

Flying Operations

AC-130U OPERATIONS

This instruction implements AFD 11-2 and establishes employment procedures for AFSOC AC-130U aircraft and aircrew.

SUMMARY OF REVISION

This revision updates Crew Coordination para 3; updates Rules of Engagement para 6.1; adds paras 7 and 8, Sensor Alignment and Prestrike; adds para 9.3 Fire Control Officer Duties; para 10.1.4 and 10.1.5 Pilot Duties updated; para 10.3.4.1 FCO Duties updated; para 10.4 Sensor Operator Duties added; para 12 Warning added; para 12.1.1 Two-Shot Drill added; para 14 Munitions expanded; para 21.5 AC-130U CAS Guide Note added; para 23 Armed Reconnaissance updated; Section E Low Level updated; updated Attachment 5; updated Attachment 6.

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OPR: HQ AFSOC/DOVF (Capt Taylor)

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Figure 1. Standard Procedures for Controlling Fighters from an Offset to the South**Attachments**

- 1 - Critical Information
- 2 - Mission Planning Guide
- 3 - AC-130U Briefing Guidelines
- 4 - Gunship Compatible Beacons
- 5 - J-Fire Nine Line CAS Brief
- 6 - AC-130U Call For Fire

Section A - General Information

1. Introduction. This document provides general guidance for the employment of the AC-130U. In order for the gunship to operate effectively, employment tactics must remain compatible with the combat environment. All crewmembers must actively participate in keeping tactics and publications up to date. Submit proposed changes to HQ AFSOC/DOV IAW volume 1 of this instruction.

2. Critical Information. AC-130U crewmembers must not divulge sensitive information to persons who do not have a need to know. This includes private conversations and discussions over non-secure telephone lines. Attachment 1 lists this critical information.

3. Crew Coordination. The highly complex systems and the large number of crew members may cause confusion and loss of mission effectiveness if coordination and discipline are not stressed at all times. Communications will be limited to mission related items during checklists, taxi, munitions upload, weapons delivery, low level, inflight refueling, takeoff, approach and landing.

4. Interphone System:

4.1. All crewmembers will monitor ALL/TKR. Conduct all challenge and response checklists on ALL/TKR. This net will serve as the primary means of communication between crewmembers during tactical operations. During 105mm operations the "Gun Ready" call will be made by the flight engineer (FE) to the crew over ALL/TKR.

4.2. Pilots and flight engineers will use P1. During inflight refueling operations, the pilots will select HOT MIKE on P1 and push-to-talk on ALL/TKR. All crewmembers will monitor P1 during inflight refueling operations. Pilots and Lead Gun will monitor P2 during tactical operations.

4.3. The navigator (nav), fire control officer (FCO), and electronic warfare officer (EWO) will use P2 for normal communications. The sensor operators will use P3 for normal communications.

4.4. The flight engineer, loadmaster (LM), and airborne gunners (AG) will use P4 for normal communication between their stations. The lead gun will advise the flight engineer of gun status over P4.

4.5. Crewmembers will use the CALL system to alert the crew to threats and intraplane emergencies.

Note: TCTO 1C-130(A)U-517 Intercommunication System (ICS) Upgrade renames the ALL/TKR channel to MAIN. MAIN will be monitored by all crewmembers at all times. PVT 1 should be used by the flight engineer, gunners and loadmaster. PVT 2 should be used by the BMC for target confirmation and coordination and should

also be monitored by the pilot and lead gunner. All crew positions may use their respective ISO nets and LOCAL when available for additional crew coordination or training.

5. Radio Communications. Radio communications are extremely demanding during gunship missions. It is imperative to maintain strict radio discipline. Use brevity and proper terminology to avoid unnecessary delays or confusion.

6. Mission Planning. Thorough mission planning is the key to the crew maintaining situational awareness throughout the mission. Effective mission planning should give the crew an in-depth knowledge of the ground plan, including the commander's intent and all factors affecting the gunship. Inadequate mission planning may result in the loss of situational awareness and subsequent mission failure.

6.1. Rules of Engagement (ROE). The crew must be familiar with the established ROEs. CJCSI 3121.01, *Standing Rules of Engagement for US Forces*, applies and may be supplemented for the particular mission. Commanders at all levels may request changes to the ROE through the chain of command. Changes to ROE must be rapidly disseminated to all personnel. The ROE will never limit the inherent right and obligation of individual and unit self-defense. Even if there are no forces declared hostile, commanders will defend their units against a hostile act or hostile intent. The two elements of self-defense are necessity and proportionality. For necessity, a hostile act must occur or there must be a demonstrated intent to commit a hostile act. The threat posed by the hostile act or intent must be imminent. Proportionality infers that the use of force must be reasonable in intensity, duration, and magnitude and must be consistent with the threat to ensure the safety of the force. Individuals will be prepared to act in self-defense. Nothing in the ROE limits crew members' rights to take appropriate action to defend themselves.

6.2. Liaison Officers (LNO). When possible, close air support (CAS) missions should include a representative from the ground force commander. The LNO should know the ground situation during mission planning, as well as inflight. The LNO knows the ground commander's intent for the mission and can speak/address the acceptable risks of close fire support.

6.3. Employment Decisions. The aircraft commander is the decision authority on tactics and employment. He is responsible for risk assessment and mission execution. Select weapons and munitions prior to flight whenever possible. This is not intended to limit flexibility, but to reduce task loading in the employment area.

6.4. Planning Guide. Specific factors will vary between missions. Attachment 2 should be used as a guide for mission planning, but in no way limits the scope or depth of planning.

6.5. Mission Briefings. Conduct planning and mission briefings IAW Attachment 3.

Section B - Crew Duties

7. Sensor Alignment. Sensor (fire control) alignment checks will normally be performed over the departure airfield if time and weather conditions permit.

8. Wet Boresight. The wet boresight will be completed by the fire control officer with assistance from the navigator as necessary. If unable to perform a wet boresight prior to reaching the target area, the first round should be placed as far as practical from friendly positions. Subsequent rounds can then be brought onto the target. This will reduce the hazard to friendly ground forces when firing untweaked weapons. Procedures for combat tweaking are discussed in Volume 7 of this instruction.

9. Prestrike. The prestrike phase begins prior to the combat entry point and includes activities prior to target acquisition. In most cases these duties apply from before combat entry until past the combat exit point.

9.1. Pilot Duties:

9.1.1. Ensure the aircraft is configured for combat entry.

9.1.2. Complete the Combat Entry checklist as appropriate.

9.1.3. Scan for threats.

9.2. Copilot Duties:

- 9.2.1. Complete the Combat Entry checklist as required.
- 9.2.2. Coordinate with Air Traffic Control (ATC) and/or Ground Control Intercept (GCI) controllers as appropriate.
- 9.2.3. Assist with navigation and threat avoidance.
- 9.2.4. Assist the navigator in coordination with other aircraft, (e.g. tankers, fighter escorts, etc.) and tactical control agencies.
- 9.2.5. Scan for threats to the aircraft.
- 9.3. Fire Control Officer Duties:
 - 9.3.1. Update and verify the Tactical Situation Map (TSM).
 - 9.3.2. Assist with navigation and in contacting tactical control agencies as required.
- 9.4. Navigator Duties:
 - 9.4.1. Navigate the aircraft and keep the crew advised of the aircraft position.
 - 9.4.2. Prior to reaching the designated working area, contact the tactical controlling agency to obtain essential mission updates.
 - 9.4.3. Coordinate mission activities with other aircraft.
- 9.5. Electronic Warfare Officer Duties:
 - 9.5.1. Complete all equipment checks, preset the defensive equipment, and go on watch prior to entering a threat area.
 - 9.5.2. Monitor compliance with defensive ROEs.
 - 9.5.3. Monitor/run the mission execution checklist and advise the crew of situation updates.
 - 9.5.4. Assist the navigator in avoiding threat areas.
 - 9.5.5. Record defensive information.
 - 9.5.6. Coordinate with the DSO.
 - 9.5.7. Update and verify the threat information on the Tactical Situation Map (TSM).
- 9.6. Loadmaster, Flight Engineer, and Scanner Duties: The loadmaster, flight engineer, and scanners will be in position to perform scanner duties prior to entering any threat environment.
- 9.7. Sensor Duties: Complete all equipment checks, check/set pulse repetition frequency (PRF) codes as required, and set up battle damage assessment (BDA) recorders.
- 9.8. All Other Crewmembers:
 - 9.8.1. Monitor tactical control frequencies.
 - 9.8.2. Prepare for combat entry as appropriate.
- 10. Strike.** The strike phase consists of the portion of the mission in the employment area. Only duties which differ from the prestrike are listed below.
 - 10.1. Pilot Duties:
 - 10.1.1. Configure the aircraft for weapons delivery.
 - 10.1.2. Select appropriate tactics, weapon, and ammunition.
 - 10.1.3. Confirm correct sensor/gun/fire control channel and modes from the fire control data block in the HUD or B/U HUD prior to arming guns.

