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SECRETARY OF THE AIR FORCE**

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VOLUME 3**



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***Flying Operations***

***F-35A--OPERATIONS PROCEDURES***

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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This publication establishes effective and safe operations of the F-35A and implements Air Force AFD 11-4, *Aviation Service*, and Air Force Instruction (AFI) 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*. It applies to all F-35A units, applies to the Air National Guard (ANG) and Air Force Reserve Command (AFRC). This publication may be supplemented at any level, but all direct Supplements must be routed to Air Force Flight Standards Agency (AFFSA)/A3OF and Air Combat Command (ACC)/A3TO for coordination prior to certification and approval. Field units below major command (MAJCOM)/direct reporting unit (DRU)/field operating agency (FOA) level will forward copies of their supplements of this publication to their parent MAJCOM/ DRU/FOA office of primary responsibility (OPR) for post-publication review. **NOTE:** The above applies only to those DRUs/FOAs that report directly to HQ USAF. Copies of MAJCOM/ DRU/FOA-level supplements, after approved and published, will be made available on the e-Publishing website at <https://www.e-publishing.af.mil>. Refer recommended changes and questions about this publication to the OPR using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through the appropriate functional chain of command.

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<b>Chapter 1—GENERAL GUIDANCE</b>	<b>6</b>
1.1. General. ....	6
1.2. Waivers. ....	6
1.3. Processing Changes. ....	6
<b>Chapter 2—MISSION PLANNING</b>	<b>7</b>
2.1. Responsibilities. ....	7
2.2. General Procedures. ....	7
2.3. Mission Materials. ....	7
2.4. G-suit Use. ....	7
2.5. Unit Developed Checklists. ....	7
2.6. Bird/Wildlife Aircraft Strike Hazard (BASH) Programs. ....	8
2.7. Fuel Conservation. ....	8
2.8. Overwater. ....	8
2.9. Briefing/Debriefing. ....	8
<b>Chapter 3—NORMAL OPERATING PROCEDURES</b>	<b>11</b>
3.1. Preflight and Strap-in. ....	11
3.2. Ground Communications and Visual Signals. ....	11
3.3. Engine Start. ....	11
3.4. Taxi and Arming. ....	12
3.5. Flight Lineup. ....	12
3.6. Takeoff. ....	12
3.7. Formation Takeoff. ....	13
3.8. Join-up/Rejoin. ....	13
3.9. Formation, Visual and Administrative. ....	13
3.10. Tactical Formation. ....	15
3.11. Chase Formation. ....	15
3.12. Aerial Demonstrations. ....	16

3.13.	Maneuvering Parameters. ....	16
3.14.	Ops Checks. ....	16
3.15.	Radio Procedures. ....	17
3.16.	General Low Altitude Procedures. ....	18
3.17.	Air Refueling. ....	19
3.18.	Night Procedures. ....	19
3.19.	Electro-Optical Distributed Aperture System/Night Vision Procedures. ....	20
3.20.	Fuel Requirements. ....	22
3.21.	Approaches and Landings. ....	22
3.22.	Overhead Traffic Patterns. ....	23
3.23.	Tactical Overhead Traffic Patterns. ....	23
3.24.	Touch-and-Go Landings. ....	23
3.25.	Low Approaches. ....	23
3.26.	Closed Traffic Patterns. ....	24
3.27.	Formation Approaches. ....	24
3.28.	After Shutdown Procedures. ....	24
3.29.	Air-to-Air Interrogator (AAI), Identification Friend or Foe/Selective Identification Feature (IFF/SIF). ....	24
3.30.	Weather Minimums. ....	25
Table 3.1.	Weather Minimum Summary (Feet/NM/kilometer (KM)). ....	25
3.31.	Summary of Minimum Altitudes. ....	25
Table 3.2.	Minimum Altitude Summary (Feet AGL). ....	25
<b>Chapter 4—INSTRUMENT PROCEDURES</b>		<b>26</b>
4.1.	Display of Endorsed Primary Flight Reference. ....	26
4.2.	Takeoff and Join-up. ....	26
4.3.	Trail Procedures. ....	26
4.4.	Formation Break-up. ....	28
4.5.	Formation Penetration. ....	29
4.6.	Formation Approach. ....	29
4.7.	Instrument Approach. ....	29
4.8.	Simulated Instrument Flight. ....	29
4.9.	Flight into Known Icing Conditions. ....	29
<b>Chapter 5—AIR-TO-AIR WEAPONS EMPLOYMENT</b>		<b>30</b>

5.1.	References. ....	30
5.2.	Simulated Gun Employment. ....	30
5.3.	Training Missions with Live Air-to-Air (A/A) Ordnance. ....	30
5.4.	Flare Employment. ....	30
5.5.	Maneuvering Limitations. ....	30
<b>Chapter 6—AIR-TO-SURFACE WEAPONS EMPLOYMENT</b>		<b>31</b>
6.1.	References. ....	31
6.2.	Weather Minimums. ....	31
6.3.	Simulated Gun Employment. ....	31
6.4.	Training Missions with a Hot Gun. ....	31
6.5.	Simulated Attacks against Off-Range or Manned Targets. ....	31
6.6.	Pop-Up Attacks. ....	31
6.7.	Target Identification. ....	32
6.8.	Live Ordnance Procedures. ....	32
6.9.	Flare Employment. ....	32
6.10.	Night Weapons Delivery/Range Operations. ....	32
6.11.	Night Altitudes. ....	32
6.12.	Night Bank Angle. ....	32
<b>Chapter 7—ABNORMAL OPERATING PROCEDURES</b>		<b>33</b>
7.1.	General. ....	33
7.2.	Ground Aborts. ....	33
7.3.	Takeoff Aborts. ....	33
7.4.	Air Aborts. ....	33
7.5.	Engine Malfunctions. ....	34
7.6.	Radio Failure. ....	34
7.7.	Severe Weather Penetration. ....	36
7.8.	Lost Wingman Procedures. ....	36
7.9.	Spatial Disorientation. ....	37
7.10.	Armament System Malfunctions. ....	38
7.11.	Post Arresting Gear Engagement Procedures: ....	39
7.12.	In-flight Practice of Emergency Procedures. ....	39
7.13.	Search and Rescue (SAR) On-Scene Commander Procedures. ....	40
7.14.	Fuel Dumping: ....	40

<b>Chapter 8—LOCAL OPERATING PROCEDURES</b>	<b>42</b>
8.1.    General. ....	42
8.2.    If Applicable Procedures. ....	42
8.3.    Distribution of Local Supplements. ....	43
<b>Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION</b>	<b>44</b>
<b>Attachment 2—CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND HIGH                   YIELD EXPLOSIVE (CBRNE) OPERATIONS</b>	<b>52</b>
<b>Attachment 3—FLIGHT BRIEFING GUIDES</b>	<b>54</b>
<b>Attachment 4—CRITICAL ACTION PROCEDURES (CAPS)</b>	<b>78</b>

## Chapter 1

### GENERAL GUIDANCE

**1.1. General.** This instruction, in conjunction with other governing directives and AFI (as supplemented), prescribes procedures for operating F-35A 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.

1.1.1. **Deviations.** Deviations from these procedures require specific waiver 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.

1.1.2. **Supplements.** Comply with applicable supplements to all guidance referenced in this Volume. Develop additional supplements IAW AFI 33-360, *Publications and Forms Management*.

