U.S. ARMY SPECIAL WARFARE SCHOOL
Fort Bragg, North Carolina

MATA HANDBOOK for VIETNAM

JANUARY 1966 (Revised)
THE MATA HANDBOOK FOR VIETNAM

This handbook contains useful reference material vital for the military advisor in Vietnam and is designed to assist him in the performance of his duties.

The material contained herein reflects doctrine as currently taught at the Special Warfare School and is derived from material intended for School use. This handbook is prepared for use in the MATA courses of instruction and serves as a ready reference for advisors in Vietnam.

Suggestions and recommendations for changes or corrections should be submitted directly to the Commandant, U.S. Army Special Warfare School, ATTENTION: Director of Instruction, Fort Bragg, North Carolina 28307.
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CHAPTER 1

GENERAL

1. YOUR LEGAL STATUS

   a. As a United States Armed Forces advisor to the Republic of Vietnam you are accorded complete immunity from Vietnamese civil and criminal jurisdiction by the Vietnamese Government. This immunity is provided for under the provision of the Mutual Defense Assistance Agreement—Vietnam which was negotiated between the United States and France in 1950. Both the United States and Vietnamese Governments have agreed to the continuation of this agreement.

   b. This immunity is not formally provided to all U.S. support personnel and the members of U.S. military units stationed within the Republic of Vietnam. Until such time as additional agreements are negotiated, each incident that occurs will have to be resolved on an individual basis by representatives of both governments.

   c. All personnel are, however, subject to the provisions of the Uniform Code of Military Justice. Local incidents involving U.S. personnel are reported to MACV for appropriate disciplinary action.

   d. Article 3 of the 1949 Geneva Conventions, on Prisoners of War and Civilians, governs the treatment of captured personnel in an insurgency. U.S. official policy requires United States Armed Forces personnel to adhere to the provisions of Article 3 in an insurgent situation and encourages all parties to the conflict to adhere to all of the provisions of the 1949 Geneva Conventions. Article 3 may be summarized as follows:

      (1) No torture of captives.

      (2) No use of captives as hostages.

      (3) No degrading treatment of captives.

      (4) No execution of captives without a fair trial by a regular court.

The U.S. advisor should also be alert to any injustices resulting from the behavior of the local military and encourage the maintenance of legal order and justice in the local community.
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**Figure 1 (1)** Name of provinces corresponding to numbers on provincial map of Vietnam.
NOTE: There are two types of special zones, those under the direct control of JGS and those under tactical zone control.

Figure 2. RVNAF Chain of Command.
Figure 3. Rank of the Army of the RVN.
CHAPTER 2

WEAPONS

2. GENERAL

Some of the weapons described in this chapter may appear to be obsolete in the current, U.S. Army arsenal; however, the advisor will often find such weapons in use in Vietnam.

3. U.S. RIFLE, CALIBER .30, M-1

Figure 4. U.S. Rifle Caliber .30 M-1
Súng Trường Mỹ M-1

a. Reference:

FM 23-5

b. Characteristics:

(1) Air cooled

(2) Semi-automatic

(3) Gas operated

(4) Shoulder weapon

(5) Clip loaded
c. Data:

(1) Weight, w/o bayonet 4.31 kgs
(2) Weight, w/bayonet and sling 4.93 kgs
(3) Length overall 110.74 cm

d. Lubrication: All parts moving or camming against other parts need lubrication to prevent friction. Oil may be used on all these parts. In addition, the following parts and places should have rifle grease added as friction is heavy:

(1) The camming surface in the hump of the operating rod.
(2) Under the lip of the receiver above the bolt.
(3) Locking recesses in the receiver.
(4) Bolt camming lug on the face of the hammer.

e. Immediate Action: With the right hand palm up, pull the operating rod handle all the way to the rear, release, aim, and fire.

f. Inspection: Check for correct assembly. (Pull operating rod to rearmost position—bolt should remain open. Close bolt, lock safety, and squeeze trigger. Hammer should not fall. With safety off, squeeze trigger. The hammer should fall.)

(1) Inspect receiver. (Chamber should be clean. Rear sight elevating knob should produce sharp clean clicks when there is proper tension. If not, run aperture all the way up, press down; if aperture drops, tension must be adjusted.)

(2) Check butt plate cap door to make sure it closes properly. Check completeness of accessories.

(3) Check for broken or missing extractor, ejector, or firing pin. (Move bolt to rear to check.)

(4) Check front hand guard for looseness.
(5) Check for loose or missing gas cylinder lock screw.

(6) Check functioning of safety.

4. PISTOL, CALIBER .45, M1911 AND M1911A1

Figure 5. Pistol, Caliber .45, M1911 and M1911A1

a. Reference:

   FM 23-35

b. Characteristics:

   (1) Recoil operated

   (2) Semi-automatic

   (3) Magazine fed

   (4) Air cooled

   (5) Hand weapon
c. Data:

(1) Weight 1.13 kgs

(2) Length 21.91 cm

d. Lubrication: A light coat of oil is required on all moving parts.

e. Immediate Action: With slide forward - manually cock the hammer without opening the chamber and make one additional attempt to fire. If the pistol still fails to fire, wait 10 seconds, chamber a new round, and attempt to fire.

With slide not all the way forward, remove finger from trigger and attempt to push slide forward. If it does not go, remove magazine, remove round, and chamber a new round and attempt to fire.

f. Inspection:

(1) Check for correct functioning of the safety lock, disconnector, grip safety, and half-cock feature of the hammer. (To check safety lock, cock hammer, press safety lock upward into safe position and while depressing the grip safety, squeeze the trigger. Hammer should not fall.)

(2) Check grip safety. (Cock hammer, release safety lock, do not depress grip safety, point pistol downward and squeeze trigger. Hammer should not fall.)

(3) Check half cock feature. (Half-cock hammer, pull trigger, hammer should not fall; also, if hammer is drawn back between half-cock and full-cock, and hammer is released, it should fall to half-cock.)

(4) Disconnector functions properly. (Cock hammer, shove slide .64 cms to rear, hold slide in position, squeeze trigger. Allow slide to go forward while maintaining pressure on trigger. Hammer should not fall. Final test is to pull slide all the way to the rear, engage slide stop, squeeze trigger, and at the same time release slide. Hammer should not fall.

(5) Check trigger pull to determine if it is excessively heavy or dangerously light.

(6) Sight burred or otherwise damaged.
(7) Worn or broken firing pin, extractor, or ejector.

(8) Weak or broken firing spring.

(9) Deformed magazine lip or magazine follower.

(10) Dented or battered magazine.

(11) Weak or broken magazine spring.

(12) Cracked or broken stocks.

(13) Inoperative magazine catch and release.

5. RIFLE, XM16E1, 5.56-MM

Figure 6. Rifle, XM16E1, 5.56-mm

Figure 6. Rifle, XM16E1, 5.56-mm

Súng-Trưởng M16

a. Reference:

FM 23-9

b. Characteristics:

(1) Gas operated

(2) Air cooled

(3) Semi or fully automatic
(4) Shoulder weapon

(5) Magazine fed

c. **Unusual Characteristics:**

(1) A gas tube which replaces the gas cylinder found on most weapons.

(2) Clamp-type bipod.

(3) Flash suppressor which allows the anti-tank grenade to be directly attached.

(4) Straight line design that reduces climbing tendency.

(5) Plastic forearms and stock.

(6) A winter trigger guard that allows the weapon to be fired while wearing a mitten.

(7) Carrying handle to which a telescopic sight can be attached giving a sniper capability.

d. **Data:**

(1) Weight of rifle 2.75 kgs

(2) Barrel length, w/flash suppressor 53.98 cm

(3) Overall length 98.43 cm

(4) Magazine capacity 20 rounds

(5) Sights:

(a) Rear: 2-leg peep for 273 and 455 meters.

(b) Front: Post.

**NOTE:** One click will move the strike of the bullet 1 inch for each 100 yards. This applies to both windage and elevation.
(6) Rifling: 6 grooves, right twist, 1 turn in 35.56 cm.

(7) Ammunition: Cal. .223, 55-grain, boattail bullet.

e. Firing Characteristics:

(1) Muzzle velocity (approximate) 1005.8 meters per second

(2) Muzzle energy 1328 foot lbs

(3) Cyclic rate of fire 700/800 per minute

(4) Maximum rate of fire:

(a) Semi-automatic 45/65 per minute

(b) Automatic (using 20-rd magazine) 120/150 per minute

(5) Sustained rate of fire 12-15 per minute

(6) Maximum effective rate of fire:

(a) Semi-automatic 30/40 per minute

(b) Automatic 50/70 per minute

(7) Maximum range 2,578.03 meters

(8) Maximum effective range 457.20 meters

f. Simple Field Strip:

(1) Remove magazine and pull charging handle to the rear and inspect the chamber.

(2) Depress bolt lock and put safety on SAFE position.
(3) Press take-down pin to the right.

(4) Lift up on carrying handle and separate the upper and lower receiver.

(5) Withdraw charging handle and remove bolt and bolt carrier, then remove handle from its recess.

(6) Remove firing pin retaining pin.

(7) Remove firing pin.

(8) Turn bolt cam pin one-half turn to the right and remove.

(9) Separate the bolt from the bolt carrier.

(NOTE: Further disassembly is not necessary. Notice gas tube and where it enters the bolt carrier. Notice gear type projections on front of bolt and where they lock into the barrel extension. Note the location of the hammer, disconnect, and automatic sear.)

g. **Assembly of Rifle:** Assemble in reverse order.

h. **Care and Cleaning:**

(1) The weapon is rust and corrosion resistant.