10.1.4. Prior to firing during CAS missions, ensure the distance between the target and the friendly location(s) complies with appropriate requirements.

10.1.5. Receive target confirmation and clearance to fire from the navigator.

10.1.6. Direct the arming and safing of the guns when appropriate to ensure safety and mission execution.

10.1.6. Pilot will not attempt to fire the 105mm until the flight engineer makes the "gun ready" call.

10.2. FCO Duties:

10.2.1. Assume primary navigation duties in the target area.

10.2.2. Coordinate target validity with the navigator and sensor operators.

10.2.3. Verify friendly location relative to the target.

10.2.4. Prior to firing during CAS missions, ensure the distance between the target and the friendly location(s) complies with appropriate requirements.

10.2.5. Coordinate with the aircraft commander on tactics, weapons, and ammunition selection if other than pre-briefed.

10.2.6. When the correct sensor/gun/fire control channel and modes are set in the fire control system state "FCO is ready, Channel A and/or B."

10.2.7. Update and verify the threat information on the Tactical Situation Map (TSM).

10.2.8. Record BDA information.

10.2.9. Assist the navigator in communications.

10.3. Navigator Duties:

10.3.1. Maintain communications with tactical control agencies for mission requests and clearance to fire.

10.3.2. Complete a target briefing for new targets or fire missions as required.

10.3.3. Confirm the target location, identity, validity with respect to the ROEs and issue final clearance to fire.

10.3.4. Assist the FCO with tactical navigation.

10.3.5. Operate the strike radar as required for mission execution.

10.4. Sensor Operator Duties:

10.4.1. The primary sensor(s) will:

10.4.1.1. Track the target or friendlies as directed by the fire control officer.

10.4.1.2. Give consent as required.

10.4.1.3. Call ordnance impact as required.

10.4.1.4. Perform two shot as required.

10.4.2. The secondary sensor will:

10.4.2.1. Backup primary sensor operator and/or fire control officer as required.

10.4.2.2. Search for additional targets.

10.4.2.3. Search for threats to the aircraft as required.

11. Poststrike. The poststrike phase of the mission begins at the combat exit point. Only duties which differ from prestrike are listed below.

11.1. Pilot Duties: Initiate the Combat Exit checklist.

11.2. Navigator Duties:

11.2.1. Assume primary navigation duties.

11.2.2. Relay appropriate command and control information to inbound aircraft and provide inflight reports as required.

Section C - Employment Considerations

12. Gunfire Modes:

12.1. Trainable (TRN). The trainable mode should be considered the primary firing mode. This mode allows more timely and accurate weapon delivery. The pilot is allowed more flexibility in maintaining firing geometry, which is particularly important in high wind or off nominal situations. Further, the sensor can adjust fire or move to a different target with minimal coordination.

WARNING: When firing in the trainable mode, the primary sensor must ensure the consent switch is off unless tracking the target and attempting to fire the weapon.

12.1.1. Two-Shot Drill. The two-shot drill is a technique allowing the sensor operator to correct for fire control error. After the first shot is fired, the primary sensor operator observes ordnance impact. If the round misses the target, the sensor operator notes the impact error and offsets the sensor dot-quad from the target in the opposite direction. AFSOCI 11-202, Vol 7 contains more detailed information.

12.2. Fixed (FXD). The fixed mode retains all fire control inhibits, but places the gun in a nominal fixed position. The pilot maneuvers the aircraft to place fire on the target. The rate and coincidence parameters may be set as appropriate for the tactical situation.

12.3. Semi-Fixed (SEMI). The semi mode bypasses mission computer inhibits for rate, coincidence, and sensor consent. The pilot maneuvers the aircraft to place fire on the target. The pilot must exercise caution because the armed guns will fire any time the trigger is depressed.

12.4. Manual (MAN). The manual mode bypasses all mission computer inhibits and the fire control display is not updated. The electronic control unit (ECU) still completes its parameter checks. The pilot maneuvers the aircraft to place fire on the target using the standby reticle (STBY). He must adjust his aimpoint for ballistic winds. He may correct for gun error by applying the FCS gun deltas to the nominal azimuth and elevation settings of the standby reticle. The LWCP must also be in the manual mode, and the fire control override switch must be placed in the ORIDE position.

12.5. Fire Control Override (ORIDE). The Fire Control Override Switch may be placed to ORIDE in either FXD or SEMI and must be used in MAN. ORIDE provides a circuit directly from the pilot's trigger to all three ECUs. The gun arming circuit is used to select the gun or guns to fire. The pilot must exercise caution because the armed guns will fire any time the trigger is depressed.

12.6. Dual Target Attack (DTA). The Dual Target Attack mode allows the fire control system to configure a primary sensor and gun for each fire control channel. Both channels may fire independently and near-simultaneously. There is a half-second interrupt in the OFP whenever firing in the TRN, FXD, or SEMI mode to prevent rounds from colliding near the aircraft.

13. Radar. The APQ-180 radar gives the AC-130U a true all-weather capability to fire against radar significant targets or a beacon offset.

13.1. For IMC firing confirm valid sensor/sensor (SENSR/SENSR) values for the radar and both INSs. Perform SENSR/SENSR calibration if necessary and slaving checks to confirm proper nav/radar system accuracy. Do not fire using the INS as primary sensor.

13.2. Optimum mapping of an area using high resolution maps requires the aircraft heading be offset 20 degrees or greater from the target.

13.3. Interdiction of targets using the radar as the primary sensor requires use of a radar track mode: fixed target track-automatic (FTT-AUTO), fixed target track-manual (FTT-MAN), beacon track (BCNT), or ground moving target track (GMTT).

13.3.1. FTT-AUTO is best used against small isolated targets such as vehicles, aircraft, or small buildings.

13.3.2. FTT-MAN is best used against large or clustered targets.

13.4. If the radar and weapon combinations have been tweaked, projectile impact point prediction (PIPP) should be off for maximum ordnance delivery. PIPP can be selected for subsequent shots to check for accuracy.

13.5. The navigator should consent when FTT has a valid track indication and an azimuth and elevation bias of less than 1.

14. Munitions:

Note: Additional information on specific munitions and targets is contained in AFSOCMAN 11-1 Vol 4.

14.1. 105mm. The 105mm cannon fires both the M1, 32.5 pound high explosive (HE) and the M60, 34.2 pound white phosphorous (WP) projectile.

14.1.1. The fuzes available for the HE round are the super quick M557, selectable to point detonate (PD) or a 0.05 second delay, the hardened FMU-153B, with PD or 0.004 to 0.009 second delay, and the M732 proximity fuze, which detonates approximately 7 meters above the ground, or point detonates if the proximity function is not set or fails.

14.1.2. The M1 HE projectile with the M557 fuze in the PD mode is effective against personnel and light vehicles. The M1 HE projectile with M557 fuze in delay is effective against light structures and personnel under heavy foliage or cover as the round penetrates prior to detonation. This combination does not work as well against concrete or hardened structures as the fuze and projectile may break up on impact, causing the round to not function.

14.1.3. The M1 HE projectile with the FMU-153B fuze in delay mode has hardened target penetration capability.

14.1.4. The M732 fuze makes the M1 HE round an effective personnel physical suppression weapon, as the air burst enables the fragmentation to impact prone or entrenched troops. For effective area coverage it may be necessary to fire several rounds at least 20 degrees apart, aiming approximately 2 mils high of the central point. The M732 fuze may function based on the height of the highest obstacle in the area.

14.1.5. The M60 WP round, used only with the M557 fuze, is an effective smoke round with limited incendiary effect.

WARNING: No foreign objects will be placed in or passed through the 105mm gun barrel except as prescribed by technical order or regulatory procedures.

WARNING: M557 PD fuzes may detonate prematurely when fired in heavy rainfall.

CAUTION: Do not load or fire the 105mm in moderate or greater turbulence.

14.2. 40mm. The 40mm automatic gun fires a variety of 2 pound projectiles. The primary War Reserve Materiel (WRM) stocks are the PGU-9B/B and PGU-9C/B High Explosive Incendiary (HEI) [Zirconium liner] cartridges. Other cartridges include PGU-9B HEI-P [Misch metal liner], the MK-2 series HE-P and HEI-P cartridges (primarily used for training), and the M81 series Armor Piercing (AP) cartridges, some of which contain a 12 second burn-time tracer element (approximately 10,000 feet). The 40mm may be preferred for CAS in very close proximity to friendlies because of its small fragmentation pattern.

14.2.1. The PGU-9B/B and PGU-9C/B HEI rounds are very effective against personnel, light vehicles, and as an incendiary for open flammables.

14.2.2. The PGU-9B is somewhat less effective against these same targets as it contains less HE filler, resulting in a less effective fragmentation.

14.3. 25mm. The GAU-12 25mm gatling gun fires at a rate of 1,800 shots per minute. The munitions available include the PGU-25 and PGU-38 high explosive incendiary (HEI) and PGU-23 target practice (TP).

14.3.1. The PGU-25 and PGU-38 HEI are effective against exposed personnel and light materials, and functions with both fragmentation and incendiary effects.

