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Flying Operations

F/A-22--OPERATIONS PROCEDURES



COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This volume implements AFD 11-2, *Aircraft Rules and Procedures*; AFD 11-4, *Aviation Service*; and AFI 11-202V3, *General Flight Rules*. It applies to all F/A-22 units. It does not apply to the Air Force Reserve Command. MAJCOMs are to forward proposed MAJCOM-level supplements to this volume to HQ AFFSA/XOF, through HQ ACC/DOTO, for approval prior to publication IAW AFD 11-2, paragraph 4.2. Copies of MAJCOM-level supplements, after approved and published, will be provided by the issuing MAJCOM to HQ AFFSA/XOF, HQ ACC/DOTO, and the user MAJCOM offices of primary responsibility. Field units below MAJCOM level will forward copies of their supplements to this publication to their parent MAJCOM office of primary responsibility for post publication review. Keep supplements current by complying with AFI 33-360V1 (annual review). See paragraph 1.3. of this volume for guidance on submitting comments and suggesting improvements to this publication. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW AFD 37-1, *Information Management* and AFMAN 37-123, *Management of Records* and disposed of IAW the Air Force Records Disposition Schedule (RDS) located at <https://webrims.amc.af.mil>

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

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## Chapter 1

### INTRODUCTION

#### 1.1. General.

1.1.1. **Scope.** This instruction outlines the procedures applicable to the safe operation of the F/A-22. With the complementary references, this instruction prescribes standard operational procedures for all USAF F/A-22 pilots.

1.1.2. **Pilot Responsibility.** This instruction, in conjunction with other governing directives, prescribes procedures for operating F/A-22 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.

1.1.3. **Deviations.** Deviations from these procedures require specific approval of the MAJCOM/DO unless an urgent requirement or an aircraft emergency dictate otherwise. In that case, the pilot in command will take the appropriate action to safely recover the aircraft.

1.1.4. **References.** The primary references for F/A-22 operations are T.O.s 1F/A-22A-1, 1F/A-22A-1-1, 1F/A-22A-34-1, AFTTP 3-1 and AFTTP 3-3, AFI 11-214, *Air Operations Rules and Procedures*, and this instruction. Training units may develop phase manuals from the procedures contained in these documents. Phase manuals may expand on basic procedures but in no case will they be less restrictive. Operational units may use these phase manuals.

1.1.5. **Supplements.** Develop supplements IAW AFI 33-360 Volume 1. Per AFI 33-360 Volume 1, paragraph 3.44.2, the paragraph method is the only authorized way to supplement.

**1.2. Waivers.** Forward waiver requests through appropriate channels to the applicable MAJCOM/DO for approval. Approved waivers are issued for a maximum of one year from the effective date. Provide information copies of approved waivers to the lead and user MAJCOM OPRs for this instruction.

#### 1.3. Instruction Changes.

1.3.1. Submit recommendations for change to this instruction on an AF Form 847, *Recommendation for Change of Publication* to the parent MAJCOM. MAJCOMs forward approved recommendations to HQ ACC/DOTO. HQ USAF/XO is the approval authority for interim changes to this instruction.

## Chapter 2

### MISSION PLANNING

**2.1. Responsibilities.** The responsibility for mission planning is shared jointly by all flight members and the operations and intelligence functions of fighter organizations.

#### **2.2. General Procedures.**

2.2.1. Accomplish sufficient flight planning to ensure safe mission accomplishment to include fuel requirements, map preparation, and takeoff/landing data.

#### **2.3. Map/Chart Preparation.**

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

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

##### **2.3.3. Low Altitude Maps.**

2.3.3.1. On low altitude flights (LOWAT syllabus rides, military training routes, VR routes), each aircraft in the flight will contain a minimum of one CHUMed map of the low altitude route/operating area. The map will be of a scale and quality that terrain features, hazards, and chart annotations are of sufficient detail to allow navigation and safe mission accomplishment.

2.3.3.2. Highlight all man-made obstacles at or above the planned flight altitude. Additionally, annotate low-level maps with time and/or distance tick-marks to ensure positive positional awareness of obstacles along the planned route of flight plus or minus 5 NM.

2.3.3.3. Annotate all maps with a route abort altitude (RAA). Compute the RAA, for the entire route/area, at a minimum of 1,000 feet above the highest obstacle/terrain feature (rounded up to the next 100 feet) within the lateral limits of the route or training area, but in no case less than 5 NM either side of planned route. Minimum Safe Altitudes (MSA) may be used for specific legs of a route.

2.3.3.4. Aircrew members flying under VFR or inside MTRs in CONUS will supplement existing mission planning materials (e.g. CHUM, FLIP AP/1B, etc.) With either:

2.3.3.4.1. PFPS/Falcon View with the following overlay options selected: airports/heliports, airspace boundaries, airways, MTR, parachute jump and SUAs boundaries; or

2.3.3.4.2. Sectional aeronautical charts.

2.3.3.5. Low level charts and route books used during flight will be annotated with location and dimensions of class A/B/C/D airspace, civil/military airfields and other potential high density traffic areas (e.g., parachute activity areas and ultra light/hang glider/gliders sites, etc.) within 5 NM of any planned VFR route or MTR lateral boundary. Applicable airfield approach control frequencies in the vicinity of class A/B/C/D airspace will be annotated and briefed on all such flights. In addi-

tion, annotate and brief the intersection of other VR/IR routes (if applicable) and any other possible areas of conflict.

2.3.3.6. Use of sectional aeronautical charts in flight is not required.

2.3.3.7. Aircrew members flying outside CONUS will follow gaining MAJCOM, theater or host nation guidance on mission planning. If no gaining MAJCOM, theater or host nation guidance exists, use the best charts or Falcon View overlay options available to accomplish the requirements of paragraph [2.3.3.5](#).

## 2.4. Briefing/Debriefing.

2.4.1. **Briefings.** Flight leaders are responsible for presenting a logical briefing that will promote safe, effective mission accomplishment.

2.4.1.1. All pilots/crewmembers/passengers must attend the flight briefing unless previously coordinated with unit supervisors. Anyone not attending the flight brief must receive a briefing on mission events and emergency procedures.

2.4.1.2. Briefers will reference applicable portions of briefing guides. Items listed may be briefed in any sequence. Those items understood by all participants may be briefed as "standard." Specific items not pertinent to the mission do not need to be covered.

2.4.1.3. Takeoff and landing data (TOLD) will be annotated on mission data cards. The minimum TOLD required is maximum abort speed (dry/wet) takeoff distance and speed, rotation speed, and normal/heavy weight landing distance (dry/wet).

2.4.1.4. Review takeoff data, and ensure every member of the flight understands it. Place particular emphasis on takeoff and abort factors during abnormal situations such as short/wet runway, heavy gross weights, non-standard cable configurations, and abort sequence in formation flights.

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

2.4.1.6. For all low-level mission briefings, place emphasis on obstacle/ground avoidance, altitude-warning features (low altitude warning) low altitude comfort level, and complacency avoidance.

2.4.1.7. Start briefings at least 1.5 hours before scheduled takeoff. Start alert briefings in sufficient time to be completed prior to pilot changeover.

2.4.1.8. Structure flight briefing to accommodate the capabilities of each flight member.

2.4.1.9. Brief an appropriate alternate mission for each flight. The alternate mission must be less complex than the primary unless Wings have developed and published standard alternate mission profiles in the local pilot aid. Brief specific mission elements different than the primary mission or published profiles. Mission elements/events may be modified and briefed airborne as long as flight safety is not compromised. Flight leads will ensure all flight members acknowledge changes. Do not fly unbriefed missions/events.

2.4.1.10. All missions will be debriefed.

2.4.2. **Deployed Operations, Exercise, and Quick Turn Briefings.** If all flight members attend an initial or mass flight briefing, the flight lead on subsequent flights need brief only those items that have changed from the previous flight(s).

2.4.3. **Briefing Guides.** Mission briefing guides are contained in the Attachments. Units may augment these guides as necessary. Pending development by a higher headquarters, units that fly missions not covered by this instruction or its supplements will develop briefing guides for those missions and submit them to MAJCOM/DOT (19AF/DOK) for review.

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

2.5.1. Unit developed checklists may be used in lieu of flight manual checklists provided they contain, as a minimum, all items (verbatim and in order) listed in the applicable checklist. These checklists will reflect the same change number, change date and applicable supplement numbers as the flight crew checklist for configuration control.

2.5.2. Units will produce a pilot aid that, as a minimum, includes:

2.5.2.1. Briefing Guides.

2.5.2.2. Local radio channelization and airfield diagrams.

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

2.5.2.4. Arresting gear information for divert bases.

2.5.2.5. Bailout and Jettison Areas.

2.5.2.6. Cross-country procedures to include: command and control, engine documentation, JOAP samples, and aircraft servicing.

2.5.2.7. Other information as deemed necessary by the units. For example: stereo flight plans, turnaround procedures, local training areas, instrument preflight, and alert procedures.

2.5.2.8. Forms will be developed IAW AFI 33-360V2, *Content Management Program-Information Management Too (CMP-IMT)*.

2.6. G-suit/Combat Edge Use. IAW AFI 11-301 Vol. 1, *Aircrew Life Support (ALS)* Program, the following apply:

2.6.1. G-suit is required during all flights when 2 or more Gs are anticipated

2.6.2. COMBAT EDGE is required on all tactical flights. Flight without the vest is only acceptable for instrument sorties and/or ferry flights where less than 6Gs is pre-planned/anticipated.

## Chapter 3

### NORMAL OPERATING PROCEDURES

**3.1. Ground Communications.** The pilot will accomplish the ground crew briefing (when required) in accordance with the briefing guide contained in this instruction. Normally, the pilot and ground crew will communicate using the intercom during all engine start and pre-taxi checks. Use the intercom system, to the maximum extent possible, anytime aircraft engines are operating and maintenance technicians are performing tasks on the aircraft. Units with active air defense commitments may waive the use of intercom during alert scrambles.

**3.2. Ground Visual Signals.** When ground intercom is not used, use visual signals IAW AFI 11-218, *Aircraft Operations and Movement on the Ground*, and this instruction. All signals pertaining to operation of aircraft systems will originate with the pilot. The crew chief will repeat the given signals when it is safe to operate the system. The pilot should not activate any system that could pose danger to the ground crew prior to receiving proper acknowledgment from ground personnel. The following signals augment AFI 11-218.

3.2.1. **APU START.** With clenched fist, pilot makes a pulling motion.

3.2.2. **ENGINE START.** Hold up number of fingers corresponding to which engine is being started and make circling motion.

3.2.3. **FLIGHT CONTROLS CHECK.** Raise arm, clench fist, and make a stirring action.

3.2.4. **REFUELING RECEPTACLE OPEN or CLOSED.** Display hand flat on top of helmet with fingers extended. To open, raise fingers to the vertical position and heel of hand remaining stationary. To close, reverse signal.

3.2.5. **WEAPONS BAY OPEN or CLOSE.** Display hands with fingers extended, palms up and edges of hands touching. Move hands apart several times.

3.2.6. **LOSS OF BRAKES WHILE TAXIING.** Lower tailhook.

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

### 3.3. Ground Operations.

3.3.1. The minimum taxi interval is 150 feet staggered or 300 feet in trail. Spacing may be reduced when holding short of or entering the runway.

3.3.2. Do not taxi during snow and/or icy conditions until the taxi route and runway have been checked for safe conditions. In this case, taxi on the centerline with a minimum of 300 feet spacing.

3.3.3. Quick Check and Arming. Keep hands in view of ground personnel during quick check, arming or dearming operations. If the intercom system is not used during EOR checks, the pilot will establish and maintain visual contact with the ground personnel to allow the use of visual signals.

3.3.4. Do not taxi in front of aircraft being armed/de-armed with forward firing ordnance.

**3.4. Flight Lineup.** Flights will line up as appropriate based on weather conditions, runway conditions, and runway width. Use a minimum of 500 feet spacing between separated elements/flights. If runway width precludes line-up with wingtip clearance between all aircraft in the flight, use 500 feet spacing between elements or delay run-up until the preceding aircraft/element releases brakes.

