Chapter 9

TRAINING POLICY

9-1. **General.** This chapter outlines procedures, requirements, and restrictions for qualification and continuation training or evaluation flights. See AFRs 60-1, 60-16, and 51-2, as supplemented, for additional information.

9-2. **Crew Complement and Scheduling:**

a. Minimum Crew Complement. See paragraph 3-2.

b. Crew Qualification. See paragraph 3-1. If passengers other than mission essential ground personnel are carried, noncurrent or unqualified pilots will not perform crew duties.

9-3. **Crew Duty Time. See paragraph 3-11.**

9-4. **Not Used**

9-5. **Debriefing:**

a. Review and evaluate overall training performed.

b. Advise student or aircrew member of future training requirements.

c. Answer technical questions.

d. Training reports completed and recorded.

9-6. **Training Aircraft Not Capable of Flight (Not applicable to ARF).** If an aircraft is not in commission or otherwise capable of departure within four hours after scheduled departure time, the training mission will be cancelled and the crew rescheduled. Departure consists of actual takeoffs for assigned/planned training missions, and does not include maintenance ops checks or aborted hover checks. Exceptions may be granted by the flying unit commander or operations officer with concurrence of the aircraft commander. The delayed departure is not to be charged as a crew delay.

9-7. **Weather Criteria For Training. See paragraph 6-22.**

9-8. **Special Maneuvers:**

a. Only the 1550 CCTW is authorized to conduct forced landing training. This training is limited to the H-1F and will be held to the minimum necessary to meet proficiency requirements of the appropriate syllabus and course training standards. Procedures and minimum altitudes will be IAW 1550 CCTW directives.

b. Request radar traffic advisories for all phases of simulated instrument flight to the maximum extent possible. (Not applicable for PAVE LOW low-level TF operations.)

c. Initiate simulated instrument missed approaches no lower than the published minimum altitude for the approach being flown.

d. Accomplish H-3/53/H-60 touch-and-go landings IAW the flight manual. Touch-and-go landings do not require an instructor pilot at the controls as long as the throttles are set at maximum (100% Nr for H-60) for the approach, landing, and takeoff.

e. Live Hoist Training (Non-Exercise). Restrict live hoist training to the minimum necessary to accomplish initial qualification, requalification, and proficiency training. Unit commanders determine eligibility of personnel to ride the hoist during training. Recommended hoist altitude is 10 feet, but may be higher when required by the mission. When over water or over vessels, hover at the minimum altitude necessary to avoid salt spray. Practicing hoist with or without a tag line is permissible.

9-9. **Remote Area Operations Training:**

a. Power Restrictions:

(1) Clear escape route—hover power +5% (EXCEPTION: H-1F/H—3 PSI or 24 pph)

(2) Restricted escape route—OGE +5% (EXCEPTION: H-1F/H—3 PSI or 24 pph)

b. Simulated Maximum Power Remote Operations Maneuver:

(1) Accomplish high and low reconnaissance and compute the power required to accomplish the maneuver. Use the computed power as the simulated maximum power available; however, do not hesitate to use all available power in the interest of safety.

NOTE: Prior to the first water hoist or remote area operations a power available check will be accomplished.

(2) Approach/Landing. Initiate the approach after careful consideration of all factors influencing the crew and aircraft performance. (See chapter 19 for operational considerations.) Try to fly the approach using no more than the power computed for the hover or landing. Vary closure rate, and vertical velocity to fly the desired approach angle and arrive at the specific landing/hover spot. As the aircraft decelerates, be cognizant of the influence that wind, ground effect, and translational lift have upon your ability to control vertical velocity. Attempting to arrest a high descent rate with power can result in settling with power, rotor droop and subsequent loss of tail rotor effectiveness and landing hard.

(3) Takeoff. Accomplish the takeoff using simulated maximum power takeoff techniques without applying more than the simulated maximum power available. Recompute takeoff power if required.

9-10. **Unaided Night Remote Area Operations Training Site (for NVG/PAVE LOW refer to chapter 30):**

a. Site Selection:

(1) The minimum size of the landing area must be at least two rotor diameters.

(2) Sites must be selected where the vertical development of the surrounding terrain does not restrict the pilot's option to execute a go-around, with minimum maneuvering, at any point in the approach. Additionally, the terrain within 3 NM of the site will not exceed 200' above the site elevation.

NOTE: This requirement may be satisfied by restricting the approach and departure route to directions which will avoid terrain exceeding the above criteria.

b. Prior to full darkness:

(1) A visual survey of the site will be made to check for obstacles, general site condition and wind. This survey may be accomplished by other crews flying during the day, or by ground party. After darkness, a survey may be accomplished by NVG equipped crews.

(2) Position lights to outline the landing site. Refer to figures 19-7 and 19-8 for optional lighting pattern.

c. Prior to making the first approach, determine wind direction. Forecast winds may be used when wind direction cannot be determined otherwise. When using forecast winds ensure an adequate power margin is available in the event winds differ from forecast.

d. Do not leave flight altitude until the location of the LZ has been positively identified.

e. Plan night navigation and remote area operation in such a way that a realistic training scenario is created. A ground party may be utilized to increase the realism of the training.

f. For 37 ARRS: This training may be accomplished at launch control facilities (LCFs) or launch control centers (LCCs). If LCF or LCC pads are used, a survivor or safety observer is not required, provided lights from the complex make the pad clearly discernible.

9-11. Simulated Instrument Flight. The use of a hood or other artificial vision-restricting device is not authorized for any phase of flight. (Exception: A vision-restriction device is authorized for PAVE LOW system training providing an instructor with unrestricted vision has access to a set of flight controls.) Simulated instrument flight may be flown and logged without use of a vision-restricting device.

9-12. Helicopter Maneuver Standards and Simulated Emergency Flight Procedures. See tab 9-A.

TRAINING GUIDE

1. Maneuver standards are provided to supplement the flight manuals. These procedures are intended for use on all missions, but may not reflect the optimum performance required for some operational situations. Deviations from this guide may be made, if required, to accomplish mission objectives. Operational/special mission maneuvers not addressed in this tab will be conducted IAW the appropriate directive/technical order that defines such maneuvers.

2. Emergency procedures training is designed to develop aircrew proficiency, reaction time, planning, and judgment in preparation for actual emergencies. Simulated emergencies must provide realistic training without unacceptably increasing risk. Instructors should be alert and take prompt action to terminate simulated emergency maneuvers and execute a go-around at the first indication of deteriorating aircraft performance or serious student proficiency problems. Place emphasis on the procedures for positive identification of the simulated emergency condition before initiating corrective action. System failures must not be unreasonably compounded and must not be simulated in conjunction with a simulated engine failure unless normally associated with that engine failure. The surprise approach of initiating emergency procedures, aircraft system failures, or unusual attitude training must be tempered to allow for a possible wrong reaction/ mistake which could jeopardize safety; therefore, such emergencies will only be practiced with sufficient airspeed and altitude to ensure a safe recovery. In high density traffic areas, emergencies which could require an in-depth analysis/discussion or detailed cockpit duties should only be simulated when traffic congestion is at a minimum. Accomplish all simulated emergency maneuvers IAW the flight publication and this tab.

3. Simulated Emergency Restrictions/Procedures:

a. Prohibited Maneuvers. The following maneuvers will not be accomplished in the aircraft:

(1) Actual engine shutdown
(2) Blade stall and power settling
(3) Dual fuel control failures
(4) Dual hydraulic system failures
(5) Boost-off to a hover (H-1F/H)
(6) Manual fual to a hover (H-1F)
(7) Water landing (except H-3)
(8) Slide takeoff (H-1) (Exception: UH-1N for overriding operational requirements, providing max gross weight is not exceeded.)

b. Special Restrictions. Unusual attitude training and emergency procedures involving engines, engine fuel systems, flight controls, or hydraulic systems will be accomplished only:

(1) During daylight visual meteorological conditions.
(2) Prior to official sunset.
(3) During training/currency/evaluation flights.
(4) When passengers are not aboard.
(5) When an instructor/flight examiner pilot is designated on flight orders under "Crew Position" as IAC or FEAC and occupies a pilot seat with a set of controls. Instructor pilot candidates may perform or supervise simulated emergencies and during initial evaluations under the supervision of a flight examiner pilot not in a pilot seat if the other pilot at the controls is qualified in the aircraft. (Exception MH-53 certified aircraft commanders may perform AFCS off.)

c. Practice Autorotations. The following policy is established for practice autorotations:

(1) Due to the risk associated with this maneuver, carefully consider wind, density altitude, aircraft gross weight, and individual pilot proficiency prior to training/currency. Fly each approach as if a landing may be required. If a malfunction occurs, then the aircraft is then in position to execute a safe landing.

(2) The initial autorotation for training/currency will be a straight-ahead autorotation accomplished by the instructor to evaluate aircraft performance (during evaluations, the pilot being evaluated may perform this autorotation).

(3) Instructor pilots will terminate the maneuver and initiate a power recovery at the first indication of abnormally high/low rotor RPM, excessive sink rate, low airspeed, ineffective flare, or at any time an inadvertent touchdown might occur.

(4) Autorotations will be accomplished to a runway, taxiway, or approved slide area, if possible. When such an area is not available, a smooth level area is to be selected, and the instructor/flight examiner will ensure it is free of obstructions prior to commencing training.

(5) Except for H-1F/H hovering autorotations, all practice autorotations will be terminated with a power recovery.

(6) Power recovery autorotations require the aircraft to be aligned within 45 degrees of the wind direction on final approach. For hovering autorotations, the wind must be aligned within 15 degrees. A functional wind indicating device must be close enough to the recovery point to provide readily discernible, accurate wind information.

(7) H-1 Autorotation Procedures:

(a) Minimum entry altitude is 800 feet AGL for 180-degree turning autorotations; 500 feet AGL for all others (except hovering autorotations H-1F/H). Minimum airspeed prior to the flare is 60 knots, (50 knots—H-1F). For 180-degree turning autorotations the aircraft must be wings level, have a minimum of 60 KIAS (50 KIAS—H-1F) rotor RPM within limits, normal rate of descent and be aligned with landing/recovery heading at no lower than 150 feet AGL. If any of these conditions are not met, initiate a power recovery immediately. The wings level requirement does not prohibit minor heading corrections on final.

(8) H-3 minimum entry altitude for 180-degree autorotations is 800 feet AGL; 500 feet AGL for all others. During 180-degree autorotations, the aircraft must be wings level, have a minimum of 60 KIAS, rotor RPM within limits, and be aligned with landing/recovery heading at no lower than 200 feet AGL. If any of these conditions are not met, initiate a power recovery immediately. The wings level requirement does not prohibit minor heading corrections on final.

(9) H-60A minimum entry altitude for 180-degree autorotations will be 800 feet AGL; 500 feet AGL for all others. The power control levers will not be retarded. Initiate the flare between 125 and 75 feet AGL with a minimum of 70 KIAS. The power recovery will be completed no lower than 15 feet. For all autorotations, the aircraft must be wings level, have a minimum of 80 KIAS, rotor RPM within limits, and be aligned for landing/recovering heading at no lower than 150 feet. If any of these conditions are not met, initiate a power recovery immediately. The wings level requirement does not prohibit minor heading corrections on final.

(10) H-53 minimum entry altitude for autorotations will be 1,000 feet AGL. The throttles will not be retarded.

d. Simulated Single-Engine Emergencies. The following procedures apply to dual-engine helicopters:

(1) Single-engine approaches and landings must be practiced to a hard surface landing area or slide area.

(2) Initiation of practice single-engine emergencies will not be lower than the following:

(a) 150 feet AGL, 55 KIAS, for H-1N or in a hover (paragraph 5t, this tab)

(b) 300 feet AGL, 70 KIAS, for H-3

(c) 300 feet AGL, 80 KIAS, for H-53

(d) 300 feet AGL, 80 KIAS, for H-60A

NOTE: Practice single-engine emergencies may be initiated below the above listed altitude as long as torque available is limited on both engines versus reducing torque available on the simulated failed engine. Instructors must use caution when simulating single-engine emergencies at low altitudes and airspeeds.

(3) The following simulated single-engine maneuvers will be practiced by limiting the torque available on both engines versus reducing torque for the simulated failed engine:

(a) Single-engine join ups—air refueling

(b) Single-engine approaches to a spot (H-3)

(c) Water landings (H-3)

e. Boost—OFF (H-1), Aux Servo—OFF (H-3), and AFCS—OFF (H-53/60A). Conduct under the following limitations:

(1) Maneuvers will be initiated in straight and level flight at a minimum altitude of 300 ft AGL and 70 KIAS for H-3, 300 ft AGL and 80 KIAS for H-53/60, and 500 ft AGL and 70 KIAS for H-1. UH-1N may enter boost off on the ground.

(2) Approaches to a hover/landing will be made to a hard surface landing area or slide area (H-1 execute shallow approach).

(3) If any control difficulties are encountered while the system is off, the instructor/flight examiner will take control of the aircraft and restore the system as appropriate.

4. General Procedures:

a. Takeoffs and landings will be made using a constant heading or ground track into the wind or alignment with the runway. Crosswind correction will be accomplished by using the wing-low method on takeoff until a climb is established and during the final portion of approach. At other times, the crab method may be used.

b. Maneuvers will be flown with emphasis on precise altitude, airspeed, and aircraft control.

c. Instrument flying will be IAW AFR 51-37 and the flight publication. H-3 unusual attitude training will only be performed in the simulator.

d. Minimum light/communications out procedures in Chapter 30 may be used without NVG's by aircrews not qualified in NVG operations.

5. H-1 Procedures:

a. One hundred percent Nf will be used for all maneuvers in the H-1N; 6600 N2 in the H-1H; 6450 ± 50 Nf in the H-1F.

b. Entry altitude for all approaches will be 300 feet AGL unless specified otherwise in this regulation.

c. A 3- to 5-foot skid height will be used for all hovering maneuvers.

d. Landing/searchlights will be on for all night takeoffs and after turning final for night approaches unless safety, weather, excessive glare or aircraft operational procedures dictate otherwise.

e. Takeoff to a Hover: IAW Flight Manual.

f. Taxiing—5 knots maximum groundspeed.

g. Sideward/Backward Flight:

(1) Constant heading and groundspsed

(2) Five knots maximum groundspeed

h. Landing from a Hover: IAW Flight Manual.

i. 360 Degree Hovering Turns:

(1) Constant rate of turn

(2) Fifteen knots maximum wind velocity for training

j. Crosswind Takeoff and Landing:

(1) Heading 90 degrees from wind direction

(2) Fifteen knots maximum wind velocity for training, except when taxiing to/from parking area on initial departure and termination

k. Normal Takeoff/Climbs:

(1) Hover power plus 5-8 PSI (40-60 pph) H-1F; 5 PSI H-1H; 10 percent H-1N

(2) Seventy KIAS for climb

(3) To initiate the takeoff from the ground, increase collective smoothly as for takeoff to a hover. As the aircraft leaves the ground, accelerate forward at hover altitude passing translational lift, then continue the takeoff.

l. Marginal Power Takeoff:

(1) Simulate maximum power will be hover power

(2) Fifty foot simulated obstacle

(3) Initiate the takeoff by smoothly applying forward cyclic. As the aircraft accelerates, it may tend to settle, especially with light or calm winds. (If necessary, compromise the maneuver by adding power to avoid ground contact.) Parallel the ground at three to five feet until translational lift is attained. After passing through translational lift, initiate a climb (without decelerating below translational lift speed) so as to clear the 50 foot simulated obstacle. Continue to accelerate (without descending) to 50 KIAS. At 50 KIAS, the manuever is terminated and a normal climb (power and airspeed) will be established.

m. Maximum Performance Takeoff:

(1) Simulated maximum power available: Hover plus 5-8 PSI (40-60 pph) H-1F/H, 10-15 percent H-1N.

(2) One hundred foot simulated obstacle.

(3) Smoothly increase power to the required setting. After the aircraft has left the ground and is passing through normal hover altitude, establish a slightly nose-low attitude. Maintain attitude until passing 100 feet AGL, then smoothly lower the nose without descending and increase the airspeed to 70 KIAS. When this speed is attained, adjust power and attitude to maintain a normal climb.

n. Traffic Pattern. If a rectangular traffic pattern is flown, fly the downwind leg at 500 feet AGL and 90 KIAS (80 KIAS H-1F). During the turn to base descend to 300 feet AGL and slow the aircraft to 70 KIAS (60 KIAS H-1F). The before landing checklist will be accomplished prior to turning final. (Pattern altitudes specified above may be adjusted to comply with local traffic control rules.) Other pattern types may be flown as the situation warrants; however, caution must be exercised to avoid excessive bank angles/descent rates or low airspeeds. The point of rollout on final should allow controlled, straight approach without a need for aggravated flares, abrupt control movements, or large collective input.

o. Normal/Shallow Approach: IAW flight manual

p. Steep Approach: IAW flight manual

q. Approach to a Touchdown:

(1) Zero, or near zero, groundspeed

(2) Landing attitude

(3) Initiate and fly the desired approach angle. As hover altitude is approached, continue the descent and angle while slowing the groundspeed and vertical velocity to have a landing attitude, at or near zero groundspeed, upon touchdown. Cushion the touchdown with collective and continue to fly the aircraft fully onto the ground.

r. Slide Landing: IAW flight manual

s. Manual Fuel Operations:

(1) H-1F Simulated Fuel Control Failure: Enter inflight at normal traffic pattern altitude and airspeed, within autorotational distance of a suitable landing area. The minimum ceiling for manual fuel training is 1,000 feet. To return to automatic fuel mode on the ground, slowly rotate the throttle to full open and hold the manual fuel switch down until the manual fuel light goes out, plus 5 seconds. To return to automatic fuel mode inflight, slowly open the throttle. As RPM increases above the manual setting, hold the manual fuel switch down until the manual fuel light goes out, plus 5 seconds. Limit manual fuel operations to the minimum required for training. To avoid system overheat, do not fly back-to-back manual fuel approaches.

(2) H-1H Simulated Fuel Control Failure: Entry will be at normal traffic pattern altitude and airspeed, within autorotational distance of a suitable landing area or while on the ground with the throttle at flight idle. To return to automatic fuel control after landing, reduce the throttle to flight idle after the collective is at minimum. Return the governor switch to automatic when N1 is below 70 percent, but before it reaches 60 percent.

(3) H-1N Simulated Fuel Control Failure: Entry will be at normal traffic pattern altitude and airspeed, in a hover when single-engine hover capability is available or while on the ground. Ensure collective setting is below maximum single-engine torque available prior to retarding the throttle to flight idle. Positively identify and place the corresponding fuel governor switch to manual position. Increase the throttle to maintain torque approximately 5-10 percent below the governed engine. To return to automatic fuel mode, use the same procedure as for entering manual fuel.

t. H-1N Simulated Single-Engine Flight and Landing:

(1) Single engine entry will not be initiated unless indicated torque is below the maximum computed single-engine torque available.

(2) Prior to the approach, confirm computed single engine power is available.

(3) If any unsafe conditions exist both engines will be used for the go-around.

u. Unusual Attitude Training. Instructors simulating unusual attitudes for training will not exceed 30 degrees of bank, a 20 degree nose high attitude, or a 10 degree nose low attitude. Unusual attitude training is recommended for pilots receiving or maintaining NVG qualification. This training should be kept to a minimum. Unusual attitude training will not be initiated below 1000 feet AGL.

v. Emergency Procedures. Actual and practice emergency procedures are accomplished IAW applicable flight manuals unless specified otherwise in this chapter.

6. H-3 Procedures:

a. Maneuvers will be planned and executed to use a minimum of 103 percent Nr.

b. Entry altitude for approaches will be 300 feet AGL.

c. Taxiing:

(1) One hundred two (102) percent Nr minimum

(2) AFCS on

(3) Minimum pitch necessary

(4) To start the aircraft rolling, increase collective to approximately 25 percent torque and use a small amount of cyclic if required. Once the aircraft starts to roll, collective may be lowered to the minimum necessary to maintain taxi speed.

(5) Maximum taxi speed will normally be 5 kts.

d. Hovering (Initial Takeoff). Altitude five feet wheel clearance, or sufficient altitude to clear obstruction.

e. Sideward/Backward Flight:

(1) Altitude at least five feet wheel clearance above the surface or obstructions

(2) Constant heading or ground track

(3) Maximum five knots apparent groundspeed

f. Three Hundred Sixty Degree (360°) Hovering Turns:

(1) Altitude five feet wheel clearance above the surface or obstructions

(2) Constant rate of turn over a spot.

(3) Three hundred sixty-degree (360°) hovering turns will not be practiced when winds exceed 20 knots.

g. Landing from a Hover. Use caution to avoid landing while drifting sideways. After touchdown, the collective pitch should be placed smoothly in the full down position.

h. Normal Takeoff from a Hover:

(1) Throttles Maximum

(2) Use 20 percent torque above hover power (not to exceed 103 percent torque), or until Nr droops to 100 percent, whichever occurs first.

(3) Gradually move forward from the hover while smoothly pulling in the power listed in (2), above. After accelerating through translational lift, bring the nose up and establish a 70-80 KIAS climb. Accomplish the after takeoff check after passing 100 feet AGL and 70 KIAS. Climb airspeed is 70-80 KIAS.

i. Normal Takeoff from the Ground:

(1) Throttles Maximum

(2) Use 20 percent torque above hover power (not to exceed 103 percent torque), or until Nr drops to 100 percent, whichever occurs first.

(3) Smoothly and steadily increase collective until reaching power listed in (2), above. As the helicopter clears the surface, adjust pitch altitude (approximately 5 degrees nose low) until approaching 70-80 KIAS, then raise the nose slightly (approximately 3-5 degrees nose high) to establish a 70-80 KIAS climb. CAUTION: Avoid an excessive nose low attitude while near the ground.

j. Normal Running Takeoff:

(1) Align with wind on smooth hard surface or runway heading.

(2) Increase collective to 30 percent torque and initiate ground roll.

(3) At approximately 30 KIAS, move cyclic aft and smoothly increase collective to desired power (approximately 20 percent more than hover power), and allow aircraft to fly off the ground.

(4) Climb IAW the single-engine height velocity diagram and accelerate to 50 knots.

(5) At 50 KIAS, adjust power as desired, initiate climb, and accelerate to climb airspeed.

k. Running Takeoff (Simulated Heavy Weight):

(1) Use a paved or smooth, hard surface only

(2) Throttles maximum

(3) Limit torque to 10 percent less than that required to hover with a five foot wheel clearance.

(4) Start the aircraft rolling forward by applying forward cyclic and approximately 30 percent torque. Approximately 30 knots indicated airspeed, apply simulated maximum power available, and aft cyclic to fly the aircraft smoothly off the ground. After takeoff, climb IAW the single-engine height velocity diagram and accelerate to 50 KIAS (runway and terrain permitting). The simulated maneuver will be terminated upon reaching 50 KIAS and a normal climbout will be accomplished.

l. Maximum Performance Takeoff (Simulated):

(1) Throttles maximum

(2) Use 30 percent torque above hover power (not to exceed 103 percent torque) or until Nr drops to 100 percent, whichever occurs first.

(3) Initially increase power so the aircraft becomes light on the wheels. Then increase power smoothly to maximum or simulated maximum. Airspeed should be increased until reaching 200 feet altitude and 50 KIAS. At this point, accelerate to safe single-engine airspeed (70-80 KIAS) before establishing a normal climb profile.

m. Traffic Pattern. If a rectangular pattern is flown, the downwind leg will be flown at 500 AGL and 90 knots airspeed; during the turn-to-base descend to 300 feet AGL and slow the aircraft to 70 knots. A level turn will be made to the final approach heading. The before landing check will be accomplished on the downwind leg.

NOTE: These altitudes will be used whenever possible if local conditions will permit, otherwise comply with appropriate local traffic patterns.

n. Normal Approach:

(1) Seventy knots entry airspeed

(2) Thirty-degree apparent angle of descent

(3) Control rate of descent so it does not exceed 500 FPM. Constantly decrease airspeed during the approach so the aircraft leaves translational lift as it enters ground effect.

o. Steep Approach:

(1) Fifty knots groundspeed

(2) Forty-five degrees apparent angle of descent

(3) Control rate of descent so it does not exceed 500 FPM throughout approach and 300 FPM during the last 100 feet. Constantly decrease airspeed during the approach so the aircraft leaves translational lift as it enters ground effect.

p. Shallow Approach:

(1) Seventy knots entry airspeed

(2) Ten-degree apparent angle of descent

(3) Control rate of descent so it does not exceed 500 FPM. Constantly decrease airspeed during the approach so the aircraft leaves translational lift as it enters ground effect.

q. Running Landing:

(1) Seventy knots entry airspeed

(2) Ten-degree apparent angle of descent

(3) Adjust collective pitch, as necessary, to maintain the desired approach angle and dissipate speed gradually throughout the approach so the landing can be accomplished while maintaining translational lift. Use caution so as not to have an excessive nose high altitude at touchdown. After aircraft is firmly on the ground, apply wheel brakes.

r. Practice Single-Engine Landing:

(1) Simulated engine failure will not be initiated (retarding throttle) below 300 feet AGL/70 KIAS.

(2) Practice single-engine landings will only be made on smooth, hard surfaces approved for such training maneuvers.

(3) Engine failure will be simulated by retarding either speed selector until the Nf needle decreases to 96-98 percent Nf. Simulate those checklist items which would shut down the engine, cause auxiliary tanks to jettison, or create any unsafe condition.