14.3.2. The PGU-23 TP is primarily used for target practice, although it does provide some penetration capability. TP is most effective when mixed with HEI to provide an impact signature.

Note: Additional information on the capability of gunship munitions is available in the AFSOCMAN 11-1.

14.4. Marker Flare Launching Procedures. All mark launches will be directed by the pilot using the following procedures and voice commands:

“LM, Pilot/Copilot standby to launch marks” - loadmaster ensures the jettison port is open and the marks are prepped.

“LM standing by” - loadmaster replies when ready to jettison the mark.

“Launch marks now” - loadmaster jettisons the mark.

“Marks away” - loadmaster replies after marks are jettisoned.

At this point (if not firing on a previously jettisoned mark) the pilot may roll wings level for 5-8 seconds and then roll into an orbit. This action will place the jettisoned flares near the orbit center and expedite the location process.

15. Target Illumination. The AC-130U is capable of covert illumination operations. Any illumination decisions should be made with consideration to the capability of the threat.

15.1. Laser Illuminator. The laser illuminator assembly (LIA) is an excellent source of illumination for the all light level television (ALLTV). In most contingency situations, minimum use of the LIA is desirable. If the system is required for verification of a ground position, a 1 to 2 second cycle should allow observers to identify the position while limiting the exposure of the gunship.

16. Ground Marking Methods. There are a number of methods for marking ground positions. If possible, one or more of these methods should be employed to help identify friendly positions. In any case, the key to safely identifying friendly positions is situational awareness.

16.1. Beacons. Electronic beacons can be used in conjunction with the APQ-180 to identify and track friendly locations. Offsets from beacons can be used to identify and engage targets in poor visibility conditions. Information on gunship compatible beacons is located in Attachment 4.

16.2. Visual Markers. There are a variety of suitable visual markings which may be used to positively identify a ground force prior to providing fire support in close proximity. Reference paragraphs 21. Close Air Support and 21.3. Troops in Contact of this volume for specific procedures and requirements.

16.2.1. Reflective tape, often called GLINT tape, is a very common marker used on both troops and vehicles. The tape is usually a good aid to identification, but requires the use of the laser illuminator and can be washed out by surrounding lights.

16.2.2. Covert and overt strobes are also good marking devices, but must be an active source and may not be optimum in some situations. Virtually any distinctive light source/pattern can also aid in identification of ground references. These should be carefully coordinated to eliminate the possibility of ambiguous references.

16.2.3. Laser target pointers (GCP-1, LPL-30, etc.) are excellent for both marking and identifying friendly positions. Lasers are not as susceptible to being washed out by surrounding lights and various techniques are available to expedite friendly/target identification, such as roping and walking the beam to the target. Consideration should be given to the tactical situation when using laser target pointers.

16.3. DF Homing. The AC-130U is capable of both VHF and UHF homing. This method can be useful in situations such as combat recovery, where the ground party is unsure of its exact location.

16.4. Radar Reflectors. Ground parties can use omni-directional radar reflectors to aid in covert identification of their position. If multiple reflectors are used in a predetermined configuration they must be placed at least 10 feet apart.

17. Tactical Considerations:

Note: Additional information on specific tactical considerations is contained in AFSOCMAN 11-1 Vol 4.

17.1. Threat and Ground Situation. The threat and ground situation will normally be the primary factors affecting tactics. The AC-130U is best suited for low and selected medium threat environments. The gunship operates at night to reduce the effectiveness of visually directed weapons.

17.1.1. The keys to survival are to limit exposure and always expect to be fired upon, especially when firing.

17.2. Employment Altitude. Factors affecting employment altitude include threats, target type, requirements for target identification, weather, proximity of friendly troops or civilians, aircraft performance, etc. Generally, a higher threat environment will drive a higher employment altitude.

17.3. Aircraft Lighting. The gunship will normally use minimum lighting during combat operations. When operating with other aircraft, the canned beacon and formation lights are recommended. However, when operating under an overcast or in hazy conditions, reflections from the canned beacon and formation lights may be seen from the ground.

17.4. Weather and Visibility. The AC-130U is capable of operations in IMC or poor visibility using the APQ-180 strike radar. The radar will track fixed targets, moving targets, or beacon offsets. Some accuracy degradation will be experienced and the greater circular error probability (CEP) must be factored into mission planning, especially when firing close to friendly forces.

17.5. Sky Condition. Ambient illumination must be considered during all operations. The gunship can be silhouetted against a high ceiling, or illuminated by the moon, stars, ground lights, fires, or flares. Moon state must also be considered as the gunship may be visible on clear nights with high illumination.

17.6. Terrain. When operating in high terrain or mountainous areas, lower above ground level (AGL) altitudes make the gunship more vulnerable to threats. Gun emplacements may be located on hillsides closer to the gunship. Consider aircraft performance when operating in mountainous areas. Three engine capability will be reduced in high terrain, high pressure altitude situations. For a target on a hillside, any miss distance will be exaggerated when firing down the incline rather than into the incline.

17.7. Convoys. In general, when attacking a line of vehicles, attack the lead vehicle first and the last vehicle second. When these vehicles are immobilized, the other vehicles may be trapped, allowing them to be attacked at will. Firing a single round of 105mm or 40mm in front of a vehicle should cause the vehicle to stop.

17.8. Cargo Door. Due to structural stress and airspeed limitations encountered during some aircraft defensive maneuvers, the cargo door should be kept closed in high threat environments. In certain non-maneuvering flight situations (i.e., search and rescue missions) consideration may be given to flying with the cargo door open. The open cargo door provides the most expedient exit in an emergency situation.

18. Defensive Tactics. Specific defensive procedures are classified. This information is maintained in the AFSOCMAN 11-1.

19. Intelligence Gathering. Every crew that flies a tactical mission must debrief the intelligence section immediately after the mission. The EWO and anyone else with pertinent information will attend the debrief. These debriefs are extremely important, as they provide the best source of intelligence on the current battlefield situation. Additionally, good reporting ensures the best tactics and procedures evolve from actual combat situations. Everyone with the potential to gather useable data concerning the threat should do so. Primary importance is placed on threat identification and location. Note the following key points after threat encounters:

19.1. Time and location of the encounter.

19.2. Type of threat.

19.3. Evasive actions taken and their result.

19.4. Effect of the encounter on the mission.

20. Tactical Recoveries and Self Contained Approaches.

20.1. Visual Tactical Recoveries. Overhead and downwind recoveries allow rapid recovery of an aircraft. Random steep and random shallow recoveries allow recovery to an airport in a threat environment. Specific procedures for tactical recoveries are contained AFSOCI 11-202 Volume 1 Chapters 5 and 8.

20.2. Self Contained Approaches. AC-130U Automatic Instrument Landing Approaches (AILA) are considered self contained approaches (SCA) and will be flown in accordance with AFI 11-206 paragraph 5.8.2.

20.2.1. SCA minimum descent altitude (MDA) will be touchdown zone elevation plus 500 feet. Minimum visibility will be 1 nm.

20.2.1.1. HQ AFSOC/DO may authorize SCA MDA to be touchdown zone elevation plus 300 feet. Minimum visibility will be 3/4 nm.

20.2.2. Approach Path and Glideslope Construction. Plan to intercept a 3 degree glideslope from en route altitude, unless terrain or obstructions dictate a different glideslope. Avoid using glideslopes greater than 5 degrees.

20.2.3. Use all sources available to identify significant vertical obstructions within 3 nm of the LZ, the approach path, departure path, and go-around path. These are minimum distances and may need to be increased by the crew.

In all cases, the course should give a minimum of 500 feet clearance (300 feet for authorized contingency operations) from any obstruction within 3 nm of the LZ, approach, departure, and go-around path. For each significant obstacle identified, plan and brief a specific means of avoidance during the approach. The following examples may be used singularly or in combination: use a steeper glideslope; if possible, move the touchdown point further down the runway or landing zone; a dog-leg to final may also be used, but the radius of turn must be planned to have the aircraft wings level on final at no less than 2 nm prior to touchdown.

20.2.4. The navigator will construct an approach plate for the SCA/AILA using the AFSOC Form 96, SCA Planning Form.

20.2.5. The DR computer can be used to simplify approach plate construction. Once the planned glideslope has been determined, use the slide rule side to determine descent rate in feet/nm using the following formula:

$$\frac{\text{Glideslope}}{57.3} = \frac{\text{Feet/nm}}{60}$$

Using this formula, a 3 degree glideslope equates to 318 feet/nm. This figure can now be converted to a VVI. Leaving the slide rule set up as it is (with feet/nm set over 60), look above the planned ground speed to find the planned VVI. Using the example of 318 feet/nm, a planned ground speed (after final slowdown) of 115 equates to a VVI of 600 feet/minute. The slide rule side can also be used to determine the planned start descent point. Since you already know how many feet/nm you need to lose (318 in this example), and you know the approach starts at 500 feet, you can set up a proportion to find planned descent point:

$$\frac{\text{Feet/nm}}{1.0} = \frac{500}{\text{Descent Point}}$$

Using the example of 318 feet/nm, this proportion yields a descent point of 1.6 nm. Leaving the slide rule side set up as it is, you can also determine how many feet/nm you need to lose each 1/2 nm by looking above .5. In this case, the slide rule yields a value of 159 feet for every 1/2 nm. You now have all the information needed to construct an approach plate. Adding the values obtained for each 1/2 nm to the TDZE will yield the predicted MSL altitude at each 1/2 nm. To obtain the predicted AGL altitude, carefully analyze the terrain to compute actual terrain elevation below the aircraft. Subtract terrain elevation from the predicted MSL altitude to obtain predicted AGL altitude at each 1/2 nm.

