AC-119G OPERATIONS

SECTION A

1. General: The AC-119G is equipped with four 7.62mm mini-guns firing out the left side of the fuselage. Each gun has a maximum rate of fire of 6,000 rounds per minute. They can be fired individually or in any combination as the target and situation may require. Gun selection is made by the aerial gunner at the direction of the pilot. Each gun holds either 1,500 or 2,000 rounds, depending on modification, and can be reloaded in flight by the aerial gunner. The guns are sighted and fired by the pilot. Depending on sighting mode selected by the pilot, sighting is done manually by lining the sight pipper on the target, or automatically by lining up a movable reticle with a fixed reticle in the gunsight. The movable reticle is controlled by the aiming direction of the observation device mounted in the crew entry door. The AC-119 also carries an illuminator mounted in the left aft troop jump door for night illumination of the target. The illuminator has a variable intensity lamp from 8KVA to 20KVA in either visual or infra-red modes of operation. The infra-red mode is used for target illumination in conjunction with the night observation sight. Flares are also carried in a flare launcher mounted in the right para-troop door. The procedures, tactics, and techniques in this chapter are derived from operational procedures employed in a combat environment and are not intended as limiting factors to effective employment of the weapons system. However, development of new tactics and procedures in a hostile environment should be attempted only by experienced personnel. Procedures found effective should be documented. The treatment of tactics in this chapter is aimed at aircrew members with little or no experience in side firing weapons systems.

2. Crew Requirements: Only combat ready AC-119 aircrews will participate in tactical missions. Exception is made only for aircrew members receiving training in a CCTS or under the supervision of a combat ready instructor. Minimum crew for AC-119G tactical missions will be:

a. Pilot
b. Co-pilot
c. Navigator/Safety Officer
d. NOS operator/navigator
e. Flight engineer
f. Illuminator operator
g. Aerial gunners (2)

3. Use of Personal Equipment: Parachutes will be utilized for all tactical missions. Harnesses will be worn by all crew members for takeoffs, landings, and during all target operations. Availability and use of life preserver units and overwater emergency equipment will be in accordance with command and local search and rescue procedures and directives.

4. Use of Check Lists: Aircraft commanders will insure that appropriate aircrew checklist are used for all phases of tactical missions in accordance with AFR 60-9.

5. Takeoff and Landing Data: Takeoff and landing data will be available for all takeoffs and landings. When operating from ground alert or during special operations, computation, and availability of takeoff and landing data will be in accordance with command approved procedures.

6. Target Identification: No ordnance will be expended until the pilot understands the precise target location. The FAC or ground controlling agency must provide specific information regarding location of friendly and unfriendly forces and firing restrictions, if applicable. For missions supporting non-English speaking units, the pilot and observer will positively identify the target prior to any ordnance expenditure.

7. Weapon System Demolition: If required to prevent enemy use, demolition of the mini-guns, or complete destruction of the aircraft, will be in accordance with instructions found in the appropriate manual, supplemented by command directives and local procedures.

8. Aircrew Procedures and Responsibilities: The pilot will participate in the planning of the mission to insure successful execution and recovery. He will make the final decision regarding tactics and procedures to be employed on a specific target. Specific aircrew duties which may vary according to mission requirements will be outlined in Section II. The following general aircrew procedures apply to all strike missions:

a. Pre-target procedures:

(1) Review all known target information to include type of target, terrain, weather, location and strength of enemy forces, and emergency procedures.

(2) Determine initial altitude and flare settings for night operations.

(3) Set power as required. For formal target operations 2200-2300 RPM, mixtures rich.

(4) Set fuel tank selectors to fullest tank. Check fuel quantity closely to monitor loss of fuel from ground fire during target operations.

(5) Determine and brief crew on plan of attack and last minute instructions to include escape and evasion.

(6) Complete pre-target checklists.

b. Post-Strike Procedures:

(1) Complete post strike checklists.

(2) Complete strike report and relay to appropriate control agencies.

