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SECRETARY OF THE AIR FORCE**

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Flying Operations**

F-16--OPERATIONS PROCEDURES

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This publication establishes effective and safe operations of the F-16 and implements AFPD 11-2, *Aircraft Rules and Procedures*; AFPD 11-4, *Aviation Service*; and AFI 11-202V3, *General Flight Rules*. It establishes the minimum Air Force operations procedures for personnel performing duties in the F-16. This publication applies to the US Air Force Reserve Command (AFRC) and the Air National Guard (ANG). MAJCOMs, Direct Reporting Units (DRU) and Field Operating Agencies (FOA) will forward proposed MAJCOM/DRU/FOA-level supplements to this volume to HQ USAF/A3O-AT, through HQ ACC/A3TO, for approval prior to publication IAW AFPD 11-2, paragraph 4.2. Copies of approved and published supplements will be provided by the issuing office to HQ USAF/A3O-AT, HQ ACC/A3TO, and the user MAJCOM/ DRU/FOA offices of primary responsibility (OPR). Field units below MAJCOM/DRU/FOA level will forward copies of their supplements of this publication to their parent MAJCOM/DRU/FOA OPR for post-publication review. **NOTE:** The above applies only to those DRUs/FOAs that report directly to HQ USAF. Keep supplements current by complying with AFI 33-360, *Publications and Forms Management*.

Waiver authority to this publication is established in [paragraph 1.3](#). See [paragraph 1.4](#) for guidance on submitting comments and suggesting improvements.

This instruction requires the collection or maintenance of information protected by the Privacy Act of 1974. The authority to collect and maintain the records prescribed in this instruction are 37 USC 301a, Incentive Pay; Public Law 92-204 (Appropriations Act for 1973), Section 715; Public Law 93-570 (Appropriations Act for 1974); Public Law 93-294 (Aviation Career Incentive Act of 1974); DOD Instruction 7730.57, *Aviation Career Incentive Act of 1974 and Required Annual Report*; AFI 11-401, *Aviation Management*; and E.O. 9397, *Numbering System*.

for *Federal Accounts Relating to Individual Persons*. System of records notice F011 AF/XOA, Aviation Resource Management System (ARMS), applies.

Records Disposition. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located under AFRIMS in the Air Force Portal A-Z Applications List.

NOTE:

This instruction contains references to the following field (subordinate level) publications and forms which, until converted to departmental level publications and forms may be obtained from the respective MAJCOM publication distribution office.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include: changes waiver authority for those forces presented to a COMAFFOR; brings minimum safe altitude/route abort altitude computations into compliance with AFI 11-202V3; complies with HQ USAF direction to capture Chemical, Biological, Nuclear and High-Yield Explosive (CBRNE) information from rescinded AFI 10-2602 by creating a new Attachment 2; complies with HQ USAF direction to add language about aviation fuel optimization culture; adds guidance for GCAS settings; makes numerous administrative changes; increases standardization with other Combat Air Forces (CAF) 11-2MDS Volume 3s.

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Chapter 1

GENERAL GUIDANCE

1.1. Abbreviations, Acronyms, and Terms. See [Attachment 1](#).

1.2. Responsibilities. This instruction, in conjunction with other governing directives, prescribes procedures for operating F-16 aircraft under most circumstances. It is not a substitute for sound judgment. Procedures not specifically addressed may be accomplished if they enhance safe and effective mission accomplishment.

1.3. Waivers. Unless another approval authority is cited, waiver authority for this volume is the MAJCOM/A3, or COMAFFOR for those aircrew and assets under the COMAFFOR's oversight. COMAFFOR will notify HQ ACC/A3 and home station MAJCOM/A3 of waivers within 72 hours of approval.

1.4. Processing Changes.

1.4.1. Refer recommended changes and questions about this publication through MAJCOM channels to the Office of Primary Responsibility (OPR) per AFI 11-215, *USAF Flight Manuals Program (FMP)* using AF Form 847, *Recommendation for Change of Publication*.

1.4.2. HQ ACC/A3 will coordinate all changes to the basic volume with all MAJCOM/A3s.

Chapter 2

MISSION PLANNING

Section 2A—General

2.1. Responsibilities. The responsibility for mission planning is shared jointly by all flight members and the operations and intelligence functions of fighter organizations. Accomplish sufficient flight planning to ensure safe mission execution, to include fuel requirements, map preparation, and takeoff/landing data.

2.2. Bird/Wildlife Aircraft Strike Hazard (BASH) Programs. BWC are defined in AFI 91-202, *The US Air Force Mishap Prevention Program*, and AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*. The OG/CC will determine local BASH procedures.

2.2.1. Takeoffs, landings, or low-levels within one hour of either sunrise or sunset during the phase II period increase likelihood of birdstrike. Significant bird hazards are published in FLIP GP, the IFR Supplement and local airfield guidance.

2.2.2. When operating at airfields where no BASH program exists, pilots will make appropriate judgments based on observable bird conditions and seek assistance from local airfield personnel.

2.2.3. Pilots will consider bird migratory patterns during enroute portion of the mission to minimize the potential of an in-flight bird strike. The Bird Avoidance Model (BAM) on United States Avian hazard Advisory System (<http://www.usahas.com>), provides BASH information, including regionalized CONUS bird migration, PFPS software overlay, and latest news. See AFPAM 91-212 for additional information.

2.3. Standards. The OG/CC may publish and approve group or wing standards. Operations Group Stan/Eval (OGV) will review all standards for AFI 11-series compliance prior to publication.

2.4. CBRNE. Procedures for operation in a CBRNE-threat environment are contained in [Attachment 2](#).

2.5. Flight Material Preparation.

2.5.1. **Mission Data Card (MDC).** The minimum TOLD requirements on the MDC are: 2,000 foot acceleration check speed (if computed takeoff roll exceeds 2,500 feet); refusal speed (dry/wet); rotation speed; takeoff speed; takeoff distance; normal landing speed and distance (dry/wet); heavyweight (immediately after takeoff) landing speed and distance (dry/wet). If computed takeoff roll is less than 2,500 feet, evaluate aircraft performance by comparing actual takeoff distance to computed takeoff distance or use a 1000' acceleration check speed.

2.5.2. **Local Area Maps.** A local area map is not required if pilot aids include jettison areas, divert information, controlled bailout areas, and provide sufficient detail of the local area to remain within assigned training areas.

2.5.3. **Enroute Charts.** Pilots may substitute FLIP enroute charts for maps on navigational flights within areas adequately covered by these charts.

2.5.4. Low Altitude Maps.

2.5.4.1. On low altitude flights, each pilot will carry a current map (updated using Chart Update Manual or electronic equivalent) of the route/operating area. It will be of such scale and quality that the detail of terrain features, hazards, and chart annotations permits navigation and safe mission accomplishment. Circle/highlight manmade obstacles at above planned flight altitude within 5nm of the planned route. Annotate time or distance tick marks and headings.

2.5.4.2. Annotate route abort altitude (RAA) using the IFR Off Airways guidance in AFI 11-202V3 chapter 8.

2.5.4.3. For flights inside the Continental United states (CONUS) under Visual Flight Rules (VFR) or inside Military Training Routes (MTR), comply with the following:

2.5.4.3.1. Use FLIP AP/1B and either sectional aeronautical charts or mission planning software (e.g. PFPS/Falcon View/JMPS). Select the following overlay options for PFPS/Falcon View: airports/heliports, airspace boundaries, airways, MTR, parachute jump and special use airspace boundaries.

2.5.4.3.2. Annotate Low level charts, or locally developed low-level route books , with location and dimensions of class B/C/D airspace, military airfields, civil airfields, and other potential high density traffic areas (e.g. parachute activity areas and ultra light/hang glider/glider sites) within 5 nm of any planned VFR route or MTR lateral boundary. Annotate airfield approach control frequencies in the vicinity of class B/C/D airspace as well as the intersection of other VR/IR routes or other areas of conflict.

2.5.4.4. Outside the CONUS, follow gaining MAJCOM, theater, or host nation guidance on mission planning. If no such guidance exists, use the best charts or flight planning software overlay options available to accomplish the intent of maximizing traffic awareness and awareness of controlled airspace boundaries.

2.6. Fuel Conservation. Manage aviation fuel as a limited commodity and precious resource. Design procedures for optimal fuel use and efficiencies throughout all phases of mission execution, to include ground operations, flight plans, power settings and climb/descent profiles. Incorporate enroute tasks to make maximum use of airborne learning opportunities.

2.7. Overwater. Plan overwater sorties outside the local training area (e.g. cross countries, deployments, and PDM inputs) as a two-ship minimum. The OG/CC may approve exceptions.

2.8. Briefing and Debriefing.

2.8.1. All flight members will attend the briefing unless previously coordinated with unit/squadron supervisors. Flight leads are responsible for presenting a logical briefing to promote a safe and effective mission. Structure flight briefings to accommodate the capabilities of each pilot in the flight. Any item published in CAF/wing/group/squadron standards or AFIs and understood by all participants may be briefed as "standard."

2.8.2. Flight leads must plan adequate time to discuss required briefing items depending on complexity of the mission and pilot capabilities, and must start flight briefings at least 1.5 hours before scheduled takeoff. Alert briefings will start in sufficient time to be completed prior to pilot changeover. Items may be briefed in any sequence, provided all minimum

requirements listed in this AFI and AFI 11-202v3 are addressed. Additional time and CRM emphasis is required in D-model sorties especially on FAM and Incentive flights. Passenger must demonstrate oxygen regulator use, ability to establish multiple airways and mask removal after being strapped in. Reference [Attachment 3](#) for example briefing guides. All flight briefings will include:

2.8.2.1. Weather and NOTAMs

2.8.2.2. Emergency procedures

2.8.2.3. Mission priorities and task management

2.8.2.4. Significant rules (e.g. SPINS, Training Rules, ROE).

2.8.2.5. Flight member responsibilities and deconfliction contracts. Flight leads will brief a formation deconfliction/blind/get well plan for every phase of flight.

2.8.3. **Low-level Briefing.** Emphasize:

2.8.3.1. Obstacle/terrain acquisition and avoidance, bird hazards, emergency actions and weather avoidance with route abort procedures.

2.8.3.2. Employment of all controlled-flight-into-terrain protection features, e.g. Automatic Low Altitude Warning (ALOW)/Line in the Sky (LIS)/Ground Collision Avoidance System (GCAS).

2.8.3.3. Human factors to include task prioritization, g-excess illusion, and perceptual issues associated with flight over water/featureless terrain.

2.8.3.4. Airfield approach control frequencies in the vicinity of class B/C/D airspace as well as the intersection of other VR/IR routes or other areas of conflict.

2.8.4. **Dissimilar Formation Briefing.** Emphasize proper position to ensure wingtip clearance, flight member responsibilities, and aircraft-unique requirements for each phase of flight.

2.8.5. **Alternate Mission/Events and Multiple Go Days.**

2.8.5.1. Brief an alternate mission for each flight that is less complex than the primary mission. Unbriefed missions/events will not be flown. Mission elements may be modified and briefed airborne as long as flight safety is not compromised. Flight leads will ensure changes are acknowledged by all flight members. Continuation training (CT) missions may fly primary or alternate missions in any sequence.

2.8.5.2. During deployed operations, exercises, or multiple-go days when aircraft turn times do not allow follow-on mission brief(s), if all flight members attend an initial flight brief, the flight lead need only brief any changes for subsequent flights.

2.8.5.3. On multiple-go days, subsequent missions will be of equal or less complexity. Schedule and plan upgrade events on the first sortie only. If that sortie is non-effective for weather, maintenance or airspace IPs may elect to accomplish the planned upgrade events in the second sortie.

2.8.6. **Debriefing.**

2.8.6.1. All missions will be debriefed and address in-flight execution, flight member responsibilities, deconfliction contracts, tactical employment priorities, and sensor management.

2.8.6.2. Flight leads will review the video/audio record of all tactical portions of the sortie to assess flight members' AGSM effectiveness. It is imperative to evaluate not only during the G-ex, but also after the pilot has had time to fatigue--typically when the AGSM breaks down and G-induced Loss of Consciousness (GLOC) occurs. Pilots with poor AGSM technique or low G-tolerance will be identified to the operations officer. The squadron commander has the option of directing refresher centrifuge training in accordance with AFI 11-404, *Centrifuge Training for High-G Aircrew*.

2.9. Unit Developed Checklists/Local Pilot Aids. Unit developed checklists used in lieu of flight manual checklists must contain all items, verbatim and in order, unless specifically addressed in the flight manual. Pilot aids will contain:

2.9.1. Briefing guides (reference [Attachment 3](#) for examples).

2.9.2. Local radio channelization.

2.9.3. Appropriate airfield diagrams, to include cable/net barrier information.

2.9.4. Emergency information (impoundment procedures, emergency action checklists, NORDO procedures, divert information, search and rescue procedures, etc).

2.9.5. Divert base cable and barrier information.

2.9.6. Bailout and jettison areas.

2.9.7. Cross-country procedures to include: command and control, engine documentation, Joint Oil Analysis Program (JOAP) samples, and aircraft servicing.

2.9.8. Other information as desired such as: stereo flight plans, turn procedures, local training areas, instrument preflight, and alert setup procedures.

Section 2B—Night (see also night sections of Chapter 3, Chapter 5 and Chapter 6)

2.10. Minimum Safe Altitude (MSA). Compute the MSA for each leg of the intended route of flight in accordance with AFI 11-202V3.

2.11. Night chart requirements. Minimum requirement is a Form 70 or chart/map containing headings, RAAs, MSAs, and maximum/minimum route structure altitudes.

2.12. Low Altitude Navigation and Targeting Infra Red for Night (LANTIRN) Navigation Pod Operations. For brevity, the remainder of this AFI will refer to operations using this pod as Terrain Following Radar (TFR) Operations. For these purposes, TFR will presume use not only of the TFR element of the pod, but also the Navigation Forward-Looking Infra Red (NFLIR) imagery.

2.12.1. **TFR Planning.**

2.12.1.1. **Bank angles.** Plan turn point bank angles using realistic system limitations, not to exceed 45 degrees.

2.12.1.2. **Letdown Corridors.** To the maximum extent possible, select letdown points that avoid initial descent into rugged or mountainous terrain. Compute primary and alternate entry point TF letdown corridors, Recovery Initiation Altitudes (RIA), altitudes for terrain at 1 NM, and altitudes for commanded level off.