20.2.6. SCA Chart Preparation. Use the smallest scale chart available from 10 nm inbound. A 1:50,000 chart is preferred, but in no case will it be larger than 1:500,000. The navigator should select update points along the

approach. Chart construction will be IAW this chapter and include the following additional items: the IP, slowdown points, descent point, and the missed approach, departure, and go around paths. Ensure update points are annotated. The IP should be an easily identifiable point. If an identifiable point cannot be found on the extended centerline, it is advisable that equipment updates be made prior to the IP. It is critical to have sufficient, reliable update points prior to the IP and final run in.

Section D - Missions

Note: Additional information on specific missions is contained in AFSOCMAN 11-1 Vol 4.

21. Close Air Support. CAS is defined as air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces. The AC-130U is an excellent low-threat, night CAS platform. The gunship can provide accurate fire support with limited collateral damage, and it can remain on station for extended periods of time. The visual sensors provide real-time reconnaissance of the employment area. Unlike other fixed-wing CAS assets which must have qualified forward controllers (FAC) for ordnance delivery in proximity to friendlies, the AC-130U can be controlled by fire support officers, team leaders, or self-FAC. Positive terminal control is not required for AC-130Us. This unique capability makes the gunship "user friendly," but it requires a high degree of flexibility on the part of the crew.

Note: Additional information on CAS may be found in Joint Pub 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS).

21.1. Preplanned CAS. Most CAS missions are preplanned. These missions involve precise timing and require the gunship to engage predesignated targets. The gunship may be tasked to remain on station for extended periods of time to provide fire support. The method used to remain on station depends on the threat and ground situation.

21.2. Immediate CAS. The gunship may be diverted to a CAS mission. In some cases, the ground forces will not be familiar with the AC-130U. Therefore, the crew must be familiar with the J-FIRE "nine-line" briefing (Attachment 5). Although this briefing was designed for fighter aircraft, it includes basic information applicable to gunship operations. If emergency requests are made by ground troops unfamiliar with FAC procedures, the crew must be familiar with artillery fire support procedures.

21.3. Troops in Contact (TIC). A TIC situation occurs anytime friendly troops are within one kilometer of the enemy, as defined by Joint Pub 3-09.3. Normally, the first consideration in a TIC is to identify the friendly position.

21.4. Standoff CAS. The gunship can support a ground party without unnecessary exposure and without highlighting the ground party. There are two general methods for remaining on station for extended periods.

21.4.1. One method is to remain in a loose, unpredictable orbit outside the range of any known or suspected threats. Fire support or surveillance missions can be coordinated while the gunship remains in a standoff position, ready to turn inbound to the target area. Following a specific mission, or if the threat dictates, the gunship can return to the standoff orbit. This method allows rapid response and allows the gunship to maintain visual contact with the ground forces.

21.4.2. Another method is to select one or more initial points (IP) where the gunship can loiter well clear of any known or suspected threats. Support missions should be coordinated at the IP. Following a requested mission, the gunship can egress to another IP to remain unpredictable. This method requires more planning and slightly increases response time. Also, the gunship may be unable to maintain visual contact with the friendlies. These factors should be considered in the context of the overall ground situation.

21.5. AC-130U CAS Guide. The CAS Guide (Attachment 6) is a briefing guide designed specifically for the AC-130U. Most gunship customers are familiar with this guide. To reduce communications, preplanned missions should include as much of this information as possible. Do not confuse this guide with the J-FIRE "nine-line" briefing.

21.5.1. Initial Contact. The gunship will normally check in with ground forces prior to entering the employment area.

21.5.1.1. Authentication. The gunship will initiate authentication unless using secure voice.

21.5.1.2. Threats. Except in emergencies, the gunship should not enter an employment area without a threat assessment. The ground party should pass any threat updates to the gunship or state "as briefed." Delete this line for preplanned missions which include thorough threat briefings.

21.5.2. Mission Briefing. If the situation permits, expand the items of the mission briefing to a narrative. For subsequent missions, pass only appropriate items.

21.5.2.1. Friendly Location. In a TIC situation, the gunship should identify all friendlies prior to engaging targets. If this is not practical, the gunship can engage targets when the friendlies are known to be clear.

21.5.2.2. Friendly Marking. The briefing should include any marking devices, such as beacons, IR strobes, etc.

21.5.2.3. Target Location. The preferred method is to reference a target in terms of magnetic bearing and range in meters from the observer's position. Grid coordinates may be used. Targets may also be described in relation to target reference points (TRP), roads, or rivers.

21.5.2.4. Target Description. This aids in both identification and weapon selection.

21.5.2.5. Target Marking. Marking by laser identifier or tracer fire may aid in target acquisition.

21.5.3. Clearance. Normally, transmission of the fire support request is clearance to fire. However, if the target is inside the danger close range the controller must pass the ground commander's initials.

Note: For gunship operations, "danger close" is defined as the 0.1% probability of incapacitation (PI), based on JMEM criteria. Danger close distance is defined as targets inside 200 meters for the 105mm, and 125 meters for all other guns. For targets inside the 0.1% PI, the ground commander or authorized controller (fire support officer, team leader, etc.), must accept responsibility for risk to friendlies IAW Joint Pub 3-09.3. If the mission is preplanned, the ground commander or designated representative should brief minimum acceptable engagement ranges. Consider factors such as type of cover available.

21.5.4. Adjust Fire. If a marking round is used, the ground party should make adjustments from the impact in range and bearing or cardinal direction.

21.6. Peacetime Restrictions. During any peacetime live fire mission, the following restrictions apply.

21.6.1. Fire no closer to ground parties than 650 meters with the 105mm and 500 meters with the 40mm or 25mm.

21.6.2. Use no-fire zones if the ground party is within 700 meters for the 105mm, 950 meters for the 40mm, and 2000 meters for the 25mm. To determine no-fire headings, compute the bearing from friendly position to target, subtract 60 degrees for beginning of no-fire zone, then subtract another 60 degrees to determine end of no-fire zone.

22. Air Interdiction. Air interdiction is defined as air operations conducted to destroy, neutralize, or delay the enemy's potential before it can be brought to bear effectively against friendly forces, at such distances from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required. Interdiction missions may be preplanned or assigned during a mission.

22.1. Capabilities. The gunship is best suited to strike small targets in a permissive environment where limited collateral damage is required. The gunship's accuracy, low yield munitions, and target identification capability reduce the risk of collateral damage.

22.2. Limitations. As many high value interdiction targets are well defended, the gunship may be unable to engage them. Also, the gunship lacks both great hitting power and area coverage capability, which limits the potential for damage to hardened targets or large area targets.

22.3. Considerations. Normally, delivering maximum ordnance in a limited period helps to maintain the element of surprise and limit exposure. Consider using partial orbits over a specific target or firing until initiating a turn away from the target.

23. Armed Reconnaissance. Armed reconnaissance is a mission with the primary purpose of locating and attacking targets of opportunity, e.g. enemy materiel, personnel, and facilities in assigned general areas or along assigned ground communications routes, and not for the purpose of attacking specific briefed targets.

23.1. Capabilities. The gunship is well-suited to search lines of communication (LOC). Other capabilities are similar to those for interdiction.

23.2. Limitations. The narrow field of view of the sensors limits the gunship's ability to search large areas. The time required to perform armed reconnaissance must be considered with respect to the threat. The limitations associated with interdiction apply.

23.3. Search Methods:

23.3.1. Parallel. From a right offset the sensors can search an LOC while the gunship remains in position to engage targets of opportunity. This is the quickest and most common search method.

23.3.2. Spiral. This method may be employed where a thorough search of an LOC is desired or where foliage along the LOC prevents the sensor operators from observing both sides of the LOC. Although this method is time consuming, it ensures a thorough search of the LOC.

23.3.3. Random Cut. This method may be used for searching a general area by having the navigator direct the aircraft about the area. The sensor operators can interrupt the flight path and give guidance or direction in order to observe suspicious points.

23.3.3.1. Three techniques can be used to perform the various search methods. They are navigator direction, sensor/INS guidance, and sensor direction.

23.3.3.1.1. Navigator direction is performed by the navigator giving the pilot headings and maintaining the aircraft in the proper position relative to the LOC. An advantage of this technique is that it allows all sensors to search for targets or threats to the aircraft.

