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*Flying Operations*

**F-117 OPERATIONS PROCEDURES**



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This volume implements AFPD 11-2, *Aircraft Rules and Procedures*; AFPD 11-4, *Aviation Service*; and AFI 11-202V3, *General Flight Rules*. It applies to all F-117A units. It does not apply to the Air Force Reserve Command or Air National Guard units. MAJCOMs are to forward proposed MAJCOM-level supplements to this volume to HQ AFFSA/XOF, through HQ ACC/DOTO, for approval prior to publication IAW AFPD 11-2, paragraph 4.2. Copies of MAJCOM-level supplements, after approved and published, will be provided by the issuing MAJCOM to HQ AFFSA/XOF, HQ ACC/DOTO, and the user MAJCOM offices of primary responsibility. Field units below MAJCOM level will forward copies of their supplements to this publication to their parent MAJCOM office of primary responsibility for post publication review. Keep supplements current by complying with AFI 33-360V1 (annual review). See paragraph 1.5. of this volume for guidance on submitting comments and suggesting improvements to this publication. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW AFPD 37-1, *Information Management* and AFMAN 37-123, *Management of Records* and disposed of IAW the Air Force *Records Disposition Schedule (RDS)* located at <https://webrims.amc.af.mil>

The Paperwork Reduction Act of 1974 as amended in 1996 affects this instruction. Also, the Air Force Forms Management Program IAW AFI 33-360V2, *Content Management Program-Information Management Tool (CMP-IMT)*, affects this instruction.

**SUMMARY OF REVISIONS**

This publication contains significant revision and rescinds multiple FCIFs. This revision defines low altitude minimum altitudes and terminology while providing mission planning directives for low altitude airspace (para 2.2.4.). Directions for mission planning CHUM requirements (2.3.3.) and IMC low altitude route abort procedures are also added (3.11.4.7.2.). Section 3.13. adds significant guidance concerning the use of NVGs and paragraph 5.4. clarifies off-range simulated weapons employment procedures. The required takeoff interval for aircraft carrying *inert* heavyweight ordnance is changed in paragraph 3.5.6.

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## Chapter 1

### INTRODUCTION

**1.1. General.** This volume outlines those procedures applicable to the operation of the F-117A aircraft. With the complimentary references cited, this volume prescribes standard operational procedures to be used by all ACC F-117A pilots.

**1.2. Pilot's Responsibility.** This volume, in conjunction with other governing directives, prescribes procedures for F-117A aircraft under most circumstances, but is not to be used as a substitute for sound judgment or common sense. Operations or procedures not specifically addressed may be accomplished if they enhance safe, effective mission accomplishment.

**1.3. Deviations.** Deviations from these procedures require specific approval of the MAJCOM/DO unless an urgent requirement or an aircraft emergency dictates otherwise, in which case the pilot in command will take the appropriate action to safely recover the aircraft. Det 1, 53 TEG, may deviate from the contents of this volume as outlined in individually approved test plans required for Follow On Test and Evaluation (FOT&E) purposes.

**1.4. References.** This volume, in conjunction with T.O. 1F-117A-1, *Flight Manual*; AFTTP 3-1V18 (S), *Tactical Employment F-117A (U)*; and AFI 11-214, *Aircrew and Weapons Director Procedures for Air Operations*; are the primary references for F-117A operating procedures. Training units may develop phase manuals from the procedures contained in these documents. Phase manuals may be used to augment initial and mission qualification training at operational units. Phase manuals may expand these basic procedures; in no case will they be less restrictive.

#### 1.5. Waivers Requests:

1.5.1. Will be forwarded through NAF to MAJCOM/DO for approval.

1.5.2. Will remain in effect until incorporated into this volume unless otherwise stated in the approval correspondence.

1.5.3. Changes to this volume will be submitted on AF Form 847, **Recommendation for Change of Publication (Flight Publications)**, to NAF who will in-turn forward to HQ ACC/DOTO (57 WG will forward directly to ACC).

**1.6. Distribution.** Each pilot is authorized a copy of this volume.

## Chapter 2

### MISSION PLANNING

**2.1. Responsibilities.** The responsibility for mission planning is shared jointly by individual pilots, the mission planning cell (MPC), and the intelligence function of F-117A units.

#### **2.2. Mission Planning:**

2.2.1. Plan flights sufficiently to ensure safe mission accomplishment, to include fuel requirements, map preparation, and takeoff and landing data.

2.2.2. When operating from airfields equipped with a BAK-12 cable raised by a BAK-14 device, the departure end cable will be raised for all takeoffs and landings unless another arrestment system (cable/barrier) is immediately available.

2.2.3. The minimum available runway for takeoffs and landings is 8,000 feet. A compatible departure end arresting system is required for runway lengths up to 12,000 feet. If a compatible departure end arresting system is not available, the maximum abort speed using the drag chute (MA/C) must be greater than the takeoff speed (TOS). These criteria may be waived by the OG/CC.

2.2.4. **Minimum Altitudes.** Minimum altitude for peacetime mission planning will be IAW AFI 11-202V3, *General Flight Rules* and AFI 11-214, *Air Operations Rules and Procedures*.

2.2.4.1. For the purposes of this instruction, the following definitions and procedures apply:

2.2.4.1.1. Minimum Safe Altitude (MSA) – (JCS, NATO in FLIP GP) “The altitude below which it is hazardous to fly, owing to the presence of higher ground or other obstacles.” This altitude will be based on 1000 feet above the highest terrain (or obstacle whichever is higher) or 2000 feet in mountainous areas within the boundaries of the restricted areas, MOAs, Warning areas or Alert areas of intended flight. MSA will be computed for all sorties when planned flight will transit the areas mentioned above.

2.2.4.1.2. Minimum Enroute Altitude (MEA) – The lowest published altitude between radio fixes that assures acceptable navigational signal coverage and meets obstacle clearance requirements between those fixes. MEA will abide by the restrictions in AFI 11-202V3 and AFI 11-214. MEAs will be computed between each point (rounded up to the next 100 feet) for all sorties except departure and arrival points served by a published instrument procedure (SID, IAP). When planning within special use airspace, use no less than 2.5 NM either side of course to determine MEA.

2.2.4.1.3. Route Abort Altitude (RAA) – Normally used for Military Training Routes (MTRs), it is the highest altitude along the entire intended route of flight that will guarantee 1000 feet obstruction clearance (2000 feet in mountainous areas). RAA will take into account the entire corridor of the MTR and not just intended course.

2.2.4.2. When planning within special use airspace, use 1000 feet or the minimum altitude published for the airspace whichever is higher within 2.5 NM either side of course.

2.2.4.3. Mission leads will not plan routes any lower than the MEA. In flight, pilots will not descend below the MEA unless in VMC or in positive radar contact (at or above minimum vectoring altitude).

### 2.3. Map/Chart Preparation will Include:

2.3.1. **Local Area Maps.** A local area map is not required if the local in-flight guide includes jettison area, divert information, controlled bailout areas, and provides sufficient detail of the local area to remain within assigned training areas.

2.3.2. **Charts.** FLIP en route charts may be used instead of maps on navigational flights within areas that are adequately covered by these charts.

2.3.3. **Navigation Route Maps.** For overland tactical training flights, a current chart of sufficient scale and AF Form 70, Pilot Flight Plan and Flight Log, providing navigation and terrain/obstacle avoidance information will be carried. Sufficient navigational information will be included to ensure successful mission accomplishment. Maps will be updated from the Chart Update Manual (CHUM), obstacles/terrain highlighted as appropriate for safe flight and used to determine MEA, MSA and/or RAA as required. When flying MTR's, a route abort altitude and MEA between points will be annotated on all maps.

### 2.4. Briefing/Debriefing:

2.4.1. Responsibilities for flight lead, mission leads, and/or mission planners are to present a logical briefing, which will ensure safe, effective mission accomplishment. Briefing guides will be used to provide a reference list of items, which may apply to particular missions. Items listed may be briefed in any sequence. Specific items not pertinent to the mission need not be covered.

2.4.2. Briefings will begin at least 1 ½ hours before scheduled takeoff.

2.4.3. Structure to accommodate the capabilities of each pilot in the flight.

2.4.4. When dissimilar aircraft are flown in formation, proper position (to ensure adequate wingtip clearance), responsibilities, and aircraft-unique requirements will be briefed for each phase of flight.

2.4.5. Include alternate missions.

2.4.6. If all flight members attend an initial or mass briefing flight briefings need only cover those items that pertain to their particular flight.

2.4.7. Guides are in [Attachment 2](#) through [Attachment 10](#) Units may supplement these guides as necessary. Units that fly missions not covered by this volume, or its supplements, will develop and maintain briefing guides for those missions. OT&E weapons delivery and mission profiles are approved by the USAFWTC/CC and are reviewed during the specific test Safety Review Board.

### 2.5. Unit Developed Checklists/Local Pilot Aids:

2.5.1. Unit developed checklists may be used in lieu of flight manual checklists provided they are verbatim and in the order listed in the applicable checklist.

2.5.2. Local pilot aids will be developed. As a minimum, include the following:

2.5.2.1. Briefing guides.

2.5.2.2. Local UHF channelization, and airfield diagrams.

2.5.2.3. Impoundment procedures, emergency action checklists, and NORDO/divert information.

2.5.2.4. Other information as deemed necessary by individual units. For example, stereo flight plans, quick turnaround procedures, local training areas, bailout and jettison areas, and instrument preflight.

**2.6. Personal Equipment.** Pilots will have the following on all flights:

2.6.1. Flashlight (night flights).

2.6.2. Life preserver (flights over water beyond gliding distance from land).

2.6.3. F-117A-1 CL, -6 CL, and -34 CL (as necessary), Inflight Guide (basic and annex), IFR supplement, appropriate Hi-chart, and applicable approach plates.

2.6.4. G-suit.

2.6.5. Survival Vest. Survival vests will be worn on all flights unless units determine that all required equipment is available in the seat survival kit. This requirement may be waived by the OG/CC.

## Chapter 3

### NORMAL OPERATING PROCEDURES

**3.1. Ground Visual Signals.** Normally, the pilot and ground crew will communicate via the intercom system during all engine-start, pre-taxi checks, and end-of-runway (EOR) checks. The intercom system will also be used to the maximum extent possible anytime maintenance technicians are performing "red-ball maintenance" on the aircraft. When ground intercom is not used, visual signals will be in accordance with AFI 11-218, *Aircraft Operation and Movement on the Ground*, and this volume. The crew chief will repeat the given signal when it is safe to operate the system. The following signals augment AFI 11-218:

3.1.1. **Flight Control Checks.** With clenched fist, make several circular movements as if moving the control stick around the cockpit.

3.1.2. **Refueling Receptacle Open or Closed.** Display hand flat on top of helmet with fingers extended. To open, raise fingers to the vertical position and heel of hand remaining stationary. To close, reverse signal.

3.1.3. **Main Gear and Nose Gear Safety Pins and Tail Hook Pin Removed.** Point four fingers at the crew chief.

3.1.4. **Weapons Bay Open or Close.** Display hands with fingers extended, palms up, and edges of hands touching. Move hands apart several times.

3.1.5. **Trapeze Up or Down.** With the edge of one hand, make a "karate chop" into the open palm of the other hand.

3.1.6. **Antennas.** With a quick movement, extend fingers from a clenched fist several times.

### 3.2. Preflight:

3.2.1. Pilots must physically inspect the drag chute cable to ensure the metal pin has been removed from the drag chute. If the pin has been previously removed, it will be documented in the AFTO IMT 781, **ARMS Aircrew/Mission Flight Data Document**. In addition, pilots will ensure removal of ground protection equipment such as blow-in door covers and magnetic retaining devices.