9. Terms Used in AC-119 Operations:

a. Mils. The common unit of measurement in all discussions of firing and gunsight adjustment is the "mil". A mil is the deflection of one unit per thousand units of length. Transcribed to the firing pass, one mil describes a one foot arc at a range of 1000 feet, or a movement in any pre-determined direction of 1 meter at the range of 1000 meeters. For example, at a range of 3500 feet, movement of the aiming point one mill would move the impact point $3\frac{1}{2}$ feet. There are approximately 18 mils in one degree.

b. Optieal Gunsight. Used in conjunction with fire control system to provide weapons delivery information on a display in the pilots field of view so that the aircraft can be maneuvered to maintain a target within the field of fire.

c. Fixed Reticle. Reference on gunsight combining glass. When in auto or semi-automatic mode, the movable reticle will be superimposed on the fixed reticle when in correct firing position.

d. Movable Reticle. Aiming reticle on gunsight combining glass. In automatic or semi-automatic mode, information from the NOS is transmitted to the computer to position the movable reticle on the gunsight in relation to aiming position of the NOS.

e. Pipper. Center dot on reticle displays of the gunsight.

f. Gun Declination. Depression from the lateral axis to the aircraft. Guns may be installed with 0-18 degrees declination. Amount of declination will depend on operating altitude. As altitude is increased, amount of declination will be increased. Because of slight differences between guns, the settings on the gun mounts may vary with each gun. Prior to beginning a firing pass, the gunner will adjust each gun in declination and azimuth, depending on the firing altitude. A table will be prepared for each gun showing declination and azimuth settings for various operating altitudes. This table will be installed on each gun for inflight reference.

g. Mini-Gun Ballistics. The 7.62mm mini-gun fires a 150 grain bullet at a muzzle velocity of 2762 feet per second. This drops off to 500 feet per second, which is still effective against personnel, at a range of 7000 feet. Test firings have shown that dispersal in the firing pattern is remarkably tight, averaging about 6 mils total spread.

h. Boresighting: Normally the guns are boresighted to converge with the sight aiming point at the desired slant range. Other conditions may be specified by the using command to satisfy specific mission requirements. Normal gun adjustment error is less than three mils. More significant firing errors result from improper sight setting, incorrect airspeed, incorrect bank angle, winds, turbulence, or any combination. One other important factor is lateral angle (azimuth) adjustment of the weapon to offset the forward velocity of the aircraft. The azimuth of the gun will vary with altitude of the firing pass. The setting is only accurate for the specified altitude, and at the specified ground speed. With the proper azimuth settings, and proper airspeed, lead or lag with the sight is unnecessary.

i. Tracer Burnout: The 7.62mm tracer will burn for 750 meters (approximately 2350 feet). Tracers stay well grouped with ball ammunition, but burn out before impact in most cases. Burnout at normal firing ranges gives an exaggerated illusion of missing the target and should be disregarded. Tracers disappear (appear to hit) to the upper left of the aiming point. As slant range increases, they will disappear higher on the sight picture.

j. "Kentucky Windage": (Refer to Appendix) Since the gunsight is fixed in azimuth and cannot be continuously adjusted vertically as the firing pass progresses, there should exist a need for the pilot to hold the pipper someplace off the target to offset variables which constantly affect the impact point. These variables must be considered before and during every firing pass to the extent that compensation becomes almost automatic. Ignoring these variables could result in impact 100 feet or more off target. Actual application of "Kentucky Windage" will vary with individuals but must at least take into consideration the following variables.

(1) Airspeed. As previously mentioned, the guns are harmonized for 140 knots. Higher airspeed will cause impact ahead of the pipper, and lower airspeed, behind the pipper. The easiest way to control this variable is to fly the proper airspeed. Exception should be made only for the unusual target whose access requires special tactics of climbing or diving. The error caused by $\pm$ 5 knots airspeed may be disregarded, but variations over 5 knots will require compensation. Coordinated flight facilitates airspeed control during firing passes.

(2) Wind. Moderate winds are a definite factor and must be noted whenever possible. Flying into or with the wind has the same effect as decreasing or increasing airspeed. When firing into the wind, aim high; aim low when firing downwind (aircraft is crosswind). During night operations the smoke from flares offers an excellent wind reference. When firing in automatic or semi-automatic modes, wind is automatically compensated for through the computer, therefore the pilot would disregard the posirion of the pipper on the target and maintain the moveable and fixed reticles aligned in the firing pass.