(4) Accomplish the single-engine failure checklist. Simulate as necessary.

(5) Simulated single-engine landing to minimum roll and simulated single-engine water landings will be accomplished by limiting torque available on both engines. In no case will the throttle be retarded.

(6) A normal traffic pattern may be flown or a straight-in-approach initiated; however, avoid unnecessary delay in establishing an approach for a safe landing and if possible maintain or climb to a minimum of 500 feet AGL and 70 KIAS until intercepting the desired approach angle.

(7) Follow procedures outlined in TO 1H-3(C)E-1, section III.

s. Night Operations. Night transition will be flown the same as day transition except that emergencies will not be practiced. Landing/ searchlights will be on for all night takeoffs and on final for night approaches, unless safety, weather, excessive glare or operational procedures dictate otherwise.

t. Water Operations. Water transition will be accomplished the same as day transition with the following exceptions:

(1) Prior to initiating a water landing, the pilot in command will evaluate the water landing area for suitability and drop a smoke device to be used as a reference (EXCEPTION: When wind direction can be determined by other means; i.e., flags, ponds, fires, or other wind indications, and an adequate shore line is available for reference, a smoke device need not be dropped for reference.)

(2) The first landing will be accomplished from a hover.

(3) Practice single-engine landings will be accomplished by limiting torque available on both engines.

(4) A slightly nose high attitude should be maintained during running landings in the water.

(5) Rotor shutdown will not be accomplished if sea conditions exceed sea state 2.

(6) Extreme caution must be exercised when landing on water to avoid nose high attitudes near the surface due to reduced tail rotor clearance on touchdown.

u. Marginal Power Takeoff:

(1) One hundred one (101) percent Nr (set in a five-foot hover).

(2) Takeoff path smooth, level, and clear of all obstacles.

(3) Initiate takeoff by lowering the nose, while avoiding ground contact, until translational lift is attained. After passing through translational lift climb IAW the height velocity diagram and continue to accelerate until reaching 50 KIAS. After a positive climb has been established, adjust engine power, accelerate to climb airspeed, and perform a normal climbout.

v. Actual and practice emergency procedures are accomplished IAW1H-3(c)E-1, Section III.

7. H-53 Procedures:

a. One hundred (100) percent Nr will be used for all maneuvers unless maximum Nr is specified. Maintain matched torques. Maximum Nr may be simulated when conditions permit.

b. Normally, entry altitude for all approaches except autorotations will be 500 feet AGL.

c. Ten-foot wheel clearance will be used for all hovering maneuvers.

d. Landing/spotlights will be on for all night takeoffs and on final for night approaches, unless safety, weather, excessive glare or operational procedures dictate otherwise.

e. Takeoff to a Hover:

(1) Vertical ascent to 10 feet wheel height

(2) Constant heading

f. Hovering and Hovering Turns:

(1) Constant altitude over a spot

(2) Constant rate of turn

g. Hover Taxiing and Sideward/Backward Flight:

(1) Constant heading and altitude

(2) Constant groundspeed five-knot maximum for training.

h. Crosswind Takeoff and Landing:

(1) Heading 90 degrees from wind direction

(2) Use extreme caution in strong or gusty crosswinds—avoid side drift.

i. Normal Takeoff from Hover:

(1) Constant heading

(2) Lower nose slightly (5-7 degrees) and gradually move forward. Maintain hover altitude or allow a gradual climb by increasing collective and accelerate through translational lift (approximately 15 knots).

(3) Passing through translational lift, adjust attitude and power as required for normal climb (approximately 20 percent Q more than hover power as a guide), increasing altitude and airspeed simultaneously.

(4) Above 100 feet and after passing 80 KIAS, perform After Takeoff Checklist, and adjust power to maintain the desired rate of climb.

(5) After initial takeoff, or when required, perform a power available check.

j. Takeoff Without a Hover:

(1) Constant heading

(2) Increase collective while climbing vertically until approximately 2 to 3 feet, and then proceed as in a normal takeoff from a hover.

k. Normal Running Takeoff:

(1) Active runway heading or into the wind

(2) Smooth firm surface

(3) Increase collective to 30 percent torque and initiate ground roll.

(4) At approximately 30 KIAS, move cyclic aft and smoothly increase collective to desired power (approximately 20 percent more than hover power as a guide), and allow aircraft to fly off the ground.

(5) Parallel the ground at approximately five to 10 feet AGL and accelerate to 50 KIAS.

(6) At 50 KIAS, adjust power as desired, initiate climb, and accelerate to 80 KIAS.

(7) At 80 KIAS, proceed as in a normal takeoff.

l. Running Takeoff (Simulated Heavyweight):

(1) Maximum Nr

(2) Proceed as with normal running takeoff

(3) At approximately 30 KIAS, increase power to simulated maximum (power to hover at 10 feet minus 10 percent Q), and allow the aircraft to fly off the ground.

(4) Parallel the ground at approximately five to 10 feet AGL, and accelerate to 50 KIAS.

(5) At 50 KIAS, the simulated maneuver will be terminated. Increase power to normal takeoff power, initiate climb, and accelerate to 80 KIAS.

(6) At 80 KIAS, proceed as in a normal takeoff.

(7) For an actual maximum gross weight running takeoff, maximum power available would be used.

m. VFR Traffic Pattern:

(1) The downwind and base legs of a rectangular pattern will be flown at 500 feet AGL or as specified in local directives.

(2) Airspeeds: 100 KIAS downwind, 80 KIAS base

(3) Other pattern types may be flown as the situation warrants; however, exercise caution to avoid excessive bank angles/descent rates or low airspeeds. The point of rollout on final should allow a controlled, straight approach without a need for aggravated flares or abrupt control movements.

n. Normal/Shallow Approach to a Hover:

(1) Entry - 500 feet AGL and 80 KIAS

(2) Normal approach - 30 degrees apparent angle

(3) Shallow approach - 10 degrees apparent angle

(4) Constant apparent angle, groundspeed and rate of descent

(5) Vary power and pitch to arrive simultaneously at zero groundspeed and rate of descent over intended spot at 10 feet above ground in a landing attitude.

o. Approach to a Touchdown:

(1) Fly as a normal approach

(2) Continue approach to the ground, touching down in a landing attitude with a groundspeed of five knots or less.

p. Approach to a Running Landing:

(1) One hundred percent Nr (maximum Nr if power is limited).

(2) Entry - 500 feet and 80 KIAS

(3) Approach angle - 10 degrees apparent

(4) Constant apparent angle, groundspeed and rate of descent

(5) Land on smooth, firm surface only

(6) Touchdown above translational lift not to exceed 40 knots groundspeed.

q. Maximum Performance Takeoff:

(1) Maximum Nr

(2) Smoothly increase collective to maximum power allowed.

(3) Establish a near level attitude and plan to arrive simultaneously at 300 feet AGL and 50 KIAS.

(4) At 50 KIAS, lower nose to approximately 10 degrees nose low increasing airspeed.

(5) At 80 KIAS, proceed as a normal takeoff.

(6) At reduced gross weight conditions, maximum power may be limited to make the maneuver more realistic for training.

r. Minimum Roll Running Takeoff/Simulated Heavyweight:

(1) Maximum Nr

(2) Takeoff on smooth, firm surface only.

(3) Apply forward cyclic and slowly increase collective to arrive at simulated maximum power (power required for 10-foot hover) as the aircraft passes through translational lift.

(4) Proceed as in running takeoff (simulated heavyweight).

s. Marginal Power Takeoff

(1) Maximum Nr

(2) Takeoff from a 10-foot hover using only that power required for the 10-foot hover.

(3) After passing through translational lift, continue to accelerate to approximately 50 KIAS. At 50 feet (simulated obstacle) lower the nose slightly and accelerate to normal climb airspeed.

t. Steep Approach:

(1) Maximum Nr

(2) Entry - 500 ft AGL and 50 knots groundspeed

(3) Approach angle - 45 degrees apparent

(4) Constant apparent groundspeed and rate of descent

(5) Maximum rate of descent - 500 to 700 FPM (maximum of 360 FPM during last 100 feet).

(6) On final, decrease airspeed from 80 KIAS.

(7) Vary power and pitch to arrive simultaneously at zero groundspeed and rate of descent over intended spot at 10 feet above ground, or continue to a touchdown.

u. Emergency Procedures. Actual and practice emergency procedures are accomplished IAW TO 1H-53(H)B-1.

8. H-60A Procedures:

a. One hundred percent Nr will be used for all maneuvers.

b. Entry altitude for approaches will be 300 feet AGL unless specified otherwise in this regulation.

c. A 10-foot wheel clearance or sufficient altitude to clear obstructions will be used for all hovering maneuvers.

d. Takeoff to a Hover:

(1) Vertical ascent to 10-foot wheel clearance.

(2) Constant heading.

(3) Check power required to hover with precomputed data on TOLD card.

e. Sideward/Backward Flight:

(1) Constant heading or ground track.

(2) Five knots maximum groundspeed.

f. Three Hundred Sixty Degree (360°) Hovering Turns:

(1) Constant rate of turn over a spot.

(2) Fifteen knots maximum wind velocity for training.

g. Landing From a Hover:

(1) Vertical descent.

(2) Constant heading.

(3) Use caution to avoid landing while drifting sideways.

h. Hover Taxi - Five Knots Maximum Groundspeed.

i. Ground Taxi:

(1) Unlock tail wheel.

(2) Minimum pitch necessary.

(3) Maximum taxi five knots groundspeed.

(4) To start the aircraft rolling, increase collective and use a small amount of cyclic if required. Once the aircraft starts to roll, collective may be lowered to the minimum necessary to maintain taxi speed.

j. Normal Takeoff From a Hover:

(1) Constant heading and ground track.

(2) Increase power to approximately 10 percent torque above hover power and lower nose slightly, not to exceed 10 degrees nose low, to establish an 80 KIAS climb.

WARNING: On all takeoffs, the pilot not flying will verbally call out the stabilator indicator programming as the airspeed passes 40 KIAS.

k. Marginal Power Takeoff:

(1) Ten-foot wheel clearance.

(2) Hover power.

(3) 50 KIAS.

(4) Fifty-foot simulated obstacle.

(5) Initiate the takeoff by smoothly applying forward cyclic. As the aircraft accelerates, it may tend to settle (depending on wind velocity); however, add only enough power to avoid ground contact. After passing through translational lift, accelerate to establish a 50 KIAS climb. At 50 feet AGL (simulated obstacle) lower nose slightly and accelerate to normal climb airspeed.

l. Maximum Performance Takeoff:

(1) Simulated maximum power available; hover power plus 15 percent.

(2) Increase power to the required setting. After the aircraft has left the ground and is passing through normal hover altitude, establish a slightly nose-low altitude. Maintain attitude until passing 100 feet. At this point accelerate to safe single-engine airspeed (70-80 KIAS) before establishing a normal climb profile.

m. Traffic Pattern. If a rectangular pattern is flown the downwind leg will be flown at 500 ft AGL and 100 KIAS. During the turn-to-base, descend to 300 ft AGL and slow the aircraft to 80 KIAS. A level turn will be made to the final approach heading. (The before landing check will be accomplished on the downwind leg.)

NOTE: These altitudes will be used whenever possible if local conditions will permit, otherwise comply with appropriate local traffic patterns.

n. Normal/Shallow Approach:

(1) Normal approach - 30° apparent angle

(2) Shallow approach - 10° apparent angle

(3) Initiate the approach from 300 feet AGL with 80 KIAS. When the desired angle is intercepted, start a gradual reduction of airspeed. Maintain the apparent angle at which the approach is started and a constant closure rate.

o. Steep Approach:

(1) Fifty knots groundspeed.

(2) Forty-five-degree apparent angle.

(3) Maintain the apparent angle at which the approach is started throughout the approach. After the approach is entered, reduce the rate of descent to 800 feet a minute, maximum.

p. Approach to a Touchdown:

(1) Zero, or near zero, groundspeed at a specific landing spot.

(2) Landing attitude.

(3) Initiate and fly the desired approach angle. As hover altitude is approached, continue the descent and maintain angle while slowing the groundspeed and vertical velocity to have a landing attitude, at or near zero groundspeed upon touchdown. Cushion the touchdown with collective and continue to fly the aircraft fully onto the ground.

q. Running Landing:

(1) Eighty knots entry airspeed.

(2) Ten-degree apparent approach angle.

(3) Tail wheel locked.

(4) Adjust collective pitch to maintain the desired approach angle and dissipate airspeed gradually throughout the approach so the landing can be accomplished while below 60 knots groundspeed, but above translational lift. Use sufficient collective to cushion touchdown of the tail

wheel and main gear. Do not exceed 25 degrees nose high attitude at touchdown. After aircraft is firmly on the ground, use cyclic and collective as necessary to stop forward motion.

r. Practice Single-Engine Landing:

(1) Practice single-engine landings will only be practiced on smooth, hard surfaces approved for such training maneuvers.

(2) Engine failure will be simulated by retarding either throttle to produce a torque split.

(3) Accomplish single-engine failure checklist. Simulate those items which would shut down an engine, or create any unsafe condition.

(4) A normal traffic pattern may be flown or a straight-in-approach initiated; however, avoid unnecessary delay in establishing an approach for a safe landing.

(5) Use parameters for a running landing or shallow approach to a hover if single-engine hover power exists.

s. Stabilator Malfunction:

(1) Enter malfunction by taking control of the stabilator manual slew switch. (Maximum of 10 degrees nose low.)

(2) Maintain collective position settings at the time of the failure, adjust airspeed as necessary.

(3) Compiste appropriate checkliste.

t. AFCS OFF, conduct under the following limitations:

(1) Maneuvers will be initiated in straight and level flight at normal traffic pattern altitudes.

(2) Approaches to a hover/landing will be made to a hard surface landing area or slide area.

(3) If any control difficulties are encountered while the system is off, the instructor/flight examiner will take control of the aircraft and restore the system as appropriate.

u. H-60 Electrical Control Unit (ECU) Lockout Operations:

(1) Enter inflight at normal traffic pattern altitude and airspeed.

(2) Simulate an electrical control unit malfunction. With engine power control levers in FLY, pull selected engine power control lever down and push forward to ECU LOCKOUT position. Quickly retard engine power control lever to avoid exceeding TGT limits. (CAUTION: Overtemperature protection is disabled while in ECU LOCKOUT.) Smoothly adjust engine power control lever to maintain torque on controlled engine 10 percent below other engine. Avoid large and/or rapid collective movements.

(3) Execute a normal traffic pattern and an approach to a touchdown or running landing. After landing, maintain desired torque until the collective is at minimum.

(4) To reengage the ECU after landing, or inflight, retard the engine power control lever to the IDLE position; then advance the engine power control lever slowly to the FLY position.

v. Night Operations. Night transition will be flown the same as day transition, except that emergencies will not be practiced.

EXERCISE/LATN PROCEDURES

1. General. Exercises are developed to thoroughly familiarize aircrews with tactics and procedures. Exercises refers to combat and peacetime operations training, and MAC/IG directed exercises. During training exercises, realism is desired to permit a greater return in training benefits. During MAC/IG exercises, the unit's operational capabilities are tested. This guidance is applicable to in-unit exercises as well as higher headquarters directed exercises. Since these exercises are conducted in peacetime environments, flight crews must refrain from overextending themselves and their equipment.

2. Participants. All participants must be thoroughly briefed and the functions and responsibilities of each participant must be established prior to engaging in exercises.

3. Crew Duty Time. Crew duty time for exercises and inspections, see paragraph 3-11.

4. Approval of Exercise Training Areas and Low Level Navigation areas. Geographical areas, such as range complexes, may be designated as exercise/low level navigation areas. Ideally, low level navigation routes, if utilized, should feed into exercise areas. Surveying an area rather than a specific route for low level navigation will increase the effectiveness of the training by allowing greater flexibility in planning navigation legs.

a. Surveys. Low-level navigation areas/routes and/or exercise areas will be surveyed as follows:

(1) An extensive map study will be made of the selected routes and areas. All man-made obstacles over 50 feet AGL within the boundaries will be annotated on the flight map. The Chart Updating Manual (CHUM) will be used to ensure current obstacles are depicted on maps.

(2) For nav legs below 500 ft AGL, a highly experienced pilot selected by the unit commander/mission commander will fly the survey. The pilot will conduct a parallel search of the proposed route/area at the lowest applicable altitude down to a minimum altitude of 50 feet AGL. Obstacle location will be checked against map location and any additional obstacles charted.

(3) Flight surveys are not required provided the exercise area is within a designated range complex and the host provides specific information (description, location, height MSL and AGL) for all man-made obstacles over 50 feet AGL.

(4) Resurvey of routes/areas is required when they have been inactive for over six months.

b. Master Maps. Master maps depicting low level navigation areas/routes and/or exercise areas will be made available to crews during flight planning. A copy of all master maps must remain in the unit. Annotate all man-made obstacles over 50 feet AGL, except when below the tree line. Additionally, annotate any published low level routes, no-fly areas, and animal farms or other hazards within the boundaries. Location of simulated combat threats will also be placed on the map. Master maps may be placed on the existing "Known Hazards to Low Level Flight Map," if practical. Master maps will be updated monthly using the CHUM supplement. The date of the CHUM update will be annotated on the master map. Crewmembers should continuously be scanning for uncharted obstacles. When uncharted obstacles are found, training will terminate while appropriate information (location, approximate height AGL and MSL) is recorded. Aircraft commanders will ensure this information is immediately passed to appropriate supervisors upon landing.

5. Power Requirements. Power requirements will vary depending on the recovery area: See para 9-9a, Remote Area Power Restrictions.

6. Landing Areas. Crews are authorized to land anywhere in an approved exercise area as long as power/obstacle clearance requirements are met and a minimum of two rotor diameters is available.

7. Surface Wind Considerations. Normal wind limitations for training will be observed. When accurate wind information is not available, wind determination will be based on forecast winds, Doppler/computer, if available, and on site evaluation. When practical, have the survivor/ground party pop a smoke for wind verification. The need to be aware of wind conditions cannot be overemphasized. Even though computed power available may appear to be adequate, downwind approaches and maneuvering can use a considerable amount of power and flight control authority.

8. Alternate Extraction. Personnel on the ground acting as survivors, instructors, and aggressors are necessary to provide realism and supervision during exercise. The above personnel may ride the hoist, rope ladder, etc, during exercises IAW the following:

a. Survivors. Survivors should be aircrew members. There will be a qualified safety observer available on the ground to ensure the survivor properly uses the rescue device. This requirement may be met by lowering a qualified 23 AF aircrew member to assist the survivor. The survivor and accompanying ground safety observer will be briefed to consider the following when selecting recovery areas.

(1) Try to pick a clear area because a recovery can be completed faster and safer if the helicopter can land or use the extraction device from a low hover altitude.

(2) If a recovery is to be accomplished from a forested area, the foliage must be sparse enough to ensure the survivor will not be dragged through the branches. When practical select areas with trees less than 40 feet tall to decrease recovery time and provide additional safety for the survivor in the event of a hoist, or other equipment, malfunction.

b. Other exercise Personnel. Every practical effort will be made to recover other exercise personnel by landing. They may be recovered by hoist if the remaining range time prevents movement of these personnel to a suitable landing area or when an extended period of time is required to reach a suitable landing area. These personnel will be briefed to select an area within a reasonable distence which will allow the helicopter to hover as low as practical.

c. The aircrew will comply with the following:

(1) The hover height for live pickups will be the lowest altitude required by the recovery situation and still provide adequate clearance from all obstacles.

(2) Whenever practical, recoveries should be made in cleared areas. Recoveries near trees may be accomplished provided the survivor is kept clear of branches and obstructions. Hover heights higher than 40 feet should be avoided when practical.

9. Altitude Restrictions:

a. During combat exercises, helicopters will be limited to a base altitude of 50 feet above obstacles. (All crewmembers will conduct a thorough ground briefing and map study prior to each mission. Crewmembers will review airspeeds, bank angles, and altitudes commensurate with terrain, obstacles, visibility, and threats to be encountered.)

b. During peacetime EXERCISE/LATN training, comply with paragraph 5-17, this regulation.

10. H-3/53/60A Helicopter Weight Adjustment (Fuel Dumping). Refer to paragraph 6-66.

11. Pyrotechnics. Any pyrotechnics used during the exercise must be used in a manner so as not to create a fire hazard. Personnel will not depart the exercise area until all expended pyrotechnics have been extinguished.

12. Formation Flight. Formation may be flown with other type aircraft participating in a exercise provided all participating crewmembers attend a pre-exercise briefing and are thoroughly familiarized with the tactics and aircraft characteristics of those aircraft participating in the formation.

13. Passengers. Exercise participants may be carried as passengers during air refueling, low level, NWH, NVG operations and other maneuvers in support of approved exercise missions. Aircraft carrying passengers will not perform defensive maneuvering evasive actions. Supported user combat force, i.e., paratroopers, assault teams are not considered passengers within the context of this paragraph.

14. Helicopter/Fighter Evasive Training:

a. Purpose. This program provides aircrew guidance for conducting realistic combat aerial evasive maneuvers employing current tactics.

b. General. Helicopter/fighter evasive training is authorized during both higher headquarters and in-unit exercises.

c. Responsibilities. The mission commander will be responsible for planning, coordinating and conducting the mission. Additionally, the mission commander will brief all individuals involved in the mission on the rules of engagement (ROE). Every practical effort will be made to conduct a face-to-face ROE briefing with the aggressor force crewmembers.

d. Procedures. Evasive tactics must be flown under the following criteria:

(1) Helicopters are limited to 60-degree bank angles unless Dash One is more restrictive.

(2) Procedures outlined in appropriate 3-1(S) will be used.

(3) Maximum use of gun and scope camera is recommended on all engagement. Film should be analyzed and used for instructional purposes.

e. Rules of Engagement. All aircrews will comply with the ROE in this section.

(1) Helicopter(s) and aggressor will establish and maintain communication on a common prebriefed frequency during the entire engagement.

(2) If two aircraft approach head-on, each will clear to the rigbt and the fighter will go above the helicopter.

(3) If visual contact is lost during an engagement, the aggressor aircraft will proceed to an assigned altitude block.

(4) All aircraft will maintain a 1,000 feet clearance from clouds.

(5) Prevailing visibility in the area must be five nautical miles or greater.

(6) Any flight member can terminate the engagement by transmitting "Knock It Off" at which time all participants will cease maneuvering and acknowledge with call sign, such as "Jolly One, Knock It Off."

(7) Minimum separation is 1,000 feet.

(8) Minimum altitudes prior to engaging: Fighters may descend to 1,500 AGL to gain performance/tactical advantage.

(9) Live missiles will not be carried.

(10) All guns will be safetied.

(11) An engagement will be terminated when one of the following occurs:

(a) The engagement drifts to the border of the authorized area.

(b) An unbriefed, unscheduled flight enters the aerial combat tactics (ACT) area and is a factor detrimental to the safe conduct of the mission.

(c) Visual contact is lost by the aggressor aircraft within 3,000 feet.

(d) Helicopter rocks rotor tip path plane (not associated with normal maneuvering).

(e) If a dangerous situation is developing.

(f) Minimum altitude or clouds are approached.

(g) Situational awareness is lost.

f. Special Instructions.

(1) Participating aircrews must be given an overall situation briefing before participating in aerial combat tactics. This briefing will cover specific opposition aircraft capabilities, if applicable, special operating instructions and specific rules of engagement contained in this attachment.

(2) Helicopters flying at or below 300 ft AGL need not maintain radio contact with attacking fixed wing aircraft so long as vertical/lateral separation criteria are prebriefed and clearly understood by all participants. Attacking aggressor aircraft will be briefed to maintain at least 1000 ft separation from aircraft under simulated attack. Two-way radio contact is required for any air-to-air scenario involving helicopters operating above 300 ft AGL, for any scenario involving aggressor helicopters and for any scenario involving HC-130s.

(3) Formation. When helicopters flying in formation are subject to simulated fighter attack during exercise participation, the formation leader will brief formation response to attack by simulated hostile aircraft. Appropriate 3-1's, will be used as a guide. The following items must be briefed as a required supplement to the basic tactical consideration.

(a) Aircraft attacked in formation will maneuver independently in response to the attack.

(b) Aircraft under simulated aerial attack will maneuver so as to establish and maintain positive lateral separation; aircraft in close formation will make their initial breaks away from each other.

(c) Every means of making sure/positive separation between formation members will be used. Continuous visual and radio contact is preferred; evasive maneuvers will be terminated if interformation radio contact is lost and at any time doubt exists as to the position of other aircraft in the formation.

15. Helicopter/Helicopter Evasive Training. Helicopter/helicopter evasive training is only authorized at higher

headquarters' directed exercises. (Not applicable to ARF.) Current helicopter/fighter procedures and ROE apply with the following additions:

a. Descend no lower than 100 ft above obstacles.

b. A 500 ft lateral displacement and a 100 ft minimum altitude separation will be maintained between participating helicopters.

c. Engagement will terminate with loss of visual contact or a termination call.

d. Crossing ridge lines and blind covers will be coordinated with opposition helicopters to assure altitude separation of a minimum of 100 ft.

e. Helicopters will not attempt to engage aggressor helicopters offensively. Evasive tactics will be used. However, helicopters playing the role of aggressor helicopters may use tactics based on projected capabilities of the Hind/Hip helicopters.

f. All participating helicopters will maintain communications on a common prebriefed frequency at all times.

g. The copilot will monitor airspeed, altitude, rotor RPM and bank angle. It is highly recommended that a minimum of two scanners be used in the cabin area of participating aircraft when possible.