1.1.3. **Aircraft Operating Limits (AOL).** Nothing in this AFI overrides any existing AOL that may be in effect prior to full F-35A flight envelope clearance/release. Due to concurrent development and fielding of the F-35, there may be additional, more restrictive, AOLs based on restricted flight clearances. AOL restrictions are contained in F-35A Flight Series Data (FSD). Be familiar with all AOLs prior to the flight and comply accordingly. AOLs and FSD restrictions/ limitations supersede any item (i.e., airspeed, altitude, gravity load factor (G)-limits, maneuvering parameters, etc.) outlined in this AFI.

**1.2. Waivers.** Forward waiver requests through appropriate channels to the applicable MAJCOM/A3 or equivalent, or Commander Air Force Forces (COMAFFOR) for those aircrew and assets under the COMAFFOR's oversight, for approval. The COMAFFOR, MAJCOM/A3 or equivalent will notify HQ ACC/A3 of waivers within 72 hours of issuance. Waiver authority for supplemental guidance will be as specified in the supplement and approved through higher level coordination authority.

### 1.3. Processing Changes.

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

## Chapter 2

### MISSION PLANNING

**2.1. Responsibilities.** The pilot in command of each aircraft and the designated flight lead are ultimately responsible for mission planning. The operations and intelligence functions will provide supplemental planning material and information as required to effectively accomplish the assigned mission.

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

2.2.1. Accomplish sufficient flight planning to ensure safe mission accomplishment to include fuel requirements, mission materials, deconfliction plan, communication plan and takeoff/ landing data.

2.2.2. **Standards.** The squadron commander (SQ/CC) is the approval authority for squadron standards. Group/Wing standards may be published and approved by the operations group commander (OG/CC). All standards will be reviewed by Wing Stan/Eval for standardization and compliance with AFI 11-series guidance.

#### **2.3. Mission Materials.**

2.3.1. **Local Area Maps.** A local area map is not required if the F-35A Tactical Situation Display/ 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.** Flight Information Publication (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.** Refer to AFI 11-202V3, *General Flight Rules*, and AFMAN 11-217V2, *Visual Flight Procedures*, for low altitude map requirements, marking and procedures.

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

2.3.4. **Electronic Devices.** Use of portable global positioning system (GPS) units, Electronic Flight Bag and/or e-tool display device in the cockpit during flight operations (electronic charts, approach procedures, etc.), if approved, will be IAW AFI 11-202V3 and AFI 11-215, *USAF Flight Manuals Program (FMP)*.

**2.4. G-suit Use.** IAW AFI 11-301V1\_ACCSUP\_I, *Aircrew Flight Equipment (AFE) Program*, the G-suit is required on all flights when 2 or more Gs are anticipated.

#### **2.5. Unit Developed Checklists.**

2.5.1. Unit developed checklists may be used to supplement FSD checklists (except Nuclear, i.e., aircraft and weapons preflight) provided they contain, as a minimum, all items (verbatim and in order) listed in the applicable checklist. IAW AFI 11-215, forward unit-developed checklists to MAJCOM Stan/Eval and the flight manual manager for approval before use.

2.5.2. **Local Pilot Aids.** Unit produced pilot aids will contain:

- 2.5.2.1. Briefing guides;
- 2.5.2.2. Local radio channelization and airfield diagrams;
- 2.5.2.3. Emergency information (impoundment procedures, emergency action checklists, no radio (NORDO)/divert information, and search and rescue procedures, etc.);
- 2.5.2.4. Appropriate alternate/divert airfield information, to include arresting gear information;
- 2.5.2.5. Bailout and jettison areas;
- 2.5.2.6. Cross-country procedures to include: command and control, Autonomic Logistics Information System (ALIS) requirements, engine documentation, Joint Oil Analysis Program samples, and aircraft servicing; and,
- 2.5.2.7. Other information as deemed necessary by the unit. For example: stereo flight plans, turnaround procedures, local training areas, instrument pre-flight and/or alert procedures.

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

- 2.6.1. Takeoffs, landings, or low-levels within one hour of either sunrise or sunset during the phase II period increase likelihood of bird strike. Significant bird hazards are published in FLIP General Planning, the instrument flight rules (IFR) Supplement and local airfield guidance.
- 2.6.2. When operating at airfields where no BASH program exists, pilots will make appropriate judgments based on observable bird conditions and seek assistance from local airfield personnel.
- 2.6.3. Pilots will consider bird migratory patterns during enroute portion of the mission to minimize the potential of an in-flight bird strike. The Bird Avoidance Model on United States Avian Hazard Advisory System (<http://www.usahas.com>), provides BASH information, including regionalized CONUS bird migration, Portable Flight Planning System software overlay, and latest news. See AFPAM 91-212 for additional information.

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

**2.8. Overwater.** Planned flights over water, outside of the local training area (e.g., deployments, cross countries, Programmed Delivery for Maintenance (PDM) inputs, etc.) will be accomplished two-ship as a minimum. Single ship over water flights, outside of the local training area, require OG/CC approval.

**2.9. Briefing/Debriefing.**

2.9.1. **Briefings.** Flight leads are responsible for presenting a logical briefing that will promote safe, effective mission accomplishment. All pilots will attend the flight briefing unless previously coordinated with unit/squadron supervisors.

2.9.1.1. Items published in AFIs, Air Force Tactics, Techniques and Procedures (AFTTPs), or squadron/wing standards and understood by all participants may be briefed as "standard." Items not pertinent to the mission do not need to be covered.

2.9.1.2. Takeoff and landing data (TOLD) will be annotated on mission data cards. The minimum TOLD required is 1,000 foot acceleration check speed (if computed takeoff roll exceeds 2,500 feet); refused takeoff speed (stopping on runway remaining without exceeding brake energy limits); rotation speed; takeoff speed and distance; normal landing speed and distance; heavyweight (immediately after takeoff) landing speed and distance. Include wet or icy data if applicable based on location and potential for wet or icy runway surface.

2.9.1.3. 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/icy runway, heavy gross weights and non-standard cable configurations.

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

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

2.9.1.6. Flight leads will ensure briefing start time provides adequate time to discuss required briefing items depending on complexity of the mission and pilot capabilities. As a minimum, begin briefings at least 1.5 hours before scheduled takeoff. Alert briefings will start in sufficient time to be completed prior to pilot changeover.

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

2.9.1.8. Brief an appropriate alternate mission for each flight. The alternate mission will be less complex than the primary and should parallel the primary mission. If an alternate mission does not parallel the primary mission, specific mission elements different than the primary mission should be briefed. 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.

2.9.1.9. On multiple-go days when aircraft turn times do not allow follow-on mission brief(s) and only the initial flight brief is accomplished for all sorties, the following guidance applies:

2.9.1.9.1. Upgrade missions will be flown on the first sortie (second sortie if the first is non-effective for weather, airspace, or maintenance). Subsequent missions will be of equal or less complexity with no additional upgrade training without OG/CC approval; and,

2.9.1.9.2. Participants in continuation training missions may fly their primary or alternate missions in any sequence.

2.9.1.10. All missions will be debriefed and address in-flight execution, flight member responsibilities, deconfliction contracts, tactical employment priorities and sensor management. Review as much of the tactical portion of each mission as possible from the Portable Memory Device (PMD); however, flight leads will ensure that all portions of the missions are debriefed.

2.9.1.11. Flight leads will review the tactical portions of the sortie to assess flight member's anti-G straining maneuver (AGSM) effectiveness. Evaluate not only during the G-awareness exercise, but also after the pilot has had time to fatigue--typically when the AGSM breaks down and G-induced loss of consciousness (GLOC) occurs. Pilots with poor AGSM technique or low G-tolerance will be identified to the operations officer. The SQ/CC has the option of directing refresher centrifuge training in accordance with AFI 11-404, *Centrifuge Training for High-G Aircrew*.