(3) Slant Range. Firing errors due to slant range variations will be greater on the short side than on the long side. For example, if you are 1000 feet too far out (5500 feet slant range) you could expect to aim 25 mils above the target, whereas being 1000 feet too close in (3500 feet slant range) would require aiming 10 mils low.

(4) In summary, keep all variables down to a minimum. Maintain constant airspeed, altitude, and bank angle. Be able to judge when the aircraft is too close in or too far out. Depend on the co-pilot to maintain altitude and airspeed. Most of the variables can be considered and planned for during the approach phase of target acquisition.

k. Coincidence Angle: An acceptable angle of difference between the aiming point and projectile impact point. This angle is determined for each target and set into the computer for use in the automatic mode of fire. The size of the angle is determined by the size of the target area, location of friendly forces, and other factors.

SECTION B

TARGET ACQUISITION AND TRACKING

10. Manual Mode of Fire: Targets may be approached from any direction, terrain and defenses permitting. Gunsight elevation and mil settings should be determined and set prior to approaching the target. Gun declination and azimuth settings must be determined and set. The airplane is positioned so that the pipper will be in the center of the target when the aircraft is in a 30° bank coordinated turn. For most pilots, approach the target from further out, and roll into a shallow bank. When the pipper is above and slightly behing the target, increase the bank to bring the pipper down and fly the pipper on to the target. A 30° bank coordinated turn should hold the pipper directly on target. Slight variations will have to be made for wind. The maneuver should be done smoothly so that the pipper describes a " - " pattern over the ground. Firing is commenced as the pipper comes on target. The mini-gun has a ½ second minimum and no maximum burst; however, long bursts are not recommended against most targets. Double bursts cause gun malfunctions and must be avoided. While maneuvering on target, altitude must be held as constant as possible. When the aircraft becomes cross-controlled, recover and re-acquire the target. If bottom rudder is required to hold the pipper on target the aircraft is too close in and the bullets will impact above and ahead of the target. Decrease the bank momentarily and bring the pipper back on target. If top rudder is required the aircraft is too far out and the bullets will impact below and behind the target. Increase the bank momentarily and bring the pipper back on target. If the pipper is maintained on target, but the bank angle is more or less than 30°, the aircraft is too close in or too far out, and the bullets will impact high or low from the target respectively. When in manual mode, with guns armed, they will fire at any time the pilot depresses the trigger button.

11. Semi-Automatic Mode of Fire: In semi-automatic mode, the NOS operator acquires and tracks the target. Angular information from the NOS position is sent to the gunsight through the computer to position the movable reticle. Instead of maintaining the pipper on target, the pilot aligns the fixed and movable reticles to indicate when the weapons will impact on target. Wind and altitude information is set into the computer to further adjust the reticle for firing. The firing circle is entered by following the ID249. When the aircraft is on a proper tangent to the firing circle the vertical needle will be centered. As the aircraft approaches the firing circle, the horizontal needle will move down from the top of the instrument. At the correct entry point, the horizontal needle will be centered. Roll into a 30° bank coordinated turn and center the two reticles. Principles of keeping the reticles centered are the same as maintaining the pipper on target in manual mode. In semi automatic mode, the NOS operator must be tracking a target and the pilot must depress the trigger for the armed guns to fire.

12. Automatic Mode of Fire: Automatic mode of fire is identical to semi-automatic with the addition of the coincidence angle set into the computer. In automatic mode the NOS operator must be tracking a target, the reticles must be aligned within the selected coincidence angle, and the pilot must depress the trigger for the armed guns to fire.

SECTION C

TYPES OF MISSIONS

13. Primary Mission: The primary mission of the AC-119 is to provide concentrated and extended fire support against selected targets. The weapons system is most effective against, and least vulnereable to, small arms and small automatic weapons fire. It is least effective and most vulnerable to any environment of heavy automatic weapons and/or anti-aircraft artillery fire (AAA). It should not be used until air superiority is established. The weapon system can be effectively employed both offensively and defensively in the following basic missions:

a. Defense of ground positions (forts, outposts, and ground units)
b. Escort and patrol
c. Preplanned strikes of suitable targets
d. Reconnaissance
e. Forward Air Controller duties directing strike aircraft
f. Any combination of the above.