**3.5. Before Takeoff Checks.** Just prior to takeoff, all flight members will inspect each other for proper configuration and any abnormalities. Wingmen will indicate they are ready for takeoff by a head nod, radio call, or landing/taxi light signal.

### **3.6. Takeoff.**

3.6.1. Do not takeoff if the RCR is less than 12.

3.6.1.1. Per MAJCOM guidance, OG/CC may waive RCR minimum for specified units operating in cold weather locations, but in no case will takeoffs be conducted with an RCR of less than 8.

3.6.2. On training missions do not takeoff if the computed takeoff roll exceeds 80 percent of the available runway. For takeoffs, if the computed military power takeoff distance exceeds one-half of the available runway, takeoff using afterburner.

3.6.3. When operating from airfields equipped with a compatible, remotely operated cable, ensure the departure end cable is raised for all takeoffs and landings, unless another departure end cable is in place.

3.6.4. Use a minimum of 10 seconds (15 seconds when using afterburners) takeoff interval between aircraft. When joining "on top" use a minimum of 20 seconds takeoff interval.

3.6.5. Aircraft will steer toward the center of the runway at the start of the takeoff roll.

3.6.6. During rolling takeoffs, align the aircraft with the runway heading prior to advancing the throttles.

3.6.7. Wing/Group Commander or Ops Group Commander may approve intersection takeoffs if operational requirements dictate.

3.6.8. Do not takeoff with SES level below 90%.

### **3.7. Formation Takeoff: N/A**

### **3.8. Join-up/Rejoin.**

3.8.1. Day weather criteria for a VFR join-up underneath: ceiling 1,500 feet and visibility 3 miles.

3.8.2. Flight leaders will maintain 350 KCAS until join-up is accomplished unless mission requirements necessitate a different airspeed.

3.8.3. Flight leaders should limit their angle of bank to 30 degrees for turning rejoins immediately after takeoff.

3.8.4. Flight members will join in sequence. For a straight-ahead rejoin, the number two aircraft will join on the left wing and the element will join on the right wing. For a turning rejoin, the number two aircraft will rejoin on the inside of the turn and the element to the outside. If mission or flight requirements dictate, the flight leader will specifically direct the desired formation positions.

3.8.5. **Battle Damage Checks.** When circumstances permit, flight leads will direct a battle damage check after each mission prior to or during RTB. Except at night/IMC, this check is mandatory following the expenditure of any ordnance (including all types of 20mm ammunition). Brief deconfliction responsibilities and position change procedures. Fly no closer than fingertip formation spacing.

3.8.6. For further join-up procedures, see Night Joinup (3.18.3.) and Chapter 4.

### 3.9. Formation, General.

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

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

3.9.3. Airborne visual signals will be in accordance with AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*. For four-ship flights, configuration changes will be initiated 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.

3.9.4. Flight leaders will not break up formations until each wingman has a positive fix from which to navigate (visual, radar, GINS, or TACAN).

#### 3.9.5. Changing Leads.

3.9.5.1. When flying in limited visibility conditions, initiate lead changes from a stabilized, wings level attitude.

3.9.5.2. The minimum altitude for a lead change is 500 feet AGL over land or 1,000 feet AGL over water.(for night see paragraph 3.18.4.)

3.9.5.3. Do not initiate lead changes with the wingman further aft than 30 degrees from line abreast.

3.9.5.4. Flight/element leads will not initiate a lead change unless the aircraft assuming the lead is in visual contact and in a safe position to do so.

3.9.5.5. Initiate a lead change by visual signal or radio call.

3.9.5.6. Acknowledge receipt of the lead by head nod or radio call, as appropriate.

3.9.5.7. A lead change is effective upon acknowledgment.

3.9.5.8. The former leader then moves to the appropriate wing position.

### 3.10. Tactical Formation.

3.10.1. **General.** Apply the following rules for flight path deconfliction during tactical maneuvering:

3.10.1.1. Flight/element leads will consider wingman/element position and ability to safely perform a maneuver before directing it.

3.10.1.2. Wingmen/elements must maneuver relative to the flight lead/lead element and maintain sight. Trailing aircraft/elements are responsible for deconflicting with lead aircraft/elements.

3.10.1.3. Wingmen/elements will cross above the lead/lead element when deconfliction is required.

3.10.2. **Loss of Visual.** Use the following procedures when one or more flight members/elements lose visual contact within the formation:

3.10.2.1. When any flight member/element calls "Blind," then the appropriate flight member/element will immediately respond with "Visual" and a position report or "Blind."

3.10.2.2. When the other flight member/element is also "Blind," that pilot will transmit his altitude as an immediate action to deconflict flight paths. The flight lead will ensure a minimum of 500 feet altitude separation is maintained. Avoid climbs/descents through the deconfliction altitude when possible.

3.10.2.3. When there is not a timely acknowledgment of the original "Blind" call, then the flight member/element initiating the call will maneuver away from the last known position of the other flight member/element and alter altitude.

3.10.2.4. If visual contact is still not regained, the flight leader will take additional positive action to ensure flight path deconfliction within the flight to include a Terminate/Knock-It-Off call if necessary. Consider scenario restrictions such as sanctuary altitudes and/or adversary blocks.

3.10.2.5. Aircraft will maintain altitude separation until a visual is regained and, if necessary, will navigate with altitude separation until mutual support is regained.

3.10.3. **Two-Ship.** The following rules apply for flight path deconfliction during tactical maneuvering of two-ship formations:

3.10.3.1. Normally, the wingman is responsible for flight path deconfliction.

3.10.3.2. The flight lead becomes responsible for deconfliction when:

3.10.3.2.1. Tactical maneuvering places the leader in the wingman's "blind cone" or forces the wingman's primary attention away from the leader (for example, wingman becomes the engaged fighter, or from a wingman trail position the flight lead directs a 180 turn).

3.10.3.2.2. The wingman calls "padlocked."

3.10.3.2.3. The wingman calls "blind."

3.10.3.2.4. Deconfliction responsibility transfers back to the wingman once the wingman acknowledges a visual on his lead.

3.10.4. **Three/Four-Ship (or greater).** When flights of more than two aircraft are in tactical formation:

3.10.4.1. Formation visual signals performed by a flight/element leader pertain only to the associated element unless specified otherwise by the flight leader.

3.10.4.2. Trailing aircraft/element(s) will maintain sufficient spacing so that primary emphasis during formation maneuvering/turns is on deconfliction within elements, not on deconfliction between elements.

### 3.11. Chase Formation.

3.11.1. **Restrictions.** Any pilot may fly safety chase for aircraft under emergency or impending emergency conditions. Qualified pilots (including IQT/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, WSEP, live weapons delivery, etc.) and training conducted IAW AFI 11-2F/A-22, Volume 1, *F/A-22 Aircrew Training*, may be chased by CMR/BMC pilots designated by Group/Squadron Commanders. All other chase events may only be flown by IP/FEs or upgrading IPs under the supervision of an IP.

#### 3.11.2. Procedures:

3.11.2.1. A safety observer in a chase aircraft, except IP/FE/specialized mission chase, will maneuver in a 30-60 degree cone with nose/tail clearance to 1,000 feet, to effectively clear and/or provide assistance.

3.11.2.2. IP/FE/specialized mission aircraft will maneuver as necessary, but must maintain nose/tail separation until required to transition to close formation when deemed necessary by the IP/FE.

3.11.2.3. No chase aircraft will stack lower than the lead aircraft when below 1,000 feet AGL.

**3.12. Show Formation.** Brief and fly show formations as approved. Refer to AFI 11-209, *Air Force Aerial Events*, and applicable MAJCOM directives for specific rules and appropriate approval levels to participate in static displays and aerial events. AFI 11-246 Vol 3, *Air Force Aircraft Demonstrations (F/A-22, CV-22)*.

### 3.13. Maneuvering Parameters.

3.13.1. **Minimum Altitudes.** For aerobatics, remain above 5,000 feet AGL. During nose high/low speed and AHC vertical maneuvering ensure maneuvers are terminated to allow recovery above 5,000 feet AGL.

3.13.2. Avoid flight through wingtip vortices and jetwash. If it is unavoidable, immediately unload the aircraft to approximately 1 G.

### 3.14. Ops Checks.

3.14.1. Accomplish sufficient ops checks to ensure safe mission accomplishment. Ops checks are required:

3.14.1.1. During climb or at level off after takeoff.

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

3.14.1.3. Following Air Refueling.

3.14.2. Minimum items to check are ICAWS, total fuel, G-suit connection, oxygen system, cabin altitude, and HUD max G indicator.

3.14.3. For formation flights, the flight leader may initiate ops checks by radio call or visual signal and wingmen will respond appropriately.

3.14.3.1. The query and response for ops checks will include total fuel amount as read on the Standby Flight Group (SFG). If wingmen are within 500 lbs. of the flight lead, a "same" call may be used.

3.14.3.2. When external tanks are feeding, add a "tanks feeding" call to the normal Ops Check reply. Make a "tanks dry" call once the external tanks are confirmed dry. Once the "tanks dry" call has been made, no further reference to tanks need be made on subsequent Ops Checks.

3.14.4. **G-awareness Exercise** - Reference AFI 11-214 and AFTTP 3-3, Chapter 9. A G-awareness exercise will be briefed and accomplished on all tactical missions, day or night, with or without night vision goggles, anytime you plan or are likely to maneuver above 5 G's. Pilots must have sufficient visual cues to perform this maneuver. If poor weather or night illumination conditions preclude safe accomplishment of the G-awareness exercise, flight leads will modify the profile and limit maneuvering accordingly. Briefings for night G awareness maneuvers will emphasize wingman deconfliction procedures and maintaining spatial/situational awareness throughout the maneuver. Flights will accomplish the G-awareness exercise only from a line abreast formation or a combination thereof. Do not execute G-awareness exercises from formations that put the wingmen within 6000 feet of other flight members (E.G., Fighting Wing, Fluid -4). G-awareness exercises will consist of one 180 degree turn at 4-5 G, followed by a 180 degree turn of 6-7 G. Flight members will maintain a minimum of 6000' separation between aircraft during the execution of all G-Awareness exercises. Visual lookout and formation contracts will be primary for deconfliction. All available on board systems will be used to aid in maintaining separation during execution. G-awareness maneuvers and all tactical portions of all missions will be recorded hot mike for review of G straining techniques during the debrief. Flight/Element leads will ensure the airspace in which they intend to conduct a G-awareness exercise is free from potential traffic conflicts. Use Air Traffic Control (ATC) services to the maximum extent practical to make sure the airspace is clear.

### 3.15. Radio Procedures.

3.15.1. Preface all communications with the complete flight call sign unless excepted below. Transmit only that information essential for mission accomplishment or safe flight. Use visual signals when practical.

3.15.2. Use KIO or Terminate procedures to direct aircraft to stop engagements, scenarios and tactical maneuvering. (See AFI 11-214 for specific guidance)

3.15.3. The flight/mission leader will initiate all radio checks and channel changes. Individual flight members will acknowledge, in turn, by callsign prior to any flight member switching channels unless briefed otherwise.

3.15.4. Acknowledge radio checks that do not require the transmission of specific data by individual flight members in turn (Example: "2, 3, 4"). Acknowledgment indicates the appropriate action is complete, in the process of being completed, or the flight member understands.

3.15.5. In addition to the radio procedures outlined in AFI 11-202 Volume 3, Specific Mission Guides, and FLIP publications, the following radio transmissions are required:

3.15.5.1. All flight members will acknowledge understanding the initial ATC clearance. Acknowledge subsequent ATC instructions when directed by the flight lead, or anytime during trail departures as detailed in paragraph 4.3.

3.15.5.2. Gear Checks. Each pilot will report gear down on base leg, or, if making a VFR straight in approach not later than 3 miles on final. When flying an instrument approach, report gear down in response to ATC instructions or no later than the final approach fix or glide path interception point. A wingman or chase need not make this call during a formation or chased approach.

3.15.6. Use brevity code and other terminology IAW AFI 11-214, AFTTP 3-1, Volume 1 and local standards.

### 3.16. General Low Altitude Procedures.

3.16.1. Fly low level formation positions/tactics using AFTTP 3-1 and AFTTP 3-3, *Fighter Fundamentals*, as guides.

3.16.2. Line abreast formation is authorized at or above 500 feet AGL. When flying below 500 feet AGL, direct the wingman to a wedge formation position.