3.2.2. In addition to equipment required by AFI 11-202V3, as supplemented, the following must be operational for local area flying:

3.2.2.1. Both MDIs

3.2.2.2. TACAN

3.2.2.3. Standby Flight Instruments

3.2.2.4. IFF

3.2.2.5. ILS (if landing after civil twilight)

### 3.3. Taxi:

3.3.1. **Minimum Taxi Interval.** For day operations is 150 feet staggered or 300 feet in trail. Minimum taxi interval for night operations is 300 feet on centerline. Spacing may be reduced when holding short of or entering the runway/quick check area.

3.3.2. **Quick Check and Arming.** Place hands in view of ground personnel while the quick check inspection and arming/dearming is in progress.

3.3.3. **Ice/Snow Conditions.** Do not taxi with ice or snow present until all portions of the taxi route and runway have been checked for safe conditions. If ice or snow are present, taxi on the centerline with a minimum of 300 foot spacing. Aircraft will not be taxied when any portion of the taxiway has a reported RCR less than 10 or runway surface condition is worse than wet.

**3.4. Runway Line Up.** For two-ship elements, the second aircraft should be placed on the upwind side. Each pilot will lineup in the center of his half of the runway. Three ship flights may line up in echelon with the wingmen upwind. Spacing between aircraft elements will be a minimum of 500 feet. All aircraft will maintain wingtip clearance if runway width permits. If wingtip clearance cannot be maintained, aircraft will not conduct engine run-up until the preceding aircraft has begun the departure roll.

### 3.5. Takeoff:

3.5.1. Takeoff data will be reviewed and understood by all pilots prior to takeoff. Particular attention should be given to Single Engine Climb capability and maximum abort speeds.

3.5.2. Formation takeoffs are prohibited.

3.5.3. Do not takeoff if the RCR is reported less than 12.

3.5.4. The maximum wing fuel imbalance for takeoff is 1000 pounds. Pilots will not attempt to balance wing fuel on the ground with the fuel source selector as this may force fuel overboard.

3.5.5. Computed takeoff roll will not exceed 70% of the available runway. OG/CC or equivalent detachment commander may waive this requirement for contingency operations.

3.5.6. Interval between aircraft will be a minimum of 15 seconds for day and 20 seconds for night. If carrying live heavyweights, increase takeoff interval to 30 seconds.

3.5.7. At the start of the takeoff roll, steer toward the center of the departure end of the runway.

3.5.8. Day weather criteria for a VFR join-up underneath a ceiling is 1500/3.

3.5.9. For night takeoffs, the first turn should not be initiated until 1000 feet AGL and 250 KCAS. If local departures require earlier turns for airspace restrictions, the minimum parameters for the first turn will be 400 feet AGL and Single Engine Climb Speed, 450 feet per minute (fpm) rate of climb.

3.5.10. Maximum airspeed below 10,000 feet MSL outside of special use or restricted airspace is 300 KCAS unless waived by ACC DO or FAA for airshow requirements.

### 3.6. Formation:

#### 3.6.1. General:

3.6.1.1. Formations will be supervised by a certified flight lead. The maximum number of aircraft in station-keeping or trail formation at night or in forecasted/actual IMC is three. Maximum flight size during day/VMC is four.

3.6.1.2. Chase is not authorized at night unless an emergency situation exists and the SOF has coordinated for the chase.

3.6.1.3. Turning rejoins will be conducted at 300 KCAS and 30 degrees of bank, straight ahead rejoins will be at 300 KCAS, unless otherwise briefed. Element rejoins will be flown with the wingman in route formation.

3.6.1.4. Flight leaders will not normally break up formations until each pilot has sufficient positional awareness from which to navigate.

3.6.1.5. Lead changes will meet the following conditions:

3.6.1.5.1. Initiated from a stabilized, wings level attitude.

3.6.1.5.2. Minimum altitude is 1,000 AGL (day) and 2,000 AGL or radar downwind altitude (night).

3.6.1.5.3. During the day, wingmen will be no further aft than normal fingertip or route position.

3.6.1.5.4. The wingman assuming the lead must be in a position from which the lead change can be safely initiated and visual contact maintained.

3.6.1.5.5. The wingmen will acknowledge by head nod or radio.

3.6.1.5.6. The lead change is effective upon acknowledgment. The former leader (new wingman) then moves to the wing (briefed) position.

3.6.1.5.7. At night, lead changes will be initiated over the radio. Lead changes will be initiated from station keeping or trail formation only, unless equipped with night vision equipment. If night vision equipment is used, initiate from the pre-briefed formation.

3.6.1.6. **NVG Formations.** Formations flown with NVGs are in accordance with AFTTP 3-3 series manuals, or those introduced in ACC-approved training programs.

### 3.6.2. **Close Formation:**

3.6.2.1. **Fingertip.** Wingmen will maintain wingtip clearance. Fingertip is a position that aligns the tip of the lead aircraft's wing with the midpoint of the engine exhaust (fore and aft) and aligns the aft tips of the vertical stabilizers (in and out). The wingman will stack just low enough to see the wingtip position light on the underside of the wing.

3.6.2.2. **Echelon.** Turns into the echelon will be avoided if at all possible. If a turn is made into the echelon, each aircraft will maintain the same relative position as in straight and level flight. On turns away from the echelon, the fuselages of all aircraft will be maintained in the same horizontal plane.

3.6.2.3. **Crossunder.** Wingmen will reduce power and drift aft and low of the lead aircraft to ensure nose-tail and vertical separation, cross to the opposite side, and move back to the original position.

3.6.3. **Route Formation.** Route formation is an extension of fingertip formation with up to approximately 500 feet between aircraft. This position allows the wingman to check cockpit instruments, provide visual lookout, and still be close enough to move into close formation if weather or other circumstances dictate. During turns, the element or aircraft turned into will stack low only as necessary to keep lead in sight and remain below his plane of maneuvering. Crossunders may be directed using a wing dip, as in close formation.

3.6.4. **Station Keeping/Trail Formation.** Station keeping is normally used during night/VMC conditions. Trail formation is normally used during night/IMC conditions. If necessary, obtain an ARTCC-assigned altitude block when operating in controlled airspace. Units will define parameters for station keeping/trail formations in Chapter 7 to this instruction, phase manual or AFTTP 3-1 or 3-3 series publications. IRADS will not be used to achieve or maintain formation position, but may be used for situational awareness.

3.6.4.1. **Night Aircraft Lighting.** The lead will have an operational lower rotating anti-collision light to facilitate rejoins or to support trail formations. Exceptions to this guidance include reduced lighting training IAW paragraph 3.23., Night Vision Goggle operations IAW paragraph 3.13., and reduced or blacked-out lighting operations in approved MOAs or restricted areas IAW AFI 11-202 Vol 3 and paragraph 3.13.9.1. and 3.13.9.2. in this instruction. Refer to AFI 11-202 Vol 3, General Flight Rules, as supplemented for further guidance on aircraft lighting restrictions.

3.6.5. **Tactical Formation.** See phase manual or AFTTP 3-3 Vol 18.

3.6.6. **IP/SEFE Chase:**

3.6.6.1. Chase formation from a T-38 aircraft will only be accomplished by:

3.6.6.1.1. Instructor pilots (T-38 IP or F-117A IP) and/or SEFEs certified IAW T-38 Pilot Qualification Course and Continuation Training (CT) Program.

3.6.6.1.2. Det-1, 53 TEG FOT&E pilots.

3.6.6.1.3. 417 WPS chase qualified pilots.

3.6.6.2. On transition sorties, the T-38 chase aircraft will descend no lower than 50 feet AGL when performing a chase pick-up.

3.6.6.3. In-flight, the chase aircraft will maneuver as necessary for mission accomplishment, but will normally not stack below the lead aircraft on minimum altitude profiles.

3.6.6.4. In the traffic pattern, the chase aircraft may maneuver as necessary to observe performance.

3.6.6.5. F-117A aircraft will not chase F-117A in the VFR overhead pattern or perform chase pick-up patterns, unless waived by the unit commander (OG/CC) or for emergencies.

3.6.6.6. Lead aircraft will verbally/visually signal wingmen to assume a fingertip position, if necessary. An IP chase may request fingertip from the lead aircraft. This will be briefed in the pre-flight briefing.

3.6.6.7. Chase operations are not authorized at night.

3.7. **Maneuvering Parameters:**

3.7.1. In addition to T.O. F-117A-1 restrictions, which define the limits of the basic airframe (LBA), and weapons release envelopes, include the following limitations during advanced handling sorties:

3.7.1.1. No wing fuel, less than 300-lbs. left/right fuel imbalance.

3.7.1.2. +/- 25 degree of pitch maximum.

3.7.1.3. 9.5 degrees AOA maximum.

3.7.1.4. 5 Gs maximum.

3.7.1.5. Day VFR only.

3.7.1.6. Over-the-top maneuvers are prohibited--to include Loop, split-S, and Immelmann turns.

3.7.2. Peacetime night training is restricted to positive Gs only, 60 degrees of bank, and +/- 20 degrees of pitch to reduce the risks of spatial disorientation. Do not perform negative-G pushovers except for actual unusual attitude recoveries.

3.7.3. PAARS practice recoveries are limited to day VMC conditions.

3.7.4. The modified lazy-8 maneuver, chandelle, and aileron roll will be IAW approved phase manuals, AFTTP 3-1 or 3-3 series documents.

### 3.8. Ops Checks:

3.8.1. Accomplish sufficient ops check to ensure safe mission accomplishment. Pilots should monitor the fuel system at regular intervals throughout the flight to identify potential low fuel, trapped fuel or fuel imbalance situations as early as possible. Frequency will be increased during tactical maneuvering at high power settings. Ops checks are required:

3.8.1.1. During climb or at level-off after takeoff.

3.8.1.2. Prior to entering an air-to-surface range, once while on the range if multiple passes are made, and after departing the range.

3.8.1.3. At frequent intervals throughout the flight.

3.8.2. For chased flights or formation flights, the flight leader will initiate by radio call or visual signal. Response is required.

### 3.9. Radio Procedures:

3.9.1. Preface all radio communications with the complete callsign of the flight/aircraft. Transmit only essential information necessary for mission accomplishment or for safety of flight issues.

3.9.2. Radio checks that do not require the transmission of specific data will be acknowledged by individual flight members in turn. Acknowledgment by the individual flight member indicates the appropriate check will be initiated or is in the process of being completed.

3.9.3. The flight/mission lead initiates frequency changes and will check flight members in on the new frequency.

3.9.4. In addition to the standard radio procedures outlined in AFI 11-202V3, specific mission guides and FLIP publications, all flight members will acknowledge understanding of the initial ATC clearance.

**3.10. Airborne Comm Jamming Procedures.** Follow procedures in AFI 11-214, *Air Operations Rules and Procedures*. Comm jamming will be conducted only when briefed, on tactical frequencies, and in tactical training areas.

### 3.11. Tactical Navigation Procedures:

3.11.1. Reference phase manuals, AFTTP 3-3 Vol 18.

3.11.2. During briefings, emphasis will be placed on tactical navigation flight maneuvering and observation of terrain feature/obstacles along the route of flight. For air-to-surface tactics over water, include specific considerations for over water operations with emphasis on minimum altitudes.

3.11.3. Pilots will primarily reference the INS/GPS. If the INS and GPS are degraded, the flight may continue using a combination of dead reckoning (DR) and TACAN information as long as flight safety is not compromised. If on-board avionics are degraded to such a degree that accurate navigation becomes questionable, the route will be aborted and the pilot will proceed to base/instrument pattern.

#### 3.11.4. **Low Level Flight:**

3.11.4.1. Minimum altitude for low level flight is 1,000 AGL or as approved in FOT&E test plans for 53 TEG pilots. Minimum altitude for night training sorties is the MSA unless equipped with NVGs. The unit commander will certify a pilot's minimum altitude for tactical navigation.

3.11.4.2. F-117As may fly single ship low altitude tactical navigation commensurate with mission requirements and IAW AFI 11-214. Night low altitude tactical navigation requires the altitude autopilot be engaged and coupled.

