VII

TACTICAL NIGHT FLYING

A. NIGHT EMERGENCY PROCEDURES

1. General. Prior to night flight the pilot and copilot should discuss and determine crew duties in the event in-flight emergencies occur. Every crewmember should be thoroughly familiar with his duties in all types of emergencies.

2. Special Considerations.

The selection of night emergency landing areas should include consideration of the following:

(1) Dark areas are generally heavily forested areas.

(2) Light areas are generally open fields or calm water areas.

(3) Populated areas usually have numerous obstacles such as trees, powerlines and houses which are nearly impossible to see at night.

(4) Rural homes will probably have trees and powerlines adjacent to them.

(5) Open areas or fields are generally the best emergency landing areas, but caution must be used in plowed fields, pastures, etc, (for wires, animals, terraces, and other obstacles).

(6) Generally, roads and highways do not make good night forced landing areas because of the large number of wires crossing and running parallel to the road.

3. Performance of Maneuver.

Engine Failure.

(1) Pilot duties.

(a) Enter autorotation.

(b) Maneuver as necessary to suitable touchdown area.

(c) At 200' - 300' AGL turn on landing and search lights.

NOTE: Pilot should extend landing light 5 to 15 degrees and search light to autorotative angle before flight and adjust search light as necessary after takeoff.

(d) Execute touchdown.

(2) Copilot duties.

(a) Radio May-Day call.

(b) Assist pilot in finding suitable touchdown area.

B. TACTICAL NIGHT FLIGHT

1. Definition. Tactical night flying is the operation of a helicopter during the hours of darkness under tactical conditions, to include:

a. Night approaches to tactical areas.

b. Night flight in tactical environment.

c. Night formation flight.

Performance of maneuvers.

(a) Hovering. Terminal guidance signals (Fir. VII-1) will be found as an inclosure which follows. Upon entering aircraft, turn battery on and navigation lights to dim flash. Accomplish normal start and runup. When you have been cleared for hover turn your navigation lights to steady bright, then turn landing light on. Extend landing light sufficiently to illuminate area under chin bubble (5^{o}-15^{o}) When terminal guidance personnel signals aircraft, pick up to a hover, execute a pedal turn toward the ground guide, hold for signal to move. When cleared for takeoff, turn rotating beacon on.

(b) Takeoff. Normal takeoff to be used, except when it becomes necessary to clear a barrier, in which case a confined area takeoff will be used.

(c) Approaches. Turn to final should be planned so that you roll out looking down the stem of the landing "T" on the proper approach heading and altitude. Descent should be started when you reach an 8-10^{o} angle to the "T" or as necessary to clear barriers.

(d) Night operational flying procedures.

1. Map planning should be accomplished prior to the flight.

2. Each route should indicate the following:

a. Exact magnetic track for each leg.

b. Time tick marks for each two minutes of flying.

c. Times between all turning points on each route.

d. Air control points.

3. When flying low level at night maintain an altitude of 200 feet obstacle clearance and an airspeed of 80 knots. REMEMBER! Contour lines are surface of earth, so 75' - 100' trees can be anticipated as well as fire watch towers, etc. Should location or navigation progress become questionable, CLIMB IMMEDIATELY to a safe altitude (1000' absolute or higher) until sure of your location.

2. Night approach with glide angle indicator.

a. Definition. The glide angle indicator approach system is a portable light system used for night approaches to minimum lighted helipads where other approach navigation aids are not available.

b. Performance of maneuver. The glide angle indicator projects a strong beam of three adjacent colors: Amber, green, and red. (Fig. VII-1) The indicator is placed on the right front of the helipad touchdown point with the beam projected up the final approach. (Fig. VII-2) The approach path is identified by the green colored beam. The amber beam identifies the aircraft as being above the approach path and the red beam identifies the aircraft as being below the approach path. The aviator will call the airfield for clearance to land and maintain final approach altitude until he sees and intercepts the green beam of the indicator. He will then start and maintain his descent down the green indicator which will allow him to make an approach over trees and other obstructions to the helipad. The aviator will direct his attention to the green indicator until he can see the ground around his aircraft at which time he will land to the left rear of the "T".

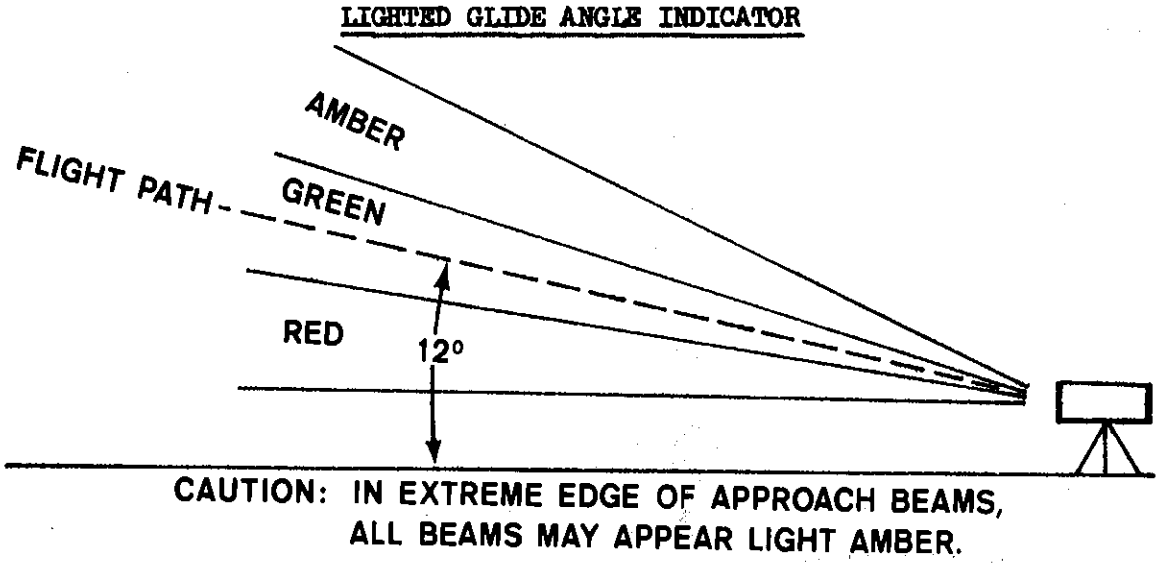


Fig. VII-1

GLIDE ANGLE INDICATOR POSITION AND HELICOPTER TOUCHDOWN POINT

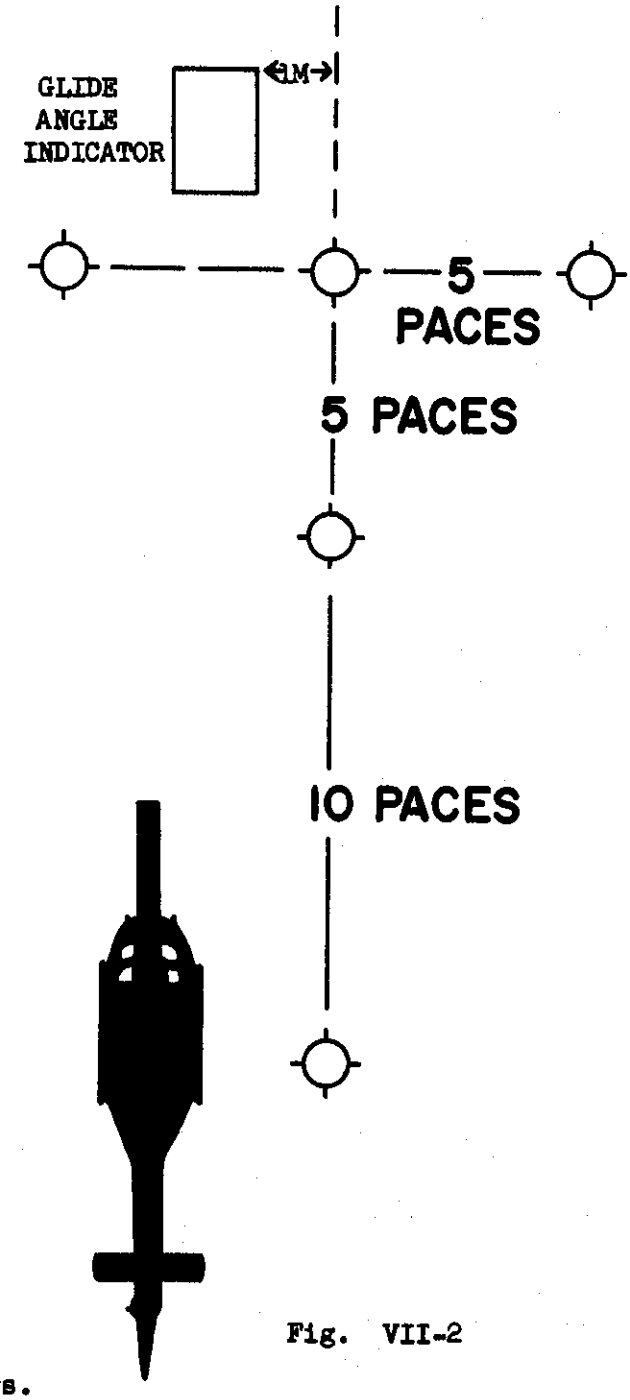


Fig. VII-2

c. Common errors.

(1) Fixation on approach lights and failure to slow down.