14. Defense of Ground Positions: The AC-119 can support ground positions for long periods of time. This, coupled with a self-supporting flare capability, and night observation sight, make it an ideal weapon system for defense of forts, outposts, villages, or other special air warfare operations. During attacks, continuous communications must be maintained with controlling agencies. Instructions will always be followed to the maximum extent possible. Positively identify the position of any friendly forces prior to firing. Caution must be

exercised to prevent confusion of fire from friendly and unfriendly positions. Bear in mind that unfriendly forces often have radio monitoring capabilities which can be used to create confusion. Fire marking systems should be used in conjunction with voice communications by ground forces to pinpoint unfriendly forces.

15. Escort and Patrol: The AC-119 is an excellent aircraft for most escort missions, with or without a FAC. It is especially adaptable to night missions because of its combined roles of spotter aircraft, gun, flareship, and night observation sight. Other favorable factors include endurance, range, communications capabilities, and multiple scanning positions. The excellent visibility from the cockpit is augumented by nemerous scanning positions in the rear. Close coverage and spotting is en hanced by the use of binoculars or light intensifying devices. The primary purpose of air escort in the AC-119 is to prevent guerilla ambush or attack of friendly surface movements, and, to mount aerial counterattacks against guerilla ambushes. Proper planning is mandatory in the successful conduct of escort type missions. Communications, Timing, proposed and alternate surface routes, terrain, weather, and availability of other strike aircraft are basic considerations. Larger movements require more detailed briefing, preparation, and coordination. Escort missions can be in support of vehicle convoys, trains, naval craft, and heliborne operations.

a. Convoy escort. The following convoy escort procedures and tactics are applicable to most escort and patrol type missions:

(1) Maintain altitude above ground level. Be prepared for immediate reaction to ground attack.

(2) Fly irregular patterns over and ahead of surface movements staying alert for evidence of enemy activity, movement, or possible ambush.

(3) When supporting a large convoy, assign one rear scanner the primary responsibility of rear element safety including straglers.

(4) When operating with a FAC, maintain visual and voice contact with each other (preferably on the same frequency with the convoy or movement commander).

(5) If guerilla activity is spotted, convoy should be halted immediately (preferably by voice but alternately by dropping smoke or other briefed signal). Maintain close coordination with the movement commander before and during attacks of detected or suspected unfriendly positions. In the event ambush parties are not detected and an attach is launched against the convoy, the same procedures apply for counter attack. Use extreme caution when firing close to friendly positions or near the convoy itself but do not hesitate to attack once enemy positions are pinpointed and clearance has been obtained. Employ standard attack procedures. Assess the enemy strength and defenses; consider alerting other types of strike aircraft. Look for planned enemy withdrawal routes from known positions, especially those which may be detected from the air only.

(6) The actions of escort aircraft and ground personnel should be determined during mission planning. This should include a withdrawal plan for

surviving ground personnel and a signal to destroy all or certain convoy vehicles in case the convoy is overrun.

(7) In case of night convoys traveling blacked-out or convoys traveling under dense foilage cover, special procedures and visual signals must be preplanned including loss of voice contact.

(8) Experience has shown that following an initial use of airpower, guerillas hesitate to attack a convoy escorted by even light spotter aircraft. Without wastefully expending ordnance, the psychological effect of the weapon system, which can be seen and heard for several miles, should not be overlooked when operating in areas of suspected or probable guerilla activity. Caution must be exercised to identify positions as positively unfriendly before attacking.

b. Train escort. The procedures for escorting rail traffic are basically the same as convoy escort. Special consideration must be given to:

(1) The vulnerability of railroad trains to guerilla activity, with particular emphasis given to limited escort protection available under any night commitment.

(2) The distance required to halt a train, along with the need for continuous direct voice contact.

(3) The amount and types of guards and defenses carried aboard the train.

(4) The special type of lucrative target that a train offers to guerilla ambush.

c. Naval escort. The procedures for escorting naval craft are basically the same as above. Usually the type boats used for "floating convoys" will be barges or small native boats. Vulnerability to guerilla attack is greatest when the water-ways used are narrow and bordered by foilage suitable for guerilla cover. As in the case of ground movements, planning must include the actions to be taken in case the naval craft is disabled or boarded to include a signal to destroy the craft.