3.11.4.3. During briefings, emphasis will be placed on low altitude flight maneuvering and observation of terrain/obstacles along the route of flight. For low altitude training over water or feature-less terrain, include emphasis on minimum altitudes and spatial disorientation.

3.11.4.4. If unable to visually acquire an obstacle which is a factor to the aircraft/flight, climb not later than 3 NM prior to the obstacle to an altitude which will ensure clearance.

3.11.4.5. During all low altitude operations, the immediate reaction to task saturation, diverted attention, "Knock-it-off", or emergencies will be to climb to a pre-briefed safe altitude (minimum of RAA or MSA as appropriate).

3.11.4.6. Weather minimums for visual low level training will be 3000 feet ceiling and 5 miles visibility or as specified by FLIP, unit regulations, or national rules, whichever is higher.

#### 3.11.4.7. **Abort procedures :**

3.11.4.7.1. VMC: Maintain VMC and safe separation from terrain/obstacles, comply with VFR altitude restrictions, squawk appropriate IFF/SIF codes, and contact the appropriate controlling agency.

3.11.4.7.2. IMC: Immediately climb to RAA or above and maintain preplanned ground track. If deviating from the preplanned ground track and/or outside the vertical and/or lateral limits of the route corridor, squawk emergency. Contact the appropriate controlling agency. If required to fly in IMC without an IFR clearance, fly the appropriate VFR hemispheric altitude until an IFR clearance is received.

3.11.5. Minimum safe speed for tactical navigation/maneuvering and entering/departing the low altitude environment is 300 KCAS/360 KGS, whichever is higher. Minimum safe speed while low altitude is 350 KCAS.

### 3.12. **Air Refueling:**

3.12.1. Initial or recurrency training in air refueling will not refuel with a student boom operator.

3.12.2. Avoid air refueling in turbulent air mass whenever possible.

3.12.3. Minimum in-flight visibility for tanker rejoins is 1 NM.

### 3.13. Night Vision Goggle (NVG) Procedures:

3.13.1. **Guidance.** USAF/MAJCOM guidance (including AFI 11-202V3, AFI 11-214, AFMAN 11-217V1, and AFI 48-123) and this instruction outline NVG procedures. AFTTP 3-1 and 3-3 series manuals incorporate expanded tactical guidance.

3.13.1.1. NVGs will only be worn in flight by NVG qualified pilots, upgrading pilots who have been briefed by a qualified NVG IP.

3.13.1.2. Fly with NVGs only in aircraft with the approved Night Vision Imaging System (NVIS) filters installed. Unit changes to authorized NVIS lighting configuration, temporary or permanent, must be approved by MAJCOM.

3.13.1.3. Pilots must ensure all primary performance instruments (with the exception of the turn and slip indicator) are visible through the appropriate filter material. Ensure primary instruments are sufficiently illuminated to allow for immediate transition to instruments if outside visual references are lost. Ensure secondary flight instruments are readily available and adequately lit through the use of the lights cutout (pinky) switch.

3.13.1.4. Don/doff NVGs at least 2,000 feet AGL or MSA, whichever is higher. This must be done in straight and level or climbing flight with the autopilot fully coupled, and no closer than station keeping formation.

3.13.2. **Preflight.** NVGs must be preflight tested and adjusted/focused for the individual pilot using (in order of preference) the Hoffman ANV-20/20 Tester, a unit eye lane or equivalent tester prior to NVG operations. See AFI 11-301, *Aircrew Life Support Program*, for specific procedures.

3.13.2.1. Each filter kit is a controlled item. Squadron life support is responsible for maintaining NVG filter kits. Units will develop procedures for inventory, issue and return of each filter kit.

3.13.2.2. NVG filters will be properly installed in the aircraft prior to taxi. Filters will be removed before leaving the aircraft. Units will develop procedures to account for all filters at the aircraft.

3.13.3. **Ground Operations.** NVGs may be donned and adjusted while stationary on the ground in the hangar or while at EOR, but must be properly stowed prior to takeoff. NVGs will not be used to taxi the aircraft.

3.13.4. **Takeoffs/Landings.** Do not wear or use NVGs during takeoff or landing. Don/doff NVGs IAW para. [3.13.1.4.](#) above. Additionally, remove and stow NVGs prior to the Final Approach Fix (FAF).

### 3.13.5. Illumination Levels:

3.13.5.1. High Illumination (HI) and Low Illumination (LI) are defined in AFI 11-214.

3.13.5.2. Cease NVG operations anytime environmental conditions degrade NVG performance such that briefed formation positions can not be flown.

3.13.5.3. Weather or other conditions may cause actual illumination levels to be higher or lower than expected. In flight, pilots must estimate whether actual in-flight illumination levels are high or low, and determine if the existing conditions provide sufficient NVG performance to accomplish the planned mission and/or events.

3.13.6. **NVG Weather Minimums.** Night weather minimum criteria while using NVGs are IAW AFI 11-202V3 and AFI 11-214.

3.13.7. **Tanker Rejoins.** NVGs may be worn for night tanker operations, but will be in the raised or stowed position no later than precontact. Goggles may be returned to the "on" position post-AAR, when the aircraft is in the observation position or clear of the tanker (if departing).

3.13.8. **Formation.** Only NVG formations introduced in ACC-approved NVG upgrade programs will be flown.

3.13.8.1. For peacetime training, all flight members will make a radio call when going "NVGs on" (NVGs are mounted, in the down position and in use) or "NVGs raised/stowed" (NVGs are on the helmet and in the raised and locked position/NVGs are off the helmet and secured in the cockpit).

3.13.8.2. When flying in station keeping or trail, only one flight member will don/doff goggles at a time. Flight leads will call turns if forced to maneuver while flight members are donning/doffing NVGs.

3.13.9. **Weapons Delivery:**

3.13.9.1. On Class A ranges, with the concurrence of the range control officer (RCO), pilots are allowed to choose external aircraft lighting settings that maximize training, minimize interference with NVGs, and still allow the RCO to safely monitor the aircraft. Depending on the lighting conditions and RCO equipment, this could involve normal, reduced, covert, or blacked-out lighting IAW AFI 11-214 (i.e., RCO with NVGs and sufficient aircraft lighting to allow safe control).

3.13.9.2. Pilots may conduct normal, reduced, or blacked-out lighting weapons deliveries IAW AFI 11-214 and AFI 11-202V3 on ranges which do not require RCO control IAW published range instructions. .

3.13.10. **In-flight Emergencies with NVGs.** NVGs will be removed and stowed during any emergency if they become a hindrance to accomplishing emergency procedures or if the pilot anticipates an ejection situation.

3.13.11. **Aircraft Modifications:**

3.13.11.1. NVG training will be conducted in fully modified aircraft whenever possible. The following components must be either NVIS modified or covered with ACC-approved NVG compatible filter covers: ADI and HSI (CMDIs), SD, Master Caution light, SD status light, overhead map lights, Roll and Pitch Autopilot Uncoupled lights, and DEP. RCS monitor light switch (peacetime), CMDI and DEP bezel lighting should be placed to OFF to prevent interference with the NVGs. All other lights must be available through actuation of the cockpit lights cutout (pinky) switch. Map lights may also be used to illuminate performance and control instruments.

3.13.12. **Abnormal Procedures:**

3.13.12.1. **Lost Sight.** Immediately ensure deconfliction to include separate altitudes if needed. Apply lost wingman procedures if required. Consider highlighting position by increasing exterior lighting level.

3.13.12.2. **NVG Failure.** Ensure spatial orientation and separation from other aircraft and the ground before attempting to remedy the NVG failure.

- 3.13.12.2.1. Simultaneously transition to instruments and illuminate cockpit light with the lights cutout (pinky) switch.
- 3.13.12.2.2. Perform lost wingman procedures if appropriate.
- 3.13.12.2.3. Climb above MSA / Route abort altitude if appropriate.
- 3.13.12.2.4. Terminate/Knock-It-Off (KIO) as applicable.
- 3.13.12.2.5. If needed, direct other aircraft in the vicinity to increase their external lights to non-NVG visible levels.
- 3.13.12.2.6. Attempt to regain NVG operation by switching to the opposite battery or changing the battery. If these steps do not solve the problem, stow NVGs and proceed with the non-NVG plan.

3.13.12.3. **Unusual Attitudes.** Simultaneously perform the three steps of the unusual attitude recovery procedure - Recognize, Confirm, Recover – while activating the lights cutout (pinky) switch to illuminate secondary flight instruments. Failure to activate this switch and confirm aircraft attitude on the secondary flight instruments may place the aircraft in an unrecoverable attitude without the pilot's knowledge. See paragraph 6.9. for further spatial disorientation considerations.

**3.14. Fuel Requirements.** The following are definitions and required quantities for F-117A operations:

- 3.14.1. Joker fuel is the fuel state above Bingo at which separation/bugout/event termination should begin.
- 3.14.2. Bingo is the fuel required for recovery from a training area/route to the base of intended landing. Bingo fuel is based on pre-briefed flight parameters, takes into account normal recovery procedures, and allows the aircraft to arrive on initial or the IAF with the appropriate recovery fuel. Bingo fuels should be planned at higher airspeeds and fuel flows in hostile airspace and maximum range in friendly airspace. Bingo fuel is a mandatory briefing item for all missions other than SAT sorties.
- 3.14.3. **Continuation Fuel.** A predetermined fuel state that will allow completion of the planned route and arrive on initial or at the IAF with the appropriate recovery fuel. Continuation fuel is a mandatory briefing item for all SAT sorties.
- 3.14.4. **Critical Fuel.** A predetermined fuel that is required to return to base by the most direct routing at maximum range airspeeds and altitudes. It will be determined from the point furthest from the base of intended landing. This fuel allows for landing with recovery fuels listed below. Critical fuel is a mandatory briefing item for all SAT mission.
- 3.14.5. **Normal VFR Recovery Fuel.** Normal VFR Recovery Fuel includes the following:
  - 3.14.5.1. During single-runway operations, pilots will arrive at initial or at the IAF for a full stop at the base of intended landing with enough fuel to recover at a suitable alternate with 2000 pounds.
  - 3.14.5.2. During multiple-runway operations, pilots will arrive at initial or at the IAF for a full stop landing with a minimum of 2500 pounds.

3.14.6. **Minimum Fuel.** Declared whenever it becomes apparent that an aircraft will enter initial or start an instrument final approach at the base of intended landing (or alternate, if required), with 2000 pounds or less or one FUEL LOW light illuminated.

3.14.7. **Emergency Fuel.** Declared whenever it becomes apparent that an aircraft will enter initial or begin an instrument final approach at the base of intended landing or alternate, if required, with 1500 pounds or less or both FUEL LOW lights illuminated.

### 3.15. Approaches and Landings:

3.15.1. When the RCR at the base of intended landing is less than 12, land at an alternate airfield if possible.

3.15.2. For daytime dry runway operations use 6,000 feet minimum spacing between landing aircraft, or as directed locally.

3.15.3. The desired touchdown point for a VFR approach is 500 feet from the threshold, or the glide-path interception point for a precision approach. When local procedures or unique runway surface conditions require landing beyond a given point on the runway, the desired touchdown point will be adjusted accordingly.

3.15.4. All aircraft will clear to the "cold" side of the runway when speed/conditions permit.

3.15.5. Do not perform approaches or landings over a raised WEB barrier (BAK 15).

3.15.6. Do not exceed 300 KCAS below 10,000 MSL outside of special use airspace or restricted airspace unless waived by ACC DO or FAA for airshow requirements.

### 3.16. No-Chute Landings:

3.16.1. Pilots will be certified prior to performing no chute landings IAW F117ATX or F117ARQ training syllabus or local procedures. Adhere to the following procedures and restrictions:

3.16.1.1. Minimum runway length is 10,000 feet with a compatible departure-end arrestment system (calculated stopping distance must be less than the distance to the last compatible cable/barrier). If runway length is 12,000 feet or greater, no departure end arrestment system is necessary.