**2.9.2. 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).

**2.9.3. Briefing Guides.** Briefing guides will be used to provide the flight lead/briefer with a reference list of items which may apply to particular missions. Items listed in **Attachment 3** may be briefed in any sequence. 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 Stan/Eval for review and/or inclusion in this volume.

## Chapter 3

### NORMAL OPERATING PROCEDURES

#### 3.1. Preflight and Strap-in.

- 3.1.1. Do not place objects in or near the engine intakes.
- 3.1.2. Secure personal items to avoid flight control/throttle interference.
- 3.1.3. Ensure ejection seat survival kit deployment switch is in the AUTO position.

**3.2. Ground Communications and Visual Signals.** The pilot will accomplish the ground crew briefing 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, pre-taxi checks and "Red Balls" anytime the aircraft engine is 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. 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. **Integrated Power Package (IPP) START.** With clenched fist, pilot makes a pulling motion;
- 3.2.2. **FLIGHT CONTROLS CLEAR.** Raise arm, clench fist, and make a stirring action;
- 3.2.3. **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;
- 3.2.4. **WEAPONS BAY OPEN or CLOSE.** Display hands with fingers extended, palms up and edges of hands touching. Move hands apart several times;
- 3.2.5. **BRAKE CHECK.** Hold left or right arm horizontal, open hand and push forward, breaking at the wrist (as in applying rudder pedal pressure with feet);
- 3.2.6. **LOSS OF BRAKES WHILE TAXIING.** Lower tail hook; and,
- 3.2.7. **GUN ARMAMENT CHECK.** Point index finger forward with thumb upward simulating a pistol and shake head (yes or no).

#### 3.3. Engine Start.

- 3.3.1. Stow loose items prior to starting the engine with the canopy open.
- 3.3.2. **Ice FOD Procedures.** The following procedures will be followed when FSD indicates engine damage due to icing is possible:
  - 3.3.2.1. If conditions warrant, the Supervisor of Flying (SOF)/Top 3 will have the first flight lead start 5 minutes early to check for inlet ice formation;

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

3.3.2.3. Hold in the arming spot with an ice FOD monitor present until cleared for takeoff; and,

3.3.2.4. Shutdown immediately if icing is visually detected and notify the SOF/Top 3. Make an appropriate entry in the portable maintenance aid (PMA) and qualified personnel must accomplish an intake inspection prior to restarting the engine.

### **3.4. Taxi and Arming.**

3.4.1. 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. Limit taxi speed to 30 knots and 10 knots in turns. Consider increasing taxi spacing when preceding aircraft engine exhaust may be ingested by On Board Oxygen Generation System (OBOGS).

3.4.2. 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.

3.4.3. Keep hands in view of ground personnel during quick check, arming or de-arming operations, especially if weapons bay doors (WBDs) will be actuated. 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.

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

3.4.5. Make every attempt to coordinate an EOR inspection with the host maintenance unit when not at home station, or at a non-USAF base.

**3.5. 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.

3.5.1. Just prior to takeoff, all flight members will inspect each other for proper configuration and any abnormalities.

### **3.6. Takeoff.**

3.6.1. Do not takeoff if the runway condition reading (RCR) is less than FSD minimum allowable RCR.

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

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. Due to high engine turbulence during takeoff roll use a minimum of 15 seconds (20 seconds when using afterburner) takeoff interval between aircraft. When carrying live air-to-ground (A/G) ordnance or executing sensor trail departures use 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 throttle.

3.6.7. Wing/OG Commanders may approve intersection takeoffs if operational requirements dictate.

**3.7. Formation Takeoff.** Prohibited, pending completion of Developmental Test and Evaluation.

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

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

3.8.2. Flight leaders will maintain 300-350 knots indicated airspeed (KIAS) until join-up is accomplished unless mission requirements or noise abatement procedures necessitate a different airspeed.

3.8.3. Flight leaders should limit 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 second 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. Accomplish air-to-air systems checks above 10,000 feet mean sea level (MSL) when practical. Maintain "see and avoid" throughout all phases of flight.

3.8.6. When circumstances permit, flight leads will direct a battle damage check after each mission prior to or during return to base (RTB). Except at night/ instrument meteorological conditions (IMC), this check is mandatory following the expenditure of any ordnance (including all types of 25 millimeter (mm) ammunition). Brief deconfliction responsibilities and position change procedures. Fly no closer than close formation spacing. Ensure all doors closed prior to landing.

3.8.7. For further join-up procedures, see Night Procedures ([3.18](#)) and [Chapter 4](#).

**3.9. Formation, Visual and Administrative.** Instructor pilots (IP)/flight leads are responsible for ensuring contracts, roles and responsibilities of each flight member are established, briefed, executed and debriefed. If any flight member cannot fulfill their basic responsibilities, contracts, or other assigned tasks, they will immediately communicate that information to the flight/element lead. IP/flight leads will task element leads/wingmen based on their ability to fulfill basic responsibilities and other assigned tasks. For additional formation considerations, reference Air Force Tactics, Techniques and Procedures (Inter-service) (AFTTP(I)) 3-3.F-35, *Combat Aircraft Fundamentals--F-35* and AFTTP 3-1.F-35, *Tactical Employment--F-35A*.

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 above ground level (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.

3.9.4. For non-tactical portions of a sortie (i.e. navigation to/from airspace) flight leaders will not break up formations until each wingman has a fix from which to navigate (visual, radar, operational GPS, inertial navigation system (INS), received tactical air navigation (TACAN) or received instrument landing system (ILS) in the appropriate steering mode).

3.9.5. **Changing Leads.** Use the following procedures when changing the formation leader:

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

3.9.5.2. The minimum altitude for a lead change is 500 feet AGL or 1,000 feet AGL over water (for night see paragraph 3.18);

3.9.5.3. Do not initiate lead changes (unless in close or route) with the wingman further aft than 30 degrees from line abreast;

3.9.5.4. Flight/element leads will not initiate a lead change from a visual formation 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; and,

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

3.9.6. **Visual Formation Maneuvering.**

3.9.6.1. Flight/element leads will consider wingman/element position and ability to safely perform a maneuver before directing it from a visual formation.

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

3.9.6.3. Wingmen/elements will cross above the lead/lead element when deconfliction is required in the low altitude environment.

3.9.6.4. **Loss of Visual.** Use the following procedures when one or more flight members/ elements lose visual contact while flying a visual formation:

3.9.6.4.1. When the flight member currently responsible for visual deconfliction goes Blind, that flight member will call "Blind" with an altitude ("Gorilla 12, blind, 14.0"). If the other flight member (in this case, Gorilla 11), is visual with the blind aircraft,

that flight member will transmit the following; "Gorilla 12, Gorilla 11, right 2, 2 miles, high." If unable to provide a visual point-out, Gorilla 11 will ensure altitude deconfliction for the element/flight;

3.9.6.4.2. When the other flight member/element is also "Blind," (in this case, Gorilla 11), that pilot will immediately deconflict from the altitude called and will transmit own altitude as an immediate action to deconflict flight paths. The flight lead will ensure a minimum of 1,000 feet altitude separation is maintained. Avoid climbs/descents through the deconfliction altitude;

3.9.6.4.3. 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;

3.9.6.4.4. 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 (KIO) call if necessary. Consider scenario restrictions such as sanctuary altitudes and/or adversary blocks; and,

3.9.6.4.5. Aircraft will maintain altitude separation until a visual is regained and, if necessary, will navigate with this altitude separation to ensure positive deconfliction between aircraft.