16. Low Level Unescorted Operations:

a. The primary consideration of low-level unescorted operations is flexibility. Crews must maximize the use of terrain masking techniques using terrain features either side of the intended track to enhance their concealment. Crews must be responsive to unplanned new threats and circumnavigate them as necessary.

b. There will be times when exact positioning and timing are a necessity. For this reason, crews will plan a minimum of two controlled checkpoints that must be passed within one-half mile. (EXCEPTION: MH-53 when operating on unique systems.) Normally, low level navigation training routes will be 30 minutes long with a minimum of three turning points. Routes will include the area within 3 NMs either side of center line as a minimum.

c. Scenarios can be developed with information that would actually cause crews to miss the checkpoints and timing; e.g., new threats en route. The crews should recognize this and possibly make an air abort decision based on their situation.

Chapter 10

LOCAL OPERATING PROCEDURES

10-1. General:

a. Units will publish local and unique unit flying related operations procedures as a unit supplement to this regulation beginning with para 10-2. The title of this supplement will indicate the unit concerned (e.g., "Det 8, 38 ARRS SUP 1, MACR 55-54 Chapter 10").

b. Send one copy of this chapter to 23 AF/DOV and one copy to HQ MAC/DOVS.

c. The purpose of this chapter is to provide aircrews with information pertaining to their local flying area. Units will refrain from putting unrelated and redundant information in this chapter such as; duty officer responsibilities, towing procedures, and familiarization flight requirements. As a minimum the following subjects will be included, as applicable:

(1) Filing Flight Plans
(2) Taxi/Parking Procedures
(3) Scramble Procedures
(4) Traffic Pattern and Landing Areas
(5) Training/Operational Landing Sites
(6) Air Operations Security

Chapter 11

LOW-LEVEL OPERATION

11-1. General. Missions which require flight below 500 feet AGL are considered low-level flying (paragraph 5-17). Operations above 50 feet obstacle clearance are permissible. There are two types of low-level flying: low-level navigation and contour navigation. Low-level flying often requires a combination of both low-level and contour navigation to gain effective terrain masking.

a. Low-Level Navigation. Low-level navigation is used when flight operations permit the use of specific headings and a constant indicated altitude and groundspeed. This method of navigation lessens the possibility of enemy detection or observation in a relatively permissive environment, and can be used over flat, open terrain where significant terrain features are not available for navigation reference. Use low-level navigation when flying over friendly territory, or to comply with low-level corridor procedures to or from forward operating locations. Low-level navigation is less demanding than contour navigation because it permits the use of standard dead reckoning (DR) techniques.

b. Contour Navigation. During contour navigation, the pilot preplans a route based on charted terrain features leading toward the objective. Groundspeed, obstacle clearance altitude, and heading may vary considerably based on the terrain, weather, visibility, and the anticipated threat. Indicated altitude will vary considerably since the pilot maintains a relatively constant obstacle clearance altitude in order to take advantage of the available contours.

c. Navigation while Terrain Masking. Terrain masking can be applied to either low-level or contour navigation. When applying this tactic, the aircraft is flown to use terrain and vegetation objects to degrade the enemy's ability to visually, optically, or electronically detect or locate the aircraft. Depending on the available terrain and based on anticipated threats, airspeed and obstacle clearance altitude may vary. The aircraft commander preplans his route to take maximum advantage of significant terrain features in order to mask the aircraft's flight. Terrain masking is most effective when an obstacle is placed between the aircraft and the threat. As the flight proceeds, the pilot may make additional changes to his preplanned route, varying his flight path to take advantage of available tree cover, minor depressions, and/or small ridge lines not detectable in map study. Terrain masking requires a broader corridor of operation and makes conventional DR techniques almost useless. Terrain masking tactics require significantly more preplanning and map familiarization for successful navigation.

11-2. Flight Planning. Thorough flight planning is the key to successful low-level operations. Pilots should arrive at their planned objective point within plus or minus two minutes of the flight plan arrival time. For H-53 PAVE LOW and other INS-equipped aircraft, parameters may be as short as plus or minus 30 seconds.

a. Map Selection. Select maps that provide the detail desired to satisfy navigation requirements. Maps with a scale of 1:250,000 or greater detail are desired for low-level operations. Use recent aerial reconnaissance photographs of the objective area, if available. Use a large scale map for navigation to the objective area and transfer to a detailed map, e.g., 1:50,000, to locate the objective. Exercise caution when transferring from one scale map to another. Make transition between maps at a prominent terrain feature, readily identifiable on both maps.

NOTE: Refer to the CHUM to ensure that maps and charts are current.

b. Route Selection. Select routes that avoid enemy threats and, if possible, provide safe areas for a precautionary landing. As a minimum, base route determination on the following:

(1) Avoid troop concentrations, radar facilities, populated areas, air defense units and other known threats.

(2) Use available terrain features for masking and navigation purposes.

(3) Avoid a direct routing to the objective. Plan sufficient course changes to avoid disclosing the objective. If possible, do not use the same routing for ingress and egress.

(4) Normally, do not exceed 15-20 NMs between checkpoints for dead reckoning. The type of terrain will dictate the selection and distances between checkpoints.

(5) Establish an Initial Point. Establish an initial point (IP) over a prominent feature that is easily identifiable from low altitudes. The distance from the IP to the objective will vary with the situation, but should be approximately 3 to 12 NMs from the objective.

TARGET ESTIMATED SIZE (METERS)	RECOMMEND IP DISTANCE (NM)
30	1
60	2
90	3
120	4
150	5
300	10

NOTE: This table would allow the aircraft to pass to the side of the target at a distance of one-half the width of the target if a one degree heading error were maintained for the entire distance.

c. Map Preparation. Carefully review maps to identify obstacles and hazardous terrain. Annotate enemy threats and turning/checkpoints on the map. (This information may classify your map.) Establish specific course lines between turning points for low-level navigation. When terrain masking, these linee do not necessarily represent the ground track to be flown. Time-tick marks based on an established groundspeed are optional. These marks may be established for each leg or be accumulative for the entire route. Other flight planning data and information may be annotated; however, use caution to avoid obscuring pertinent information. Deployed mission commanders are allowed to determine the symbols used based on the actual mission profile, threats, terrain, political considerations, etc.

d. AF Form 70. Prepare an AF Form 70, Pilot's Flight Plan and Flight Log, 23 AF approved form, or a more detailed navigation form for each mission and include the following as a minimum: turning points, headings, distances, ETEs, and fuel computations. AF Form 70 is not required if the above information is included on the map.

NOTE: Additional Flight Planning Information. Refer to 1550 CCTW aircrew training student handout, Low-Level Operation and Navigation, and combat aircrew training manuals.

11-3. Crew Coordination. Crew coordination is a critical factor during low-level operations. Limit crew conversation to accomplishment of essential tasks. Each crewmember will call out hazardous obstacles and assist navigation by identifying prominent features along the route.

11-4. Pilot Responsibilities:

a. The pilot flying the aircraft must consider the following:

(1) Plan enough room for cruise airspeed maneuvering. Don't get trapped into low airspeed, tight turns close to the ground, especially at high gross weights and high density altitudes.

(2) Be aware of wind direction and velocity. A rapid turn into a tailwind condition may result in loss of lift.

(3) Avoid steep angles of bank. At approximately 45 degrees, the tip path plane will be below the skids/landing gear.

(4) Do not attempt to clear obstacles by cyclic inputs alone. Climbs and descents are best accomplished by coordinated cyclic and collective inputs. Be aware that abrupt aft cyclic inputs while low level may result in tail rotor contact with surface obstructions.

(5) Anticipate power requirements when approaching a ridge line. If feasible, increase power early and accelerate so that when the climb is initiated, there will be sufficient airspeed to assist in clearing the terrain. Approach ridge lines at approximately 45 degrees; this provides an escape route if power is insufficient to climb over the ridge or if an unexpected threat is encountered on the other side.

(6) Special consideration should be given to preplanning immediate actions in the event of engine failure at low level. Leave yourself an escape route whenever possible.

b. The pilot/crewmember navigating will assist the pilot flying as follows:

(1) Keep the crew informed of ETAs, descriptions of turning points and intermediate checkpoints.

(2) Closely monitor the aircraft's course.

(3) Announce the direction of turn for the next leg prior to the turning point. When reaching a turning point, do not allow the pilot to turn by reference to the compass. Give him a turn and tell him when to stop.

(4) Record and compare actual time and fuel against that planned at each checkpoint on the AF Form 70, map, 23 AF approved forms or a more detailed navigation log form.

(5) Compute airspeed corrections to maintain a constant groundspeed.

(6) Monitor cockpit instruments.

(7) Make radio changes.

(8) Monitor and update navigation aids.

11-5. Enemy Threat Encounter. If appropriate, initiate immediate evasive action if exposed to ground/air threat. The evasive maneuver used will depend upon the nature of the threat, aircraft limitations, and terrain. Use jinking (rapid turns, climbs and descents) or terrain masking away from the preplanned route. Specific procedures are contained in appropriate 3-1's(S). The aircrew must continue to navigate during these maneuvers so that the mission may be resumed once the threat is evaded.

11-6. Evasive Maneuver training:

a. Establish specific route segments or evasive maneuver training areas.

b. Initiate evasive maneuvers above 100 foot obstacle clearance.

c. Maintain a minimum of 100 feet obstacle clearance during evasive maneuvering.

d. Pilots will make crew advisory calls prior to turns, and will clear their flight path throughout the maneuvering.

11-7. Unknown Position. If you become disoriented, do not spend excessive time searching for a checkpoint. Multiple overflights of an area may alert enemy ground forces for a subsequent pass. If a checkpoint cannot be identified, continue on course (as a guide, use leg time plus 10 percent), and then turn to the next course. Continue the route without establishing the exact position only if predominant terrain features can be readily identified and the area of planned overflight is relatively secure. Climbing may assist in determining position by increasing the field of vision; however, you will be more susceptible to enemy detection. If a climb is initiated, concentrate on reorientation so that a descent can be made as soon as possible. Use a climb only as a last resort due to the possible compromise of the aircraft's location. If position cannot be established, abort the mission. During training, if unable to establish aircraft position, climb to a safe altitude and reorient yourself before resuming low level navigation.

11-8. Flying Below 100 Feet Obstacle Clearance:

a. Power Reserve. A major factor affecting low-altitude flight is power reserve, especially in mountainous terrain. During training in multi-engine helicopters, when safe single-engine performance is not available, consider flying at higher altitude and maintain single-engine airspeed or above.

b. Low-Level Deceleration. Exercise care when decelerating in a low-level environment. During a low-level deceleration, rotate the helicopter around the tail rotor. Perform a low-level deceleration by increasing collective to maintain tail rotor altitude, and then apply aft cyclic to decrease airspeed. Figures 11-1, 11-2, 11-3, and 11-7 depict tail rotor clearance when the helicopter is rotated. Power required increases as the helicopter decelerates (reference Flight Manual section VI).

c. Maintain all parts of the helicopter at least 50 feet above all obstacles.

d. Prior to any steeps turns (45 degrees or more) when power available is critical ensure airspeed is adequate to trade for necessary g loading to maintain level flight. To prevent ground impact during a steep turn, immediately decrease the angle of bank then increase g loading. Figures 11-4, 11-5, 11-6 and 11-3 depict main rotor blade clearances.

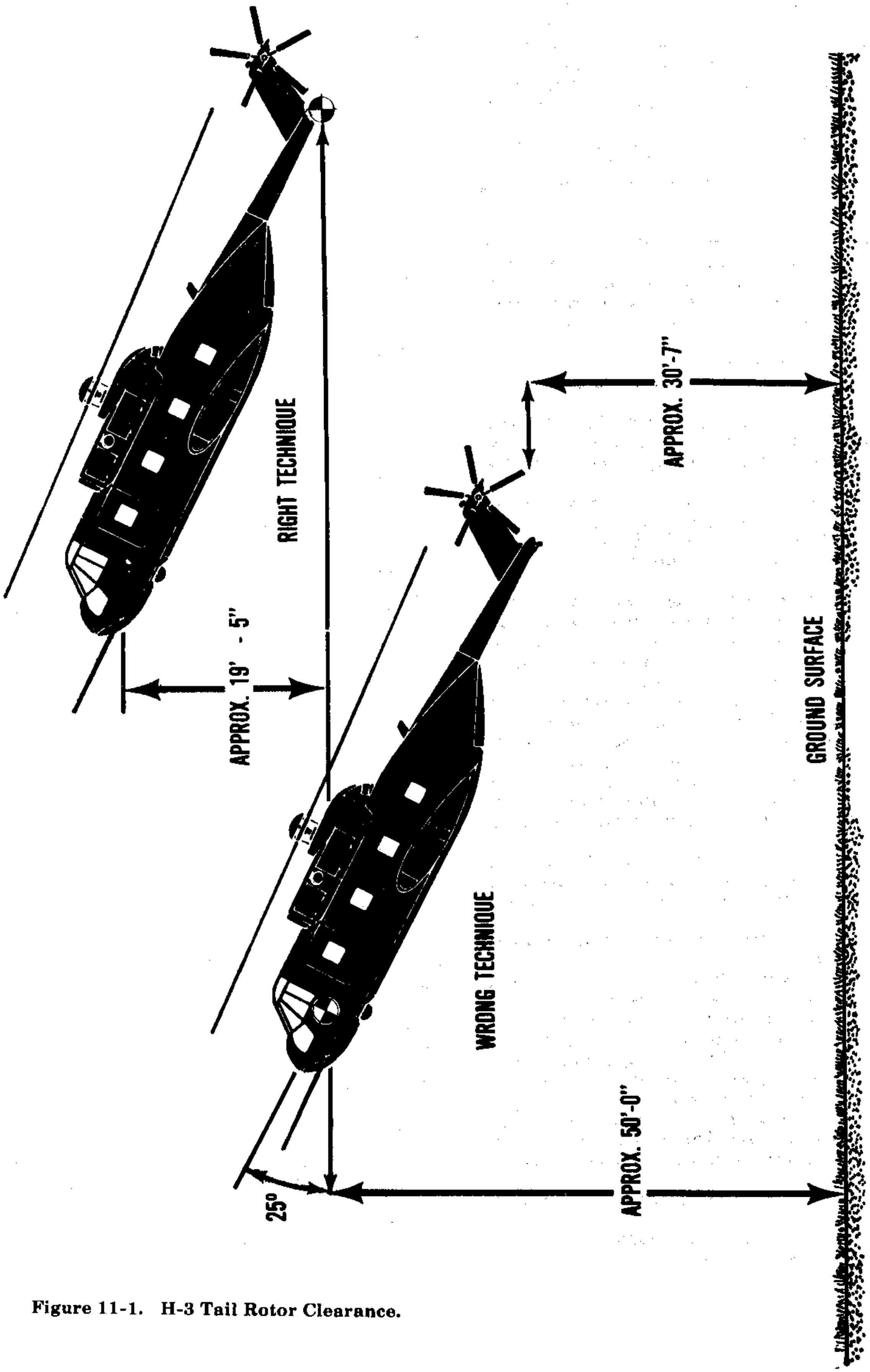


Figure 11-1. H-3 Tail Rotor Clearance.

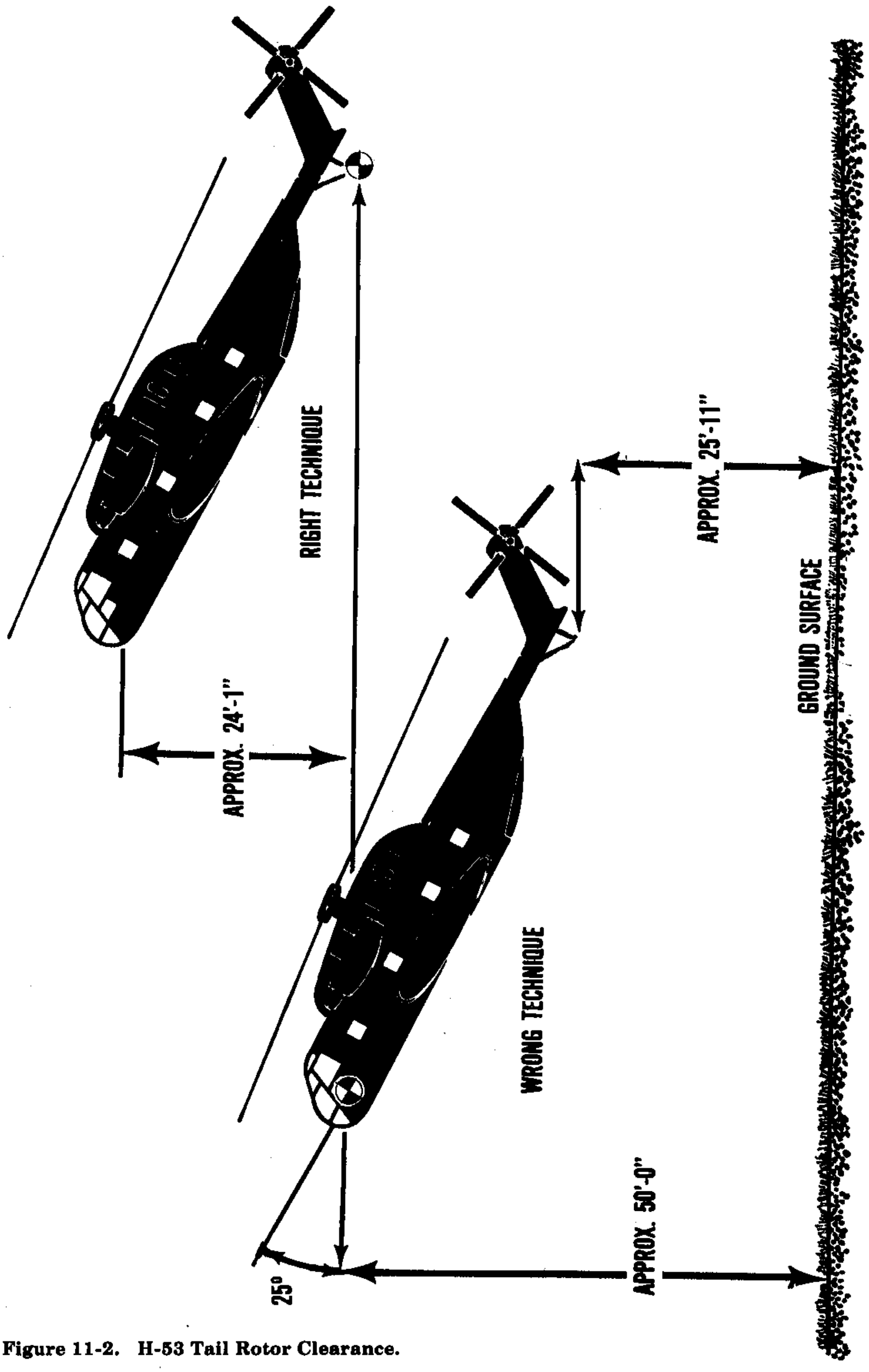


Figure 11-2. H-53 Tail Rotor Clearance.

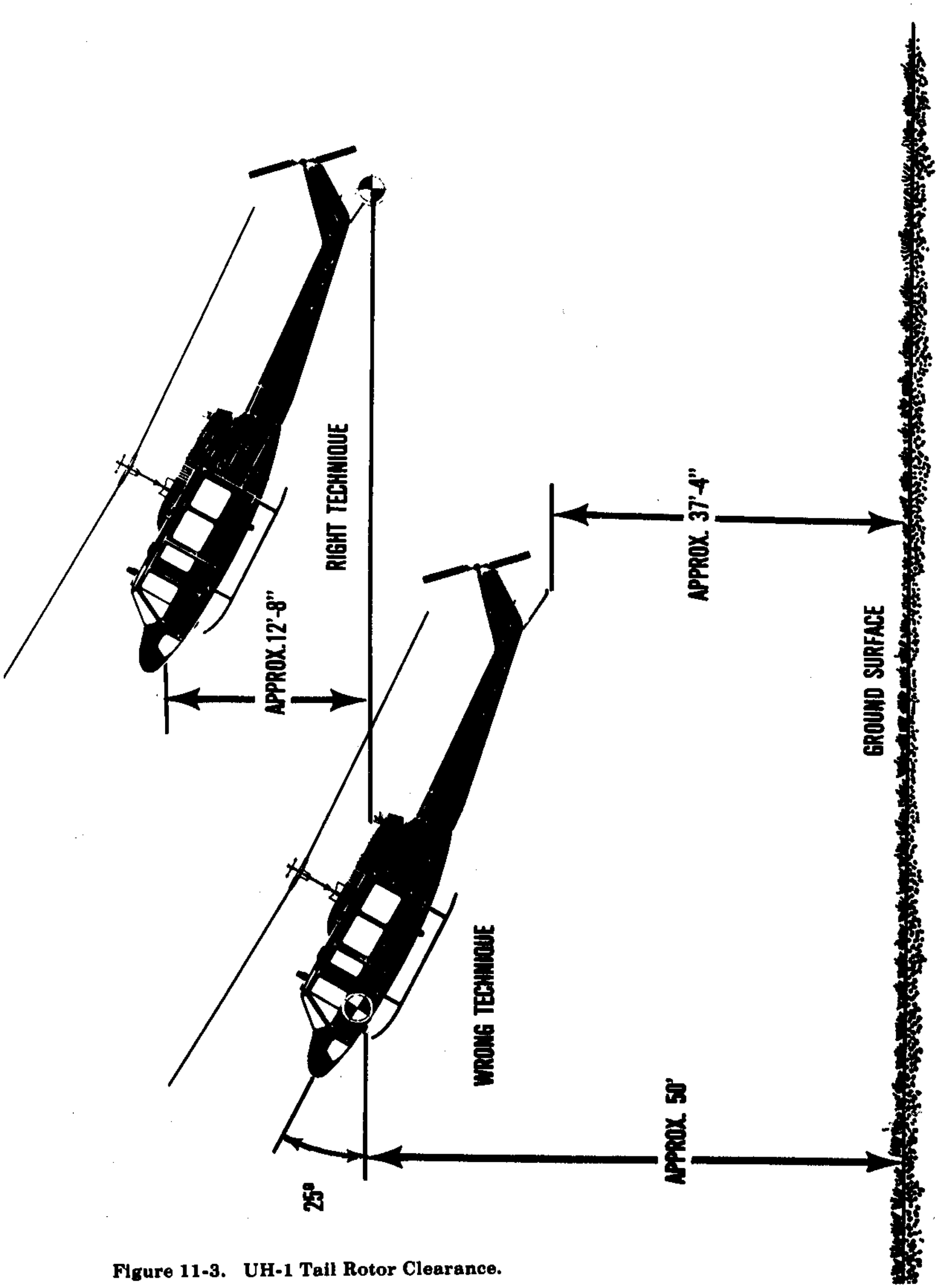


Figure 11-3. UH-1 Tail Rotor Clearance.

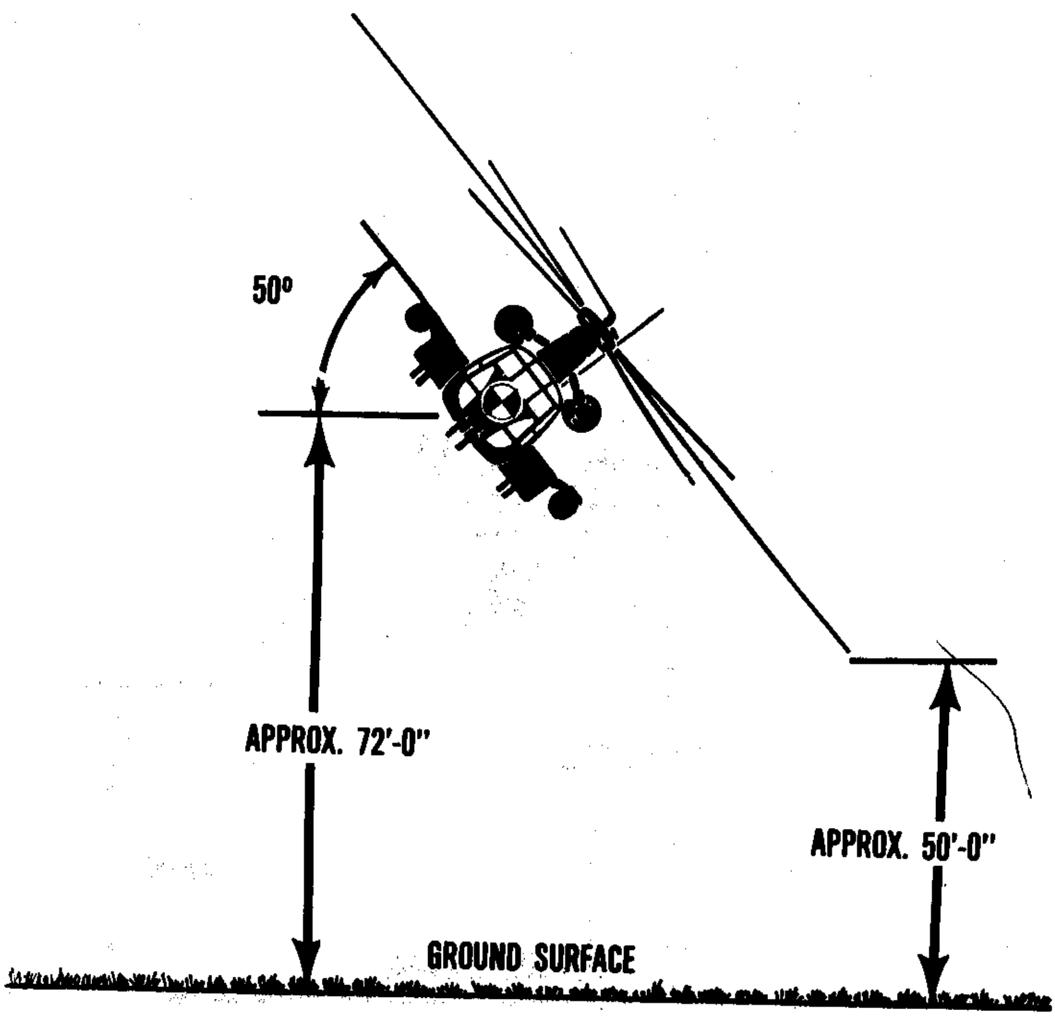


Figure 11-4. H-53 Main Rotor Clearance.