16. Planned Strikes: Strikes against selected targets require detailed and thorough planning. Careful consideration must be given to target and intelligence information in selecting tactics. Standard firing procedures would normally be employed in planning targets.

17. Armed Reconnaissance: The AC-119 has a limited capability for armed reconnaissance. The limiting factors are the small caliber of the weapon system, and the vulnerability to enemy fire. Armed reconnaissance is generally performed over hostile territory and precautions must be taken accordingly to avoid unecessary risk of aircraft an crew. When a target is acquired, normal tactics are employed. Caution is again required to avoid exposure to unnecessary

risk since the aircraft limitations may preclude discovery of heavy weapons early enough to remain out of range.

SECTION D

FACTORS AFFECTING TACTICS

18. Firing Passes: Normal firing is done in a level turn from specified altitudes above the ground. Low angle strafing passes can be made if low ceilings prevail in the target area and the urgency of the situation warrants the risk. This is done by flying approximately 1000 feet to the right of the target area at altitudes down to several hundred feet. Use the ailerons to put the pipper level with the target and top rudder to maintain direction of flight as desired. In general, the further out the pass is attempted, the higher it can be accomplished and still keep the guns on target while maintaining straight flight. Firing must be commenced well before the pipper reaches the target. Firing passes below 2000 feet are extremely hazardous due to aircraft vulnerability to ground fire and are justified only in unusual circumstances. Caution must be exercised to avoid exceeding the structural limitations of the aircraft during any phase of ordnance delivery. A crew member in the aft compartment should be assigned to watch for ground fire from the 3 o'clock to 6 o'clock position. Experience has shown that the majority of aircraft hits have come from that position. Pilots must exercise extreme caution when firing toward friendly positions. Control of the copilots master arming switch must be exercised on each roll-in and roll-out. The standard command, given by the pilot and repeated by the copilot, for operation of the copilot master arming switch will be "guns hot" and "guns cold". The standard reference to gun selection by the gunner will be numbered gun(s) "on the line". While the pilot is concentrating on the target the copilot has the responsibility of monitoring aircraft altitude. Pilots must also be aware of vertigo problems which are aggravated by constant turning and transitioning to and from the instruments during flare operations. Individual crew coordination between pilot and copilot must include a briefing on vertigo problems and recovery responsibilities.

19. Type of Targets: Gun selection and number of firing passes justified will be determined by the type and value of target. With the standard boresight pattern, concentration of bullets in the target area can be increased by firing more than one gun together. For a target where surprise is essential to success, e.g., a target of opportunity on an armed reconnaissance mission, best results can be obtained by maximum ordnance delivery on a single pass. For a target where time on station or influence in the area is primary, e.g., an escort mission, best results will be obtained by budgeting available weapons and ordnance with respect to time, area of coverage and target threat. Against targets where friendly positions are not well defined or are numerous, consideration should be given to using only one gun for one short initial burst to positively confirm the area of fire prior to firing for effect. In any event, a sufficient amount of ordnance should be expended on any pass to damage the

selected target, and merit the risk sustained in making the pass. The first rule of survival in a hostile environment is to limit exposure. The second rule is always expect to be fired upon when firing.

20. Terrain and Weather: The contrast between flat, open terrain and mountainous, jungle-covered terrain compounds the problem of devising specific tactics. Extremely effective fire is relatively easy against targets in flat, open areas, while delivery can be totally ineffective against similar targets located under heavy jungle canopies. Mountain-side targets are difficult to strike. The firing pass turns the aircraft into the hillside and forces a series of short passes, followed by recovery turns away from the target. This can disasterously expose the aircraft to enemy fire against the underside or undefended side of the aircraft. A right hand turn, firing to the outside, may even be necessary in valleys. Pilots must be wary of getting into places they cannot get out of. Limitations imposed by terrain, downdrafts, turning radius, and aircraft performance must be constantly evaluated. Aircrews must assume that hostile gun emplacements will be located advantageously on the hillsides and consider the risks before committing themselves to operations below ridge lines. Aircraft limitations become a definite factor in mountainous area. Battle damage problems are compounded. Losing an engine, for instance, could be disasterous if the only escape route requires a climb. Crash landing sites are frequently not available. Rising terrain may limit the time available for bail-out. There is no substitute for familiarity and experience in any mountainous area. Maneuvering in mountainous terrain requires adequate ceiling and visibility. Attempts should not be made to penetrate areas where weather conditions are below the minimum outlined in appropriate operational directives. A night operation in mountainous terrain with poor weather is extremely hazardous.