(2) Chasing beam vertically with collective.

(3) Too high or too low an airspeed on final.

(4) Failure to maintain heading due to concentrating on glide beam.

(5) Failure to maintain correct rate of closure.

(6) Failure to fly through the red beam and into the green beam prior to starting letdown on final.

3. Night expedient lighting.

a. Definition. Any means or equipment used to light or mark a landing point or landing zone for a helicopter or group of helicopters when standard equipment intended for that purpose is not available.

b. Description.

Almost anything which gives off light or adequately reflects light can be used for night lighting when standard night lighting devices are not available. Whatever is used should be safe for both aviator and ground crew, and both aviator and ground crew should thoroughly understand the lighting configuration for landing. A bright light should never shine directly at the aircraft, and the aircraft lights should be turned on if necessary. If more than one helicopter is to land, there should be a marker at each touchdown point. All night landings will be made 3 to 5 feet directly behind the left rear of the marking "T" or the lighting device. Some typical night lighting devices are:

(1) A "T" of flashlights, taped to sticks driven in the ground.

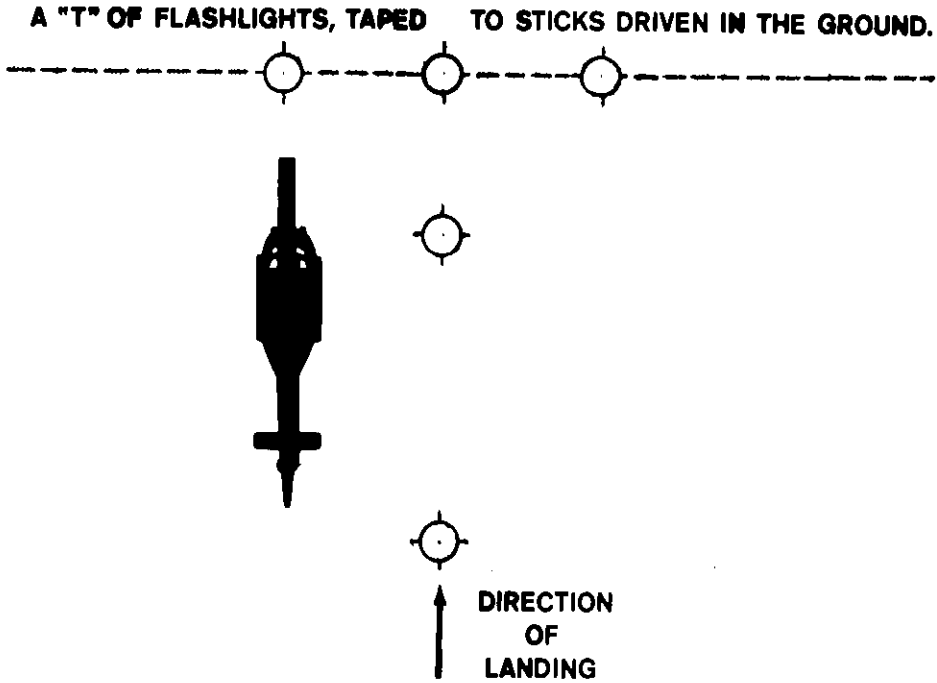
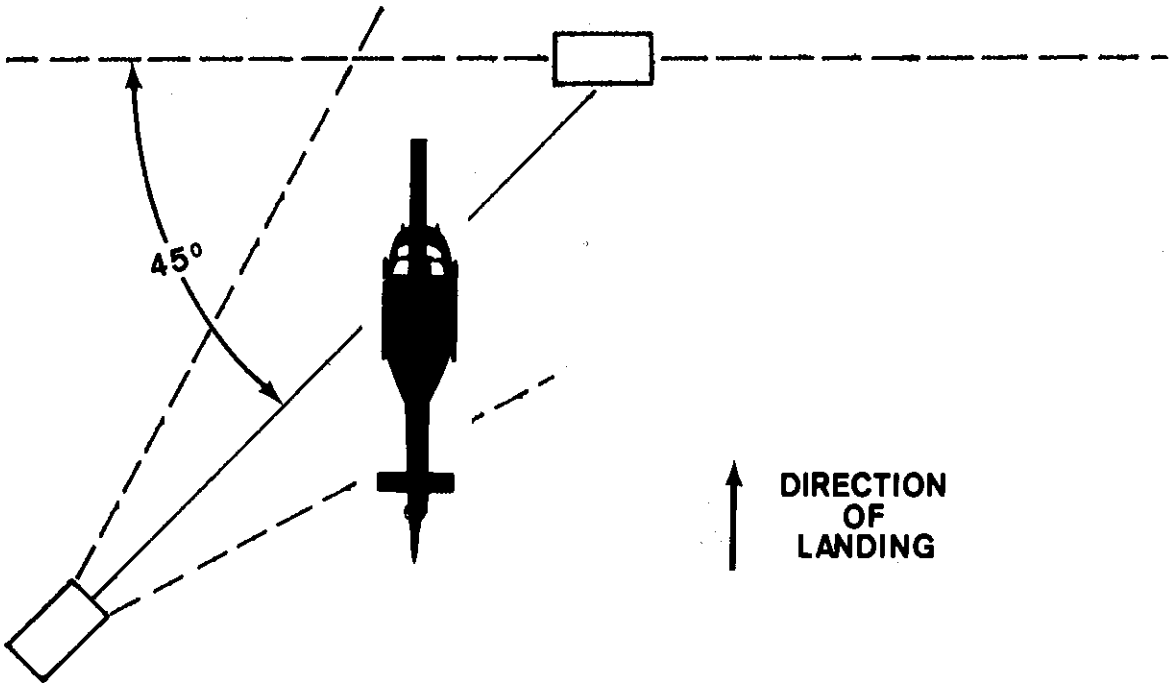


Fig. VII-3

(2) Flare pots, filled with sand and fuel, securely anchored to the ground. (Fire guard should be nearby.)

(3) The following figures show how vehicles should be used. The panel, if used, should be slightly elevated to reflect the light.

FOR 1 AIRCRAFT



NOTE:

VEHICLE MAY BE POSITIONED TO EITHER SIDE OF PANEL ON 45° ANGLE.

Fig. VII-4

FOR A FORMATION
(USING TWO VEHICLES)