3.16.3. Training in the 300 feet to 100 feet AGL altitude block will be in short segments consistent with real-world risks and realistic tactical considerations.

3.16.4. During briefings emphasize low altitude flight maneuvering and observation of terrain features/obstacles along the route of flight. For low altitude training over water/featureless terrain, include specific considerations with emphasis on minimum altitudes and spatial disorientation.

3.16.5. All obstacle avoidance planning will be based on Minimum Safe Altitude (MSA) and Route Abort Altitude (RAA) as defined in paragraph [2.3.3.3](#).

3.16.6. If unable to visually acquire or ensure lateral separation from known vertical obstructions, which are a factor to the flight, flight leads will direct a climb NLT 3 NM prior to the obstacle to ensure vertical separation. The climb must be to an altitude at or above briefed RAA/MSA. Do not descend below this altitude until positional/situational awareness dictates it is safe to do so.

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

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

3.16.9. The minimum airspeed for low-level navigation is 300 KCAS.

3.16.10. **Minimum Altitudes.** The unit commander will determine and certify pilots' minimum altitude IAW AFI 11-2F/A-22 Volume 1, as supplemented. Flight members participating in approved step-down training programs will comply with the requirements and restrictions of that program. The following minimum altitudes apply to low-level training unless national rules, route restrictions, or a training syllabus specifies higher altitudes:

3.16.10.1. 500 feet AGL for: LOWAT Category I qualified pilots.

3.16.10.2. 300 Feet AGL for: LOWAT Category II qualified pilots.

3.16.10.3. 100 AGL for: LOWAT Category III qualified pilots.

3.16.10.4. For night or IMC operation: The minimum altitude is 1000 feet above the highest obstacle within 5 NM of course.

3.16.11. During all low altitude operations, the immediate reaction to task saturation, diverted attention, knock-it-off, or emergencies is to climb to a prebriefed safe altitude (minimum 1000 feet AGL).

3.16.12. Weather minimums for visual low level training are 1,500 feet ceiling and 3 miles visibility for any route or area, or as specified in FLIP for Military Training Routes, unit regulations, or national rules, whichever is higher.

**3.16.13. Low Level Route/Area Abort Procedures :**

3.16.13.1. Compute and brief a low-level route abort altitude (RAA) for all low level operations IAW paragraph **2.3.3.3**.

**3.16.13.2. VMC route/area abort procedures :**

3.16.13.2.1. Maintain safe separation from the terrain and other aircraft.

3.16.13.2.2. Comply with VFR altitude restrictions and squawk applicable (IFF/SIF) modes and codes.

3.16.13.2.3. Maintain VMC at all times. If unable, follow IMC procedures outlined below.

3.16.13.2.4. Attempt contact with controlling agency, if required.

**3.16.13.3. IMC route/area abort procedures:**

3.16.13.3.1. Immediately climb to, or above, the briefed RAA.

3.16.13.3.2. Maintain preplanned ground track. Execute appropriate lost wingman procedures if necessary.

3.16.13.3.3. If deviations from normal route/area procedures are required, or if the RAA/MSA is higher than the vertical limits of the route/area, squawk (IFF/SIF) emergency.

3.16.13.3.4. Attempt contact with the appropriate ATC agency for an IFR clearance. If required to fly in IMC without an IFR clearance, cruise at appropriate VFR altitudes until IFR clearance is received.

**3.17. Air Refueling.** Pilots undergoing initial/recurrency training in air refueling will not refuel with a student boom operator (does not apply to KC-10).

**3.18. Night Procedures.**

**3.18.1. Night Ground Operations.**

3.18.1.1. When ground personnel are working under the aircraft, the POSN/ANTI-COLL switch will be placed in BRT (position lights 100%, steady, anti collision light off).

3.18.1.2. Taxi on the taxiway centerline with a minimum of 300 feet spacing.

3.18.1.3. Use the taxi light while taxiing unless it might interfere with 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.

3.18.1.4. Both wingtip position lights must be operational for flight.

3.18.1.5. For takeoffs, set the POSN/ANTI-COLL switch to ANTI-COLL/BRT.

**3.18.2. Night Takeoff.** 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.

3.18.3. **Night Join-up.** Weather criteria for night join-up underneath is a ceiling of 3,000 feet and 5 miles visibility. After join-up, turn set the POSN/ANTI-COLL switch to BRT except for the last aircraft in formation, which will keep the anti-collision light ON unless otherwise directed by the flight lead. Flight Leads will fly in position setting 2 and adjust as necessary for environmental conditions with the Wingman is inside of route formation.

3.18.4. **Night Formation Procedures.**

3.18.4.1. When in positions other than fingertip, route, or tactical, maintain aircraft spacing primarily by instruments, sensors/IFDL, and/or timing with visual reference secondary. If aircraft spacing cannot be ensured, then establish altitude separation (1,000 feet minimum). Crosscheck instruments at all times to ensure ground clearance.

3.18.4.2. Do not change lead or wing formation positions below 1,500 feet AGL unless on RADAR downwind. Direct lead and position changes using the radio and from a stabilized, wings-level attitude.

3.18.4.3. Night Fingertip/Route Position. Night references for fingertip and route formation positions are specified in AFTTP 3-3.

3.18.5. **Night Break-up.** Prior to a formation break-up at night, the flight leader will transmit attitude, altitude, airspeed, and altimeter setting, which will be acknowledged by wingmen. Wingmen will confirm good navigational aids.

3.18.6. **Night Landing.** Normally land from an instrument straight-in approach. Refer to AFI 11-202 Volume 3, as supplemented for specific procedures.

3.19. **Night Vision Goggles (NVG) Procedures.**

3.19.1. USAF/MAJCOM guidance (including AFI 11-202 Volume 3, and AFI 11-214) outline NVG procedures. AFTTP 3-1 and AFTTP 3-3 will incorporate expanded tactical guidance. Additionally:

3.19.1.1. NVGs will only be worn by qualified flight members or when upgrading with NVGs with a qualified NVG instructor in the flight.

3.19.1.2. Flight leads will brief the appropriate time to don/doff goggles for the sortie to be flown. Pilots will ensure deconfliction while donning/doffing goggles.

3.19.1.3. When operating in a visual formation outside of NVG Close, more frequent crosscheck of instruments will be made (approximately every 4-6 seconds) to reduce possibility of spatial dis/mis-orientation.

3.19.1.4. Flight Leads will brief the appropriate NVG-compatible formation lighting levels for each flight member to set.

3.19.2. NVGs must be preflight tested and adjusted for the individual in the unit eyeline prior to NVG operations. Do not wear NVGs during takeoff or landing. Do not don NVGs until at least 2,000 feet AGL in climbing or level flight. In all cases, remove NVGs prior to the final approach fix.

3.19.3. NVG equipped aircraft may operate below the RAA/MSA down to a minimum of 1,000 ft AGL during high-illumination (HI) periods (as defined by AFI 11-214). The flight lead or individual pilot is the final authority to assess actual illumination for a particular mission element, based on visibility and terrain features/resolution.

3.19.4. NVGs may be worn for night tanker rejoins, but will be raised to the up/stowed position or removed no later than the precontact position.

3.19.5. Unless required for battle damage checks or aircraft assistance, wingmen wearing NVGs will fly no closer than route formation.

3.19.6. **Battle Damage Checks.** NVGs will remain on.

3.19.7. **In-flight Emergencies with NVGs.** During in-flight emergencies, immediately assess whether the NVGs aid or hinder completing emergency procedures. If they are a hindrance or the emergency may deteriorate into an ejection situation, remove and stow the NVGs.

3.19.8. **Abnormal Procedures.**

3.19.8.1. **Lost sight.** If you lose sight within a flight, execute appropriate lost wingman procedures. Consider highlighting position by increasing exterior lighting level, activating the afterburners, or deploying chaff/flares as the situation warrants.

3.19.8.2. **NVG failure.** Ensure separation from other aircraft and the ground before attempting to remedy the NVG failure.

3.19.8.2.1. Transition to instruments.

3.19.8.2.2. Perform lost wingman procedures if appropriate.

3.19.8.2.3. Route abort/climb above MSA if appropriate.

3.19.8.2.4. Terminate/KIO as applicable.

3.19.8.2.5. If other aircraft are in the vicinity, direct them to raise their external lights to non-NVG visible levels.

3.19.8.2.6. Attempt to regain NVG operation by switching to the opposite battery. Once clear of other aircraft and terrain, change the battery. If these steps do not solve the problem, stow NVGs and proceed with non-NVG plan.

3.19.8.3. **Inadvertent flight into weather.** Encountering poor weather conditions during NVG operations may cause loss of SA and aircrew distraction/disorientation.

3.19.8.3.1. Single ship or separated from flight members:

3.19.8.3.1.1. Transition to instruments.

3.19.8.3.1.2. Route abort if LOWAT, otherwise climb/descend to VMC.

3.19.8.3.1.3. Terminate/KIO as applicable.

3.19.8.3.2. **Formation flight.** If entering weather in formation/close proximity to other aircraft, perform the first five steps under NVG failure, as appropriate, then climb/descend to attempt to regain VMC.

### 3.20. Fuel Requirements.

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

3.20.2. **Bingo Fuel.** A pre-briefed fuel state that 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.

3.20.3. **Normal Recovery Fuel.** The fuel on initial or at the FAF at the base of intended landing or alternate, if required. Fuel quantity will be as established locally or 2,500 pounds, whichever is higher.

3.20.4. Declare the following when it becomes apparent that an aircraft may land at the intended destination or alternate, if required, with:

3.20.4.1. Minimum Fuel – 1,800 pounds or less.

3.20.4.2. Emergency Fuel - 1,200 pounds or less.

### 3.21. Approaches and Landings.

3.21.1. The desired touchdown point for a VFR approach is 500 feet from the threshold or the glideslope interception point for a precision approach. When local procedures or unique conditions require landing beyond the normal touchdown point, adjust the touchdown point accordingly.

3.21.2. Minimum pattern and touchdown spacing between landing aircraft is 3,000 feet for similar aircraft (e.g. F/A-22 versus F/A-22), 6,000 feet for dissimilar aircraft (e.g. F/A-22 versus F-16) or as directed by MAJCOM or the landing base, whichever is higher. Increase spacing whenever wake turbulence is anticipated.

3.21.3. Normally, all aircraft will land in the center of the runway and clear to the turnoff (cold) side of the runway when speed/conditions permit.

#### 3.21.4. Landing Restrictions.

3.21.4.1. When the computed landing roll exceeds 80 percent of the available runway, land at an alternate if possible.

3.21.4.2. Do not land over any raised web barrier (e.g. MA-1A, 61QSII).

3.21.4.3. When the RCR at the base of intended landing is less than 12, land at an alternate if possible. If an alternate is not available, an approach end or midfield arrestment is recommended.

### 3.22. Overhead Traffic Patterns.

3.22.1. Overhead patterns can be made with any combination of internal/external unexpended live/inert ordnance.

3.22.2. Initiate the break over the touchdown point or as directed.

3.22.3. Execute individual breaks in a level 180 degree turn to the downwind leg at minimum intervals of 5 seconds (except IP/FE chase or when in tactical formation).

3.22.4. Aircraft must be wings level on final at approximately 300 feet AGL and 1 mile from the planned touchdown point.

3.23. **Tactical Overhead Traffic Patterns.** Tactical entry to the overhead traffic pattern is permitted when:

3.23.1. The published overhead pattern altitude and airspeed are used.

3.23.2. Specific procedures are developed and coordinated with appropriate air traffic control agencies.

3.23.3. No more than four aircraft are in the flight. Aircraft/elements more than 6,000 feet in trail are considered a separate flight.

3.23.4. No aircraft are 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. Touch-and-Go Landings.**

3.24.1. Fly touch-and-go landings IAW AFI 11-202 Volume 3, as supplemented by MAJCOM. Multiple touch-and-go landings may be flown to regain landing currency.