21. Night Operations: Night tactics vary with the type mission and the number of aircraft involved. When only two aircraft are operating in the same area, only one aircraft is required to show lights if blacked-out operation will enhance mission accomplishment. Pilots should always ascertain the presence of other aircraft by whatever means available prior to operating without lights. When more than two aircraft are in the same area, all aircraft must show lights. Aircraft separation becomes more complex and requires greater attention as the number of aircraft in the target area increases. Common altimeter settings, visual contact and voice communication, as well as aircraft lighting, are mandatory. Assigned altitudes during marginal weather conditions may be substituted for visual contact enroute to the target but are not advisable over the target. In general, support aircraft will use maximum lighting and strike aircraft will use minimum lighting. Running lights indicate direction of flight, provide a good target reference for hostile fire, and other ineffective aircraft separation. Conversely, rotating beacons provide effective aircraft separation and do not indicate precise direction of flight. When operating near the ground, especially during takeoff and landing, blacked-out operation to avoid ground fire may be necessary. Exhaust trails at high power settings will continue to present a target even with flame suppressors, but they are not as visible as lights.

a. Flare techniques. When using flares over a target, the wind must be

considered so that the target can be evenly brackated by the flare while it is burning. That is, the flare should be dropped upwind so that it will drift across the target, burning about the same length of time on each side. After the flare is dropped, the airplane is maneuvered into firing position as soon as possible. There will usually be time for approximately two orbits of the target with each flare. Just before the flare burns out another is dropped at the original point. Any necessary adjustments of release point or ignition altitude should be made. When constant illumination is mandatory, provisions must be made for faulty flares which result in "duds" or "streamers". When weather conditions are clear and visibility is good, flares are not effective when adjusted to ignite closer to the ground than normal. Flare ignition can be higher than normal when operating under an overcast. Bear in mind that flares ignited at higher altitudes are more likely to illuminate or silhouette the aircraft. For night operations, the underside of the aircraft should be painted black. During night firing passes, pilots must always remember that long gun bursts offer an excellent aiming and tracking reference for hostile gunners. Aircrews must make a conscious effort, including target study from maps or photographs, to remain orientated while operating on the target even if flare light goes out. If wind is not a factor, flares may be dropped at random points around the firing circle. Target acquisition under flares presents no particular problem as long as the night reticle pattern is selected and the light intensity of both the gunsight and the instrument panel is kept at a minimum. Use of the NOS in a flare environment is not recommended. Use the telescope daylight device under conditions of high light intensity.

b. Illuminator techniques. Use of the air light is extremely effective in illuminating the target area. Due to the limitations in azimuth and elevation it is most effective to positively identify a target once its general location is known. Once the aircraft is in the firing pass, the light can be maintained on a target throughout the pass with very little if any movement. However, in the visual mode of operation, it presents an excellent target for ground fire, therefore it should be used as little as possible, and only during an actual firing pass. In the infra-red mode of operation it is very effective in illuminating a target in conjunction with the night observation sight. The infra-red is not visible to the naked eye, therefore the risk of drawing ground fire is greatly reduced.

22. Mutual Support: Considerable advantage is gained through the use of two aircraft, especially in isolated areas where ground defenses are known to exist and/or where voice communications with friendly forces are limited. Experience has indicated that enemy forces are more reluctant to fire and thus reveal their position when more than one aircraft is present.

23. Flexibility: Tactics must be flexible. Generally, the precise location of the enemy in and around the target area will not be known. The assumption must be made that the enemy is always there. Denial of predictability will enhance survivability. It is the responsibility of the pilot to assess the situation, determine what tactics will be used and control his crew during employment of these tactics. It is essential that all crews have a thorough knowledge of both the aircraft and the weapon system, combined with delivery procedures and techniques. Only through knowledge, experience, sound judgement, and leadership can an allowance be made for flexibility. Flexibility in tactics is not to be misconstrued as a lack of air discipline.