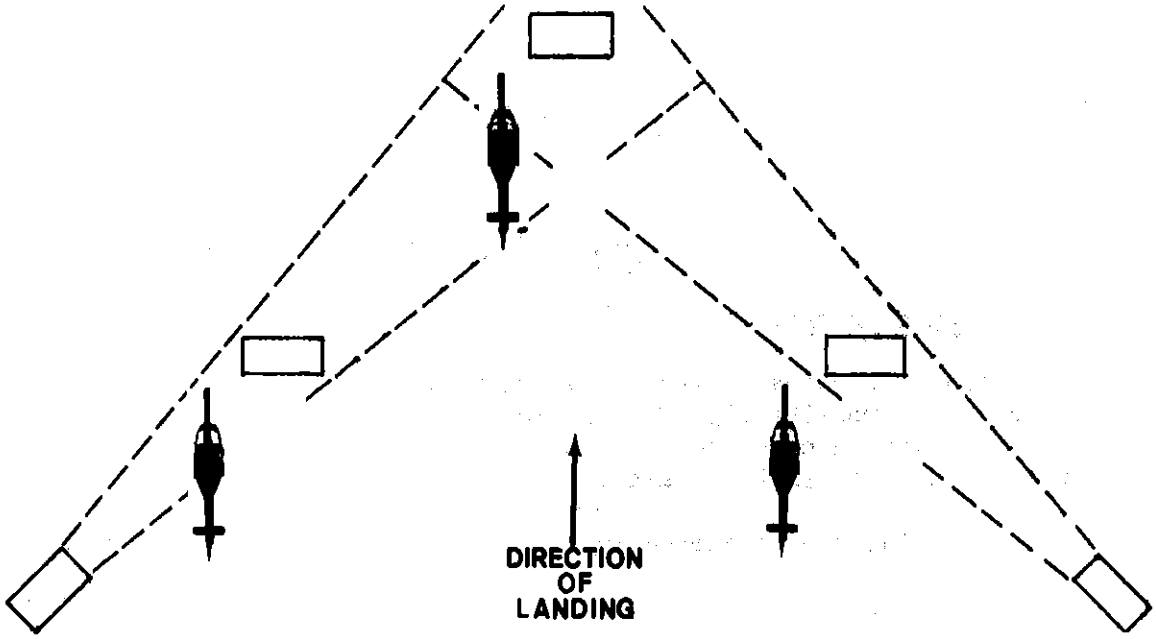


Fig. VII-5

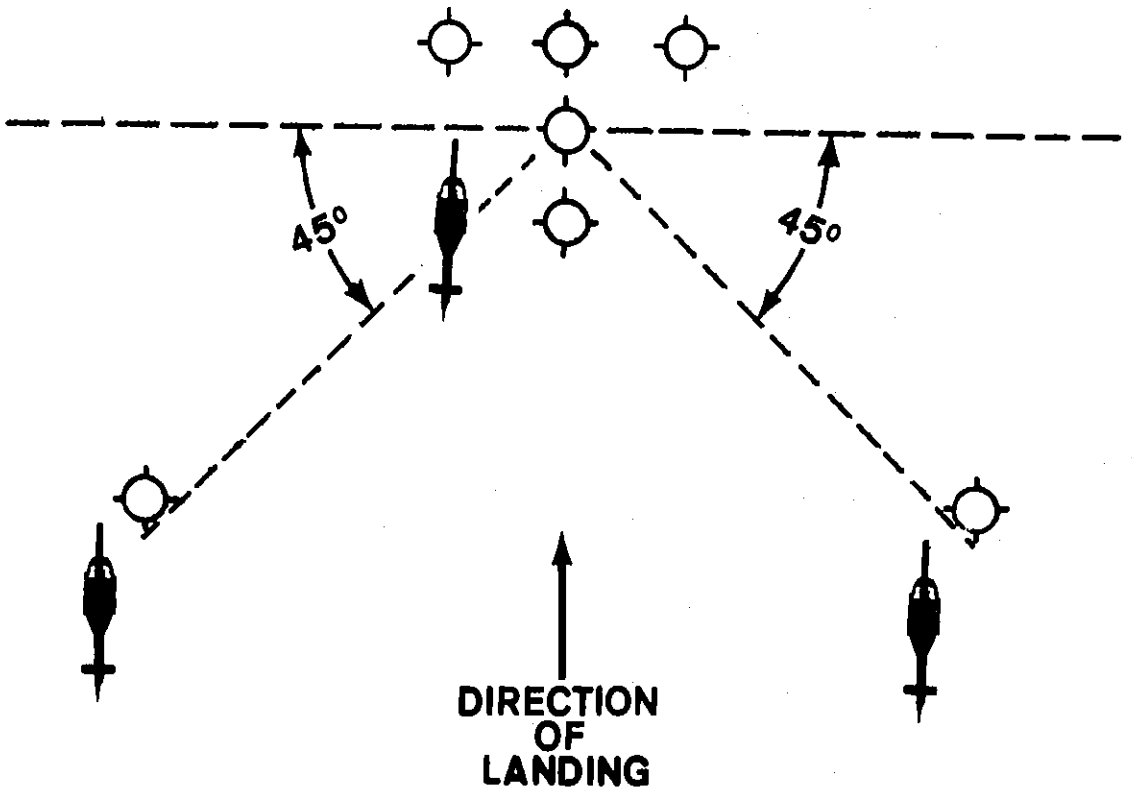


Fig. VII-6

c. Common errors.

(1) Misunderstanding the lighting configuration on the ground increasing the possibility of an approach on the wrong heading. Aviator and ground crew should be thoroughly familiar with the lighting configuration that is to be used.

(2) Failure to correctly align aircraft on desired approach heading.

4. Terminal guidance hand signals.

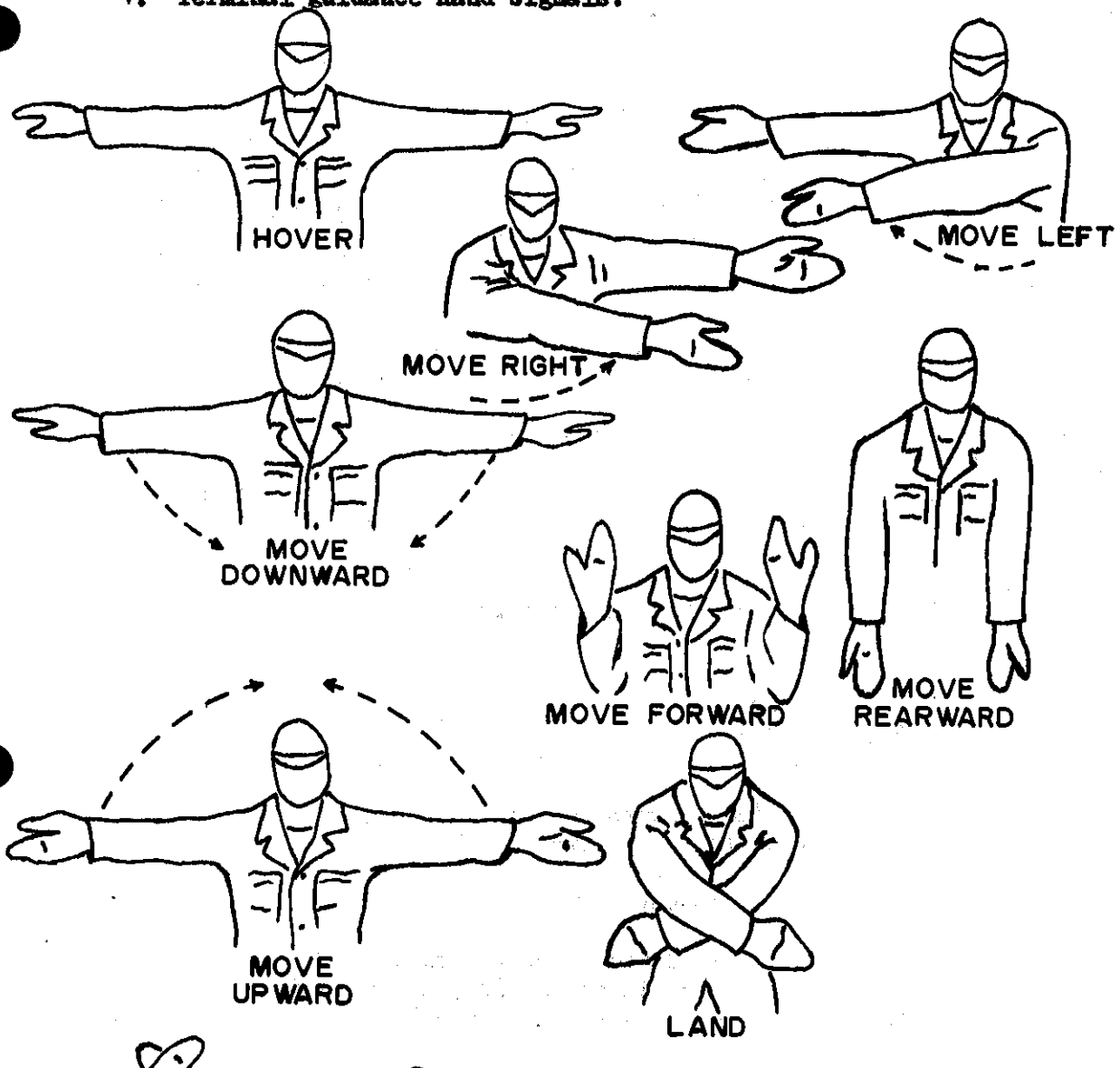


Fig. VII-7

VIII

AVOIDING ENEMY FIRE

1. General: Avoiding enemy fire can be divided into two catagories: pre-flight or in-flight planning and evasive actions if enemy ground or aircraft fire is encountered:

a. Pre-flight and in-flight planning considerations.

(1) Whenever possible plan flight routes around known or suspected enemy locations and/or enemy aircraft range capabilities.

(2) When mission and weather permit plan altitudes considering all available intelligence on types and volumes of enemy fire that could be encountered. Use the following as guidelines if more specific weapons types are not known:

(a) Small caliber weapons-1500 feet absolute or higher will usually keep you out of the effective range of most small arms fire to include 50 caliber (12.7mm).

(b) Large caliber antiaircraft weapons - Most Army helicopters could not fly high enough to avoid these types of weapons and contour flight might be best for planning purposes.

(c) Enemy high performance aircraft - contour flight will aid in concealment and/or cover from enemy aircraft.

(3) Plan alternate route(s) whenever possible.

(4) Determine the immediate (door gunners, gunships, etc) and on call (land and naval gunfire, fighters, etc) friendly fire support available and possible courses of action if enemy fire is encountered.

(5) Common errors:

(a) Failure to get frequencies, callsigns, and types of friendly fire support available during mission planning.

(b) Failure to plan alternate courses of action should enemy fire be encountered.

b. Evasive action consists of those helicopter maneuvers necessary to avoid being hit by hostile fire. The particular technique or maneuver required will depend upon the type of hostile fire encountered.

(1) Small arms. Immediately turn away from the fire towards an area of concealment. If concealment is not available, sharp turns of unequal magnitude and at unequal time intervals will provide the best protection until the helicopter is beyond the effective range of the hostile weapon. If the situation permits employ immediate suppression.

(2) Large caliber antiaircraft fire. Large caliber antiaircraft fire, especially when radar controlled, requires an immediate 90° turn. This 90° turn will move the helicopter away from the burst and the radar will continue to track the burst. Additionally, an immediate descent will further reduce the danger by getting the helicopter below the effective killing envelope of the large caliber weapon. At 30 second intervals or greater make further 90° turns and make further descents until out of the effective range of the enemy weapon.

(3) High performance aircraft: Upon sighting hostile high performance aircraft, the pilot should continue on the established flight path until the hostile aircraft starts his dive attack. Once the attack dive is initiated, he turns immediately toward the attacker and descends. This maneuver will cause his attack angle to increase. The hostile aircraft must cease his attack or he will be unable to recover from the maneuver. Once the attack is broken, the helicopter should be maneuvered to take advantage of terrain and vegetation for concealment and cover to avoid being attacked again.

2. Performance of maneuver.

a. Diving turns are accomplished by a simultaneous execution of a dive and a bank. Recovery must be started early enough to allow a smooth pullout without danger of overstressing the rotor or hitting obstacles or the ground if diving to begin contour flight.