**3.9.6.5. Two-Ship Visual Formation Deconfliction.** The following rules apply for flight path deconfliction in 2-ship visual formations:

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

3.9.6.5.2. The flight lead becomes responsible for deconfliction when:

3.9.6.5.2.1. Maneuvering places the leader well aft of the wingman's 3/9 line or forces the wingman's primary attention away from the leader;

3.9.6.5.2.2. The wingman calls "blind;" and,

3.9.6.5.2.3. Primary deconfliction responsibility transfers back to the wingman once the wingman acknowledges a visual on lead.

**3.9.6.6. Three/Four-Ship (or greater) Visual Formation Deconfliction.** When flights of more than two aircraft are in visual formation:

3.9.6.6.1. Formation visual signals performed by a flight/element leader pertain only to the associated element unless specified otherwise by the flight leader; and,

3.9.6.6.2. 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.

**3.10. Tactical Formation.** Reference AFTTP(I) 3-3.F-35/AFTTP 3-1.F-35 for tactical formation deconfliction and flight-member responsibilities.

**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 initial qualification training

(IQT)/mission qualification training (MQT) pilots who have successfully completed an Instrument/Qualification evaluation) may chase as safety observer for aircraft performing simulated instrument flight or hung ordnance patterns. Specialized missions (i.e., test and evaluation, Weapon System Evaluation Program, live weapons delivery, etc.) and training conducted IAW AFI 11-2F-35AV1, may be chased by combat mission ready (CMR)/ basic mission capable (BMC) pilots designated by OG/ SQ/CCs. All other chase events may only be flown by IPs/flight examiners (FE) 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 lead aircraft when below 1,000 feet AGL.

3.11.2.4. For live ordnance missions, the chase pilot is responsible for maintaining own-ship frag deconfliction.

**3.12. Aerial Demonstrations.** Brief and fly show formations as approved. Refer to AFI 11-209, *Aerial Event Policy and Procedures*, and applicable MAJCOM directives for specific rules and approval levels to participate in static displays and aerial events.

**3.13. Maneuvering Parameters.** Ref AFTTP(I) 3-3.F-35.

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

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

**3.13.3. Advanced Handling Characteristics (AHC)/Maneuvering Parameters.** Reference AFTTP 3-3.F-35 for AHC maneuvering parameters.

3.13.4. For aerobatics, remain above 5,000 feet AGL minimum. During vertical maneuvering (i.e., basic fighter maneuvers (BFM)) ensure maneuvers are terminated to allow recovery above 5,000 feet AGL minimum.

### 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 dissimilar air combat training ((D)ACBT) engagement or intercept; and,

3.14.1.3. Following air refueling.

3.14.2. Minimum items to check are Integrated Caution and Warning System (ICAWS) messages, total fuel, G-suit connection, oxygen system, cabin altitude and 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. The query and response for ops checks will include total fuel amount as read on the fuel Function Access Button (FAB). If wingmen are within 500 lbs. of the flight lead, a "same" call may be used.

3.14.3.1. Do not substitute data-link fuel status for operational checks.

3.14.4. **G-awareness Exercise.** Reference AFI 11-214, *Air Operations Rules and Procedures*, and AFTTP(I) 3-3.F-35. Unless performing a syllabus required event (e.g., chase of a G-awareness exercise), flight members will maintain a minimum of 6,000 feet separation between aircraft during the execution of all G-awareness exercises. On board systems (e.g. air-to-air TACAN, radar, multi-waveform advanced data link (MADL)) should be used to establish separation prior to maneuver execution. During maneuver execution use visual lookout and briefed formation contracts as primary means of ensuring aircraft deconfliction. If required, use on board systems to enhance situational awareness during the maneuver.

3.14.4.1. Flight/element leads will ensure the airspace intended for conducting the 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. Conduct the G-awareness exercise in the following airspace with preference to the order as listed:

3.14.4.1.1. Special Use Airspace (e.g. Restricted/Warning areas, ATC assigned airspace, Military Operating Areas and MAJCOM approved large scale exercise/special mission areas);

3.14.4.1.2. Above 10,000 MSL outside of Special Use Airspace;

3.14.4.1.3. Inside the confines of a Military Training Route; or,

3.14.4.1.4. Below 10,000 feet MSL outside of Special Use Airspace.

3.14.4.2. Flight/element leads flying OCONUS will follow gaining MAJCOM, Theater or Host Nation guidance on airspace in which G-awareness exercises may be performed. If no gaining MAJCOM, Theater, or Host Nation guidance is available, follow the guidance in paragraph [3.14.4.1](#) to the maximum extent practical.

3.14.4.3. Film the G-awareness exercise in Hot Mic.

3.14.5. **AGSM awareness.** Fly the tactical portion of all missions, especially basic skills missions (BFM, etc.) in Hot Mic to enable assessment of the AGSM.

### 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. IAW AFTTP(I) 3-3.F-35, refer to the radios in the following manner:

3.15.2.1. Comm A is Alpha. Alpha is assumed. Example: "Lightning Push 4."

3.15.2.2. Comm B is Bravo. Example: "Lightning Push 4 Bravo."

3.15.2.3. Comm C is Charlie. Example: "Lightning Push 238.8 Charlie."

3.15.3. 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.

3.15.4. In addition to the radio procedures outlined in AFI 11-202V3, specific mission guides, and FLIP publications, the following radio transmissions are required:

3.15.4.1. 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; and,

3.15.4.2. Each pilot will report "gear down" to the ATC agency or runway supervisory unit after extending the landing gear. This report shall be made during any approach to an airport prior to crossing the runway threshold. A wingman or chase need not make this call during a formation or chased approach.

### **3.16. General Low Altitude Procedures.**

3.16.1. Fly low level formation positions/tactics using AFTTP 3-1.F-35 and AFTTP(I) 3-3.F-35 as guides.

3.16.2. Spread formation is authorized at or above 500 feet AGL.

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

3.16.4. All obstacle avoidance planning for low altitude map requirements will be IAW AFMAN 11-217V2. If unable to visually acquire or ensure lateral separation from known vertical obstructions which are a factor to the route of flight, flight leads will immediately direct a climb no later than (NLT) 3 nautical miles (NM) prior to the obstacle to an altitude that ensures vertical separation.

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

3.16.6. 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.

#### **3.16.7. Minimum airspeeds.**

3.16.7.1. Minimum airspeed for low level navigation is 300 KIAS.

3.16.7.2. Minimum airspeed for Air Defense, Low/Slow visual identification (VID) procedures is 13 degrees angle of attack (AOA).

3.16.7.3. Minimum airspeed during low altitude offensive or defensive maneuvering (below 5,000 feet AGL) is 350 KIAS.

3.16.8. **Minimum Altitudes.** The unit commander will determine and certify pilot's minimum altitude IAW AFI 11-2F-35AV1. 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 altitude training unless national rules or a training syllabus specifies higher altitudes:

3.16.8.1. 500 feet AGL for low altitude (LOWAT) Category I qualified pilots. 300 feet AGL for LOWAT Category II qualified pilots. 100 feet AGL for LOWAT Category III qualified pilots;

3.16.8.2. For night (non- Electro-Optical Distributed Aperture System/Night Vision (EO DAS/NV)) or IMC operation, the minimum altitude is 1,000 feet above the highest obstacle within 5 NM of aircraft position;

3.16.9. During all low altitude operations, the immediate reaction to task saturation, diverted attention, KIO, or emergencies is to climb to a pre-briefed safe altitude (minimum 1,000 feet AGL); and,

3.16.10. Weather minimums for visual low level training are the higher of; unit regulations, national rules or 1,500 feet ceiling and 3 miles visibility for any area, whichever is higher.

### 3.17. Air Refueling.

3.17.1. Pilots undergoing initial/recurrency training in air refueling will not refuel with a student boom operator (does not apply to KC-10). Pilots will inform boom operators when refueling from a particular tanker type (KC-10, KC-46 or KC-135) for the first time.