(2) The metal is an alloy that will resist corrosion. Do not use cleaning solvent.

(3) The rifle needs only to be kept lightly oiled, cleaned, and all excess carbon simply wiped off the working parts.

(4) All springs must be checked to ensure that they are not broken, weak, or bent out of shape.

(5) To oil the weapon excessively would cause it to function at a very slow rate of speed and eventually malfunction.

(6) Because of its high cyclic rate of fire, all carbon should be removed as soon as possible, before it hardens.
(7) The cleaning rod should be inserted from the rear of the bore, to ensure that the cleaning patch follows the same path as the projectile, thus preventing the bore from becoming pitted.

6. CARBINE, CALIBER .30, M1 AND M2

![Figure 7. Carbine, Caliber .30, M1 and M2](image)

- Sung Cac-Bin M1 & M2

a. Reference: FM 23-7

b. Characteristics:

- (1) Air cooled
- (2) Magazine loaded
- (3) Gas operated
- (4) Semi and fully automatic
- (5) Shoulder weapon

c. Data:

- (1) Weight, w/15-round magazine (unloaded) 2.48 kgs
- (2) Weight, w/15-round magazine (loaded) 2.75 kgs
- (3) Weight, w/30-round magazine (unloaded) 2.49 kgs
- (4) Weight, w/30-round magazine (loaded) 2.97 kgs
(5) Length, w/bayonet-knife 107.34 cm
(6) Length, w/o bayonet-knife 90.37 cm
(7) Magazine capacity 15 & 30 rds
(8) Chamber pressure 18,000 kgs per sq in
(9) Maximum range 2002 meters
(10) Maximum effective range 250.25 meters
(11) Cyclic rate of fire M2 750-775 rpm
(12) Maximum effective rate of fire 40-60 rpm

d. Lubrication: Lubrication reduces friction; therefore, all parts that work or come into contact with each other should be lubricated. Normally, preservative special oil may be used on such parts as magazine catch, safety, hammer pin, trigger pin, etc.; however, since oil evaporates where friction is greatest, it is recommended that rifle grease be used on the following parts if firing is to be done:

(1) Bolt locking and operating lug.

(2) Receiver slide lugs that operate in splines on side of barrel.

(3) Bolt camming recess in hump of slide.

(4) Guide lug that operates in spline on receiver.

(5) Receiver recess where bolt lugs operate, top rear where bolt comes in contact.

e. Immediate Action: Pull operating slide all the way to the rear with the right hand palm up, release, aim, and attempt to fire. This action will clear most stoppages.

f. Only American personnel are issued M2 Carbines. Friendly Vietnamese personnel are issued M1 Carbines only. Therefore, any references to M2 Carbines are for information of advisors.
g. Inspection of the Carbine, M2, Cal .30:

(1) Pull operating slide to rear and depress operating slide stop. (If bolt does not remain open, slide stop or notch is defective.)

(2) Point safety to rear, pull and release trigger several times. (Trigger should spring forward when released. If not, trigger spring is improperly installed. Very dangerous to fire.)

(3) Pull selector to rear, trigger released, pull operating slide to rear and release. (Hammer should not fall, pull trigger, hammer should fall.)

(4) Hold trigger to rear, pull operating slide all the way back and allow to snap forward. (Hammer should not fall until trigger is released and squeezed again.)

(5) Pull operating slide completely to the rear and allow it to go forward. Push selector to automatic position. (Hammer should not fall until trigger is pulled.)

(6) Hold trigger to rear, pull operating slide to rear and release it. Repeat several times. Release trigger and squeeze. (Hammer should not fall.)

(7) Leave selector in automatic position, pull operating slide to rear, hold trigger back and allow slide to go forward slowly. (Hammer should fall just as the operating slide moves the last 79 cm. If it falls before the bolt is fully locked, the weapon is defective.)

(8) Test the safety with the selector in each position.

(9) Oilier on sling missing.

(10) Recoil plate screw loose.

(11) Rear sight windage knob binds, elevation slide fails to properly engage range indications on ramp.

(12) Check to see if extractor, ejector, or firing pin broken or missing. (Open to examine bolt.)
(13) Selector-lock spring tension.

(14) Front sight loose.

(15) Front band screw not tight.

(16) Magazine dented or otherwise damaged.

(17) Magazine catch inoperative.

(18) Trigger pull excessively heavy or light.

7. BROWNING AUTOMATIC RIFLE, M1918A2

Figure 8. Browning Automatic Rifle, M1918A2

Sùng Trung-Liên

a. Reference: FM 23-15

b. Characteristics:

(1) Air cooled

(2) Magazine fed
(3) Shoulder weapon

(4) Gas operated

(5) Fully automatic

c. Data:

(1) Weight, complete w/bipod and magazine 8.73 kgs.

(2) Length, overall w/flash hider 121.41 cm

(3) Magazine capacity 20 rds

(4) Chamber pressure 22,500 kgs per sq in

(5) Muzzle velocity 841.5 meters per sec

(6) Maximum range 3,185 meters

(7) Maximum effective range 455 meters

(8) Cyclic rate of fire:
   Slow-350 rpm
   Fast-550 rpm

(9) Sustained rate of fire 40-60 rpm

(10) Maximum effective rate of fire 120-150 rpm

d. Lubrication: All moving parts require a light coat of oil. CAUTION: Before firing the weapon, oil should be removed from the chamber and the face of the bolt.

e. Immediate Action:

(1) Pull operating handle to rear.

(2) Push operating handle forward.

(3) Tap up on magazine.

(4) Aim and attempt to fire.
f. Inspection of the BAR:

(1) First check by cocking the weapon, check safety, release safety, and squeeze trigger. (If bolt moves completely forward and locks into position, operating and trigger groups are correctly assembled.)

(2) Buffer and rate-reducing group must be checked by disassembly or test firing.

(3) Check gas cylinder and bipod group visually. (When gas cylinder body is positioned so that body lock key is directly under the barrel, gas cylinder assembly is correctly aligned.)

(4) Check if hinged butt plate is loose.

(5) Check to see if stock is warped or broken.

(6) Loose sight or binding elevating screw.

(7) Cock weapon. Check for worn or broken extractor, ejector, or firing pin.

(8) Broken carrying handle or forearm.

(9) Loose sight or cover.

(10) Missing friction washer.

(11) Loose or split flash hider.

(12) Wing nuts fail to lock adjustable legs when tightened.

(13) Defective magazines. (Check catch and spring.)

(14) Check if magazine release functions.

(15) Check sling for serviceability (webbing not frayed, keepers do not slip).
8. SUBMACHINE GUN, M-3

Figure 9. Submachine Gun, M-3
Súng Tież-Liênh M3

a. Reference: FM 23-41

b. Characteristics:

(1) Air cooled
(2) Blow-back operated
(3) Automatic
(4) Shoulder weapon
(5) Magazine fed

c. Data:

(1) Diameter of bore 1.14 cm
(2) Number of grooves 4
(3) Length of barrel 20.32 cm
(4) Length, overall with stock extended 75.70 cm
(5) Distance between sights 27.62 cm
(6) Weight without magazine (approx) 3.67 kgs

(7) Weight of 30-round magazine (empty) .34 kg

(8) Weight of 30-round magazine (loaded) .95 kg

(9) Cyclic rate of fire 450 rds per minute

(10) Sights 91.44 meters - fixed peep

(11) Maximum range 1556.48 meters

(12) Maximum effective range 91.44 meters

(13) Pull to cock weapon - M3 - M3A1

8.1 to 10.4 kgs
4.5 to 5.4 kgs

**d. Lubrication:** Before the submachine gun is fired, the following steps should be taken to make sure that it will function properly:

1. Field disassemble the weapon.

2. Clean the bore and chamber with a clean, dry patch.  
   (NOTE: Do not apply oil to the bore or chamber before firing.)

3. Clean all parts thoroughly.

4. Use a lightly oiled cloth, apply a light coat of lubricating preservative oil to all parts that do not come in contact with the ammunition. Apply a light coat of rifle lubricant grease to the guide rods.

5. Assemble the weapon.

6. Wipe excess oil from the receiver.

7. Clean the magazines, and place a light film of oil on their outer surfaces.

**e. Immediate Action:**
a. As the first step in reducing a stoppage, remove the magazine, retract the bolt, and inspect the chamber to ensure that it does not contain a live cartridge or any other obstruction. If there is no obstruction, close the cover, replace the magazine, open the cover and attempt to fire. If the gun still does not fire, check to see whether a live cartridge has chambered; if it has not, remove the magazine and insert a new magazine.

b. If there is a live cartridge or other obstruction lodged in the chamber, cock the gun and hold the cover down firmly; remove the barrel; then clear the chamber by using the stock to push the obstruction out of the barrel. Under combat conditions, when time is short, omit the step of removing the barrel.

