• Notification methods include radio-teletyped message (via Defense Data Network—DDN), telephone (USASC phone numbers: DSN 558-2660/4273/3410, commercial (205) 255-2660/4273/3410), or other immediate means.

• Notification of aviation accidents will include PRAM information. Notification of ground accidents will include the following:

- ❑ Unit.
- ❑ Time/date of accident.
- ❑ Location of accident (coordinates).
- ❑ Name, rank, SSN, and MOS/job series of persons(s) involved.
- ❑ On/off duty.
- ❑ Component (RA, USAR, ARNG, civilian).
- ❑ What was the victim doing?
- ❑ What were the injuries?
- ❑ What materiel/property damage occurred?
- ❑ What was estimated accident classification? (Class A = $1,000,000 or more, Class B = $200,000 to $999,999).
- ❑ What happened?

Report transmission

Methods for transmission of accident report forms should be dictated by available resources (electronically, by message, by mail, by telefax (if time sensitive), or hand carried. When time sensitive safety of use issues are involved or suspected, telefax the report to USASC (DSN 558-5318, commercial (205) 255-5318).

USASC addresses

- Mail: Commander, U.S. Army Safety Center, ATTN: CSSC-DA, Fort Rucker, Alabama 36362-5363.
- Message: CDR USASC FT RUCKER AL //CSSC-DA//.

Section VII

Survivability Positions

Commander's Responsibility

- Protect troops
- Improve and maintain unit survivability continuously
- Provide materials
- Supervise construction
- Inspect periodically
- Plan and select fighting position sites
- Get technical advice from engineers as required

References: FM 5-103 and FM 5-34, chapter 4

Do's and Don'ts

- Do ensure adequate material is available
- Don't fail to supervise
- Do dig down as much as possible
- Don't use sand for structural support
- Do maintain, repair, and improve positions continuously
- Don't use sandbags for structural support
- Do inspect and test position safety daily, after heavy rain, and after receiving direct and indirect fires
- Don't forget to camouflage
- Do revet excavations in sandy soil (see page 81, step 2)
- Don't drive vehicles within 6 feet of a position
- Do interlock sandbags for double-wall construction and corners
- Don't take shortcuts
- Do check stabilization of wall bases
- Don't put soldiers in marginally safe bunkers
- Do fill sandbags approximately 75 percent
- Don't overfill sandbags
- Do construct to standard
- Don't build above ground unless absolutely necessary
- Do use common sense
- Don't forget lateral bracing on stringers

Summary of materials

In a combat situation, it may be necessary to improvise construction of a survivability position by using materials not normally associated with the construction. Some examples of field-expedient material are:

Wall revetment
- Sheet metal
- Corrugated sheet metal
- Plastic sheeting
- Plywood
- Air mat panels
- Air Force air load pallets

Wall construction (building up)
- Sand grid material
- 55-gallon drums filled with sand
- Expended artillery shells filled with sand
- Shipping boxes/packing material
- Prefabricated concrete traffic barriers

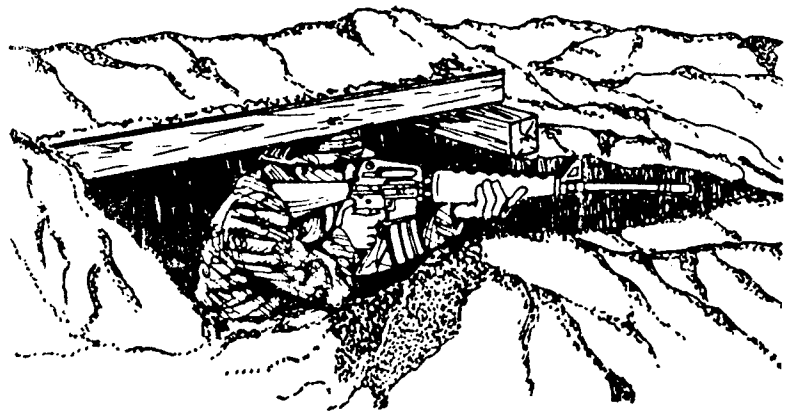
Overhead cover stringers
- Single pickets
- Double pickets
- Railroad rails
- "I" beams
- 2-inch-diameter pipe and larger
- Timbers 2"x4", 4"x4" and larger
- Reinforced concrete beams
- 55-gallon drums cut longitudinally in half
- Large diameter pipe/culverts cut in half
- Precast concrete panels 6-8 inches thick
- Airfield panels
- Air Force air load pallets
- Shipping pallets