3.17.2. Quick flow procedures are authorized and will be conducted IAW F-35A FSD and Allied Tactical Publication (ATP)-56(B), *Air to Air Refuelling* (and annexes).

### 3.18. Night Procedures.

#### 3.18.1. Night Lighting Requirements.

3.18.1.1. **Position lights.** Only one position light (POSIT) on each wing is required. However, if each wing only has one light, they must be on opposite sides; one upper, one lower (ex: top left, bottom right). Substituting a formation light in lieu of a wingtip position light is not permitted.

3.18.1.2. **Landing/Taxi Light.** The landing/taxi light must be operational prior to takeoff. The taxiing aircraft will come to a stop if the area cannot be visually cleared without the landing/taxi light.

3.18.1.3. **Strobe lights.** One operational strobe light (STROB) is required for night operations (ground and air). The strobe lights can be turned DIM or OFF if it causes distraction to the pilot. If the strobe lights are turned off while outside operational airspace, then at least one aircraft within a standard formation must have POSIT switch in the FLASH setting. Position lights in the FLASH setting meet AFI 11-202V3 requirements for anti-collision.

#### 3.18.2. Night Ground Operations.

3.18.2.1. When ground personnel are working under the aircraft, select POSIT BRT STDY, STROB OFF (position lights 100%, steady, strobe lights off).

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

3.18.2.3. Use the landing/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 landing/taxi light.

3.18.2.4. For taxi, set POSIT BRT FLASH, STROB BRT.

3.18.3. **Night Takeoff.** For takeoffs, set POSIT BRT FLASH, STROB BRT. 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.

3.18.4. **Night Join-up.** Weather criteria for night join-up underneath is a ceiling of 3,000 feet and 5 miles visibility. Flight Leads will direct lighting adjustments for the flight based on environmental conditions and flight member feedback.

### 3.18.5. **Night Formation Procedures.**

3.18.5.1. When in non-visual formations at night, maintain aircraft spacing primarily by instruments, sensors/MADL, and/or timing. If aircraft spacing cannot be ensured, establish altitude separation (1,000 feet minimum). Crosscheck to ensure terrain clearance.

3.18.5.2. 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.

3.18.5.3. Night Formation Parameters. References and parameters for night formation positions are specified in AFTTP(I) 3-3.F-35.

3.18.6. **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 their onboard systems required for independent night navigation are functional.

3.18.7. **Night Landing.** Normally, all night landings will be from an instrument straight-in approach. Refer to AFI 11-202V3, for specific procedures.

## 3.19. **Electro-Optical Distributed Aperture System/Night Vision Procedures.**

3.19.1. Until AFTTP 3-1.F-35 and AFTTP(I) 3-3.F-35 incorporate expanded tactical guidance for EO DAS/NV, current guidance (including AFI 11-202V3, AFI 11-214, and AFI 11-2F-35V1) outlines the EO DAS/NV training program.

3.19.1.1. Using the EO DAS/NV and the Helmet Mounted Display (HMD) for night operations the pilot may choose to display either a full 360 degree Distributed Aperture System (DAS) infrared video; or the near-infrared Night Vision Camera (NVC) reliant on lunar or cultural lighting.

3.19.1.2. Flight leads will brief the appropriate time to initiate EO DAS/NV operations for the sortie. All flight members will make a radio call when switching to/from EO DAS/NV. Flight leads will call turns if forced to maneuver while flight members are switching to/from EO DAS/NV.

3.19.1.3. When operating in a visual formation outside of NV route formation, frequent crosscheck of horizon/instruments will be made to reduce possibility of spatial dis/mis-orientation.

3.19.1.4. Flight Leads will brief the appropriate EO DAS/NV compatible formation lighting levels for each flight member to set.

3.19.2. The HMD must be preflight tested and adjusted by the pilot prior to flight. EO DAS/NV operations will be off until at least 2,000 feet AGL in climbing or level flight. Cease EO DAS/NV operations no later than 5 minutes prior to landing, unless necessary to handle an emergency.

3.19.3. With EO DAS/NV, pilots may operate below the route abort altitude (RAA)/minimum safe altitude (MSA) down to a minimum of 1,000 ft AGL during high-illumination 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. EO DAS/NV may be used for night tanker rejoins, but will be deselected no later than the stern position.

3.19.5. Unless required for aircraft assistance, wingmen using EO DAS/NV will fly no closer than route formation.

3.19.6. **EO DAS/NV Battle Damage Checks.** If executed, fly no closer than parameters for route formation (as defined in AFTTP(I) 3-3.F-35).

3.19.7. **In-flight Emergencies.** During in-flight emergencies, EO DAS/NV may be used to safely recover the aircraft.

3.19.8. **Abnormal Procedures.**

3.19.8.1. **Lost sight.** If you lose sight within a visual formation, execute appropriate lost wingman procedures. Consider highlighting position by increasing exterior lighting level, activating the afterburner, or deploying flares as airspace allows.

3.19.8.2. **EO DAS/NV failure.** Ensure separation from other aircraft and the ground before attempting to remedy the 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; and,

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

3.19.8.3. **Inadvertent flight into weather.** Encountering poor weather conditions during EO DAS/ NV operations may cause loss of situation awareness (SA) and pilot 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 low altitude, otherwise climb/descend to VMC; and,
- 3.19.8.3.1.3. Terminate/KIO as applicable.

3.19.8.3.2. Formation flight. If entering weather in formation or close proximity to other aircraft, perform the first five steps under EO DAS/NV failure (paragraph [3.19.8.2](#)), as appropriate, then climb/descend to attempt to regain VMC.

### 3.20. Fuel Requirements.

3.20.1. **Joker Fuel.** Fuel state above BINGO at which separation/bugout/event termination should begin.

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 final approach fix 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. This is based on 20 minutes reserve at 10,000 feet MSL flying max endurance airspeed (fulfilling AFI 11-202V3 fuel reserve requirements); and,

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 to 1,000 feet from the threshold or the glide slope 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-35A versus F-35A), 6,000 feet for dissimilar aircraft (e.g., F-35A versus F-16) or as directed by MAJCOM or the landing base, whichever is higher. Increase spacing whenever wake turbulence is anticipated. Increase landing separation to 9,000 feet when wind conditions increase the likelihood of encountering lead aircraft's wake turbulence.

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. BAK-15, MA-1A, 61QSII).

3.21.4.3. When the RCR at the base of intended landing is less than minimum RCR allowed in the FSD, 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:

3.22.1.1. Unexpended live ordnance (internal carriage only);

3.22.1.2. Unexpended inert ordnance (internal or external);

3.22.1.3. Any 25mm gun ammunition or flares; and,

3.22.1.4. Does not apply to hung or misfired ordnance (secure or unsecure).

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. Plan to arrive wings level on final at approximately 300 feet AGL and 1 mile from the planned touchdown point.

3.22.5. Do not operate beneath the ceiling, under VFR, within the lateral boundaries of controlled airspace for an airport when the ceiling is less than 1,000 feet.

**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; and,

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 11-202V3. Multiple touch-and-go landings may be flown to regain landing currency.

3.24.2. Do not fly touch-and-go landings with hung or live external ordnance.

**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; and,

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/climb out 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. From a formation approach or chase position, a sequential closed may be flown with ATC concurrence at an interval to ensure proper spacing. Plan to arrive on downwind below 250 KIAS.

**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 visual approach slope indicator (VASI), if available. In all cases, use a rate of descent similar to a normal precision approach.