2.12.2. **TFR Briefing.** Emphasize ensuring the LANTIRN system is fully operational, transitioning to low altitude, and TF maneuvering limitations.

Chapter 3

NORMAL OPERATING PROCEDURES

Section 3A—Ground Operations

3.1. Preflight.

- 3.1.1. **(B/D model aircraft)** when the rear cockpit is occupied by other than a fully qualified F-16 pilot, place the stick control switch in the FWD position.
- 3.1.2. Do not carry baggage/equipment in an unoccupied rear cockpit; in the avionics bay behind the cockpit; or in the aft canopy fixed transparency area (turtle back).
- 3.1.3. Do not place objects in or on top of the engine intake.
- 3.1.4. Secure publications, maps and personal items to avoid flight control/ throttle interference.
- 3.1.5. Select Pressure Breathing (PBG) except when using Aircrew Eye and Respiratory Protection System (AERPS) or Aircrew Chemical Defense Equipment (ACDE). If flying with the COMBAT EDGE vest, remove the port plug on the CRU-94 (if installed), stow the plug during flight to prevent a FOD hazard, then re-install upon completion of the sortie.
- 3.1.6. Ensure ejection seat survival kit deployment switch is in the automatic position.
- 3.1.7. Do not select CAT I on the Stores Configuration Switch with Category III configurations IAW T.O. 1F-16-1-2.
- 3.1.8. **(AFRC)** Before hot pit refueling, turn targeting pod power off. After fueling, taxi clear of the pits before re-applying power to the pod.

3.2. Ground Visual Signals. Normally, pilot and ground crew will communicate by the intercom system during all engine start, pre-taxi and end of runway (EOR) checks. Use the intercom system to the maximum extent possible anytime maintenance technicians are performing "redballs" on the aircraft and for EPU checks performed in congested areas. Do not actuate any system which endangers ground crew prior to receiving acknowledgment. Units with an active air defense commitment may waive use of ground intercom during alert scrambles. 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.

3.2.1. The following signals augment AFI 11-218:

- 3.2.1.1. **EPU OPERATIONAL CHECK.** Raise two fingers and rotate hand.
- 3.2.1.2. **FLIGHT CONTROLS CLEAR.** Raise arm, clench fist, and make a stirring motion.
- 3.2.1.3. **BRAKE CHECK.** Hold left or right arm horizontal, open hand and push forward, breaking at the wrist (as in applying rudder pedal pressure with feet).
- 3.2.1.4. **LOSS OF BRAKES WHILE TAXIING.** Lower tailhook.

3.2.1.5. **GUN ARMAMENT CHECK.** Point index finger forward with thumb upward simulating a pistol and shake head (yes or no).

3.2.1.6. **EPU ACTIVATION.** Raise hand with palm open and perform shoving motion indicating "stay away." Then cup hands over oxygen mask indicating hydrazine vapors may be present.

3.3. Taxi and Arming.

3.3.1. **Taxi Interval/Speed.** Minimum taxi interval is 150 feet staggered or 300 feet in trail. Spacing may be reduced when holding short of or entering the runway. Unless mission requirements dictate, limit taxi speed to 30 knots, 15 knots over a raised cable, and 10 knots in turns.

3.3.2. **Ice/Snow Conditions.** Do not taxi during ice and/or snow conditions until all portions of the taxi route and runway have been checked for safe conditions. When ice and/or snow are present on the taxiway, taxi on the centerline with a minimum of 300 feet spacing. Minimum RCR for taxi is 10. OG/CC may waive this requirement.

3.3.3. **Ice FOD Procedures.** The following procedures apply when the conditions in T.O. 1F-16-1 indicate engine damage due to icing is possible.

3.3.3.1. If conditions warrant, the Supervisor of Flying (SOF)/Top 3 will have the first flight lead start 5 minutes early to check for inlet ice formation.

3.3.3.2. Position ANTI ICE switch to ON prior to engine start.

3.3.3.3. An ice FOD monitor must be available to monitor the engine inlet for ice buildup whenever the aircraft is stopped for an extended period of time (i.e. ramp/shelter and EOR). Avoid standing water and snow/slush accumulations.

3.3.3.4. Hold in the arming spot with an ice FOD monitor present until cleared for take-off.

3.3.3.5. Shutdown immediately if icing is visually detected and notify the SOF/Top 3. Make an appropriate entry in the aircraft forms and qualified personnel must accomplish an intake inspection prior to restarting the engine.

3.3.4. **EPU Check.** Do not allow maintenance technicians to approach the aircraft until the EPU check is complete. Use intercom or a "thumbs up" signal to indicate when safe.

3.4. EOR Inspections and Before Takeoff Checks. Place hands in view of ground personnel while the quick check inspection and/or arming/de-arming are in progress. If the intercom system is not used during EOR checks, the pilot will establish and maintain visual contact with the chief and use visual signals. EOR inspections will be accomplished immediately prior to takeoff at a designated location, usually near the end of the runway or while departing the chock area (not required for alert scrambles). At non-USAF bases, make every attempt to coordinate an EOR inspection with the host maintenance unit.

3.4.1. **Forward Firing Ordnance.** Do not taxi in front of aircraft being armed/de-armed with forward firing ordnance.

3.4.2. Flight members will inspect each other for proper configuration and any abnormalities.

3.5. Flight Lineup. Consider weather conditions, runway conditions, and runway width. Minimum spacing between separated elements/flights is 500 feet. Wingmen must maintain wingtip clearance with their element lead. If runway width permits, lineup with wingtip clearance between all aircraft in the flight.

Section 3B—Takeoff and Departure

3.6. Takeoff.

3.6.1. Do not takeoff when the RCR is less than 10.

3.6.2. Pilots will review takeoff data with emphasis on takeoff and abort factors such as short/wet runway, heavy gross weights, cable configurations and abort sequence in formation flights.

3.6.3. On training missions, do not takeoff if the computed takeoff roll exceeds 80 percent of the available runway single ship or 70 percent for a formation takeoff.

3.6.4. Ensure a compatible departure end cable is raised for all takeoffs and landings (including remotely operated cables). OG/CC may waive this requirement.

3.6.5. OG/CC may approve intersection takeoffs if operational requirements dictate.

3.6.6. Make an afterburner takeoff anytime the computed MIL power takeoff roll exceeds 50 percent of the available runway.

3.6.7. **Centerline Stores.** Start the takeoff roll beyond a raised approach end cable unless runway length, runway conditions (wet/icy), winds, gross weight or cable availability dictate otherwise. Exception: aircraft with a centerline fuel tank may takeoff across approach end BAK-12 arrestment cables with an 8-point tie down system.

3.6.8. Minimum takeoff interval between aircraft/elements is 10 seconds (15 seconds for afterburner). Increase interval to 20 seconds minimum for join-up on top or when carrying live air-to-surface ordnance.

3.6.9. After releasing brakes, aircraft/elements will steer toward the center of the runway.

3.6.10. Formation Takeoff.

3.6.10.1. Formation takeoffs are restricted to two aircraft

3.6.10.2. Do not make formation takeoffs when:

3.6.10.2.1. Runway width is less than 125 feet.

3.6.10.2.2. Standing water, ice, slush or snow is on the runway.

3.6.10.2.3. The crosswind or gust component exceeds 15 knots.

3.6.10.2.4. Loaded with live munitions (excluding air-to-air missiles, 20mm ammunition, 2.75 rockets, AGM-88, AGM-65, and night illumination flares).

3.6.10.2.5. Ferrying aircraft from contractor/AFMC facilities.

3.6.10.2.6. Asymmetric loading or a difference of more than 2,500 pounds gross weight.

3.7. Initial Join-up and Rejoins.

- 3.7.1. Day weather minimums for VFR join-ups below a ceiling are 1,500 foot ceiling and 3 miles (5 km) visibility.
- 3.7.2. Flight leads will maintain 350 KIAS until join-up is accomplished unless mission requirements necessitate a different airspeed. Pilots may delay AB cancellation to establish closure on lead or lead element.
- 3.7.3. Battle damage/bomb check will be accomplished on RTB, when practical (i.e. weather prohibits accomplishing BD check). This check is mandatory after expending any ordnance (including 20mm ammunition).
- 3.7.4. Accomplish air-to-air systems checks above 10,000 MSL when practical.
- 3.7.5. For further join-up procedures, see Night Operational Procedures ([Section 3E](#)) and Instrument Procedures ([Chapter 4](#)).

Section 3C—Enroute

3.8. Air Refueling.

- 3.8.1. Pilots undergoing initial or recurrency training in air refueling will not refuel with a student boom operator (does not apply to KC-10). Lead/IP will announce when an upgrade or equal pilot is in the formation, and will request a qualified (non-student) boomer.
- 3.8.2. Pilots will inform boom operator when refueling from particular tanker type (e.g. KC-10, KC-135) for the first time.
- 3.8.3. Quick flow procedures are authorized and will be conducted IAW aircraft-specific T.O. 1F-16X-1.

3.9. Aircraft Handling Characteristics (AHC)/Maneuvering Parameters.

- 3.9.1. The following are the minimum altitudes for the prescribed maneuvers.
 - 3.9.1.1. Confidence Maneuvers/Advanced Handling - 10,000 feet AGL, except dive recovery maneuver (15,000 feet AGL minimum entry altitude).
 - 3.9.1.2. Horn Awareness and Recovery Training series (HARTS) numbers 1, 2 and 3 - 10,000 feet AGL.
 - 3.9.1.3. HARTS series numbers 4 and 5 - 15,000 feet AGL.
 - 3.9.1.4. Aircraft will not descend below 5,000 feet AGL during aerobatic maneuvering.
- 3.9.2. Avoid flight through wingtip vortices/jet wash. If unavoidable, the aircraft should be unloaded immediately to approximately 1 G.
- 3.9.3. Do not manually extend the trailing edge flaps in an attempt to improve aircraft performance. EXCEPTION: Trailing edge flaps may be manually extended during intercepts performed by air sovereignty tasked unit aircraft, or during low/slow (below 5000' AGL) VID training, on targets traveling at less than 200 KIAS.

3.9.4. Do not attempt to bypass flight control limiters to improve performance. Examples are: transfer fuel to alter center of gravity (CG), manual pitch override (MPO) to gain additional negative G or assaulting two limiters at low airspeed.

3.9.5. The minimum airspeed for all maneuvering is based upon activation of the low speed warning tone. When the low speed warning tone sounds, the pilot will take action to correct the low speed condition.

3.9.6. The following is guidance for Horn Awareness and Recovery Training Series (HARTS) (reference AFTTP 3-3.F-16):

3.9.6.1. HARTS maneuvers will be flown in CAT-1 loaded aircraft only.

3.9.6.2. In F-16 C/D Block 40-52 aircraft, do not fly HARTS maneuvers 4 and 5 unless in one of the following configurations: Clean, 300 gallon centerline tank, MAU-12s on stations 3 and 7, and/or AIM-9/AMDs on stations 1 and/or 9.

3.10. Formation, General. Flight leads and instructors will ensure contracts, roles and responsibilities of each flight member are established, briefed, executed and debriefed. Flight members will immediately notify lead if unable to fulfill basic responsibilities, contracts or other assigned tasks. Flight leads will avoid tasking element leads/wingmen beyond their abilities without sacrificing basic responsibilities. Reference AFTTP 3-3.F-16 and AFTTP 3-1.F-16.

3.10.1. The flight lead is always responsible for flight actions. Wingmen will be prepared to take the lead when directed.

3.10.2. In IMC, the maximum flight size in visual formation is four aircraft except when flying in close formation with a tanker.

3.10.3. Do not use rolling maneuvers to maintain or regain formation position below 5,000 feet AGL or in airspace where aerobatics are prohibited.

3.10.4. Use airborne visual signals in accordance with AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*, or detailed in local procedures. Initiate configuration changes for four-ship flights by radio call, when practical. When formation position changes are directed by radio, all wingmen will acknowledge prior to initiating the change. A radio call is mandatory when directing position changes at night or under instrument conditions.

3.10.5. Flight leads will not break up flights from visual or sensor formations until each pilot has a fix from which to navigate (visual, radar, INS or TACAN).

3.10.6. Lead changes.

3.10.6.1. The minimum altitude for changing leads within a formation is 500 feet AGL over land or 1,000 feet AGL over water [see also Night Operational Procedures ([Section 3E](#))].

3.10.6.2. During limited visibility conditions (e.g. night, IMC) initiate lead changes from a stabilized, wings level attitude [see also Night Operational Procedures ([Section 3E](#)) and Instrument Procedures ([Chapter 4](#))].

3.10.6.3. Do not initiate lead changes with the wingman further back than normal fingertip or route position, or greater than 30 degrees back from line abreast.

3.11. G-Awareness Exercises (G-Ex) (Reference AFTTP 3-3. F-16 and AFI 11-214).

3.11.1. A G-Ex is required if planned maneuvering will exceed 5g. Accomplish the G-Ex day or night, only in VMC, with a discernable horizon, and only when unaided or NVG-aided visual cues are adequate to safely perform the maneuver. If these requirements are not met, omit the G-Ex and reduce mission tasking to limit maneuvering to 5g.

3.11.2. Unless performing a syllabus required event (e.g. chase of a G-Ex), flight members will maintain a minimum of 6,000 feet separation between aircraft during G-Ex execution. Use on-board systems (e.g. air-to-air TACAN, Radar, data link) to establish separation prior to maneuver execution. The G-Ex will consist of at least two 90 degree turns (the second turn of the G-Ex for air-to-air sorties will be a minimum of 180 degrees). The first turn will be a smooth onset rate to 4-5g. Ensure proper g-suit operation and anti-g straining maneuver. Regain airspeed and perform the second turn at 5-7g (or as aircraft limits allow).

3.11.3. Conduct the G-Ex in order of preference listed below to help ensure the airspace is clear from potential traffic conflicts. If practical, use ATC to help clear the airspace:

3.11.3.1. Special Use Airspace (e.g. Restricted/Warning areas, Air Traffic Control Assigned Airspace (ATCAA), MOAs and MAJCOM approved large scale exercise/special mission areas).

3.11.3.2. Above 10,000 MSL outside of special use airspace.

3.11.3.3. Inside the confines of a Military Training Route (MTR).

3.11.3.4. Below 10,000 feet MSL outside of special use airspace.

3.11.4. Flight/element leads flying outside of CONUS will follow gaining MAJCOM, theater or host nation guidance on airspace in which G-Ex may be performed. If no such guidance exists, follow the above procedures to the maximum practical extent.