23.3.3.1.2. Sensor/INS guidance is achieved by using the fire control system to provide guidance information to the pilots. This technique requires minimum crew coordination to maintain the aircraft in a favorable position to acquire and attack targets. Any LOC visible to the sensors or programmed in the INS may be searched using these techniques. If the LOC is visually lost for any reason and cannot be immediately reacquired, the sensor operator should return aircraft guidance to navigator direction, inertial guidance or request an orbit.

23.3.3.1.3. Sensor direction is performed by the sensor operator giving the pilot headings that maintain the aircraft in the proper position relative to the LOC. This method can be used to parallel LOCs not on charts. Refer to Volume 8 for detailed sensor operator techniques.

Note: Pilots on NVGs can assist as an additional visual sensor and can aid in the performance of these search methods.

24. Specialized Missions. The AC-130U may be tasked to perform a number of specialized missions which are based on CAS or interdiction.

24.1. Point Defense. This mission is essentially a preplanned CAS mission. The situation may allow for more in-depth planning and coordination, but procedures are the same as for a CAS scenario.

24.2. Surface Vehicle Escort. Another version of CAS is escort. Special considerations include searching the route ahead of the surface vehicle. Also, beacons on the lead and trail vehicles aid in maintaining contact in heavy foliage or poor visibility. Because of extended exposure time in most escort scenarios, a permissive environment is desired for the gunship to operate.

24.3. Reconnaissance. The all-light-level capability of the gunship, combined with its range and endurance make the gunship a viable reconnaissance platform. The electronic sensors can also be used for surveillance operations.

24.4. Combat Recovery. The gunship can conduct combat recovery operations. These missions include combined operations with helicopters and fighters. Because of the potential complexity of these missions, thorough mission planning is essential.

24.5. Limited Command and Control Center. The gunship can be used to relay between ground parties, or as a ground-to-air or air-to-air liaison on a limited basis. Planners must realize that any planned use of the gunship in this capacity could adversely affect the gunship's tactical mission and therefore must be weighed carefully. If a separate mission commander is on board, that mission commander should be allocated a specific radio and call sign other than the one used by the tactical crew.

25. Helicopter Operations. The gunship can provide escort, landing zone (LZ) security, and fire support for helicopter operations. The gunship can also vector helicopters to points or around threats. To aid in identification, beacons can be placed on the helicopters. When the helicopter is providing close-in fire support for a ground party, the gunship can provide fire support for targets outside of 500 meters. A single fire support coordination net should be used for both aircraft. Calls for fire can then be coordinated based on distance from the friendlies. For the purpose of fire support, the helicopter orbit should be considered a friendly ground unit.

26. Fighter Operations. Fighters can operate with the gunship as part of a strike package. Fighter assets provide additional strike capability with greater standoff and hardened target capability, and larger area suppression weapons. Fighters can also provide real-time threat suppression in the target area and during en route portions of the mission. Operations with fighter aircraft require effective teamwork between the dissimilar aircraft and increase the complexity of crew coordination on the gunship. A thorough knowledge of the capabilities and limitations of the fighter aircraft is essential for proper coordination. Flexibility and situational awareness must be maintained at all times.

26.1. Mission Planning. Due to the complexity of operations with fighters thorough mission planning is critical. If possible, the fighter flight lead, as a minimum, should attend the mission planning. If a face-to-face brief is not possible, use any means available to coordinate the mission. Use the mission planning guide (Attachment 2), but recognize that this does not limit the extent of mission planning considerations. In the event that fighters are assigned during the mission, use the J-FIRE "nine-line" briefing, and include all other pertinent information. In this case, fighters should be controlled from an assigned IP.

26.2. Rendezvous. Rendezvous may be made en route for escort purposes or at the target area based on timing. In most cases, coordinating a geographic location and TOT will allow for a smooth rendezvous. Aids for the rendezvous include AWACS, GCI, and air-to-air TACAN. Coordinate altitude deconfliction prior to the rendezvous.

26.3. Formation Procedures. The type of formation used will depend upon the type and number of escort aircraft, as well as the threat environment. The fighter flight lead will make all formation decisions. Normally the fighters will hold high, 2,000 feet above the gunship and aft of the 3 to 9 o'clock line. Formation position can change based on operational requirements. To aid the escort in maintaining visual contact, the gunship should call heading changes in excess of 30 degrees, and call when rolling into or out an orbit. Threat suppression attacks can be initiated visually, with clearance from the gunship, or as a prebriefed measure based on positive visual separation.

Note: Additional information on specific escort operations is contained in MCM 3-1 and AFSOCMAN 11-1.

26.4. Lighting. Normal escort lighting should consist of formation lights and the canned beacon. The UARRSI lights can be used in permissive environments and as a "get well" technique in case of lost sight. The covert beacon (AC-130U) may be used if the fighter is NVG-equipped.

26.5. Radio Procedures. Keep communications as close to J-FIRE terminology as possible. Use lasing and sparkling terminology consistent with J-Laser procedures. J-Laser calls include: 10 Seconds, Laser On, Spot, Shift, and Terminate. In some cases these procedures must be altered for operational concerns. Brief planned deviations prior to the mission. As an aid to situational awareness the gunship can monitor the escort intraflight frequency as well as the common strike frequency.

26.5.1. The pilot or copilot should have positive control of the radio for abort calls. Anytime a "no-gun" is experienced the pilot/copilot will call "Abort, Abort, Abort" to prevent the fighter from flying through the gun line with a hot gun situation.

26.6. Employment. There are two basic methods for controlling fighter aircraft. The first is to have the flight or flights hold in a relatively safe location offset from the target area. The second method requires the escort to remain in visual formation with the gunship. Mission requirements will drive the employment decision.

26.6.1. Offset. Controlling fighters from an IP works well for CAS scenarios and is consistent with CAS procedures. The fighters can hold at a higher altitude to increase loiter time and reduce exposure to ground threats. The fighters are not required to maintain formation with the gunship, so they will be more capable of scanning the employment area for threats. Threat suppression attacks are similar to formation procedures. Attacks on targets assigned by the gunship require specific clearance. For ease in coordination, select IPs which allow the fighters a cardinal direction run-in to the target area. The distance from the IP to the target area will depend on the threats and type of fighter aircraft. This method creates a high level of situational awareness, but requires a thorough understanding of all procedures in order to avoid unnecessary and confusing communications. Specific procedures vary for different methods of target designation and are addressed in those sections.

26.6.2. Perch. Employing fighters from the perch may be required on missions with large target areas, such as armed reconnaissance. This method can also be used for CAS scenarios, but may increase the task load of the escort pilots as they must continually maintain formation with the gunship. This may also reduce the escort pilot's ability to scan the area for threats. Clearance to engage threats is similar to escort procedures. Assigned targets still require specific clearance. This method allows a degree of flexibility for large area operations and allows timely suppression of threats.

26.7. Deconfliction. Deconfliction can be visual, or based on altitude or geographic separation. Visual separation may be impossible in some situations. Altitude separation can be accomplished by having the fighters descend below the gunship altitude for attacks and remain low until well clear of the gunship position. Geographic deconfliction requires the fighters to know the gunship position relative to the target area. Therefore, the gunship should add a cardinal bearing from the target to appropriate transmissions. The fighters can then operate in the portion of the orbit opposite the gunship.

26.8. Marking Targets. The gunship will normally aid the strike aircraft in identifying an assigned target. The specific method used to identify the target will depend upon the situation. Factors to consider include, but are not limited to, type of strike aircraft, threat environment, friendly location, type of target, type of weapon, accuracy required, and illumination.

26.8.1. Coordinates. Fighters may be able to accurately identify targets using the Military Grid Reference System (MGRS coordinates). This method may not be accurate enough for certain small targets, or if the proximity of friendly troops is a factor.

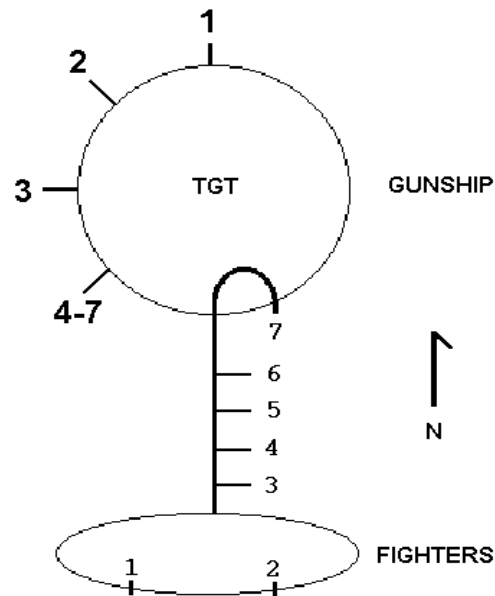
26.8.2. Laser Designation. This is the primary means of marking targets for aircraft equipped with laser spot trackers, e.g., the A-6, A-10, F-15E, F/A-18, and some NATO aircraft. At higher altitudes the fighters should be able to see the laser spot regardless of the gunship's position in the orbit. Here, J-Laser terminology or a plain English equivalent works well (see figure 1). If at all possible, the fighter should take over the spot and provide its own terminal guidance. If the gunship provides terminal guidance, the gunship must designate the target from the side of the orbit closest to the fighters. In this case, the J-Laser procedures should be amended so that the gunship makes the "10 seconds" and "Laser on" calls. If the fighter makes these calls, the gunship may not be in a position to lase. Laser designation offers excellent standoff capability, particularly when combined with Mavericks.