Stand-alone positions
- Prefab, concrete catch basins, valve pits, utility boxes
- Military vans
- Connexes or shipping containers
- Large diameter pipe/culvert
- Steel water tanks
- Other storage tanks (cleaned and ventilated)
- Vehicle hulks

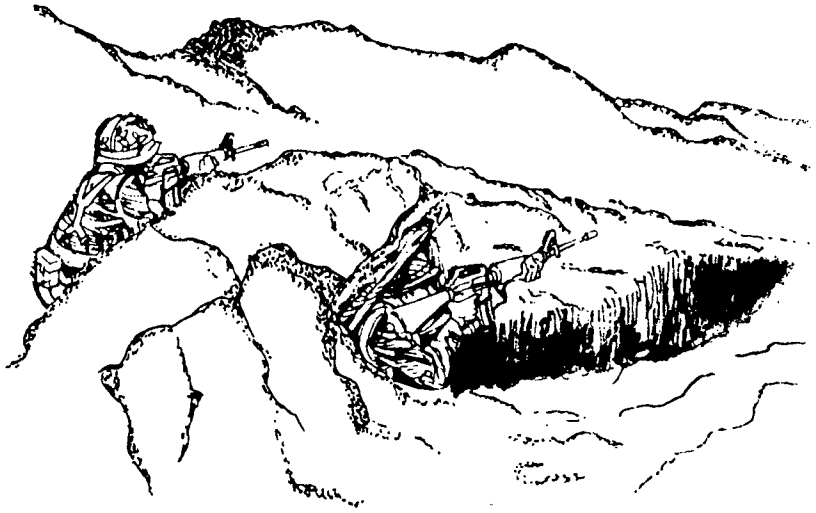
NOTE: All positions require a minimum of 18 inches dry sand overhead cover (double thickness for wet sand).

Types of positions

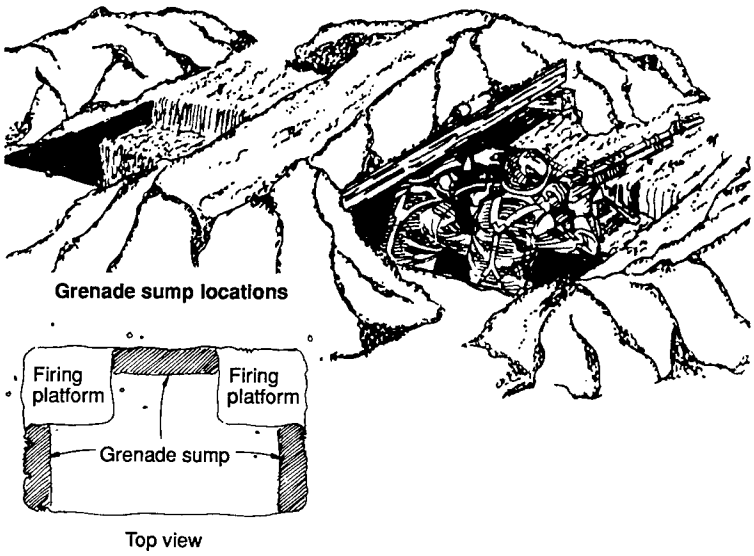
One-Man Fighting Position



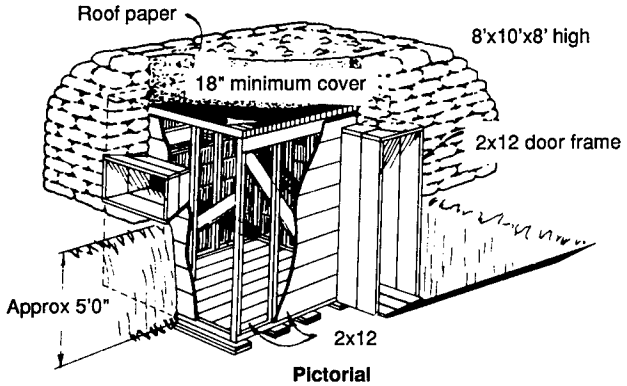
Two-Man Fighting Position



Crew-Served Fighting Position



Command Bunker



For additional bunker designs, see appendix B of FM 5-103: Survivability. A variety of positions can be made with locally procured material.