9. THOMPSON SUBMACHINE GUN, M1A1, CALIBER .45

Figure 10. Thompson Submachinegun, M1A1, Caliber .45

Sung Tiêu-Liên Tom-Son

a. Reference:

(1) FM 23-40
(2) DA Pamphlet 30-115

b. Characteristics:

(1) Air cooled
(2) Blow-back operated
(3) Semi or fully automatic
(4) Shoulder weapon
(5) Magazine fed
c. Data:

(1) Overall length of gun 83.82 cm
(2) Weight, w/loaded magazine 5.4 kgs
(3) Chamber pressure 5,400 - 7,200 kgs per sq in
(4) Muzzle velocity 276 meters per sec
(5) Cyclic rate of fire 600-725 rpm
(6) Maximum effective range 100 meters
(7) Maximum range 1,500 meters

d. Lubrication: All moving parts require a light coat of oil.

e. Immediate Action: In the event of a misfire, retract or cock the bolt with a sharp, quick pull on the actuator knob. This should ensure ejection of misfired cartridge. Inspect chamber to see that it does not contain an unexpended round.

f. Inspection of the Submachine Gun, Cal. .45:

(1) Check for correct functioning of the safety lock. (When bolt is forward, and cover closed, the safety back on the cover engages in the safety lock recess in the bolt.)

(2) Check trigger pull if it is excessively heavy or light.

(3) Worn or broken firing pin, extractor, or ejector.

(4) Dented or battered magazine.

(5) Inoperative magazine catch and release.

(6) Broken hand loader and cleaning rod stop.

(7) Bent or deformed stock.
(8) Missing oiler cap.

(9) Broken stock catch. (Stock will not remain in open position.)

(10) Check for incorrect assembly. (Pull bolt to rear sharply. It should be engaged and held to the rear by the sear.)

(11) Pull bolt to the rear, close cover, and squeeze the trigger. (Bolt should not move forward.)

(12) Pull bolt to the rear, open cover, and squeeze the trigger. (Bolt should move forward.)

(13) Hold trigger to the rear, pull bolt to the rear, and release it. (Bolt should not be held to the rear by the sear, but should move forward.)

(14) If failure to chamber, check for dirty chamber, obstruction in chamber, and weak driving springs. (Check stability of driving springs and guide rods.)

10. BROWNING MACHINE GUN, CALIBER .30, M1919A6

Figure 11. Browning Machine Gun, Caliber .30, M1919A6

Sung Dai-Liên 30
a. Reference: FM 23-55

b. Characteristics:

(1) Belt-fed

(2) Recoil operated

(3) Air cooled

(4) Fully automatic

c. Data:

(1) Weight, w/bipod and shoulder stock 14.85 kgs

(2) Weight on mount M2 22.05 kgs

(3) Muzzle velocity 841.50 meters per second

(4) Chamber pressure 22,500 kgs per sq in

(5) Maximum effective range 1,097.28 meters

(6) Maximum range 3,200.40 meters

(7) Maximum rate of fire 600-675 rpm

(8) Maximum effective rate of fire 150 rpm

(9) Sustained rate of fire 75 rpm

d. Headspace:

(1) The gun should be fully assembled when making headspace adjustment.

(2) Pull the bolt to the rear about three-quarters of an inch.

(3) Screw the barrel into the barrel extension, using the nose of a cartridge or the combination wrench in the barrel notches, until the recoiling parts
are unable to go fully forward under the pressure of the driving spring when the bolt is released from three-fourths of an inch distance. (The barrel notches will be visible between the trunnion block and the barrel extension.)

(4) Unscrew the barrel from the barrel extension one notch at a time (checking after each notch) until the barrel and barrel extension goes fully forward without being forced.

(5) Unscrew the barrel two additional notches. This compensates for heat expansion of the barrel when the gun is fired. Correct headspace adjustment now exists.

e. **Immediate Action:**

(1) If the gun fails to fire, pull the bolt to the rear and release it, re-lay, and attempt to fire. If the gun still fails to fire, note the position of the bolt handle.

(2) If bolt handle is forward, tap cover, hold left hand on belt at point where cartridges enter feedway, simultaneously pulling bolt to rear twice, and releasing it.

(3) If belt feeds, re-lay and attempt to fire.

(4) If belt does not feed, raise cover, remove first round from belt, close cover, reload, re-lay, and fire.

(5) If gun still fails to fire, check bolt, eliminate cause of stoppage, re-load, re-lay, and fire.

(6) If bolt handle is not forward, pull bolt to rear and release.

(7) If bolt goes forward, re-lay and fire.

(8) If belt does not go forward, raise cover, eliminate cause of stoppage, reload, re-lay, and fire.

(9) If the gun fails to fire after the application of immediate action, it is probable that the stoppage is of an unusual type and requires a detailed inspection for the cause of stoppage.
f. Inspection of the M1919A6 Machine Gun:

(1) Check for loose or bent shoulder stock.

(2) Wing nut at stock loose, missing, or screw threads stripped.

(3) Rear sight loose; windage screw knob, elevation knob, or elevation knob binding; illegible sight graduations.

(4) Cover latch inoperative.

(5) Cover bolt cotter key missing, cover bolt spring broken.

(6) Front sight assembly incomplete, fails to raise or lower, or lock in upright position, adjusting nut binding.

(7) Carrying handle retaining pin loose.

(8) Flash hider loose, retaining clip missing.

(9) Thumb screws damaged, fail to tighten.

(10) Pintle battered, cotter key missing from pintle bolt.

(11) Check receiver. (Before raising cover, pull bolt handle to rear and release it. Forward movement of bolt should be smooth, rapid, and sharp. Raise the trigger and the firing pin should go forward.)

(12) Raise the cover, if this is difficult, check for improperly seated backplate group.

(13) Check cover. (Free moving belt feed lever, undamaged belt feed lever stud belt feed pawl and belt holding pawl should be under spring tension. Cock weapon, lift extractor, and raise trigger. Firing pin should be visible in the T-slot of the bolt. Check ejector to ensure its spring is not broken.)

(14) Check headspace. (Tight headspace exists if notches on rear of barrel can be seen. Headspace is loose if bolt can be pulled to rear independently of barrel and barrel extension.)
11. 40MM GRENADE LAUNCHER, M-79

Figure 12. 40mm Grenade Launcher, M-79.
Sung Phong-Luu M-79

a. Reference:

(1) TC 23-3

(2) TM 9-1010 205-12

b. Characteristics:

(1) Single shot

(2) Break open

(3) Breech loaded

(4) Shoulder fired

c. Data:

(1) Length of launcher 69.29 cm

(2) Length of barrel group 37.36 cm

(3) Length of barrel 35.56 cm
(4) Weight of launcher 2.68 kgs

(5) Chamber pressure 1350 kgs per sq in

(6) Muzzle velocity 76.20 meters per second

(7) Maximum range 375.00 meters

(8) Maximum effective range (area) 350.00 meters

(9) Maximum effective range (point) 150.00 meters

(10) Minimum range (training) 80.00 meters

(11) Minimum range (combat) 31.00 meters

(12) Bursting area 5.00 meters radius HE

d. Ammunition:

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Fuze</th>
</tr>
</thead>
<tbody>
<tr>
<td>381E1</td>
<td>HE</td>
<td>M552 (spin armed in 3 meters-Limited Standard)</td>
</tr>
<tr>
<td>381E1</td>
<td>Practice</td>
<td>M552</td>
</tr>
<tr>
<td>406E1</td>
<td>HE</td>
<td>M551 (spin and set back armed in 14-28 meters-Standard)</td>
</tr>
<tr>
<td>407E2</td>
<td>Practice</td>
<td></td>
</tr>
</tbody>
</table>

12. BROWNING MACHINE GUN, CALIBER .50, M2HB

Figure 13. Browning Machine Gun, Caliber .50, M2, HB Sung Dai-Lien 50
a. **Reference:** FM 23-65

b. **Characteristics:**

(1) Air cooled

(2) Recoil operated

(3) Fully and semi-automatic

(4) Alternate feed (right and left)

(5) Belt fed (metallic link)

(6) Ground and vehicle weapon

(7) Fixed, flexible and turret-type mounts

c. **Data:**

(1) Weight of gun  
57 kgs (approx.)

(2) Weight of receiver group  
25.20 kgs

(3) Weight of barrel  
11.70 kgs

(4) Weight of tripod mount, M3, w/elevating mechanism.  
19.80 kgs

(5) Length overall  
165.10 cm

(6) Length of barrel  
114.30 cm

(7) Muzzle velocity  
893.06 meters per second

(8) Chamber pressure  
23,400 kgs per sq in

(9) Maximum effective range  
1828.80 meters
(11) Maximum rate of fire 500 rpm
(12) Maximum effective rate of fire 100 rpm
(13) Sustained rate of fire 40 rpm

d. Field Expedients:

(1) Headspace adjustment: With the gun fully assembled, and the recoiling parts of the gun retracted until the lug on the barrel locking spring enters the .95 cm hole in the right sideplate, screw the barrel all the way into the barrel extension. Make sure that the barrel extends through the barrel extension. Un-screw the barrel two notches. The gun should now be safe to fire. If the gun operates sluggishly, unscrew the barrel, ONE, BUT ONLY ONE, additional notch.

(2) Timing gauges: When it is impossible to use a regular timing gauge, the following may be used to represent the FIRE and NO FIRE gauges.

(a) Fire gauge:

1. One dime.

2. One dog tag.

(b) No Fire gauge:

1. One nickel and one dime.

2. Four dog tags.

(c) When using these field expedients to check timing, the check is made in the same manner as when using the regular timing gauges.

e. Immediate Action:

(1) If gun fails to fire, wait 5 seconds, pull the bolt to the rear, release it, re-lay, and attempt to fire.

(2) If the gun still fails to fire, check cover latch, ammunition belt, pull
the bolt to the rear, and release it.

(3) If the belt feeds, re-lay and attempt to fire.

(4) If the belt does not feed, raise the cover, remove the first round from the belt; remove the round from the chamber and T-slot if present; reload, re-lay, and attempt to fire.