NOTE: Diving turns should be accomplished at a maximum airspeed of 90 knots for training purposes.

b. Climbing turns are rarely used as an evasive maneuver in helicopters, but may be advantageous in extreme situations. The execution employs the use of a high speed cyclic climb.

c. Level turns as an evasive maneuver is primarily a matter of timing and not a subject of training in the flight course.

d. Common errors.

(1) Too slow to react to ground fire.

(2) Turns too abrupt and not coordinated.

(3) Failure to change flight path.

NOTE: Contour flights and evasive maneuvers will be demonstrated and practiced only at designated areas.

3. Evasive actions while in formation consist of coordinated changes in airspeed, altitude, or direction to minimize exposure time to enemy fire while maintaining the integrity of your formation. If more abrupt movements are required the flight leader will have to break up his flight into elements or single aircraft.

Common errors.

(1) Flight leader does not react to ground fire.

(2) Flight leader attempts evasive maneuvers that lose his flight.

IX

LOAD OPERATIONS

1. Internal loads.

a. Tactical operations using the internal tank equipped UH-1B.

(1) General.

This section presents details concerning the water tank loads which have been installed in the Tactics' fleet UH-1B aircraft.

(2) Description.

Water tanks have been installed in the UH-1B aircraft to provide loaded aircraft for student training. The water tank is the UH-1 ferry flight fuel tank. The tank installation weighs approximately 400 pounds empty. This figure includes 200 pounds of concrete blocks or sand cans which are secured on the floor under the tank. When the tank is filled, the whole installation weighs approximately 1400 pounds. This installation allows a convenient means to vary the load by rapid loading and unloading.

(3) Use of the water tank load.

(a) The water tank will be full unless otherwise noted in the 2408-13. When reducing the load neither sand cans nor blocks will be removed. Anyone changing the status of this full load is required to record the change in the 2408-13. The aircraft must have three sand cans secured in the cargo compartment if the tank is loaded.

(b) Since the fuel tank was designed for use in the aircraft, the aircraft can also be safely flown with any water tank load, power permitting. However, the maximum slope landing to be negotiated with a reduced water load is approximately 7°. Adherence to this limitation will prevent mast bumping which may occur under certain wind conditions.

(c) The water quantity can be checked by carefully examining the transparent plastic tube mounted on the tank. Occasionally, it is difficult to determine the water level in this manner due to cloudy conditions in both the water and the tube. Some tanks may have a color float marker to indicate this level. In addition, the tank will be stenciled to designate the load weight at various water levels.

(d) The tanks are to be drained by use of hoses with fittings which match the valve at the bottom of the tank. PAMI personnel working in vicinity of these aircraft will drain the tank if requested. If it is necessary to drain a tank by either an instructor or student, it is only necessary to open the valve by inserting a small device in the drain valve. As a field expedient, a pencil will usually be sufficient for this purpose. However, it is important to direct the water outside the aircraft. A paper guide will usually suffice for this purpose.

(e) Whenever possible, the full water tank and fuel tank load will be carried to start a flight period. However, if a takeoff cannot be accomplished because of the weight, the load is to be adjusted by reducing the water as outlined above in para 1a(3)(d). For dual flights only the load is reduced in sufficient amount to enable a sustained 2 foot hover with stabilized 6600 RPM. This will permit a maximum gross load takeoff as described in Section IX Para 1c, Page 78. Solo flights must use the go-no-go guide to determine weight reduction.

(f) When convenient and prior planning allows, it is possible to vary the fuel load rather than the water load. However no fuel is to be drained and a thirty minute fuel reserve is to be maintained for planning purposes on all flights.

b. Loss of rotor rpm. (Applicable to all load training)

There are many situations which an operational aviator in a combat environment may be faced with before he has a large number of flight hours under his belt. In most of these situations he must depend upon his own knowledge and skill.

In the interest of increasing this knowledge some of the common causes and corrections for one of the most common of these problems "Lost Rotor RPM" are listed on the following pages:

CAUSE	CORRECTIVE ACTION
1. PRIOR TO LIFT-OFF	
a. Over Gross Weight.	a. Lighten load.
b. Exceeding Go-No-Go.	b. Lighten load. (400 lbs = 1% N_1)
c. Engine or Governor Malfunction.	c. Maintenance.
d. Fast application of pitch. (Exceeding N_2 acceleration rate.)	d. Apply small amount of pitch to allow N_1 gas producer time to accelerate through its low RPM area. Then the collective application will not result in low N_2 and rotor RPM.
2. AT A HOVER	
a. Over gross weight.	a. Lighten load.
b. Exceeding Go-No-Go.	b. Lighten load. (400 lbs - 1% N_1)
c. Excessive control movements.	c. Make small, smooth corrections. Eliminate unnecessary control movements.
d. Downwind flight.	d. If downwind hover cannot be avoided, hover at lower altitude or slide skids along ground, terrain permitting.
3. ON TAKE-OFF (prior to trans lift)	
a. Excessive acceleration attitude.	a. Apply aft cyclic, maintain altitude with collective.
b. Excessive pitch application.	b. Level skids, reduce collective.
c. Loss of effective ground cushion.	c. Level skids, land aircraft, regain RPM.
d. Downwind flight.	d. Level skids, land aircraft. Reduce load or take-off into wind.
(after trans lift)	
a. Excessive acceleration attitude.	a. Apply aft cyclic, maintain altitude with collective.
b. Excessive pitch application.	b. Apply aft cyclic, reduce collective.
c. Turbulent air caused by rotor wash in formation flight.	c. Seek clean air, stabilize RPM, rejoin formation.

CAUSE	CORRECTIVE ACTION
4. IN FLIGHT	
a. Turbulent air caused by rotor wash in formation flight.	a. Seek clean air.
b. Excessive airspeed for load conditions.	b. Reduce power (airspeed).
5. ON APPROACH (Prior to loss of Trans lift)	
a. Turbulent Air caused by rotor wash in formation flight.	a. Seek clean air.
b. Sudden and excessive pitch application.	b. Anticipate power requirements to allow N_1 acceleration.
c. Excessive cyclic movement.	c. Stop unnecessary cyclic movements.
(After loss of Trans Lift)	
a. Turbulent Air.	a. Level skids, cushion landing with remaining pitch.
b. Downwind Flight.	b. Avoid if possible. If altitude permits, decelerate, momentarily lower pitch to gain RPM and make run-on landing.
c. Sudden and excessive application of pitch.	c. Reduce pitch, reapply slowly.
d. Excessive cyclic movement.	d. Stop unnecessary movement, reduce pitch to gain RPM.
6. EXTERNAL LOAD OPERATIONS	
a. Exceeding gross weight limitations.	a. Lighten load. (Remember for a given gross weight approximately 5 PSI more torque is required to hover out of-ground effect versus in-ground effect.
b. Excessive and erratic control movements.	b. Stop control movements, momentarily reduce pitch.
c. Excessive acceleration attitude.	c. Decelerate and reduce pitch.
d. Turbulent air.	d. Seek clean air.

CAUSE	CORRECTIVE ACTION
	(NOTE: If flight cannot be maintained, land load or jettison load before RPM becomes critically low.)

c. Maximum performance hover and level acceleration takeoff.

(1) Maneuver applicable to all dual OPORD's where single aircraft with internal loads are flown. Maneuver may also be performed during formation flight periods. (Single helicopter departures) The student will not perform this maneuver while solo but will use standard Go-No-Go chart procedures.

(2) Definition: The takeoff with two foot hover power at high gross weights (D model 9000 - 9500 lbs) (B model 7500 - 8500 lbs) provides the pilot with a means of taking off from areas that have suitable terrain relatively free of barriers, when Go-No-Go 2% N_1 reserve is not available and mission accomplishment dictates.

(3) General: Charts in the UH-1 Operators' Manual shows that the two foot skid height level acceleration takeoff as most advantageous for clearing barriers at high gross weights. Most helicopters in a combat zone are operated at or near maximum gross weights a high percentage of the time, and much can be gained by pilots fully understanding the advantages of the takeoff from two feet instead of light on the skids. This implementation can render valuable gains in aircraft utilization and mission accomplishment, but aviators must accept the fact that this takeoff is to be used only if a two foot hover and ground cushion can be maintained until reaching effective translational lift.

(4) Performance of maneuver.

(a) Terrain. Before this type takeoff can successfully be completed the terrain should be generally level and free from obstacles such as large rocks or tree stumps. Tall grass such as elephant grass may dissipate lift and cause the takeoff to be impossible. Water under the takeoff path will also cause a loss of lift when the takeoff is attempted. The takeoff should not be attempted when obstacles have to be cleared immediately after takeoff or where ground cushion cannot be maintained.