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

3.27.1.3. Formation approaches will not descend below 100 feet AGL.

3.27.2. **Formation Landings.** Prohibited, pending completion of Developmental Test and Evaluation.

**3.27.3. Formation Drag Procedures.**

3.27.3.1. Formation drag approaches are restricted to:

3.27.3.1.1. Day;

3.27.3.1.2. Weather: 1,500 feet/3 miles; and,

3.27.3.1.3. Formation: two-ship maximum.

3.27.3.2. When directed to take spacing, wingmen will reduce power, extend speed brakes and slow to no less than 250 KIAS while achieving 1.5 to 2.5 NM spacing.

3.27.3.3. Designate the preceding aircraft as Next-to-Shoot (NTS), call "tied," maintain briefed spacing and perform a single ship pattern/landing.

**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 bird strike, lost panels, damaged ordnance, and structural damage resulting from over-Gs or other in-flight abnormalities.

**3.29. Air-to-Air Interrogator (AAI), Identification Friend or Foe/Selective Identification Feature (IFF/SIF).** F-35 AAI use in the National Airspace System (NAS) will comply with the following:

3.29.1. Aircraft shall limit AAI training activities to approved Special Use Airspace (SUA), as defined by DoD Flight Information Publications AP/1, AP/1A, and AP/1B (i.e., Military Operations Areas, Warning Areas, Restricted areas, and Military Training Routes);

3.29.2. Outside of SUA, pilots shall limit AAI interrogations to mission essential and safety of flight purposes. Pilots may perform an interrogator check momentarily on the ground and/or after take-off for system verification purposes.

3.29.3. Whenever possible, reduce interrogation to the minimum azimuth necessary to meet target identification requirements (i.e., point interrogate vs. using full capability of system);

3.29.4. For operations within the United States and Possessions, each IFF mode will only be interrogated once during a set sequence. Additionally, do not utilize any scan multiplier greater than one; and,

3.29.5. Only employ Mode 4 interrogations in areas where use of Mode 4 airborne interrogations have been specifically authorized by the National Telecommunications and Information Administration, and IAW with all conditions on the Mode 4 frequency transmit authority.

**3.30. Weather Minimums.** Refer to Table 3.1 for a summary of weather minimums affecting F-35A operations.

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

<b>Event</b>	<b>Minimum</b>
VFR Rejoin (Day)	1500 / 3 NM / 4.8 KM
VFR Rejoin (Night)	3000 / 5 NM / 8 KM
Low Level Navigation (Day)	1500 / 3 NM / 4.8 KM, Notes 1 & 2
Low Level Intercepts (Day)	3000 / 5 NM / 8 KM, Note 3
<b>NOTES:</b>	
1. Unless National rules are higher.	
2. 2,000/8 KM in countries where the minimum altitude is 1,000 feet AGL.	
3. 3,500/8 KM in countries where the minimum altitude is 1,000 feet AGL.	

**3.31. Summary of Minimum Altitudes.** Refer to Table 3.2 for a summary of minimum altitudes that affect F-35A operations.

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

<b>Event</b>	<b>Minimum</b>
Aerobatics / ACBT / AHC	5,000
Lead Change	See Note
Chase (Emergency)	300
Chase (FE/IP)	50
Formation Low Approach	100
Low Approach	So as not to touchdown
Knock-it-Off	1,000
<b>NOTE:</b> 500 feet over land; 1,000 feet over water; 1,500 feet at night/IMC unless on radar downwind.	

## Chapter 4

### INSTRUMENT PROCEDURES

#### 4.1. Display of Endorsed Primary Flight Reference.

4.1.1. Anytime flight conditions (illumination, visibility, weather) or procedures (National Airspace System) require flight by reference to instruments, the pilot **MUST** select and continuously display an endorsed primary flight reference (PFR). The Standby Flight Display (SFD) and Helmet Mounted Display are not endorsed PFRs. Currently approved single medium PFR displays are heads-down, either:

4.1.1.1. Helmet Mounted Display Virtual Heads-Up Display (HMD v-HUD). Note that under some flight regimes, the horizon line and pitch ladder collides (coexists) with the airspeed, altitude and heading symbology, causing potential readability issues; or,

4.1.1.2. Full-color Electronic Flight Instrument (EFI). When using this display, pilots are prohibited from using the pop-up data entry keypad overlaid on the EFI.

4.1.2. The primary unusual attitude reference is the HMD v-HUD. Do not use the HMD or SFD to recover from an unusual attitude or when executing lost wingman procedures except when no other attitude reference is available.

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

4.2.1. The flight lead 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. ATC will provide radar flight following for the entire formation.

4.2.2. If weather is below 1,500 feet and 3 miles, each aircraft will climb on takeoff heading to 1,000 feet AGL minimum 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 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. Limit all turns to a maximum of 30 degrees of bank.

4.3.1.6. If a flight member is not a Shoot List Track or on MADL, each aircraft will follow the "No- Shoot List Track" procedure until the aircraft/element immediately in trail has established the preceding aircraft as the NTS and called "tied."

#### 4.3.2. **Shoot List Track procedure.**

4.3.2.1. Each aircraft/element will call "tied" when a Shoot List Track is established with the preceding aircraft. Once all aircraft are tied, no further radio calls are required, unless contact is lost. Flight leads will ensure that wingman are aware of any unplanned or ATC directed intermediate level off altitudes.

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

#### 4.3.3. **No-Shoot List Track procedure.**

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

4.3.3.2. Each aircraft/element will maintain 1.5-2.0 mile spacing using all available aircraft systems and navigational aids to monitor position.

4.3.3.3. 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."

4.3.3.4. 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.

4.3.3.5. 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 minimum safe altitude restrictions.

4.3.3.6. 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.

#### 4.3.4. **Trail Departures.**

4.3.4.1. Use 20 seconds takeoff spacing.

4.3.4.2. Each aircraft will accelerate in military (MIL)/afterburner (AB) power until reaching 350 KIAS. Climb at 350 KIAS until reaching cruise mach/KIAS, unless otherwise briefed.

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

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

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

4.3.6.1. Trail recovery procedures must be coordinated and 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 station, local divers and deployed locations where procedures have been established and briefed. As a minimum, procedures must address each recovery profile, missed approach, climb out, lost contact, lost communications and desired/maximum spacing requirements.

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

4.3.6.3. Trail recoveries are authorized when weather at the base of intended landing is at or above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.3.6.4. Trail recoveries will not terminate in simultaneous precision approach radar (PAR) or airport surveillance radar (ASR) approaches. Recoveries to separate PAR/ASRs are authorized, however, flights must 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 in IMC is 9,000 feet and will be maintained using sensors.

4.3.6.6. Prior to taking spacing, the flight lead must coordinate the trail recovery with ATC and ensure all wingman have operational navigational aids and radar (or station keeping sensors).

4.3.6.6.1. Accomplish the spacing maneuver in VMC to the max extent possible.

4.3.6.7. The formation must squawk as directed by ATC. Regardless of flight position, the lead aircraft in the trail recovery will squawk the ATC issued Mode 3 code. ATC instructions to the lead aircraft will be for the entire flight.

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

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

4.3.6.10. All aircraft will report the final approach fix.

4.3.6.11. If contact is lost with the preceding aircraft, the pilot will transmit "(Callsign) lost contact." The preceding aircraft will respond with altitude, airspeed and heading. Establish altitude deconfliction and coordinate a separate clearance with ATC. If contact is lost while established on a segment of a published approach, flight members may continue the approach, but must confirm separation via navigation aids. If separation cannot be confirmed, execute missed approach or climb out as instructed by ATC.