(5) If the gun still fails to fire, change the defective part, reload, re-lay, and attempt to fire.

(6) If the gun still fails to fire, or the recoiling groups fail to go into battery, check lubrication; recheck or reset heads pace and timing; re-lay and attempt to fire.

f. Inspection Check List:

(1) Barrel. Inspect the bore and chamber for rust. See that they are clean and lightly oiled.

(2) Moving parts. See that they are clean and lightly oiled. Operate the retracting slide handle and bolt latch release several times to see that the parts function without excessive friction.

(3) Headspace and timing. Check with the gages to ensure that heads pace and timing are correct.

(4) Rearsight and windage knob. Ensure that the sight is in good condition, clean, free of grease or dirt, and lightly oiled. Elevation should be reset at 1,000, windage zero, and the sight should be down.

(5) Mount. See that it is clean, lightly oiled, lubricated, and that all clamps are securely tightened. It should function properly and be complete.
13. MORTAR, 60-MM, M-19

Figure 14. Mortar, 60-mm, M-19
Súng Cối 60

a. Reference: FM 23-85

b. Characteristics:

(1) Smooth bore

(2) Muzzle loaded

(3) High angle-of-fire weapon

(4) Drop or lever fire capability

c. Data:

(1) Mortar, complete 20.34 kgs

(2) Mortar, with M1 baseplate 9.23 kgs

(3) Barrel weight 7.20 kgs

(4) Bipod weight 7.38 kgs
(5) Baseplate weight  
5.76 kgs

(6) Baseplate, M1, weight  
2.03 kgs

(7) Overall length  
81.92 cm

(8) Elevation w/M5 mount  
w/M1 baseplate  
40 to 85 degrees  
0 to 85 degrees

(9) Traverse, right or left  
125 mils

(10) One turn of handwheel  
15 mils

(11) One turn of elevating crank  
1/2 degree

(12) Maximum rate of fire  
30 rpm

(13) Sustained rate of fire  
18 rpm

(14) Bursting area  
10.05 meter radius  
(HE & WP)

(NOTE: Firing for more than 1 minute at the maximum rate of fire will cause gas leakage around the base cap.)

d. Ammunition:

(1) HE, M49A2  
1828.80 meters

(2) Smoke, M302  
1508.76 meters

(3) Practice, M50A2  
1828.80 meters

(4) Training, M69  
228.60 meters

e. Inspection of the 60-mm Mortar: When inspecting the 60-mm mortar, observe the following points:

(1) Barrel. Check general appearance and cleanliness of the bore.
(2) Firing mechanism. Examine for fouling, rust, or foreign substance on any of the parts. Trip the firing lever so that the striker moves forward and strikes the base of the firing pin when the selector is on LEVER FIRE. The firing pin should protrude 51 cm. beyond the surface of the firing pin bushing when the firing selector is on DROP FIRE.

(3) Bipod. Check general appearance and see that all moving parts are lubricated.

(a) Elevating mechanism. Elevate and depress the mortar to see that the mechanism operates without binding, excess play, or undue looseness.

(b) Traversing mechanism. Traverse the mortar to see that the mechanism operates smoothly without binding or undue looseness.

(c) Cross-leveling mechanism. Operate the mechanism to see that it functions correctly without excess play. Check the index marks (for centering the bubble) to see that they are distinct.

(4) Base plate. Check general appearance. Examine the locking lever to ensure that it operates easily and locks the spherical projection securely to the base plate.

(5) Sight and its mounting. Check to see if the operating condition of the sight or rigidity of its mounting has been impaired.

f. Safety Checks:

(1) Before firing:

(a) No. 1 sees that:

1. There is mask and overhead clearance.

2. The mortar is locked to the base plate.

3. The mortar clamp bolt is secure.

4. The locking nut is tight.
5. The legs are fully spread, and locked in that position by the spring latch.

(b) No. 2 sees that:

1. The bore is clean.

2. Each shell is clean—particularly the bourrelet.

3. The safety pin and striker spring of each shell are present.

(2) During firing:

(a) No. 1:

1. From time to time checks the clamp bolt and locking nut to see that they are tight.

2. Checks frequently to see that the base plate and bipod positions are safe for firing.

(b) No. 2: Swabs the bore after every fire for effect or after every 10 rounds.

14. MORTAR, 81-MM, M29

Figure 15. Mortar 81-mm, M29
Súng Cối 81
a. Reference: FM 23-90

b. Characteristics:

(1) Smooth bore

(2) Muzzle loaded

(3) High angle-of-fire weapon

(4) Drop fire

c. Data:

(1) Weight complete 42.08 kgs

(2) Barrel 12.60 kgs

(3) Bipod 18 kgs

(4) Base plate 11.48 kgs

(5) Overall length of mortar 129.54 cm

(6) Elevation (approximate) 700-1500 mils

(7) Elevation for one turn of handwheel 10 mils

(8) Total turns of handwheel for full traverse (approximate) 19 turns

(9) Traverse - right or left of center (approximate) 95 mils

(10) One turn of handwheel, traverse (approximate) 7 mils

(11) Maximum rate of fire 24 rpm

(12) Sustained rate of fire 3 rpm
(13) Maximum range 3657.60 meters

(14) Bursting area 27.43 x 18.29 meters

(NOTE: Firing of mortar for more than 1 minute at the maximum rate of fire causes a gas leakage at the base of the barrel.)

d. Ammunition:

(1) HE (VT, Sq, Sq/D 3657.60 meters

(2) WP (Sq, VT, Sq/D) 3657.60 meters

(3) TP (Sq) 3017.52 meters

(4) Training shell (inert) 274.32 meters

e. Inspection of the 81-mm Mortar: When inspecting the 81-mm mortar, observe the following points:

(1) Barrel. Check the general appearance and cleanliness of the bore and the threaded exterior. Ensure that the barrel is not dented.

(2) Firing pin. Examine for fouling, corrosion, foreign substances, and broken or burried point. Ensure that the firing pin is properly seated.

(3) Bipod. Check the general appearance and see that all moving parts are properly lubricated. Elevate and depress the mortar. The elevating mechanism should operate smoothly without binding or undue looseness. Operate the cross-leveling mechanism to see that it functions properly without excess play, that the level vial is clear, and that the index marks for centering the bubble are distinct.

(4) Base Plate. Check the general appearance of the base plate. Rotate the socket cap to see that it functions without binding.

(5) Sight and Mounting. Check to see that the sight is in operating condition and that the dovetailed base of the sight bracket is inserted and locked into the dovetailed slot of the mortar yoke.
f. Safety Checks:

(1) Before firing:

(a) No. 1 makes certain that:

1. There is mask and overhead clearance.

2. Barrel is locked to the base plate and the open end of the socket cap is pointing in the direction of fire.

3. Shock absorber clevis lock pin is secure.

4. Locking nut is secure.

5. Chain is taut and is hooked to the left leg.

(b) No. 2 sees that the bore is clean.

(c) No. 3 checks to see that:

1. Each cartridge is clean.

2. Fuse safety pin of each cartridge is present and in place, if applicable.

3. Increments are present and in proper condition.

4. Ignition cartridge is present and in proper condition.

(2) During firing:

(a) No. 1 checks frequently to see that:

1. Shock absorber clevis lock pin is secure and the locking nut is tight.

2. Open end of the socket cap is pointed in the direction of fire.

(b) No. 2 swabs the bore after every 10 rounds or after each fire for effect.
15. **MORTAR, 4.2 INCH, M30**

![Figure 16. Mortar, 4.2-Inch, M30](image)

**Sung Coi 4.2**

a. **Technical Data Characteristics:**

1. **Maximum range**
   - 5486.40 meters

2. **Muzzle velocity**
   - 877.82 meters

3. **Type of ammunition**
   - HE, ILL and CHEM
   - Semi fix complete Rd

4. **Rate of fire (prolonged fire)**
   - 20 per min

5. **Type of recoil**
   - Spring

6. **Elevation limits**
   - 706 - 1156 mils

7. **Traversing limits**
   - 125 R; 125 L;
   - 250 Total

8. **Total weight**
   - 287.78 kgs
(9) Prime mover

1/4 or 3/4-ton, w/trl

(10) Section crew

7 men

(11) Air transportability

Air drop

b. Check List for Maintenance:

(1) Tube must be free of oil and foreign matter before firing.

(2) Check the tube for cleanliness.

(3) Check all fire controls before firing.

(4) Check bearing surface for rust and burrs.

(5) Check all ammunition and propellants.

(6) Check for tightness of screws.

(NOTE: Elevation 900 is most used.)

16. ROCKET LAUNCHER, 3.5 - INCH, M20A1B1

![Rocket Launcher, 3.5-Inch, M20A1B1](image)

Figure 17. Rocket Launcher, 3.5-Inch, M20A1B1

Ba-Dô-Ca

a. Reference: FM 23-32

b. Characteristics:

(1) Air cooled

(2) Smooth bore

(3) Open tube (2 pieces)
(4) Recoilless

(5) Shoulder weapon

(6) Electrical type firing mechanism

b. Data:

(1) Weight (approx) 5.85 kgs.
(2) Type of operation Rocket propelled
(3) Maximum range (approx) 822.96 meters
(4) Maximum effective range Moving-182.88 meters
Stationary-274.32 meters
(5) Bore sight 1371.60 meters
(6) Armor penetration (approx) 27.94 cm
(7) Maximum rate of fire 12-18 rpm
(8) Sustained rate of fire 4 rpm
(9) Bursting area (approx) 9.14 by 18.29 meters (heat)

d. Ammunition:

(1) Type used Heat, TP and WP
(2) Weight of rocket 4.05 kgs

e. Safety Precautions:

(1) All loading and unloading is done on the firing line with the launcher on the gunner's shoulder. The muzzle is pointed down-range, not toward the ground.
(2) Face protection: For temperatures below 70 degrees F, the field protective mask must be used. For temperatures above 70 degrees F, the anti-flash mask must be worn.