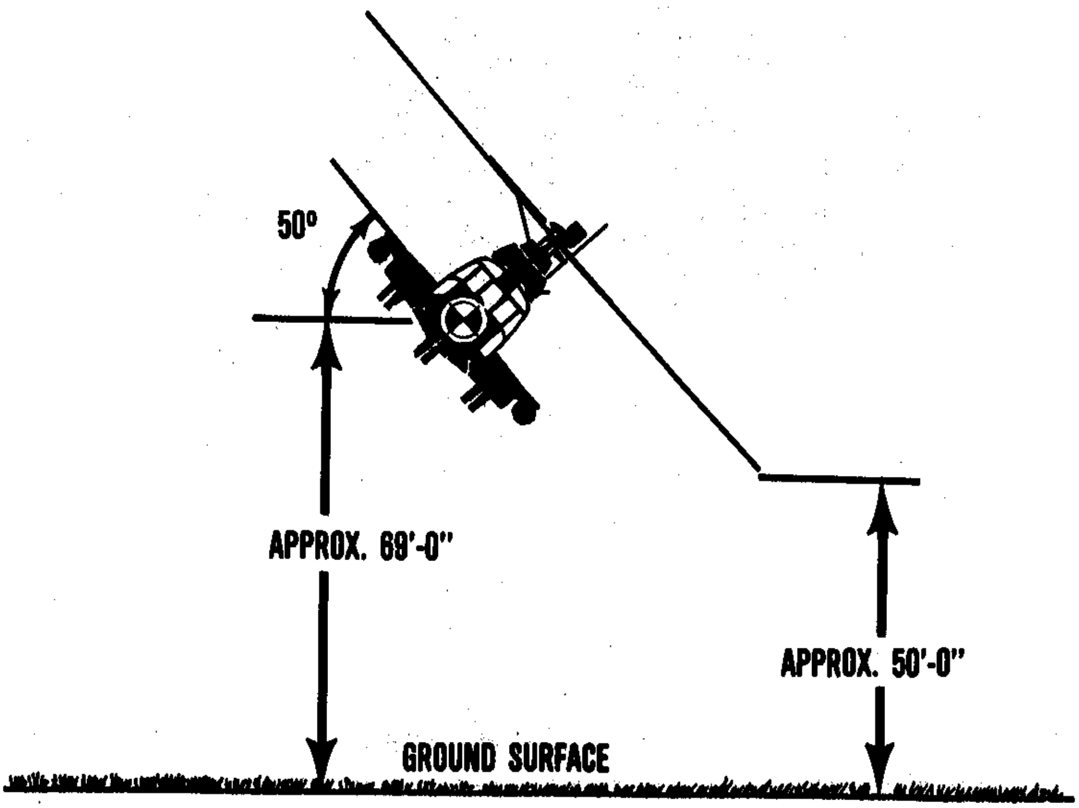


Figure 11-5. H-3 Main Rotor Clearance.

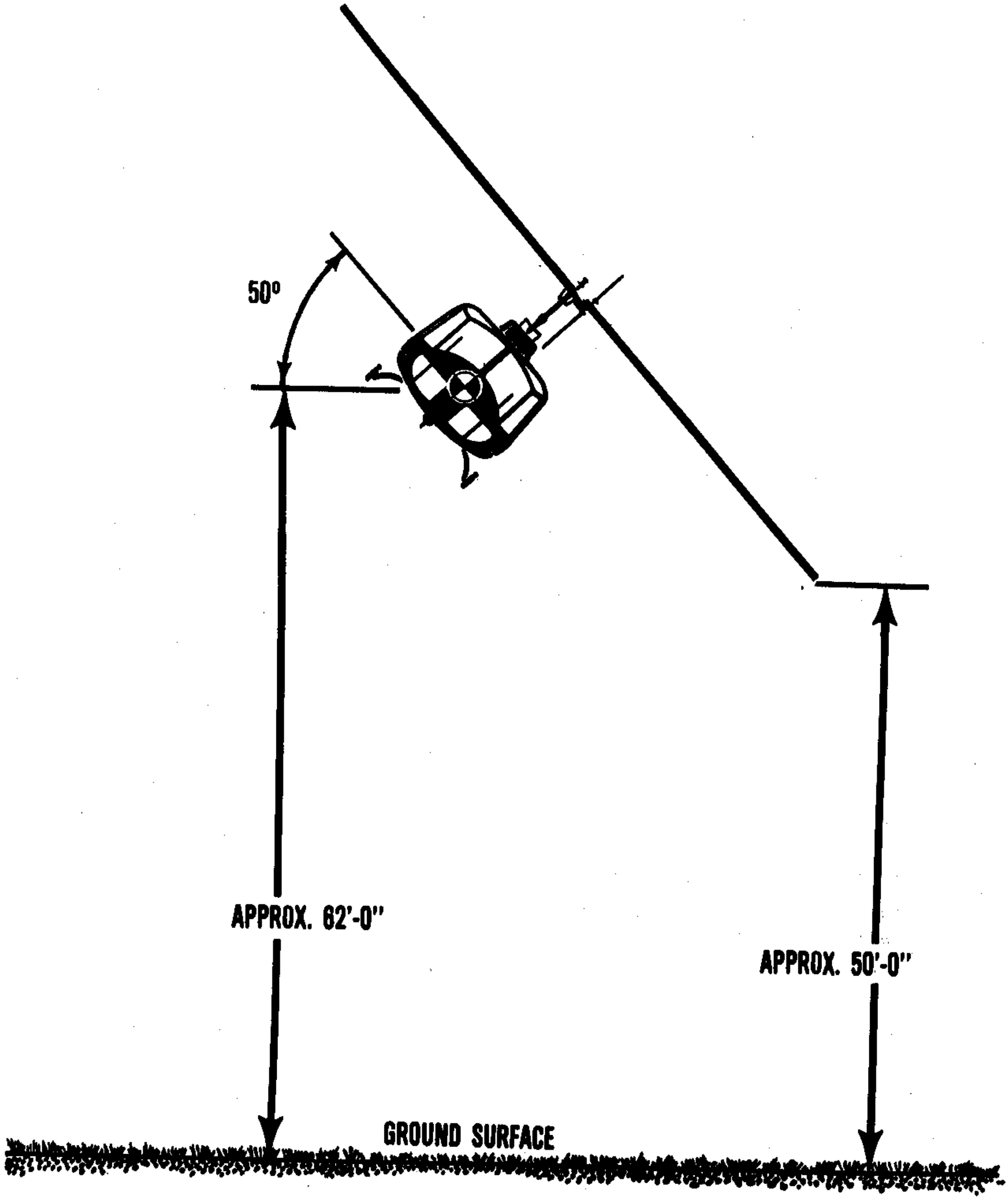


Figure 11-6. Main Rotor Clearance.

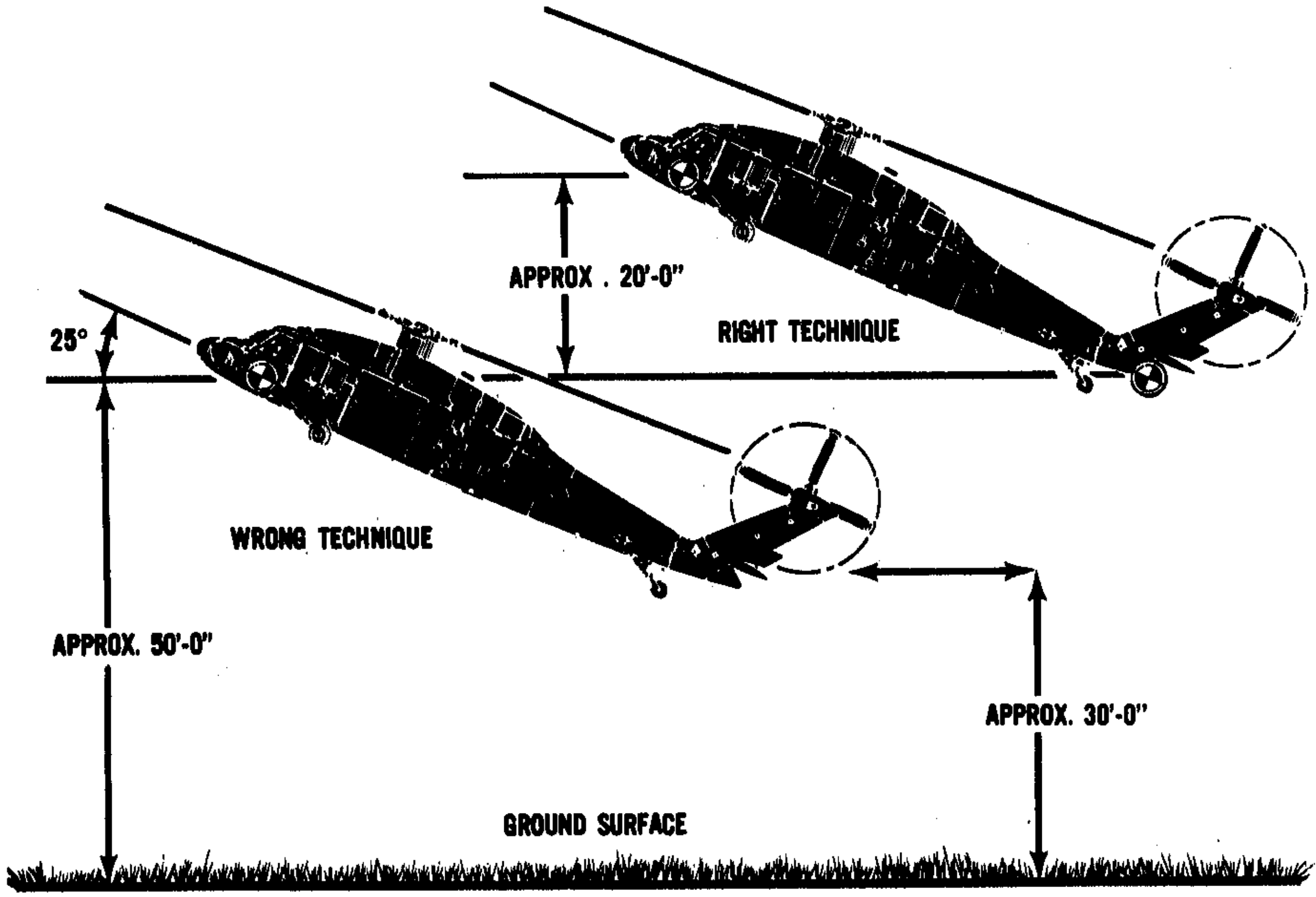


Figure 11-7. H-60A Tail Rotor Clearance.

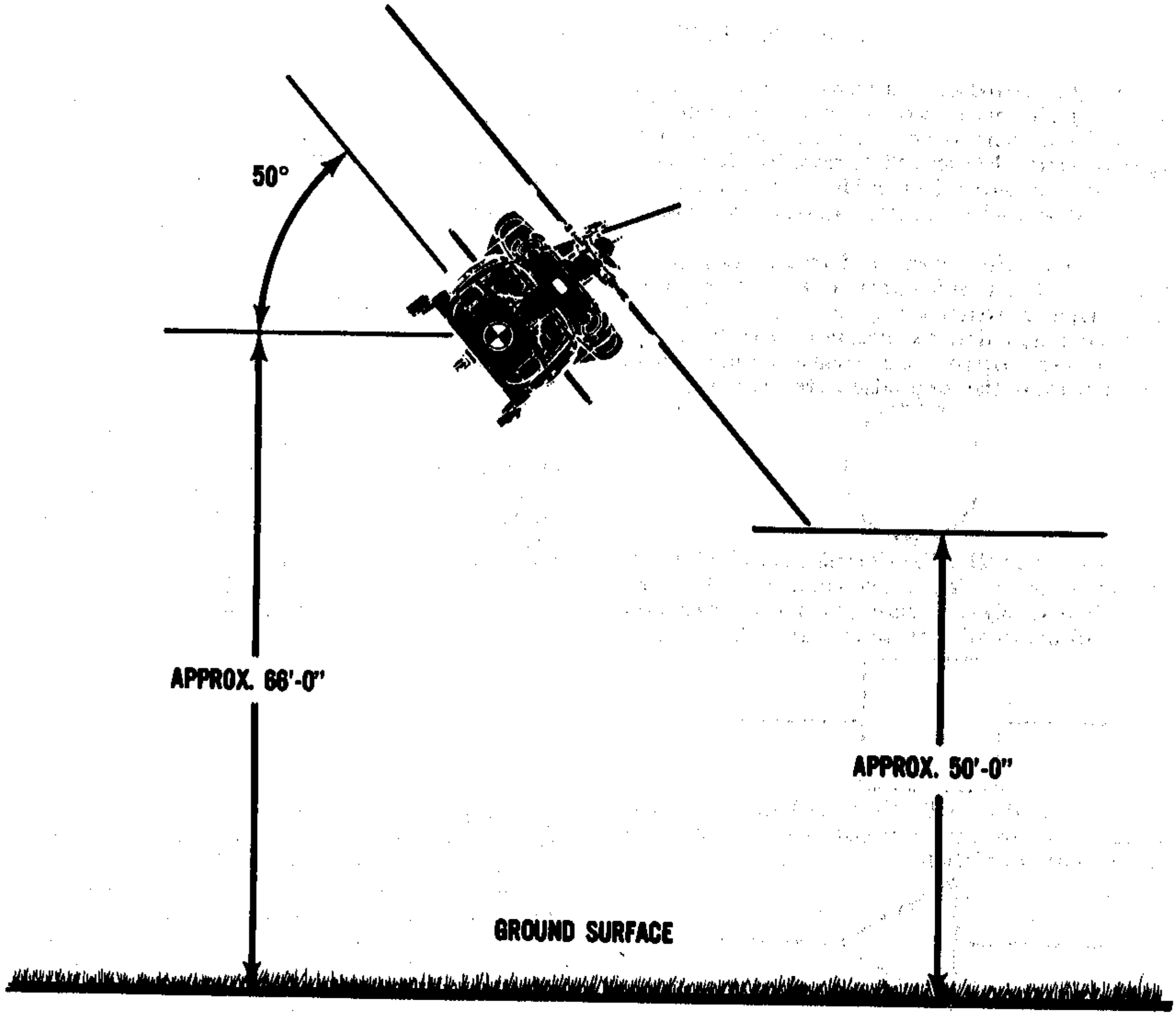
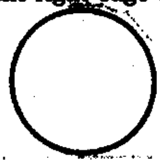


Figure 11-8. H-60A Main Rotor Clearance.

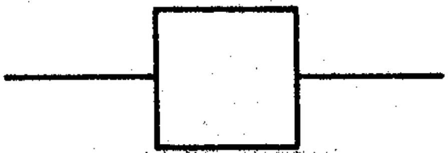
STANDARD SYMBOLS FOR MAP PREPARATION

The following standard annotations and symbols should be used in preparing maps for both combat and non-combat operations. Recommend the use of black ink, pencil, or symbol tapes to portray data on inflight materials. Navigation computer, tactical airlift mission plotter or suitable substitute should be used for annotating standard symbols.

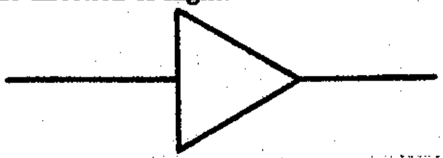
a. Waypoint. Use a circle to depict en route points where the aircraft course is altered or key actions occur. Number waypoints consecutively to facilitate identification. Place corresponding navigation information blocks (NIB) immediately adjacent to or slightly downtrack from the waypoint along the right edge of the strip chart.



b. Initial Point (IP). The IP is identified by a square centered on the point, with the sides parallel to the course line. If the IP is simply a coordinate, a dot will be positioned on the coordinate location centered within the square.



c. Objective Point (OP). The OP is identified by a triangle centered on the planned point with the apex pointing in the direction of flight.



d. Navigation Information Block (NIB). The NIBs are designed to give the crew the required navigational data from the present waypoint to the next waypoint.

(1) To Waypoint. The number designator of the next waypoint and ARIP, PIP, IP, LZ, etc., if applicable.

(2) Mag Hdg. The magnetic heading to the next waypoint. (True heading if required for unique Nav system.)

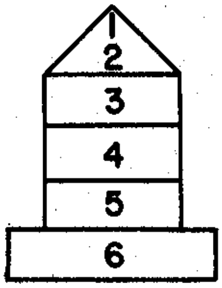
(3) Coordinates. Depending on the type of helicopter navigation equipment, insert the latitude/longitude, UTM, or doppler grid coordination.

(4) ETE. The time to the next waypoint.

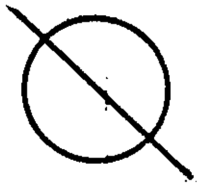
(5) MSA. Minimum safe altitude for each leg. (See paragraph 5-17.)

(6) Fuel (recommended entry).

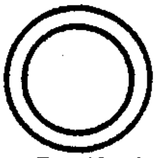
(7) Distance (recommend entry).



e. Emergency Landing Bases. Use a single circle with a diagonal line to identify those airfields compatible with unit aircraft and which may be used in an en route emergency. The number of emergency bases selected and the frequency of occurrence are at the discretion of the mission planner.



f. Alternate Recovery Bases (Optional). Use two concentric circles to identify those airfields compatible with unit aircraft and which are preferred for recovery in case the primary base is unusable because of weather, damage, or other reasons. Connect this symbol to the planned course by a dashed line depicting the alternate course from either a planned divert point or from the primary recovery base, as determined by the mission planner.

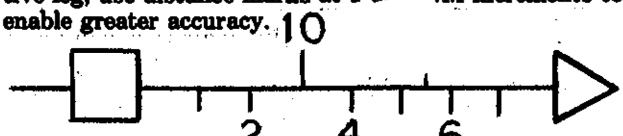


g. Recovery Arrow Box (Optional). Use a horizontally divided arrow box pointing in the general direction of the alternate recovery base to provide navigational information to the alternate base. This box depicts base name, distance in NM from divert point to alternate base, and Command and Control communications. The mag course from divert point to alternate base. Estimated fuel required for the recovery may be placed immediately beneath the recovery arrow box.

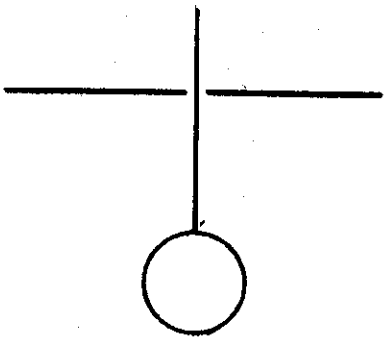
h. Course Line and Time/Distance Marks. Draw course lines for the entire route inbound to the objective and continue on to portray the return route to the primary and alternate recovery bases.

(1) Time Marks (Optional). Place them on the right side of the course line. Use longer marks to indicate even minutes and shorter, unnumbered marks for odd minutes. Time marks are of particular value along the pre-initial point route segment.

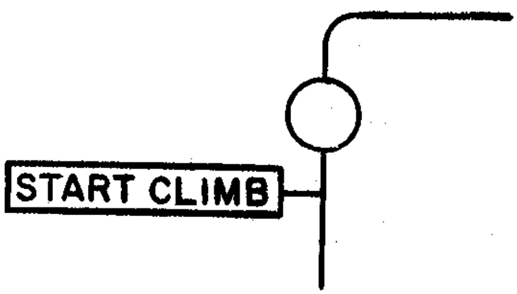
(2) Distance Mark (Optional). When used, place them on the left side of the course line. Use longer marks to indicate 10 NM increments and shorter unnumbered marks to indicate 5 NM increments. Over the IP to objective leg, use distance marks at 1 or 2 NM increments to enable greater accuracy.



i. Combat Entry Point. A heavy line identifies and locates the point at which the flight route crosses the FEBA/FLOT. The line extends at least one inch on either side of the course line. The entire FEBA should be annotated, if known.

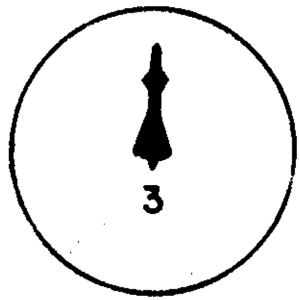


j. Operational Advisory Annotations. Advisory annotations concerning operational aspects of the mission are positioned to the sides of the course line. The annotations consist of a line at the point en route where the function should be performed and the action is noted on the side end of the line. The action description may be either enclosed in a box or left open at the discretion of the mission planner. Examples of these operational advisories are as follows: start climb, start decent, IFF/SIF STBY, lights off, lights on, TACAN receive only, start TFA, IFF/SIF ON, TACAN-T/R.



k. Order of Battle (OB). Depict threat information directly on the navigation chart using the following symbols and annotations. Chartpak symbols can be obtained from the unit intelligence office.

(1) Surface-to-Air Missiles (SAM). The number associated with the symbol indicates the specific type weapon system (SA-2, SA-3, SA-6, etc). The actual SAM location is at the base of the symbol, which is to be oriented parallel to track. Use circles to indicate effective radii of the system at the planned mission altitude. (Symbols are mandatory, radii are optional.)



(2) Antiaircraft Artillery (AAA). Depict known AAA sites and indicate type (i.e., ZSU-23-4, 57 mm, etc).

ZSU-23-4

(3) Aircraft. Indicate locations of enemy airfields supporting aircraft capable of intercepting the mission. The delta-wing symbol indicate all-weather capable aircraft and the swept wing symbol indicates clear-air mass (CAM) interceptors.

Chapter 12

FLIGHT ENGINEER PROCEDURES

12-1. **General.** This chapter contains normal procedures for flight engineers not contained in the flight manual and/or applicable TOs.

12-2. **Authority To Clear a Red X.** Flight engineers normally are not authorized to clear a Red X. If a situation is encountered where the aircraft is on a Red X and qualified maintenance personnel are not available, the home station chief of maintenance may authorize the flight engineer to clear the aircraft for flight.

12-3. **Refueling/Defueling.** Flight engineers normally are not required to refuel or defuel aircraft; however, the flight engineer may refuel/defuel when maintenance personnel are not available. Use the refueling/defueling checklist during all refueling and defueling operations. If ground support personnel are not available, the aircraft commander will designate other crewmembers to assist the flight engineer.

12-4. **Aircraft Systems Management.** The flight engineer will monitor aircraft systems during flight and ground operations. Notify the pilot of all abnormal indications and take action as directed. When noting a malfunction during takeoff that may be cause for an abort, state the problem (e.g., rotor RPM low).

12-5. **Flight Monitoring.** The flight engineer will assist with flight monitoring.

a. Notify the pilot when seeing deviations more than 200 feet/20 KIAS from assigned altitude/airspeed, and 10 degrees from assigned heading. Also, advise pilot when approaching any aircraft flight manual limitation and comply with other duties as briefed by the pilot.

b. Notify the pilot if aircraft configuration (e.g., rotor RPM, gear, cargo door, ramp) is not correct for the maneuver being performed.

c. Maintain outside vigilance during flight.

d. Monitor the primary radio, interplane radio, interphone, and HOT MIC.

e. Assist in navigation as necessary.

12-6. **TOLD Cards:**

a. Complete TOLD cards prior to takeoff. Whenever possible, Told data should be completed prior to the aircrew briefing. Use the TOLD card as a worksheet. Compute data applicable to the type takeoff/landing to be made (in and out of ground effect, power available/required at intended hover height, single engine capability, etc.).

b. During multiple takeoffs/landings, only affected parameters need be recomputed if favorable conditions afford an additional margin of safety in all other areas (e.g., gross weight decreases due to fuel burn-off, while pressure altitude and temperature remain constant).

c. MAC Form 154 Helicopter Mini TOLD Card. The helicopter mini TOLD card is a tool to bring critical performance data to the attention of the entire crew. The mini TOLD card will be used for approaches when power required is within 10% of power available, when OGE is not available, and at the discretion of the pilot. If involved in NVGs or low-level operations, the form should be filled out during premission planning using the worst case data. Units may modify the MAC Form 154 to fit unit or aircraft requirements, i.e., change 5 feet to 4 feet for hover height or torque to PSI, etc.

12-7. **Fuel Management:**

a. Preflight. The flight engineer will ensure the preplanned fuel load is on board the aircraft.

b. In-flight. The flight engineer will monitor fuel management. He or she will compute fuel consumption, bingo fuel and keep the pilot advised of fuel status at all times.

12-8. **Weight and Balance.** A new or corrected DD Form 365-4, Weight and Balance Form F, need not be recomputed provided the initial takeoff gross weight (item 16) is not changed by more than 500 lbs. Although no written adjustment may be required the flight engineer will compute these changes to ensure center of gravity limits are not exceeded. The aircraft commander will be informed of the changes.