**4.4. Formation Break-up.** Formation break-up from a visual formation will occur in VMC. If IMC is unavoidable, breakup from a visual formation will occur in straight and level flight. This restriction does not apply to trail formation. Prior to an IMC break-up, the flight leader must transmit attitude, airspeed, altitude, and altimeter setting which will be acknowledged by wingmen. Flight leaders will confirm (and wingmen will acknowledge) that all flight members

have the ability to navigate independently, and sufficient navigation systems to land (operable GPS/INS, and/or reception of appropriate TACAN/ILS).

#### **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.** Stack level with gear down when in the clear, below the weather.

#### **4.7. Instrument Approach.**

4.7.1. Pilots will not fly any published instrument approach procedure (e.g. DoD, Jeppesen) that requires airspeeds less than those specified in the FSD.

4.7.2. The F-35A is Approach Category E. Accomplish missed approach IAW FSD procedures. Missed approach airspeed is 250 KIAS.

4.7.3. Only use actual approach Category D minimums in IMC at an emergency or divert airfield where no Category E minimums are published. Practice Cat D approaches may be accomplished in VMC. In both cases, pilots must also comply with the following restrictions:

4.7.3.1. A straight-in approach is flown;

4.7.3.2. For the final approach segment, the aircraft is flown at 165 KIAS or less; and,

4.7.3.3. For the missed approach segment, fly at 255 knots true airspeed (KTAS) or less. Any time 255 KTAS requires a KIAS below the speed specified in F-35 FSD; Category D approaches shall not be flown.

4.7.4. Do not fly area navigation (RNAV) or GPS approaches. The F-35A is not approved for RNAV approaches.

#### **4.8. Simulated Instrument Flight.**

4.8.1. **Restrictions.** Follow the simulated instrument flight restrictions defined in AFI 11-202V3.

**4.9. Flight into Known Icing Conditions.** Prohibited, pending completion of Developmental Test and Evaluation.

## 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-35A operations.

#### **5.2. Simulated Gun Employment.**

5.2.1. Prior to flight, confirm the status of the gun system.

5.2.2. Never perform simulated gun employment with a hot gun (not safe IAW FSD). Never perform a trigger check with a hot gun, (loaded or empty) regardless of Master Arm switch position.

5.2.3. Simulated gun employment may be accomplished with a loaded gun provided the gun is confirmed safe IAW F-35A FSD, and a trigger check is first performed with the master arm switch in ARM with TRAIN 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. Training Missions with Live Air-to-Air (A/A) Ordnance.** Procedures in AFI 11-214 apply.

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

5.3.1.1. For air-to-air laser employment, procedures in AFI 11-214 apply.

#### **5.4. Flare Employment.**

5.4.1. Due to metal nose cap debris and risk to ground personnel, employment of MJU-68 or MJU-69 flares is restricted to airspace over an authorized munitions impact area.

5.4.2. Employment of any training flare, MJU-61 or equivalent, will comply with current airspace restrictions for flare employment.

5.4.3. Flares will not be deployed with a pursuing aircraft within 10 degrees of tail and 2,000 feet or less range to minimize potential for flare ingestion by attacking aircraft.

#### **5.5. Maneuvering Limitations.**

5.5.1. Negative-G gun jinks are prohibited.

5.5.2. Minimum airspeed during LOWAT maneuvering is 350 KIAS.

5.5.3. Reference FSD for configuration limits as various stores are certified for the F-35A.

## 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-35A operations. Qualification and scoring criteria are contained in AFI 11-2F-35AV1.

**6.2. Weather Minimums.** Basic weather minimums established in AFI 11-214 apply.

**6.3. Simulated Gun Employment.**

6.3.1. Prior to flight, confirm the status of the gun system.

6.3.2. Never perform simulated gun employment with a hot gun (not safe IAW FSD). Never perform a trigger check with a hot gun, (loaded or empty) regardless of Master Arm switch position.

6.3.3. Simulated gun employment may be accomplished with a loaded gun provided the gun is confirmed safe IAW F-35A FSD, and a trigger check is first performed with the master arm switch in ARM with TRAIN 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.

**6.4. Training Missions with a Hot Gun.**

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

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

**6.5. Simulated Attacks against Off-Range or Manned Targets.** Off-range is defined as an area or range in which A/G ordnance release is either not authorized or in which unintentional or inadvertent release could result in ordnance impacting an area not authorized for that ordnance. AFI 11-214 and the following apply:

6.5.1. Pilots will NOT press the pickle button with inert A/G ordnance loaded unless the following conditions are met:

6.5.1.1. TRAIN Mode On;

6.5.1.2. Air-to-Air Master Mode selected; and,

6.5.1.3. No Air-to-Ground NTS designated.

6.5.2. Do not conduct off-range simulated weapons employment with hung ordnance.

6.5.3. Do not conduct any off-range simulated weapons employment (A/A or A/G) with live ordnance (except 25mm IAW AFI 11-214) aboard the aircraft.

6.5.4. With live ordnance loaded (other than 25mm with a safe gun); the Master Arm switch will stay SAFE unless the pilot is in appropriate airspace and preparing to employ live ordnance.

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

**6.7. Target Identification.** Pilots will positively identify the target prior to weapons release. Pilots will confirm the proper coordinates, elevation, and weapons data is loaded in the steer point for their assigned target(s) and that these values match the desired point of impact for A/G weapons. Pilots will ensure they completely understand how coordinates and elevation for their target(s) were generated and that use of this data is in compliance with all range procedures, training rules or rules of engagement. For training sorties, achieve positive identification by either visually acquiring the target or by confirming target location through valid on-board/off-board cues. Cues may include, but are not limited to, radar, GPS, marking rounds, Electro-Optical Targeting System track, infrared pointers or NV-compatible marking devices. Exercise caution when relying on a single cue to confirm target location.

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

6.8.1. Refer to AFI 11-214;

6.8.2. Do not make simulated weapons delivery passes on manned targets with live air-to-ground munitions loaded on the aircraft; and,

6.8.3. When ground controllers are on class B/C ranges the following procedures apply:

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

6.8.3.2. Ground personnel locations will be briefed and acknowledged by all pilots; and,

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

**6.9. Flare Employment.**

6.9.1. Due to metal nose cap debris and risk to ground personnel, employment of MJU-68 or MJU-69 flares is restricted to airspace over an authorized munitions impact area.

6.9.2. Employment of any training flare, MJU-61 or equivalent, will comply with current airspace restrictions for flare employment.

6.9.3. Flares will not be deployed with a pursuing aircraft within 10 degrees of tail and 2,000 feet or less range to minimize potential for flare ingestion by attacking aircraft.

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

**6.11. Night Altitudes.** Compute an MSA for the entire pattern using the IFR Off Airways guidance in AFI 11-202V3 Chapter 8. The minimum altitude for night High Angle Strafe (HAS) is the Target MSA (as defined in [Attachment 1](#)) unless executed by an NV-low qualified pilot (as defined in AFI 11-2F-35AV1) under high-illumination conditions (as defined in AFI 11-214).

**6.12. Night Bank Angle.** Do not exceed 135 degrees of bank when returning to the low altitude structure (below 5,000 feet AGL).

## Chapter 7

### ABNORMAL OPERATING PROCEDURES

#### 7.1. General. These procedures do not supersede F-35A FSD 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 F-35A FSD 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 F-35A FSD emergency procedures and the aircraft may be safely recovered.

7.1.3. Unless authorized by FSD and local procedures, do not taxi the aircraft with nose wheel steering or brake malfunctions.

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 an abort occurs during takeoff roll, notify tower and flight members with call sign and intentions when practical. Following aircraft will alter takeoff roll to ensure clearance or abort takeoff if adequate clearance cannot be maintained. The phrase "Cable, Cable, Cable" will be used to indicate a departure-end cable arrestment. The phrase "Barrier, Barrier, Barrier" will be used to indicate a departure-end net arrestment. Local procedures will address net barrier raising procedures.