3.16.1.2. Maximum internal stores and fuel weight will not exceed 8,000 pounds or as restricted locally.

3.16.1.3. Dry runway.

3.16.1.4. No tailwind.

3.16.1.5. No trapped fuel (aft CG).

3.16.2. Terminate the no-chute landing and use the drag chute under the following conditions:

3.16.2.1. If any doubt exists as to the ability to stop the aircraft on the remaining runway.

3.16.2.2. If the aircraft is not slowing.

3.16.2.3. If experiencing any problem or emergency which may affect the braking ability of the aircraft (i.e, anti-skid light, total utility failure, etc.)

3.16.3. Pilots will not use the 9.5 degree aerobrake procedure outlined in T.O. 1F-117A-1.

**3.17. Drag Chute Jettison:**

- 3.17.1. Maneuver the aircraft into the prevailing wind prior to releasing the chute to avoid possible aircraft damage due to drag chute attachment clevis impact during crosswinds.
- 3.17.2. Place power between idle and 70% on both engines.
- 3.17.3. Allow adequate time for the rudders to center before releasing chute (approximately two seconds).
- 3.17.4. If unsure of the prevailing wind conditions, jettison the chute straight ahead on the downwind side of the runway, with a minimum of 20 knots.

**3.18. Overhead Traffic Patterns:**

- 3.18.1. Minimum altitude is 1500 AGL.
- 3.18.2. Initiate the break at the approach end unless directed otherwise by local procedures or tower.
- 3.18.3. Plan the final turn to be wings level at 300 feet AGL and 1 mile from the touchdown point.
- 3.18.4. Maximum G in the VFR traffic pattern is 3.

**3.19. Low Approaches/Go-arounds:**

- 3.19.1. Do not directly overfly aircraft on the runway. Clear to the outside of the runway and remain 500 feet below traffic pattern altitude until crossing the departure end unless otherwise directed.
- 3.19.2. Observe the following minimum altitudes:
  - 3.19.2.1. Normal low approaches (day or night): So that touchdown does not occur.
  - 3.19.2.2. Formation low approaches will use the following limitations:
    - 3.19.2.2.1. Day. 100 ft AGL.
    - 3.19.2.2.2. Night. Night formation approaches are not authorized.
  - 3.19.2.3. Chase aircraft during an emergency: 300 ft AGL.
  - 3.19.2.4. T-38 IP/SEFE chase aircraft: 50 ft AGL.
  - 3.19.2.5. F-117A IP or SEFE chase aircraft: 100 ft AGL.
  - 3.19.2.6. See paragraph [6.14](#). for single engine minimums.

**3.20. Closed Traffic Patterns.** Minimum airspeed for initiating a closed pattern is 250 KCAS. Initiate the closed pattern at the departure end of the runway unless directed otherwise by local procedures or the controlling agency. Fly the pattern to arrive on downwind at 220-250 KCAS. Use no more than 3 Gs pulling closed.

**3.21. Formation Approaches:**

- 3.21.1. Normally accomplish formation approaches from a precision approach. If not, the approach will be accomplished utilizing a published instrument approach or a VFR straight-in approach using the VASI/PAPI, if available. In all cases the rate of descent should be similar to a normal precision approach.

- 3.21.2. A qualified flight lead will lead the approach unless an IP or a flight lead qualified squadron supervisor is in the element.
- 3.21.3. Position the wingman on the upwind side if the crosswind exceeds 5 knots.
- 3.21.4. Wingmen will maintain a minimum of 10 feet lateral wingtip spacing after stacking level.
- 3.21.5. Do not perform formation approaches when the weather is below the weather category of the most restrictive pilot in the element.
- 3.21.6. Penetrations are restricted to two aircraft when the weather at the base of intended landing is less than overhead traffic pattern minimums.
- 3.21.7. Formation landings are prohibited.

**3.22. Formation trail recoveries, drag maneuvers and flight split-up.** Trail recoveries are only authorized at home station and deployed locations that have established procedures (i.e., Letters of Agreement or local regulatory guidance). Drag maneuvers will not be performed to gain separation during instrument approaches. Unit will provide additional guidance on formation trail recoveries, drag maneuvers and flight split-up. As a minimum, procedures will address each recovery profile, missed approach, climbout, loss of visual, loss of communications, and desired maximum spacing requirements.

**3.23. Reduced Lighting Training.** Will be conducted IAW AFI 11-202 Volume 3, *General Flight Rules*, as supplemented. In addition, comply with the following restrictions:

3.23.1. Without NVGs:

3.23.1.1. Only the anti-collision light will be extinguished.

3.23.1.2. Pilots must be CMR/BMC.

3.23.1.3. Maximum aircraft is two.

3.23.1.4. Air-to-air TACAN must be operational. Only the flight lead will extinguish the anti-collision light; all other lights on the lead aircraft and the wingman's aircraft will remain on.

3.23.1.5. Minimum vertical separation between elements practicing anti-collision light out training in the same airspace is 2,000 feet.

3.23.2. With NVGs: Refer to paragraph [3.13.9.2.](#)

**3.24. Tanker Flyby Pickup Rendezvous:**

3.24.1. This procedure may be accomplished using EMCON 1 or 2. The plan will be thoroughly coordinated between all parties.

3.24.2. At night or in IMC, fighters will not begin their turn until 1000 ft AGL and 250 KCAS.

3.24.3. Subsequent tankers in a cell will fly over in 5-minute intervals to allow succeeding fighter elements to perform takeoff requirements.

## Chapter 4

### INSTRUMENT PROCEDURES

**4.1. Approach Category.** The F-117A is designated as an approach category E aircraft. Missed approach airspeed is 200-250 KCAS.

**4.2. Practice Instrument Approaches.** Pilots may fly instrument approaches at other than home base under the following conditions:

4.2.1. Facility/base operations, at the airfield where instrument practice is planned, should be contacted in advance to preclude conflicts with other local traffic.

4.2.2. Pilots must plan the mission so as to have adequate fuel to climb to cruising altitude from the last missed approach, cruise to the IAF at home base, divert to a designated alternate, and land with at least 2,000 pounds of fuel remaining.

4.2.3. Minimum altitude restrictions listed in para 3.19. apply.

**4.3. Takeoff and Joinup Procedures:**

4.3.1. For formation operations, the flight lead will notify the appropriate ATC agency when a VMC joinup cannot be accomplished due to weather conditions or operational requirements and coordinate for an altitude block. Formation trail departures will comply with instructions for a non-standard flight as defined in FLIP. Flight lead should request IFF squawks for in-trail wingmen.

4.3.2. If the weather is below 1500/3, or at night, the first turn should not be initiated until 1000 feet AGL and 250 KCAS. If departures require earlier turns, the minimum parameters for the first turn will be 400 feet AGL and Single Engine Climb Speed, 450 feet per minute (fpm) rate of climb.

**4.4. Trail Departures.** For trail departures, basic instrument flying is the first priority and will not be sacrificed when performing secondary tasks, to include formation positioning. Strictly adhere to the briefed climb speeds, power settings, altitudes, headings and turn points. If task saturation occurs, cease attempts to maintain trail, immediately concentrate on flying the instrument departure and notify the flight lead. Depending on the severity of the saturation/disorientation pilots should consider the use of the Pilot Activated Automatic Recovery System (PAARS) to regain orientation. Adhere to the following procedures:

4.4.1. Takeoff spacing will be 20 seconds minimum.

4.4.2. Maximum flight size during the daylight hours (including nautical twilight) is four.

4.4.3. Maximum flight size at night is three.

4.4.4. After takeoff, all flight members will accelerate in mil power to 300 KCAS. Regardless of actual weather conditions, the flight lead will execute all climbs in MIL power and pitch as required to maintain minimum safe airspeed of 300 KCAS unless otherwise briefed. Bank angle will be 30 degrees unless otherwise briefed.

4.4.5. Until all flight members call visual, emission option permitting, each aircraft will call passing each 5000 feet altitude increment with altitude and heading (or heading passing).until level-off, rejoined or visual. The flight lead will call initiating any heading change. It is imperative that each

preceding aircraft monitor the radio transmissions and progress of each succeeding aircraft and immediately correct deviations from departure routing or planned course.

4.4.6. Each aircraft will maintain 20-30 second or 2-3 miles spacing using all available aircraft systems and navigational aids to monitor position.

4.4.7. Each aircraft will maintain at least 1,000 foot vertical separation from the preceding aircraft during climb, descent and level-off until visual, except where departure procedures specifically preclude compliance or the altitude block places any aircraft below MSA. If MSA cannot be complied with, vertical separation may be reduced to 500 feet.

4.4.8. When all flight members reach cruise altitude and are cleared to maintain a block altitude by ATC, the lead will accelerate to the briefed airspeed.

**4.5. Formation Breakup.** Formation breakup should not be accomplished in IMC. However, if unavoidable, breakup will be accomplished in straight and level flight. Prior to a weather breakup, the flight lead will confirm that the wingman has good nav aids and transmit attitude, airspeed, altitude, and altimeter setting. The altimeter setting will be acknowledged by the wingman. See para. 3.22. for additional guidance.

**4.6. Use of the Head Up Display (HUD).** The HUD may be used as an additional instrument reference in night/IMC conditions. It will not be used as the sole instrument in these conditions. The HUD will not be used to recover from an unusual attitude or when executing lost wingman procedures except when no other reference is available.

**4.7. Pilot Activated Automatic Recovery System (PAARS).** PAARS must be considered as an available tool if the pilot encounters a spatially disorienting situation. The use of PAARS can greatly aid a pilot in the recovery of an aircraft under these conditions. The PAARS is not a spin recovery system or a ground avoidance system.

**4.8. Simulated Instrument Flight Procedures:**

4.8.1. Requires a chase aircraft in order to log simulated instrument flight in the F-117A. This does not preclude flying multiple instrument approaches in VMC without a chase; however, in this case the primary emphasis will be on the "see and avoid" concept.

**4.9. Flight in Precipitation/Icing Procedures:**

4.9.1. Pilots will avoid penetrating weather or precipitation, particularly within 2,000 ft of the freezing level, to the maximum extent possible. If precipitation cannot be avoided, pilots should reduce airspeed to 300 KCAS or below, fuel and stores permitting and select FLIR to the standby (stowed) position.

4.9.2. Pilots will activate the engine anti-ice on and follow appropriate checklist for icing lights (MDI and/or annunciator), if there are suspected icing conditions during flight. Follow established maintenance procedures to initiate an ice FOD inspection.

**4.10. INS/GPS Flight:** The F-117A is approved to use INS/GPS only for enroute point-to-point Latitude/Longitude Area Navigation (RNAV). The enroute navigation portion may not exceed one and

one-half hours (1.5 hours) between INS updates. An update is defined as establishing a positive position using on-board systems or visual references. Do not fly RNAV or GPS approaches.

## Chapter 5

### AIR TO SURFACE WEAPONS EMPLOYMENT

**5.1. General.** AFI 11-214 contains air-to-surface procedures applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F-117A operations. Qualification and scoring criteria are contained in AFI 11-2F-117V1. For all attacks, actual or simulated, it is imperative that pilots know the configuration of their aircraft prior to flight. Loading simulated ordnance on a station with expendable ordnance may result in an unintentional release off range.

#### **5.2. Weather Minimums:**

5.2.1. In accordance with AFI 11-214.

5.2.2. Ceiling will be at least 500 feet above the highest portion of the pattern flown. In no case will the ceiling/vis be lower than 2,000 feet AGL/3 NM for day and no lower than 3,000 feet AGL/5 NM for night.

#### **5.3. Training Rules (TR):**

5.3.1. In accordance with AFI 11-214. Additionally, the following general guidelines will apply to all F-117A operations:

5.3.1.1. When planned navigation routes conflict (i.e., during a simultaneous attack), a 1,000 foot minimum altitude differential, off range, and 500 feet on range is required between converging aircraft.