(b) Execution of takeoff. After the pilot has determined that the helicopter can be hovered at two feet above the ground and the terrain will permit this type takeoff, the helicopter should be put on the ground to allow the engine inlet temperature to cool for a

few seconds. The helicopter is then flown vertically to a skid height of two feet above the ground, accelerated slowly at two feet to the climbout airspeed (approximately 20 knots) and held at that airspeed until the obstacles are cleared. Care should be exercised to maintain the proper pitch attitude of the helicopter. An excessively nose low attitude will require an excess amount of power to maintain altitude causing RPM bleed off; whereas, a nose high attitude will prolong reaching effective translational lift and therefore lengthen the distance required to clear an obstacle. After reaching effective translational lift, an airspeed of approximately 18 - 20 knots (as recommended in the UH-1 Operators' Manual, chart, takeoff distance - feet) should be maintained to give shortest takeoff distance to clear an obstacle. If the skid height is greater than two feet prior to obtaining climb out airspeed, the takeoff distance will be greater or if the climb out airspeed is greater or less than the value given in the takeoff distance charts listed in the -10 (approximately 20 knots), takeoff distance will be increased. Under power limited conditions (two foot hover and full power available) a slight nose down flight attitude is required during acceleration. If loss of lift occurs in the area just prior to translational lift, the helicopter shall be leveled to avoid ground contact with the forward portion of the skids. If ground contact does occur, takeoff distances will be greatly increased in addition to the possibility of skid damage. If the helicopter cannot hover two feet above the ground without lowering RPM or if obstacles, terrain, or wind conditions are not suitable for this type takeoff, gross weight should be reduced.

(5) Common errors:

(a) Excessive control movements.

(b) Pitch angle too high or too low.

(c) Failure to maintain 2 foot hover altitude prior to attaining effective translation.

(d) Attempting to expedite takeoff, causing RPM bleed off.

2. External load operations.

a. Purpose. To familiarize and to establish standards and procedures for ground personnel, pilots and other concerned in the conduct of external loads operations. Procedures contained herein will be followed by all concerned during tactical training.

b. Procedures. All procedures will be followed for every external load operation.

(1) Preflight.

(a) Prior to attempting external loading, the crew members preflight will include, but is not limited to, the following:

1. Visually determine that cargo hook is installed and safetied.

2. Battery switch - ON.

3. Arming switch - ON.

4. Check electrical and manual release (both pilots and copilots). To accomplish this check one man is required under aircraft placing pressure on cargo hook and one man in cockpit.

(2) Personnel requirements.

(a) Aircraft crew members will consist of pilot and copilot (IP and student). External loading will not be attempted by student solo aircraft.

(b) Ground personnel, as a minimum, will consist of two men, (signal man and hook-up man) briefed and thoroughly familiar with hand and arm signals contained in FM 55-1520-211-10 and applicable safety procedures as specified herein. (Fig. IX-1)

(3) Cargo hook-up, flight, release procedures.

(a) Cargo hook-up.

1. On arrival at loads hook-up area, the pilot in command will visually determine that ground personnel are in position and ready for hook-up.

a. Signalman is placed in front of the load, facing the aircraft, so that he will remain in constant view of the pilot. (Fig. IX-2)

b. Hook-up man is placed to the right of the load initially facing the aircraft, turning as he hooks the load and facing the signalman. He then moves to his right and forward to the signalman's position.

2. Prior to hovering over the load the pilot visually checks that the flexible loop is attached to cargo, arming switch in "ON" and keys FM transmitter to dissipate accumulated static electricity.

3. When hovering toward and over the load for hook-up, the pilot follows the signalman's directions, making constant minor corrections to remain clear of the load and centered.

4. Once over the load the aircraft crew and hook-up crew must be constantly alert for possible engine failure.

a. Pilot.

(1) If prior to hook-up an engine failure or loss of power occurs, execute a hovering autorotation to the left of the load. Hold sufficient pitch after autorotation is entered and left cyclic is applied, in order to clear the load. Once clear of the load, execute a normal hovering autorotation.

(2) After hook-up, should engine failure or loss of power occur, every attempt will be made to release the load and execute a hovering autorotation to the left of load. Both electrical and manual release should be attempted if time permits. (IF LOAD IS NOT RELEASED, COLLECTIVE PITCH MUST BE MAINTAINED AS LONG AS POSSIBLE TO PERMIT GROUND PERSONNEL TO CLEAR THE AREA. IT CANNOT BE OVEREMPHASIZED THAT DUE TO THE NATURE OF TURBINE ENGINES, A POWER LOSS OR ENGINE FAILURE MAY OCCUR, WITH VERY LITTLE WARNING TO EITHER GROUND OR AIR CREW. CONSTANT ALERTNESS IS IMPERATIVE!)

b. Ground crew. If engine failure or loss of power occurs, the ground crew will perform the following:

(1) Signalman. Turn away from the aircraft and lie face down on the ground, covering his head with his arms to protect from flying objects should the aircraft crash.

(2) Hook-up man. Dive and roll to the right as far as possible, following same procedures as the signalman to protect himself from injury. "Right" is defined as, "to the right of the hook-up man as he hooks the load". (His back to the aircraft tail boom.)

(4) Flight procedures.

(a) Load hook-up will be signaled to the pilot. Once hook-up man is clear of aircraft, the signalman will insure that the aircraft is centered over the load prior to giving the signal to lift the load.

(b) Prior to lifting the load clear of the ground, the pilot will increase collective, maintaining a centered position over the load until the weight of the load is felt on the aircraft. At this time to complete the lift-off:

1. Make minor corrections with cyclic to center over the load.

2. Maintain directional control with pedals while smoothly applying additional collective pitch; minor cyclic corrections to prevent drifting, raising the load to 3 feet above the ground.

3. If aircraft will hover without loss of rpm, maintain aircraft at a hover and place the cargo release switch in the OFF position then depress the electrical cargo release button (both pilot's and copilot's). The cargo release switch will then be placed in the ARM position. If a malfunction of the hook occurs, i.e., the load is dropped when moving the cargo release switch from ARM to OFF to ARM, or, when the electrical cargo release button is depressed with the cargo release switch in the OFF position, the aircraft WILL NOT be used for external loads and an appropriate write up made in the -13. This procedure should insure that there is no stray voltage which will accidentally release a load while switching from ARM to OFF to ARM and also that a load cannot be accidentally released while the cargo release switch is in OFF position. After the above check has been made, and clearance from signalman has been received, a normal takeoff is executed with the cargo release switch in the ARM position.

(c) When conditions permit, all flight with external loads should be planned to avoid populated areas.

1. After takeoff, utilize normal climb procedures (60 kts - 500 FPM)

2. Cargo arming switch OFF at 300 feet absolute. Verbally announce "Cargo Release Switch OFF."

3. En route airspeed of 60 - 70 kts will produce smoothest and safest flight.

4. Due to size, shape, or unequal weight distribution, oscillation or pendulum-like swinging of the load may occur during flight. If this condition develops:

a. Reduce airspeed to lessen or eliminate the oscillation, taking care not to aggravate the situation by over-controlling or "chasing the load."

b. Smooth handling of the aircraft should preclude the necessity of deliberately releasing the load.

c. Should oscillation become so severe as to cause an uncontrollable flight attitude or threat of structual damage:

(1) Check below to prevent injury or damage to persons or property.

(2) Jettison the load.

(3) Plot the location, report the release of the load to the appropriate authority, be prepared to render assistance to recovery personnel.

NOTE: Should a load be inadvertently released, the recommended course of action is in (3) above.

(5) Release procedure. Patterns and approaches must be planned to allow for shallow turns, and the termination at a high hover.

(a) Prior to descending below 300' absolute and after turning final: Cargo arming switch - ARM, visually check to insure pilot does not have finger on release button. Verbally announce "Cargo release switch ARMED."

(b) Plan the approach when conditions permit, using normal approach angle and techniques.

(c) Care must be taken to allow for the load clearance over barriers at the landing zone.

(d) During the final portion of the approach the apparent ground speed and rate of closure may appear somewhat slow. This is normal in order to prevent abrupt flaring and a large application of power during termination. (TERMINATE SUFFICIENTLY HIGH TO PREVENT DRAGGING THE LOAD.)

(e) If terminal guidance personnel are located at the landing zone, follow their signals in order to deliver the load at a pre-planned position.

After termination of the approach at a hover and over the desired delivery spot; to release the load:

a. Slowly reduce collective pitch, maintaining heading with pedals, and using minor cyclic corrections to prevent drifting, until the weight of the load rests on the ground.

b. Release the load (electrically or manually).

c. Insure load is released (i.e., power gauges, visual sight from your aircraft, other aircraft, ground handlers, etc).

(f) Actions in the event of electrical failure hindering communications, or precluding electrical release of the load:

1. Prior to flight, pilot and IP copilot establish a procedure to accomplish release of the load using the manual release.

2. Arm and hand signals will work best, provided both crew members understand them.

c. Common errors.

(1) Too fast on final. This leads to excessive rates of descent and the necessity for abrupt flares and power demands at termination, which may exceed the helicopters' capabilities. The need for executing slow smooth approaches and anticipation of the turbine power lag is emphasized.

(2) Lack of self-control - over controlling tenseness - most common in external load operations.

(3) Pilot exerting pressure on release button during arming and disarming procedures or during normal operations.

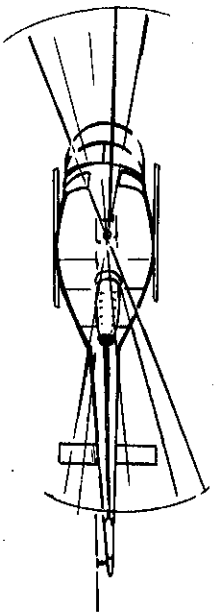
(4) Failure to announce arming and disarming cargo release switch.

(5) Arming cargo release - during turns and other periods of rapid load oscillation.