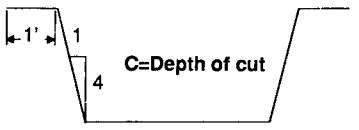
Preconstruction phase

Determine the level of protection required through IPB, OCOKA, and METT-T. See page 88 for a summary of protection levels for common threat weapons systems.

Construction sequence

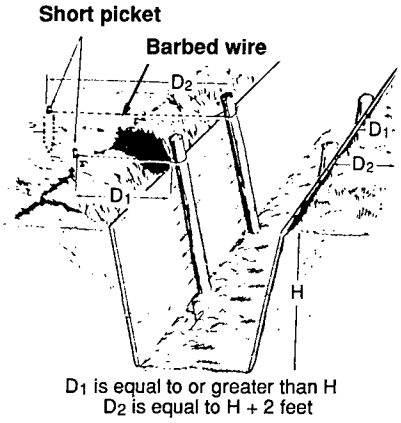
Step 1: Excavate earth

- Slope walls 1:4 (for every 4 feet in depth, slope back 1 foot).
- Pile dirt at least 1 foot back from the edge of excavation or 1/4 of the cut, whichever is greater.



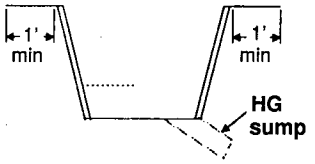
Step 2: Install revetment

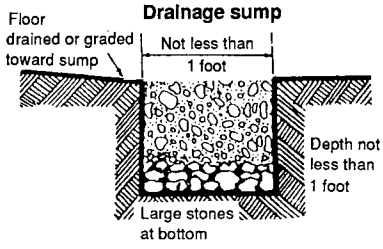
- Use sheeting material and pickets to revet walls to prevent cave-in.
- Pickets/posts must be tied back.
- Drive pickets at least 1/3 C into ground.



Step 3: Install floor drains and HG sumps (seasonal, optional)

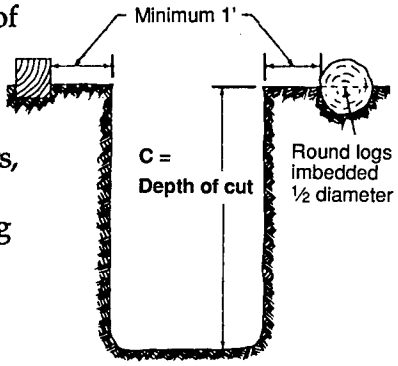
- Slope floor from rear to front.
- Pallets may be used for floor cover.
- Install 1'x1' rock sump the length of the position.
- Install hand-grenade sump on front wall, minimum 5" wide, 30° angle.





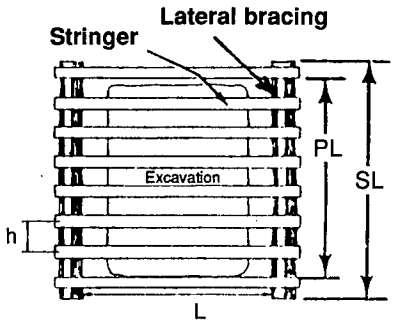
Step 4: Install supports for overhead stringers (bearing plates)

- Setback from the edge of the excavation must be at least 1 foot (or 1/4 C, whichever is greater).
- Supports can be timbers, pipes, or concrete beams.
- Supports should be dug in approximately 1/2 height.