3.11.5. Film the G-Ex in HUD and in Hot Mic. Fly the tactical portion of all basic missions (BFM, BSA, ACM, etc) in Hot Mic to enable assessment of the AGSM.

3.12. Tactical Formations.

3.12.1. **Tactical Maneuvering.** Wingmen/elements must maneuver relative to the flight lead/lead element and they must maintain sight. Trailing aircraft/elements are responsible for deconflicting with lead aircraft/elements and will do so vertically when required. At low altitude, wingmen/trailing elements will deconflict high. Trailing aircraft/element(s) will maintain sufficient spacing so that primary emphasis during formation maneuvering/turns is on low altitude awareness and deconfliction within elements, not on deconfliction between elements. Normally, the wingman is responsible for flight path deconfliction, but the flight/element lead becomes primarily responsible when:

3.12.1.1. Tactical maneuvering places the leader well aft of the wingman's 3/9 line or forces the wingman's primary attention away from the leader (e.g., wingman becomes engaged fighter).

3.12.1.2. The wingman calls "padlocked."

3.12.1.3. The wingman calls "blind. Primary deconfliction responsibility transfers back to the wingman once the wingman acknowledges a visual on his lead.

3.12.2. Loss of Visual ("Blind") Procedures.

3.12.2.1. Flight members will call blind with an altitude to the hundreds of feet, i.e. "Blind 16.9". The visual flight member will respond with "visual" and talk eyes on.

3.12.2.2. If the other flight member is also "Blind," they will call blind with an altitude. Lead will be directive to ensure altitude separation is maintained and direct the wingman's flow direction. Use a minimum of 500 ft (1,000 above 5,000 ft AGL) altitude separation. Avoid climbs/descents through the deconfliction altitude. All flight members must visually clear their flight path.

3.12.2.3. If there is no timely acknowledgment of the original "Blind 16.9" call, then the flight member/element initiating the call will maneuver away from the last known position of the other flight member/element and climb/descend if necessary. If visual contact is still not regained, the flight lead will take additional positive action to ensure flight path deconfliction. Scenario restrictions such as sanctuary altitudes and/or adversary blocks must be considered.

3.12.3. **Sensor formations.** If SA is lost or "Blind" in a sensor formation, call "Blind" with altitude and follow the above procedures. Wingmen will strive to maintain an altitude stack at all times in sensor formation.

3.13. Chase Formation.

3.13.1. **Restrictions.** Any pilot may fly safety chase for aircraft under emergency or impending emergency conditions. All chase events may be flown by IP/Flight Examiners (FEs) or upgrading IPs under the supervision of an IP. Qualified pilots, including Initial Qualification Training (IQT)/Mission Qualification Training (MQT) pilots who have successfully completed an Instrument/Qualification evaluation) may chase as safety observer for aircraft performing simulated instrument flight or hung ordnance patterns. Specialized missions (i.e., OT&E, Weapon System Evaluation Program (WSEP), live weapons delivery, etc) and training conducted IAW AFI 11-2F-16V1, *F-16--Aircrew Training*, may be chased by Combat Mission Ready (CMR)/Basic Mission Capable (BMC) pilots designated by group/squadron commanders.

3.13.2. Procedures.

3.13.2.1. On transition sorties, the chase aircraft will perform a single-ship takeoff. In-flight, the chase aircraft will maneuver as necessary, but must maintain nose-tail separation. The chase will not stack lower than lead aircraft below 1,000 feet AGL. In the traffic pattern, the chase aircraft may maneuver as necessary to observe performance.

3.13.2.2. A safety observer in chase will maneuver in a 30-60 degree cone with nose/tail clearance out to a range of 1 NM, from which he can effectively clear and/or provide assistance.

3.13.2.3. For live ordnance missions, the chase pilot is responsible for ensuring frag deconfliction is maintained for his aircraft.

3.14. Show Formation. Such formations will be specifically briefed and flown IAW applicable directives. Refer to AFI 11-209, *Air Force Participation in Aerial Events*, and applicable MAJCOM or ANG directives for specific rules and appropriate approval levels to participate in static displays and aerial events.

3.15. Low Altitude Operations (reference AFTTP 3-1. F-16 and AFTTP 3-3.F-16).

3.15.1. **Airspeed and Altitude.** The minimum airspeed for low level navigation is 300 KIAS and the minimum altitude is 500 ft AGL (or IAW approved step-down training). For night or IMC operation, the minimum altitude is the MSA (see AFI 11-202V3) unless operating under TFR procedures or NVG Procedures.

3.15.2. At low altitude, the immediate reaction to task saturation, diverted attention, knock-it-off, or emergencies is to climb to a prebriefed safe altitude (minimum 1,000 feet AGL).

3.15.2.1. For F-16s equipped with GCAS “PULLUP” command capability, when a PULLUP-PULLUP” warning sounds, the pilot will take immediate action to ensure terrain clearance, while referencing the primary flight instruments.

3.15.2.2. F-16’s with pilot-selectable GCAS Minimum Terrain Clearance (MTC) settings will set an altitude that does not result in “PULL-UP” warnings at normal operational altitudes. Minimum MTC is 50 feet for strafe and visual bombing, and 125 feet for all other operations. Wings with significant tall trees in the operating area or VR routes will account for average tree height when setting MTC altitudes.

3.15.3. **Weather.** Consult FLIP for minimum weather on a VR or IR route. For low altitude training outside the CONUS, comply with theater/host nation guidance.

3.15.3.1. **Deteriorating weather on a VR Route.**

3.15.3.1.1. **Able to maintain VMC.** If it becomes apparent that weather ahead will not permit continued flight on the VR, maintain VMC, slow down, maneuver to exit the route structure, and establish a VFR hemispheric altitude.

3.15.3.1.2. **Unable to maintain VMC.** Climb to briefed deconfliction altitudes (reference Chapter 2). Squawk applicable (IFF/SIF) modes and codes and contact a controlling agency to pick up an IFR clearance if required. Maintain preplanned ground track.

3.15.4. **Obstacle/terrain Avoidance.** If unable to visually acquire or ensure lateral separation from known vertical obstructions which are a factor to the route of flight, flight leads will immediately direct a climb NLT 3 NM prior to the obstacle to an altitude that ensures vertical separation.

3.15.5. At altitudes below 1,000 feet AGL, wingmen will not fly at a lower AGL altitude than lead.

3.15.6. When crossing high or hilly terrain, maintain positive G on the aircraft and do not exceed 120 degrees of bank. Maneuvering at less than 1 G is limited to upright bunting maneuvers.

3.15.7. **TFR Operations during the Day.** In order to train for TFR at night, comply with applicable portions of Section 3E Night. Vision Restriction Devices (VRD) will only be worn while conducting daytime TFR training. When a VRD is in use, a safety observer must be present. A safety observer is defined as a crewmember qualified in that aircraft in the rear cockpit of a two-place aircraft or another aircraft flying in the chase position. The chase aircraft must maintain continuous visual contact and have two-way radio communication between aircraft. During training with a VRD, pilots are cleared to fly no lower than they are certified to fly during night TFR.

Section 3D—Recovery and Landing

3.16. Gear Checks. For a VFR straight in, call gear down no later than 3 mile final. For an instrument approach (reference [Chapter 4](#)), call gear down at the final approach fix or published glide slope intercept point. For an overhead, call gear down departing the perch. For a SFO or FO, call gear down at base key.

3.17. Angle of Attack (AOA). Final approach will normally be flown at 11 degrees AOA. Pilots will compare the computed final approach airspeed with AOA.

3.18. Landing restrictions. When the computed landing roll exceeds 80 percent of the available runway, land at an alternate if possible. When the RCR at the base of intended landing is less than 10, land at an alternate if possible. Do not land over any raised web barrier (e.g., MA-1A, 61QS11).

3.19. Desired touchdown point and spacing.

3.19.1. The desired touchdown point is 500 feet from the aim point. The aim point for a VFR approach is the threshold. The aim point for a precision approach is the glide path interception point. To avoid possible speedbrake or nozzle damage, touch down either past a raised approach-end cable, or 500 feet prior to the cable. With centerline stores, touchdown will normally be past an approach-end cable. Circumstances that may dictate landing prior to the cable include runway length, wind, runway condition (wet or icy), gross weight or an aircraft malfunction where full normal braking may not be available. Single-ship or formation landings with centerline stores may be made across BAK-12 arrestment cables which have been modified with an 8-point-tie-down system.

3.19.2. Touchdown spacing behind an aircraft while flying a 13 degree approach will be a minimum of 6,000 feet due to susceptibility of the aircraft to wake turbulence and speedbrake/tail scrapes. Minimum pattern and touchdown spacing between landing aircraft is 3,000 feet for similar aircraft (e.g. F-16 following F-16), 6,000 feet for dissimilar fighter aircraft (e.g., F-16 following F-15) or as directed by MAJCOM or the landing base, whichever is higher. When wake turbulence is expected due to calm winds or when landing with a light tail wind, spacing should be increased.

3.19.3. All aircraft will land in the center of the runway and clear to the cold side when speed/conditions permit.

3.20. Low Approaches.

3.20.1. Observe the following minimum altitudes:

3.20.1.1. IP/FEs flying chase position: 50 feet AGL.

3.20.1.2. Formation low approaches: 100 feet AGL.

3.20.1.3. Chase aircraft during an emergency: 300 feet AGL unless safety or circumstances dictate otherwise.

3.20.2. During go-around, remain 500 feet below VFR overhead traffic pattern altitude until crossing the departure end of the runway unless local procedures, missed approach/climbout procedures or controller instructions dictate otherwise.

3.21. Touch-and-Go Landings. Fly touch-and-go landings IAW AFI 11-202V3. Do not fly them with live or hung external ordnance or with fuel remaining in any external tank.

3.22. Overhead Traffic Patterns. Unless the OG/CC determines that local conditions (e.g. threat condition, populated areas) dictate otherwise, do not fly overhead patterns with unexpended heavy-weight ordnance (larger than BDU-33).

3.23. Tactical Overhead Traffic Patterns. Tactical entry to the overhead traffic pattern is permitted if the following conditions are met:

3.23.1. Published overhead pattern altitude and airspeed are used.

3.23.2. Specific procedures have been developed locally and coordinated with appropriate air traffic control agencies.

3.23.3. The flight consists of a maximum of four aircraft (aircraft/elements more than 6,000 feet in trail will be considered a separate flight).

3.23.4. No aircraft offset from the runway in the direction of the break (the intent is to avoid requiring a tighter than normal turn to arrive on normal downwind).

3.23.5. Normal downwind, base turn positions, and spacing are flown.

3.24. Closed Traffic Patterns. Initiate the pattern at the departure end of the runway unless directed/cleared otherwise by local procedures or the controlling agency. An element low approach may be followed by a sequential closed with controller approval. Plan to arrive on downwind at 200-250 KIAS.

3.25. Back Seat Approaches and Landings.

3.25.1. An upgrading IP may only accomplish back seat landings when an IP is in the front cockpit.

3.25.2. During back seat approaches and landings, the front seat pilot will visually clear the area, monitor aircraft parameters/configurations and be prepared to direct a go-around or take control of the aircraft (as briefed by the rear cockpit IP) if necessary.

3.26. Formation Approaches and Landings.

3.26.1. Aircraft must be symmetrically loaded. Consider symmetrical as those stores loadings which do not require an abnormal trim or control application to counter a heavy wing or yaw during takeoff and acceleration to climb airspeed.

3.26.2. Elements will be led by a qualified flight lead unless an IP or flight lead qualified squadron supervisor is in the element.

3.26.3. Use a rate of descent similar to a precision approach. Fly a published precision instrument approach if one is available. If not, fly a non-precision approach or VFR straight in and reference available lighting systems (e.g. VASI, PAPI) for descent angle.

3.26.4. If the crosswind exceeds 5 knots, lead will position the wingman on the upwind side.

3.26.5. The wingman will maintain a minimum of 10 feet lateral wingtip spacing. If the wingman overruns lead after landing, accept the overrun and maintain the appropriate side of the runway and wingtip clearance. Do not attempt to reposition behind lead.

3.26.6. Do not make formation landings when:

- 3.26.6.1. The crosswind or gust component exceeds 15 knots.
- 3.26.6.2. The runway is reported wet; or ice, slush or snow is on the runway.
- 3.26.6.3. The runway width is less than 125 feet.
- 3.26.6.4. Arresting gear tape connectors extend onto the runway surface at the approach end of 125 feet wide runways (excluding overrun installations).
- 3.26.6.5. Landing with hung ordnance or unexpended live bombs.
- 3.26.6.6. The weather is less than 500 foot ceiling and 1.5 miles visibility (or a flight member's weather category, whichever is higher). This applies to chased approaches and formation low approaches.

Section 3E—Night (see also night sections of Chapter 2, Chapter 5 and Chapter 6)

3.27. General Night Procedures.

3.27.1. **Night Ground Operations.** The anti-collision (strobe) light may be OFF and the position lights STEADY if they prove to be a distraction. Taxi spacing will be a minimum of 300 feet and on the taxiway centerline. The taxi light will normally be used during all night taxiing. **EXCEPTION:** When the light might interfere with the vision of the pilot of an aircraft landing or taking off, the taxiing aircraft will come to a stop if the area cannot be visually cleared without the taxi light.

3.27.2. **Night Takeoff.** Aircraft will maintain the anti-collision light ON and position lights FLASH for takeoffs, unless IMC will be encountered shortly after takeoff. **EXCEPTION:** For formation takeoffs, flight/element leads will turn the anti-collision light OFF and position lights STEADY after reaching the run-up position on the runway. During a night formation takeoff, brake release, gear retraction and AB termination will be called on the radio. Following takeoff, each aircraft/element will climb on runway heading to 1,000 feet AGL before initiating turns, except where departure instructions specifically preclude compliance.

3.27.3. **Night Join-up.** Weather criteria for night join-up underneath a ceiling is 3,000 foot ceiling and 5 miles visibility. After join-up, the anti-collision light will be OFF and position lights will be STEADY for all except the last aircraft, which will keep the anti-collision light ON and position lights FLASH unless otherwise directed by the flight lead.

3.27.4. **Position/Lead Changes.** Unless operating with NVGs and/or TFR, do not change lead or wing positions below 1,500 feet AGL unless on radar downwind. Call such changes over the radio and initiate them from a stabilized, wings-level attitude whenever possible.