ORGANIZATION FOR HOOK-UP

SIGNALMAN

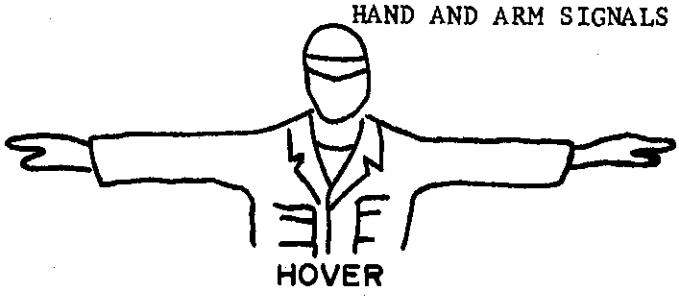
HOOK-UP MAN (RIGHT OF LOAD)

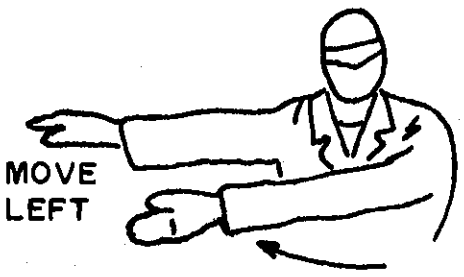


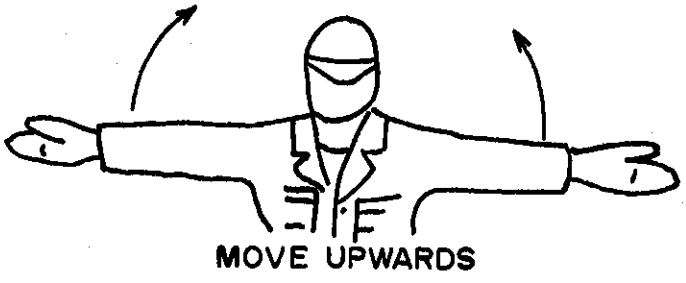
A/C DIRECTION OF MOVEMENT

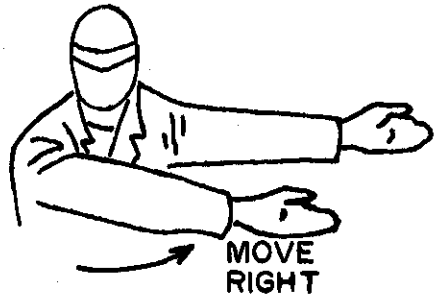
Fig. IX-1

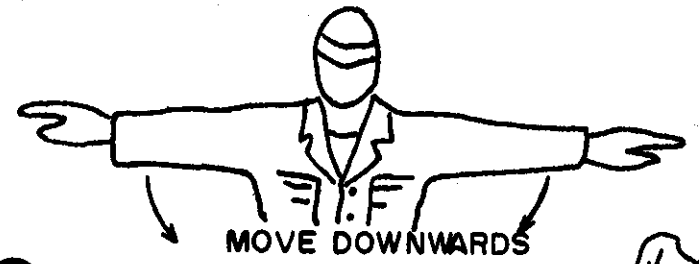
HAND AND ARM SIGNALS

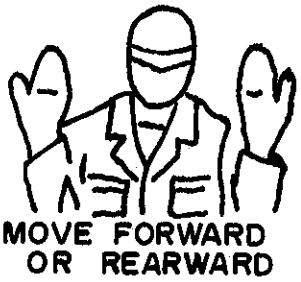












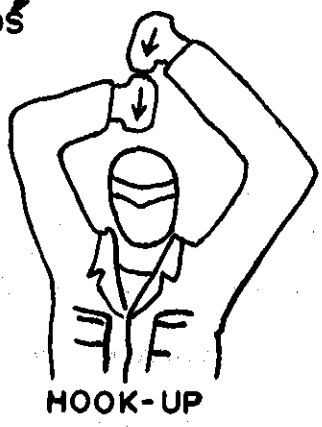


Fig. IX-2

X

REVETMENT TRAINING

1. Definition: A revetment is any type of protective system that may be emplaced around parking pads to offer limited protection to aircraft. It may be comprised of a variety of materials such as; sandbags, sand/water filled 55 gallon drums, PSP, wood, or any other suitable materials.

2. Performance of maneuver.

a. Approach the revetment at a one-foot hover. Prior to entering the confines of the revetment, insure the helicopter is centered and parallel to the walls of the revetment.

b. Maintain a constant heading and ground speed with coordinated use of anti-torque pedals and cyclic control. Displace the cyclic into a crosswind if necessary so as to maintain a constant ground track and the aircraft parallel to the revetment walls.

c. With the collective pitch, a one-foot hover will be maintained. This altitude will allow the pilot to place the aircraft immediately on the ground (in the event an uncontrolled sideward drift of the aircraft is encountered).

d. Upon arriving over the termination point, make descent to touchdown. Make necessary corrections with pedals and cyclic control to maintain a constant heading during landing.

e. Exit from revetment: To exit the revetment bring the aircraft to a one-foot hover. Maintain directional control with pedals and apply aft cyclic to accomplish a rearward exit from the revetment. Insure ground and obstacle clearance for the tail rotor at all times.

f. When clear of revetment, maintain a normal three-foot hover.

g. If high wind conditions exist, the A/C may be ground taxied into the revetment.

h. Extreme caution must be exercised when operating a loaded aircraft in a revetment.

XI

ATTACK HELICOPTER OPERATION

Attack helicopter employment in Vietnam is a tactical necessity in all phases of combat operations. The Army aviator must realize that when he is assigned to a combat zone, he will most likely have daily contact with the attack helicopter. It is, therefore, essential to become thoroughly familiar with all phases of attack helicopter operations.

1. Attack helicopter missions and Cardinal Rules

a. Attack helicopters perform three basic missions

(1) The escort role was the first mission that attack helicopters fulfilled in RVN. Escort of waterborne and ground convoys as well as airmobile columns are performed by attack helicopters.

(2) Reconnaissance and security missions are frequently accomplished by attack helicopters. The general types of reconnaissance are route, area, and zone. Special types of reconnaissance are LZ reconnaissance, post-strike reconnaissance, and reconnaissance by fire.

(3) The direct fire support mission has become the primary mission of attack helicopters. The attack helicopter is a gap-filler in the direct fire support mission. It fills the gap in fire power between the ground commanders organic fires and that of artillery and tactical airstrikes.

b. There are three types of fires delivered by attack helicopters. The type fire depends upon results desired, weapons selected, and slant range to the target.

(1) Neutralization fires reduce enemy's effectiveness by hampering movement and interrupting fire of his weapons.

(2) Destruction fires are those delivered for purpose of destroying personnel or material targets.

(3) Combined fires can be delivered from attack helicopters since they carry more than one type of ammunition and armament.

c. Cardinal Rules - the 12 established rules are combat proven guides which enhance mission success and increase survivability in the combat environment.

(1) Avoid target overflight

(a) Engage target at helicopters maximum effective range.

(b) Disengage before reaching enemy's effective range (400 - 500 meters).

(2) Avoid flight in the "deadman" zone.

(a) Airspace where most aircraft hits occur. Size of zone affected by enemy's antiaircraft capability, observation, etc.

(b) The zone in Vietnam extends from 50 feet AGL to 1000 feet AGL with 50 - 500 being the most dangerous part of the zone.

(3) Avoid flying the 180^{o} wing position.

(4) Make a high reconnaissance first.

(a) Both weather and enemy's antiaircraft capability may prevent high reconnaissance.

(b) Allows selection of low level routes.

(5) Always assume the area is hot - well trained troops may hold their fire in order to lure in a more lucrative target.

(6) Locate the friendly troops first - enemy fire cannot be returned until friendly positions are known.

(7) Avoid flying parallel to terrain features - Enemy fields of fire are oriented towards open areas.

(8) Avoid firing over the heads of friendly troops

(a) The beaten zone of helicopter weapons will be perpendicular to enemy lines rather than parallel, which is preferrable.

(b) Helicopter will be attacking directly into enemy weapons which are oriented towards friendly troops.

(c) There is a possibility that "short" rounds may hit friendly troops.

(d) Machinegun brass dumped overboard may panic or injure troops.

(9) Conserve ammunition - consider mission and don't expend ammunition uselessly against marginal targets.

(10) Know the situation - by reading intelligence reports and attending briefings.

(11) Brief to the man - aircraft commander should insure that everyone in his aircraft knows the situation.

(12) Take your time - sound tactics and accurate fire delivery are primary and speed is secondary.

2. Tactical Fire Team Formation.

a. Definition: A tactical fire team formation can best be described as an extremely loose "free cruise" formation.

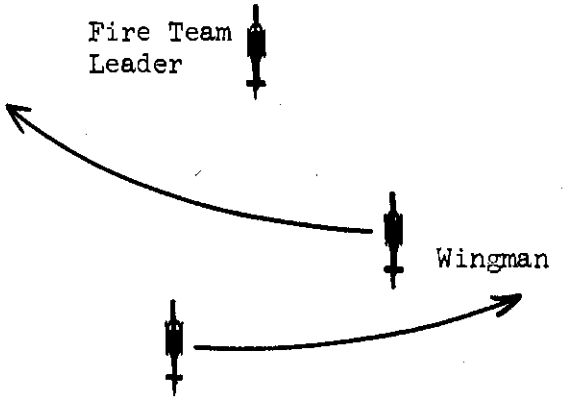
b. Purpose: The specific purpose of fire team formation is to allow maximum control, flexibility, mutual support by observation and fire power. A typical fire team formation is:

(1) In addition to maintaining mutual support, this formation precludes the aircraft following the same ground track.