12-9. **Use of DD Form 365-4:**

a. Canned DD Form 365-4 are not authorized, except for alert and FCFs. (Exception: 37 ARRS units may use canned 365-4s for all normal operations.)

b. Wings/unit DOV will determine whether "zero fuel" weights/computations are required on the DD Form 365-4. If "zero fuel" is not utilized, the following applies to the DD Form 365-4:

(1) Line through item 21.

(2) Enter "less fuel" under item 22. (Item 10 minus item 23.)

(3) Enter the aircraft's minimum fuel in item 23 and line through the adjoining index/mom squares.

(4) All other zero fuel references on the 365-4 may be left blank.

c. Passengers. Item 13 will indicate the number of passengers in a compartment/seat/position, their weight, and the compartment/arm/station.

EXAMPLE:	H-1 Series	2/400/117.0
	H-3	1/200/D-10
		1/200/D-11
		3/600/D
	H-60	2/400/320.7
	H-53	3/600/D

d. Cargo. Use the last cargo and compartment/arm/station column on the right side of the form.

Chapter 13

HELICOPTER STANDARD CONFIGURATION

Standard configuration is detailed in appropriate 57 series regulations. This chapter contains the policy governing configuration.

13-1. Responsibilities. All helicopters are configured IAW the appropriate 57-series regulation. Additional special mission equipment may be added at the option of the unit commander. Rescue aircraft need not be fully rescue configured when a specific mission requires placement of additional seats/cargo in the space provided for mission equipment, when maximum gross weight is a consideration, or when otherwise authorized (e.g., VIP, MAST, host base support, survival school support). Locate items at the stations indicated when they are on board. All equipment authorized for and installed on the aircraft will be categorized and managed IAW AFR 66-21. Aircraft will not be modified to secure/install equipment unless authorized by aircraft technical orders or AFR 57-4.

NOTE: Cargo/Equipment. Securing life support/medical equipment/medical kits with seat belts is authorized. Items requiring constant access, such as nav kits or mission kits, that weight less than 20 pounds may be secured with seat belts. Secure cargo/equipment items not requiring rapid removal during an aircraft or medical emergency with devices identified in TO 1C-1-71. Do not modify tiedown devices in any fashion.

13-2. Rescue-Equipped TDY Aircraft. Normally, any time a Rescue aircraft departs home station, it will be equipped to accomplish the rescue mission. Unit commanders will determine the equipment required to be on board TDY aircraft which are unable to maintain full rescue configuration. (The 37 ARRS, 1550 CCTW, and Det 2, 67 ARRS, are exempt from the requirements of this paragraph.)

13-3. Deviations. Commanders may authorize deviations from standard configuration. Configure assigned aircraft with equipment required to accomplish tasked missions. Helicopters assigned to the 1550 CCTW are not required to carry the pyrotechnics/mission equipment storage box or contents while performing their assigned training mission. Deviations from combat configuration requirements are authorized at employment locations (including exercises) when the mission dictates.

13-4. Combat Requirements. Any unit tasked for combat operations will deploy or operate, as applicable, from home station with the additional combat equipment and pyrotechnics unless otherwise directed in the tasking/execution order. When tasked for combat operations, configure aircraft with basic combat equipment. The requirements of this chapter do not apply to 1550 CCTW aircraft; however, armor will be available and identified by tail number.

13-5. FCF Configuration. Aircraft may fly functional check flights without the equipment installed; however, emergency survival equipment required by MACR 55-22 as supplemented will be on board.

13-6. Exercise Configuration. Mission commanders are authorized to establish and publish equipment requirements for use during all headquarters approved exercise (i.e. RED FLAG, MAPLE FLAG, etc.). Establish equipment requirements based upon the scenario. The configuration(s) should not be altered just for the purpose of carrying additional observers, ferrying simulated survivors, etc. Aircraft will be employed and perform SAR alert in the configuration(s) developed for the exercise. Survival equipment required by MACR 55-22 as supplemented will be included in these configurations.

13-7. Discrepancies. Document all standard configuration discrepancies using AFTO Form 781A.

Chapter 14

FORMATION FLYING

SECTION A—HELICOPTER FORMATION PROCEDURES

14-1. General. The primary purposes of helicopter formation flight are mutual support and control. In addition, formation flight enhances discipline, maneuverability, and flexibility. If more than three aircraft are required for a tactical situation, consideration should be given to breaking into smaller elements to aid threat avoidance. The minimum separation between the closest portions of any two helicopters in any formation is one rotor diameter and a vertical step-up (optional) for each succeeding helicopter. Tactical formation will not normally be flown in marginal weather conditions. Formation flights with dissimilar aircraft are authorized when all participating crewmembers are briefed and are thoroughly familiar with the other aircraft's performance and tactics. Rotor disk separation will be based on the largest rotor disk diameter.

NOTE: The formation training standards for tactical crews are: (1) Ability to fly in position at one to three rotor disk separation. Equal proficiency at one and three disks separation is required. (2) Ability to execute simultaneous takeoffs and landings. (3) Ability to conduct operations in minimum illumination with reduced aircraft lighting (as unit mission dictates). (4) Ability to conduct operations in a comm-out environment.

NOTE: See FLIP planning for proper formation flight plan filing procedures.

14-2. Responsibilities. Every crewmember has specific responsibilities which directly affect the safety and mission of the entire formation.

a. Flight Leader. The flight leader must know and consider the capabilities of all members of the flight. Flight lead is responsible for:

(1) Briefing the flight covering as a minimum those items contained in the formation briefing guide (chapter 31).

(2) Performing maneuvers within the capabilities of all members of the flight.

(3) Maintaining formation integrity and air discipline.

(4) Directing radio channel changes, making radio calls, navigating, ensuring formation clearance from other aircraft and hazards, and directing all formation changes.

(5) Conducting a postmission formation debriefing.

b. Wingman. The wingman is responsible for:

(1) Maintaining position in the formation.

NOTE: Advise flight lead when it is necessary to deviate from any directed position.

(2) Acknowledge radio-channel changes with chalk position prior to initiating the action (NA for comm-out).

(3) Navigation and terrain/obstacle clearance independent of lead (to the maximum extent possible during night operations on Pave Low's wing).

(4) Backing up the flight lead where necessary and being able to assume the lead if required.

(5) Notifying lead if visual contact with formation aircraft is lost, flying safety is jeopardized, or radio failure occurs.

(6) Questioning flight lead via the radio anytime a significant deviation occurs that may jeopardize mission accomplishment.

c. Crewmembers. Each crewmember has the responsibility to provide mutual coverage for other aircraft in the formation. This includes scanning the six o'clock position of other helicopters in the formation since rearward visibility is extremely limited. Mutual coverage is especially important in a combat environment where the flight is susceptible to an attack from enemy ground and airborne weapon systems. Scanners are also responsible for notifying the pilot of all changes in the relative position of other aircraft in the formation.

14-3. Not Used.

14-4. Communication. Formation flight will not be initiated without positive inter-aircraft radio communications (may not be required for contingency operations). Prior to conducting formation flight, a communications check of all aircraft in the formation will be conducted. In the event of radio failure, lead will direct an abort for that particular aircraft if mission requirements make the abort necessary.

a. Radio Procedures. After initial radio contact has been established between aircraft, lead is responsible for all calls pertaining to the flight.

(1) Frequency changes will be initiated only by lead.

(2) Wingmen will acknowledge (by chalk position in the flight) a frequency change prior to switching to the new frequency; however, lead may prebrief way points for communication changes, these do not require acknowledgement. Throughout the formation mission, an acknowledgement of a frequency change indicates all checklists are complete and you are ready for the next event. If you are not ready, reply with "standby." The frequency will not be changed until all have made the normal acknowledgement.

(3) Lead will check in on the new frequency followed by all wingmen (in order).

(4) If a wingman fails to check in after a reasonable length of time, lead will attempt contact on another radio. If this fails, lead will direct a member(s) of the flight back to the previous (or a prebriefed) frequency to reestablish contact. As a last resort, lead will initiate a prebriefed chattermark code on guard in order to establish contact on prebriefed frequencies.

(5) Both the pilot and copilot in each aircraft in the flight will monitor all interplane frequencies.

(6) Only essential transmissions will be made. Strict radio procedures and discipline must be enforced in order to avoid jeopardizing safety and mission effectiveness.

b. Signals. Formation signals contained in AFR 60-15 may be used. Aircraft commanders will ensure their aircrews have the appropriate equipment to pass light signals prior to engaging in night formation flights.

(1) Helicopter formation light signals are included in Annex A. Other light signals may be utilized if prebriefed.

(2) The following sequence is recommended for passing light signals between helicopters.

(a) Sender gives an "attention" signal (circling motion).

(b) Receiver acknowledges by giving an "attention" signal in reply.

(c) Sender passes signal.

(d) Receiver acknowledges by passing signal back to sender.

(e) Sender verifies signal with a "yes" signal (vertical motion) or a "no" signal (horizontal motion).

(f) Sender gives "execute" signal by either turning on upper strobe light or by passing an infinity symbol (horizontal figure 8 motion).

14-5. Types of Formation. Formations of more than two aircraft may be divided into elements. The following formations are authorized for helicopters:

NOTE: NVGs may be used when flying any close helicopter formation (one to three rotor disks) listed below. Fluid trail may be flown using NVGs as specified. Refer to chapter 30, NVG Operations, for the limitations and cautions that must be observed when operating on NVGs.

a. Echelon Formation. (See figure 14-1.) Each aircraft holds a position approximately 30° to 45° astern of the preceding aircraft on either the right or left side. Turns are normally made away from the formation (N/A for two-ship formation). During echelon turns away from the flight, each succeeding aircraft (wingmen) maintains its position relative to the horizon (level turn). During turns into the flight, each succeeding aircraft maintains its position relative to the formation leader. Wingmen may stack slightly high or low, as required, to maintain visual contact with the preceding aircraft.

NOTE: Left echelon is normally used when two or more helicopters rendezvous with a tanker for refueling.

b. Staggered Formation. (See figure 14-2.) Spacing is normally one to three rotor disks.

c. Staggered Trail. (See figure 14-3.) This formation resembles staggered formation. Spacing is normally one to three rotor disks, at a 10° to 20° angle, astern of the preceding helicopter. This formation provides a good alternative to flying trail formation if straight trail alignment is not required.

d. Trail Formation. (See figure 14-4.) A formation where each aircraft holds a position one to three rotor disks directly behind the preceding aircraft, stacked slightly higher.

e. Tactical Formation. A loose formation with the wingmen positioned a minimum of 500 feet from the preceding aircraft anywhere from line abreast to trail depending on tactical requirement. Whenever possible, the wingman will stay out of lead's 5 o'clock to 7 o'clock position. This will provide better mutual coverage of 6 o'clock positions. Wingmen should be far enough from the preceding aircraft so as to allow room for maneuvers in any direction. Vertical separation should not be greater than plus or minus 100 feet. This formation is normally used in a combat environment. Tactical formation allows lead to maintain flight integrity and still maneuver the formation with few restrictions. Tactical formation also allows for improved mutual support and is recommended for long flights as it conserves fuel and is less demanding on the aircrew. Tactical formation is comprised of the following fundamental formations:

(1) Two-ship Line Abreast: (See figure 14-5). The wingman holds a position approximately 0° to 10° back from the lead aircraft, with 1000 feet lateral separation on either the right or left side. This formation is commonly flown over flat terrain where masking options are limited. It is restricted to daylight operations.

(2) Fluid Trail. Formation is similar in design to staggered formation (see paragraph 14-5b) except for increased lateral separation (see figure 14-6). Wingmen are allowed to maneuver in the 90° quadrant astern (45° left or right) of the preceding aircraft. Techniques for maintaining the desired interval at the completion of a turn are presented in figure 14-7. This formation is flown while terrain masking in mountainous or rough terrain. It may be used during NVG operations in mid to high level ambient illumination conditions only.

NOTE: Limit maneuvering flight, especially at night, when operating in three-ship fluid trail. Wingmen will fly a set position to the maximum extent possible.

(3) Spread. Figures 14-8 and 14-9 depict two- and three-ship spread formations, respectively.

(a) Two-ship. Wingman maintains a position either at line abreast, with 1000 feet lateral separation, or at a position 45° astern of lead, with 500 feet lateral separation. Position depends upon terrain and the tactical situation. This formation is restricted to daylight operations.

(b) Three-ship. The number 2 wingman flies fluid trail on lead and number 3 is spread, line abreast with 1000 feet lateral separation. If terrain restricts the formation, number three moves to a position 45° astern of lead with 500 feet lateral separation. Each wingman stays on his respective side of lead at all times. This formation is restricted to daylight operations.

14-6. Engine Start and Taxi. Start engines by visual signal, radio call, or at prebriefed time. Prior to requesting taxi clearance, flight lead will check-in the flight (NA for comm-out taxi and takeoff operations). The flight will normally taxi in order with a minimum of 100 feet spacing from main rotor to tail rotor.

14-7. Line-up for Takeoff. The following procedures will be utilized:

a. Lead will normally taxi to downwind side of the takeoff area/runway to permit line-up and hover checks. Lead must allow adequate room on the runway for all formation members to maneuver.

b. Spacing should be commensurate with the type helicopters and conditions with a minimum of one rotor disk. Increased spacing may be required; e.g., heavy gross weights, dusty conditions, rolling takeoffs, dissimilar aircraft, etc.

c. Indicate ready for takeoff by stating aircraft position in the formation. If not ready state, "stand by." During comm-out each aircraft chalk position will indicate ready for takeoff by extinguishing its strobe and/or position

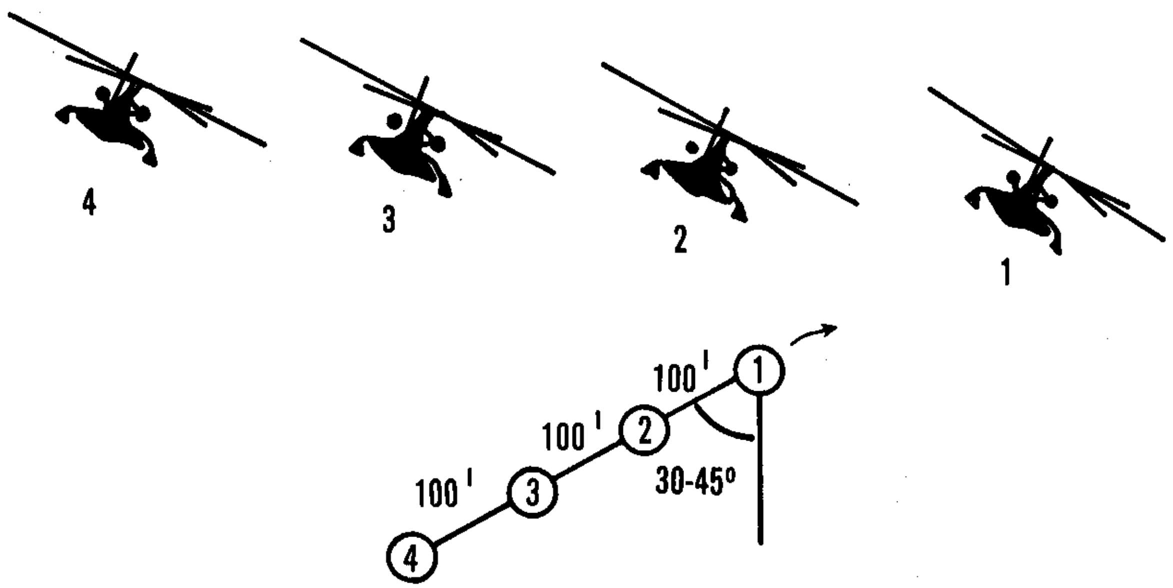


Figure 14-1. Echelon Formation.

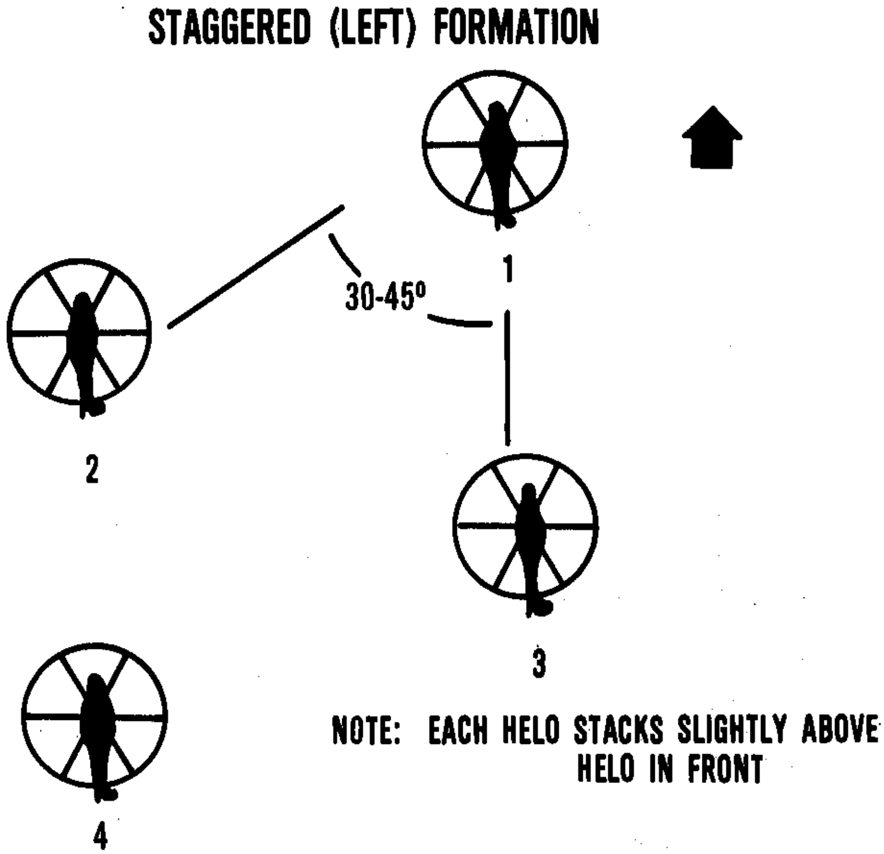


Figure 14-2. Staggered (Left) Formation.

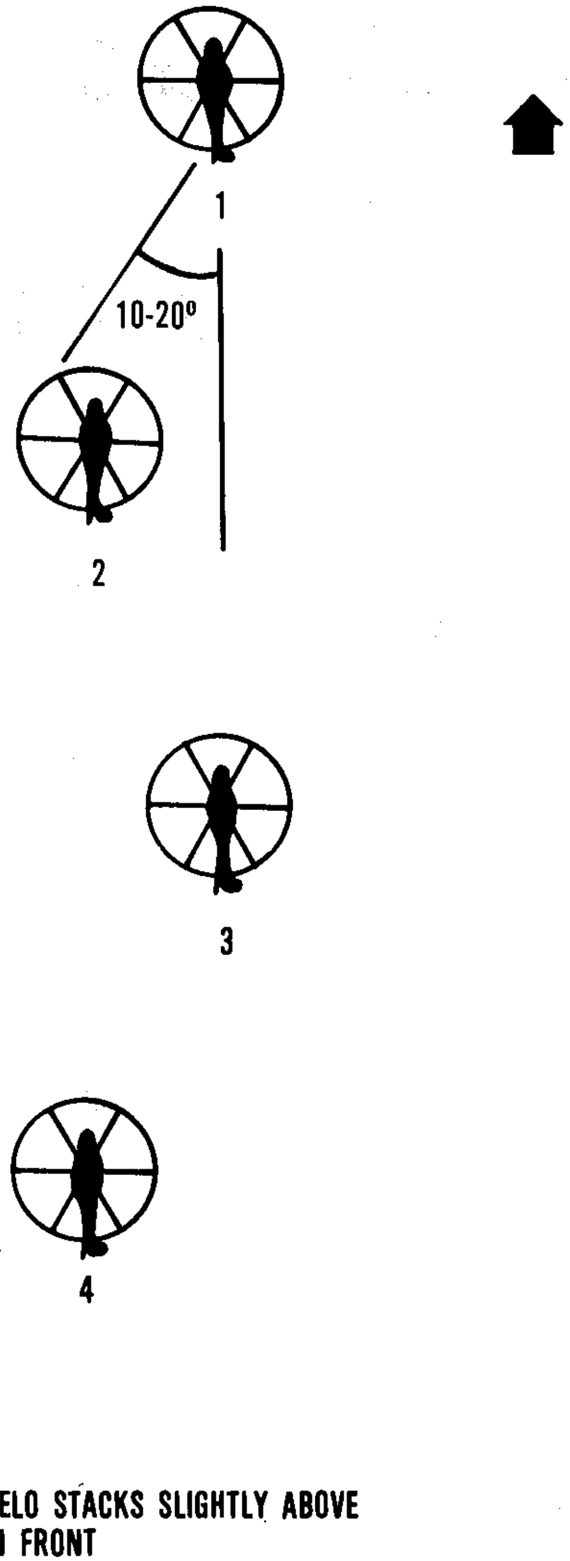


Figure 14-3. Staggered Trail (Left) Formation.

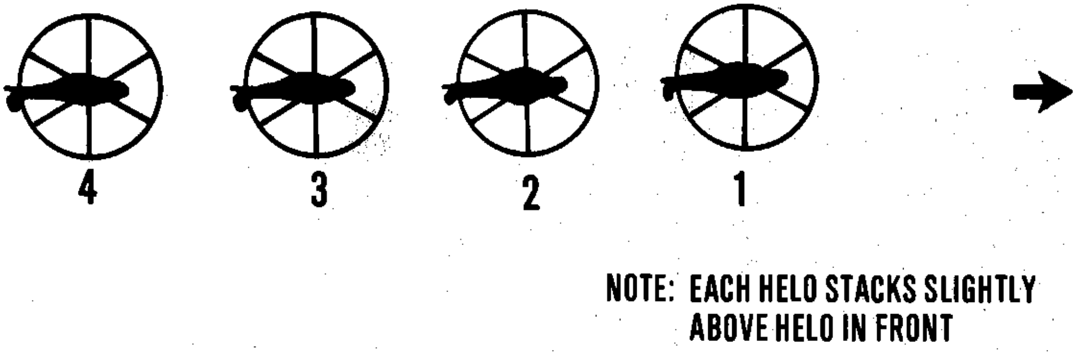


Figure 14-4. Trail Formation.

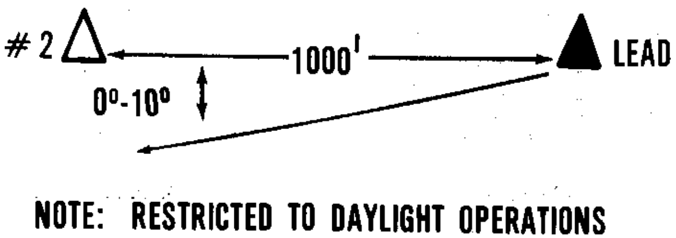


Figure 14-5. Two-Ship Line Abreast.

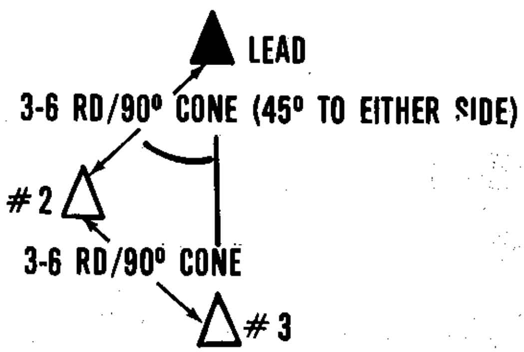


Figure 14-6. Three-Ship Fluid Trail.

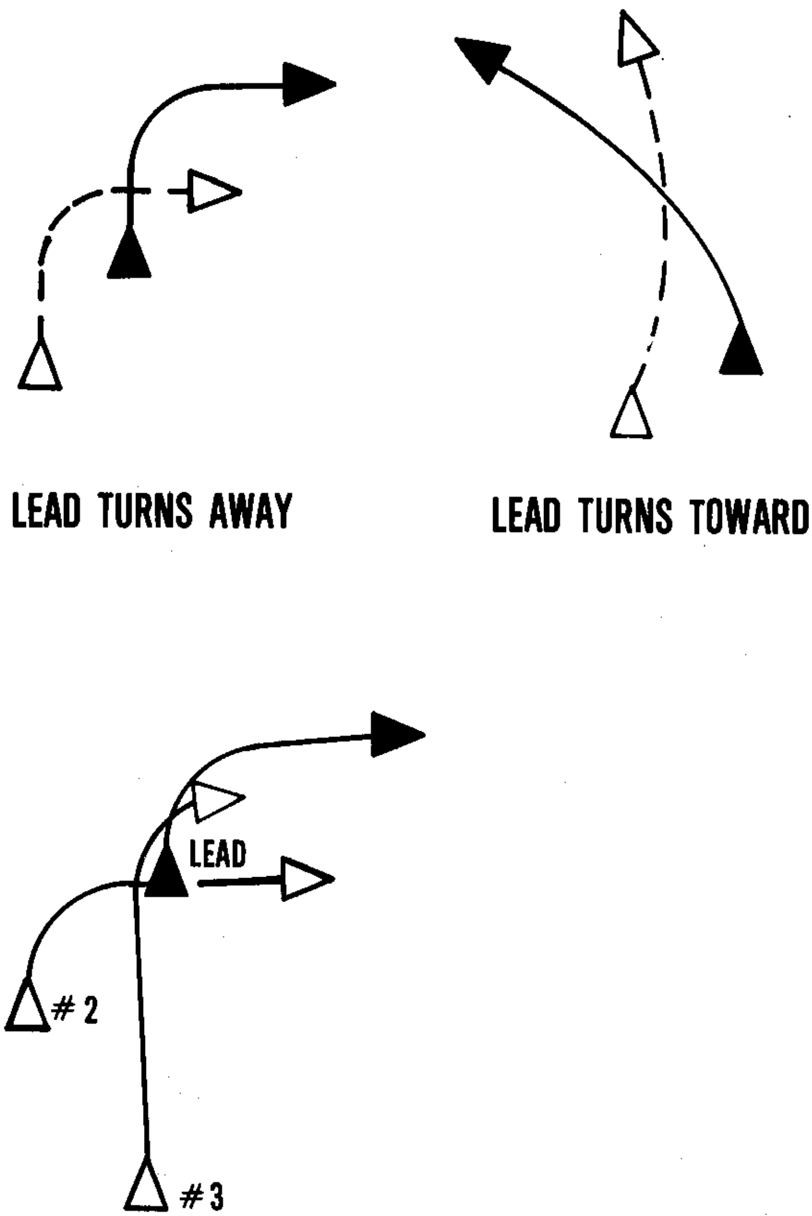


Figure 14-7. Turning Techniques for Maintaining Desired Interval.