5.3.1.2. When departing the Initial Point (IP) during an on-range simultaneous attack, pilots will transmit their altitude and altimeter setting.

5.3.1.3. Minimum spacing:

5.3.1.3.1. Different run-in headings. Minimum spacing between aircraft attacking the same or different targets must allow for bomb fall deconfliction.

5.3.1.3.2. Same run-in heading. Minimum spacing between aircraft attacking the same target is limited to applicable fuzing and frag envelope.

5.3.1.4. If the aircraft is required to climb/descend during an IP-target run, discontinue the attack until the aircraft levels at the desired altitude.

5.3.1.5. Minimum altitudes for level weapons delivery:

5.3.1.5.1. Outside of special use airspace, minimum altitude is IAW AFI 11-202 Vol 3 or 10,000 MSL, whichever is higher. Momentary deviations from minimum altitudes are approved for weather avoidance during day VMC. At no time will pilots descend below 2,000 feet AGL to avoid weather.

5.3.1.5.2. Within special use airspace, minimum altitude for level weapons delivery (simulated/inert/live) is determined by fuzing and fragmentation envelopes, the MEA or the MSA whichever is higher. At no time will pilots descend below 1,000 feet AGL to avoid weather.

5.3.1.6. Full cockpit switchology is approved for on-range attacks only (range restrictions permitting). Additional local guidance will be developed when employing with actual or simulated ordnance (Bomb Rack Simulator or Bomb Rack Sensing Switch Cover, Sim Plug).

5.3.1.7. All attacks will be accomplished "trap up."

5.3.1.8. The Laser will remain in the OFF position, the IRADS will not be placed in IR/LSR (FLIR or DLIR), and the Master Arm will remain SAFE until on the assigned range and ready/cleared to release. Exceptions to this include paragraph 5.5. for off-range simulated weapons employment.

5.3.1.9. A functional DLIR Laser is required to release an LGB. An LGB will not be released unless laser ranging (LR) or track ranging (TR) is indicated on the SD. If pilots have a normal DLIR Laser indication (no DLIR alerts) of CF or AF on the SD, release may be consented. Exceptions to this are weapons delivery tactics described in AFTTP 3-1 or 3-3 series documents.

5.3.1.10. Flight/mission leads/single-ship pilots will ensure the target is certified for lasing and there is no possibility another aircraft might underfly the lasing aircraft.

5.3.1.11. Terminate the target attack if the autopilot becomes uncoupled unless IAW an approved training program. The attack may be continued if the autopilot is recoupled.

5.3.1.12. F-117 maneuvering category is NON-MANEUVERING. The F-117A will be considered a non-player for all air-to-ground and air-to-air threats and associated radars. F-117A pilots will not make any threat reaction maneuvers.

5.3.1.13. **Weather minimums:**

5.3.1.13.1. Target attacks outside of restricted airspace may continue through the weather as long as the attack occurs above the MEA and while under positive IFR clearance.

5.3.1.13.2. Target attacks within restricted airspace may continue through the weather as long as the attack occurs above MEA or MSA as appropriate with deconfliction from other flights during multi-ship operations.

5.3.1.14. Heads-down cockpit switch changes at night will only be made in wings level flight.

5.3.1.15. **Heavyweight Ordnance.** Weapons stations with actual ordnance will not be selected/activated (SAFE will not be boxed on the stores management display (SMD)) and the pickle button will not be depressed until on range and the pilot intends to expend the ordnance IAW range procedures.

5.3.1.15.1. Inert Ordnance. Do not conduct off-range camera attacks with inert or heavy-weight practice ordnance unless all switches are SAFE or OFF.

5.3.1.15.2. Live Ordnance. Off range camera attacks are prohibited.

**5.4. Off-Range Simulated Weapons Employment.** Prior to performing a simulated attack on a cultural/off-range target, pilots will ensure the following:

5.4.1. The aircraft is under IFR control.

5.4.2. Master Arm--SAFE.

5.4.3. Laser Mode Select Switch--OFF.

- 5.4.4. IRADS Mode Select Switches--IR (FLIR--standby, if DLIR only).
- 5.4.5. Fuse Arming Option--not selected.
- 5.4.6. The pickle button is not activated.
- 5.4.7. Off-range simulated weapons employment will not be conducted with suspected or confirmed hung ordnance aboard the aircraft.
- 5.4.8. Simulated weapons will only be loaded on uncarted/unexpendable stations when conducting attacks off range. The pilot will ensure the station selected does not have expendable ordnance.

**5.5. Exercise Participation/Stealth Restrictions.** The following are restrictions placed on F-117A participation in exercises and stealth procedures:

- 5.5.1. The F-117A may only be "stealthed" up during peacetime training missions that comply with current security directives.
- 5.5.2. F-117A pilots will comply with all other training rules/SPINS to include external lighting, IFF squawks and altitudes.
- 5.5.3. Waiver authority to these restrictions rests with the OG/CC but must be IAW the appropriate classification guide.

## Chapter 6

### ABNORMAL OPERATING PROCEDURES

**6.1. General.** This chapter contains procedures to follow when other than normal operations occur. This does not, however, replace or supersede procedures contained in the flight manual or the use of sound judgment and the following applies:

6.1.1. No aircraft will be accepted for flight with a malfunction that is addressed in the emergency/abnormal procedures section of the flight manual until appropriate corrective actions have been accomplished.

6.1.2. Aircraft will not be taxied with malfunctions that affect the nose wheel steering, brake systems or with generator malfunctions/failures. Transient malfunctions (one time occurrence corrected by resetting or recycling a single time) are acceptable.

6.1.3. Once a malfunctioning system is isolated, that system will not be used again unless its use in a degraded mode is essential for recovery. If the fault is corrected/reset, and current in-flight procedures allow, the flight may be continued. Do not conduct in-flight troubleshooting after flight manual emergency procedures are completed.

6.1.4. Pilots experiencing in-flight emergencies will be switched over to a single frequency approach channel as soon as practical, at the discretion of the pilot.

#### 6.2. Ground Aborts:

6.2.1. Prior to takeoff, the flight leader will realign the flight positions to maintain a numerical call-sign sequence. Flight leaders will advise the appropriate command agencies of such changes.

6.2.2. Wingmen in a flight of two or more aircraft with only one designated flight lead in the formation must sympathetically abort or proceed to the pre-briefed single ship mission should the flight lead abort. FTU students who have not completed their initial qualification check must always be accompanied by a chase aircraft occupied by an F-117A IP.

6.2.3. Pilots who do not take off with the flight may join the flight at a briefed rendezvous point. If a joinup is to be accomplished in a restricted area or MOA, all events will be terminated until the joining aircraft has achieved the desired position.

#### 6.3. Takeoff Aborts:

6.3.1. Procedures will be planned for by reviewing and understanding the takeoff data prior to takeoff. Particular emphasis should be placed on takeoff and abort factors during abnormal situations such as short/wet runways and heavy gross weights.

6.3.2. Clear to the appropriate side of the runway as expeditiously as possible. If this is not feasible because of possible cable engagement, clear straight ahead. As soon as possible, give call sign and state intentions. The phrase "Cable, Cable, Cable" will be used to indicate a departure-end cable arrestment. The phrase "Barrier, Barrier, Barrier" will be used to indicate a web-type barrier engagement or to direct tower to raise the web barrier.

6.3.3. Lower the tailhook if there is any doubt about the ability to stop on the remaining runway. This decision will be based on the cable/barrier compatibility, runway length, aircraft speed, weather conditions, braking conditions, and aircraft gross weight.

6.3.4. Pilots will ensure the integrity of their brake system prior to passing the last compatible barrier.

6.3.5. See Hot Brake Procedures below.

#### **6.4. Takeoff Continued with Loss Of Engine:**

6.4.1. If takeoff is continued, the pilot's primary concern should be attaining single engine climb (SEC) speed, and maintaining AOA less than 10 degrees. Altitude permitting, this can best be accomplished by jettisoning any ordnance and commencing fuel dump when ability to maintain aircraft control permits.

6.4.2. The decision to jettison live or inert ordnance should be made based on the pilot's assessment of the relative risk of possible weapons frag damage to the aircraft and danger to personnel and equipment on the ground versus the potential gain of reduced gross weight. If terrain impact appears imminent, the pilot should consider immediate ejection rather than a last ditch attempt to save the aircraft through ordnance jettison.

#### **6.5. Air Aborts:**

6.5.1. Aircraft will maintain their original numerical callsign after takeoff.

6.5.2. The pilot of the aborting aircraft will advise the flight leader or controlling agency (if single ship) of the conditions necessitating the abort, intentions, and assistance required.

6.5.3. The mission will be aborted for any of the following:

6.5.3.1. Birdstrike.

6.5.3.2. Over-G.

6.5.3.3. Flight Control System Anomalies (this does not include a single FCS light that resets IAW flight manual procedures providing the light does not repeat for similar maneuvers).

6.5.3.4. Engine flameout/stagnation.

6.5.3.5. All anomalies will be reported during maintenance debriefing.

6.5.4. If possible, pilots will dump fuel above 5,000 ft AGL. Pilots will advise ATC, annotate in AFTO IMT 781 and advise maintenance whenever fuel is dumped.

#### **6.6. Radio Failure:**

6.6.1. Pilots will comply with procedures outlined in FLIP and local directives. A pilot who experiences total radio failure while in close or route formation will maneuver within close/route parameters to attract the attention of another flight member and give the appropriate visual signals. The mission should be terminated as soon as practical and the NORDO aircraft led to the base of intended landing or a divert base. A formation approach to a drop-off on final should be performed unless safety considerations dictate otherwise.

6.6.2. If the NORDO aircraft intends to make an arresting gear engagement, the pilot will fly a straight-in approach flashing the landing light on final to signal the tower.

**6.7. Severe Weather Penetration.** Flight through severe weather should not be attempted. However, if unavoidable, prior to penetration, flights will break up into single ships and recover with separate clearances. Airspeed should be reduced to 300 KCAS or less (250 KCAS below 10,000 ft MSL if minimum safe airspeed allows.) Refer to T.O. F-117A-1 for specific procedures for flying in severe weather or icing.

### **6.8. Lost Wingman Procedures:**

6.8.1. Immediate separation of aircraft is essential. Upon losing sight of the leader, or if unable to maintain formation due to spatial disorientation, the wingman will simultaneously execute the applicable lost wingman procedures while transitioning to instruments. Refer to paragraph 6.9. for specific spatial disorientation considerations. Smooth application of control inputs is imperative to minimize disorienting effects. Once lost wingman procedures have been executed, permission to rejoin the flight must be obtained from the flight lead. These procedures also apply to chase aircraft.

6.8.1.1. **Two or Three-Ship Wings Level Flight.** For two- or three-ship flights, in wings level flight (climb, descent, or straight and level) simultaneously inform the leader and turn away using 15 degrees of bank for 15 seconds, then resume heading and obtain a separate clearance. Use the following procedure:

6.8.1.1.1. **Inside of the Turn.** Momentarily reduce power to ensure nose/tail separation, and inform the flight leader to roll out of the turn. Maintain angle of bank to ensure lateral separation and obtain a separate clearance. The leader may resume turn only when separation is ensured.

6.8.1.1.2. **Outside of the Turn.** Reverse the direction of the turn using 15 degrees of bank for 15 seconds and inform the leader. Continue straight ahead to ensure separation prior to resuming the turn. Obtain a separate clearance.

6.8.1.1.3. **Precision/Non-Precision Final.** The wingman will momentarily turn away to ensure clearance, inform lead, and commence the published missed approach procedure while obtaining a separate clearance from approach control.

6.8.1.1.4. **Missed Approach.** The wingman will momentarily turn away to ensure clearance, inform lead, and continue the published or assigned missed approach procedure while climbing to 500 feet above missed approach altitude. Obtain a separate clearance from approach control.