(3) The weapon being of the recoilless principle has a danger zone to the rear. It is triangular in shape and consists of three zones. Before firing a rocket, clear the area to the rear of the launcher of personnel, material, and dry vegetation as indicated in zones A and B.

(4) Clear zone A, the blast area, of all personnel, ammunition, material, and inflammables such as dry vegetation. The danger in this zone is from the blast of flame to the rear. Clear zone B of personnel and material unless protected by adequate shelter. The principle danger in zone B is from the rearward flight of nozzle closure or igniter wires. An additional safety factor for training is contained in zone C.

f. Disassembly: No parts will be disassembled by the troops in the field.

g. Inspection of the 3.5-Inch Rocket Launcher:

(1) Dented or cracked barrel or scored interior.

(2) Loose barrel coupling.

(3) Loose or binding sight hinge.

(4) Bent indicator arm; weak indicator arms spring; marred elevation plate.

(5) Scratched or broken lens.
(6) Contactor latch group inoperative.

(7) Safety fails to function.

(8) Trigger has no spring action.

(9) Check electrical circuits condition. (Check for paint covered or corroded electrical contacts, loose connections, broken wires, damaged insulation, and broken or damaged pistol grips.)

(10) Check contactor latch group. (Move control handle to load position; right and left stops should protrude into bore, trip lever up. Move control handle to fire position; stops should come up out of bore, trip lever should rotate downward into rear of bore.)

(11) Check for bent shoulder stock.

(12) Check for loose or damaged trigger guard.

(13) Check for frayed carrying strap and poor condition of painting surfaces.

17. RIFLE, RECOILLESS, 57-MM, M18A1

Figure 18. Rifle, Recoilless, 57-mm, M18A1

Súng Khổng Giàng

a. Reference: FM 23-80
b. **Characteristics:**

1. Air cooled
2. Recoilless
3. Shoulder or mounted weapon
4. Single-loaded
5. Fires fixed ammunition

c. **Data:**

1. Rifle with integral mount
2. Rifle with machine gun tripod
3. Length of rifle
4. Type of breech
5. Firing mechanism
6. Muzzle velocity
7. Maximum range
8. Maximum effective range
9. Bursting area

<table>
<thead>
<tr>
<th>Type used</th>
<th>Weight of round</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE, HEAT, WP and AP</td>
<td>2.52 kgs</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Detailed Characteristics</th>
<th>Measurement</th>
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<tr>
<td>Type used</td>
<td>HE, HEAT, WP and AP</td>
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<tr>
<td>Weight of round</td>
<td>2.52 kgs</td>
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<tr>
<td>Length of rifle</td>
<td>156.46 cm</td>
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<tr>
<td>Type of breech</td>
<td>Percussion type</td>
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<tr>
<td>Muzzle velocity</td>
<td>365.76 m/s</td>
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<tr>
<td>Maximum range</td>
<td>4389.12 m</td>
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<tr>
<td>Maximum effective range</td>
<td>1737.36 m</td>
</tr>
<tr>
<td>Bursting area</td>
<td>9.14 x 31.09 m</td>
</tr>
<tr>
<td></td>
<td>15.54 m</td>
</tr>
</tbody>
</table>
e. Immediate Action:

(1) The gunner calls "MISFIRE."

(2) The assistant gunner waits 60 seconds and then recocks.

(3) The gunner re-lays and attempts to fire.

(4) If the weapon still fails to fire, the gunner calls "MISFIRE." The assistant gunner waits 60 seconds, then opens the breech and checks the primer of the round.

(5) If the primer is dented, another round is loaded. If the primer is not dented, the assistant gunner checks firing mechanism.

(NOTE: CAUTION 1. All troops should be clear of the breech end of the weapon. If the weapon is hot, and in the opinion of the safety officer, the possibility of a "cook-off" exists, the weapon will be abandoned and personnel moved a safe distance. After 1 hour the weapon may be unloaded.)

1. Safety: The danger zone from back blast is triangular in shape. It extends approximately 50 feet to the rear of the point of emplacement and at its widest point covers a space of 18.29 meters on either side of the axis of the emplaced rifle. Do not face the weapon within 91.44 meters of the rear of its breech because of the danger of flying particles thrown up by the blast action. The following danger zone will be for all training:
For COMBAT ONLY the following may be used:

Area 1 - probably lethal
Area 2 - severe wounding
Area 3 - moderate wounding
Area 4 - slight wounding

g. Inspection Check List:

(1) Make sure that the hammer notch on the sear is facing the hammer.

(2) Inspect the breechblock cover screws before firing and frequently during firing to see that they are tight at all times.

(3) Make sure the qualifying marks on the bracket section of the trigger handle body are aligned with the qualifying marks on the tube.

18. HOWITZER, 155-mm

Figure 19. Howitzer, 155-mm, M114 or M114A1

Da: Bac 155
a. **Technical Data and Characteristics:**

(1) **Maximum range** 14,955 meters

(2) **Muzzle velocity** 16.91 meters per second *(w/ch 7)*

(3) **Type of ammunition** HE, ILL and Chem Separate loading

(4) **Rate of fire** Rapid fire: 3 rds per min; Prolonged fire: 1 rd per min

(5) **Type of recoil** Hydropneumatic

(6) **Maximum lengths of recoil**
   - 132.40 cm low angle
   - 104.14 cm high angle

(7) **Elevation limits** 0 to 1156 mils

(8) **Traversing limits** 418L; 448R; 866 mils total

(9) **Total weight** 5,715 kgs

(10) **Prime mover** 4 or 5-ton truck or M5 tractor

(11) **Section crew** 11 men

(12) **Air transportability** Air landed

b. **Check List for Maintenance. Check:**

(1) The replenisher, oil reserve before firing and once after each 10 rounds.

(2) For lubrication by lubrication order.
(3) Bearing surface for rust, scores, or burrs.

(4) Breech block for rust and cleanliness.

(5) Primer vent for cleanliness.

(6) All fire control before firing.

(7) All ammunition and powder before firing.

(8) Recoil and recoil maintenances. (Note: See TM 9-331A.)

(9) Air brake hose coupling.

19. HOWITZER, 105-mm M101

![Figure 20. Howitzer, 105-mm, M101](image)

Dai-Bac 105

a. Technical Data and Characteristics:

(1) Maximum range 11,270 meters

(2) Muzzle velocity 472.40 meters per second (w/charge 7)
(3) Type of ammunition

HE, HE, Chemical, Heat, blank, semi-fixed

(4) Rate of fire

Rapid - 4-8 per min
Prolonged - 100 rds per hr

(5) Type of recoil

Hydropneumatic

(6) Length of recoil

99.06 to 106.68 cm

(7) Elevation limits

-39 to ± 1156 mils

(8) Traversing limits

400 L; 409 R; Total mils

(9) Prime movers

3/4-ton truck, 2 1/2-ton truck, or M-4 tractor

(10) Section crew

9 men

b. Maintenance Check List:

(1) Bore and chamber: Check for rust, cracks, or powder fouling.

(2) Recoil mechanism: Proper amount of oil, proper setting of respirator, or excessive oil leakage.

(3) Bearing surface: Check for rust, burrs, dirt, and proper lubrication.

(4) Brake: Check brake ratchet for proper adjustment; clean and free of rust and dirt.

(5) Sighting equipment: Check sight mounts for looseness and proper adjustment. Check lens for dust, moisture, etc.

(6) Lubrication: See LO 9-325.
(7) Tires: Check for proper air pressure; check for cuts and other damage.

(8) Trails: Check locking latch and trail pin; check that drawbar is secure.

20. ANTIPERSONNEL MINE (CLAYMORE) M18A1
a. General

(1) Description: The claymore mine is a one-shot, directional-fragmentation weapon that is designed primarily for use in the defensive role against mass infantry attacks.

(2) Detailed description: The Claymore, M18A1, consists of a plastic body, a fixed plastic slit-type sight, four adjustable legs and two detonator wells. The front portion of the plastic case is a fragmentation face containing steel fragments. The back portion of the case contains a layer of explosive (1.5 pounds of composition C4).

b. Accessories. The Claymore, M18A1, and all accessories are carried in the M7 bandolier. The accessories include:

(1) Instruction sheet: Sketches and printed matter on this sheet show some of the techniques of employment of the mine.

(2) Detonator: One M6 electric blasting cap which is attached to 100 feet of firing wire.

(3) Firing device: The firing device, M57, is a handheld pulse generator which by a single actuation of the handle produces a double (one positive and one negative) electrical pulse (3 volts).

c. Effects of the Mine.

(1) Casualty effects: When detonated, the Claymore, M18A1, delivers highly effective fragments in a fan-shaped beaten zone 2 meters high and 50 meters wide at a range of 50 meters. This makes 50 meters the optimum effective range of the weapon. The fragments are moderately effective up to a range of 100 meters and can travel up to 250 meters forward of the weapon.