26.8.3. Sparkling. Some cases require marking the target with direct fire. The preferred marking round is 40mm HEI. Firing one round every three seconds provides good illumination of the target. The 105mm WP round is also a good marking round. J-Laser terminology works well, except that "sparkle" replaces "laser." One disadvantage of sparkling is that the gunship must remain in a firing orbit around the target. Also, when the fighter calls "terminate" there may still be a round in the air, which may create a potential hazard for the fighter. Further, visual references for the target may be lost following the cease fire. Finally, this method expends ordnance which could be otherwise employed. One technique is to combine one or two marking rounds with other methods.

26.8.3.1. The pilot or copilot should have positive control of the radio for abort calls. Any time a "no-gun" is experienced the pilot/copilot will call "Abort, Abort, Abort" to prevent the fighter from flying through the gun line with a hot gun situation.

26.8.4. Visual References. The pilot can describe targets with reference to identifiable landmarks or ground illumination from fires or flares. The pilot should act as a FAC since the PA shows the target location while outside references are the same as for the fighter pilots. The sensor's field of view is too small to allow the navigator a good perspective of the area. The space between ground references should be used as a distance unit and the line between

them as a directional reference. Actual distance and direction will be difficult to determine. This method works well for area targets when ground references are available and allows for a stand-off option. A disadvantage is that extreme accuracy is difficult.

Figure 1. Standard Procedures for Controlling Fighters from an Offset to the South.**GUNSHIP**

1. Target brief using J-Fire procedures.
"NORTH"
2. -----
3. Laser on
"WEST"
4. -----
5. Laser off.
6. -----
7. -----

FIGHTER

- Fighters holding 5 to 10 nm south of the target prepare for run-in.
- "10 SECONDS"
- Fighter maneuvers for run-in.
- "LASER ON"
- Fighter descends below gunship by 5 nm.
- "SPOT" when fighter acquires target.
- "TERMINATE" when spot is no longer required.
- "RIFLE" for Maverick.
- "GUNS" for strafe.
- "PICKLE" for bombs.
- "OFF LEFT/RIGHT" fighter remains below gunship until 5 nm from target.

Section E - Low Level Operations

27. General. This section contains low level procedures to be utilized by specially qualified crews only. Low level ingress and egress may be used to delay detection or to avoid certain en route threats.

28. Mission Planning. Low level missions require in-depth planning. The crew flying the mission should normally plan the route and mission the day prior to the mission.

28.1. Planning Considerations. The following factors may have a significant influence on low level operations.

28.1.1. Weather conditions, including turbulence, illumination, wind, and temperature must be considered during mission planning.

28.1.2. Threats, including airborne interceptor (AI), surface to air missiles (SAM), and anti-aircraft artillery (AAA).

28.1.3. Enemy passive detection capability.

28.1.4. Aircraft performance with special consideration of high gross weight operations.

28.1.5. Chart inaccuracies.

28.2. Route Selection. The route of flight should consist of short legs, and frequent course changes to deny enemy anticipation of the target area. Incorporate pertinent intelligence information into all phases of route selection. Use the following guidelines during route construction.

28.2.1. Avoid egress along the ingress routes to the maximum possible extent.

28.2.2. Avoid routes previously used by friendly forces.

28.2.3. Avoid flights over built-up areas or along major LOCs.

28.2.4. Select turnpoints that can be verified visually by pilots, sensors, radar, or geographical coordinates. Avoid turnpoints that are frequently inhabited or defended, such as bridges, etc.

28.2.5. Do not plan turns into significantly higher terrain or other hazards.

28.2.6. Establish en route climb points based on calculated aircraft three engine performance.

28.2.7. Routes should be planned to a start climb point. The selection of this point will be situationally dependent, allowing the crew sufficient time to climb to orbit altitude while minimizing exposure to threat systems and maximizing tactical surprise.

28.2.8. Identify update points along the route.

28.2.9. Identify legs which require emitters off or radio silence.

28.2.10. Whenever possible, plan the leg course prior to the IP to be within 30 degrees of the run-in course.

28.3. Pilots and navigators will check FLIP, section AP/1B for the location of published low level routes and nuclear power plants. Avoid nuclear power plants by 5 nm. To use a published route, it must be scheduled with the controlling agency.

28.4. Do not fly low level missions through Class B, C, or D airspace without the approval of the appropriate controlling agency.

28.5. When possible, avoid uncontrolled airports by 3 nm and controlled airports by 5 nm.

28.6. Avoid prohibited airspace by 3 nm unless approved by the airspace's controlling agency.

28.7. Construct the route to avoid high density traffic areas to the maximum extent possible.

28.8. Maintain a minimum altitude of 2,000 feet AGL over national parks, seashores, lake shores, recreation areas, and scenic riverways administered by the National Park Service, as well as national wildlife refuges, big game refuges, game ranges, and wildlife ranges administered by the U.S. Forestry Service or U.S. Fish and Wildlife Service.

28.9. If moderate or greater turbulence is encountered during low level, initiate a climb to a higher altitude where turbulence is light or less.

28.10. Maintain Visual Meteorological Conditions (VMC) at all times during low level operations. Weather requirements will be IAW AFI 11-206. For contingency or combat operations the route may be continued in Instrument Meteorological Conditions (IMC) at Minimum Safe Altitude (MSA) IAW para 29.3.1.

28.11. For low level operations, the pilot's radar altimeter, one INS and one navigation mission computer must be operational.

29. Low Level Altitudes. Selection of operational altitudes will depend upon environmental conditions such as AAA weapons, terrain, and threat radar. Plan and fly missions at the highest altitude that avoids or minimizes detection.

29.1. Gunship low level altitude will be at least 500 feet above the highest obstruction within 3 nm of course centerline.

29.2. Legs should be segmented to minimize signature. A segment is a leg or portion of a leg with an altitude based upon the highest obstacle or elevation within 3 nm of course centerline. The segment begins 3 nm prior to the obstruction or elevation and extends to 3 nm past, although an earlier descent may be initiated IAW paragraph 29.2.2. Establish climb and descent points based on aircraft performance. Required climb rates will not exceed aircraft three engine capability.

29.2.1. Climb points will be set to ensure the aircraft is established at the segment altitude no later than 3 nm prior to a controlling obstacle/elevation.

29.2.2. Descent points may be set to allow a descent to the next segment altitude when aircraft position is confirmed at least 1 nm past the controlling obstacle/elevation. Otherwise do not descend until 3 nm past the obstruction.

29.3. Minimum Safe Altitude (MSA). Compute MSA for each leg by adding 1000 feet to the elevation of the highest obstacle or terrain feature, rounded to the next higher 100 foot increment, within 3 nm of the planned route centerline (1000/3). MSA provides minimum terrain clearance but limits threat detection and aircraft signature. It provides the crew with a safe altitude at which to analyze positional uncertainties or aircraft malfunctions. Only resume lower altitude operations after the suspected malfunction is resolved or aircraft position is absolutely confirmed to be within 3 nm of planned route centerline.

29.3.1. MSA or higher will be used as the IMC altitude for contingency and combat operations.

29.4. Emergency safe altitude (ESA). ESA will be 1,000 feet (2,000 feet in mountainous terrain), rounded to the next higher 100 foot increment, above the highest obstruction within 10 nm of the planned route centerline (1000/10 or 2000/10). If terrain elevation varies significantly, the route may be divided into route segments of similar terrain elevation with an ESA computed for each route segment.

30. Chart Requirements. The pilots, navigator, FCO, EWO, IR, and TV will have a color chart. It is desirable to use a 1:250,000 (JOG) or larger scale during mission planning, as terrain features can be evaluated more realistically and specific points can be more accurately determined. A 1:500,000 (TPC) may be used in flight. As a minimum, the items listed below will be annotated on the chart.

30.1. The planned route of flight between the combat entry point (CEP), the start climb point or target, and the combat exit point. Charts should be drawn point to point. Annotate planned deviations for terrain masking and timing control. Calculate MSA for the planned deviation course also.

30.2. Distance Marks. Annotate distance marks on the low level course line.

30.2.1. Distance Marks. Indicate distance remaining to the next checkpoint. The increment used between marks is at the option of the user, but may be no greater than 5 nm.