6.8.1.1.5. For number 3 in a three ship echelon formation, use lost wingman procedures for number four.

6.8.1.2. **Four-Ship Flights.** For four-ship flights (or three-ship flights in echelon), if only one aircraft in the flight becomes separated, the previous procedures will provide safe separation. However, because it is impossible for number 4 to immediately ascertain that number 3 is still has visual contact with the lead, it is imperative that number 4's initial action be based on the assumption that number 3 has also become separated. Number 2 and 3 will follow the procedures outlined above. Number 4 will follow the appropriate procedure as follows:

6.8.1.2.1. **Wings Level Flight (Climb, Descent, Straight, and Level).** Simultaneously inform the leader and turn away using 30 degrees of bank for 30 seconds, then resume heading and obtain a separate clearance.

6.8.1.2.2. **Inside of the Turn for #4.** Momentarily reduce power to ensure nose/tail separation, increase bank 15 degrees, and inform the flight leader to roll out of the turn. Maintain angle of bank to ensure lateral separation and obtain a separate clearance. The leader may resume turn only when separation is ensured.

6.8.1.2.3. **Outside of the Turn for #4.** Reverse the direction of the turn using 30 degrees of bank for 30 seconds and inform the leader. Continue straight ahead to ensure separation prior to resuming the turn. Obtain a separate clearance.

6.8.2. The flight leader should acknowledge the lost wingman's radio call and transmit flight parameters, actions, and/or intentions as appropriate. Care must be taken to observe published terrain clearance limits.

6.8.3. If a wingman becomes separated and any aircraft experiences radio failure, the aircraft with the operational radio will obtain a separate clearance. The NORDO aircraft will set IFF/SIF IAW FLIP radio out procedures, or local directives.

## **6.9. Spatial Disorientation (SD):**

6.9.1. Conditions that prevent a clear visual horizon or increase pilot tasking are conducive to SD. When SD symptoms are detected, the following steps will be taken until symptoms abate:

6.9.1.1. Execute lost wingman procedures, if appropriate.

6.9.1.2. Concentrate on flying basic instruments with frequent reference to the attitude indicator. Use heads down instruments. Defer nonessential cockpit tasks.

6.9.1.3. If symptoms persist, bring aircraft to straight and level flight with reference to the attitude indicator, conditions permitting. Maintain straight and level flight, terrain permitting, until symptoms abate. Maximize the use of autopilot to include Pilot Activated Automatic Recovery System (PAARS), if applicable.

6.9.1.4. If necessary, declare an emergency and advise ATC.

6.9.2. It is possible for spatial disorientation to deteriorate to the point where the pilot is unable to see, interpret, or process information from the flight instruments. Aircraft control in such a situation is impossible. A pilot must recognize when physiological or psychological limits have been exceeded and abandon the aircraft.

6.9.3. For spatial disorientation procedures with night vision goggles, see paragraph [3.13.12.3](#).

## **6.10. Armament System Malfunctions:**

6.10.1. If an inadvertent release occurs:

6.10.1.1. Record switch positions at the time of release and provide to armament and safety personnel.

6.10.1.2. Record the impact point, if possible.

6.10.1.3. Check armament switches safe and do not attempt further release in any mode. Treat remaining stores as hung ordnance.

6.10.1.4. If remaining stores present a carriage/landing hazard, attempt jettison in a suitable area.

6.10.2. If failure to release occurs:

6.10.2.1. Recheck switch positions and make an additional attempt to expend, time permitting, or have another aircraft perform a bomb check. If no release occurs a second time, do not make another attempt to expend.

6.10.2.2. If suspected or actual hung ordnance exists, follow the appropriate local hung ordnance procedure.

6.10.2.3. Stores jettison will be accomplished IAW T.O. 1F-117A-34-CL-1.

6.10.3. If hung ordnance is confirmed or suspected:

6.10.3.1. Declare an emergency (except for BDU 33).

6.10.3.2. Fly a hung ordnance pattern.

6.10.3.3. When practical, advise tower of condition, intentions, and request dearming crews. Upon landing, proceed to dearm and inform the dearming crew so the condition or the ordnance can be checked/secured.

6.10.3.4. Overhead patterns and practice low approaches will not flown with hung ordnance. Overhead patterns and practice low approaches may be flown with unexpended ordnance if normal post-release indications are present.

6.10.4. A no-spot BDU-33 release attempt does not require a hung ordnance pattern if the bay doors are closed and normal release and post release indications are present.

**6.11. Unintentional No-Chute Landings:**

6.11.1. If the drag chute fails to deploy on a dry runway, pilots will check the airspeed approaching the 5,000 ft remaining point. Use the following guidelines:

6.11.1.1. If greater than 155 KCAS, lower the hook and call "Barrier, Barrier, Barrier/Cable, Cable Cable", and continue max braking. Release brakes approaching the cable to effect a successful engagement. If the cable is missed, reapply max braking and continue to steer to the middle of the runway. Expect a brake fire. Barrier engagement may hinder the possibility of ground egress.

6.11.1.2. If less than 155 KCAS, max braking should stop the aircraft prior to the end of the runway

6.11.2. Max braking should be used on a wet runway. If a cable engagement appears imminent, call for the cable and/or barrier and lower the hook. Approaching the cable, release brakes to effect a successful engagement. If cable is missed, reapply max braking and anticipate a barrier engagement, if available.

**6.12. Post Arresting Gear Engagement Procedures:**

6.12.1. Do not shutdown the engine unless fire or other conditions dictate, or directed to do so by the arresting crew and/or emergency response personnel.

6.12.2. Do not taxi until directed to do so by the arresting gear crew and/or emergency response personnel.

6.12.3. Increase power to control aircraft rollback after the cable has been stretched. DO NOT use wheel brakes.

### 6.13. Hot Brake Procedures:

6.13.1. General. Anytime hot brakes are suspected or if notified of hot brakes, declare a ground emergency, receive clearance and immediately taxi to the nearest hot brake area. Turn the aircraft into the wind and wait for fire response personnel.

6.13.1.1. Aborted takeoffs above 100 knots will be inspected for hot brakes.

6.13.1.2. Suspect hot brakes after any unintentional no-chute landing.

### 6.14. In-flight Practice of Emergency Procedures:

6.14.1. Perform IAW AFI 11-202V3; AFI 11-2F-117V1, *F-117--Aircrew Training*; T.O.s; phase manuals; and this volume, as supplemented.

6.14.2. The following are prohibited in actual aircraft:

6.14.2.1. All practice and/or training related to aborted takeoffs. If the simulator is unavailable, a static aircraft (engines off/no external power) may be used, provided no switches are actuated.

6.14.2.2. In-flight practice airstarts or engine shutdowns, unless required for functional check flights (actual or training).

6.14.2.3. Simulated in-flight loss of both engines.

6.14.2.4. EPU activation during simulated single engine operations.

6.14.2.5. Simulated single engine landings at night.

6.14.3. Simulated single engine procedures include the following:

6.14.3.1. Simulated single engine approach and landing operations will adhere to flight manual prescribed airspeed and AOA parameters.

6.14.3.2. During night operations, go-arounds will be initiated at or above 300 ft AGL using both engines.

6.14.3.3. For day operations planned go-around will be initiated no lower than 100 ft AGL (two engine) or 300 ft AGL (single engine).

**6.15. Search and Rescue Combat Air Patrol (SARCAP) Procedures.** In the event an aircraft is lost in flight, actions must begin to locate possible survivors and initiate rescue efforts. It is imperative that all flight members aggressively pursue location and rescue downed personnel even though they seem uninjured. Many downed aircrews initially suffer shock or have delayed reactions to ejection injuries. The following are procedures that are by no means complete and should be adjusted to meet each unique search and rescue situation:

6.15.1. **Squawk.** Immediately terminate maneuvering using appropriate Knock-It-Off procedures. Establish a SARCAP commander. IFF should be placed to EMER to alert ATC/GCI of the emergency situation.

6.15.2. **Talk.** Communicate the emergency situation and aircraft/flight intentions immediately to applicable control agencies. Use GUARD frequency if necessary.

6.15.3. **Mark.** Mark the last known position of survivor/crash site using any means available. TACAN/INS position, ATC/GCI positioning, or ground references should be used to identify the immediate area for subsequent rescue efforts.

6.15.4. **Separate.** Remain above the last observed parachute altitudes until position of all possible survivors is determined. Deconflict other aircraft assisting in the search and rescue.

6.15.5. **SARCAP.** Establish a SARCAP by altitude to preclude midair collision. The high/low CAPs should be established as necessary to facilitate communication with other agencies.

6.15.6. **Bingo.** Revise BINGO fuels or recovery bases as required to maintain maximum SARCAP coverage over survivors/crash site. Do not overfly BINGO fuel. Relinquish SARCAP operation to designated rescue forces upon their arrival.

#### **6.16. Recoveries Without a Transponder (IFF):**

6.16.1. Due to the F-117A's low air traffic control radar observability without IFF, pilots will immediately notify controlling agencies if the IFF is inoperative, and provide accurate position reports to controlling agencies for separation from other traffic.

6.16.2. If radar vectors are required for an approach, pilots will slow to 250 KCAS when within approximately 25 DME of the field and lower the landing gear to enhance the radar return for RAP-CON.

#### **6.17. Forms Adopted.**

AF Form 847, **Recommendation for Change of Publication.**

AFTO IMT 781, **ARMS Aircrew/Mission Flight Data Document.**

AF Form 70, **Pilot Flight Plan and Flight Log.**

RONALD E. KEYS, Lt General, USAF  
DCS/Air and Space Operations

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFPD 11-2, *Aircraft Rules and Procedures*

AFPD 11-4, *Aviation Service*

AFTTP 3-1V18, *F-117A Tactical Employment*

AFI 11-2F-117V1, *F-117--Aircrew Training*

AFI 11-202V3, *General Flight Rules*

AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*

AFI 11-209, *Air Force Aerial Events*

AFI 11-214, *Air Operations Rules and Procedures*

AFI 11-218, *Aircraft Operation and Movement on the Ground*

AFI 11-301V1, *Aircrew Life Support (ALS) Program*

AFI 33-360V1, *Air Force Content Management Program—Publications*

AFI 33-360V2, *Content Management Program-Information Management Tool (CMP-IMT)*

AFMAN 11-217 Volume 1 and 2, *Instrument Flight Procedures*

AFPAM 11-216 *Air Navigation*

T.O. 1F-117A-1, *Flight Manual*

AFPD 37-1, *Information Management*

AFMAN 37-123, *Management of Records*

AFI 48-123, *Medical Examinations and Standards*

***Abbreviations and Acronyms***

**A/A**—Air-to-Air

**ACC**—Air Combat Command

**AFTTP**—Air Force Tactics, Techniques, and Procedures

**AGL**—Above Ground Level

**AHC**—Aircraft Handling Characteristics

**AOA**—Angle of Attack

**ARCP**—Air Refueling Contact Point

**ARIP**—Air Refueling Initial Point

**ARTC**—Air Refueling Training Corridor

**ATC**—Air Traffic Control  
**ATCAA**—Air Traffic Control Assigned Airspace  
**AWACS**—Airborne Warning and Control System  
**CAP**—Combat Air Patrol  
**CC**—Commander  
**CHUM**—Chart Update Manual  
**CMR**—Combat Mission Ready  
**COMM**—Communication  
**CT**—Continuation Training  
**DLIR**—Downward Looking Infrared  
**DNIF**—Duties Not Including Flying  
**DO**—Director of Operations  
**DR**—Dead Reckoning  
**DRU**—Direct Reporting Unit  
**E&E**—Escape and Evasion  
**EMCON**—Emission Control  
**EOR**—End of Runway  
**EP**—Emergency Procedure  
**FAAH**—Federal Aviation Administration Handbook  
**FAC**—Forward Air Controller  
**FCS**—Flight Control System  
**FENCE**—Fuel, Emissions, Navigation, Communications, Expendables  
**FLIP**—Flight Information Publication  
**FLIR**—Forward Looking Infrared  
**FLOT**—Forward Line of Own Troops  
**FRAG**—Fragmentation  
**FSCL**—Fire Support Control Line  
**FTU**—Formal Training Unit  
**FW**—Fighter Wing  
**G**—Gravitational Load Factor  
**GBU**—Guided Bomb Unit  
**GCI**—Ground Control Intercept