(2) Danger from backblast: The minimum safe firing distance from the weapon is 15 meters provided all secondary hazards such as pebbles are removed. From 16 to 100 meters, the operator should be in a foxhole or lie prone (preferably in a depression or behind protection regardless of how the weapon is employed).
d. Installation of the Claymore.

(1) The claymore may be installed as a controlled or as an uncontrolled weapon. The claymore may be mounted on a tree, a building or any similar object; however, it must be considered that damage to these objects will result from the backblast of the mine after it has been fired.

(2) To install the claymore as a controlled weapon.

(a) The legs are unfolded to about a 45 degree angle and pressed halfway into the ground, making sure that the convex surface marked "Front Toward Enemy" and the arrows on top of the case are pointing in the direction of the intended target area.

(b) Aim the mine at an aiming point approximately 2 1/2 meters above the ground at a range of approximately 50 meters. This aiming point should be the center of the desired area of coverage.

(c) Aim through the slit sight at the aiming stake. The bottom edge of the sight should be parallel to the ground to be covered with fragment spray.

(d) Prior to inserting the blasting cap into the detonator well, secure the firing wire to a stake driven into the ground near the mine. This will minimize accidental disturbance while laying out the firing wire. The wire should be buried to protect it and to prevent detection.

(e) Time permitting, conduct a circuit test. After testing, connect the blasting cap assembly to the firing device. The mine is now armed.

(3) When claymores are employed as uncontrolled weapons, they are treated as mines or booby traps. Their locations are marked, reported, and recorded in accordance with the procedures set forth in FM 20-32.

e. Disarming. To disarm the Claymore, M18A1, reverse the procedures described in paragraph d.

NOTE: Ensure that the man installing or disarming the claymore keeps the firing device on his person at all times and does not connect it to the firing wire until actually ready to fire the mine. This ensures that a second individual does not accidentally fire the mine while the first individual is installing or disarming it, and also lessens the possibility of the mine being detonated by electrical storms.
CHAPTER 3
AIR OPERATIONS

21. GENERAL CONCEPTS

a. The information presented herein applies to the aerial delivery of certain counterinsurgency forces and cargo into the operational territory.

b. Much of the criteria for size of landing zones, glide paths, etc., are extracted from Air Force publications. They can be reduced considerably if the type of aircraft and its performance characteristics, are known. The size of the field is included in the landing zone report.

22. DROP ZONES

a. General. The selection of a DZ must satisfy the requirements of both the aircrew and the reception committee. The aircrew must be able to locate and identify the DZ. The reception committee selects a site that is accessible, reasonably secure, and permits safe delivery of incoming personnel and supplies.

b. Air considerations.

(1) Desirable terrain features.

(a) The general area surrounding the site must be relatively free from obstacles which may interfere with safe flight.

(b) Flat or rolling terrain is desirable; however, in mountainous or hilly country, sites selected at higher elevations such as level plateaus can be used.

(c) Small valley or pockets completely surrounded by hills are difficult to locate and normally should not be used.

(d) In order to afford the air support unit flexibility in selecting the IP, it is desirable that the aircraft be able to approach the target site from any direction.

(e) There should be an open approach quadrant of at least 90° to allow the aircrew a choice when determining their approach track from the IP.
Figure 22. Level turning radius required for one approach DZ’s and LZ’s (medium aircraft).
(f) DZ's having a single, clear line of approach are acceptable for medium aircraft if there is a level turning radius of 5 kilometers on each side of the site (1.5 kilometers for light aircraft) (figure 22).

(g) Rising ground or hills of more than 1,000 feet elevation above the surface of the site should normally be at least 16 kilometers from DZ for night operations. In exceptionally mountainous areas deviations from this requirement may be made. Any deviation will be noted in the DZ report.

(h) Deviations from the aforementioned minimum distances cause the aircraft to fly at higher than desirable altitudes when executing the drop.

(2) Weather in drop areas. The prevailing weather conditions in the area must be considered. Ground fogs, mists, haze, smoke, and low-hanging cloud conditions may interfere with visual signals and DZ markings. Excessive winds also hinder operations.

(3) Obstacles. Due to the low altitude at which operational drops are conducted, consideration must be given to navigational obstacles in excess of 300 feet above the level of the DZ and within a radius of 8 kilometers. If such obstacles exist and are not shown on the issued maps, they must be reported.

(4) Enemy air defense. Drop sites should be located to avoid having the aircraft fly over or near enemy air installations when making the final approach to the DZ.

c. Ground Considerations.

(1) Shape and size.

(a) The most desirable shape for a DZ is square or round. This permits a wider choice of aircraft approach directions than is normally the case with rectangular-shaped sites.

(b) The required length of a DZ depends primarily on the number of units to be dropped and the length of their dispersion pattern.

1. Dispersion occurs when two or more personnel or containers are released consecutively from an aircraft in flight. The long axis of the landing pattern is usually parallel to the direction of flight (figure 23).
Figure 3. Computation of dispersion.
2. Dispersion is computed using the rule-of-thumb formula: \( \frac{1}{2} \) speed of aircraft (MPH) \( \times \) exit time (seconds) = dispersion (yards). Exit time is the elapsed time between the exits of the first and last items.

3. The length of the dispersion pattern represents the absolute minimum length required for DZ's. If personnel are to be dropped, a safety factor of at least 100 meters is added to each end of the DZ site.

(c) The width of rectangular-shaped DZ's should allow for minor errors in computation of wind drift.

(d) The use of DZ's measuring less than 300 x 300 meters should be avoided.

(2) Surface.

(a) The surface of the DZ should be reasonably level and free from obstructions such as rocks, trees, fences, etc. Tundra and pastures are types of terrain which are ideal for both personnel and cargo reception.

(b) Personnel DZ's located at comparatively high elevations (6,000 feet or higher) should, where possible, use soft snow or grasslands, due to the increased rate of parachute descent.

(c) Swamps and low marshy ground, normally less desirable in the summer, and paddy fields when dry often make good drop zones.

(d) Personnel and cargo can be received on water DZ's.

1. Minimum depths for reception of personnel is 1.5 meters and arrangements must be made for rapid pickup.

2. The surface of the water must be clear of floating debris or moored craft, and there should be no protruding boulders, ledges, or pilings.

3. The water must also be clear of underwater obstructions to a depth of 1.5 meters.

4. Water reception points should not be near shallows or where currents are swift.
5. Minimum safe water temperature is $\neq 50^\circ F$ ($\neq 10^\circ C$).

(e) Supply drop zones may, in general, use any of the following surfaces:

1. Surfaces containing gravel or small stones no larger than a man's fist.

2. Agricultural ground, although in the interest of security, it is inadvisable to use cultivated fields.

3. Sites containing brush or even tall trees; however, marking of the DZ and the recovery of containers is more difficult.

4. Marsh, swamp, or water sites, provided the depth of water or growth of vegetation will not result in loss of containers.

3) Ground security. The basic considerations for ground security are that the DZ be:

(a) Located to permit maximum freedom from enemy interference.

(b) Accessible to the reception committee by concealed approach and withdrawal routes.

(c) Adjacent to areas suitable for the caching of supplies and disposition of aerial delivery equipment.

23. REPORTING DROP ZONES

a. Drop Zone Data. The minimum drop zone data which is reported includes:

(1) Code name. Extracted from the SOI; also, indicate if primary or alternate DZ.

(2) Location. Complete military grid coordinates of the center of the DZ.

(3) Open quadrant. Measured from center of DZ, reported as a series of magnetic azimuths. The open quadrant indicates acceptable aircraft approaches (figure 22).
(4) Track. Magnetic azimuth of required or recommended aircraft approach (figure 24).

(5) Obstacles. Those that are over 300 feet in elevation above the level of the DZ, within a radius of 8 kilometers and which are not shown on the issued maps. Obstacles are reported by description, magnetic azimuth, and distance from the center of the DZ (figure 25).

(6) Reference point. A landmark shown on the issued maps, reported by name, magnetic azimuth and distance from the center of the DZ (figure 25). Used with (2) above in plotting the DZ location.

(7) Date/time drop requested.

(8) Supplies requested. Extracted from the catalog supply system.

b. Additional Items. In special situations, additional items may be required, e.g., additional reference points, navigational check points in the vicinity of the DZ, special recognition and authentication means. Subparagraphs (7) and (8) above are included only when requesting a resupply mission in conjunction with the reporting of the DZ.

c. Azimuths. Azimuths are reported as magnetic and in three digits. With the exception of the aircraft track, all azimuths are measured from the center of the DZ. Appropriate abbreviations are used.

d. Initial Points (IP's). It is desirable to reconcile the requested aircraft track with an identifiable landmark that may be used by the aircrew as an IP. The IP, located 8-24 kilometers from the DZ, is the final navigational checkpoint before reaching the target. Upon reaching the IP, the pilot turns to a predetermined magnetic heading that takes him over the DZ within a certain number of minutes (figure 26). The following features constitute suitable IP's:

(1) Coastlines. A coastline with breaking surf is easily distinguished at night. Mouths of rivers over 46 meters wide, sharp uprisings, or inlets are excellent guides for both day and night.

(2) Rivers and canals. Wooded banks reduce reflections, but rivers more than 27 meters wide are visible from the air. Canals are easily recognizable from their straight banks and uniform width. Small streams are not discernible at night.
Figure 24. Computation of open quadrant and desired heading.
Figure 25. Reporting of obstacles and reference point.
Figure 26. Relationship between IP and requested track.
(3) Lakes. Lakes at least 1 kilometer square give good light reflection.