3.27.5. **Night Break-up.** Prior to a night formation break-up, the flight lead will confirm position and transmit attitude, altitude, airspeed, and altimeter setting. Wingmen will acknowledge and confirm good navigational aids.

3.27.6. **Night Landing.** Land from the most precise approach available. Night formation landings will only be performed when required for safe recovery of the aircraft.

3.28. Operating with both Night Vision Goggles (NVG) and Terrain Following Radar (TFR). When both NVG and TFR are in use, pilots may rely on one system or the other as required in order to safely operate down to the applicable minimum altitudes. For example, with

a failed Nav FLIR but an operative TFR component of the Navigation Pod, pilots may choose to substitute NVG (if all requirements/minimum altitudes in para. 3.29 are met) for Nav FLIR.

3.29. Night Vision Goggles (NVG) Procedures.

3.29.1. **NVG 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. Reference AFI 11-301, *Aircrew Flight Equipment (AFE) Program*, 25 Feb 2009.

3.29.2. **Cockpit Lighting.** Fly with NVGs only in aircraft whose cockpit lighting MAJCOM designates as NVG compatible. MAJCOMs will only make such a designation if all control and performance instruments are sufficiently illuminated by the NVG-compatible lighting so as to make them immediately available to the pilot in the event they need to transition to instruments.

3.29.3. **Weather/Visibility/Illumination Levels/Minimum Altitudes.** Reference AFI 11-214 and AFI 11-202V3. Cease NVG operations anytime environmental conditions degrade NVG performance such that briefed formation positions cannot be flown.

3.29.4. **NVG Qualifications.** Do not wear NVGs in flight unless the pilot is NVG qualified or there is a qualified NVG IP in the flight (ratio of one NVG IP per non-NVG qualified pilot). F-16B/D Familiarization flights are authorized if appropriate academics are accomplished and an NVG IP is in the front seat.

3.29.5. **Radio Calls.** All flight members will make a radio call when going “NVGs on” or “NVGs raised/stowed.”

3.29.6. **Obstacle/Intra-Flight Deconfliction.** When flying in route formation, only one flight member per element will don/doff goggles at a time. Flight leads will call turns if forced to maneuver while flight members are donning/doffing NVGs.

3.29.7. **Takeoffs/Landings.** NVGs will be stowed or raised during takeoff until at or above 2000 feet AGL in climbing or level flight and only in VMC. Stow or raise NVGs no later than 5 minutes prior to landing unless NVGs are required to handle an emergency.

3.29.8. **NVG Use during Air to Air Refueling (AAR).** Stow or raise stow NVGs no later than the stern position and resume NVG use no earlier than boom disconnect.

3.30. Terrain Following Radar (TFR) Operations at Night.

3.30.1. **Minimum Altitude, Weather and Airspeed.** The minimum altitude for TFR training will be the higher of VR/IR/MOA minimum altitude or pilot minimum altitude as certified by the unit commander IAW AFI 11-2F16V1. The minimum weather for TFR on an IR/VR route will be as per FLIP. Minimum airspeed for TFR navigation is 400 KCAS.

3.30.2. **INS Alignment.** Do not conduct TFR operations unless the ground alignment was either full performance or an extended interrupted alignment with a flashing RDY/ALIGN (status 10).

3.30.3. **TFR Checks/Radio Calls.** Verify proper operation of all technical-order-required systems before operating at low altitude. To the maximum extent possible, do so above 10,000 feet MSL or within special use airspace. Set the CARA ALOW feature at 90 percent of the set clearance plane (SCP) or 90 percent of the command-directed minimum altitude,

whichever is higher. Pilots may place CARA to standby or off only during air refueling operations. All pilots will confirm TFR and radar altimeter are on and working properly before descending below the MSA by calling "(Call Sign), RALT ON, TFR ON." Check CARA for proper operation when descending through 4,500 feet AGL. During descent, pilots will accomplish a 1,000 foot SCP level off prior to selecting a lower SCP.

Section 3F—Other

3.31. Targeting Pod Operations. Do not use the TGP for anything other than navigational SA below 1000' AGL (e.g. VID or aircraft, designation for weapons deliver).

3.32. Radio Procedures. Preface all communications with the complete flight call sign (except for wingman acknowledgment). Transmit only that information essential for mission accomplishment or safety of flight.

3.32.1. **Radio Checks.** Acknowledge radio checks, which do not require the transmission of specific data by individual flight members, in turn (**EXAMPLE:** "2, 3, 4"). Acknowledgment indicates the appropriate action is either complete, is in the process of being completed or is understood by the flight member.

3.32.2. **Clearance Acknowledgement.** All flight members will acknowledge understanding the initial air traffic control (ATC) clearance. Acknowledge subsequent ATC instructions when directed by the flight lead.

3.32.3. Brevity code and other terminology will be IAW AFI 11-214 and AFTTP 3-1.General Planning, *General Planning and Employment Considerations*.

3.32.4. Ops Checks.

3.32.4.1. Monitor the fuel system carefully to identify low fuel, trapped fuel or an out of balance situation as soon as possible. Frequency should be increased during tactical maneuvering at high power settings. Ops checks are required:

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

3.32.4.1.2. When external fuel tanks (if carried) are empty.

3.32.4.1.3. Prior to each (D)ACBT engagement or intercept.

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

3.32.4.2. Minimum items to check are engine instruments, total and internal fuel quantities/balance, G-suit connection, oxygen system and cabin altitude. If the G-suit malfunctions or becomes disconnected, terminate all ACBT maneuvering until normal operation is reestablished.

3.32.4.3. For formation flights, the flight lead will initiate ops checks by radio call or visual signal. Response will be made by radio call or visual signal.

3.32.4.3.1. During Ops checks, ensure the fuel quantity selector knob is returned to the NORM position. Totalizer-only Ops checks may be used periodically during high demand phases of flight.

3.32.4.3.2. For mandatory ops checks when external tanks are carried, each flight member will check the external tank(s) and add "Tank(s) feeding/dry" to the Ops Check. Once the tank(s) have been confirmed and called dry, this may be omitted from subsequent ops checks.

3.32.4.3.3. Do not substitute data-linked fuel status for operations checks.

3.33. Lap Belts. Use extreme caution when disconnecting the lap belt in flight due to potential for lap belt buckle/side-stick controller/throttle interference.

3.34. Change of Aircraft Control. Both pilots of an F-16B/D must know at all times who has control of the aircraft. Transfer of aircraft control will be made with the statement "You have the aircraft." The pilot receiving control of the aircraft will acknowledge "I have the aircraft." Once assuming control of the aircraft, maintain control until relinquishing it as stated above. **EXCEPTION:** If the intercom fails, the pilot in the front cockpit (if not in control of the aircraft) will rock the wings and assume control of the aircraft, radios and navigational equipment unless briefed otherwise.

3.35. Fuel Requirements.

3.35.1. **Joker Fuel.** A briefed fuel needed to terminate an event and proceed with the remainder of the mission.

3.35.2. **Bingo Fuel.** A briefed fuel state which allows the aircraft to return to the base of intended landing or alternate, if required, using preplanned recovery parameters and arriving with normal recovery fuel as listed below:

3.35.3. **Normal Recovery Fuel.** The fuel on initial or at the FAF at the base of intended landing or alternate, if required. This fuel quantity will be the higher of what is established locally or:

3.35.3.1. All F-16 Blocks 10 through 32 - 1,000 pounds.

3.35.3.2. All F-16 Blocks 40 and higher - 1,200 pounds.

3.35.4. **Minimum/Emergency Fuel.** Declare the following when 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:

3.35.4.1. Minimum Fuel:

3.35.4.1.1. All F-16 Blocks 10 through 32 - 800 pounds or less.

3.35.4.1.2. All F-16 Blocks 40 and higher - 1,000 pounds or less.

3.35.4.2. Emergency Fuel:

3.35.4.2.1. All F-16 Blocks 10 through 32 - 600 pounds or less.

3.35.4.2.2. All F-16 Blocks 40 and higher - 800 pounds or less.

3.35.5. **Afterburner Use.** Do not use AB below 2,000 pounds total fuel or established bingo fuel, whichever is higher, unless required for safety of flight.

3.36. Radar Altimeters and Terrain Warning/Avoidance Systems.

3.36.1. If the aircraft is equipped with such systems (CARA, DTS, PGCAS, AGCAS, etc.), turn them on for all flights. Set LIS altitude advisory as appropriate on all missions. (AFRC) GCAS will be enabled with a minimum altitude setting is 200 feet for day operations and 700 feet for night operations; pilots will ensure that the appropriate values are set prior to takeoff.

3.36.2. **Non-TFR Operations.** Set the ALOW function of the radar altimeter at the briefed minimum altitude or the command-directed minimum altitude, whichever is higher.

3.37. Wind and Sea State Restrictions. Do not conduct training missions when surface winds along the intended route of flight exceed 35 knots steady state. Do not conduct over water training missions when surface winds exceed 25 knots steady state or when the sea state exceeds 10 feet (or 4 meters-USAFA). This is not intended to restrict operations when only a small portion of the route is affected. The OG/CC or equivalent is the waiver authority.

3.38. Identification Friend or Foe/Selective Identification Feature (IFF/SIF). To reduce adverse affects on ATC radars, attempt to limit Mode IV interrogations while pointing towards areas of known high density civilian traffic. Outside operational training airspace, maximize use of Spot from STT or TWS versus Scan and CRM.

Chapter 4

INSTRUMENT PROCEDURES

4.1. General.

4.1.1. **Head-Up Display (HUD) Use.** Regardless of Block or OFP, do not use the HUD to recover from an unusual attitude or while executing lost wingman procedures except when no other reference is available. The HUD in F-16 Block 25/30/32 aircraft and Block 40/50 aircraft with Operational Flight Program (OFP) 40T5/50T4 (TV Code 117/115) and later OFPs may be used as a primary flight reference in night/IMC conditions. The HUD in all other F-16 Blocks and OFPs may be used as an additional instrument reference, but not the sole reference, in night/IMC conditions.

4.1.2. **INS/GPS or EGI Use.** The F-16 INS/GPS and EGI are approved for enroute Area Navigation (RNAV). Neither RNAV nor GPS approaches are authorized.

4.1.3. **Simulated Instrument Flight.** Simulated instrument flight requires a qualified safety observer in the aircraft or in a chase aircraft. The observer may occupy either seat of the F-16B/D provided the intercom is operable. Use the radar to aid in clearing the area. Pilots in F-16A/C aircraft may not log simulated instrument flight without a chase. They may fly multiple approaches in VMC without a chase, but will place their primary emphasis on seeing and avoiding other aircraft. Chase aircraft may move into close formation on final for a formation landing provided simulated instrument flight is terminated.

4.2. Takeoff and Initial Join-up.

4.2.1. If weather is below 1,500 foot ceiling and 3 miles (5 km), each aircraft and element will climb on takeoff heading to 1,000 feet AGL before initiating any turns, except when departure instructions specifically preclude compliance.

4.3. Trail Procedures.

4.3.1. **General.** During trail formations, basic instrument flying is the first priority and will not be sacrificed when performing secondary trail tasks. Strictly adhere to the briefed airspeeds, power settings, altitudes, headings and turn points. If task saturation occurs, cease attempts to maintain radar contact, immediately concentrate on flying the instrument procedure, then notify the flight lead. The flight lead will notify ATC.

4.3.1.1. Flight leaders will request non-standard formation from ATC.

4.3.1.2. ATC instructions issued to the lead aircraft apply to the entire flight.

4.3.1.3. Normal spacing is 2-3 NM.

4.3.1.4. Each aircraft and element will follow the No Radar Contact procedures until the aircraft or element immediately in trail has radar contact and called "tied."

4.3.2. No Radar Contact.

4.3.2.1. The flight leader will call initiating all turns. Subsequent aircraft must delay turns to maintain the desired spacing.

4.3.2.2. Each aircraft and element will maintain 20 seconds or 2-3 mile spacing using all available aircraft systems and navigational aids to monitor position.

4.3.2.3. During climbs and descents, each aircraft or element will call passing each 5,000 foot altitude increment with altitude and heading (or heading passing) until join-up, level-off, or the following aircraft or element calls "tied."

4.3.2.4. Each aircraft and element will call initiating any altitude or heading change. Acknowledgments are not required; however, it is imperative that preceding aircraft or elements monitor the radio transmissions and progress of the succeeding aircraft and elements, and immediately correct deviations from the planned route.

4.3.2.5. Each aircraft and element will maintain at least 1,000 feet vertical separation from the preceding aircraft or element until establishing radar or visual contact, except in instances where departure instructions specifically preclude compliance. Reduce vertical separation to 500 feet if necessary to comply with MSA restrictions.

4.3.2.6. In the event a visual join-up cannot be accomplished on top or at level-off, the flight leader will request altitude separation for each succeeding aircraft or element to meet the requirements of the above paragraph.

4.3.3. **Radar Contact.**

4.3.3.1. Each aircraft and element will call "tied" when radar contact is established with the preceding aircraft. Once all aircraft are tied, no further radio calls are required, except to acknowledge ATC instructions, unless radar contact is lost.

4.3.3.2. In flights of three or more aircraft, use all available aircraft systems (i.e. radar, TACAN, AAI, etc.) to ensure that trail is maintained on the correct aircraft.

4.3.4. **Trail Departures.**

4.3.4.1. Use a minimum of 20 seconds takeoff spacing.

4.3.4.2. Each aircraft/element will accelerate in MIL or AB power until reaching 350 KIAS (or as required by local procedures). Upon reaching this speed, the flight leader will set a pre-briefed power setting. Climb at 350 KIAS until reaching cruise Mach/TAS, unless otherwise briefed.

4.3.4.3. Make all turns using 30 degrees of bank.

4.3.5. **En Route Trail.** Flight leads must brief airspeeds, power settings, and configurations.

4.3.6. **Trail Recovery.**

4.3.6.1. Trail recoveries are only authorized at home station, deployed locations, and locally designated primary divert bases. Appropriate ATC agencies must approve and local operating procedures must address trail recovery procedures. As a minimum, procedures must address each recovery profile, missed approach, climb-out, desired and maximum spacing requirements, lost contact and lost communications.