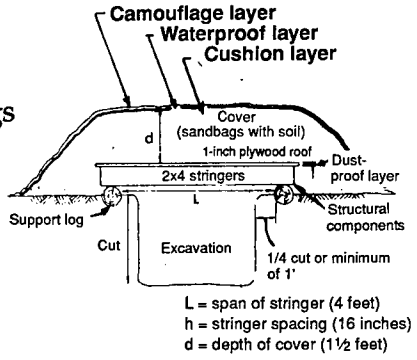
Step 5: Install stringers

- Stringers can be 2"x4", 2"x6", or 4"x4", pipe, pickets
- Use charts on pages 86 and 87 for stringer spacing
- PL = position length
- SL = support length = position length + depth of cut
- L = span of stringer
- h = stringer spacing

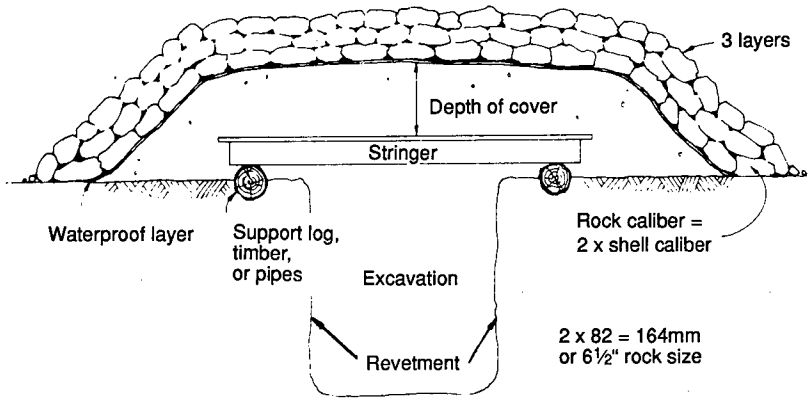


Step 6: Install overhead cover (OHC) and camouflage

- Use plastic or a poncho for waterproof layer.
- Use at least 18" of sandbags with sand for cushion layer.
- Use plywood or sheeting mat for dust-proof layer (could be boxes or plastic panel).
- Use surrounding topsoil and desert lightweight camouflage screen system (LCSS).



This will stop air burst, contact burst and small arms.



Use extra armored "burst" layer to stop delay fuze burst up to 82mm mortar.

Built-up positions

- Only when absolutely necessary (e.g., bedrock prevents excavation).
- Refer to page 78 for appropriate construction and structural material.
- Don't use sandbags as structural support (e.g., sandbag wall supporting OHC).
- Consult FM 5-103 for above-ground bunkers and shelters.
- Camouflage with surrounding top soil. Slope to blend in with terrain.

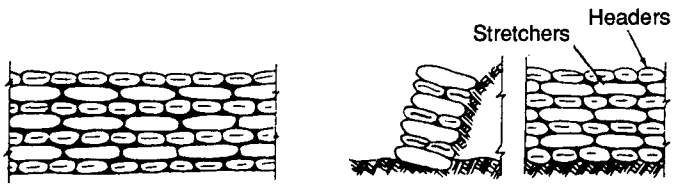
Soil considerations

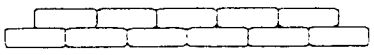
- Rain, vibrations, and vehicle traffic will weaken soil.
- Maintain position by periodically inspecting revetment walls, cover, waterproofing, and slopes. If bunker walls or roofs are bowing, reinforce them or abandon them.
- Inspect stringers for wear, cracks, bends, and bows. Replace if necessary.
- Open excavations will not hold a side wall. They cave in and collapse.
- After an artillery barrage, test, inspect, and repair position.

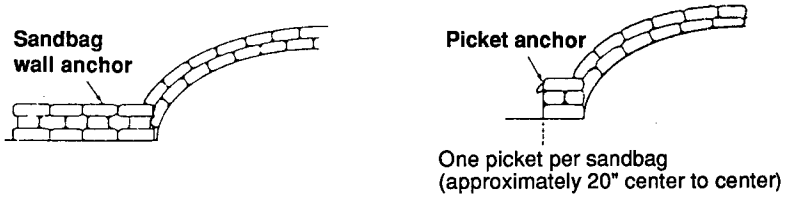
Walls of fighting and protective positions are built of sandbags much the same way bricks are used. Sandbags are also useful for retaining wall revetments as shown.

Sandbags are made of an acrylic fabric and are rot and weather resistant. Under all climatic conditions, they have at least a two-year lifespan with no visible deterioration. (Some older-style cotton bags deteriorate much sooner.) The useful life of sandbags is prolonged by *filling* them with a mixture of dry earth and portland cement, normally in the ratio of one part cement to 10 parts dry earth. The cement sets as the bags take on moisture. A 1:6 ratio is used for sand-gravel mixtures. As an alternative, filled bags are dipped in a cement-water slurry. Each sandbag is then pounded with a flat object such as a 2x4 to make the retaining wall more stable.