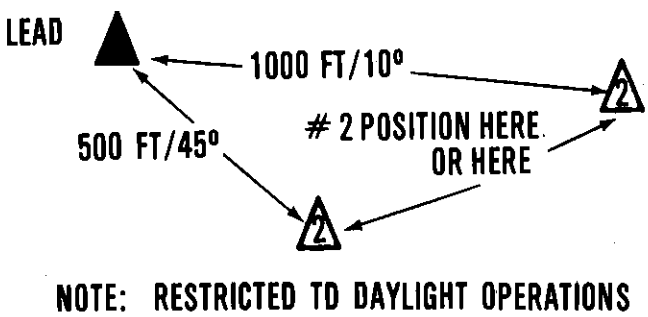


Figure 14-8. Two-Ship Spread Formation.

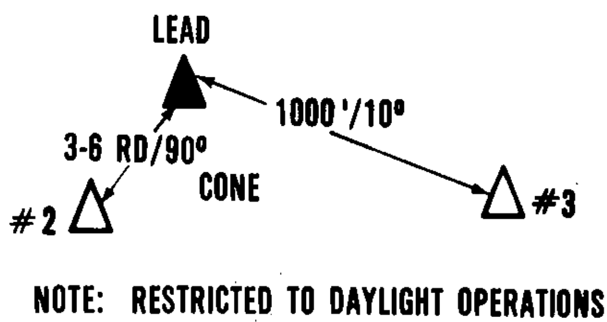


Figure 14-9. Three-Ship Spread Formation.

lights. When all aircraft have extinguished their strobe and/or position lights, and ATC clearance is received, lead will extinguish its strobe lights, wait five seconds and initiate takeoff. During training, the last member of the flight will fly with position lights and a strobe light on. The strobe light will be on prior to takeoff.

14-8 Takeoff. There are two types of formation takeoffs—"wing" and "tactical." Either type may be initiated from the ground or a hover. Prebrief the type to be used.

NOTE: Power checks will be accomplished as briefed by lead.

a. Wing Takeoff. Aircraft takeoff simultaneously maintaining formation separation. Lead may be required to hold a slightly lower than normal power setting to enable the wingmen to maintain position without requiring excessive power.

b. Tactical. Lead initiates a takeoff. Wingmen may delay takeoff as much as ten seconds between aircraft before initiating takeoff. Lead will climb at briefed airspeed and rate of climb.

14-9. Aborts:

a. Prior to takeoff, an aborting aircraft will notify lead, clear the formation (as appropriate), and return as directed.

b. If an abort occurs during takeoff, the aborting aircraft will call individual call sign, abort, and state intentions. For example, "Jolly 49, abort, straight ahead." Aborting aircraft will turn on a strobe at night. The aborting aircrew will, if possible, maintain their respective side of the formation from which the takeoff was started. The aborting aircraft is responsible for avoiding any aircraft in front of it.

c. Succeeding aircraft may continue takeoffs or delay as the situation dictates.

d. If an abort occurs, all other aircraft will assume new position, and complete the mission as briefed. With the permission of the flight leader, a spare aircraft or the original may rejoin the formation in last position.

14-10. Join-Up. Two types of join-ups may be used: Straight ahead or turning. Unless prebriefed or directed by lead, wingmen will request permission to rejoin. Lead will direct which type of rejoin to be used. Wingmen maintain clearance on preceding aircraft, close to slightly wide position and synchronize airspeed. Wingmen then move into their respective prebriefed formation positions. Once reestablished in formation, wingmen will report (e.g., "Two's in"). This call is not required during comm-out formation.

a. Straight Ahead. Lead establishes a heading while wingmen accelerate until established in position. To expedite the maneuver, lead may reduce airspeed until wingmen call in position. This type of join-up is used when you want to depart on course or when a turn after takeoff would not be practical.

NOTE: If an overshoot becomes unavoidable, the joining aircraft should reduce power, raise the nose to decelerate, and, if necessary, turn slightly away from the formation. Keep lead (or the preceding aircraft) in sight. Resume the rejoin once closure rate is under control.

b. Turning. Lead establishes an angle of bank no greater than 20 degrees. Wingmen then turn inside of lead/preceding aircraft until established in position.

NOTE: If an overshoot becomes unavoidable, the joining aircraft should pass behind the preceding aircraft so as not to lose visual contact. Never pass directly under or over any other aircraft in the formation (see figure 14-10).

c. Night Join-Ups. Exercise extreme caution during night join-ups, especially turning join-ups and rejoins, due to the difficulty in estimating distance and closure rate. It is essential that all formation aircraft maintain prebriefed parameters (i.e., airspeed, heading, rate of climb). After takeoff, maintain visual contact with lead. Lead maintains all lights on bright (except NVG operations) until join-up is complete and then reset lights. Adjust lights as requested by the wingman.

14-11. Night Formation. Night formations procedures are the same as for day, but increased vigilance is an absolute necessity due to decreased visual references. All corrections should be slower and more cautious. The formation light settings are:

NOTE: Lead should adjust light settings as requested by the wingman once the formation is joined.

a. VFR Formation (Not applicable for NVG operations):

(1) Fuselage Lights—ON (If applicable)

(2) Formation Light (Slime Lights)—ON (If applicable)

(3) Strobe Lights—OFF (ON for the last aircraft in formation—ON for lead during night join-ups or crossover)

(4) Blade Tip Lights—ON (If applicable)

(5) Position Lights—ON

(6) Other Interior Lights (As required)

b. NVG Formation

(1) Formation Lights (Slime Lights)—ON 50% (Dim)

(2) Blade Tip Lights—ON 50% (If applicable)

(3) Cargo Compartment Lights (As required)

(4) Position Lights—ON (Dim)

(5) Strobe Light(s)—OFF for CONUS units (one strobe light will be on for the last aircraft in formation when above 300 ft AGL)

14-12. En Route:

a. Spacing for most formations will be 1 to 3 rotor disks (except tactical formations) with each helicopter stacked slightly above the preceding helicopter. Wingmen will follow the applicable overshoot procedures in paragraph 14-10 any time an excessive closure rate develops.

b. Formations are normally flown with a maximum of five (5) aircraft per element to ensure safe lost visual procedures. If VMC is assured and larger formations are required, they may be used.

c. The purpose for flying low level/terrain masking is to avoid detection during tactical missions. Avoid IMC to the maximum extent possible. Avoiding IMC will greatly reduce the chance of entering a situation which would require the use of lost visual contact procedures and a climb to MSA. When deteriorating weather conditions are encountered enroute, consider the following options: Alter the course to circumnavigate the weather; a course reversal to remain in VMC; send a "weather ship" ahead of the formation; a formation landing. These options will allow the flight leader to maintain formation integrity until an alternate plan of action can be determined.

d. Minimum altitude for en route formation is 500 feet AGL except when mission requirements dictate a lower altitude (see paragraph 5-17).

14-13. Pitch-Out and Rejoin. Lead will place the flight in echelon and give the prebriefed pitch-out signal. Lead will begin a turn away from the formation and maintain the turn for approximately 180 degrees. The pitch-out need not be a level turn. The wingman (men) will delay 3 seconds and begin a turn to duplicate the flight path of lead or wingman ahead of him. The lead aircraft will then signal for rejoin if desired. This is a maneuver used primarily in training.

14-14. Changing Formation. Unless briefed otherwise, lead will set the formation, changing aircraft as required to reduce pilot fatigue, provide terrain clearance, etc. If lead desires a formation change, radio, light or visual signals may be used to change the formation. As an alternative, lead may direct "two" to set the formation while en route.

a. Crossover. During the crossover, wingmen will maintain appropriate clearance. Use a heading change of approximately five degrees to cross from one side to another. Once number two changes, all corresponding aircraft will move to establish the new formation, i.e., if the formation is staggered left and two moves to right, all even numbered positions will move to the right with the odd number chalk positions maintaining their position behind the lead aircraft.

b. Lead Change (Figs 14-11, 12, 13). Formation lead changes can be directed ONLY by the lead aircraft. Lead changes will be acknowledged by all flight aircraft prior to execution. Lead changes and formation changes will not be accomplished simultaneously. However, a staggered formation will switch sides when #2 becomes lead without any repositioning of aircraft. The new lead may change formations after the lead change is completed. When lead has received acknowledgement of lead change from all aircraft, it will give the execute signal. Then:

(1) For trail, echelon, and staggered formations, lead will immediately turn away from its number two wingman, and when clear, decelerate so that the flight will pass. Lead will then fall back into formation as the last aircraft. If a lead change is initiated from a trail formation, the lead will always clear to the right. Lead will use scanners to stay clear of the flight. Variations of lead change procedures will be briefed as applicable.

(2) When radios are used the aircraft assuming lead will state "abeam" when approaching abeam the leader, and ready to assume formation lead. The lead, when ready to relinquish formation lead, will state "tally-ho." The new lead states "assuming lead" and takes up the appropriate squawk.

(3) Maintain the original formation call sign regardless of the number of lead changes.

(4) A variation of the formation lead change may involve lead directing an immediate lead change on the radio (i.e., inoperative radar while terrain following at night in mountainous terrain). The formation will in turn go to trail. The designated alternate lead will pull out to the right and once abeam he will assume lead. The previous leader will fall back into a prebriefed position in the formation.

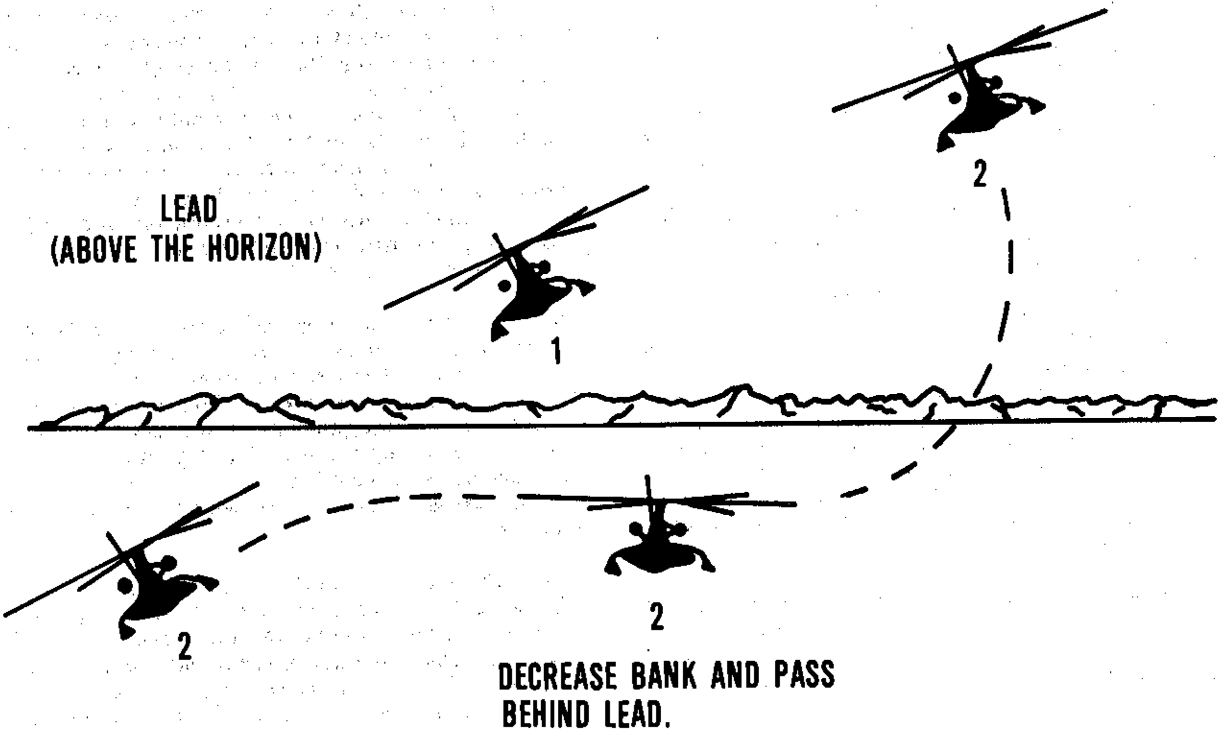


Figure 14-10. Overshoot: Turning Rejoin.

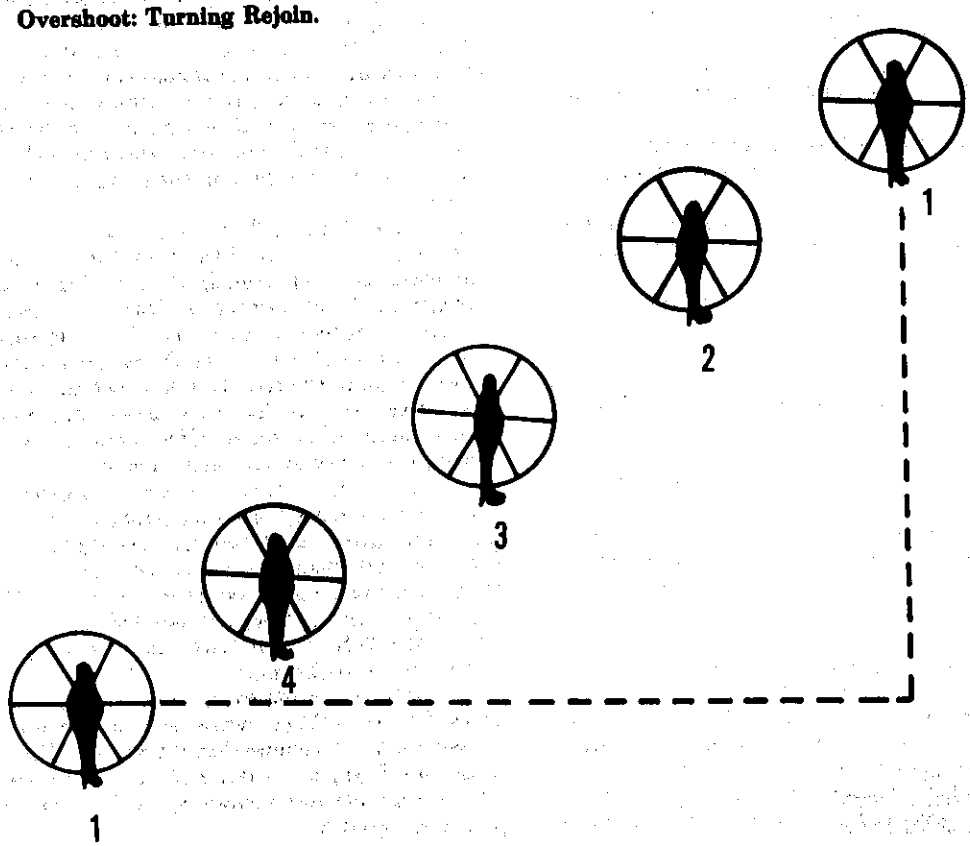


Figure 14-11. Lead Changes—Echelon Left Formation.

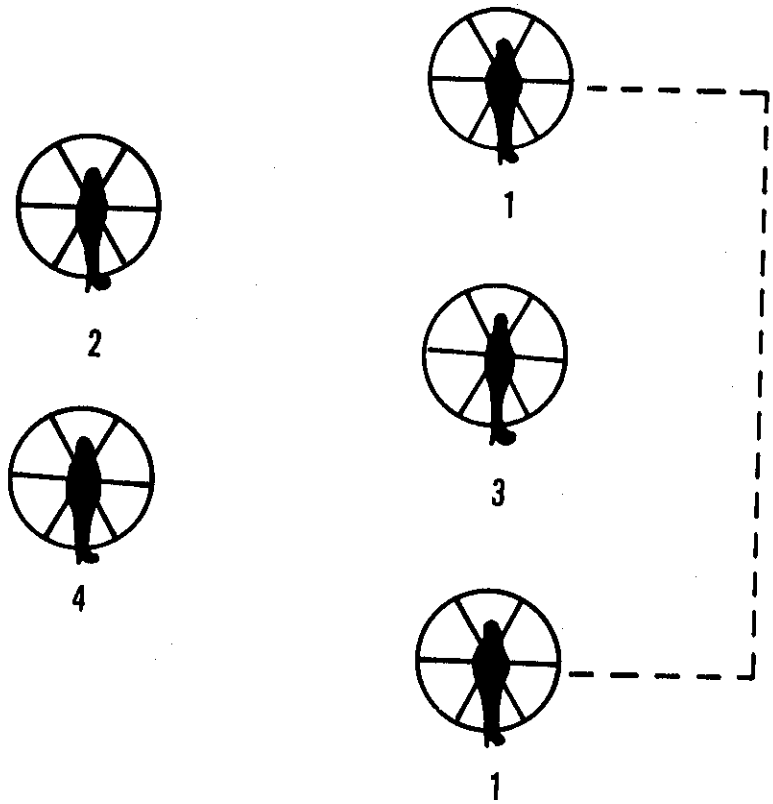


Figure 14-12. Lead Changes—Staggered (Left) and Staggered Trail (Left).

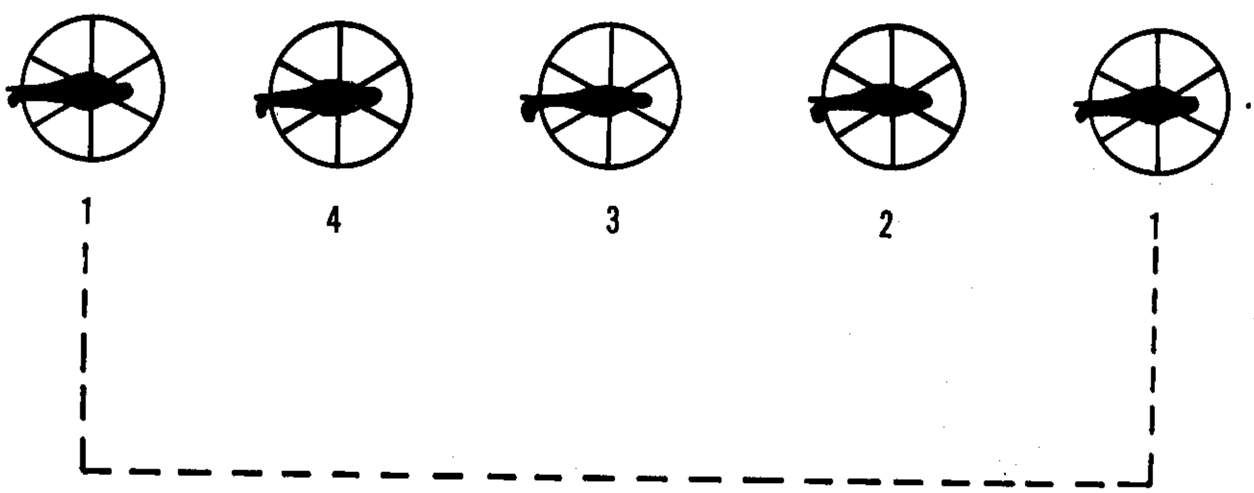


Figure 14-13. Lead Changes—Trail Formation.

14-15. Lost Visual Contact (See figures 14-14, 15, 16). When a wingman loses sight of the preceding aircraft, it is imperative that all members of the formation react quickly and precisely to prevent a mid-air collision. In such a case, the aircraft losing contact will call,
"Call sign, chalk Position, Lost Visual Contact." Lead will immediately initiate the breakup by saying "Execute", and follow this with the type of breakup (mountainous or non-mountainous) base heading, airspeed he will maintain, and the MSA for that route segment. All wingmen will take action based on the announced heading, airspeed and MSA. Wingmen will acknowledge lead's calls and bring their lights up. Once the formation executes the lost visual procedure, lead will announce or prebrief any changes to magnetic

headings, airspeed, and MSA. These items may change for several reasons; e.g., formation continues on course, formation aborts mission, MSA changes for next leg of route, etc.

a. If another aircraft calls lost visual contact and you still have sight of the preceding aircraft, maintain formation position on that aircraft. If you then lose sight of the preceding aircraft, execute lost visual contact procedures for your original chalk position in the formation.

EXAMPLE: A four-ship formation. Aircraft #3 loses sight of #2. Aircraft #3 calls lost visual and lead makes appropriate calls. Aircraft #2 still has sight of lead, aircraft #4 still has sight of #3. Aircraft #2 keeps formation with lead; aircraft #4 keeps formation with #3. Aircraft #3 executes the lost visual contact procedure for his chalk position because aircraft #2 may subsequently lose sight of lead.

b. If a wingman calls lost visual contact and lead is still VMC and able to ensure terrain/obstacle clearance, lead should stay in VMC. Lead must still make base heading, airspeed, and MSA calls for the wingman executing the lost visual contact procedure.

c. If confronted with a large formation requirement where lost visual contact (e.g., inadvertent IMC) is possible, strong consideration should be given to cancelling the mission or rerouting the formation. In these conditions, the maximum number of aircraft should be limited to five per element.

d. A minimum safe altitude (MSA) should be preplanned for all route segments of the flight. These MSAs must be known by all members of the flight and should be designated on their maps/flight logs.

(1) The MSA for nonmountainous terrain should be at least 1000 feet above the highest terrain 10 NM either side of course. Within the United States (50 states) this distance may be reduced to 5 NM.

(2) The MSA for mountainous terrain should be at least 2000 feet above the highest terrain 10 NM either side at course. within the United States (50 states) this distance may be reduced to 5 NM.

e. The following lost visual contact procedures are for nonmountainous operations. (Mountainous areas are a 500-foot gradient within¼ NM of the flight path.)

(1) Echelon Left/Right:

(a) Lead maintains base heading (usually straight ahead), airspeed (this may require an acceleration for large formations), and MSA (this may require a climb if low level).

(b) Aircraft #2 turns 20 degrees away from base heading (left for echelon left, right for echelon right) and climbs 400 feet above MSA.

(c) Aircraft #3 turns 30 degrees and climbs 600 feet above MSA.

(d) Aircraft #4 turns 40 degrees and climbs 800 feet above MSA.

(e) After reaching assigned altitude, each aircraft will maintain his offset heading for 30 seconds and then return to base heading.

(f) Climb power will be prebriefed.

NOTE: The rule of thumb for all nonmountainous lost visual contact procedures is multiply your position (chalk number) by 10 degrees for your heading offset and by 200 feet for your altitude above MSA. Timing for all wingmen is 30 seconds and starts when you reach your altitude. At the end of your timing, return to the base heading.

(2) Staggered Left/Right and Staggered Trail Left/Right:

(a) Lead's procedures are same as echelon left/right.

(b) Aircraft #2 turns 20 degrees left/right from hase heading and climbs 400 feet above MSA.

(c) Aircraft #3 turns 30 degrees right/left from base heading and climbs 600 feet above MSA.

(d) Aircraft #4 turns 40 degrees left/right from base heading and climbs 800 feet above MSA.

(e) After reaching assigned altitude, each aircraft will maintain his offset heading for 30 seconds and then return to base heading.

(f) Rate of climb will be prebriefed.

(3) Trail. All procedures are the same as staggered right.

f. The following lost visual contact procedures are for mountainous terrain. These procedures are only suggested because lost visual contact in a mountainous environment, especially low-level, is a critical situation and the tactical environment, existing weather conditions, and terrain may require deviations. Every formation briefing will contain IMC avoidance considerations and lost visual contact procedures. The following procedure applies to staggered left/right, staggered trail left/right, and trail.

(1) Lead will fly at base airspeed. If possible/feasible, lead should accelerate to allow the formation more maneuvering room and to avoid excessively slow airspeeds for wingmen. EXAMPLE: Assuming 100 KIAS as the cruise airspeed, lead should maintain base heading, accelerate to 110 KIAS base airspeed, and climb to MSA if IMC is encountered.

(2) Aircraft #2 will adjust to maintain base airspeed minus 10 knots and climb 400 feet above MSA.

(3) Aircraft #3 will adjust to maintain base airspeed minus 20 knots and climb 600 feet above MSA.

(4) Aircraft #4 will adjust to maintain base airspeed minus 30 knots and climb 800 feet above MSA.