**HUD**—Head Up Display  
**IAW**—In Accordance With  
**ID**—Identify/Identification  
**IFE**—In Flight Emergency  
**IFR**—Instrument Flight Rules  
**ILS**—Instrument Landing System  
**IMC**—Instrument Meteorological Conditions  
**IP**—Instructor Pilot or Initial Point  
**KCAS**—Knots Calibrated Airspeed  
**KIAS**—Knots Indicated Airspeed  
**KTAS**—Knots True Airspeed  
**MAJCOM**—Major Command  
**MARSA**—Military Assumes Responsibility for Separation of Aircraft  
**MDI**—Module Display Indicator  
**MEA**—Minimum Enroute Altitude  
**MOA**—Military Operating Area  
**MQT**—Mission Qualification Training  
**MSA**—Minimum Safe Altitude  
**MTR**—Medium Training Route  
**NAF**—Numbered Air Force  
**NAV**—Navigation  
**NLT**—No Later Than  
**NMR**—Non Mission Ready  
**NORDO**—No Radio  
**NOTAM**—Notice to Airmen  
**NT**—Night  
**OG**—Operations Group  
**OPR**—Office of Primary Responsibility  
**OPS**—Operations  
**OT&E**—Operational Test and Evaluation  
**PAARS**—Piloted Activated Automatic Recovery System  
**PAR**—Precision Approach Radar

**PARA**—Paragraph

**RAP**—Ready Aircrew Program

**RCR**—Runway Condition Reading

**RCS**—Radar Cross Section

**ROE**—Rules of Engagement

**RTB**—Return To Base

**SA**—Situational Awareness, Strategic Attack

**SAFE**—Selected Area For Evasion

**SAR**—Search and Rescue

**SARCAP**—Search and Rescue Combat Air Patrol

**SAT**—Surface Attack Tactics

**SEFE**—Stan/Eval Flight Examiner

**SII**—Special Interest Item

**SIM**—Simulation

**SOF**—Supervisor of Flying

**SSE**—Simulated Single Engine

**TA**—Terrain Avoidance

**TACAN**—Tactical Air Navigation

**TBD**—To Be Determined/Developed

**TDY**—Temporary Duty

**TM**—Target Mode

**T.O.**—Technical Order

**TOT**—Time Over Target

**TR**—Training Rules, Transit Route

**UHF**—Ultra High Frequency

**USAF**—United States Air Force

**USAFAWC**—USAF Air Warfare Center

**USAFWTC**—USAF Weapons and Tactics Center

**VFR**—Visual Flight Rules

**VIS**—Visibility

**VMC**—Visual Meteorological Conditions

**VOL**—Volume

WX—Weather

*Terms*

**Attempted Release**—The stores management processor (SMP) issues a release pulse in either automatic or manual mode with all switches correctly positioned.

**Hung Weapon**—A live or inert weapon that does not separate from the aircraft following an attempted release.

**Live Weapon**—Actual munitions containing a primary explosive charge (GBU-27, Mk 84, CBU-87, etc.).

**Practice Weapon**—A weapon intended for training or practice and containing no primary explosive charge.

**Retained Weapon**—A weapon still on board the aircraft with no release attempted or after successfully releasing the intended number of weapons in a partial load. Weapons not released due to procedural errors are retained.

**Weapon**—Any live, inert, or training munitions.

*Addresses*

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1535 Command Dr, Suite D-309  
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**Attachment 2****GENERAL BRIEFING GUIDE****A2.1. Mission Preparation:**

- A2.1.1. Time hack
- A2.1.2. EP/threat of the day
- A2.1.3. Mission objective(s)
- A2.1.4. Mission overview
- A2.1.5. Mission data card
- A2.1.6. G-Awareness
- A2.1.7. Fuels required
- A2.1.8. Joker
- A2.1.9. Bingo
- A2.1.10. Critical fuel
- A2.1.11. Continuation fuel
- A2.1.12. Environmental conditions
  - A2.1.12.1. Weather
  - A2.1.12.2. Sunrise/sunset (if applicable)
  - A2.1.12.3. Moon illumination (if applicable)
  - A2.1.12.4. Contrail levels
- A2.1.13. NOTAMs
- A2.1.14. Personal equipment
- A2.1.15. FCIF/pubs/maps
- A2.1.16. SIIs

**A2.2. Ground Procedures:**

- A2.2.1. Pre-flight of aircraft/weapons
- A2.2.2. Ground crew briefing (when applicable)
- A2.2.3. Act only on pilot's instructions
- A2.2.4. Ground emergency procedures
- A2.2.5. Hand signals
- A2.2.6. Aircraft danger areas
- A2.2.7. Check-in

A2.2.8. Taxi/marshalling/arming

A2.2.9. Spare procedures

**A2.3. Takeoff:**

A2.3.1. Runway lineup

A2.3.2. Takeoff interval

A2.3.3. Trail departure

A2.3.4. Abort

A2.3.5. Landing immediately after takeoff

**A2.4. Departure:**

A2.4.1. Join-up

A2.4.2. Formation

A2.4.3. Ops checks

**NOTE:** Ensure the majority of time is used for discussion of tactics, complicated mission segments/special activities, and other new or important items. If regular briefing items have already been discussed during mission planning or are standard, specialty checklist items, they may be reviewed briefly or omitted as appropriate.

**Attachment 3**

**INSTRUMENT/NAVIGATION/TRANSITION GUIDE**

**A3.1. Climb:**

- A3.1.1. Instrument departure
  - A3.1.1.1. Power setting/airspeed
  - A3.1.1.2. Routing (SID, radar vectors, etc.)
- A3.1.2. Level off
- A3.1.3. Formation

**A3.2. Cruise:**

- A3.2.1. Enroute
- A3.2.2. Cruise data
- A3.2.3. Nav aids
- A3.2.4. Fuel awareness/ops checks

**A3.3. Area:**

- A3.3.1. Airspace restrictions/area orientation
- A3.3.2. Instructor responsibilities (if applicable)
- A3.3.3. Maneuvers/G-awareness/ops checks/fuel awareness
- A3.3.4. Airwork
- A3.3.5. Departure
  - A3.3.5.1. Routing
  - A3.3.5.2. Joker
  - A3.3.5.3. Bingo

**A3.4. Approaches:**

- A3.4.1. Holding/penetration
- A3.4.2. Missed approach/climb out

**A3.5. Special Subjects:**

- A3.5.1. Alternate mission
- A3.5.2. Emergency/alternate airfields
- A3.5.3. Spatial disorientation/unusual attitudes

A3.5.4. Hazards associated with human factors (i.e., Channelized attention, complacency, task saturation/prioritization)

A3.5.5. Low altitude ejection

A3.5.6. Lost wingman

A3.5.7. Aircraft lighting considerations

**Attachment 4****AIR REFUELING GUIDE****A4.1. General:**

- A4.1.1. Tanker call sign(s),
- A4.1.2. Receiver assignments
- A4.1.3. Refueling tracks(s)
- A4.1.4. Altitude
- A4.1.5. Airspeed
- A4.1.6. Radio frequencies
- A4.1.7. ARIPs, ARCPs, ARTCs

**A4.2. Buddy Procedures:**

- A4.2.1. Departure
- A4.2.2. Join-up

**A4.3. En Route:**

- A4.3.1. Route of flight
- A4.3.2. Formation
- A4.3.3. Ops checks

**A4.4. Rendezvous:**

- A4.4.1. Type rendezvous
- A4.4.2. Holding procedures/formation
- A4.4.3. Ground radar assistance
- A4.4.4. Tanker identification - A/A TACAN/ground radar/visual
- A4.4.5. Wingman/deputy lead responsibilities
- A4.4.6. Receiver formation/join-up procedures
- A4.4.7. Rendezvous overrun

**A4.5. Refueling:**

- A4.5.1. Checklist procedures
- A4.5.2. Radio calls
- A4.5.3. Refueling order
- A4.5.4. Techniques

A4.5.5. Radio silent procedures (visual signals)

A4.5.5.1. Visual signals

A4.5.5.2. EMCON

A4.5.6. Fuel off-load

A4.5.7. Abort points/abort bases

A4.5.8. Drop-off procedures

A4.5.9. Wake turbulence

**A4.6. Rejoin and Exit:**

A4.6.1. Formation

A4.6.2. Clearance

**A4.7. Emergency Procedures:**

A4.7.1. Breakaway procedures

A4.7.2. Systems malfunctions

A4.7.3. Damaged receptacle

**A4.8. IMC/Night Considerations (if applicable):**

A4.8.1. Lost wingman procedures

A4.8.2. En route

A4.8.3. On the tanker

A4.8.4. Aircraft lighting

**A4.9. Special Subjects:**

A4.9.1. Alternate mission

A4.9.2. Spatial disorientation

A4.9.3. Hazards associated with human factors (i.e., Channelized attention, complacency, and task saturation/prioritization).

**Attachment 5**

**COMBAT BRIEFING GUIDE**

**A5.1. Time Hack**

**A5.2. Objectives**

**A5.3. Overview**

A5.3.1. Ground operations

A5.3.2. Takeoff/departure/route

A5.3.3. Update points

A5.3.4. Ingress

A5.3.5. RTB

A5.3.6. Approaches/diverts

**A5.4. Scenario/Intel:**

A5.4.1. Theater of operations

A5.4.2. Political borders checks

A5.4.3. FLOT/FSCL

A5.4.4. Safe areas/contact procedures

A5.4.5. Stealth lines/fence checks

A5.4.6. ROE collateral/no collateral

A5.4.7. Support assets/locations

**A5.5. Weather/NOTAMS:**

A5.5.1. Homeplate/alternate

A5.5.2. Enroute

A5.5.3. Target area

A5.5.3.1. Altimeter/cloud bases

A5.5.3.2. D-value/winds

A5.5.3.3. Moon rise/illumination

A5.5.3.4. Absolute humidity

A5.5.4. NOTAMS

**A5.6. Mission Data Card:**

A5.6.1. Callsign/times/TOLD

A5.6.2. Mission number

A5.6.3. Tanker info

A5.6.4. Joker

A5.6.5. Bingo/Critical

A5.6.6. Continuation fuel

A5.6.7. Asset information

## **A5.7. Ground Operations:**

A5.7.1. Pre-step

A5.7.1.1. Sanitize

A5.7.1.2. Vest/gun/glinc tape

A5.7.1.3. E&E maps/firefly

A5.7.1.4. AF Form 70/photos

A5.7.1.5. EDTM

A5.7.1.6. Flashlights

A5.7.2. Preflight cockpit

A5.7.2.1. IRADS cooling

A5.7.2.2. EDTM loading/faults

A5.7.2.3. INS coords

A5.7.2.4. SMD (weapons/laser codes/bit checks)

A5.7.3. Preflight aircraft

A5.7.3.1. RAM/butter/bubbles

A5.7.3.2. Forms

A5.7.3.3. Platy bricks

A5.7.3.4. Inert bottle

A5.7.3.5. KY-58 fill

A5.7.4. Preflight weapons

A5.7.4.1. WLP (laser codes, bomb code)

A5.7.4.2. Bombs (guidance pkg., laser)

A5.7.5. Taxi

A5.7.5.1. Time/comm procedures

A5.7.5.2. Route

A5.7.5.3. EOR check IRADS/INS/SMD

A5.7.6. Takeoff/departure

- A5.7.6.1. Heavyweight jettison
- A5.7.6.2. Aborts/engine failure plan
- A5.7.6.3. Departure procedures
- A5.7.6.4. NLT time/ make-up time/plan