The stretchers and headers technique serves to tie together double walls.



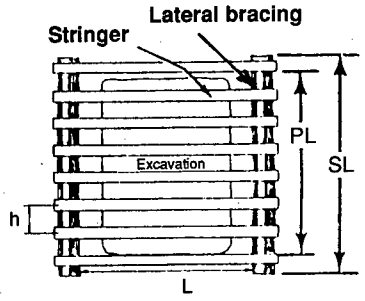




Loose-sand design

L = span of stringer (6 feet)
d = depth of cover
PL = position length
h = stringer spacing
C = depth of cut
SL = support length = PL + C

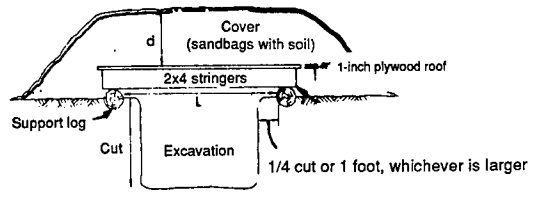
Lateral bracing can be 2"x4", sandbags, ammo can, or any field expedient. Lateral bracing prevents "rolling" of overhead cover.



Design to use if stringers are—

8′ pickets
L = 6′
d = 2′
C = 5′
PL = 6′
SL = 11′
8′ "U" shaped pickets (open side down)
h = 5" center to center spacing (from chart)
U shaped picket is 3" wide
PL = 6′ x 12" = 72" long
72"/5" c to c spacing = 14.4 rounded up = 15 + 1 pickets
16 pickets required

4 x 4′s
L = 6′
d = 2′
C = 5′
PL = 6′
SL = 11′
4 x 4 stringers
h = 10" center to center spacing (from chart)
PL = 6′ x 12" = 72" long
72"/10" = 7.2" rounded up = 8 + 1
9 stringers required



L = span of stringer (4 feet) h = stringer spacing (16 inches) d = depth of cover (1½ feet)

Procedure

1. Determine L, span length in feet, from design (see page 80) for L 3', use column a; for L 6', use column b; for L 9', use column c.

2. Determine the number of layers of sandbags required. One sandbag layer equals approximately 5 inches. The layers of sandbags equal the cushion layer of your OHC design.

3. Use the smallest number that is greater than the number of layers in your design. For example, if your design calls for 4 layers of sandbags, use the row starting with 5.

4. Intersect row and column to determine the maximum span between steel picket stringers.

5. If using a burst layer, add four sandbag layers.

Table 1. Maximum span of steel picket roof supports for sandbag layers

	a.	b.	c.
Number of Sandbag Layers	Span Length, Feet		
	3	6	9
Single-Picket Beams*	Center-to-Center Spacing, Inches		
2 (10 inches)	7	7	6
5 (25 inches)	6	5	4
10 (50 inches)	4	4	3
15 (75 inches)	4	3	2
20 (100 inches)	3	3	2
Double-Picket Beams**			
2 (10 inches)	7	7	7
5 (25 inches)	7	7	7
10 (50 inches)	7	6	5
15 (75 inches)	7	5	4
20 (100 inches)	6	5	4

* Used with open side down.
** Two pickets are welded together every six inches along the span to form box beams.

Table 2. Maximum span of inverted landing mats (M8A1,AM2) for roof supports

Number of Sandbag Layers	Span Length, Feet
2	10
5	6 1/2
10	5
15	4
10	3 1/2

Bunkers

Basic criteria to consider when designing a bunker are the purpose (command post or fighting position) and the degree of protection desired (small arms, mortars, bombs) (table 4). The bunker can be constructed wholly or partly underground. Prefabrication of bunker assemblies (wall and roof) afford rapid construction and placement flexibility. When using timber, avoid notching construction timber. Common field bunkers are shown in chapter 4 of FM 5-103.