(5) As each aircraft reaches its assigned altitude, maintain heading and assigned airspeed for 3 minutes, then accelerate to a prebriefed indicated airspeed.

(6) Climb power will be prebriefed.

g. Based on an assessment of the weather situation, threat environment, aircraft navigation capability, etc., lead will decide whether to abort or continue the mission.

(1) After completion of breakup, if lead determines that it is necessary, the flight will contact ATC facilities for approach to an appropriate facility. When ATC facilities are not available and/or lead is VMC, lead will designate (by waypoint number or distance short of a waypoint), the location (letdown point) and altitude (MSL) for descent to lead's altitude.

(a) At this point, lead will ensure he is at the designated altitude.

(b) As aircraft #2 reaches the letdown point, it will report altitude departing and descend at 500 feet per minute until reaching the designated altitude. Aircraft #2 will report reaching VMC, ensure position and anticollision lights are on, and accelerate to catch lead.

(c) When aircraft #3 reaches the letdown point, if it has heard #2 report reaching VMC, #3 will follow the same letdown procedure as #2.

(d) When aircraft #4 reaches the letdown point, if it has heard #3 report reaching VMC, #4 will follow the same letdown procedure as #2.

(2) As the flight rejoins, each aircraft will return to mission lighting after the succeeding aircraft rejoins.

When the entire flight is rejoined, all aircraft will recheck mission lighting. If any aircraft does not achieve VMC at the designated altitude, it will immediately climb back to its assigned altitude and advise lead. As a general guide, lead will not clear the flight down until lead has appropriate weather minimums for the mission being flown (operational or training).

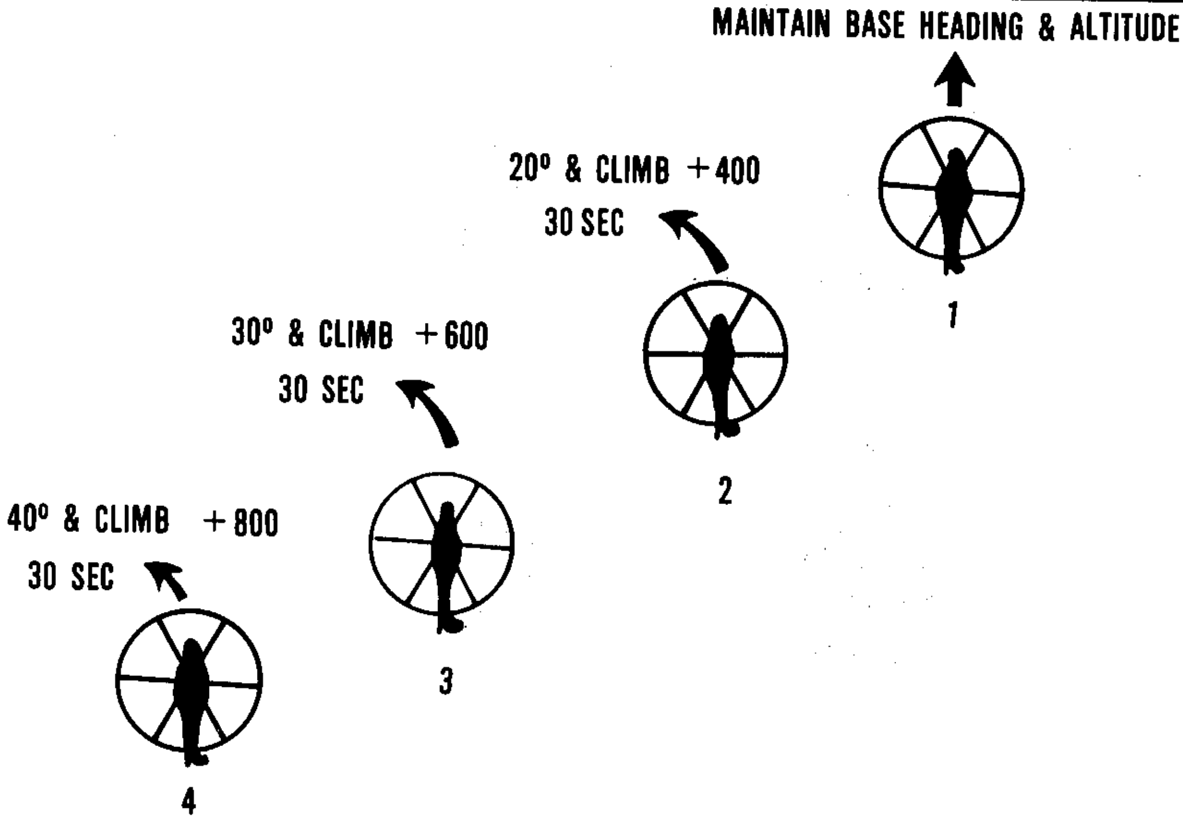


Figure 14-14. Lost Visual Contact—Procedures for Left Echelon.

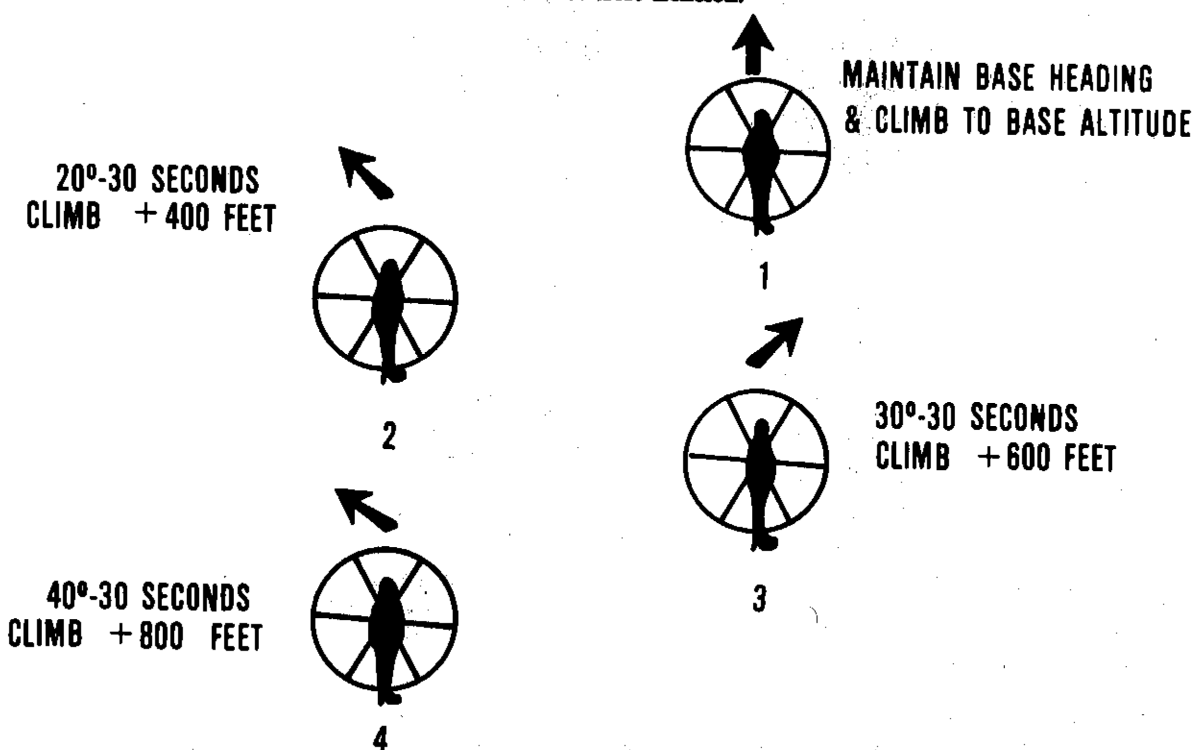


Figure 14-15. Lost Visual Contact—Staggered (Left) and Staggered Trail (Left).

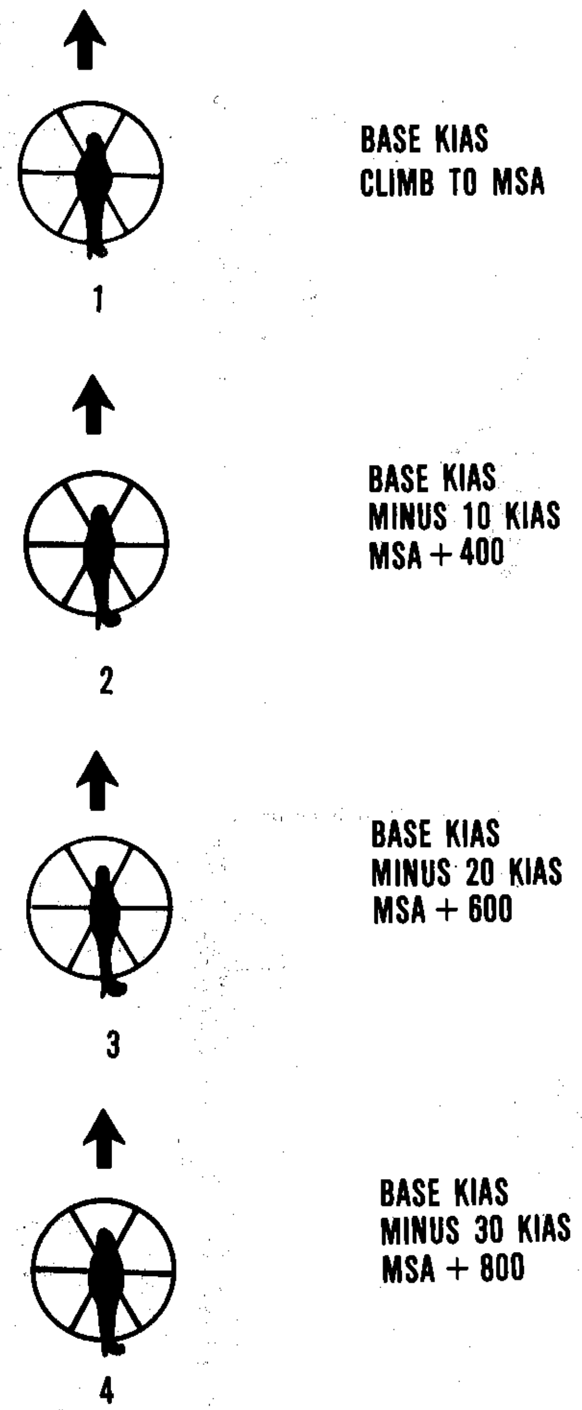


Figure 14-16. Lost Visual Contact—Trail Formation (Mountainous Terrain Procedure).

14-16. Evasive Maneuver Battle Drill:

a. General. No rigid set of procedures can be given to cover all tactical situations since the maneuvers used by a helicopter force vary according to the threat and tactical situation. However, in all situations, a decision must be made promptly whether to take evasive action. Once the decision to take evasive action has been made, action must be initiated immediately.

b. Attack Warning. A successful evasion depends on the timely receipt of a warning of the attack, which depends on effective lookout techniques and rapid communications, i.e., radios calls in comm-out environment.

c. Lookout Doctrine. Each aircrew member shall be assigned a sector of lookout responsibility. Within the limitations of aircraft configuration, the aggregate of such sectors shall provide 360 degrees of lookout around the aircraft. Lookout sectors shall be designated by clock coding with twelve o'clock coding oriented on the nose of the aircraft. Vertical sectors shall be designated with reference to the horizon so that level shall refer to a position on the horizon, high to a position above the horizon, and low to a position below the horizon. Sectors shall overlap when possible. Individual lookout sectors and responsibilities shall not be modified or relaxed when a helicopter is operating in a flight.

d. Exact terminology should be used when calling threats. Some examples are:

(1) Bogie—Any aircraft not positively identified as friendly.

(2) Bandit—Any aircraft positively identified as hostile.

(3) SAM—Visual sighting of missile launch.

(4) Triple A—Visual sighting of antiaircraft weapons.

(5) Ground Fire—Visual sighting of small arms fire or other ground threat which cannot be readily identified.

(6) Engaged—The threat is attacking or maneuvering for an attack.

(7) Not Engaged—The threat is not making a hostile move or has not begun an attack.

(8) Low—Below the altitude of your aircraft or flight.

(9) Level—At the same altitude as your aircraft or flight.

(10) High—Above your aircraft's altitude.

e. The sequence and content of threat calls must be accurate and succinct. When calling a break, use the following sequence:

(1) Desired evasive maneuver
(2) Type of Threat
(3) Clock position
(4) Altitude
(5) Distance
(6) Description of Threat

f. Examples of threat calls are:

(1) Not Engaged: "Bogie/Bandit, 10 o'clock high, 5 miles."

(2) Engaged: "BREAK RIGHT (LEFT), BANDIT 4 O'CLOCK HIGH, TWO MILES, MiG-21." (See paragraph 14-16h(4), threat call for large formation.)

NOTE: The "Break" implies two critical elements: (1) you are engaged, and (2) the aircraft is CLEAR in the direction of the break called.

g. Small Formation Considerations:

(1) A small formation should employ tactics which use mutual support to defeat the enemy. Lead, of course, must be free to maneuver, as necessary. The wingman then maneuvers so as to maintain visual contact with lead. Several advantages can be realized:

(a) Two or three targets of opportunity may help to throw off the aggressor as he takes that split second on each pass to decide which helicopter to attack.

(b) If the formation is attacked by more than one aggressor and those aggressors go after one aircraft, the free helicopter(s) may be able to warn the engaged wingman of an undetected attack from a blind quadrant.

(c) The free helicopter(s) may also have more time to call for armed assistance (if available) while monitoring the attack.

(2) For a two-ship formation to successfully execute evasive maneuvering, prep' nning, in the form of certain radio calls and an agreed upon response to those calls, is essential. Maneuvers executed from the tactical spread formation are described below. See figure 14-17 for a depiction of each maneuver.

(a) Delayed 90: Maneuver that maintains proper line abreast position at the completion of the turn. Used for turns of 90° or more.

1. Verbal command to execute the maneuver is "SAVE ______ Flight, delayed 90 right (or left)"—"Execute."

2. The aircraft on the outside of the directed turn begins a steep turn in the proper direction (always towards the other helicopter). The helicopter on the inside continues straight ahead until the turning aircraft is out of sight (normally 4-5 or 7-8 o'clock position) then follows with a steep turn in the same direction, rolling out parallel to the other aircraft.

(b) Check Turn: Normal turn to make heading changes up to 45°.

1. Verbal signal to start the turn is, "Pony ______ Flight, check (# of degrees) right (or left)"—"Execute."

2. Both aircraft turn the desired number of degrees in the proper direction.

NOTE: The aircraft on the inside of the turn must decelerate slightly while the outside aircraft accelerates to maintain position until the turn is completed.

(c) Reverse: The best method of reversing direction, while line abreast, is an in-place 180o turn to either the left or right side, as directed.

1. Verbal signal to begin the maneuver is, "Jolly ______ Flight, reverse right (or left)"—"Execute."

2. Each aircraft simultaneously makes a steep banked, 180o turn in the proper direction.

(d) Cross Turn: Another type of 180o turn which may be required if terrain/obstacles prevent reverse turn.

1. Verbal signal to initiate the maneuver is "Save ______ Flight, Cross turn"—"Execute."

2. The leader executes a steep turn towards the wingman while maintaining altitude and a constant power setting. The wingman delays his turn momentarily, then executes a steep turn toward lead and maneuvers to cross "down track" of lead, in the same horizontal plane.

(e) In-Place Turn: The quickest way to go from line abreast to trail and trail to line abreast.

1. Verbal command to execute the turn is, "Pony ____ Flight, in place 90, right (or left)"—"Execute."

2. Both aircraft turn 90° in the proper direction.

(f) Split: A maneuver executed from any formation to allow lead and the wingman to separate from the formation in opposite directions.

1. Verbal signal to initiate the maneuver is, "Jolly ____ Flight, split"—"Execute."

2. Both aircraft turn away from the other approximately 90°

(3) Maneuvers executed from the three-ship tactical spread formation are described below. See figure 14-18 for a depiction of each maneuver.

(a) Delayed 90: Maneuver that maintains proper spread positioning at the completion of the turn. Used for turns of 90° or more.

1. Verbal command for execute the maneuver is "Save ____ Flight, delayed 90 right (or left)"—"Execute."

2. The helicopter(s) on the outside of the directed turn initiate a steep turn in the proper direction. Turns involving lead and number 2 wingman will be performed simultaneously. The helicopter(s) on the inside continue straight ahead until the turning helicopter(s) are out of sight (normally 4-5 or 7-8 o'clock position) then follow with a steep turn in the same direction, rolling out parallel to the other helicopter(s).

(b) Reverse: The best method of reversing direction while in three-ship tactical spread formation is an in-place 180° turn performed simultaneously by all three helicopters. The turn will only be made towards the wingman flying line abreast. This will allow the number 2 wingman sufficient room to maneuver.

1. Verbal signal to begin the maneuver is, "Jolly ____ Flight, reverse right (or left)"—"Execute."

2. Each aircraft simultaneously makes a steep banked, 180° turn in the proper direction.

h. Large Formation Considerations. For large formations, especially at night, the response to an attack can quickly become very complicated. The response may vary greatly based on many factors such as the nature of the airborne threat, the number and types of aircraft in the formation, the terrain, etc. Some basic principles should be observed, however. If the intention is to break up the formation, consider the following:

(1) All members of the formation should be aware of their location within the flight and should be prepared to break away from the formation in such a way they will not break into another member of the formation, causing a mid-air. The breakup should be preplanned and prebriefed to avoid conflicts.

(2) If the preplanned break forces a member of the formation to place his 6 o'clock towards the attacker, he should be prepared to immediately reverse course once he is clear of the formation.

(3) If possible, an attempt should be made to maintain element integrity, thus allowing use of the two-ship tactics mentioned above, if applicable.

(4) Bandit Break. After receipt of "Bandit Break," all aircraft will turn away from the flight and descend to terrain flight altitude. The first consideration must be given to evasive maneuvering and terrain masking to break enemy contact. After initial breakup turns are accomplished and when all aircraft are clear of each other, each helicopter will maneuver as required to avoid being destroyed. When the enemy threat has passed, the aircraft will proceed to the rendezvous point. The rendezvous point will be the second following waypoint; i.e., a breakup between point four and five will rendezvous at point six.

(5) At the rendezvous point, the aircraft will either enter a standard rate left turn or land if conditions permit. Ten minutes after the TOT for that waypoint, lead will announce departing the rendezvous point and proceed either en route or RTB with the remaining aircraft. All aircraft that have not rejoined at this time will proceed on their own on the route and attempt join-up en route.

14-17. Leaving Formation. Aircraft normally will leave the formation by decelerating/turning away from the formation until clear of the formation. Notify lead when departing the formation. Do not rejoin until permission is received from lead.

14-18. Terminal Operations. Procedures for formation approaches and landings to a preplanned landing area (objective, LZ, PZ, holding area, FARP, etc.) must be planned and briefed in detail. Situation permitting, the procedure will be executed exactly as briefed. This, however, does not preclude common sense deviations from preplanned procedures should an unexpected situation be encountered.

a. At a preplanned point, determined either by time or recognizable terrain feature, the flight will decelerate to approach airspeed and assume landing formation. Aircraft lighting configuration will be changed to that required for landing and pilots of aircraft with retractable landing gear will ensure gear is down and locked. Landing lights should be used only if necessary for safety.

b. Wingmen should not fixate on lead or the preceding helicopter during the approach. While maintaining formation position, pilots will identify and land to either preplanned points (such as lights) or select a landing point in relation to lead and/or the preceding helicopter. Pilots must rely on periodic crosschecks and scanners to maintain position during the approach.

(1) Shallow approaches, when feasible, are best for marginal power situations since power changes and flare attitudes are minimized, and all aircraft arrive in ground effect at about the same time. Shallow approaches also minimize brownouts in dusty conditions.

(2) Wingmen may stack level to slightly high in order to enter ground effect at about the same time as the leader. These factors help the wingmen make a simultaneous landing. Stacking low will subject the helicopter to intense rotorwash. Stacking high may result in an OGE hover. Both situations result in significantly higher power requirements at the bottom of the approach.

(3) The formation leader and each wingman must avoid turning maneuvers, especially S-turns, to the maximum extent possible during the final approach. These maneuvers require each succeeding aircraft to change airspeed and power during the turn in order to maintain position in the formation. The resulting changes in airspeed, power, bank angle/turn rate, and sink rate are amplified significantly as they progress from lead to the end of the formation. When this situation occurs at slow airspeed and/or low altitude, the results can be disastrous.

c. Go-around procedures must also be preplanned and briefed in detail. Go-arounds can be executed either as a flight or individually. The decision for a flight to go-around can be made only by flight lead and must be announced on a radio. In the absence of further instructions from flight lead, the flight will maintain formation integrity and execute

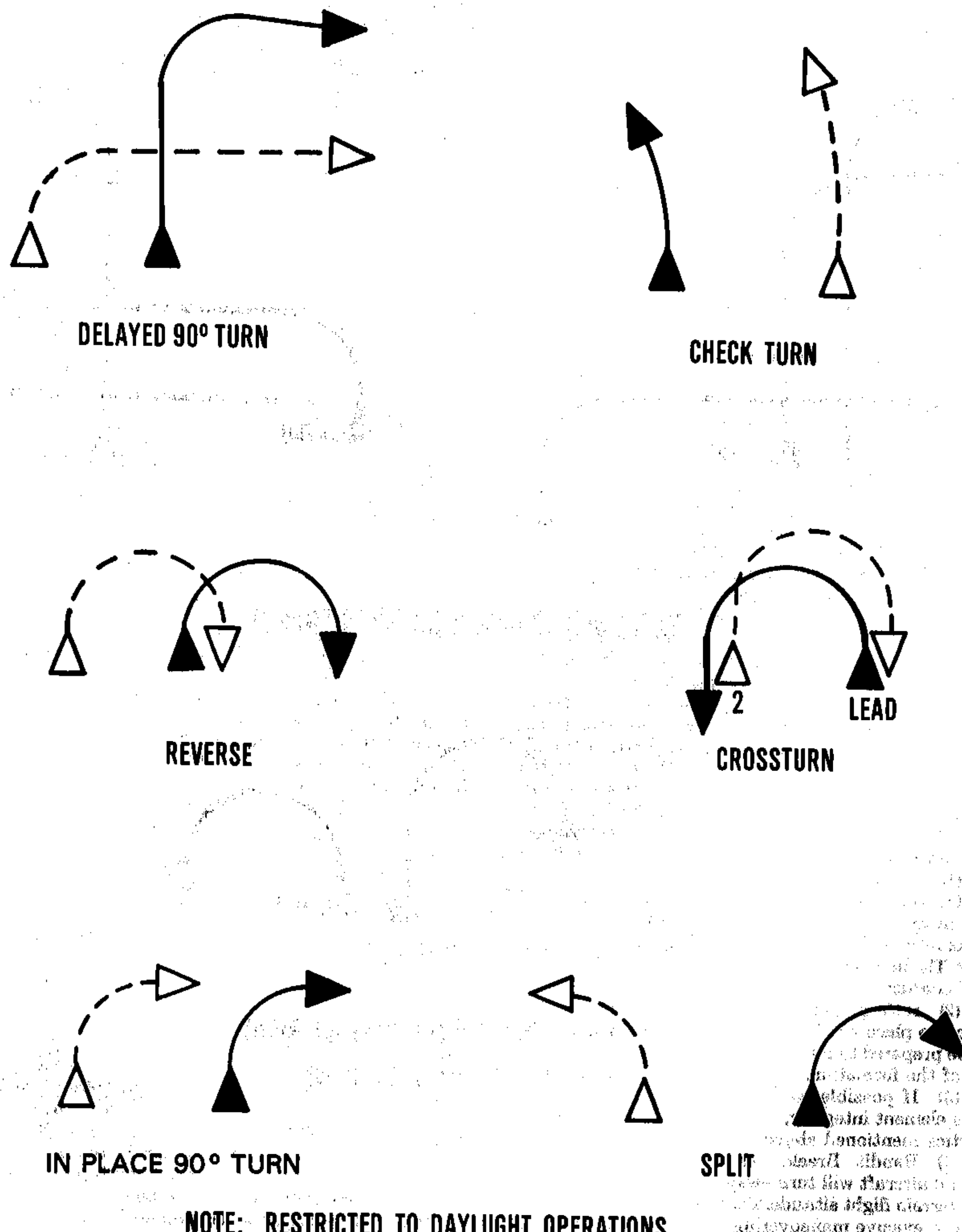
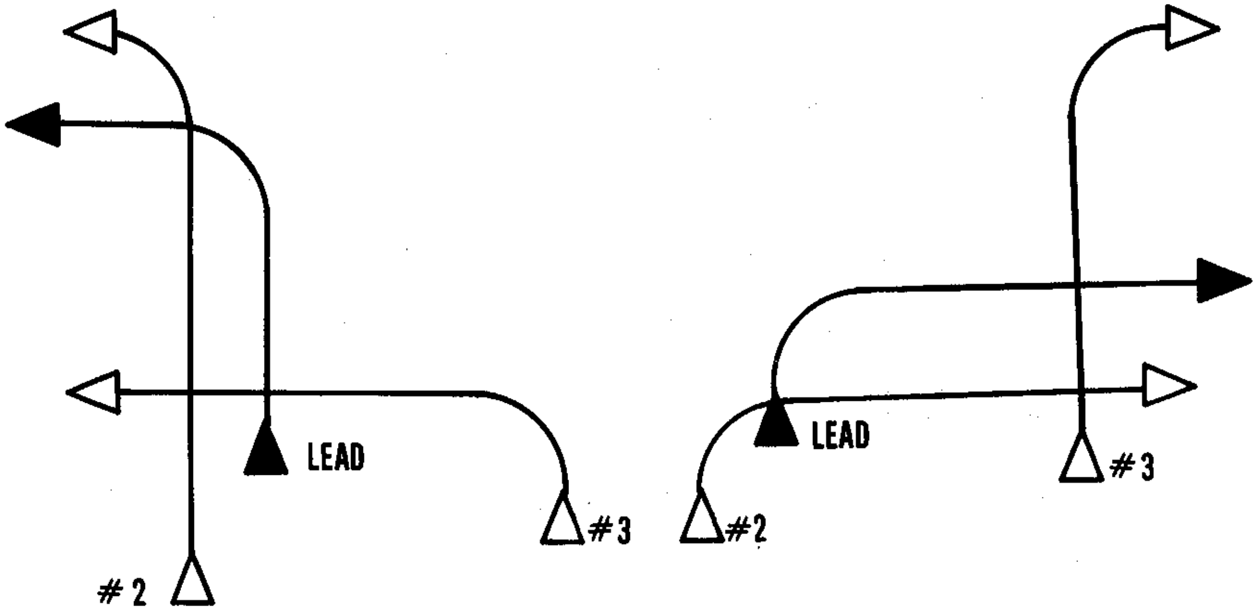
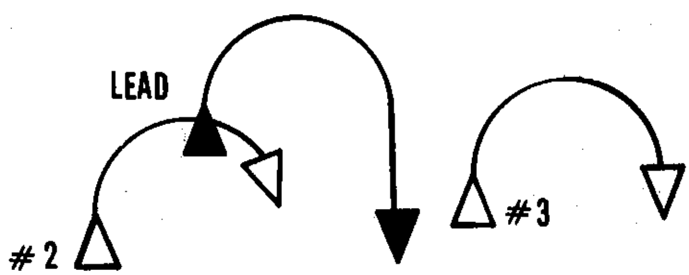


Figure 14-17. Tactical Turns—Two-Ship Spread Formation.