(2) This formation is ideal for reconnaissance missions, can be used to enter a racetrack pattern, affords maximum control and permits great flexibility to the team leader.

(3) This is by no means the only enroute formation. Unit SOP's will establish definite guidelines to be followed when employed in different tactical situations.

(4) When the fire team is reinforced by one or more additional aircraft, the additional aircraft will space themselves on the wingman. Example of this is:



c. Considerations: Factors of METT are prime considerations in the selection of a fire team formation.

d. Common student errors:

(1) Students fail to pick up proper spacing on the team leader.

(2) Team leader fails to select proper terrain and overflies a parallel prominent terrain feature.

(3) Wingman fails to deviate course so as to enable him to provide needed support to team leader.

(4) Wingman fails to exercise "free cruise" privileges and remains fixed on one side.

(5) Wingman follows same track of team leader.

3. Attack Patterns: Specific attack patterns cannot normally be preplanned. The wise commander will tailor each attack to conform to certain basic principles. The factors of surprise volume of fire, speed, timing, exploiting enemy weakness and best use of weapons against a specific target will assist the leader in formulating his plan.

a. Primary considerations. It must be realized that the attack pattern must have primary consideration before it can become valid. The following are three of these factors:

(1) Control. No formation will be used when control cannot be maintained. The elements of the formation must be responsive to the leader's orders.

(2) Flexibility. To be responsive, we must be capable of rapidly shifting our formation to meet new threats or exploit enemy weaknesses.

(3) Firepower. The requirement to deliver maximum fire in any direction, as an example, the requirement for fire to the front, may cause us to use a specific formation tailored for that purpose.

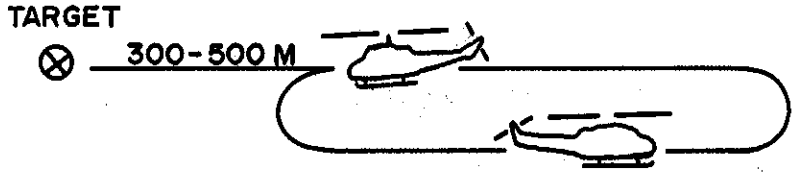
b. Secondary consideration. It is also the desire of the commander to place emphasis on two other factors that should be used when the mission is such that they can be employed. These two factors are not mandatory, but are common to the different attack patterns used in Vietnam.

(1) Mutual support. All aircraft will ideally be within support range of each other at all times.

(2) Exposure. The overflight of the same ground by several elements should be avoided when possible. The formations should not be executed so as to place any element of the formation in a poor position and must allow adequate separation of elements.

c. Standard attack patterns. As we can see, the attack helicopter can be employed in almost any pattern. The commander's ingenuity and the use of the basic guideline will prevent any habitual methods that the enemy can use in an effective countermeasure.

(1) Racetrack



(a) Advantages.

1. Used when terrain is restrictive.

2. Long axis of beaten zone on long axis of the target.

3. Best use of weather (wind and sun).

4. Control is easy.

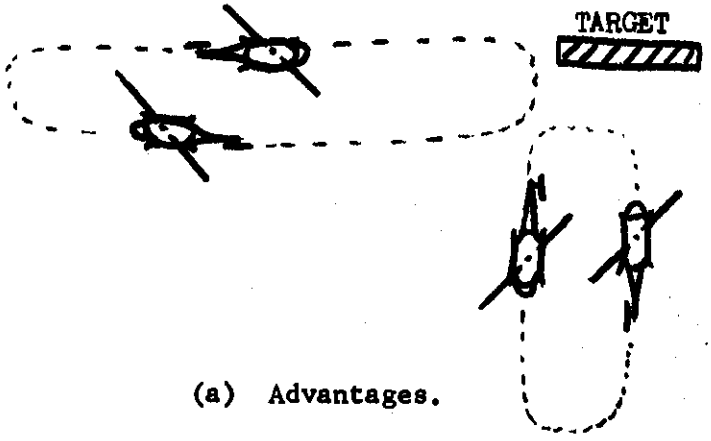
(b) Disadvantages.

1. Enemy can concentrate fires in one direction.

2. High exposure unless ground track changed frequently.

NOTE: The racetrack pattern is most commonly used in the direct fire support mission.

(2) The "L" attack pattern.



(a) Advantages.

1. (Most important) Force enemy to defend in more than one direction at the same time.

2. Attain surprise and firepower on initial assault.

3. Good target coverage.

4. Mutual support.

(b) Disadvantages.

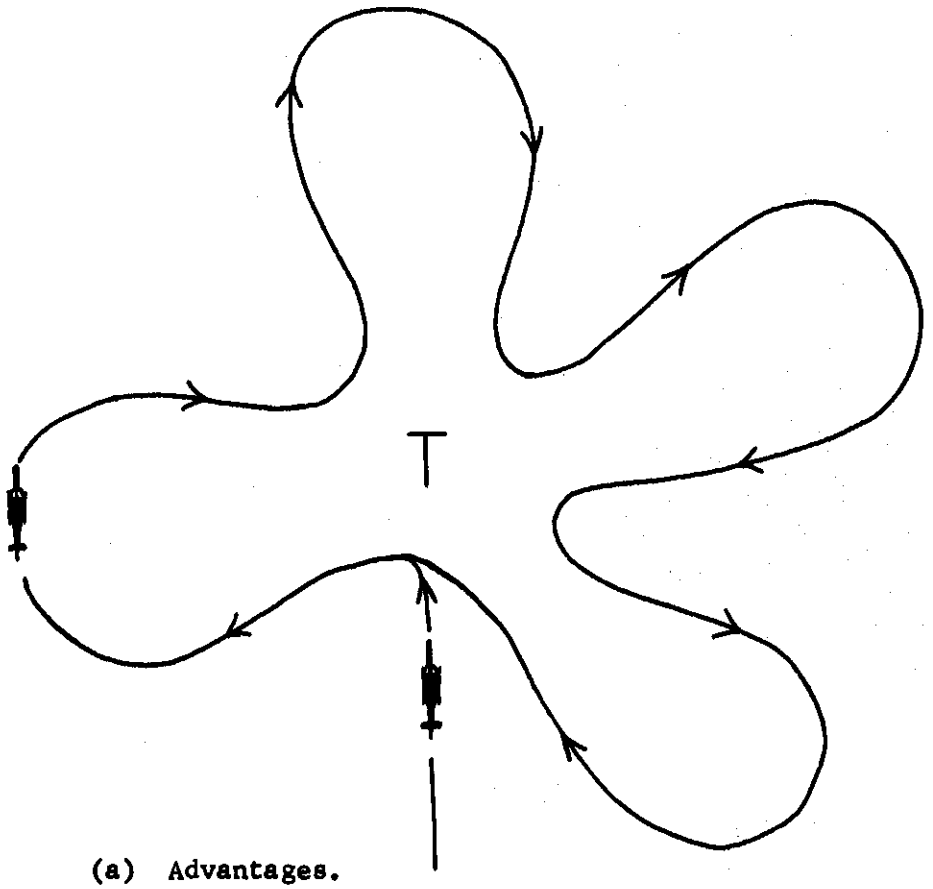
1. The beaten zone of one fire team not on long axis of target.

2. Control between the two fire teams is critical.

3. Firing over the heads or towards friendlies when within the area.

4. Requires minimum of two fire teams to execute.

(3) The cloverleaf attack pattern.



(a) Advantages.

1. (Most important) Good target coverage by attacking from many directions.

2. Continuous fire on target.

3. Mutual support.

(b) Disadvantages.-

1. Difficult to use in support role.

2. Difficult to control.

(4) For training purposes simulated firing runs will be conducted as follows:

(a) Diving fire - 60 knots entry airspeed and 60 knot power setting.

(b) Running fire (low level) - 70 to 80 knot entry airspeed and 60 knot power setting.

(c) All firing runs will be terminated so as not to exceed 90 knots airspeed and descent below 50 feet obstacle clearance.

4. Fire Commands. Normally all control within the gunship formation is maintained by radio. Unit SOP's will establish a standard format for the fire command and what is must contain. The following is an example of what a typical fire command might consist of.

a. Mission status report.

(1) Aircraft condition.

(2) Crew status.

(3) Fuel remaining.

(4) Ordnance remaining.

(a) Rockets.

(b) 7.62mm

(c) 40mm

b. Fire command.

(1) Alert.

(2) Target description and location.

(3) Attack pattern.

(4) Direction of break.

(5) Adjustment and coordination.

(6) Adjustment and coordination.

(7) End of mission.

c. Fire report.

(1) Target description.

(2) Direction (clock system).

(3) Range.

d. Conducting the attack - target analysis.

(1) Mission.

(2) Target vulnerability.

(3) Size and shape.

(4) Location.

(5) Avenues of approach.