Table 3. Center to center spacing for wood supporting soil cover to defeat contact burst

NOMINAL STRINGER SIZE (IN)	DEPTH OF SOIL (d) M (FT)	SPAN LENGTH (L) M (FT) .6 (2)	1.2 (4)	1.8 (6)	2.4 (8)	3 (10)
	CENTER-TO-CENTER STRINGER SPACING (h) CM (IN)					
	82-MM CONTACT BURST					
2 x 4	.6 (2)	7.6 (3)	10 (4)	10 (4)	10 (4)	8 (3)
	.9 (3)	46 (18)	30 (12)	20 (8)	13 (5)	8 (3)
	1.2 (4)	46 (18)	36 (14)	18 (7)	10 (4)	8 (3)
2 x 6	.6 (2)	10 (4)	18 (7)	20 (8)	20 (8)	15 (6)
	.9 (3)	46 (18)	46 (18)	41 (16)	30 (12)	20 (8)
	1.2 (4)	46 (18)	46 (18)	46 (18)	28 (11)	18 (7)
4 x 4	.6 (2)	18 (7)	25 (10)	25 (10)	22 (9)	18 (7)
	.9 (3)	46 (18)	46 (18)	46 (18)	30 (12)	20 (8)
	1.2 (4)	46 (18)	46 (18)	46 (18)	25 (10)	18 (7)
4 x 8	.5 (1.5)	10 (4)	13 (5)	18 (7)	20 (8)	20 (8)
	.6 (2)	36 (14)	46 (18)	46 (18)	46 (18)	46 (18)
	.9 (3)	46 (18)	46 (18)	46 (18)	46 (18)	46 (18)
	120- and 122-MM CONTACT BURSTS					
4 x 8	1.2 (4)	9 (3.5)	10 (4)	13 (5)	13 (5)	15 (6)
	1.5 (5)	30 (12)	30 (12)	30 (12)	28 (11)	25 (10)
	1.8 (6)	46 (18)	46 (18)	46 (18)	41 (16)	30 (12)
6 x 6	1.2 (4)	--	--	14 (5.5)	15 (6)	15 (6)
	1.5 (5)	36 (14)	36 (14)	33 (13)	30 (12)	25 (10)
	1.8 (6)	46 (18)	46 (18)	46 (18)	41 (16)	30 (12)

NOMINAL STRINGER SIZE (IN)	DEPTH OF SOIL (d) M (FT)	SPAN LENGTH (L) M (FT) .6 (2)	1.2 (4)	1.8 (6)	2.4 (8)	3 (10)
	CENTER-TO-CENTER STRINGER SPACING (h) CM (IN)					
	120- and 122-MM CONTACT BURSTS					
6 x 8	1.2 (4)	14 (5.5)	15 (6)	20 (8)	23 (9)	25 (10)
	1.5 (5)	46 (18)	46 (18)	46 (18)	46 (18)	43 (17)
8 x 8	1.2 (4)	19 (7.5)	23 (9)	28 (11)	30 (12)	33 (13)
	1.5 (5)	46 (18)	46 (18)	46 (18)	46 (18)	46 (18)
	152-MM CONTACT BURST					
4 x 8	1.2 (4)	--	--	--	--	9 (3.5)
	1.5 (5)	15 (6)	15 (6)	18 (7)	18 (7)	18 (7)
	1.8 (6)	43 (17)	41 (16)	36 (14)	30 (12)	25 (10)
	2.1 (7)	46 (18)	46 (18)	46 (18)	38 (15)	28 (11)
6 x 6	1.5 (5)	18 (7)	20 (8)	20 (8)	20 (8)	18 (7)
	1.8 (6)	46 (18)	46 (18)	38 (15)	30 (12)	25 (10)
	2.1 (7)	46 (18)	46 (18)	46 (18)	38 (15)	28 (11)
6 x 8	1.2 (4)	--	--	--	--	15 (6)
	1.5 (5)	25 (10)	28 (11)	30 (12)	30 (12)	30 (12)
	1.8 (6)	46 (18)	46 (18)	46 (18)	46 (18)	43 (17)
8 x 8	1.2 (4)	--	--	--	--	20 (8)
	1.5 (5)	36 (14)	38 (15)	41 (16)	43 (17)	41 (16)
	1.8 (6)	46 (18)	46 (18)	46 (18)	46 (18)	46 (18)

NOTE: The maximum beam spacing listed in the table is 46cm (18 inches). This is to preclude further design for roof material placed over the stringers to hold the earth cover. A maximum of 1-inch wood or plywood should be used over stringers to support the earth cover for 82mm bursts; 2-inch wood or plywood should be used for 120mm or 152mm bursts.