**A5.8. Ingress Routing:**

- A5.8.1. Continuation/bingo fuels
- A5.8.2. Altitudes/MEAs
- A5.8.3. Sensor update points
- A5.8.4. Turns (hand fly vs. Autopilot)
- A5.8.5. Stealth line, GO/NO-GO
- A5.8.6. Lights/inert point
- A5.8.7. Threats
- A5.8.8. Route changes IRD
- A5.8.9. Timing/make up

**A5.9. Target Area:**

- A5.9.1. Attack plan
- A5.9.2. Pacing/switchology
- A5.9.3. Polarity changes
- A5.9.4. IRADS crosscheck
  - A5.9.4.1. ALG
  - A5.9.4.2. Grey scales
- A5.9.5. Threat locations/times

**A5.10. Targets:**

- A5.10.1. Acquisition plan/imagery
- A5.10.2. TGT descriptions
- A5.10.3. Offsets
- A5.10.4. Weapons
  - A5.10.4.1. Effects
  - A5.10.4.2. Delivery parameters
  - A5.10.4.3. TOF/LDT/ALDT

A5.10.4.4. DLIR look time

A5.10.4.5. Simultaneous effects

A5.10.4.6. Release ROE

A5.10.5. No sight plan

A5.10.6. WX backup plan

A5.10.7. Threat reaction

**A5.11. Egress:**

A5.11.1. Routing

A5.11.2. Contingencies

A5.11.3. Armament safety check

A5.11.4. Destealth/fence-out

A5.11.5. IFF line

A5.11.6. Antennas (radios/IFF)

A5.11.7. Inflight report

A5.11.8. AWACS/JSTARS/ABCCC

A5.11.9. Divert/wounded bird

A5.11.10. Jettison

**A5.12. RTB:**

A5.12.1. Safe passage procedures

A5.12.2. Instrument approach

A5.12.3. Hung bomb procedures

**A5.13. Contingencies:**

A5.13.1. Wx avoidance

A5.13.1.1. TM wide

A5.13.1.2. Anti-ice

A5.13.2. Systems malfunction

A5.13.3. Early/late TOT

A5.13.4. Emergency divert

A5.13.5. Dump targets

**A5.14. Mission Recap**

**A5.15. Peacetime Addendum:**

A5.15.1. Actual route/weapons

A5.15.2. Range/times

A5.15.3. Training rules

A5.15.4. Instructional briefing

A5.15.5. Flight briefing

**Attachment 6****AIR TO SURFACE WEAPONS EMPLOYMENT GUIDE****A6.1. Range Formation:**

- A6.1.1. Target/range description
- A6.1.2. Restrictions
- A6.1.3. Range entry/holding
- A6.1.4. Radio procedures
- A6.1.5. Formation
- A6.1.6. Sequence of events
- A6.1.7. Pattern procedures

**A6.2. Employment Procedures/Techniques:**

- A6.2.1. Switch positions
  - A6.2.1.1. Arming
  - A6.2.1.2. Displays
- A6.2.2. Final
  - A6.2.2.1. Airspeed
  - A6.2.2.2. Sight picture/corrections/aim-point
  - A6.2.2.3. Release parameters
  - A6.2.2.4. Release indications
  - A6.2.2.5. Recovery procedures

**A6.3. Special Subjects:**

- A6.3.1. Error analysis
- A6.3.2. Training rules/special operating instructions/procedures
- A6.3.3. Fouls
- A6.3.4. Minimum altitudes
- A6.3.5. Maneuvering limitations
  - A6.3.5.1. Aircraft
  - A6.3.5.2. Stores (carriage/release)
- A6.3.6. Target fixation
- A6.3.7. Time to ground impact
  - A6.3.7.1. Wings level

A6.3.7.2. Over bank with G loading

A6.3.8. Hazards associated with human factors (i.e., Channelized attention, complacency, and task saturation/prioritization).

**A6.4. Night Procedures (if applicable):**

A6.4.1. Aircraft lighting

A6.4.2. Radio calls

A6.4.3. Target id/range lighting

A6.4.4. Night spacing techniques

A6.4.5. Instrument crosscheck/disorientation

**A6.5. Over Water Range Operations:**

A6.5.1. Employment techniques

A6.5.1.1. Depth perception/reduced visual cues

A6.5.1.2. Distance/altitude estimation

A6.5.2. Special considerations

A6.5.2.1. Adjusted minimum altitudes

A6.5.2.2. Training rules/special operating procedures

**A6.6. Range Departure/Recovery:**

A6.6.1. Armament safety checks

A6.6.2. Rejoin

A6.6.3. Battle damage/bomb check

A6.6.4. Hung ordnance

A6.6.5. Inadvertent release

**Attachment 7****NVG BRIEFING GUIDE**

**A7.1. NVG Briefing Guide** This guide is meant to highlight general NVG considerations, and provides a reference for a basic NVG briefing. All applicable NVG considerations should be incorporated into the specific briefing for the mission being flown.

**A7.1.1. Weather / Illumination:**

A7.1.1.1. Civil/Nautical Twilight

A7.1.1.2. Moon Rise/Set Times/Phase/Elevation/Azimuth

A7.1.1.3. Ceiling/Visibility

A7.1.1.4. Lux/EO TDA

A7.1.1.5. Obscurants to Visibility

**A7.2. NVG Preflight:**

A7.2.1. Check Adjustments/Helmet Fit and Security

A7.2.2. Batteries

A7.2.3. Resolution/Focus

A7.2.4. NVG Compatible Flashlight

**A7.3. Cockpit Preflight:**

A7.3.1. Cockpit Setup

A7.3.2. Cockpit Lighting (Leaks)

A7.3.3. NVIS Filter Installation

A7.3.4. Cockpit FAM

**A7.4. Before Takeoff:**

A7.4.1. Don NVGs/Check focus and Adjust as required

A7.4.2. Stow for Takeoff

**A7.5. Airborne:**

A7.5.1. Exterior Lights

A7.5.2. NVG Donning

A7.5.3. Scan Pattern

A7.5.3.1. Forward Scan

A7.5.3.2. Narrow Field of View

A7.5.3.3. Peripheral Vision

A7.5.3.4. Scan Techniques

A7.5.4. Join-up and Enroute Considerations

A7.5.4.1. Rejoin/Closure

A7.5.4.2. Air to Air TACAN

**A7.6. Mission:**

A7.6.1. Minimum Altitudes

A7.6.2. Weather Avoidance

A7.6.3. City / Cultural Lighting

A7.6.4. Direction / Orientation of Lighting

A7.6.5. NVG Formations

**A7.7. NVG Abnormal Situations / Emergencies:**

A7.7.1. NVG Lost Sight

A7.7.2. NVG Lost Wingman

A7.7.3. Transition to Instruments

A7.7.4. Visual Illusions / Depth Perception

A7.7.5. Disorientation / Misorientation / Vertigo

A7.7.6. Fatigue

A7.7.7. NVG Failure

A7.7.8. Battery Failure / Swap Out

A7.7.9. Overconfidence in NVG Capabilities

A7.7.10. Correct Lighting of Primary / Secondary Flight Instruments

A7.7.11. Lost Comm

A7.7.12. Unusual Attitudes / Recoveries

A7.7.13. Aircraft Emergency

A7.7.14. Ejection-Goggle Off

A7.7.15. NVG FOD Considerations (Batteries, Equipment, etc.)

**A7.8. NVG ROE / Training Rules**

**Attachment 8****AIR COMBAT TRAINING/EXERCISE GUIDE****A8.1. Security:**

- A8.1.1. Normal mission procedures
- A8.1.2. Emergency recoveries
- A8.1.3. Divert
- A8.1.4. Bailout

**A8.2. Recovery/Landing:**

- A8.2.1. Rejoin
- A8.2.2. Battle damage/bomb check (if applicable)
- A8.2.3. Flight break-up (if applicable)
- A8.2.4. Contingency routing
  - A8.2.4.1. Hung/unexpended ordnance (if applicable)
  - A8.2.4.2. Weapons/aircraft malfunction (if applicable)
- A8.2.5. Pattern and landing
- A8.2.6. After landing/de-arm

**A8.3. Special Subjects:**

- A8.3.1. Instructor responsibilities
- A8.3.2. Chase procedures
- A8.3.3. IFF procedures
- A8.3.4. Radar/visual search responsibilities/midair collision avoidance
- A8.3.5. Dissimilar formations
- A8.3.6. Terrain avoidance
  - A8.3.6.1. Departure/enroute/recovery
  - A8.3.6.2. Use of radar altimeters
- A8.3.7. Bird strike procedures/use of visor(s)
- A8.3.8. Hazards associated with human factors (i.e., Channelized attention, complacency task saturation/prioritization).
- A8.3.9. Visual illusions/perceptions
- A8.3.10. Spatial disorientation/unusual attitudes
- A8.3.11. Lost wingman

A8.3.12. Radio inoperative

A8.3.13. SARCAP

A8.3.14. Recall procedures

A8.3.15. SIIs

A8.3.16. G-Awareness

**Attachment 9****LOW LEVEL NAVIGATION GUIDE****A9.1. General:**

- A9.1.1. Route/Clearance/Restrictions
- A9.1.2. Flight Responsibilities
  - A9.1.2.1. Navigation
  - A9.1.2.2. Visual Search
- A9.1.3. Entry/Spacing/Holding/Initial Altitude (MSA)

**A9.2. Route Procedures:**

- A9.2.1. Stealth Check/Fence Check
- A9.2.2. Formation/Turns
- A9.2.3. Low-Level Navigation
  - A9.2.3.1. Dead Reckoning
  - A9.2.3.2. Use of Nav Aids
  - A9.2.3.3. Use of INS
  - A9.2.3.4. Visual Procedures
  - A9.2.3.5. Updates
  - A9.2.3.6. Timing
  - A9.2.3.7. Fuel Awareness
  - A9.2.3.8. Terrain Avoidance/Following
  - A9.2.3.9. Leg Altitudes
    - A9.2.3.9.1. Obstacles
- A9.2.4. Threat Reactions/Avoidance

**A9.3. Emergencies:**

- A9.3.1. Aircraft Malfunctions
- A9.3.2. Route Abort Procedures/ATC Frequencies

**A9.4. TRs/Special Operation Instructions****A9.5. Alternate Mission:**

- A9.5.1. Type Mission
- A9.5.2. Mission Objectives

**A9.6. Special Subjects:**

A9.6.1. Airspace Restrictions

A9.6.2. Ops Checks

A9.6.3. Fuel Awareness/Consumption Rates

A9.6.4. Maneuvering Limits

A9.6.4.1. Airspeed

A9.6.4.2. Gs

A9.6.4.3. Recognition/Prevention/Recovery from Out of Control

A9.6.5. Time to Ground Impact

A9.6.5.1. Wings Level

A9.6.5.2. Over Bank/G-Loading

A9.6.6. Night Considerations

A9.6.7. Hazards Associated W/Human Factors (Channelized Attention, Task Saturation, Prioritization, and Complacency).

**Attachment 10****MISSION DEBRIEFING GUIDE****A10.1. Ground Procedures****A10.2. Takeoff, Join-Up, Departure****A10.3. En Route Procedures****A10.4. Recovery/Landing/After Landing****A10.5. General:**

- A10.5.1. Radio procedures
- A10.5.2. Flight discipline/effectiveness
- A10.5.3. General areas for improvement

**A10.6. Specific Mission Accomplishment/Analysis:**

- A10.6.1. Mission reconstruction
- A10.6.2. Mission support (FAC, GCI, helicopters, etc.)
- A10.6.3. VTR/film assessment (if applicable)
- A10.6.4. Learning objectives achieved
- A10.6.5. Lesson(s) learned
- A10.6.6. Recommendations for improvement

**A10.7. Comments/Questions**