3.24.2. Do not fly touch-and-go landings with hung ordnance, live external ordnance, or with fuel remaining in any external tank.

### **3.25. Low Approaches.**

3.25.1. Observe the following minimum altitudes:

3.25.1.1. Normal single ship low approaches - so that touchdown does not occur.

3.25.1.2. IP/FE flying chase position - 50 feet AGL.

3.25.1.3. Formation low approaches and non-IP/FE chase - 100 feet AGL.

3.25.1.4. Chase aircraft during an emergency - 300 feet AGL unless safety or circumstances dictate otherwise.

3.25.2. 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.

**3.26. Closed Traffic Patterns.** Initiate the pattern at the departure end of the runway unless directed/cleared otherwise by local procedures or the controlling agency. When in formation, a sequential closed may be flown with ATC concurrence at an interval to ensure proper spacing. Plan to arrive on downwind at 200-250 KCAS.

### **3.27. Formation Approaches.**

#### **3.27.1. General.**

3.27.1.1. Normally accomplish formation approaches from a published instrument approach or a VFR straight-in approach using the VASI, if available. In all cases, use a rate of descent similar to a normal precision approach.

3.27.1.2. Aircraft must be within 3,000 pounds weight of each other and symmetrically loaded.

3.27.1.3. Position the wingman on the upwind side if crosswind exceeds 5 knots.

3.27.1.4. Formation Approaches will not go below 100' AGL.

3.27.2. **Formation Landings** : N/A

**3.28. After Shutdown Procedures.** All flight members will accomplish a post flight walk-around. The intent of this inspection is to find evidence of birdstrike, lost panels, damaged ordnance, and structural damage resulting from over-Gs or other in-flight abnormalities.

**3.29.** Refer to **Table 3.1.** for a summary of weather minimums affecting F/A-22 operations.

**Table 3.1. Weather Minimum Summary (Feet/NM/KM).**

<b>Event</b>	<b>Minimum</b>
VFR Rejoin (Day)	1500 / 3NM / 4.8 KM
VFR Rejoin (Night)	3000 / 5NM / 8KM
Low Level Navigation (Day)	1500 / 3NM / 4.8KM (notes 1&2)
Low Altitude Intercepts (Day)	3000 / 5NM / 8KM (note 3)
<b>NOTES:</b>	
1. Unless national rules are higher.	
2. 2000/8 in countries where the minimum altitude is 1000 feet AGL.	
3. 3500/8 in countries where minimum altitude is 1000 feet AGL.	

**3.30.** Refer to **Table 3.2.** for a summary of minimum altitudes that affect F/A-22 operations.

**Table 3.2. Minimum Altitude Summary (in Feet AGL).**

<b>Event</b>	<b>Minimum</b>
Aerobatics / ACBT / AHC	5000
Lead Change	See note
Chase (Emergency)	300
Chase (FE / IP)	50
Formation Low Approach	100
Low Approaches	So as to not touchdown
KIO	1000
<b>NOTE:</b> 500 feet over land; 1000 feet over water; 1500 feet at night / IMC unless on radar downwind.	

## Chapter 4

### INSTRUMENT PROCEDURES

#### 4.1. Approach Category.

4.1.1. The F/A-22 is Approach Category E. Accomplish missed approach IAW flight manual procedures. Missed approach airspeed is 250 KCAS.

4.1.2. Use approach Category D minimums at an emergency/divert airfield where no Category E minimums are published. Airfields with Category D minimums may be designated as an alternate (divert) airfield. Further, practice instrument approaches may be flown using Category D minimums if VMC can be maintained throughout the procedure. Under these circumstances, approach Category D minimums may be used provided:

4.1.2.1. A straight-in approach is flown.

4.1.2.2. The aircraft is flown at final approach airspeed of 165 KCAS or less.

4.1.2.3. The aircraft is flown at 255 knots true airspeed (KTAS) or less for the missed approach segment of the approach. At high-pressure altitudes and temperatures 255 KTAS may not be compatible with published missed approach airspeeds and Category D approaches should not be flown.

4.1.3. The F/A-22's GINS is approved for enroute Area Navigation (RNAV). The enroute navigation may not exceed 1.5 hours between INS updates. An update is defined as establishing a positive position using visual, TACAN, GPS, or on-board radar. Do not fly RNAV approaches.

#### 4.2. Takeoff and Join-up.

4.2.1. The flight leader must get an appropriate ATC clearance (altitude block or trail formation) when a flight join-up is not possible due to weather conditions or operational requirements. Formation trail departures must comply with instructions for a nonstandard formation flight as defined in FLIP.

4.2.2. If weather is below 1500 feet and 3 miles, each aircraft 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.

4.3.1.1. During trail formations, basic instrument flying is the first priority and must 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 trail, concentrate on flying the instrument departure, and then notify the flight lead. The flight lead will then notify air traffic control (ATC).

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

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

4.3.1.4. Flight leads will brief aircraft/element spacing. Minimum spacing between aircraft when in non-standard formation is 9,000 feet and will be maintained using on board systems.

4.3.1.5. If IFDL is working properly, a "tied" call is not required. If a flight member is not on IFDL, each aircraft will follow the No NTS procedures until the aircraft/element immediately in trail has established the preceding aircraft as the NTS and called "tied."

#### 4.3.2. **No NTS.**

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/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/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/element calls "tied."

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

4.3.2.5. Each aircraft/element will maintain at least 1,000 feet vertical separation from the preceding aircraft/element until establishing radar/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/element to meet the requirements of the above paragraph.

#### 4.3.3. **With NTS.**

4.3.3.1. Each aircraft/element will call "tied" when an NTS is established with the preceding aircraft. Once all aircraft are tied, no further radio calls are required, unless contact is lost. If ATC directs a question, or guidance directly to a certain aircraft that pilot may respond directly to ATC. Flight leads will ensure that wingman are aware of any unplanned or ATC directed intermediate level off altitudes.

4.3.3.2. In flights of three or more aircraft, use all available aircraft systems (i.e. radar, IFDL, 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 will accelerate in MIL/AB power until reaching 350 KCAS. Climb at 350 KCAS until reaching .88 mach, unless otherwise briefed.

4.3.4.3. Upon reaching 350 KCAS, the flight leader will set and maintain 90% ETR unless otherwise briefed.

4.3.4.4. Limit all turns to a maximum of 30 degrees of bank.

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

#### 4.3.6. **Trail Recovery.**

4.3.6.1. Trail recovery procedures must be coordinated/approved through the responsible ATC facilities and addressed in a local operating procedure or in the unit supplement to this volume. Trail recoveries will only be accomplished at home stations/deployed locations where procedures have been established and briefed. As a minimum, procedures must address each recovery profile, missed approach, climbout, lost contact, lost communications and desired/maximum spacing requirements.

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/above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.3.6.4. Trail recoveries will not terminate in simultaneous PAR or ASR approaches. Recoveries to separate PAR/ASRs are authorized, flights will split prior to PAR/ASR final.

4.3.6.5. The flight lead must brief the flight on spacing, configuration, and airspeeds. Minimum spacing between aircraft is 9,000 feet in IMC and will be maintained using on-board radar.

4.3.6.6. The flight lead must coordinate the trail recovery with ATC prior to taking spacing.

4.3.6.7. Prior to split-up, the flight lead must ensure that all wingmen have operative navigational aids and air-to-air radar.

4.3.6.8. Formation break-up will be accomplished IAW paragraph 4.4. Flight separation will be IAW local ATC directives.

4.3.6.9. The formation must squawk as directed by ATC.

4.3.6.10. ATC instructions to the lead aircraft will be for the entire flight. ATC will provide radar flight following for the entire formation.

4.3.6.11. Limit all turns to a maximum of 30 degrees of bank.

4.3.6.12. Once established on a segment of a published approach, each aircraft must comply with all published altitudes and restrictions while maintaining in-trail separation.

4.3.6.13. Unless local procedures establish defined reference points for airspeed/ configuration changes, the flight lead must direct changes by radio. At flight lead's call, all aircraft must simultaneously comply with the directed change.

4.3.6.14. All aircraft must report the final approach fix.

4.3.6.15. If contact is lost with the preceding aircraft, the pilot will transmit "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 climbout as instructed by ATC.

**4.4. Formation Break-up.** If possible, accomplish formation break-up in VMC. If IMC, accomplish the break-up in straight and level flight. Prior to a break-up in IMC, the flight leader must transmit attitude, airspeed, altitude, and altimeter setting which will be acknowledged by wingmen. Wingmen must confirm good navigational aids.

#### 4.5. Formation Penetration.

4.5.1. Restrict formation penetrations in route/close formation to two aircraft when the weather at the base of intended landing is less than overhead traffic pattern minimums.

4.5.2. Formation penetrations using sensor trail procedures are authorized when weather at the base of intended landing is at/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.

#### 4.7. Simulated Instrument Flight.

4.7.1. Restrictions. IAW AFI 11-202V3, the following restrictions apply to simulated instrument flight:

4.7.1.1. The aircraft must be equipped with a functional two-way radio.

4.7.1.2. A safety observer, should accompany the flight whenever possible in a chase aircraft.

4.7.1.3. The safety observer must maintain continuous visual contact and two-way communications between aircraft.

4.7.2. Practice Instrument Approaches. Approaches conducted in other than actual weather conditions (IMC). Although controlling the aircraft primarily by reference to the flight instruments, the PIC must be able to see the ground, surrounding terrain, and when established on the final segment of the approach, the airport environment.

**NOTE:** These approaches meet the requirement for primary simulated instrument time because the PIC has chosen to fly the approach using flight instruments as the primary reference for maintaining aircraft attitude.

4.7.3. **Safety Observers.** Practice approaches may be conducted without a safety observer if the PIC is instrument qualified and current in the type of approach being flown. When flying a practice approach without a safety observer, PICs must maintain a composite crosscheck sufficient to establish situational awareness as to terrain and other traffic. PICs are not relieved of their responsibility to see and avoid other traffic.

## Chapter 5

### AIR-TO-AIR WEAPONS EMPLOYMENT

**5.1. References.** AFI 11-214 contains air-to-air procedures, to include operations with live ordnance applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F/A-22 operations.

**5.2. Simulated Gun Employment.** Missions may be flown with a loaded gun provided the gun is safe IAW T.O. 1F/A-22C-34-1CL-1 and a trigger check is first performed with the master arm switch in arm with Embedded Training deselected. Point the aircraft away from other aircraft and inhabited areas during the trigger check. Do not perform a trigger check with a hot gun. If an aircraft is flown with a hot gun or live missiles, the procedures in AFI 11-214 apply.

#### **5.3. Maneuvering Limitations.**

5.3.1. Minimum airspeed during low altitude offensive or defensive maneuvering (LOWAT) is 350 KCAS.

5.3.2. Negative-G gun jinks are prohibited.

#### **5.4. Aerial Gunnery Tow Procedures.** AFI 11-214 applies. In addition:

5.4.1. **TDU-32 A/B Banner Deployment.** The Banner is towed by a Lear and departs the airfield fully deployed. Enroute to the range, chase aircraft will ensure a stable flying Banner. While in straight and level flight, the chase pilot will also pass the direction of "Banner lean" in clock position to the tow pilot. This will establish the best turn direction for employment. (If Banner is flying at the 10 o'clock position; tow will turn right)

#### **5.4.2. Abnormal Procedures.**

5.4.2.1. **Unable to Release Banner.** If possible, the Lear will gain chase aircraft (shooter desired) and proceed to local jettison area and attempt jettison. If Banner still remains, recover IAW local procedures or use AGTS cable remaining procedures.

5.4.2.2. **Banner Shot Off, Cable Remaining.** Release cable in working area. Shooter rejoins with tow to ensure no cable remains. If cable remains, follow procedures in 5.4.3.2 (Unable to release Banner)

## Chapter 6

### AIR-TO-SURFACE WEAPONS EMPLOYMENT

**6.1. References.** AFI 11-214 contains air-to-surface procedures applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F/A-22 operations. Qualification and scoring criteria are contained in AFI 11-2F/A-22V1.