4.3.6.2. Limit trail recovery to a maximum of four aircraft.

- 4.3.6.3. Trail recoveries are authorized when weather at the base of intended landing is at or above the highest pilot weather category in the flight or approach minimums, whichever is higher.
- 4.3.6.4. The flight lead must brief the flight on spacing, configuration and airspeeds.
- 4.3.6.5. The flight lead must coordinate the trail recovery with ATC prior to taking spacing.
- 4.3.6.6. Prior to wingmen taking spacing for the trail recovery, the flight lead will ensure that all wingmen have operative navigational aids and radar.
- 4.3.6.7. Accomplish flight separation IAW local directives and in VMC if possible.
- 4.3.6.8. The formation must squawk as directed by ATC.
- 4.3.6.9. ATC will provide radar flight following for the entire formation.
- 4.3.6.10. Limit all turns to a maximum of 30 degrees of bank.
- 4.3.6.11. Once established on a segment of a published approach, each aircraft must comply with all published altitudes and restrictions while maintaining in-trail separation.
- 4.3.6.12. Unless local procedures establish defined reference points for airspeed and configuration changes, the flight lead must direct changes by radio. At flight lead's call all aircraft must simultaneously comply with the directed change.
- 4.3.6.13. All aircraft must report the final approach fix.
- 4.3.6.14. If contact is lost with the preceding aircraft, the pilot will transmit "Callsign (C/S) lost contact." The preceding aircraft will respond with altitude, airspeed and heading. Establish altitude deconfliction and coordinate a separate clearance with ATC. If contact is lost while established on a segment of a published approach, flight members may continue the approach, but must confirm separation via navigation aids. If separation cannot be confirmed, execute missed approach or climb-out as instructed by ATC.
- 4.3.6.15. Flight leads will coordinate with local ATC prior to penetration if the trail recovery will terminate in a Precision Approach Radar (PAR) or Airport Surveillance Radar (ASR) approach.

4.4. Formation Break-up. Formation break-up from a visual formation will occur in VMC. If IMC is unavoidable, breakup from a visual formation will occur in straight and level flight. This restriction does not apply to trail formation. Prior to an IMC break-up, the flight lead will confirm position and transmit attitude, altitude, airspeed, and altimeter setting. Wingmen will acknowledge and confirm good navigational aids (reception of appropriate TACAN, ILS and/or appropriate GPS/INS waypoint).

4.5. Formation Penetration.

- 4.5.1. Restrict formation penetrations in route or close formation to two aircraft when the weather at the base of intended landing is less than overhead traffic pattern minimums.
- 4.5.2. If a formation landing is intended, position the wingman on the appropriate wing prior to weather penetration.

4.5.3. Formation penetrations using radar trail procedures are authorized when weather at the base of intended landing is at or above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.6. Formation Approach. During IMC formation flights, do not change lead or wing positions below 1,500 feet AGL unless on radar downwind or if required during a formation approach with an F-16 experiencing an Emergency.

4.7. Instrument Approach Procedures.

4.7.1. Pilots will not fly any published instrument procedure (e.g. DoD, Jeppesen, ICAO) that requires airspeeds less than those specified in T.O. 1F-16x-1.

4.7.2. The F-16 is Approach Category E. Use approach Category D minimums at an emergency or divert airfield where no Category E minimums are published, provided:

4.7.2.1. A straight-in approach is flown.

4.7.2.2. For the final approach segment, the aircraft is flown at 165 KIAS or less.

4.7.2.3. For the missed approach segment, the aircraft is flown at 260 knots true airspeed (KTAS) or less. At high density altitudes 260 KTAS may require a KIAS below the speed specified in T.O. 1F-16x-1 and Category D approaches shall not be flown.

Chapter 5

AIR-TO-AIR WEAPONS EMPLOYMENT

5.1. General. Reference AFI 11-214 for procedures and restrictions. In addition, F-16 pilots shall comply with the requirements of this chapter.

5.2. Simulated Gun Employment.

5.2.1. Never perform simulated gun employment with a hot gun (one that is not safe IAW T.O. 1F-16x-34-1-1). Never perform a trigger check with a hot gun, regardless of Master Arm switch position.

5.2.2. Prior to flight, confirm the status of the gun system. Prior to simulated gun employment, perform a trigger check with the Master Arm switch in SIMULATE and the aircraft pointed away from other aircraft and populated areas. If HUD symbology reads "ARM" or SMS/MFD symbology reads "RDY," do not squeeze the trigger or continue with simulated weapons employment.

5.3. Maneuvering Limitations.

5.3.1. Negative "G" guns jink maneuvers are prohibited.

5.3.2. Minimum airspeed during low altitude offensive or defensive maneuvering is 350 KIAS.

5.3.3. All configurations are authorized for unlimited maneuvering as defined by AFI 11-214. Before conducting unlimited maneuvering in a CAT III configured aircraft, consider gross weight, drag, departure susceptibility and training requirements.

5.3.4. **(AFRC Only)** F-16D aircraft with centerline stores are prohibited from utilizing the Unlimited maneuvering category, as defined by AFI 11-214.

Chapter 6

AIR-TO-SURFACE WEAPONS EMPLOYMENT

Section 6A—General

6.1. General. Reference AFI 11-214 for procedures and restrictions. In addition, F-16 pilots shall comply with the requirements of this chapter.

6.2. Simulated Gun Employment.

6.2.1. Never perform simulated gun employment (squeezing the trigger with the Master Arm switch in SIM) with a hot gun (one that is not safe IAW T.O. 1F-16x-34-1-1). Never perform a trigger check with a hot gun, regardless of Master Arm switch position.

6.2.2. Prior to flight, confirm the status of the gun system. Prior to simulated gun employment, perform a trigger check with the Master Arm switch in SIMULATE and the aircraft pointed away from other aircraft and populated areas. If HUD symbology reads “ARM” or SMS/MFD symbology reads “RDY,” do not squeeze the trigger or continue with simulated weapons employment.

6.3. Training Missions with a Hot Gun.

6.3.1. Pilots will not select strafe submode until immediately prior to roll in and will deselect strafe submode immediately after completing the safe escape maneuver.

6.3.2. When firing the laser, ensure you are in a mode that will not allow the gun to fire.

6.4. Simulated Attacks against off-Range or Manned Targets. Do not conduct such attacks with hung ordnance. Do not conduct them with live ordnance, except for 20 mm ammunition with a safe gun. When the aircraft is loaded with expendable stores (e.g. bombs, external fuel tanks, TERs carted at the pylon), load simulated weapons (zero quantity) in the SMS/MFD only on empty or uncarted/unexpendable stations (**EXCEPTION:** Captive Maverick and HARM missiles may be selected). Confirm the Master Arm switch is in OFF or SIMULATE prior to the first attack. Flight lead will query and flight members will reply to a “*check zero quantity, uncarted station*” radio call.

6.5. Weather. In training, do not conduct climbing or diving deliveries with a ceiling below 2,000 feet AGL or level deliveries with a ceiling below 1,500 feet AGL.

6.6. Pop-Up Attacks. Abort pop-up attacks if airspeed decreases below 350 KIAS (300 KIAS above 10,000 feet AGL).

6.7. Target Identification. Pilots shall positively identify the target prior to weapons release. For wartime or contingency sorties, comply with ROE. For training sorties, achieve positive identification by either visually acquiring the target or by confirming target location through valid on-board/off-board cues. Cues may include, but are not limited to, radar, GPS, marking rounds, IR Maverick lock on, IR pointers or NVG-compatible marking devices. Exercise caution when relying on a single cue to confirm target location.

6.8. Safety of Ground Personnel. When ground controllers are present on Class B/C ranges, range personnel will brief pilots on locations of these personnel and each pilot will acknowledge. Pilots must know applicable range weapons delivery procedures, appropriate targets and

weapons footprints. Pilots shall not expend ordnance if any doubt exists as to the ground personnel or intended target locations.

Section 6B—Night

6.9. Altitude. Compute an MSA for the entire bombing pattern using the IFR Off Airways guidance in AFI 11-202V3 chapter 8. The minimum altitude for night High Angle Strafe (HAS) is the Target MSA (as defined in [Attachment 1](#)) unless executed by an NVG-low qualified pilot (as defined in AFI 11-2F-16 Vol 1) under high-illumination conditions (as defined in AFI 11-214).

6.10. Bank Angle. Do not exceed 135 degrees of bank when returning to the low altitude structure (<5K AGL)

6.11. TFR. If ingressing under TFR protection to a climbing delivery that will result in the need to exceed TFR roll limits, cease manipulating the targeting pod no later than pull up initiation. Focus on maintaining aircraft control. Do not resume manipulation of the targeting pod until either above the MSA or back within TFR protection.

Chapter 7

ABNORMAL OPERATING PROCEDURES

7.1. General. Follow the procedures in this chapter when other than normal circumstances occur. These procedures do not supersede procedures contained in the flight manual.

7.1.1. Do not accept an aircraft for flight with a malfunction which is addressed in the emergency/abnormal procedures section of the flight manual until appropriate corrective actions have been accomplished.

7.1.2. Do not fly an aircraft with a tripped engine monitoring system (EMS) Go-No-Go indicator (Bit Ball) until maintenance has accomplished the appropriate procedures and cleared the fault.

7.1.3. Do not taxi with a known malfunction of the nose-wheel steering system, the brake system, or a generator [**NOTE:** F-16C/D aircraft may be taxied with a single generator failure (main or standby) if the other generator is operating normally].

7.1.4. Once a malfunctioning aircraft system is isolated, do not use that system again unless its use in a degraded mode is essential for recovery. Do not conduct ground or in-flight trouble-shooting after flight manual emergency procedures are complete.

7.1.5. In the F-16B/D, the pilot in command is primarily responsible for handling in-flight emergencies. The additional pilot will confirm that all critical action procedures have been accomplished and will provide checklist assistance at the request of the pilot in command.

7.1.6. For actual/perceived flight control malfunctions, pilots will terminate maneuvering and take appropriate action. If the problem was due to crew/passenger stick or rudder interference, the pilot will take positive action to ensure no further control interference occurs.

7.1.7. When a fuel imbalance exceeds dash one limits, terminate tactical maneuvering and investigate. If the problem was caused by a slow feeding external or internal fuel tank and can be corrected, the mission may continue IAW dash one guidance. If not, terminate the mission. Instruments, deployment missions, level weapons deliveries and straight-through-non-maneuvering intercepts are authorized to reduce gross weight until a safe landing is possible.

7.2. Critical Action Procedures (CAPs). CAPs are in [ATTACHMENT 4](#).

7.3. Ground Aborts.

7.3.1. If a flight member aborts prior to takeoff, the flight lead will normally renumber the flight to maintain a numerical call sign sequence. Flight leads will advise the appropriate agencies of such changes.

7.3.2. Pilots who do not takeoff with the flight may join the flight in accordance with the brief or flight lead instructions. If a join-up is to be accomplished on an air-to-ground range, all events will be terminated until the joining aircraft has achieved proper spacing.

7.4. Takeoff Aborts.

7.4.1. If an abort occurs during takeoff roll, say call sign and intentions when practical. Following aircraft will alter takeoff roll to ensure clearance or abort takeoff if adequate clearance cannot be maintained. 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 departure-end net arrestment. Local procedures will address net barrier raising procedures.

7.4.2. When aborting above 120 KIAS, or whenever hot brakes are suspected, declare a ground emergency. Taxi the aircraft to the designated hot brake area and follow hot brake procedures.

7.4.3. If aborting at or above 100 knots, lower the hook. If aborting below 100 knots, lower the hook if there is any doubt about the ability to stop on the remaining runway.

7.5. Air Aborts.

7.5.1. If an abort occurs after takeoff, all aircraft will maintain their original numerical call sign.

7.5.2. Escort aborting aircraft with an emergency condition to the field of intended landing. When other than an emergency condition exists, the flight lead will determine if an escort for the aborting aircraft is required..

7.5.3. Abort the mission, regardless of apparent damage or subsequent normal operation, for any of the following:

7.5.3.1. Bird strike

7.5.3.2. Actual or suspected foreign object damage.

7.5.3.3. Recovery below FRAG altitude with live ordnance.

7.5.3.4. Moderate to severe icing.

7.5.3.5. Over-G (**NOTE:** Land as soon as practical out of a straight-in approach).

7.5.3.6. Flight control system anomalies, including uncommanded departures from controlled flight (**EXCEPTION:** intentional departures from controlled flight conducted IAW a MAJCOM-approved syllabus), but not including flight control system lights that reset IAW flight manual procedures.

7.5.3.7. Engine flameout/stagnation or shutdown.

7.6. Radio Failure (NORDO). Reference AFI 11-205 and the Flight Information Handbook.

7.6.1. NORDO in Formation.

7.6.1.1. 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.

7.6.1.2. If flying other than close/route formation when radio failure occurs, the NORDO aircraft should attempt to rejoin to a route position at approximately 500 feet on another

flight member. The NORDO aircraft is responsible for maintaining clearances from other flight members until his presence is acknowledged by a wingrock, signifying clearance to join. Once joined, the NORDO aircraft will give the appropriate visual signals. If pre-briefed, the NORDO aircraft may proceed to a rendezvous point and hold. If no one has rejoined prior to reaching bingo fuel, the NORDO aircraft should proceed to the base of intended landing or a divert base. Aircraft experiencing any difficulty/emergency in addition to NORDO will proceed as required by the situation.

7.6.2. NORDO on a Class A Range or a Manned Class B Range.

7.6.2.1. Attempt contact with the RCO on the appropriate back-up frequency or back up radio.

7.6.2.2. If contact cannot be reestablished, make a pass by the range control tower on the attack heading while rocking wings and turn in the direction of traffic. The flight lead will direct another flight member to escort the NORDO to a recovery base or rejoin the flight and RTB.

7.6.2.3. If the NORDO aircraft has an emergency, make a pass by the range control tower, if practical, on the attack heading while rocking wings, turn opposite the direction of traffic, and proceed to a recovery base. The flight lead will direct a flight member to join-up and escort the emergency aircraft.

7.6.3. NORDO on an Unmanned Class B Range or on a Class C Range.

7.6.3.1. Make a pass on the target maintaining normal pattern spacing, if possible, while rocking wings. The flight lead will direct another flight member to escort the NORDO aircraft to a recovery base or rejoin the flight in sequence and recover. If the NORDO aircraft has an emergency, if practical, it will make a pass on the target maintaining normal pattern spacing, rocking wings, turn opposite direction of traffic and proceed to a recovery base. The flight lead will direct a flight member to join-up and escort the emergency aircraft.