THREE SHIP SPREAD DELAYED 90° TURNS



THREE SHIP SPREAD REVERSE RIGHT

NOTE: RESTRICTED TO DAYLIGHT OPERATIONS

Figure 14-18. Tactical Turns—Three-Ship Spread Formation.

the go-around and landing exactly as preplanned. Individual pilots, upon determining they cannot safely execute the preplanned approach and landing, can decide to execute an individual go-around. The decision will be announced on the appropriate radio net, accompanied by a change in lighting configuration to ensure visual recognition by the remainder of the flight and executed exactly as preplanned. If another landing attempt is to be made, choice of landing location will be made with the following priority: Original preplanned landing point, preplanned alternate landing point, or other than preplanned landing point. If the pilot decides to land to an other than preplanned landing point, the decision will be announced on a radio. If a pilot executes an individual go-around and original position in formation must be regained, it can be accomplished by executing a prebriefed option of: Repositioning on the ground at the landing area prior to takeoff; takeoff in the original chalk sequence regardless of landing point; repositioning in the air after takeoff; or repositioning on the ground at a subsequent landing area.

NOTE: Prior to the approach, consider the amount of fuel contained in each external tank (if installed) since tank jettison may be required while executing a go-around. Consider keeping most of the fuel in the external tanks for training missions so that the maximum amount of weight will be jettisoned if required. Operational missions may require a sufficient amount of fuel remain in the main tanks in order to complete the mission if the tanks are jettisoned.

d. Lead will consider the capabilities of the wingmen (gross weight, power requirements, etc) and the condition of the landing area (obstacles, surface conditions, etc) when determining the type of approach to be flown.

(1) Wing Landing. During staggered trail formation recoveries, maintain one to three rotor disk separation throughout the approach and landing. Increased separation may be prebriefed. Wingmen may stack level with lead. This will allow the entire formation to enter ground effect simultaneously.

WARNING: Do not stack below the preceding aircraft. This is an area of intense rotor induced turbulence.

WARNING: Avoid turning maneuvers, especially "S" turns, on final when flying large formations. Be alert to marginal power conditions on final where any aircraft in the formation may elect to "S" turn in order to maintain necessary airspeed/energy level. Maintain formation separation always on the preceding aircraft while considering the effects your maneuvering may have on subsequent aircraft in the formation.

(2) Tactical Formation Recovery. During tactical formation recoveries, maintain 500 feet separation throughout the approach and landing unless the aircraft are assigned separate helicopter pads in which case aircraft may close to the clearance interval.

(3) Individual Recovery (Nontactical). Lead breaks up the formation prior to entering the traffic pattern. Aircraft enter normal traffic individually for landing.

(4) Overhead Approach (Nontactical). If more than two aircraft, transition to echelon formation prior to entry onto initial, echelon flight away from the direction of the break. Fly traffic patterns at 500 feet AGL. Break interval should be prebriefed and never be less than two seconds. Lead may increase break interval if landing conditions warrant a greater time interval than briefed. Execute the break over the landing spot. Make a level 180 degree turn to downwind and accomplish the before landing check. Wingmen should fly the same pattern as the preceding aircraft to achieve the proper spacing. Each flight member will plan to land on the runway not closer than 200 feet behind the preceding helicopter. Each aircraft will plan the approach to allow room to safely pass the aircraft ahead of it. Announce any emergency as soon as possible.

14-19. Helicopter Station Keeping Procedures. Whenever possible, attempt to maintain formation integrity and adhere to normal formation procedures given in this chapter. In the event that IMC conditions exist which preclude use of these procedures primary consideration should be given to using single-ship IFR procedures, deviating around the weather or delaying further flight until VFR conditions exist. If, however, operational considerations mandate IMC formation, the following procedures will be used. The weather penetration must be preplanned and an altitude reservation (ALTRV) requested IAW FLIP. Prior to using these procedures, formation leaders must ensure all pilots in the formation have a thorough understanding of these procedures and that formation aircraft have appropriate operational navigation and communication equipment.

a. Prior to entering IMC, calibrate each aircraft's compass, navigation equipment, airspeed, and altimeter against those of the flight lead. To make this check, fly in any authorized close formation. Lead announces base heading, airspeed, altitude, and gives DME check. The other elements note the errors in their instruments while in coordinated flight.

b. Once proper corrections are determined, assume IFR formation positions. Normally, only two helicopters fly in formation, but it may be required to fly with more than two under certain operations. In that event, lead flies at base altitude. Number two flies at base altitude plus 500 feet, and one mile in trail. Number three flies at base altitude plus 1,000 feet and two miles in trail. Number four flies at base altitude plus 1,500 feet and three miles in trail. The 500-foot stagger and one-mile longitudinal separation are minimums and should be increased to 1,000 feet and two miles if feasible. Altitudes and airspeeds may be decreased when using on board radar for station keeping (PAVE LOW).

NOTE: Be aware of atmospheric pressure variations and update altimeter settings frequently.

c. Station keeping is maintained primarily by use of air-to-air TACAN and course guidance from surface navaids (except PAVE LOW using unique systems). When dead reckoning, fly corrected headings and check alignment with UHF-DF at least every 10 minutes. An HC-130 may be able to assist in station keeping by flying extended trail and tracking flight members on radar. The HC-130 must be used in a monitoring role and is needed to accomplish lost comm procedures.

NOTE: The station keeping capabilities of the HC-130 are very limited and dependent upon the aircraft's minimum operational speed, the operational status of the radar, the radar operator's abilities, and the weather. All of these factors must be considered prior to committing the HC-130 to a station keeping assistance role.

(1) Maintain trail position with air-to-air TACAN. If all others are on the same channel (i.e., lead on 29Y and all others on 92Y), each airplane will display DME based

on lead. Make channel assignments based on channels needed for navigation; this permits switching to X-band and T/R to obtain navigation data.

(2) Make formation altitude changes by calling, for example, "JOLLY 96, new base altitude, 4,500 feet climb (descend), NOW." On the command the flight initiates a 500 FPM climb (or descent). Maintain constant prebriefed/ en route airspeed during the climb/descent. Lead calls out passing each 500 feet during the maneuver, so other elements can adjust their rates of climb or descent. At level-off, lead reconfirms new base altitude and airspeed.

(3) To accomplish a turn over a point on the ground, where there is no ground NAVAID, calculate the time required to travel the distance your helicopter is in trail from lead, and delay turning for that number of seconds from the turn command. Lead calls; for example, "JOLLY 96, new base heading 350 degrees, turn NOW."

(4) To adjust position in the formation, increase or decrease airspeed by 10 knots. Hold this change for 36 seconds for each tenth of a mile change of position needed. For example, ¼ NM position change would take 1½ minutes to complete. When in the correct position, resume corrected base airspeed.

(5) If air-to-air TACAN is lost, maintain position by:

(a) Station keeping assistance from an HC-130 escort. Provided it has already been used in that capacity and is in position to immediately render assistance.

(b) Frequent UHF-DF check. This is an emergency procedure and to be used only until Air Traffic Control is advised and the flight member is directed to accomplish single ship procedures.

d. Accomplish single ship recoveries under IMC using separate ATC clearances.

e. In the event of lost comm during IMC, maintain the last assigned heading and altitude and squawk 7600 for three minutes, then return to assigned squawk. Survival radios may be used to reestablish radio contact. If after squawking, radio contact is not regained, the comm out flight member will separate from the formation, rejoin at the rear of the formation and accomplish the prebriefed IFR clearance to include all particular instrument approaches at the destination. The HC-130 will notify lead (alternate lead) which flight member has lost comm and how he is separating from the flight. Lead will then contact ATC and tell them what routing, altitude, and instrument approach that flight member is going to accomplish.

SECTION B—AIR REFUELING FORMATION PROCEDURES

14-20. General. This information augments the basic air refueling procedures presented in TO 1-1C-1 and TO 1-1C-1-20. The following refueling formations will be used for all training and exercise scenarios. If other formations are required for unusual situations (operational missions), every effort will be made to develop the formations during face-to-face mission planning activities.

a. Air Refueling Formation #1 (Primary). (Figure 14-19.) This may consist of two C-130 tankers (one primary and one spare) and up to four receivers. All receivers will refuel from the primary tanker. During rendezvous, the first receiver and last helicopter will have their top anticollision lights ON. When the primary tanker begins slowdown to air refueling speed, the spare tanker will assume a position slightly behind and approximately 500 to 1,000 feet to the right. The lead and spare tanker will configure at the same time. As the lead tanker passes the lead receiver, the receiver will call "Tally Ho" (or with a signal three-second light from the cabin for commout) to the tanker. The receiver will then climb/descend to the refueling altitude. The receiver will signal the tanker (by turning top anticollision light OFF) that he is in the observation position. The lead tanker will then turn his top anticollision light OFF and the spare tanker will turn his top anticollision light ON. When the lead tanker is ready to refuel the receivers, he will signal to the receiver with a "green" flash from an Aldis lamp. The receiver will then move to the refueling position, refuel, then disconnect. From the disconnect position, the receiver will turn his top anticollision light ON and move straight back until right and abeam the last receiver. When clear to move left, the receiver will move into left echelon off the last receiver. Once the first receiver is established in echelon as the last aircraft, he will keep his top anticollision light ON to carry the lighting for the helicopter/tanker formation. The preceding helicopter will turn his anticollision light OFF. The second receiver will turn his top anticollision light ON and move to the left observation position. When all receivers have finished refueling, the helicopter flight will descend to the left and the spare tanker will assume a normal echelon formation. Subsequent helicopter flights to be refueled will be no closer together than six NM.

b. Air Refueling Formation #2 (Tanker in Trail). (Figure 14-20.) In this formation, the assumption is that all of the helicopters will be navigating en route as one flight. The helicopter flight will split into two trail elements prior to the ARIP. Spacing will be one to four NM depending on mission requirements such as type and number of helos in each element. Air-to-air TACAN will be the primary means of maintaining separation. Timing may be used as a backup. Also, each element will configure into the correct formation and set up external lights prior to the ARIP. Each element will then use the same join-up procedures, light signals, light configurations, and rotation throughout the refueling as described under the primary procedure. This formation option requires two C-130 tankers, each as a primary tanker. The tanker formation will rendezvous with the helicopter elements from a close trail position. As the tanker formation approaches the second helicopter element, the second tanker drops out of formation and completes a join-up on the second helicopter element. The first tanker continues forward to rendezvous and join-up with the first helicopter element. If a third, spare tanker is available but not used, it will remain with second tanker in loose right echelon until fuel begins flowing, then will move forward to spare the lead tanker. After refueling has begun, the second tanker will accelerate to close the distance between elements. When the second helicopter element has completed refueling, the second tanker will accelerate and rejoin in right echelon with the first tanker. The second helicopter element will also accelerate and rejoin with the first helicopter element at the prebriefed join-up altitude. The first element, after refueling, will also descend to the rejoin altitude and slow to the rejoin airspeed as prebriefed. As the helicopter flights rejoin, the last helicopter in the first element will turn its top anticollision light OFF. If there is a second helicopter flight, it will maintain at least ten NM between the second element of the first flight and the lead element of the second flight.

c. Air Refueling Formation #3 (Crossover). (Figure 14-21.) Use of this refueling formation at night will be limited to optimum moon illumination in order to minimize the possibility of helicopter crewmembers experiencing spatial disorientation during crossing over from the first to the second tanker. This formation requires two C-130 tankers, two of which are primary refuelers, and one helicopter flight consisting of no more than four receivers. The two tankers approach the helicopter flight in right echelon formation. As the lead tanker slows through 155 knots, the second tanker assumes a position approximately 500-2,000 feet to the right in an extended echelon formation position. The third tanker, if present, would assume a position 2,000-3,000 feet behind the second tanker and 200-300 feet above refueling altitude (depending on composition of the helicopter elements). During the rendezvous, the first receiver and last helicopter in the formation will have their top anticollision lights ON. When the helicopter flight is in the left observation position, the lead helicopter will turn his top anticollision light OFF and the lead tanker will turn his top anticollision light ON to indicate crossover clearance for the second receiver element. At this time, the lead receiver of the second element will turn his top anticollision lights ON. When the second helicopter element is in the proper observation position, both the lead receiver of the second element and the tanker will turn their top anticollision lights OFF. The light signals and rotation within each element will be the same as in the primary procedure. After the first element completes the refueling, the lead helicopter will turn its top anticollision light ON. When the second element has completed its refueling, the second tanker will begin a rejoin with the lead tanker and turn its top anticollision light ON as a signal for the second helicopter element to crossover and rejoin the first element. As the second element movee back across, the last receiver in that element turns his top anticollision light ON until in left echelon on the first element.

d. Spare Tanker Procedures. When the receiver is in the left observation position and the lead tanker passes the spare tanker signal, the lead tanker will accelerate away from formation and the spare tanker will move into position to refuel element/flight.

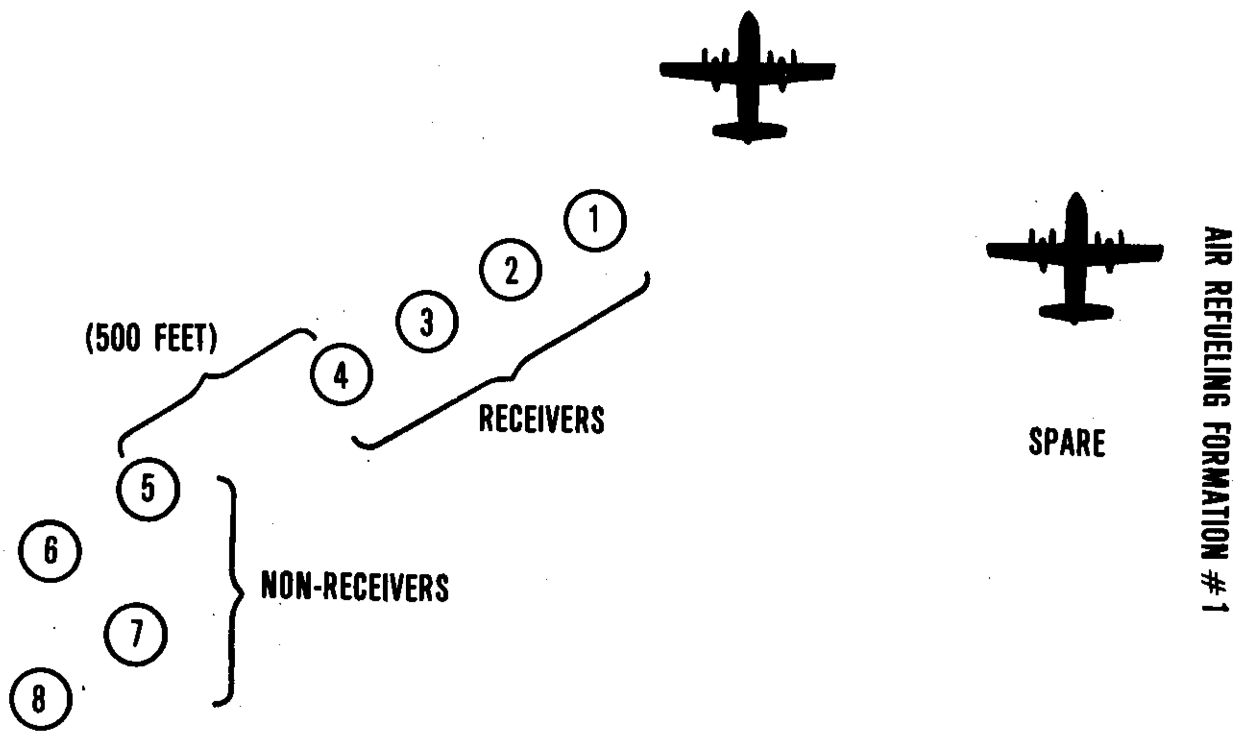


Figure 14-19. Primary.

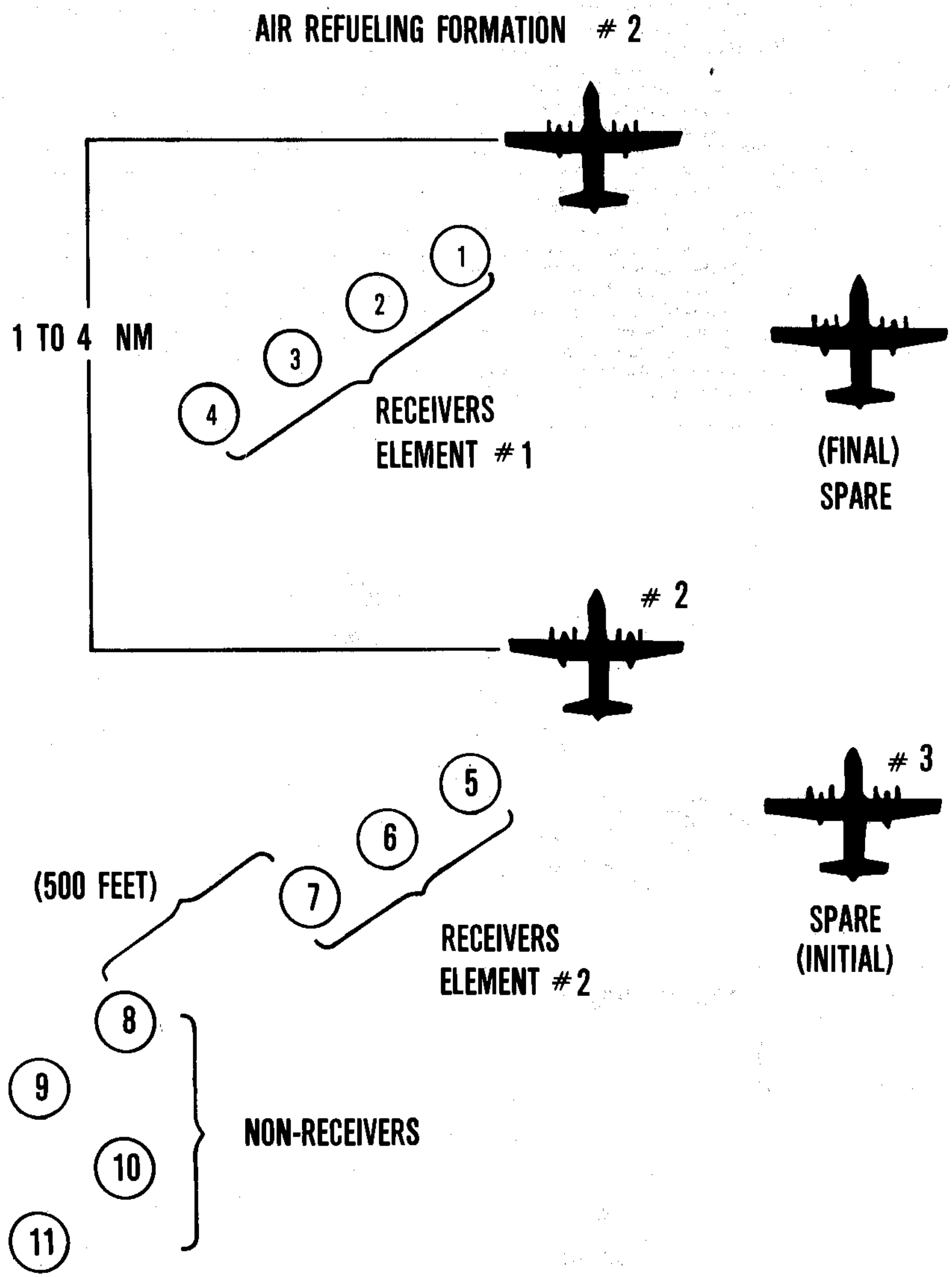


Figure 14-20. Tankers in Trail.

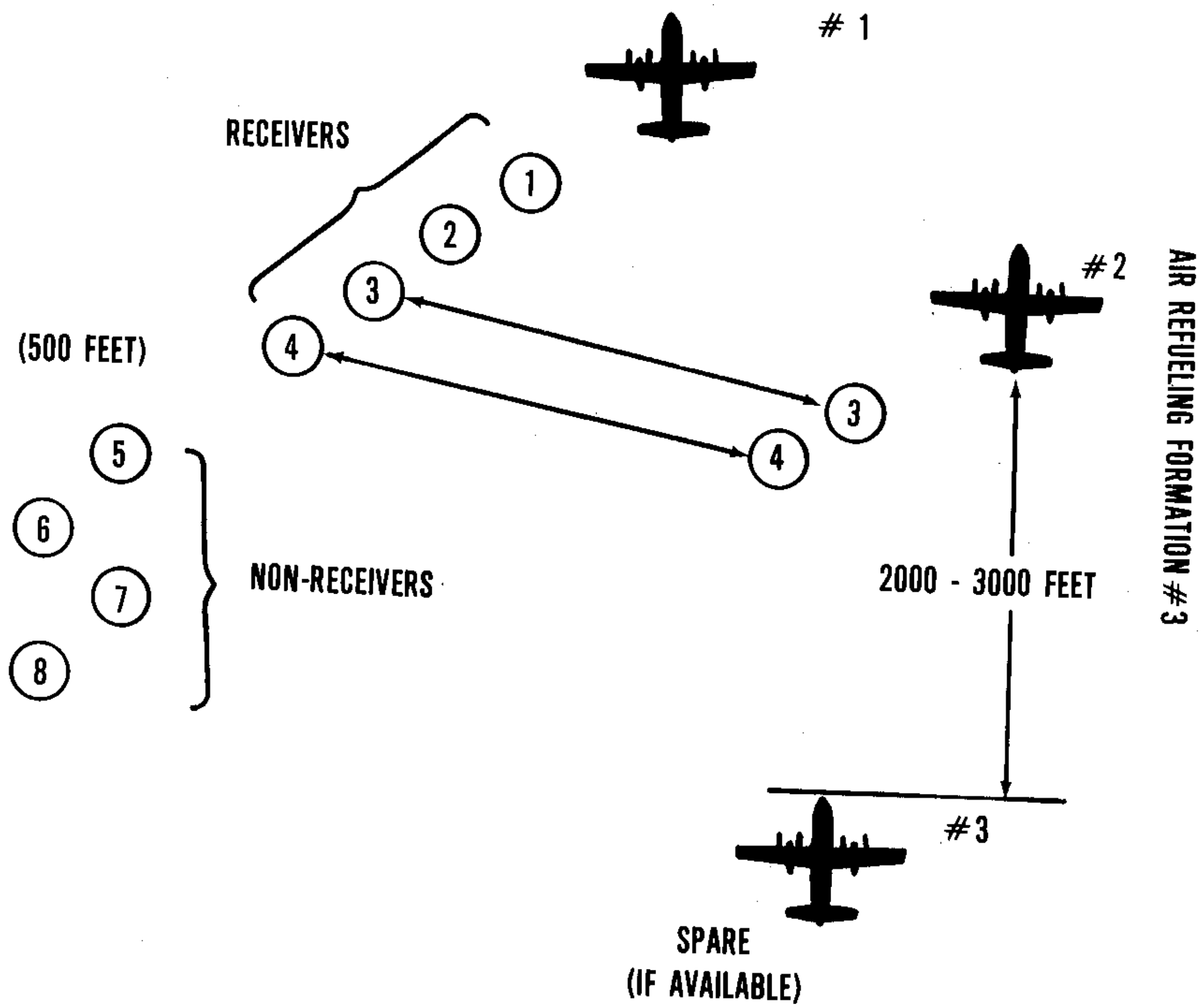


Figure 14-21. Crossover.