**6.2. Off-Range Attacks.** With inert air-to-ground munitions loaded on the aircraft, Embedded Training will be confirmed in “On” prior to the first attack. Flight leads will verbally confirm all flight members have Embedded Training enabled prior to the attack. Pilots will not press the pickle button when conducting off-range A/G attacks with inert GBU-32 loaded on the aircraft.

6.2.1. AFI 11-214 and the following apply:

6.2.1.1. Do not conduct off-range simulated weapons employment with hung ordnance aboard the aircraft.

6.2.1.2. Do not conduct off-range simulated weapons employment with live ordnance (except air to air missiles and/or 20mm) aboard the aircraft.

**6.3. Weather Minimums.** Basic weather minimums established in AFI 11-214 apply. In no case will the ceiling be lower than 2,000 feet AGL for climbing or diving deliveries, or 1,500 feet AGL for level deliveries.

**6.4. Night Weapons Delivery/Range Operations.** All procedures in AFI 11-214 apply.

6.4.1. Compute a MSA for the entire bombing pattern.

**6.5. Target Identification.** Pilots must positively identify the target prior to weapons release. Achieve positive identification by either visually acquiring the target or by confirming target location through valid on-board/off-board cues. These cues include radar, GINS, marking rounds, IR pointers or NVG compatible marking devices. Pilots should exercise caution and possess a high level of target situational awareness when relying on a single target cue to confirm target location.

**6.6. Live Ordnance Procedures.** When carrying live air-to-ground munitions:

6.6.1. Refer to AFI 11-214.

6.6.2. Do not make simulated weapon delivery passes on targets occupied by personnel.

6.6.3. When Ground Controllers are operating on Class B/C ranges the following procedures apply:

6.6.3.1. All pilots will be familiar with applicable range weapons delivery procedures, appropriate targets and weapons footprints.

6.6.3.2. Ground personnel locations will be briefed and acknowledged by all pilots.

6.6.3.3. Pilots will not expend ordnance if any doubt exists as to the ground personnel or intended target locations.

## Chapter 7

### ABNORMAL OPERATING PROCEDURES

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

7.1.1. Do not accept an aircraft for flight with a safety of flight malfunction addressed in the emergency/abnormal procedure section of the flight manual until it has been corrected.

7.1.2. Do not use a malfunctioning system unless it is required for safe recovery of the aircraft. Do not continue in-flight troubleshooting a malfunction after completing flight manual emergency procedures and the aircraft may be safely recovered.

7.1.3. Do not taxi aircraft with malfunctions that effect the nosewheel steering or brake system.

7.1.4. For actual or perceived flight control malfunctions, terminate maneuvering and take appropriate action.

#### **7.2. Ground Aborts.**

7.2.1. If a flight member aborts prior to takeoff, the flight leader will normally renumber the flight. Flight leaders must advise the appropriate agencies of such changes.

7.2.2. In the event of an abort, formation flight may only continue if it is led by a qualified flight lead. The alternatives are a sympathetic abort or proceeding on a pre-briefed single-ship mission.

7.2.3. Delayed aircraft may join the flight at a briefed rendezvous point or may fly a briefed alternate single ship mission. If accomplishing a join-up, cease tactical maneuvering until the delayed aircraft is joined and all flight members are ready to continue.

#### **7.3. Takeoff Aborts.**

7.3.1. If aborting the takeoff, clear to the appropriate side of the runway as expeditiously as possible based on position within the element. If this is not feasible because of possible cable engagement, clear straight-ahead. As soon as practical, give callsign and state intentions. Call "Cable, Cable, Cable" to indicate a departure-end arrestment. Following aircraft hold their position, abort or takeoff as appropriate to maintain adequate clearance.

7.3.2. When applying the brakes above 120 KCAS during a takeoff abort, or hot brakes are suspected; declare a ground emergency, taxi the aircraft to the designated hot brake area, and follow hot brake procedures.

7.3.3. If aborting a takeoff at or above 100 KCAS, lower the tailhook. If aborting below 100 KCAS, lower the tailhook if there is any doubt about the ability to stop on the runway.

#### **7.4. Air Aborts.**

7.4.1. If an abort occurs after takeoff, all aircraft will maintain their original numerical callsign.

7.4.2. Escort aborting aircraft with an emergency to the field of intended landing. In other cases, the flight leader will determine if an escort is required.

7.4.3. Abort the mission and land out of a straight-in approach, regardless of apparent damage or subsequent normal operation, for any of the following:

7.4.3.1. Birdstrike/Foreign Object Damage.

7.4.3.2. Flight control system anomalies. This does not include flight control system ICAWS that reset IAW flight manual procedures.

7.4.3.3. Single engine.

7.4.4. If an aircraft experiences an over-G, use the following procedures:

7.4.4.1. Perform a battle damage check after all over-Gs.

7.4.4.2. Terminate the mission and land as soon as practical from a straight-in approach.

7.4.4.3. Document over-Gs in the IMIS after flight.

**7.5. Engine Malfunctions.** Report all engine anomalies during maintenance debriefing.

**7.6. Radio Failure.**

7.6.1. **General.** Individual aircraft experiencing radio failure will comply with procedures outlined in FLIP, AFI 11-202 Volume 3, this instruction, and local directives.

7.6.2. **Formation :**

7.6.2.1. Flight members who experience 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. Terminate the mission as soon as practical and lead the NORDO aircraft to the base of intended landing or a divert base. Perform a formation approach to a drop-off on final unless safety considerations dictate otherwise.

7.6.2.2. 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.

7.6.3. **Aerial Gunnery/Missile Firing NORDO Procedures :**

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

7.6.3.2. Shooting aircraft: safe the armament switches, join on another member of the flight or the tow aircraft, IAW para [7.6.2](#).

7.6.3.3. Aerial gunnery Lear tow aircraft: rocks wings and continue the turn if an attack is in progress. The flight leader of the attacking aircraft will "knock off" the attack and join on the tow's wing, remaining clear of the target in the event it is cut. The tow pilot will use standard hand signals to indicate his difficulty. The flight leader will signal when the target is cleared for cut with a slicing motion across the throat. After the target is away and the flight lead determines there is no

remaining cable, the tow will RTB with an escort following the briefed NORDO recovery procedures. If cable remains, follow local procedures.

#### 7.6.4. **NORDO Recovery :**

7.6.4.1. Apply the procedures in AFI 11-205 and FLIP.

7.6.4.2. 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.

7.6.4.3. A NORDO aircraft intending to make an approach-end cable engagement should signal the escorting aircraft by extending the tailhook. If the NORDO aircraft is not escorted, the pilot should fly a straight-in approach flashing the landing light on final to signal the tower.

**7.7. Severe Weather Penetration.** Avoid flight through severe weather. If unavoidable, flights should break-up and obtain separate clearances prior to severe weather penetration.

**7.8. Lost Wingman Procedures.** In any lost wingman situation, immediate separation of aircraft is essential. Upon losing sight of the leader or if unable to maintain formation the wingman will simultaneously:

7.8.1. Execute the applicable lost wingman procedures. Refer to para **7.9.** for specific spatial disorientation (SD) considerations. Smooth application of control inputs is imperative to minimize the effects of SD.

7.8.1.1. Transition to primary flight instruments.

7.8.1.2. Inform lead by transmitting "C/S is lost wingman."

7.8.1.3. After executing a lost wingman procedure, do not attempt rejoining with the flight until obtaining permission from the flight lead.

7.8.1.4. When able, obtain a separate clearance.

7.8.1.5. Observe all published terrain clearance limits.

#### 7.8.2. **Two- or Three-Ship Flights (three-ship echelon, refer to four-ship procedures):**

7.8.2.1. **Wings-level flight (climbing, descending, or straight and level).** Turn away using 15 degrees of bank for 15 seconds, then resume original heading.

##### 7.8.2.2. **Turns:**

7.8.2.2.1. **Outside the Turn.** Reverse the direction of turn using 15 degrees of bank for 15 seconds. Continue straight ahead to ensure separation prior to resuming the turn.

7.8.2.2.2. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and direct the flight leader to roll out of the turn. Maintain the original turn. The leader may only resume the turn when separation is ensured.

7.8.2.3. **Final Approach.** Momentarily turn away from lead to ensure clearance and execute the published missed approach procedure.

7.8.2.4. **Missed Approach.** Momentarily turn away from lead to ensure clearance and continue the published or assigned missed approach procedure. Climb to 500 feet above missed approach altitude.

7.8.3. **Four-Ship Flights.** Number 2 and 3 follow the procedures outlined above. Number 4's initial action assumes that number 3 has also gone lost wingman. In addition to paragraph 7.8., number 4 will:

7.8.3.1. **Wings-Level Flight (climbing, descending, or straight and level).** Turn away using 30 degrees of bank for 30 seconds, then resume the original heading.

7.8.3.2. **Turns:**

7.8.3.2.1. **Outside the Turn.** Reverse direction of turn using 30 degrees of bank for 30 seconds to ensure separation from lead and number 3.

7.8.3.2.2. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and increase bank angle by 15 degrees. Direct the leader to roll out. The leader will only resume the turn when separation is ensured.

7.8.4. Leader must acknowledge the lost wingman's radio call and, when appropriate, transmit attitude, heading, altitude, airspeed, and other parameters.

7.8.5. If a wingman becomes separated and any aircraft experiences radio failure, the aircraft with the operational radio will obtain a separate clearance. The NORDO aircraft will turn the IFF Mode 3C to 7600 while proceeding with previous clearance. If an emergency situation arises along with radio failure, set the IFF to EMERGENCY for the remainder of the flight.

7.8.6. Only practice lost wingman procedures in VMC.

**7.9. Spatial Disorientation (SD).** Conditions that prevent a clear visual horizon or increase pilot tasking are conducive to SD. To prevent SD, the pilot must increase his instrument crosscheck rate. If SD symptoms are encountered:

7.9.1. **Single Ship:**

7.9.1.1. Concentrate on flying basic instruments with frequent reference to the HUD. The SFG may be used as an alternate attitude reference if it is using a different GINS source than the HUD. (i.e. HUD on GINS 1 and SFG on Right UFD)

7.9.1.2. If symptoms persist and conditions permit, fly straight and level flight until symptoms abate, usually within 60 seconds. Consider using the autopilot.

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

7.9.1.4. NOTE: It is possible for SD to proceed to the point where the aircrew is unable to see or interpret the flight instruments. In this situation, aircraft control may be impossible. If this occurs, the aircrew should consider ejecting.

7.9.2. **Formation Lead:**

7.9.2.1. Advise the wingmen that he has SD and comply with procedures in paragraph 7.9.1.

7.9.2.2. Use the wingmen to confirm attitude and provide verbal feedback.

7.9.2.3. If symptoms persist, terminate the mission and recover the flight by the simplest and safest means possible.

#### 7.9.3. **Formation Wingman:**

7.9.3.1. Advise lead of the disorientation.

7.9.3.2. Lead will advise wingman of aircraft attitude, altitude, heading, and airspeed.

7.9.3.3. If symptoms persist and conditions permit, lead will establish straight and level flight for 30-60 seconds.

7.9.3.4. If the above procedures are not effective, lead should consider passing the lead to the wingman, provided the leader will be able to maintain situational awareness from a chase position. Transfer lead while in straight and level flight. Once assuming the lead, maintain straight and level flight for 60 seconds. If necessary, terminate the tactical mission and recover by the simplest and safest means possible.

7.9.4. **Greater than 2-Ship Formation.** Lead should separate the flight into elements to more effectively handle a wingman with persistent SD symptoms. Establish straight and level flight IAW paragraph 4.4. (Formation Break-up). Plan to keep the element with the SD pilot straight and level while the other element separates.

### 7.10. **Armament System Malfunctions.**

#### 7.10.1. **Inadvertent Release.**

7.10.1.1. Record switch positions at the time of inadvertent release and provide to armament and safety personnel. Record the impact point, if known.

7.10.1.2. Safe the armament switches and do not attempt further release in any mode. Treat remaining stores as hung ordnance and follow hung ordnance procedures during RTB.

7.10.1.3. If remaining stores present a recovery hazard, jettison them in a suitable area on a single pass, if practical.

7.10.2. **Failure to Release/Hung Ordnance.** If ordnance fails to release when all appropriate switches are set, proceed as follows.