7.6.3.2. Unexpended Ordnance. If radio failure occurs and circumstances preclude landing with unexpended ordnance, safe jettison of ordnance may be accomplished provided the following conditions are met:

7.6.3.3. The NORDO aircraft joins on another flight member who has radio contact with the RCO and the remainder of the flight.

7.6.3.4. Stores jettison visual signals specified in AFI 11-205 are relayed to the NORDO aircraft to initiate jettison.

7.6.4. NORDO during Missile or Air-to-Air Gunnery Firing.

7.6.4.1. Aircraft will not fire without two-way radio contact.

7.6.4.2. If radio failure occurs, safe the armament switches, join on another member of the flight or the tow aircraft, IAW paragraph [7.6.1](#)

7.6.4.3. Gunnery target tow aircraft experiencing radio failure will rock wings and continue the turn if an attack is in progress. The flight lead of the attacking aircraft will join on the tow's wing. Remain clear of the banner in the event it is cut. The tow pilot will use standard hand signals to indicate his difficulty. The flight lead will signal when

the banner is cleared for cut with a slicing motion across the throat. After the banner is away and the flight lead determines there is no remaining cable, he will take the lead, RTB with the tow aircraft on the wing, advise the tower of the NORDO and establish the appropriate landing pattern. If cable remains, follow local procedures.

7.6.5. NORDO during Recovery.

7.6.5.1. If a formation straight-in approach is flown and a go-around becomes necessary, the chase will go-around, pass the NORDO aircraft and rock his wings. The NORDO aircraft will go-around, if the situation allows. If the NORDO aircraft is in formation as a wingman, the leader will initiate a gentle turn into the wingman and begin the go-around.

7.6.5.2. To signal the need for an approach-end arrestment, lower the tailhook (visual formation) or fly a straight in approach flashing the landing light (unescorted).

7.7. Severe Weather Penetration. Do not fly through severe weather. If unavoidable, flights will split-up and obtain separate clearances prior to severe weather penetration.

7.8. Spatial Disorientation (SD). SD has proven to be a leading killer of F-16 pilots. Although SD is most common at night or in IMC, it can and has happened in day VMC. Reference AFMAN 11-217V1 for information on the causes of SD, how to avoid it, and how to mitigate its consequences.

7.9. Lost Wingman.

7.9.1. **Priorities.** The first priority is to establish safe separation from other aircraft (e.g. tanker or wingman). Next, obtain a separate clearance to ensure obstacle/terrain clearance and clearance from other traffic.

7.9.2. **Prohibitions.** Do not practice lost wingman procedures in other than day VMC conditions.

7.9.3. **General Procedures.** Simultaneously transition to instruments and inform lead while executing lost wingman procedures (ref AFTTP 3-3.F16 for amplifying data). Lead will acknowledge the radio call and transmit attitude, heading, altitude and airspeed. Once lost wingman procedures have been executed, permission to rejoin must be obtained from the flight lead.

7.9.4. **Two- or Three-Ship Flights.** (NOTE: If in three-ship echelon, refer to four-ship lost wingman procedures.)

7.9.4.1. **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.

7.9.4.2. **Outside the Turn.** Reverse the direction of 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.

7.9.4.3. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and inform the flight lead 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.

7.9.4.4. **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.

7.9.4.5. **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.

7.9.5. **Four-Ship Flights.** If only one aircraft in the flight becomes separated, the previous procedures would provide safe separation, but since it is impossible for number 4 to immediately ascertain that number 3 still has visual contact with the leader, it is imperative that number 4's initial action be based on the assumption that number 3 has also become separated. Numbers 2 and 3 will follow the procedures outlined above. Number 4 will follow the appropriate procedure listed below:

7.9.5.1. **Wings-Level Flight.** Simultaneously inform the leader and turn away using 30 degrees of bank for 30 seconds, then resume heading and obtain a separate clearance.

7.9.5.2. **Outside the Turn.** Reverse direction of turn using 30 degrees of bank for 30 seconds to ensure separation from lead and number 3 and obtain a separate clearance.

7.9.5.3. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and increase bank angle by 15 degrees. Inform the leader to roll out. Obtain a separate clearance. Leader will resume turn only when separation is ensured.

7.10. Armament System Malfunctions.

7.10.1. **General.** Do not attempt to expend ordnance using a weapons release system with a known malfunction. If abnormal missile launch or erratic missile flight occurs, have the launching aircraft visually inspected by a chase pilot, if possible, to determine if any damage has occurred.

7.10.2. **Inadvertent Release.** Record switch positions at the time of inadvertent release and impact point, if known, and provide the information to debrief personnel. Check switches safe and do not attempt further release in any mode. Treat remaining stores as hung and obtain a chase aircraft for RTB, if practical. If remaining stores present a recovery hazard, jettison in a suitable area on a single pass, if practical.

7.10.3. **Hung Freefall Ordnance or Missile Hangfire/Misfire.** First confirm switches/Option Select Button (OSB) settings were correct. If they were, record all relevant switch/OSB settings and proceed as follows.

7.10.3.1. **Hung Live Freefall Ordnance.** Attempt delivery using an alternate delivery mode, if applicable. If unsuccessful, use selective jettison procedures for the store. If unsuccessful and the ordnance is either unsecure or the security of the ordnance cannot be determined, consider selective jettison of the rack.

7.10.3.2. **Hung Practice/Inert Freefall Ordnance.** Make an additional attempt to expend. If unsuccessful, select an alternate delivery mode and try again. If unsuccessful, ordnance from other stations/dispensers may be released provided this does not violate load symmetry limits. If remaining stores present a recovery hazard, jettison in a suitable area on a single pass, if practical.

7.10.3.3. **Maverick Missile Hangfire.** A missile that fires but fails to depart the aircraft is a hangfire. If able, have a chase pilot inspect such a missile.

7.10.3.4. **Maverick Missile Misfire.** A missile that fails to fire when all appropriate switches were selected is a misfire. If this occurs, safe the Master Arm switch. If able, have a chase pilot inspect the missile for smoke or fire. If either exists, jettison the missile on the range. If not, pilots may attempt another pass. If the second attempt fails and conditions permit, remain dry in the pattern for 15 minutes, then proceed to the recovery base following hung ordnance/weapons malfunction recovery procedures.

7.10.3.5. **Hung Ordnance/Weapons Malfunction Recovery Procedures.** Visually inspect the aircraft for damage, if practical. Declare an emergency (not required for hung practice/inert ordnance or for live unexpended ordnance). Obtain a chase aircraft, if available. Avoid populated areas and trail formations. Land from a straight-in approach.

7.11. In-flight Practice of Emergency Procedures. Reference AFI 11-202V3. A simulated emergency procedure is any procedure that produces an effect closely paralleling the actual emergency. One example would be retarding the throttle sufficiently to emulate the performance of an aircraft with a flamed out or idle engine.

7.11.1. **Prohibitions.** Do not practice aborted takeoffs in the aircraft. Instead, use the flight simulator, Cockpit Familiarization Trainer or a static aircraft, in that order of preference. Do not practice in-flight engine shutdown. Do not practice SFO patterns unless crash rescue is available and either an active tower or a ROM (or equivalent, e.g. SOF) is in operation. Do not practice SFO patterns in conditions other than day VMC.

7.11.2. **Simulated Flameout (SFO)/Emergency Landing Patterns.** OG/CCs will establish specific procedures for SFO training and establish letters of agreement with appropriate agencies. They will publish those procedures in their supplement to this volume. General SFO procedures follow:

7.11.2.1. The SFO pattern may be entered from any direction or altitude that will ensure the aircraft is properly configured above 2,000 feet AGL and in a position to safely complete the approach.

7.11.2.2. Do not initiate or continue an SFO if a potential traffic pattern conflict exists that would require division of the pilot's attention between the SFO and sequencing with traffic. Discontinue an SFO whenever excessive maneuvering is required, whether as a result of a traffic conflict or when making corrections. Discontinue an SFO if unable to obtain wings level on final by 200 feet AGL. Discontinue an SFO if airspeed drops below Dash One minimum airspeed any time between base key and the initiation of the flare. Once the decision to discontinue an SFO has been made, initiate a go-around and do not attempt to resume the SFO.

7.11.2.3. Except when operating IAW a MAJCOM-approved syllabus (e.g. AFMC high angle of attack training), do not touch down from an SFO.

7.11.2.4. Make radio calls IAW local procedures, but as a minimum call

7.11.2.4.1. "High Key"

7.11.2.4.2. "Low Key"

7.11.2.4.3. "Base Key, Gear Down, (Intentions)"

7.12. Search and Rescue (SAR) Procedures. OG/CCs will establish specific procedures in the unit supplement to this volume. General procedures are:

7.12.1. **Squawk.** Immediately cease tactical maneuvering by executing Knock-It-Off procedures. Place IFF to EMER to alert ATC/GCI/AWACS of the emergency situation.

7.12.2. **Talk.** Establish an On Scene Commander (OSC). Communicate the emergency situation and intentions immediately to applicable control agencies. Use GUARD frequency if necessary.

7.12.3. **Mark.** Mark the last known position of survivors/crash site using any means available, e.g. visual ground references, TACAN, INS, EGI, ATC/GCI/AWACS, HMCS, or TGP. Pass this information to follow-on SAR forces.

7.12.4. **Separate.** Remain above the last observed parachute altitudes until the position of all possible survivors is determined. If visual contact with parachute is not maintained, allow approximately 1 minute per thousand feet (16 feet per second) for parachute descent. The OSC will establish deconfliction between all aircraft involved in the SAR.

7.12.5. **Update Bingo/Recovery Base.** Revise bingo fuels or recovery bases as required to maintain maximum SAR coverage over survivor(s). Do not overfly bingo. Relinquish OSC duties to more qualified rescue forces (e.g. SANDY 1, US Coast Guard) upon their arrival.

7.13. Abnormal Operation of TFR or NAV FLIR. Honor all fly ups and allow automatic fly ups to develop. If aural or visual pull-up warnings occur but the system does not initiate an automatic fly up, initiate a manual one. Fly up procedures follow:

7.13.1. Allow the system to raise the nose to the appropriate angle or do so manually (**NOTE:** using climb angles greater than 20 degrees can result in rapid airspeed bleed off and increased susceptibility to SD).

7.13.2. Throttle - As required to preserve airspeed. Do not hesitate to use AB.

7.13.3. When terrain clearance ensured, Paddle Switch - Depress and release (**NOTE:** continuing to hold the paddle switch depressed inhibits fly-up commands to the FLCS).

7.13.4. If the system does not reset:

7.13.5. Continue climb until at or above MSA.

7.13.6. Level off and refer to checklist (if required).

7.13.7. If the malfunction clears, pilots may resume TFR.

7.14. Post Arresting Gear Engagement Procedures. Do not shut down the engine unless fire/other conditions dictate or directed to do so by the arresting gear crew. Raise the tailhook on the signal from the arresting crew. Do not taxi until directed to do so by the arresting gear crew.

Chapter 8

LOCAL OPERATING PROCEDURES

8.1. General. This chapter provides a consolidated framework for wings to supplement (IAW AFI 33-360) local operating procedures. Units composed of multiple aircraft types may publish guidance in a single, stand-alone local operating instruction instead of supplementing this AFI. Added or stand-alone procedures will not be less restrictive than those contained elsewhere in this volume. This chapter is not intended to be a single source document for procedures contained in other directives or regulations. Avoid unnecessary repetition of guidance provided in other established directives; however, reference to those directives is acceptable when it serves to facilitate the location of information. This chapter is authorized to be issued to each pilot. Units may supplement the following paragraphs for local operating guidance:

- 8.1.1. **Section A. Introduction.**
- 8.1.2. **Section B. General Policy.**
- 8.1.3. **Section C. Ground Operations.**
- 8.1.4. **Section D. Flying Operations.**
- 8.1.5. **Section E. Weapons Employment.**
- 8.1.6. **Section F. Abnormal Procedures.**
- 8.1.7. **Attachments (Illustrations).**

8.2. If applicable, include procedures for the following in the appropriate section above:

- 8.2.1. Command and Control.
- 8.2.2. Fuel Requirements and Bingo Fuels.
- 8.2.3. Diversion Instructions.
- 8.2.4. Jettison Areas, Procedures and Parameters (IFR/VFR).
- 8.2.5. Controlled Bailout Areas.
- 8.2.6. Local Weather Procedures.
- 8.2.7. Unit Standards.
- 8.2.8. Approved Alternate Missions.
- 8.2.9. Cross-Country Procedures.
- 8.2.10. **Search and Rescue and On-Scene Commander Procedures.**
- 8.2.11. **Bird/Wildlife Aircraft Strike Hazard (BASH) program guidance IAW AFI 91-202, The US Air Force Mishap Prevention Program and AFPAM 91-212, Bird Aircraft Strike Hazard (BASH) Management Techniques.**
- 8.2.12. **Environmental Restrictions to Flight Operations (winds, sea state, temperature, etc.) applicable to unit operating locations.**

8.3. Instructions. Prior to publishing, units will forward copies of the local supplement of this document to MAJCOM and appropriate subordinate agencies, who will review and return comments back to the unit(s).