6. Armament Systems. (See Fig. XI-1, XI-2)

a. M6, M16, and M21. The M6 and automatic gun of the M21 are highly effective weapons subsystems designed primarily for neutralization fire operations. They are capable of providing complete cover for escort missions because of their flexibility. Both systems have consistently demonstrated their effectiveness against personnel and light material targets in the Republic of Vietnam. The M6 system consists of four M60C machineguns mounted two on each side of the aircraft. The M16 has the same configuration as the M6 with the addition of two rocket pods with seven 2.75" FFAR per pod. The M21 consists of two miniguns, one mounted on each side of the aircraft, plus two rocket pods mounted the same as the M21 subsystem.

b. M5. The M5 weapons subsystem is the first armament system designed exclusively for an Army helicopter. The M5 was developed as an area fire weapon to be used against troops, and other soft targets. It provides an immediately responsive and highly mobile means of delivering volume area fire in support of airmobile and ground maneuver elements. It fires the 40mm grenade.

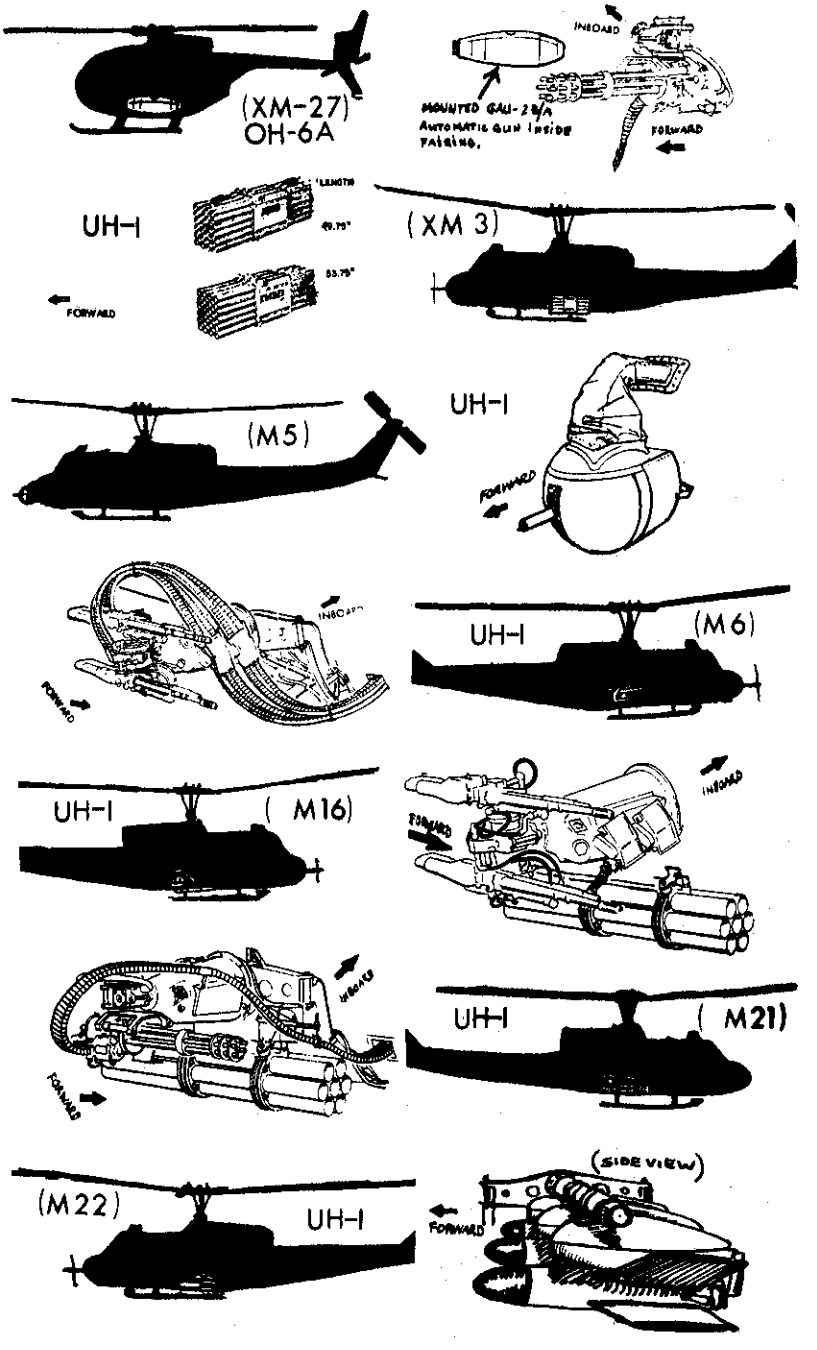
c. XM3. The XM3 subsystem is used primarily on LZ prestrikes, destructive and neutralization type missions. The XM3 subsystem consists of 24 2.75" rocket pods mounted on each side of the aircraft, giving a total payload of 48 2.75" Folding Fin Aerial Rockets. The system is mounted on the external stores pylons of the aircraft.

Folding Fin Aerial Rocket. The 2.75" FFAR is an integrated part of the M21, M16 and the XM3 subsystems. It is designed to be employed as direct fire area weapon against troops, lightly armored vehicles and other soft targets. The rocket, when in use on the attack helicopter provides a means of delivering immediately responsive and highly mobile nonuclear direct fire support for airmobile and ground maneuver elements.

d. M22. The M22 subsystem is the most destructive system used by attack helicopters. This system is used primarily against point type targets such as tanks and armored personnel carriers. The system consists of six AGM-22B wire guided missiles. This missile will defeat any known armor in the world - 23" of armor at a 90° angle.

TYPE AIRCRAFT USED . . .		UH-1	UH-1	UH-1	UH-1	UH-1	UH-1	OH-6A
HELICOPTER ARMAMENT SYSTEM		XM3	M5	M6	M16	M21	M22	XM-27
AMMUNITION	Capacity	48 rockets	150 rounds	6700 rounds	6700 rounds 14 rockets	6400 rounds 14 rockets	6 missiles	2000 rounds
	Type	2.75 inch	40mm	7.62mm	7.62mm 2.75 inch	7.62mm 2.75 inch	AGM22B	7.62 mm
	Burst Radius	10 meters	10 meters	NA	NA 10 meters	NA 10 meters	NA	NA
RANGE	Maximum	9300 meters	1750 meters	3200 meters	3200 meters 9300 meters	3200 meters 9300 meters	3500 meters	3100 meters
	Effective	2500 meters	1200 meters	750 meters	750 meters 2500 meters	1000 meters 2500 meters	3500 meters	1000 meters
	Minimum	300 meters	300 meters	100 meters	100 meters 300 meters	100 meters 300 meters	500 meters	100 meters
RATE OF FIRE		6 pairs/ sec	220shots/ min	2200 shots/ min	2200 shots/min 6 psirs/sec	4000/4800 spm 6 pairs/sec	NA	2000/ 4000 spm
FLEXIBLE LIMITS (Machine Guns Only)	Vertical	FIXED	+15° -35°	+15° -60°	+15° -60°	+10° -85°	WIRE	+10° -24°
	Horizontal		60° left and right	70° out 12° in	70° out 12° in	70° out 12° in	GUIDED	NONE
WEIGHTS	Loaded Unloaded	1439 lbs 452 lbs	335 lbs 233 lbs	830 lbs 428 lbs	1294 lbs 604 lbs	1346 lbs 674 lbs	682 lbs 249 lbs	276 lbs 96 lbs

Fig. XI-1


(XM-27)
OH-6A
INBOARD
FORWARD
UH-1
FORWARD
(XM 3)
(M5)
UH-1
FORWARD
UH-1
(M6)
UH-1
(M16)
INBOARD
FORWARD
UH-1
(M21)
(M22)
UH-1
(SIDE VIEW)
FORWARD

7. Safety. The primary consideration of any aviator is the accomplishment of his assigned mission as safely and expeditiously as possible. The same considerations for aircraft safety are as appropriate to any aircraft and equally applicable to attack helicopters. The mounting of weapon systems on the aircraft create additional requirements. Additionally, operating these aircraft in a training environment impose some artificial restrictions on their operation to insure the safety of personnel and facilities in the area of training. The following ten rules will be followed on the aerial gunnery ranges at Fort Rucker and have general application to the operation of attack aircraft anywhere.

a. Immediately upon arriving at the aircraft, insure that all armament switches are off, circuit breakers are out and weapons are clear.

b. Circuit breakers will be reset and switches turned on only after the aircraft are airborne from the base heliport.

c. Ammunition will not be inserted in the chutes of the M-21 system or beyond the drive motors of the M-16 system prior to arrival at the ranges.

d. No weapon will be fired from a helicopter on the ground after rockets have been loaded.

e. Barrels will be mounted on the M-16 system only after arrival at the range.

f. Safing sector of the M 134 minigun will not be mounted prior to being cleared to fire.

g. Armed helicopters on the range will be approached and departed directly to the sides. Do not walk in front of any helicopter on the range. The fact that the guns on one side of a helicopter have been cleared does not mean that both sides have been cleared.

h. All firing on the ranges will be done within the range limits published for that range.

i. Switches will not be armed prior to crossing the "Start Fire Line" and will safe prior to crossing the "Cease Fire Line" or breaking from a firing run.

j. Prior to departure from the ranges, all weapons will be clear, ammunition removed from the chute, switches off and circuit breakers out. Barrels will be removed from the M 16 system and safing sectors removed from the M 134.

These basic safety requirements are applied here at Fort Rucker and every student aviator should become thoroughly familiar with them. It should be remembered that these safety requirements do not end here at Fort Rucker. When reassigned to Vietnam or elsewhere, you should remember these basic safety precautions when working on or around armed helicopters.