7.10.2.1. Hung live ordnance or aircraft malfunction that precludes further live weapons delivery.

7.10.2.1.1. Attempt to release store(s) using an alternate delivery mode. If unsuccessful, attempt to jettison store(s) using selective jettison procedures. Lastly, consider attempting to selectively jettison the pylon if ordnance is unsecured or security cannot be determined.

7.10.2.1.2. If ordnance remains on the aircraft, follow the hung ordnance recovery procedures.

#### 7.10.3. **Hangfire/Misfire:**

7.10.3.1. A missile that fires but fails to depart the aircraft is a hangfire. If this occurs, the missile should be closely observed and safety checked by a chase pilot.

7.10.3.2. A missile that fails to fire when all appropriate switches were selected is a misfire. If this occurs, safe the Master Arm switch and follow the hung ordnance recovery procedures.

**7.10.4. Hung Ordnance/Weapons Malfunction Recovery:**

- 7.10.4.1. If practical, visually inspect the aircraft for damage.
- 7.10.4.2. Declare an emergency for hung live ordnance (not required for hung practice/inert ordnance or for live unexpended ordnance).
- 7.10.4.3. If available, obtain a chase aircraft (N/A at night) and avoid populated areas and trail formations.
- 7.10.4.4. Close main weapons bay doors prior to landing
- 7.10.4.5. Land from a straight-in approach.

**7.10.5. Miscellaneous Procedures:**

- 7.10.5.1. Pilots will not attempt to expend ordnance using a delivery system with a known weapons release malfunction.
- 7.10.5.2. When abnormal missile launch or erratic missile flight is noted after launch, visually inspect the launching aircraft by another pilot (if possible) to determine if any damage has occurred.

**7.11. Post Arresting Gear Engagement Procedures.**

- 7.11.1. Do not shut down the engine(s) unless directed by the ground crew, there is a fire, or other conditions dictate.
- 7.11.2. Raise the tailhook on the ground crew's signal.
- 7.11.3. Do not taxi until directed.
- 7.11.4. Comply with local directives.

**7.12. In-flight Practice of Emergency Procedures.**

- 7.12.1. Simulated Emergency Procedure is defined as any procedure that produces an effect that closely parallels an actual emergency, such as retarding the throttle to simulate the drag equivalent to a flamed out engine.
- 7.12.2. **Aborted Takeoff Practice.** Only practice aborted takeoffs in the Full Mission Trainer (FMT), Weapons and Tactics Trainer (WTT), or Cockpit Procedures Trainer (CPT).
- 7.12.3. Simulated in-flight loss of both engines is prohibited.
- 7.12.4. Practice in-flight engine shutdown is prohibited.
- 7.12.5. Emergency Landing Patterns (Refer to AFI 11-202 Volume 3).
  - 7.12.5.1. **Field Requirements.** Practice of emergency landing patterns at active airfields is authorized provided that crash rescue and air traffic control facilities are available and in operation.
  - 7.12.5.2. **Supervisory Requirements.** IQT (including FTU) pilots require an IP in a chase aircraft. MQT (including FTU) pilots require a SOF in place and an IP or flight lead monitoring from the traffic pattern.

**7.12.5.3. Pattern Procedures :**

7.12.5.3.1. Include the type of practice emergency pattern in the gear check call.

7.12.5.3.2. Initiate practice single-engine go-arounds in sufficient time to ensure the aircraft does not descend below 300 feet AGL. Simulated single-engine approaches may descend below 300 feet AGL provided the approach terminates in a full stop landing or the go-around from a low approach or touch and go landing is performed with both engines. When conducting such training, the pilot will advise the appropriate air traffic controller of his intentions.

7.12.5.3.3. Only simulated single-engine patterns will be practiced while flying. HUD-off and Standby Flight Group approaches will only be practiced in the FMT, WTT or CPT.

**7.13. Search and Rescue (SARCAP) Procedures.** If an aircraft crashes, immediately attempt to locate possible survivors and initiate rescue efforts. Expect that the aircrews may initially suffer from shock or have delayed reactions due to ejection injuries. The following procedures are by no means complete and should be adjusted to meet each unique search and rescue situation.

7.13.1. Knock off maneuvering.

7.13.2. Establish a SARCAP commander.

7.13.3. Squawk 7700 to alert ATC/GCI of the emergency situation.

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

7.13.5. Mark the last known position of survivors/crash site using any means available (TACAN, INS, ATC/GCI position and/or visual references).

7.13.6. Remain above the highest ejection altitude, if known, or the highest observed parachute until determining the position of all possible survivors.

7.13.7. Deconflict other aircraft assisting in the SARCAP by altitude to preclude midair collision. Establish high/low CAPs as necessary to facilitate communications.

7.13.8. Revise BINGO fuels or recovery bases as required to maintain maximum SARCAP coverage. Do not overfly the adjusted BINGO fuel.

7.13.9. Relinquish SARCAP operation to designated rescue forces upon their arrival.

7.13.10. Follow local or briefed procedures.

**7.14. Forms Adopted.** AF Form 847, **Recommendation for Change of Publication.**

RONALD E. KEYS, Lt General, USAF  
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**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 11-2F/A-22, Volume 1, *F/A-22 Aircrew Training*  
AFI 11-202, Volume 3, *General Flight Rules*  
AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*  
AFI 11-209, *Air Force Aerial Events*  
AFI 11-214, *Air Operations Rules and Procedures*  
AFI 11-218, *Aircraft Operations and Movement on the Ground*  
AFI 11-246, *Air Force Aircraft Demonstrations (F22, CV-22)*  
AFI 11-301 Volume 1, *Aircrew Life Support (ALS) Program*  
AFI 11-404, *Centrifuge Training for High-G Aircrew*  
AFI 33-360 Volume 1, *Air Force Content Management Program-Publications*  
AFI 33-360 Volume 2, *Content Management Program-Information Management Tool (CMP-IMT)*  
AFI 48-123, *Medical Examinations and Standards*  
AFMAN 11-217 Volume 1 and 2, *Instrument Flight Procedures*  
AFMAN 37-123, *Records Disposition Schedule*  
AFPAM 11-216, *Air Navigation*  
AFPAM 11-419, *G-Awareness for Aircrew*  
AFPD 11-2, *Aircraft Rules and Procedures*  
AFPD 11-4, *Aviation Service*  
AFPD 37-1, *Information Management of Records*  
AFTTP 3-1 Volume 1, *General Planning and Employment Considerations*  
AFTTP 3-1 Volume 12, *Tactical Employment—F/A-22*  
AFTTP 3-3 Volume 12, *Combat Aircraft Fundamentals—F/A-22*  
FLIP, *Flight Information Publication*  
T.O. 1F/A-22A-1/1F/A-22A-1-1, *Flight Manual—F/A-22*  
T.O. 1F/A-22C-34-1-1, *Avionics and Non-Nuclear Weapons Delivery Manual—F/A-22*

***Abbreviations and Acronyms***

**AAI**—Air-to-Air Interrogator

**AB**—After Burner

**ACBT**—Air Combat Training  
**ACC**—Air Combat Command  
**ACMI**—Air Combat Maneuvering Instrumentation  
**AGL**—Above Ground Level  
**AHC**—Aircraft Handling Characteristics  
**ALC**—Air Logistics Center  
**ALS**—Aircrew Life Support  
**AOA**—Angle of Attack  
**ASR**—Airport Surveillance Radar  
**ATC**—Air Traffic Control  
**AWACS**—Airborne Warning and Control System  
**BMC**—Basic Mission Capable  
**CATMs**—Captive Training Missiles  
**CAP**—Combat Air Patrol  
**CG**—Center of Gravity  
**CHUM**—Chart Update Manual  
**CMR**—Combat Mission Ready  
**CPT**—Cockpit Procedures Trainer  
**C/S**—Call Sign  
**DH**—Decision Height  
**DMVR**—Digital Mass Memory Video Recorder  
**ECM**—Electronic Countermeasures  
**EOR**—End of Runway  
**FAF**—Final Approach Fix  
**FE**—Flight Examiner  
**FLIP**—Flight Information Publications  
**FTU**—Formal Training Unit  
**FW**—Fighter Wing  
**G**—Gravitational Load Factor  
**GCI**—Ground Controlled Intercept  
**GINS**—Global Positioning/Inertial Reference System  
**HUD**—Heads Up Display

**I****A****W**—In Accordance With  
**I****C****A****W****S**—Integrated Caution, Advisory, and Warning System  
**I****F****E**—In-Flight Emergency  
**I****F****D****L**—Intra-Flight Data Link  
**I****F****F**—Identification Friend or Foe  
**I****F****R**—Instrument Flight Rules  
**I****M****C**—Instrument Meteorological Conditions  
**I****M****I****S**—Integrated Maintenance Information System  
**I****P**—Instructor Pilot  
**I****Q****T**—Initial Qualification Training  
**K****C****A****S**—Knots Calibrated Airspeed  
**K****T****A****S**—Knots True Airspeed  
**K****M**—Kilometers  
**L****O****W****A****T**—Low Altitude Training  
**M****A****J****C****O****M**—Major Command  
**M****D****A**—Minimum Descent Altitude  
**M****I****T**—Mass Item  
**M****O****A**—Military Operating Area  
**M****Q****T**—Mission Qualification Training  
**M****S****A**—Minimum Safe Altitude  
**M****S****L**—Mean Sea Level  
**N****/****A**—Not Applicable  
**N****A****F**—Numbered Air Force  
**N****L****T**—Not Later Than  
**N****M**—Nautical Miles  
**N****O****R****D****O**—No Radio  
**N****T****S**—Next-to-Shoot  
**N****V****G**—Night Vision Goggles  
**O****P****R**—Office of Primary Responsibility  
**O****T****&****E**—Operational Test and Evaluation  
**P****A****C****A****F**—Pacific Air Forces  
**P****A****R**—Precision Approach Radar

**RAA**—Route Abort Altitude

**RCR**—Runway Condition Report

**RNAV**—Area Navigation

**RTB**—Return to Base

**RWR**—Radar Warning Receiver

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

**SES**—Stored Energy System

**SETOS**—Single Engine Takeoff Speed

**SFG**—Standby Flight Group

**SIF**—Selective Identification Feature

**TACAN**—Tactical Air Navigation

**TERPS**—Terminal Instrument Procedures

**TOLD**—Takeoff and Landing Data

**T.O.**—Technical Order

**TOT**—Time On Target

**USAF**—United States Air Force

**USAFE**—United States Air Forces in Europe

**UFD**—Upfront Display

**VASI**—Visual Approach Slope Indicator

**VFR**—Visual Flight Rules

**VMC**—Visual Meteorological Conditions

**VR**—VFR Route

**WSEP**—Weapon Systems Evaluation Program

**Attachment 2****GENERAL BRIEFING GUIDE****MISSION DATA**

1. Time Hack
2. EP/Threat of the Day
3. Mission Objective(s)
4. Mission Overview
5. Mission Data Card
  - a. Mission Commander/Deputy Lead
  - b. Joker/Bingo Fuel
  - c. Takeoff and Landing Data
  - d. Working Area
6. Weather/Sunrise/Sunset/Moon Illumination
7. NOTAMs/Bird Strike Potential
8. Personal Equipment
9. FCIF/Pubs/Maps

**GROUND PROCEDURES**

1. Pre-Flight
  - a. Aircraft
  - b. Armament
2. Check-In
3. Taxi/Marshaling/Arming
4. Spare Procedures

**TAKEOFF**

1. Runway Lineup
2. Takeoff/Takeoff Interval
3. Abort
4. Jettison Procedures
5. Low Altitude Ejection
6. Landing Immediately After Takeoff

**DEPARTURE/ENROUTE**

1. Routing

2. Trail Departure
3. Join-Up/Formation
4. Systems/Ops Checks

RECOVERY

1. Rejoin
2. Battle Damage Check
3. Type Recovery
4. Flight Break-Up
5. Pattern and Landing
6. After Landing/De-Arm
7. Emergency/Alternate Airfields