8.4. Prescribed and Adopted Forms.

8.4.1. **Prescribed Forms:** No forms prescribed

8.4.2. **Adopted Forms:** AF Form 847, *Recommendation for Change of Publication*
AFTO Form 781, *ARMS Aircrew/Mission Flight Data Document*
AFTO FORM 781 A, *Maintenance Discrepancy and Work Document.*

PHILIP M. BREEDLOVE, Lt Gen, USAF
DCS, Operations, Plans and Requirements

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

- AFI 11-202, Volume 3, *General Flight Rules*, 5 April 2006
- AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*, 19 May 1994
- AFI 11-209, *Air Force Aerial Events*, 4 May 2006
- AFI 11-214, *Air Operations Rules and Procedures*, 22 Dec 2005
- AFI 11-218, *Aircraft Operations and Movement on the Ground*, 11 May 2005
- AFI 11-246, Volume 1, *Air Force Aircraft Demonstrations (A-10, F-15, F-16, F-22)*, 29 September 2008
- AFI 11-301 Volume 1, *Aircrew Flight Equipment (AFE) Program*, 25 Feb 2009
- AFI 11-301 Volume 4, *Aircrew Laser Eye Protection (ALEP)*, 21 Feb 2009
- AFI 11-404, *Centrifuge Training for High-G Aircrew*, 28 Oct 2005
- AFI 33-360 *Publications and Forms Management*, 18 May 2006
- AFMAN 11-217 Volume 1, *Instrument Flight Procedures*, 3 Jan 2005
- AFMAN 11-217 Volume 3, *Supplemental Flight Information*, 23 Feb 2009
- AFMAN 33-363, *Management of Records*, 1 March 2008
- AFPAM 11-216, *Air Navigation*, 1 Mar 2001
- AFPAM 11-419. *G-Awareness for Aircrew*, 1 Dec 1999
- AFPD 11-2, *Aircraft Rules and Procedures*, 14 Jan 2005
- AFPD 11-4, *Aviation Service*, 1 Sep 2004
- AFTTP 3-1 Volume 1, *General Planning and Employment Considerations*, 15 Sep 2008
- AFI 11-2F-16V1, *F-16--Aircrew Training*, 19 Jan 2007
- AFTTP 3-1.F-16, *Tactical Employment--F-16*, 28 Jul 2009
- AFTTP 3-3.F-16, *Combat Aircraft Fundamentals--F-16*, 5 May 2008
- AFI 91-202, *The US Air Force Mishap Prevention Program*, 1 Aug 1998
- AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*, 1 Feb 2004

Abbreviations and Acronyms

- ACBT**—Air Combat Training
- ACM**—Air Combat Maneuver
- ACMI**—Air Combat Maneuvering Instrumentation
- AFTTP**—Air Force Tactics, Techniques, and Procedures

AGL—Above Ground Level
AGSM—Anti-G Straining Maneuver
ALOW—Automatic Low Altitude Warning
AMD—Acceleration Monitoring Device
AOA—Angle of Attack
ARA—Airborne Radar Approach
ASR—Airport Surveillance Radar
ATC—Air Traffic Control
AVTR—Airborne Video Tape Recorder
AWACS—Airborne Warning and Control System
BFM—Basic Fighter Maneuver
BMC—Basic Mission Capable
CAP—Critical Action Procedure
CARA—Combined Altitude Radar Altimeter
CFT—Cockpit Familiarization Trainer
CG—Center of Gravity
CHUM—Chart Update Manual
CMR—Combat Mission Ready
CE—Combat Edge
DACT—Dissimilar Air Combat Tactics
DLO—Desired Learning Objective
DMPI—Desired Mean Point of Impact
ECM—Electronic Counter Measure
EMCON—Emission Control
EMS—Engine Monitoring System
EOR—End of Runway
EP—Emergency Procedure
FAC—Forward Air Controller
FAC—A-Forward Air Controller-Air
FAC—G-Forward Air Controller-Ground
FAF—Final Approach Fix
FCIF—Flight Crew Information File

FE—Flight Examiner
FLCS—Flight Control System
FLIP—Flight Information Publications
FLUG—Flight Lead Upgrade Program
FOD—Foreign Object Damage
FTU—Formal Training Unit
GCI—Ground Control Intercept
GLOC—G-induced Loss of Consciousness
HARTS—Horn Awareness and Recovery Training Series
HI—High Illumination
HUD—Heads-Up Display
IFF—Identification, Friend or Foe
IFR—Instrument Flight Rules
ILS—Instrument Landing System
IMC—Instrument Meteorological Conditions
INS—Inertial Navigation System
INU—Inertial Navigation Unit
IP—Instructor Pilot or Initial Point
IPUG—Instructor Pilot Upgrade
IQT—Initial Qualification Training
IR—Instrument Route
JOAP—Joint Oil Analysis Program
KIO—Knock-It-Off
LAAF—Low Altitude Advisory Function
LANTIRN—Low Altitude Navigation and Targeting Infrared for Night
LEP—Laser Eye Protection
LGB—Laser-Guided Bomb
LI—Low Illumination
LIS—Line in the Sky
MAP—Missed Approach Procedure (Joint Pub 1-02); [Missed Approach Point] {USAF}
MDA—Minimum Descent Altitude
MFL—Maintenance Fault List

MOA—Military Operating Area
MPO—Manual Pitch Override
MQT—Mission Qualification Training
MSA—Minimum Safe Altitude
MSL—Mean Sea Level
NVG—Night Vision Goggles
NVIS—Night Vision Imaging System
OAP—Offset Aim Point
OFP—Operational Flight Program
OT&E—Operational Test & Evaluation
PAR—Precision Approach Radar
PDM—Programmed Depot Maintenance
PFL—Pilot Fault List
RAA—Route Abort Altitude
RCO—Range Control Officer
RCR—Runway Conditions Reading
RMSA—Recovery Minimum Safe Altitude
RNAV—Area Navigation
ROE—Rules of Engagement
ROM—Runway Operations Monitor
SA—Surface Attack or Situational Awareness
SAR—Search and Rescue
SAT—Surface Attack Tactics
SCP—Set Clearance Plane
SD—Spatial Disorientation
SFO—Simulated Flame Out
SOF—Supervisor of Flying
TAMSA—Target Area MSA
TDA—Tactical Decision Aid
TF—Terrain-Following
TFR—Terrain-Following Radar
TOLD—Takeoff and Landing Data

TOT—Time on Target

VFR—Visual Flight Rules

VMC—Visual Meteorological Conditions

VR—Visual Route

VRD—Vision Restriction Device

VTR—Video Tape Recorder

WSEP—Weapon System Evaluation Program

Terms

Air Combat Training (ACBT)—A general term which includes (D)BFM, (D)ACM, and (D)ACT (AFI 11-214).

Air Combat Tactics (ACT)—Training in the application of BFM, ACM, and tactical intercept skills to achieve a tactical air-to-air objective.

Basic Mission Capable (BMC)—See AFI 11-2F-16V1.

Combat Edge (CE)—A positive-pressure breathing-for-G (PPG) system which provides pilots additional protection against high positive G accelerations experienced during flight. The system consists of aircrew equipment (high-pressure mask, counter-pressure suit, G-suit), and aircraft equipment (oxygen regulator, G-valve, and interfacing sense line). At 4-G and above, regulated air and oxygen are supplied to provide automatic mask tensioning, vest inflation, and positive pressure breathing to the mask.

Combat Mission Ready (CMR)—See AFI 11-2F-16V1.

Continuation Training (CT)—See AFI 11-2F-16V1.

Dissimilar ACBT (DACBT)—ACBT in conjunction with another MDS aircraft as adversary. The connotation (D)ACBT refers to either similar or dissimilar ACBT. These connotations correspond to all facets of ACBT (i.e., BFM, ACM, ACT).

Flight Lead (FL)—As designated on flight orders, the individual responsible for overall conduct of mission from preflight preparation/briefing to postflight debriefing, regardless of actual position within the formation. A certified 4-ship FL may lead formations and missions in excess of four aircraft, unless restricted by the unit CC. A 2-ship FL is authorized to lead an element in a larger formation.

Initial Qualification Training (IQT)—See AFI 11-2F-16V1.

Low Altitude Navigation and Targeting Infrared for Night (LANTIRN)—A navigation and targeting system that provides tactical aircraft with a low-altitude, under-the-weather, day and night operational capability.

Low Altitude Training (LOWAT)—See AFI 11-2F-16V1.

Mission Qualification Training (MQT)—See AFI 11-2F-16V1

Target MSA— An altitude that provides at least 1,000 feet of clearance above all obstacles within 5 nautical miles of the target.

Squadron Supervisor—Squadron Commander, Asst/Operations Officers, Flight CCs (ANG and AFRC only, as designated by the OG/CC).

Attachment 2

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND HIGH YIELD EXPLOSIVE (CBRNE) OPERATIONS

A2.1. General Information. Potential adversary use of CBRNE weapons against a friendly airfield presents a serious threat to flying operations. Although the most effective way for aircrews to avoid this threat is to be airborne before those weapons are detonated/dispersed and then land at a field that has not been contaminated, all personnel must be prepared to operate from a field that has come under CBRNE attack.

A2.2. Mission Preparation. Be aware of the status of the CBRNE environment at the planned launch and recovery airfields, potential divert bases, and throughout the area in which the sortie may fly. Know the current and forecast surface wind direction and the MOPP level in effect for relevant sectors of the airfield. Don appropriate aircrew chemical defense equipment (ACDE) or Ground Crew Ensemble (GCE) to match the appropriate MOPP level (reference AFMAN 10-100) and carry individual protective equipment (IPE) as required.

A2.3. Stepping to Fly and Aircraft Preflight. This may entail donning ACDE or transitioning from GCE to ACDE. Take precautions to protect aircrew from injury and or contamination while in transit from the squadron facility to the aircraft. If possible, transport aircrew in a vehicle that provides overhead cover (enclosed vehicle). If aircrew travel on foot is unavoidable, choose a route that takes maximum advantage of available overhead cover (sun shades, buildings, etc.) to avoid agents that may be settling from the air. If extra aircrew members are available for preflight duties, consider assigning them to do so wearing GCE. This will allow the aircrew actually flying to minimize exposure.

A2.3.1. Alarm Red (or Theater Equivalent) Prior to Engine Start. If Alarm Red occurs during the step or preflight process, take cover and don appropriate MOPP. This may require use of the ground crew mask. A hardened aircraft shelter (HAS) provides optimum protection, if available. Use caution if entering a HAS that contains aircraft and/or equipment. Close doors after entry. If a HAS or other overhead cover is not immediately available, accept the best rapidly reachable cover.

A2.4. Engine Start to Takeoff. If a HAS is available, use it to minimize exposure time by accomplishing aircraft arming and End of Runway (EOR) procedures inside it (if local procedures permit) and by delaying taxi time as long as possible prior to takeoff.

A2.4.1. Aircraft Launch to Survive (LTS). Units will develop local procedures to provide this option to the commander. In general, aircraft may LTS any time after engine start if they have sufficient fuel and safe, expeditious access to a runway. This option may only be practical for aircraft that are near EOR prior to takeoff or that have just landed.

A2.4.2. Alarm Red Prior to Taxi. If in a HAS, the normal procedure is to shut down. Engine noise may preclude effectiveness of normal alert notification procedures, so ensure ground personnel are aware of the alarm warning, assume proper MOPP, and close HAS doors. Use hand signals if necessary.

A2.4.3. Alarm Red (or Theater Equivalent) After Taxi. Units typically establish procedures for this contingency depending on whether additional protection is available along the taxi route (empty HAS, for instance). Ideally, ground crew sheltering in such a

HAS would be available to assist in normal engine shutdown procedures and to close HAS doors. If protection is not available, the best option may be LTS. Maintain contact with Command and Control (C2) entities (Wing Operations Center, Maintenance Operations Center, Supervisor of Flying, etc.) to ensure unity of effort in the overall plan.

A2.5. Takeoff to Landing.

A2.5.1. Contamination. If Chemical Warfare (CW) agent contamination occurred prior to takeoff, flying the aircraft will dissipate the agent to some degree. The total amount of dissipation will be greater with lower flight altitudes and longer flight times. Because the agent may have entered wheel wells, flaps, etc., consider flying in landing configuration to increase airflow to these areas. In any circumstances, merely flying the aircraft is unlikely to achieve complete decontamination.

A2.5.2. Preparing to Land. Aircrew should remain aware of the status of primary and alternate landing locations. Do not attempt to land during Alarm Red situations unless there is no other option. Follow C2 directions and either hold or divert. If mission needs preclude divert, hold until the Alarm Red (or theater equivalent) has cleared or become an Alarm Black. Prior to landing, gain awareness of contaminated sectors of the airfield and of current/forecast surface winds. Use this information in conjunction with C2 direction to plan a route from landing to engine shutdown. The liquid deposition phase following a CW airburst attack can extend up to 1 hour. If landing during Alarm Black, expect a contaminated environment and MOPP 4.

A2.6. Landing to Engine Shutdown. Take advantage of any protection available, minimizing taxi time and distance. Maintain contact with C2 in order to remain aware of unexploded ordnance and/or damage to airfield movement surfaces. If a HAS is available and local procedures permit, accomplish aircraft de-arm and EOR procedures there. If Alarm Red (or Theater Equivalent) occurs between landing and engine shutdown, considerations are similar to those discussed in the engine-start-to-takeoff section.

A2.7. After Engine Shutdown. Don appropriate MOPP if not already worn. If circumstances permit, accomplish normal post-flight inspection procedures. If the aircraft is not contaminated, close the canopy. If there is any suspicion of personnel contamination, aircrew will process through an aircrew contamination control area (ACCA). Accomplish maintenance debriefings under cover to the maximum extent possible.

Attachment 3**FLIGHT BRIEFING GUIDES****A3.1. General Briefing Guide. Mission Data.**

Time Hack

EP / Threat of the Day

Mission Objective(s)

Mission Overview

Mission Data Card

 Mission Commander / Deputy Lead

 Joker / Bingo Fuel

 Takeoff and Landing Data

Weather / Sunrise / Sunset / Moon Illumination

Tactical Decision Aid / Transmissivity / Absolute Humidity

NOTAMs / Bird Strike Potential

Personal Equipment

FCIF / Pubs / Maps

Ground Procedures.

Step

Pre-Flight

 Aircraft

 Armament

Boresight

Check-In

Taxi / Marshalling / Arming

Spare Procedures

Takeoff.

Runway Lineup

Formation Takeoff

Takeoff Interval

Abort

Jettison Procedures

Low Altitude Ejection

Landing Immediately After Takeoff

Departure/En Route.

Routing

Trail Departure

Join-Up / Formation

Systems / Ops Checks

Airspace.

Area

Times

Restrictions (Chaff/Flare/Supersonic)

Bailout (Controlled/Uncontrolled)

MSA

Recovery.

Rejoin

Battle Damage / Bomb Check

Type Recovery

Flight Break-Up

Pattern and Landing

After Landing / De-Arm

Emergency / Alternate Airfields

Special Subjects (As Applicable).