30.3. The magnetic course and leg distance.

30.4. The MSA for the leg or segment.

- 30.5. Any additional altitude restrictions, no-fly areas, etc., as required.
- 30.6. Climb and descent points for each leg segment where there are significant terrain or obstruction differences. Designate the climb point using three-engine climb performance at planned aircraft gross weight for that point along the route.
- 30.6.1. Required climb rates will not exceed aircraft three engine capability. Climb rate may be planned on 1,000 feet per minute. At 220-240 knots ground speed, this equates to approximately four nautical miles per 1,000 feet. For example, if you need to climb 2,000 feet for an obstacle on course centerline, place the climb advisory arrow eight nautical miles prior to the point at which the climb must be completed (eleven miles prior to the obstacle).
- 30.7. Print the ESA in bold numbers on the chart. When multiple ESAs are used, or when lengthy strip charts are used, the ESA will be annotated on each chart segment.
- 30.8. Identify the highest obstruction within 3 nm for each leg, and the highest obstruction within 10 nm for the route or segment.
- 30.9. Annotate the chart number and edition, date prepared, date and edition of current Chart Updating Manual (CHUM), and preparer's name on the back or unused portion of the front of all charts. As a minimum, plot all CHUM obstructions which fall within 10 nm of course centerline.
- 30.10. The navigator's chart will include the low level hazard areas (crop dusting, sky diving, high traffic areas, etc.) as appropriate.
- 30.11. The EWO's chart will include detection free altitude (DFA) or maximum threat free altitude for each leg. Threats will be specifically identified with the symbol, expected radar warning receiver (RWR) indication, and area of coverage. Legs which require emitters off and radio silence will be annotated as required.
- Note:** Chart may become classified.
- 30.12. Optional entries include alternate legs for timing control, acceleration points, and any additional information which could enhance the operation. Time marks may also be annotated to indicate time elapsed from the last checkpoint.
- 30.13. Normally, the pilot and copilot should have one low level chart annotated properly for the route of flight. A single chart may be shared providing the pilot completes an AFSOC Form 78, Pilot's Low Level Log, for the planned route of flight.
- 30.14. Chart construction is a valuable and integral part of mission planning. Use of a color copier to reproduce low level charts is acceptable, but this alone does not constitute adequate mission preparation. Instructors and evaluators may utilize color copier reproductions with no additional preparation when they do not perform primary crew duties.
- 30.15. Annotations and Symbols. The following annotations and symbols can be used in preparing maps, charts, and objective materials. Deviations in positioning are authorized to the extent necessary to preserve chart legibility or significant radar, visual, and relief features.
- 30.15.1. Turn Point or Checkpoint. Use a circle to depict en route points where the aircraft course is altered and key en route positions such as navigation checkpoints (either radar or visual). Letter or number consecutively these points throughout the mission to facilitate easy identification.
- 30.15.2. Initial Point (IP). Identify the IP by a square centered on the point (cultural or natural) with the sides parallel to the final approach course line. If the IP is simply a coordinate point, position a dot on the coordinate location centered within the square.
- 30.15.3. Objective Area. Identify the objective area (i.e., target or LZ) by a triangle centered on the area with the apex pointing in the direction of flight.
- 30.15.4. Emergency Landing Bases. Use a single circle with a diagonal line to identify those airfields compatible with unit aircraft which may be used in an en route emergency. The number of emergency bases selected and the

frequency of occurrence along the mission route are at the discretion of the mission planner. Planners may annotate airfield coordinates near the base.

30.15.5. Route Width (Optional). Base route width parameters on flight planned course. The route perimeter may be drawn on both sides of course centerline.

30.15.6. Course Arrow Boxes. Use course arrow boxes to place essential navigation data on the route charts for each leg. Where the leg is split between two strip charts, use the course arrow box on both. The box will contain the magnetic course, distance, and MSA. Distance is optional on pilot charts.

30.15.7. Combat Entry and Exit Point. A heavy line identifies and locates the point at which the route enters and exits a hostile environment.

30.15.8. Operational Advisory Arrows. Annotations concerning operational aspects of the mission, located where the en route maneuver should be performed.

30.15.8.1. Operational advisory arrows for climb or descent points for each leg or leg segment where there are significant terrain or obstruction elevation differences.

31. En Route Procedures:

31.1. General. Make every effort to fly the route as planned. If unforeseen circumstances require deviation from the plan, every effort will be made to return to the planned route as soon as possible. Obstacle avoidance will be accomplished using all means available (NVGs, radar, ALLTV, IR, radar altimeter, and mission computers).

31.2. Crew Duties. In addition to normal crew duties, low level missions require additional duties and crew coordination.

31.2.1. Pilot/Copilot Duties:

31.2.1.1. The pilot flying the aircraft will use aircraft barometric altimeter to maintain leg segment altitude. The flying pilot will maintain the desired aircraft altitude and ground speed for TOT control and will repeat outbound course, altitude, and airspeed updates when briefed.

31.2.1.2. The pilot not flying the aircraft will monitor terrain and assist with obstacle avoidance and navigation. The pilot not flying the aircraft is the primary visual navigation chart reader. The pilot not flying the aircraft will confirm all course, altitude, airspeed, and MSA updates with his chart to assist the navigator.

31.2.1.3. The pilots and navigator will set their radar altimeter to the planned AGL altitude.

31.2.1.4. Repeat course, altitude, and airspeed changes when briefed.

31.2.1.5. Both pilots will select NAV1 or NAV2 guidance on the navigation select switch.

31.2.2. Navigator Duties:

31.2.2.1. Coordinate navigation with the pilots.

31.2.2.2. Advise the pilots when to climb, descend, change heading, or groundspeed.

31.2.2.3. Update mission computer to provide course guidance for the pilots.

31.2.2.4. Use the radar when feasible to monitor course and weather.

31.2.2.5. Monitor the radar altimeter.

31.2.3. FCO Duties:

31.2.3.1. Brief each turnpoint no later than 5 nm prior to arrival.

31.2.3.2. Maintain a low level log for en route timing.

31.2.3.3. The FCO is the secondary navigation chart reader using the sensors to monitor the aircraft's progress. Monitor altitude, heading, and course on each leg. Direct sensors to acquire turn points, update points, and targets as required.

31.2.3.4. Monitor the radar altimeter.

31.2.4. IR and TV Operator Duties: Identify points along the route as directed by the FCO.

31.2.5. EWO Duties:

31.2.5.1. Brief threats, DFA, and escape heading for each leg.

31.2.5.2. Make radio calls as directed by the aircraft commander.

31.2.6. Engineer Duties:

31.2.6.1. Monitor engine instruments and radar altimeter.

31.2.6.2. During low level may assist in terrain avoidance using NVGs.

31.2.7. Loadmaster Duties: Ensure that gun deck lights are off and all electronic rack lights are covered.

31.2.8. Scanner Duties: During low level, scanners may use NVGs to aid in obstacle and threat avoidance.

31.3. Defensive Tactics. Low level defensive tactics differ from those at medium altitudes and are contained in AFSOCMAN 11-1 Vol 4.

31.4. Emergency Procedures. During training missions, the following procedures apply. Contingency missions may require modification of these procedures.

31.4.1. Aircraft Emergency. The pilot flying the aircraft will initiate a climb to ESA. Low level operations will cease unless the situation is terminated.

31.4.2. Inadvertent Weather Penetration. Initiate a climb to ESA or VMC, whichever is lower. Continue the low level if VMC can be maintained.

31.4.3. Crew Becomes Disoriented. Initiate a climb to ESA. Continue the low level once the aircraft position is identified and the aircraft is reestablished on the route.

Note: Threats, terrain, weather, and mission priority are factors when considering a climb from the low level environment during contingency operations.

32. NVG Procedures:

32.1. When the use of NVGs is anticipated, the aircraft commander will ensure that sufficient goggles are aboard the aircraft. Pilots will use ANVIS-6 or 4949F goggles. Pilots, flight engineer, and loadmaster will (visual scanners may) carry a set of NVGs on missions requiring NVGs. All individuals must perform a thorough preflight of their goggles in a test lane or test set.

32.1.1. Check NVGs to ensure proper operation and that ANVIS goggles have been checked IAW ANVIS technical order.

32.1.2. Adjust NVGs to fit individual features and ensure all adjustment features work.

32.1.3. Ensure lenses are clear.

32.1.4. Check attachment hardware on goggles and helmet mount.

32.1.5. Ensure extra batteries are available for crewmembers.

32.1.6. Ensure demist shield is available for each set.

32.2. When NVG use is required, the pilots, flight engineer, and loadmaster should (scanners may) wear them or have them immediately available. Terrain, visibility, formation position, etc., will govern NVG use by the pilots. Threat environment may govern use of NVGs by visual scanners.

32.3. When using NVGs, it is essential that specific crew duties and procedures during aircraft emergencies, inadvertent weather penetration, or RWR threat warning be determined in advance. Details such as who will fly the aircraft, who will transition from NVGs, who will perform emergency actions, what maneuvers will be flown, cockpit lighting, etc., must be planned for and briefed.

32.4. Cockpit lighting must be NVG compatible and carefully adjusted prior to NVG operations. The objective is to have the cockpit instruments visible yet still minimize reflection and glare that may interfere with NVG effectiveness. Ensure all cockpit lights, lip lights, finger lights, and flashlights are NVG compatible and do not wash out or degrade the goggles.