**Attachment 3****SPECIAL SUBJECT BRIEFING GUIDE****(as applicable)**

1. Instructor Responsibilities
2. Chase Procedures
3. IFF Procedures
4. Radar/Visual Search Responsibilities/Midair Collision Avoidance
5. Dissimilar Formations
6. Carriage / Jettison Limitations
7. Terrain Avoidance
  - a. Departure/Enroute/Recovery
  - b. Altitude Warning Settings
8. Bird Strike Procedures/Use of Visor(s)
9. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)
10. G-Awareness
  - a. G-Suit connection/G-tolerance/G-Awareness Turn
  - b. Use of L-1 Anti-G Straining Maneuver (AGSM)
11. Visual Illusions/Perceptions
12. Spatial Disorientation/Unusual Attitudes
13. Lost Wingman
14. Radio Inoperative
15. SARCAP
16. Recall Procedures
17. SIIs

**Attachment 4**

**ADVANCED HANDLING/INSTRUMENT BRIEFING GUIDE**

**AIRWORK**

1. Airspace Restrictions
2. Area Orientation
3. Instructor Responsibilities
4. Maneuvers

**APPROACHES**

1. Frequencies
2. Holding
3. Penetration
4. Missed Approach / Climb Out

**SPECIAL SUBJECTS**

1. "G" Awareness
2. Fuel Awareness/AB Use/Consumption Rates
3. Maneuvering Limitations
  - a. Airspeed and "G"
  - b. Recognition/Prevention/Recovery From Out of Control
  - c. Maneuvering at Heavyweight/High Angles of Attack/Asymmetrical Configuration
  - d. Effects of CG Throughout the Flight
  - e. Time to Ground Impact
    - (1) Wings Level
    - (2) Overbank/Under G
4. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 5****AIR REFUELING BRIEFING GUIDE****GENERAL**

1. Tanker Call Sign(s)/Receiver Assignments
2. Refueling Track(s)
  - a. Altitude
  - b. Airspeed
  - c. Airspace Restrictions
3. ARIPs, ARCPs, ARCTs

4. Radio Frequencies

**BUDDY PROCEDURES**

1. Departure
2. Join-Up

**ENROUTE**

1. Route of Flight
2. Formation
3. Ops Checks

**RENDEZVOUS**

1. Type Rendezvous
2. Holding Procedures/Formation
3. Ground Radar Assistance
4. Tanker Identification - TACAN/Radar/AAI/Visual
5. Radar Procedures/Techniques
6. Wingman/Deputy Lead Responsibilities
7. Receiver Formation/Join-Up Procedures
8. Rendezvous Overrun

**REFUELING**

1. Checklist Procedures
2. Radio Calls
3. Refueling Order
4. Techniques
5. Radio Silent Procedures

- a. EMCON
- b. Visual Signals

- 6. Fuel Off-Load
- 7. Bingo Fuel (Abort Points/Abort Bases)
- 8. Drop-Off Procedures
- 9. Wake Turbulence

#### REFORM AND EXIT

- 1. Formation
- 2. Clearance

#### EMERGENCY PROCEDURES

- 1. Breakaway Procedures
- 2. Systems Malfunctions
- 3. Damaged Receptacle

#### IMC/NIGHT CONSIDERATIONS

- 1. Lost Wingman Procedures
- 2. Aircraft Lighting

#### SPECIAL SUBJECTS

- 1. Fuel Awareness/AB Use/Consumption Rates
- 2. Flight Path Deconfliction/Other Receiver Considerations
- 3. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 6****AIR COMBAT TRAINING (ACBT) / INTERCEPT BRIEFING GUIDE****GENERAL/ADVERSARY COORDINATION/GCI COORDINATION**

1. Call Signs
2. Number and Type Aircraft
3. Scenario
  - a. Objective(s)
  - b. Type Threat Simulated/Tactics Limitations (If Any)
  - c. CAP Points/Target Locations
  - d. Safe Areas/FEBA/Ground Threats
  - e. VID/EID/BVR Criteria
4. Mission Contingencies
  - a. Single Radar Scope/No GCI
  - b. Single Frequency
  - c. Area Weather/Alternate Mission
  - d. Minimum Participants (Primary/Alternate Missions)
5. Area Information
  - a. Controlling Agency (GCI/AWACS/ACMI)
    - (1) GCI/Flight
    - (2) Comm Requirements
    - (3) Type/Level of Control
  - b. Airspace Restrictions
  - c. CAP Points/Target Locations
  - d. Frequencies
  - e. Squawks
  - f. Block Altitudes/Min Altitudes/Flight Parameters
  - g. Transmissions
    - (1) KIO
    - (2) Shots/Kills
    - (3) Fuel/Altitude Awareness
6. Rendezvous/Recovery Procedures
  - a. Dissimilar Formation

- 7. Weapons Employment
  - a. Simulated Ordnance (Type/Quantity)
  - b. Shot Criteria
  - c. Kill Criteria/Removal
  - d. Shot/Kill Passage

8. Training Rules

9. Emergency Procedures

- a. Recovery
- b. Escort Procedures

10. Debriefing (Time/Place)

FLIGHT/ELEMENT TACTICS

1. Avionics Set-up

- a. Radar
- b. Waypoints/Route
- c. IFF
- d. Air-to-air TACAN
- e. IFDL
- f. RW/EW Scan Schedules/Search Volumes

2. CAP/Patrol Phase

- a. Type Pattern
- b. Formation/Altitude/Airspeed
- c. Search Responsibilities
- d. Commit
  - (1) Criteria/Range
  - (2) Procedures

3. Ingress/Intercept Phase

- a. Formation/Altitude/Airspeed
- b. Detection
  - (1) Search Responsibilities (Radar/Visual)
  - (2) Sorting
- c. Targeting Plan
- d. Intercept Type/Planned Tactics

- (1) Plan (Direct Attack/Deception)
- (2) Mutual Support Requirements
- (3) Identification Requirements/Procedures
- (4) Minimum Altitudes/Airspeeds
- (5) Vertical/Horizontal Conversions/Turning Room

e. Night/IMC Intercepts

- (1) ECM/Chaff/ Evasion Restrictions
- (2) Radar Requirements
- (3) Altitude Separation Requirements

4. Engagement Phase

a. Plan

- (1) Turn and Fight
- (2) Hit and Run
- (3) Abort

b. Clearance for Wingman to Engage

- (1) Offensive
- (2) Defensive

c. Alternate Plan (Degraded Situation)

5. Egress/Separation Phase

a. Disengagement Plan (Why/When/How)

- (1) Loss of Mutual Support
- (2) Fuel
- (3) Ordnance

b. Egress Formation/Responsibilities

6. Contingencies

- a. Single Contact
- b. Short Range Commit
- c. Single Ship (Loss of Mutual Support)
- d. Safe Escape/Rendezvous Point

7. Live Missile/Hot Gun Safety Procedures

8. Additional Considerations

- a. Threat Reaction

- b. Degraded Systems
- c. Tactical Lead Changes
- d. Bandit Options
- e. DMVR
- f. Codewords
- g. Environmental Considerations

9. Alternate Mission

- a. Type Mission (refer to appropriate mission briefing guide)
- b. Mission Objectives

SPECIAL SUBJECTS

- 1. "G" Awareness
- 2. Fuel Awareness/AB Use/Consumption Rates
- 3. Flight Path Deconfliction
- 4. Maneuvering Limitations
  - a. Airspeed and "G"
  - b. Recognition/Prevention/Recovery from Out of Control
  - c. Time to Ground Impact
    - (1) Wings Level
    - (2) Overbank/Under "G"
- 5. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 7****ESCORT MISSION BRIEFING GUIDE**

## ENROUTE TO RENDEZVOUS/POST-MISSION NAVIGATION

1. Formation
2. Route of Flight
3. Control Agency Call Sign/Frequency

## RENDEZVOUS

1. Protected Force Call Sign
2. Altitude
3. Airspeed

## ESCORT PROCEDURES

1. Type Formation
2. Tactics
3. Commit
  - a. Criteria/Range
  - b. Procedures
4. Escort Route
5. EW/RW

## TRAINING RULES

## ALTERNATE MISSION

1. Type Mission (refer to appropriate mission briefing guide)
2. Mission Objectives

## SPECIAL SUBJECTS

1. Airspace Restrictions
2. "G" Awareness
3. Fuel Awareness/AB Use/Consumption Rate
4. Flight Path Deconfliction
5. Maneuvering Limitations
  - a. Airspeed and "G"
  - b. Recognition/Prevention/Recovery from Out of Control
6. Time to Ground Impact
  - a. Wing Level

b. Overbank/Under "G"

7. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 8****AERIAL GUNNERY TOW COORDINATION BRIEFING GUIDE**

## TOW COORDINATION

1. Ground/T.O./Departure
2. Rendezvous
3. Airspace Data
4. GCI Support
5. Target Launch/Chase
6. Shooter Order
7. Type Pattern
8. Tow Altitude Block(s)/Flight Parameters
9. Intercept Phase/Pattern Set-Up
10. Arming Procedures
11. Timing
12. Tow Maneuvering Parameters
13. Shooter/Firing Plan
14. Radio Procedures
15. Termination
  - a. Timing
  - b. Minimum Altitude
  - c. Joker/Bingo Fuel
  - d. Winchester
  - e. Fouls
16. Armament Safety Check
17. Scoring
18. Subsequent Set-Ups
19. Target Drop Procedures
20. Recovery Order
21. Abnormal Procedures
  - a. Erratic Target
    - (1) During Deployment
    - (2) During Employment

- b. Target Drag-Off
- c. Recovery With Target/Cable
- d. NORDO
  - (1) During Engagement
  - (2) Target Drop
  - (3) Visual Signals
  - (4) Recovery

**Attachment 9****AERIAL GUNNERY BRIEFING GUIDE****GENERAL**

1. Formation
2. Area Information
  - a. Controlling Agency
  - b. Airspace Restrictions
  - c. Frequencies
3. Switch Positions
4. Arming Procedures
5. Intercept / Set-Up
6. Shooter Sequence
7. Position Changes
8. Chase Procedures
9. Timing

**EMPLOYMENT**

1. Firing Parameters
  - a. Minimum Range
  - b. Overtake
  - c. Angle-Off
  - d. Error Analysis
2. Contingencies
  - a. Avionics Malfunctions
  - b. Gun Malfunctions
  - c. Range Estimation Without Radar
3. Safety Considerations
  - a. Target Fixation
  - b. Debris Avoidance
  - c. Fouls

**TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS****ALTERNATE MISSION**

1. Type Mission (refer to appropriate mission briefing guide)

2. Mission Objectives

SPECIAL SUBJECTS

1. Minimum Altitudes

2. "G" Awareness

3. Fuel Awareness/Ops Checks/AB Use/Consumption Rates

4. Maneuvering Limitations

a. Airspeed/"G"/Stress

b. Recognition/Prevention/Recovery From Out of Control

5. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 10****LOW-LEVEL NAVIGATION BRIEFING GUIDE****GENERAL**

1. Route/Clearance/Restrictions
2. Flight Responsibilities
  - a. Navigation
  - b. Radar/Visual Search
3. Entry/Spacing /Holding/Initial Altitude (MSA)

**ROUTE PROCEDURES**

1. Fence Checks
2. Tactical Formation/Turns
3. Low Level Navigation
  - a. Dead Reckoning/Use of Navigation Aids/ Equipment (i.e. GINS/SD)
  - b. Radar Procedures/Techniques
  - c. Visual Procedures/Techniques
  - d. Updates/Calibrations
  - e. Time/Fuel Control
  - f. Terrain Following/Avoidance/Wingman Considerations
  - g. Leg Altitudes/ Obstacles (MSL/AGL)
  - h. Turnpoint Acquisition
4. Threat Reactions
  - a. RW/EW/EXCM
  - b. Engagement Criteria
  - c. Flight Path Deconfliction
  - d. Termination

**EMERGENCIES**

1. Aircraft Malfunctions
2. Route Abort Procedures (RAA/MSA)/ATC Frequencies

**TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS****ALTERNATE MISSION**

1. Type mission (refer to appropriate mission briefing guide)
2. Mission Objectives

SPECIAL SUBJECTS

1. Airspace Restrictions
2. "G" Awareness/Ops Checks
3. Fuel Awareness/AB Use/Consumption Rates
4. Flight Path Deconfliction
5. Maneuvering Limitations
  - a. Airspeed and "G"
  - b. Recognition/Prevention/Recovery From Out of Control
6. Time to Ground Impact
  - a. Wings Level
  - b. Overbank/Under "G"
7. Night Considerations
8. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**Attachment 11****ALERT BRIEFING GUIDE**

This guide is all-inclusive and is designed to incorporate all the applicable items from the General Briefing Guide. If a specialized mission such as air refueling is anticipated, the specific briefing guide for that mission should also be used.