(4) Forest and woodlands. Forested areas at least 1 kilometer square with clearly defined boundaries of unmistakable shape.

(5) Major roads and highways. Straight stretches of main roads with one or more intersections. For night recognition, dark surfaced roads are not desirable as IP’s, although when the roads are wet, reflection from moonlight is visible.

24. MARKING DROP ZONES

a. Purpose. The purpose of DZ markings is to identify the site for the aircrew and to indicate the point over which the personnel or cargo should be released (release point). The procedures for marking DZ’s are determined before infiltration and are included in the SOI.

b. Equipment.

(1) DZ’s may be marked at night by using lights. A few of the possible lighting devices are flashlights; flares; and small wood, oil, or gas fires.

(2) For daylight operations the issued Panel Marking Set, AP-50 or VS-16 is satisfactory for use. If issued panels are not available, sheets, strips of colored cloth, or other substitutes may be used as long as there is a sharp contrast with the background. Smoke signals, either smoke grenade or simple smudge fires, greatly assist the aircrew in sighting the DZ markings on the approach run.

(3) The use of electronic homing devices permits reception operations to be conducted during conditions of low visibility. Such devices normally are used in conjunction with visual marking systems.

c. Computation of Release Point. The release point must be determined to ensure delivery of personnel or cargo within the usable limits of the DZ. Computation of the release point involves the following factors (figure 27):

(1) Personnel and low-velocity cargo drops.

(a) Dispersion. Dispersion is the length of the pattern formed by the exit of the parachutists or cargo containers (figure 23). The desired point of impact for the first parachutist/container depends upon the calculated dispersion.
DISTANCE FROM RELEASE POINT TO END OF FORWARD THROW — 100M.
DISTANCE FROM END OF FORWARD THROW TO FIRST BUNDLE IMPACT POINT —
COMPUTED WIND DRIFT.

Figure 27. Computation of release point.
(b) Wind drift. This is the horizontal distance traveled from the point of exit to the point of landing as a result of wind conditions. The release point is located an appropriate distance upwind from the desired impact point. To determine the amount of drift, use the following formulas:

1. For personnel using the T-10 parachute: Drift (yards) = altitude (hundreds of feet) \times wind velocity (MPH) \times 4.5 (constant factor).

2. For all other low velocity parachute drops: Same as 1 above; however, substitute a constant factor of 2.8 for 4.5.

NOTE: Where no mechanical wind velocity indicator is available, the approximate velocity can be determined by dropping bits of paper, leaves, dry grass, or dust from the shoulder and pointing to the dry place where they land. The estimated angle in degrees formed by the arm with the body, divided by 4, equals wind velocity.

(c) Forward throw. This is the horizontal distance traveled by the parachutist or cargo container between the point of exit and the opening of the parachute. This factor, combined with reaction time of personnel in the aircraft, is compensated for by moving the release point an additional 100 meters in the direction of the aircraft approach (figure 28).

(2) High-velocity and free-drops. Due to their rapid rate of descent, high-velocity and free-drop loads are not materially affected by wind conditions. Otherwise, the factors of dispersion and forward throw are generally similar to those for personnel and low-velocity drops and are compensated for in the same manner.

d. Methods of Release Point Marking. There are two methods for marking the DZ release point. The principal difference between the two is the method of providing identification. The marking systems described below are designed primarily for operational drops executed at an altitude of 800 feet. Training jumps are conducted at an altitude of 1,250 feet and require the use of a flank panel or light placed 200 meters to the left of the release point markings. The configuration of present cargo and troop-carrying aircraft prevents the pilot from seeing the markings after approaching within approximately 1.5 kilometers of the DZ while flying at 1,250 feet above the DZ. From this point on, the pilot must depend on flying the proper track in order to pass over the release point. The flank marker serves to indicate when the aircraft is over the release point and the exact
moment the drop should be executed. Operational drops executed at 800 feet altitude do not require the flank panel because the pilot does not lose sight of the markings as he approaches the DZ.

e. Placement of Markings.

(1) Markings must be clearly visible to the pilot of the approaching aircraft. As a guide, markings must have a clearance of at least 460 meters from a 100-foot obstacle (figure 29).

(2) Additionally, precautions must be taken to ensure that the markings can be seen only from the direction of the aircraft approach. Flashlights may be equipped with simple hoods or shields and aimed toward the flight path. Fires or improvised flares are screened on three sides or placed in pits with sides sloping toward the direction of aircraft approach.

(3) When panels are used for daylight markings of DZ's, they are positioned at an angle of approximately 45° from the horizontal to present the maximum surface toward the approaching aircraft.

25. RECEPTION COMMITTEES

a. General. A reception committee is formed to control the drop zone or landing area. The reception committee can be anyone who is capable of performing the following duties. A permanent committee for each unit provides the best results, eliminating the need to cross-train everyone to be capable of this mission; however, training in depth should be accomplished to ensure that losses of key personnel will not adversely affect the operation of the group as a whole.

b. The duties and functions of a reception committee are to:

(1) Provide security for the reception operation.

(2) Emplace DZ markings and air/ground identification equipment.

(3) Maintain surveillance of the site before and after the reception operation.

(4) Recover incoming personnel and cargo (FM 31-20).

(5) Provide for dispatch of personnel or cargo in evacuation operations.
Figure 28. Methods of release point marking.
Figure 29. Placement of DZ Markings.
(6) Provide for sterilization of the site only when secrecy is possible and desirable.

c. Composition. The reception committee is normally organized into five parties. The composition and functions of the five parties are as follows:

(1) Command party.

(a) Controls and coordinates the actions of all reception committee components.

(b) Includes the reception committee leader (RCL) and communications personnel, consisting of messengers and radio operators.

(c) Provides medical support, to include litter bearers, during personnel drops.

(2) Marking party.

(a) Operates the reception site marking system, using one man for each marker.

(b) The marking party must be well rehearsed. Improperly placed or improperly operated markings may result in aborting the mission.

(3) Security party.

(a) Ensures that unfriendly elements do not interfere with the operation.

(b) Consists normally of inner and outer security elements.

1. The inner security element is positioned in the immediate vicinity of the site and is prepared to fight delaying or holding actions.

2. The outer security element consists of outposts established along approaches to the area. They may prepare ambushes and road blocks to prevent enemy movement toward the site.

(c) Provides march security for moves between the reception site and the destination of the cargo.

(4) Recovery party.
(a) Recovers cargo and aerial delivery equipment from the DZ. Unloads aircraft or landing craft.

(b) For aerial-delivery operations the recovery party should consist of at least one man for each parachutist or cargo container. For such operations, the recovery party is usually dispersed along the length of the anticipated impact area. The members spot each parachute as it descends and move to the landing point. They then recover all parachute equipment and cargo, moving to a pre-determined assembly area with the infiltrated personnel or equipment.

(c) The recovery party is normally responsible for sterilizing the reception site to ensure that all traces of the operation are removed when secrecy is possible and desired.

(5) Transport party.

(a) Moves items received to distribution points or caches.

(b) May consist of part, or all, of the members comprising the command, marking, and recovery parties.

(c) Uses available means of transportation such as pack animals and wagons.

26. LANDING ZONES (LAND)

a. General. The same general considerations applicable to DZ selections apply to the selection of LZ's, however, sitesize, approach features, and security are far more important.

b. Selection Criteria.

(1) Desirable terrain features;

(a) LZ's should be located in flat or rolling terrain.

(b) Level plateaus of sufficient size can be used. Due to decreased air density, landings at higher elevations require increased minimum LZ dimensions. If the LZ is located in terrain above 4,000 feet or areas with a very high temperature the minimum lengths should be increased as follows:

i. Add 10 percent to minimums for safety areas.
2. Add 10 percent to minimum for the altitude for temperatures over 90°F. Add 20 percent for temperatures over 100°F. (38°C.)

(c) Pockets or small valleys completely surrounded by hills are usually unsuitable for landing operations by fixed-wing aircraft.

(d) Although undesirable, sites with only a single approach can be used. It is mandatory when using such sites that:

1. All takeoffs and landings are made upwind.

2. There is sufficient clearance at either end of the LZ to permit a level 180° turn to either side within a radius of 5 kilometers for medium aircraft and 1.6 kilometers for light aircraft.

2) Weather. Prevailing weather in the landing area should be favorable. In particular, wind direction and velocity, and conditions restricting visibility, such as ground fog, haze, or low-hanging cloud formation, must be determined.

3) Size. The required size of LZ's varies according to the type of aircraft used. Safe operations require the following minimum dimensions (figures 30 and 31).

(a) Medium aircraft. 920 meters in length and 30 meters in width (45 meters at night).

(b) Light aircraft. 305 meters in length and 15 meters in width (45 meters at night).

(c) In addition to the basic runway dimensions, and to provide a safety factor, these extra clearances are required.

1. A cleared surface capable of supporting the aircraft, extending from each end of the runway, and equal to 10 percent of the runway length.

2. A 15-meter strip extending along both sides of the runway and cleared to within 1 meter of the ground.

4) Surface.

(a) The surface of the LZ must be level and free of obstructions such
Figure 30. Landing zone (land) medium aircraft (night operations)
Figure 31. Landing zone (land) light aircraft (night operations).
as ditches, deep ruts, logs, fences, hedges, low shrubbery, rocks larger than a
man’s fist or grass over .45 meters in height.

(b) The subsoil must be firm to a depth of .6 meters.

(c) A surface containing gravel and small stones or thin layers of loose
sand over a firm layer of subsoil is acceptable. Plowed fields or fields containing
crops over .45 meters in height should not be used.