WARNING: Because of the distinct possibility of crewmembers experiencing spatial disorientation during low level flight, one pilot should be immediately ready to fly the aircraft should the other pilot become disoriented.

STEPHEN R. CONNELLY, Colonel, USAF
Director, Operations

DISTRIBUTION X:

HQ USAF/XOFU, Washington DC 20330-5000.....1

USSOCOM/SOJ3, MacDill AFB, FL 33608-7001.....1

Attachment 1

CRITICAL INFORMATION

1. Combat readiness, tactical training, or combat efficiency status.
2. Any additions or changes in equipment that alters unit or force operating capabilities.
3. Maintenance status of aircraft tactical systems.
4. Weapons delivery accuracy.
5. Combat configured munitions load and mix.
6. Any shortages, whether logistical or personnel, that affect combat readiness or operational capabilities.
7. Command and control procedures.
8. The security classification or nickname of any classified operation, project, or program.
9. The existence of plans held by wing, group, or squadron.
10. Threat tactics and countermeasures.
11. Exercise scenarios, development, schedules, dates, and objectives.
12. Association of callsigns with unit designators or aircraft types.
13. Unclassified but sensitive information contained in daily message traffic.
14. Information on the itineraries of key officials, VIPs, or the purpose of their visit.
15. Identification of intelligence sources.
16. Any critical lack of intelligence data or collection capability.

Attachment 2**MISSION PLANNING GUIDE****A2.1. GENERAL INFORMATION.**

- A2.1.1. Minimum risk routing.
- A2.1.2. Tanker information.
- A2.1.3. SAFE areas and SAR procedures.
- A2.1.4. Alternate airfields.
- A2.1.5. Working area charts, photographs, etc.
- A2.1.6. Base altitudes.
- A2.1.7. Command and control procedures.
- A2.1.8. Communication plan.
 - A2.1.8.1. Call signs and frequencies, including alternatives.
 - A2.1.8.2. Secure comm; HAVE QUICK procedures.
 - A2.1.8.3. Specific radio set-up on board the aircraft.
 - A2.1.8.4. Authentication procedures.
 - A2.1.8.5. Brevity words.
 - A2.1.8.6. Comm out procedures.
- A2.1.9. ROEs, both offensive and defensive.
- A2.1.10. Threat assessment.

A2.2. GROUND FORCES INFORMATION.

- A2.2.1. Charts and photographs.
- A2.2.2. Ground maneuver plan, including alternatives.
 - A2.2.2.1. Infil and exfil locations.
 - A2.2.2.2. Planned routes.
 - A2.2.2.3. Blocking positions.
- A2.2.3. Communication plan (see A2.1.8).
- A2.2.4. Priority of fires information.
- A2.2.5. Ground commander's intent for close fire support (e.g., minimum engagement ranges).
- A2.2.6. Identify probable targets and assign codewords to the same.
- A2.2.7. Friendly marking methods.
- A2.2.8. Maximum ordnance altitude (Max Ord) of mortars or artillery support.

A2.3. DISSIMILAR AIRCRAFT INFORMATION.

- A2.3.1. Communication plan (see A2.1.8).
- A2.3.2. Rendezvous point, time, and altitude.
- A2.3.3. Formation procedures.
- A2.3.4. Threat ROEs and deconfliction procedures.
- A2.3.5. Preplanned SEAD procedures.
- A2.3.6. Employment area deconfliction procedures.
- A2.3.7. Target marking/designating procedures, including backups.
- A2.3.8. Fire support procedures for dissimilar aircraft.
- A2.3.9. Planned deviations from J-FIRE terminology, when required.
- A2.3.10. Emergency procedures.

Attachment 3
AC-130U BRIEFING GUIDELINES

A3.1. MISSION PLANNING BRIEFINGS. The mission planning portion of the crew, as a minimum, needs this briefing to plan the mission. Specialists normally brief items A3.1.1 through A3.1.3. The squadron planning staff will normally brief the operational information. This guide assumes that crewmembers are fully aware of the theater standard operating procedures (SOPs), air tasking order/message (ATO/ATM), Special Instructions (SPINS), rules of engagement (ROEs), and order of battle. For training missions, the navigator usually briefs non-standard operations items.

A3.1.1. Weather, including illumination, end evening nautical twilight (EENT), and beginning morning nautical twilight (BMNT).

A3.1.2. Communications/Communications Electronics Operating Instructions (CEOI).

A3.1.3. Intelligence updates.

A3.1.4. Basic operations.

A3.1.4.1. Aircraft fuel, munitions, parking, call signs, etc.

A3.1.4.2. Supporting air operations, e.g. tanker information, combat air patrol (CAP), etc.

A3.1.4.3. Ground operations, e.g. maneuver plan, commander's intent, etc.

A3.1.4.4. Mission tasking.

A3.2. MISSION BRIEFING. The aircraft commander will ensure the entire crew is briefed on the following.

A3.2.1. Basic operations.

A3.2.2. Mission chronology. The aircraft commander should ensure information on each target area is briefed in chronological order.

A3.2.2.1. The navigator normally briefs en route portions.

A3.2.2.2. The EWO should brief threats for each area.

A3.2.2.3. The FCO should brief his plan for identifying specific targets and navigation in the target area.

A3.2.2.4. The pilot should brief specific employment tactics including altitude, time on station, munitions, etc.

A3.2.2.5. The pilot should also brief crew coordination issues to include TSM/DGU utilization, defensive systems status, Direct Support Officer inputs, and LIA usage. This is not all-inclusive and may be expanded situationally.

Attachment 4**GUNSHIP COMPATIBLE BEACONS**

<u>Gunship Sensor</u>	<u>Compatible Beacon</u>	<u>Remarks</u>
APQ-180	SST-201X Miniponder	Can be used in single pulse reply, or any of 9 selectable double-coded replies
	SST-181X or AN/UPN-25	Same as SST-201X
	PPN-19	Must be set to I-band mode with either code B or G selected.

Attachment 5

J-FIRE NINE LINE CAS BRIEF

CAS BRIEFING FORMAT (9-LINE)	
(Omit data not required, do not transmit line numbers. Units of measure are standard unless otherwise specified. * denotes minimum essential in limited communications environment. Bold denotes readback items when requested)	
Terminal controller: “ _____ ”, this is _____	(terminal controller)
(aircraft callsign)	
*1. IP/BP: “ _____ ”	
*2. Heading: “ _____ ” (magnetic)	
(IP/BP to target)	
Offset: “ _____ ” (left/right)	
*3. Distance: “ _____ ”	
(IP-to-target in nautical miles/BP-to-target in meters)	
*4. Target elevation: “ _____ ” (in feet/MSL)	
*5. Target description: “ _____ ”	
*6. Target location: “ _____ ” (latitude/longitude or grid coordinates or offsets or visual)	
*7. Type mark: “ _____ ” Code: “ _____ ”	(actual code)
(WP, laser, IR, beacon)	
*8. Location of friendlies: “ _____ ”	
Position marked by: “ _____ ”	
9. Egress: “ _____ ”	
Remarks (As appropriate): “ _____ ”	
(threats, restrictions, danger close, attack clearance, SEAD, abort codes, hazards)	
“Time on target (TOT):” _____ OR Time to target (TTT): “Stand by _____ plus _____, Hack.”	
Note: When identifying position coordinates for joint operations, include the map datum data. Desert Storm operations have shown that simple conversion to latitude/longitude is not sufficient. The location may be referenced on several different databases, for example, land-based versus sea-based data.	

Attachment 6**AC-130U CALL FOR FIRE**

1. Observer/Warning Order: “ _____, this is _____, Fire Mission Over.”
(AC-130U) (Observer)
2. Friendly Location/Mark: “My position _____ marked by _____.”
(TRP, Grid, etc.) (Beacon, IR Strobe, etc.)
3. Target Location/Mark: “ _____ ”
(Bearing (magnetic) & Range (meters), TRP, Grid etc.)
4. Target Description/Mark: “ _____, marked by _____, Over.”
(Target Description) (IR Pointer, Tracer, etc.)
5. Remarks: “ _____.”
(Threats, danger close clearance, restrictions, “at my command”, etc.)

AS REQUIRED

1. Clearance: transmission of the Fire Mission is clearance to fire. Danger Close is 200 meters with the 105mm and 125 meters with the 40mm, 25mm, and the 20MM. Ground commanders/FSOs pass their initials or state “**Cleared Danger Close**” to accept the risk inherent in ordnance delivery inside danger close distance. This clearance may be preplanned.
2. At my command: add “**At My Command**” on line five. The gunship will call “**ready to fire**” when ready.
3. Adjust Fire: Only adjust fir marking rounds or incorrect target. Adjust from impact by giving range (meters) and cardinal (North, South, East, West) direction.

DON'Ts

1. Do not ask the gunship to identify colors.
2. Do not reference clock positions.
3. Do not pass run-in headings/no-fire headings.
4. Do not correct left/right or long/short.