General Roles and Responsibilities (IP, Flight Lead, Wingman)

Formation Specific Responsibilities and Priorities

Flight Member Mission Priorities

Task / Sensor Prioritization

Deconfliction Contracts

Chase Procedures

IFF Procedures

Collision Avoidance

Radar / Visual Search Responsibilities

Departure/Enroute/Recovery

High Density Traffic Areas

- Mid-Air Collision Avoidance
 - From Other Military Aircraft
 - From Civilian Aircraft
- Dissimilar Formations
- Terrain Avoidance
 - Departure / En Route / Recovery
 - Use of Controlled Flight Into Terrain Prevention Systems
 - CARA ALLOW
 - MSL Line-In-The-Sky
 - Ground Collision Avoidance System (GCAS)/Minimum Terrain Clearance (MTC)
 - Targeting Pod Attitude Advisory Function
- Bird Strike Procedures / Use of Visor(s)
- Human Factors Considerations (i.e., Channelized Attention, Task Saturation / Prioritization and Complacency)
- G-Awareness
 - Turn / G-Suit connection / G-tolerance
 - Use of L-1 Anti-G Straining Maneuver
- Visual Illusions / Perceptions
 - Spatial Disorientation / Unusual Attitudes / G-excess illusion
- Lost Wingman
- Radio Inoperative
- SAR / CSAR
- Recall Procedures
- SIIs
 - Pilot currencies for events to be flown
- Training Rules / Special Operating Instructions / Rules of Engagement
- Tactical Portion of Mission
- A3.2. Additional Briefing Items, NVG Weather / Illumination:**
 - Civil / Nautical Twilight
 - Moon Rise/Set Times / Phase / Elevation / Azimuth
 - Ceiling / Visibility
 - LUX / EO TDA

Obscurants to Visibility

NVG Preflight:

Check Adjustments / Helmet Fit and Security

Batteries

Resolution / Focus (Hoffman ANV-20/20 Tester, Eye Lane)

NVG Compatible Flashlight

Cockpit Preflight:

Cockpit Setup

Cockpit Lighting (Leaks)

Cockpit FAM

Check Focus and Stow for Taxi

Before Takeoff:

Don NVGs / Check and Adjust

Stow for Takeoff

Airborne:

Exterior Lights

NVG Donning

Scan Pattern

Forward Scan

Narrow Field of View vs. Field of Regard

Peripheral Vision

Scan Techniques

Join-up and Enroute Considerations

Rejoin / Closure

Air-to-Air TACAN

G-Awareness Considerations

Lighting

Visible Horizon

Deconfliction / Separation

Route Study / Scene Interpretation

NVG Predictions

Terrain / Shadowing / Visual Illusions / Visible Horizon

Terrain Avoidance
Radar Altimeter
TFR Usage
City / Cultural Lighting
Direction / Orientation of Lighting
Formation Maneuvering
Map Reading
F-16D NVG Procedures / Crew Coordination
NVG Abnormal Situations / Emergencies
Lost Sight-NVGs
Lost Wingman-NVGs
Transition to Instruments
Visual Illusions / Depth Perception
Disorientation / Misorientation / Vertigo
Fatigue
NVG Failure
Battery Failure / Swap Out
Overconfidence in NVG Capabilities
Correct Lighting of Primary / Secondary Flight Instruments
Lost Comm (with Wingman / Target)
Aircraft Emergency
Ejection-Goggles-OFF
Target Fixation
Lack of Dive Information
Target / Fighter Enters IMC
No Tally by 1,500' Slant Range
Radar Break Lock Inside 1,500'
Excessive Overtake / Target Maneuvers
Laser Eye Protection (LEP) Use
Laser / IR Pointer Safety
NVG FOD Considerations (Batteries, Equipment, etc)
NVG ROE/Training Rules

A3.3. Additional Briefing Items, Air Refueling. General

- Tanker Call Sign(s) / Receiver Assignments
- Refueling Track(s)
 - Altitude
 - Airspeed
 - Airspace Restrictions
- ARIPs, ARCPs, ARCTs
- Radio Frequencies
- Buddy Procedures:
 - Departure
 - Join-Up
- En Route:
 - Route of Flight
 - Formation
 - Ops Checks
- Rendezvous:
 - Type Rendezvous
 - Holding Procedures / Formation
 - Ground Radar Assistance
 - Tanker Identification - TACAN / Radar / Visual
 - Radar Procedures / Techniques
 - Wingman / Deputy Lead Responsibilities
 - Receiver Formation / Join-Up Procedures
 - Rendezvous Overrun
- Refueling:
 - Checklist Procedures
 - Radio Calls
 - Refueling Order
 - Techniques
 - EMCON Level
 - Visual Signals
 - Fuel Off-Load

Bingo Fuel (Abort Points / Abort Bases)

Drop-Off Procedures

Wake Turbulence

Reform and Exit:

Formation

Clearance

Emergency Procedures:

Breakaway Procedures

Systems Malfunctions

Damaged Receptacle

IMC/Night Considerations:

Lost Wingman Procedures

Aircraft Lighting

Special Subjects:

Fuel Awareness / AB Use / Consumption Rates

Flight Path Deconfliction / Other Receiver Considerations

Human Factors Considerations (i.e., Channelized Attention, Task Saturation /
Prioritization and Complacency)

A3.4. Additional Briefing Items, Low-Level Navigation. General

Route / Clearance / Restrictions

Flight Responsibilities

Navigation

Radar / Visual Search

Entry / Spacing / Holding / Initial Altitude / MSA

TFR Checks / TFR Letdown

Route Procedures:

Fence Checks

Tactical Formation / Turns

Low-Level Navigation

Dead Reckoning / Use of Navigation Aids/ Equipment (i.e., INS)

Radar Procedures / Techniques / Predictions

Visual Procedures / Techniques / IR Predictions

Updates / Calibrations

Time / Fuel Control

Terrain Following / Wingman Considerations / Pilot Comfort Level

Leg Altitudes / Set Clearance Plane / Obstacles (MSL / AGL)

Turnpoint Acquisition

Obstacle / Ground Avoidance

Use of Altitude Warning Features (ALOW and Line-In-The-Sky MSL Floor Settings)

Threat Reactions

RWR / ECM / Chaff / Flares

Engagement Criteria

Flight Path Deconfliction

Termination

Contingencies

Aircraft Fallout Plan

Rejoin After Late Takeoff

Emergencies:

Aircraft Malfunctions

Route Abort Procedures (RAA / MSA) / ATC Frequencies

Alternate Mission

Type Mission (refer to appropriate mission briefing guide)

Mission Objectives

Special Subjects

Airspace Restrictions

G-Awareness / Ops Checks

Fuel Awareness / AB Use / Consumption Rates

Flight Path Deconfliction

Maneuvering Limitations

Airspeed and G

Recognition / Prevention / Recovery from Out of Control

Time to Ground Impact

Wings Level

Overbank / Under G

Night Considerations

Human Factors Considerations (i.e., Channelized Attention, Task Saturation / Prioritization and Complacency)

A3.5. Additional Briefing Items, Air-to-Surface Range Operations. Range Information

Target / Range Description

Restrictions

Range Entry / Holding

Radio Procedures

Formation

Sequence of Events

Pattern Procedures

Aircraft Fallout Plan

Rejoin on Range for Late Takeoffs

Employment Procedures/Techniques:

Avionics / Switch Positions

Weapons Switchology / Delivery Mode

Radar Switchology

Special Weapons Switchology

Laydown / Loft Events

Ground track / Altitude / Airspeed

Radar / Optical Depiction (OAP / TGT)

Radar / Optical Tuning / Techniques

Pickle / Release Point

Breakaway / Recovery Technique

Backup Deliveries / EMR

Delivery Spacing

Pop-Up Delivery

Entry Airspeed / Altitude

Pop Point / Pull-Up Angle / Power Setting

Target Acquisition

Pull Down / Apex Altitudes

Pattern Corrections

Roll-In

Position

Techniques (Pitch / Bank / Power)

Roll-Out / Wind Effect

Final

Aim-Off Distance

Dive Angle

Airspeed

HUD Depiction

Sight Picture / Corrections / Aim-Point

Release Parameters

Release Indications

Recovery Procedures

Special Procedures:

Live Ordnance Considerations

Safe Escape / Safe Separation

Fuse Arming / Frag Avoidance

RBS Operations

Laser Operations

Night Procedures:

Aircraft Lighting

Radio Calls

Target ID / Range Lighting

Night Spacing Techniques

Instrument Cross-check / Disorientation

Flare Pattern

Flare Release Points and Interval

Wind Effect / Offset

Dud Flare Procedures

Switching Aircraft Patterns

Over Water Range Operations:

Employment Techniques

Depth Perception / Reduced Visual Cues

Distance / Altitude Estimation

Pop-Up Positioning

Timing

Visual / Aircraft References to Establish Pull-Up Point

Special Considerations

Adjusted Minimum Altitudes

Range Departure Procedures:

Armament Safety Checks

Rejoin

Battle Damage / Bomb Check

Jettison Procedures / Parameters

Hung / Unexpended Ordnance

Inadvertent Release

Gun Unsafe / Jam

Alternate Mission

Type Mission (refer to appropriate mission briefing guide)

Mission Objectives

Special Subjects

Error Analysis

Fouls

Minimum Altitudes

Target Fixation

G-Awareness

Fuel Awareness / Ops Checks / AB Use / Consumption Rates

Maneuvering Limitations

Airspeed / G / Stress (Carriage / Release)

Recognition / Prevention / Recovery from Out of Control

Time to Ground Impact

Wings Level

Overbank / Under G

Human Factors Considerations (i.e., Channelized Attention, Task Saturation / Prioritization, and Complacency)

A3.6. Crew Coordination / Passenger / Ground Crew Briefing Guide: Crew Coordination / Passengers:

Pre-Flight

Prohibited Items

Cockpit Layout

Flight Maneuvering Parameters

Change of Aircraft Control

Rear Seat Landing Procedures

Emergencies

Runway Departure

Canopy Loss

Ejection / Egress (With and Without Intercom) / Ejection Mode Selector Handle Position

Loss of Intercom

Bird Strike Procedures / Use of Visor(s)

Flight Control Interference

Rudder Interference - Rudder Pedal Adjustment

Stick Interference - Lapbelt, Utility Light, Personal Equipment, Leg Position, Paddle Switch Override

Ground Crew:

Act Only On Pilot's Instructions

Ground Emergency Procedures

Hand Signals

Aircraft Danger Areas

A3.7. Mission Debriefing Guide. Ground Procedures

Takeoff/Join-Up/Departure

En Route Procedures

Recovery/Landing/After Landing

General:

SIIs

Radio Procedures

- Flight Member Responsibilities
 - Formation and Deconfliction Contracts
 - Sensor Management/Prioritization
- Training Rules/Special Operating Instructions
- Mission Accomplishment/Analysis:
 - Mission Reconstruction
 - Mission Support
 - VTR / Film Assessment
 - Anti-G Straining Maneuver Effectiveness
 - Tactical Employment Priorities
 - Learning Objectives Achieved
 - Lessons Learned
 - Recommendations for Improvement
- Comments/Questions

Attachment 4**CRITICAL ACTION PROCEDURES (CAPS)**

A4.1. General. The following procedures will be evaluated IAW MAJCOM guidelines. Pilots shall be able to immediately accomplish these procedures in the published sequence without reference to the checklist. Certain steps (e.g., Stores - Jettison) may be performed out of sequence, if conditions warrant. CAPs may be abbreviated when written, but procedural intent must be clear.

A4.1.1. FIRE/OVERHEAT/FUEL LEAK (GROUND)

Throttle - Off

JFS - Off

Fuel Master Switch - Off

A4.1.2. GROUND EGRESS

Throttle - Off

Seat - Safe

Belt / Kit / Harness / G-Suit - Release

A4.1.3. ABORT

Throttle - Idle

Hook - Down (Above 100 Knots or If Required)

A4.1.4. AB MALFUNCTION ON TAKEOFF (TAKEOFF CONTINUED)

Throttle - MIL

Stores - Jettison (If Required)

A4.1.5. ENGINE FAILURE ON TAKEOFF (TAKEOFF CONTINUED)

Zoom

Stores-Jettison (If Possible)

Eject

A4.1.6. ENGINE FIRE ON TAKEOFF (TAKEOFF CONTINUED)

Climb

Stores - Jettison (If Required)

A4.1.7. LOW THRUST ON TAKEOFF/AT LOW ALTITUDE (NON-AB)**A4.1.7.1. PW 200**

EEC/BUC Switch - Off.

If Thrust Is Still Insufficient:

Throttle - MAX AB.

If Thrust Is Still Insufficient:

Throttle - MIL

EEC/BUC Switch - BUC

If Nozzle Fails To Close After Transferring To BUC Or If Thrust Is Still Insufficient:

EEC/BUC Switch - OFF

Throttle - MAX AB

Stores - Jettison (If or When Required)

A4.1.7.2. GE100/129

Throttle - AB.

Stores-Jettison (If Required).

If thrust is insufficient to maintain level flight at a safe altitude:

Engine Control Switch – SEC, then PRI

A4.1.7.3. PW 220/229

Throttle - AB

Stores - Jettison (If Required)

If PRI thrust is insufficient to maintain level flight at a safe altitude:

Engine Control Switch - SEC

A4.1.8. ENGINE FAILURE/AIRSTART**A4.1.8.1. PW200**

Zoom (If at Low Altitude)

Stores - Jettison (If Required)

Throttle - OFF

Airspeed - As Required

EEC/BUC Switch - As Required.

When RPM Is Between 40-25 Percent And FTIT Is Below 700 Degrees:

Throttle - IDLE

JFS - Start 2 When Below 20,000 Feet and 400 KIAS

A4.1.8.2. PW220

Zoom (If At Low Altitude)

Stores - Jettison (If Required)

Throttle - OFF

Airspeed - As Required.

When RPM Is Between 50-25 Percent And FTIT Is Below 700 Degrees:

Throttle - IDLE

JFS - Start 2 When Below 20,000 Feet and 400 KIAS

A4.1.8.3. PW229

Zoom (If at Low Altitude)

Stores - Jettison (If Required)

Throttle - OFF, then Midrange

Airspeed - As Required

JFS - Start 2 When Below 20,000 Feet and 400 KIAS

A4.1.8.4. GE100/129

Zoom (If at Low Altitude)

Stores - Jettison (If Required)

Engine Control Switch – SEC, Then PRI

Airspeed – As Required

JFS – Start 2 When Below 20,000 Feet and 400 KIAS

A4.1.9. OUT-OF-CONTROL RECOVERY

Controls - Release

Throttle - Idle

FLCS Switch – RESET (Delete this step for analog FLCS)

If In An Inverted Deep Stall:

Rudder - Opposite Yaw Direction (Delete this step for Block 40/42/50/52 aircraft).

If Still Out-Of-Control:

MPO Switch - OVRD and Hold

Stick - Cycle in Phase