Weapon-fighting positions

Positions may be hasty or deliberate, depending on time and material availability. Positions may be dug by hand or mechanically. Table 4 shows required thicknesses for protection against direct and indirect fire.

Table 4. Material thickness (cm/in) required to protect against direct and indirect fire

Material	DIRECT FIRE			INDIRECT FIRE (blast exploding 50 feet away)		
	Small Caliber (7.62 mm)	HE-Shaped Charge		Mortar	Mortar/Rocket/ HE Shell	
		85mm (RPG7)	107-120mm (RCLR) (SAGGER)	82mm	120mm 122mm	152mm
Concrete	30(12)	76(30)	91(36)	10(4)	13(5)	15(6)
Gravel, small rocks, bricks,rubble	51(20)	61(24)	91(36)	25(10)	46(18)	51(20)
Soil, sand	107(42)	198(78)	244(96)	30(12)	51(20)	76(30)
Timber	91(36)	229(90)	274(108)	20(8)	30(12)	36(14)
Snow (tamped)	183(72)	396(156)	None	152(60)	152(60)	152(60)

Table 5. Characteristics of individual-fighting positions

TYPE OF POSITION	ESTIMATED CONSTRUCTION TIME W/HAND-TOOLS (man-hours)	NUCLEAR WEAPONS
HASTY		
Crater	0.2	Fair
Skirmisher's trench	0.5	Fair
Prone position	1.0	Fair
DELIBERATE		
One-soldier position	3.0	Fair
One-soldier position with 1 1/2 ft overhead cover	8.0	Good
Two-soldier position	6.0	Fair
Two-soldier position with 1 1/2 ft overhead cover	11.0	Good
LAW position	3.0	Fair

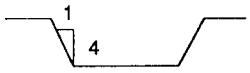
Notes: 1. All deliberate positions provide protection from medium artillery no closer than 30 feet.

2. All positions provide no protection from indirect fire blasts or direct hits from indirect fire.

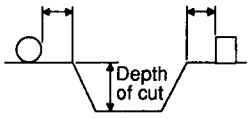
Inspection checklist

GO NO GO

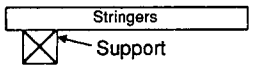
- Site location tactically sound
- Low profile maintained
- Materials of structural quality (standard construction material)

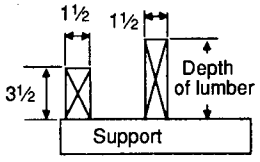


- Excavation-walls sloped

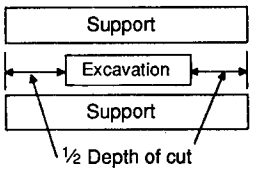


- Setback for overhead—minimum of 1 foot or 1/4 depth of cut



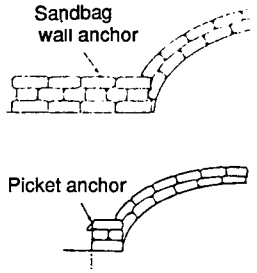


- Stringer
  - ❑ Firmly on a structural support
  - ❑ Spacing calculated using charts (on pages 86 and 87)
  - ❑ 2"x4" or 2"x6" stringers used on edge; the strength is in the depth of the lumber
  - ❑ Lateral bracing emplaced along supports (see diagram on page 85)



- Supports
  - ❑ Stringers firmly on supports
  - ❑ Supports extend past the excavation by ½ the depth of cut

	GO	NO GO
• Revetments ❑ Construction ❑ Sheeting supported by pickets ❑ Pickets tied back		
• Overhead cover ❑ Structural layer ❑ Dust layer—plywood or panels ❑ Cushion layer *at least* 18" deep ❑ Waterproof layer in place (also repels liquid chemicals) ❑ Burst layer at least 18" deep (if used) ❑ Camouflage in place		
• Sandbag ❑ Sandbags are filled approximately 75 percent ❑ Bags lapped if single walls ❑ Double walls tied together ❑ Base of height supported or walls curved		



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