(d) The surface gradient of the LZ should not exceed 2 percent.

(5) Approach and takeoff clearance. The approach and takeoff clearances
are based on the glide-climb characteristics of the aircraft. For medium aircraft
the glide-climb ratio is 1 to 40; that is, 1 foot of gain or loss of altitude for every
40 feet of horizontal distance traveled. The ratio for light aircraft is 1 to 20. As
a further precaution, any obstructions in approach and departure lanes must
conform to the following specifications (figure 32).

(a) An obstruction higher than 2 meters is not permissable at or near
either end of the LZ.

(b) A 50-foot obstruction may not be nearer than 610 meters for medium
aircraft, or 305 meters for light aircraft.

(c) A 500-foot obstruction may not be nearer than 617 kilometers for
medium aircraft or 3,22 kilometers for light aircraft.

(d) Hills of 1,000 feet or more altitude above LZ may not be nearer than
13 kilometers from the landing zone for medium aircraft.

(e) The heights of the obstacles are computed from the level of the
landing strip. Where land falls away from the LZ, objects of considerable height
may be ignored provided they do not cut the line of ascent or descent. This condi-
tion exists more often in mountainous terrain where plateaus are selected for LZ’s.
Figure 32. Takeoff and Approach clearances (fixed wing aircraft).
c. Markings.

(1) For night operations, lights are used for marking LZ’s; during daylight, panels are used. When flashlights are used, they should be hand-held for directional control and guidance.

(2) The pattern outlining the limits of the runway consists of five or seven marking stations (figures 30 and 31). Stations “A” and “B” mark the downwind end of the LZ and are positioned to provide for the safety factors previously mentioned. These stations represent the initial point at which the aircraft should touch the ground. Station “C” indicates the very last point at which the aircraft can touch down and complete a safe landing.

(3) A signal station manned by the RCL (a member of the operational detachment) is incorporated into light station “B” at the approach on downwind end of the LZ (figures 30 and 31). For night operations, the signal light operations, a distinctive panel, or colored smoke located approximately 15 meters to the left of station “B” (RCL) is used for recognition.

d. Conduct of Operations.

(1) The LZ markings are normally displayed 2 minutes before the arrival time indicated in the mission confirmation message. The markings remain displayed for a period of 4 minutes or until the aircraft completes landing roll after touchdown.

(2) Identification is accomplished by the:

(a) Aircraft arriving at the proper time on prearranged track.
(b) Reception committee leader flashing or displaying the proper code signal.

(3) Landing direction is indicated by the:

(a) RCL signal control light (station “B”) and marker “A” which are always on the approach or downwind end of the runway.
(b) Row of markers which are always on the left side of the landing aircraft.

(4) The pilot usually attempts to land straight-in on the initial approach.
When this is not possible, a modified landing pattern is flown using a minimum of altitude for security reasons. Two minutes before target time the RCL causes all lights of the LZ pattern to be turned on and aimed like a pistol in the direction of the aircraft's approach track. The RCL also flashes the code of the day continuously with the green control light in the direction of expected aircraft approach. Upon arrival in the area (within 15° to either side of the approach track and below 1,500 feet), the LZ marking personnel follow the aircraft with all lights. When the RCL determines the aircraft is on its final approach, he will cease flashing the code of the day and aim a solid light in the direction of the landing aircraft. The solid light provides a more positive pattern perspective for the pilot during landing. If a "go around" is required, all lights follow the aircraft until it is on the ground. All lights continue to follow the aircraft during touchdown and until it passes each respective light station.

(5) Landings are not normally made under the following conditions:
   (a) Lack of or improper identification received from the LZ.
   (b) An abort signal given by the RCL, e.g., causing LZ lights to be extinguished.
   (c) Any existing condition that, in the opinion of the pilot, makes it unsafe to land.

(6) After the aircraft passes the RCL position at touchdown and completes its landing roll and a right turn, the RCL takes a position midway between stations "A" and "B" and shines a solid light in the direction of the taxiing aircraft. This is the guide light for the pilot who will taxi the aircraft back to takeoff position. The RCL controls the aircraft with his light. If the RCL desires the aircraft to continue to taxi, he will flash a solid light in the direction of the aircraft. After off-loading or on-loading is complete and the aircraft is ready for takeoff, the RCL moves to a vantage point forward and to the left of the pilot, causes the LZ lights to be illuminated, and flashes his light toward the nose of the aircraft as the signal for takeoff. The RCL exercises caution so that his light does not blind the pilot.

(7) To eliminate confusion and ensure expeditious handling, personnel or cargo to be evacuated wait for unloading of incoming personnel or cargo.

(8) When all evacuating personnel are loaded and members of the reception committee are clear of the aircraft, the pilot is given a go signal by the RCL. LZ markings are removed as soon as the aircraft is airborne.
27. REPORTING LANDING ZONE

The minimum LZ data required is:

a. Code Name. Extracted from SOL.

b. Location. Complete military grid coordinates of center of LZ.

c. Long Axis. Magnetic azimuth of long axis of runway. It also indicates probable direction of landing approach based on prevailing winds.

d. Description. Type of surface, length, and width of runway.

e. Open Quadrant. Measured from center of LZ and reported as series of magnetic azimuths. Open quadrant indicates acceptable aircraft approach.

f. Track. Magnetic azimuth of desired aircraft approach.

g. Obstacles. Reported by description, magnetic azimuth, and distance from center of LZ.

h. Reference Point. Reported same as obstacles.

i. Date. Time mission requested.

j. Request. Items to be evacuated.

28. LANDING ZONES FOR ROTARY-WING AIRCRAFT

a. General.

(1) Within their range limitations, helicopters provide an excellent means of evacuation. Their advantages include the ability to:

(a) Ascend and descend almost vertically.

(b) Land on relatively small plots of ground.

(c) Hover nearly motionless, and take on or discharge personnel and cargo without landing.

(d) Fly safely and efficiently at low altitudes.

(2) Some unfavorable characteristics of helicopters are:

(a) Compromise of secrecy by engine and rotor noise and by dust.

(b) Difficulty--sometimes impossibility--of operating when icing or high, gusty winds prevail.
(c) The reduction of lifting ability during changes of atmospheric conditions.

(3) For the maximum effective use of helicopters LZ's should be located to have landings and takeoffs into the wind.

(4) During night operations, helicopters usually must land to transfer personnel or cargo.

(5) A decrease in normal air density limits the helicopter payload and requires lengthened running distances for landing and takeoff. Air density is largely determined by altitude and temperature. Low altitudes and moderate to low temperatures result in increased air density.

b. Size. Under ideal conditions, and provided the necessary clearance for the rotors exist; a helicopter can land on a plot of ground slightly larger than the spread of its landing gear; however, for night operations a safety factor is allowed, using the following criteria as a guide.

(1) An area of 50 meters in diameter is cleared to the ground.

(2) An area surrounding the cleared area, 20 meters wide, is cleared to within 1 meter of the ground.

(3) The completed LZ is a minimum of 90 meters in diameter (figure 33).

c. Surface.

(1) The surface should be relatively level and free of obstructions such as rocks, logs, tall grass, ditches, and fences.

(2) The maximum ground slope permitted is 15 percent.

(3) The ground must be firm enough to support the aircraft.

(4) Heavy dust or debris interferes with the vision of the pilot just before touchdown. This effect can be reduced by clearing, wetting down, or using improved mats.

(5) Landing pads may be prepared on swamp or marsh areas by building platforms of locally available materials, (figure 34). Such LZ's are normally used for daylight operations only. The size of the clearing for this type of LZ is the same as b above with the following additional requirements for the platform:

   (a) Be large enough to accommodate the spread of the landing gear plus 3 meters.
Figure 33. Landing zone for rotary-wing aircraft.
Figure 34. Examples of platform landing zones for rotary-wing aircraft.
Figure 35. Preparing landing pads in mountainous terrain (rotary-wing aircraft).
Figure 36. Approach/takeoff clearances (rotary-wing aircraft).
(b) Be capable of supporting the weight of the aircraft.

(c) Be of firm construction that will not move when the helicopter touches down and rolls slightly forward.

(d) Be level.

(e) If logs or bamboo are used, be constructed so that the top layer of poles is at right angles to the touchdown direction.

(6) Helicopters can land in water without the use of special flotation equipment provided:

(a) The water depth does not exceed 45.72 cm.

(b) There is a firm bottom such as gravel or sand.

(7) Landing pads can be prepared on mountains or hillsides by cutting and filling (figure 35). Caution must be exercised to ensure there is adequate clearance for the rotors.

d. Approach/Takeoff.

(1) There should be at least one path of approach to the LZ measuring 75 meters wide.

(2) A rotary-wing aircraft is considered to have a climb ratio of 1:5 (figure 36).

(3) Takeoff and departure from the LZ may be along the same path used for the approach; however, a separate departure path as free of obstacles as the approach path is desired (figure 36).

e. Marking.

(1) LZ's for rotary-wing aircraft are marked to:

(a) Provide identification of the reception committee.

(b) Indicate direction of wind or required direction of approach.

(c) Delineate the touchdown area.

(2) Equipment and techniques of marking are similar to those used with fixed-wing LZ's--lights or flares at night, smoke and panels in daylight.

(3) An acceptable method of marking is the "Y" system. This uses four marker stations (figure 37).
Figure 37. Marking of landing zones for use by rotary-wing aircraft.

NOTE: ALL LIGHTS SPACED 50 METERS APART