**MISSION DATA**

1. Time Hack
2. Mission Data Card
  - a. Call Signs
  - b. Aircraft/Location / Status
  - c. Takeoff/Landing Data (Worst Case)
  - d. Joker/Bingo Fuel
3. Actual/Forecast Weather
  - a. Home base
  - b. Alternates
  - c. Individual Weather Category/Mandatory Status
4. NOTAMs
5. FCIF/Pubs/Maps
6. Personal Equipment
7. Alert Packet
  - a. Authenticators/Duress Code
  - b. Security Procedures
8. Airfield Status
  - a. Actual versus Max Allowable Tailwind
  - b. Barriers
  - c. Navigation Aids
  - d. Hazards to Taxi/RCR

**GROUND PROCEDURES**

1. Aircraft/Armament Preflight
2. Cockpit Set-Up
3. Engine Run/Hot Preflight
4. Crew Chief Briefing
5. Quick Check Procedures

## LAUNCH PROCEDURES

1. Notification/UHF Frequency/Authentication Requirement
2. Status
  - a. Airborne Order
  - b. Battle Stations
  - c. Runway Alert
  - d. Scramble
3. Taxi
4. Takeoff/Runway Lineup/Interval/Formation
  - a. Day VMC
  - b. Day IMC
  - c. Night VMC
  - d. Night IMC
5. Join-up/Trail Formation/Power Settings/Airspeeds

## IN-FLIGHT PROCEDURES

1. Formation
2. Airspeeds
3. Weapons Safe Checks
4. Radar Search Responsibilities
5. Degraded Fire Control System
6. Transfer of Lead Procedures
7. Ops Checks
8. EMCON Procedures
9. Region Minimum Safe Altitude (MSA)
10. VID Procedures
  - a. Authority Required to Close
  - b. Formation/Tactics
  - c. Range/Altitude Separation Requirements on Target Prior Permission to Close With/Without Visual Contact
  - d. Radar Lock-On Requirements
  - e. Maximum Closure Speed
  - f. Minimum Airspeed
  - g. Loss of Contact Procedures

h. Breakaway Procedures

i. Restrictions

11. Aircraft in Distress

a. Minimum Closure Distance

b. Visual Signals - Day/Night

c. Escort Procedures

d. Recovery/Landing Visual Signals

e. Dissimilar Formation Procedures

12. Jettison Procedures

13. Lost Wingman

14. SARCAP

15. Emergency Airfields

SPECIAL SUBJECTS

1. Emergency of the Day

2. Fuel Awareness

3. Maneuvering Limitations

4. Recognition/Prevention/Recovery from Loss of Control

5. Spatial Disorientation

6. Recall Procedures

7. Rules of Engagement (ROE)

8. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

GROUND CREW BRIEFING

1. Act only on pilot's instructions

2. Ground emergency procedures

3. Hand signals

4. Aircraft danger areas

**Attachment 12****AIR-TO-SURFACE WEAPONS EMPLOYMENT BRIEFING GUIDE--SURFACE  
ATTACK TACTICS****A12.1. General Mission Data.**

- A12.1.1. Intelligence/Threat Scenario.
- A12.1.2. Low-Level (See Low-Level Briefing Guide).
- A12.1.3. Fence Checks.
- A12.1.4. Operating Area Entry/Description/Boundaries.
- A12.1.5. Target Area/Clearing Pass:
  - A12.1.5.1. Location/Description/Elevation/TOT
  - A12.1.5.2. Visual Cues in the Target Area
  - A12.1.5.3. Target Area Weather:
  - A12.1.5.4. Ceiling/Visibility
  - A12.1.5.5. Winds/Altimeter
  - A12.1.5.6. Sun Angle/Shadows
  - A12.1.5.7. IR Considerations
- A12.1.6. Threat Array:
  - A12.1.6.1. Type/Capabilities
  - A12.1.6.2. Locations
  - A12.1.6.3. Countermeasures:
    - A12.1.6.3.1. Chaff/Flare
    - A12.1.6.3.2. Terrain masking
    - A12.1.6.3.3. Radio Silent Procedures
    - A12.1.6.3.4. Authentication/Comm-Jamming/Chattermark Procedures
  - A12.1.6.4. Threat Reactions:
    - A12.1.6.4.1. LOWAT
    - A12.1.6.4.2. IP to Action Point
    - A12.1.6.4.3. During Delivery
- A12.1.7. Ordnance/Weapons Data:
  - A12.1.7.1. Type/Fuzing
  - A12.1.7.2. Weapons Settings
  - A12.1.7.3. Desired Effects

A12.1.7.4. Specific Aim Points

A12.1.7.5. Minimum Altitudes

A12.1.7.5.1. Safe Escape/Safe Separation

A12.1.7.5.2. Fuze Arming/Frag Avoidance

A12.1.8. Laser Operations.

## **A12.2. Employment Procedures.**

A12.2.1. Tactics:

A12.2.1.1. Overview

A12.2.1.2. Ingress:

A12.2.1.2.1. Formation

A12.2.1.2.2. Speed/Altitude

A12.2.1.3. Weapons Delivery:

A12.2.1.3.1. Type Delivery

A12.2.1.3.2. Switchology

A12.2.1.3.3. Attack Parameters:

A12.2.1.3.3.1. Action Point/Pop Point

A12.2.1.3.3.2. Altitudes (Pull-Down/Apex/Release/Minimum)

A12.2.1.3.4. Visual Lookout/Mutual Support Responsibilities

A12.2.1.4. Egress:

A12.2.1.4.1. Recovery/Return to Low Altitude

A12.2.1.4.2. Loss of Mutual Support/Rendezvous Point

## **A12.3. Range Departure Procedures.**

A12.3.1. Armament Safety Checks

A12.3.2. Rejoin

A12.3.3. Battle Damage/Bomb Check

A12.3.4. Jettison Procedures/Parameters

A12.3.5. Hung/Unexpended Ordnance

A12.3.6. Inadvertent Release

A12.3.7. Gun Unsafe/Jam

## **A12.4. Mission Reporting (BDA/In-Flight Report).**

## **A12.5. Contingencies.**

- A12.5.1. Rejoin for late takeoff
- A12.5.2. Two/Three Ship Options
- A12.5.3. Tactical Lead Changes
- A12.5.4. Air-to-Air TACAN
- A12.5.5. Codewords
- A12.5.6. Weather Backup Deliveries
- A12.5.7. Degraded Systems
- A12.5.8. Reattack
- A12.5.9. Wounded Bird/Escort Procedures

**A12.6. Night Procedures.**

- A12.6.1. Aircraft Lighting
- A12.6.2. Radio Calls
- A12.6.3. Target ID/Range Lighting
- A12.6.4. Night Spacing Techniques
- A12.6.5. Instrument Cross-check/Disorientation

**A12.7. Training Rules/Special Operating Instructions.**

**A12.8. Alternate Mission.**

- A12.8.1. Type Mission (refer to appropriate mission briefing guide)
- A12.8.2. Mission Objectives

**A12.9. Special Subjects.**

- A12.9.1. Error Analysis
- A12.9.2. Fouls
- A12.9.3. Minimum Altitudes
- A12.9.4. Target Fixation
- A12.9.5. "G" Awareness
  - A12.9.5.1. G-Suit connection/G-tolerance/G-Awareness Turn
  - A12.9.5.2. Use of L-1 Anti-G Straining Maneuver (AGSM)
- A12.9.6. Fuel Awareness/Ops Checks/AB Use/Consumption Rates
- A12.9.7. Maneuvering Limitations
  - A12.9.7.1. Airspeed/"G"/Stress (Carriage/Release)
  - A12.9.7.2. Recognition/Prevention/Recovery From Out of Control

A12.9.8. Time to Ground Impact

A12.9.8.1. Wings Level

A12.9.8.2. Overbank/Under "G"

A12.9.9. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency).

**Attachment 13****NVG BRIEFING GUIDE**

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

**WEATHER/ILLUMINATION**

1. Civil/Nautical Twilight
2. Moon Rise/Set Times/Phase/Elevation/Azimuth
3. Ceiling/Visibility
4. Lux/EO TDA
5. Obscurants to Visibility

**NVG PREFLIGHT**

1. Check Adjustments/Helmet Fit and Security
2. Batteries
3. Resolution/Focus
4. NVG Compatible Flashlight

**COCKPIT PREFLIGHT**

1. Cockpit Setup
2. Cockpit Lighting (Leaks)/Mirrors Up
3. Cockpit FAM
4. Check Focus and Stow for Taxi

**BEFORE TAKEOFF**

1. Don NVGs/Check and Adjust/Disconnect
2. Stow for Takeoff

**AIRBORNE**

1. Exterior Lights
2. Donning and Doffing Procedures
3. Scan Pattern
  - a. Forward Scan
  - b. Narrow Field of View
  - c. Peripheral Vision
  - d. Scan Techniques
4. Join-up and Enroute Considerations

- a. Rejoin/Closure
- b. Air to Air TACAN
- c. G-Awareness Considerations
  - (1) Lighting
  - (2) Deconfliction/Separation

## **MISSION**

- 1. Route Study/Scene Interpretation
  - a. NVG Predictions/Albedo
  - b. Terrain/Shadowing/Visual Illusions/Visible Horizon
  - c. City/Cultural Lighting
    - (1) Direction/Orientation of Lighting
    - (2) Aggressive Formation Maneuvering
    - (3) Terrain Avoidance
      - (a) Radar Altimeter
      - (b) Terrain Following (TF) Usage
    - (4) Map Reading

## **TARGET AREA**

- 1. RV/Holding Procedures (NVG Differences)
- 2. NVG Lost Wingman
- 3. Deliveries/Pattern Procedures
  - a. Minimum Altitudes
  - b. Flight Member Responsibilities
  - c. Moth Effect
  - d. Deconfliction
  - e. External Lighting/Deconfliction Procedures
- 4. Laser/IR Pointer Operations
- 5. Threat ID and Reaction
- 6. Egress

## **NVG SAFETY**

- 1. NVG Lost Sight
- 2. NVG Lost Wingman
- 3. Depth Perception

4. Visual Illusions
5. NVG Failure
6. Battery Failure/Swap Out
7. Overconfidence in NVG Capabilities
8. Entering Weather/Transition to Instruments
9. Correct Lighting of Primary/Secondary Flight Instruments
10. Disorientation/Misorientation/Vertigo
11. Deconfliction ROE
12. Transference
13. Target Fixation
14. Lack of Dive Information
15. Fatigue
16. Aircraft Emergency and NVG BDA Considerations
17. Ejection/Goggles Off
18. Laser Eye Protection (LEP) Use
19. NVG FOD Considerations (Batteries, Equipment, Filters, etc)

**Attachment 14****GROUND CREW BRIEFING GUIDE**

## GROUND CREW

1. Act only on pilot's instructions
2. Ground emergency procedures
3. Hand signals
4. Aircraft danger areas

**Attachment 15**

**MISSION DEBRIEFING GUIDE**

GROUND PROCEDURES

TAKEOFF/JOIN-UP/DEPARTURE

ENROUTE PROCEDURES

RECOVERY/LANDING/AFTER LANDING

GENERAL

1. SIIs

2. Radio Procedures

3. Flight Discipline/Effectiveness

MISSION ACCOMPLISHMENT/ANALYSIS

1. Mission Reconstruction

2. Mission Support

3. DMVR Assessment

4. Anti-G Straining Maneuver Effectiveness

5. Learning Objectives Achieved

6. Lessons Learned

7. Recommendations for Improvement

COMMENTS/QUESTIONS