7.3.2. Reference FSD for speeds above which hot brakes are probable and associated hot brake procedures. If 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, lower the tail hook 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 call sign.

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. ICAWs or emergencies requiring flight in the FSD defined optimum Cooling Envelope;

7.4.3.2. Bird strike/Foreign Object Damage;

7.4.3.3. Flight control system anomalies. This does not include flight control system ICAWS that reset IAW FSD procedures;

7.4.3.4. Engine anomalies or Engine related ICAWS that do not clear IAW FSD guidance; and,

7.4.3.5. OBOGS malfunction.

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

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

7.4.4.2. Perform a battle damage check; and,

7.4.4.3. Document over-G in the PMA 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 11-202V3, 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 (if required). 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 wing rock, 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 JOKER 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. **NORDO on a Class A Range or a Manned Class B Range.**

7.6.3.1. Attempt contact with the RCO on the appropriate back-up frequency or back up radios.

7.6.3.2. If contact cannot be reestablished, make a pass by the range control tower on the attack heading while rocking wings and turn in the direction of traffic. The flight lead

will direct another flight member to escort the NORDO to a recovery base or rejoin the flight and RTB.

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

**7.6.4. NORDO on an Unmanned Class B Range or on a Class C Range.**

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

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

7.6.4.3. The NORDO aircraft joins on another flight member who has radio contact with the range control officer and the remainder of the flight; and,

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

**7.6.5. Aerial Gunnery/Missile Firing NORDO Procedures.**

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

7.6.5.2. Shooting aircraft: safe the armament switches, join on another member of the flight or the tow aircraft, IAW paragraph **7.6.2**.

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

**7.6.6. NORDO Recovery.**

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

7.6.6.2. 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.

7.6.6.3. A NORDO aircraft intending to make an approach-end cable engagement will signal the escorting aircraft by extending the tail hook. If the NORDO aircraft is not escorted, the pilot will fly a straight-in approach flashing the landing/taxi 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. Set airspeed to F-35A FSD penetration airspeed for flight through rain or thunderstorms.

**7.8. Lost Wingman Procedures.** In any lost wingman situation, immediate separation of aircraft is essential. Refer to paragraph 7.9 for specific spatial disorientation (SD) considerations. Smooth application of control inputs is imperative to minimize the effects of SD.

7.8.1. Upon losing sight of the leader or if unable to maintain formation, the wingman will execute the applicable lost wingman procedures, simultaneously:

7.8.1.1. Transition to primary flight instruments;

7.8.1.2. Inform lead by transmitting "(Callsign) 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; and,

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. When appropriate, transmit attitude, heading, altitude and airspeed.

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 set IFF Mode 3C to 7600 while proceeding with previous clearance. If an emergency situation arises along with radio failure, set the IFF to 7700 for the remainder of the flight.

7.8.6. Only practice lost wingman procedures in VMC.

**7.9. Spatial Disorientation.** Ref AFMAN 11-217V1, *Instrument Flight Procedures*. Conditions that prevent a clear visual horizon or increase pilot tasking are conducive to SD. To prevent SD, the pilot must increase instrument crosscheck rate. Data entry via pop-up keypad is prohibited on the heads-down EFI when that display is functioning as the sole primary flight reference. If SD symptoms are encountered:

**7.9.1. Single Ship:**

7.9.1.1. Call up EFI, if not already displayed;

7.9.1.2. Concentrate on flying basic instruments with frequent reference to the EFI display or SFD if EFI is not called up;

7.9.1.3. If symptoms persist and conditions permit, fly straight and level flight until symptoms abate, usually within 60 seconds;

7.9.1.4. Consider using the autopilot;

7.9.1.5. If necessary, declare an emergency and advise ATC; and,

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

**7.9.2. Formation Lead:**

7.9.2.1. Advise the wingmen that flight lead 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; and,

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; and,

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). Consider keeping the element with the SD pilot straight and level while the other element separates.

## 7.10. Armament System Malfunctions.

7.10.1. **Inadvertent Release.** Release due to a malfunction of the armament system:

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. Treat remaining stores as hung ordnance and follow hung ordnance procedures during RTB; and,

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. Attempt to release store(s) IAW F-35A FSD. If unsuccessful, and there is NOT an unsafe condition, then follow hung ordnance recovery procedures; and,

7.10.2.2. If an unsafe condition exists (attached by 1 lug, etc.), attempt to jettison store(s) using selective jettison procedures.

7.10.3. **Hang fire/Misfire.**

7.10.3.1. A missile that fires but fails to depart the aircraft is a hang fire. 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/Hung Flare/Weapons Malfunction Recovery:**

7.10.4.1. If practical, visually inspect the area for damage to aircraft, WBDs or ordnance;

7.10.4.2. Declare an emergency for hung flare/ hung live ordnance (not required for hung practice/inert ordnance or when no attempt was made to expend live ordnance);

7.10.4.3. If available, obtain a chase aircraft, avoid populated areas and close trail formations;

7.10.4.4. Close WBDs prior to landing IAW F-35A FSD; and,

7.10.4.5. Land from a straight-in approach.

7.10.4.6. For a hung gun/hung flare, follow local Hot Gun/Hung Flare procedures.

**7.10.5. Gun Malfunctions.**

7.10.5.1. For a hung or jammed gun immediately cease the delivery and safe the system.

7.10.5.2. Do NOT attempt to use the gun again or further damage could result.

7.10.5.3. If any HOT gun symbology remains displayed after selecting Master Arm Safe or the gun cannot be verified safe, upon landing recover to a designated Hot Gun area.

7.10.5.4. Follow Hung Ordnance and Weapons Malfunction Recovery procedures.

**7.10.6. Miscellaneous Procedures.**

7.10.6.1. Pilots will not attempt to expend ordnance using a delivery system with a known weapons release malfunction.

7.10.6.2. 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.

7.10.6.3. WBDs fail to close. Follow FSD and local procedures.

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

7.11.1. Do not shut down the engine unless directed by the ground crew, there is a fire, or other conditions dictate;

7.11.2. Raise the tail hook on the ground crew's signal;

7.11.3. Do not taxi until directed; and,

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.

7.12.2. **Aborted Takeoff Practice.** Only practice aborted takeoffs in the simulator.

7.12.3. Practice in-flight engine shutdown is prohibited.

7.12.4. **Simulated Flameout (SFO).** Due to the higher idle thrust of the engine and auto-"closing" of speedbrakes with the landing gear down, representative drag of a failed engine is difficult to simulate. Live fly SFOs are negative training for an actual flamed out approach; therefore, live fly SFOs are prohibited and shall only be practiced in the full mission simulator (FMS). OG/CCs will establish specific procedures for SFO training in the FMS.

7.12.5. **Flameout (FO) Emergency Pattern.** OG/CCs will establish letters of agreement with appropriate agencies for a live flameout (FO) emergency, or procedures for an abnormal engine operation approach. They will publish those procedures in their supplement to this volume. General live fly FO procedures follow:

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

7.12.5.2. Discontinue a FO approach if unable to obtain wings level on final by FSD minimums. Discontinue a FO approach if airspeed drops below F-35A FSD minimum airspeed anytime between base key and the initiation of the flare. Once the decision to discontinue an FO has been made, focus on ejection procedures;

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

7.12.5.4.1. "High Key;"

7.12.5.4.2. "Low Key;" and,

7.12.5.4.3. "Base Key, Gear (as configured)."

**7.13. Search and Rescue (SAR) On-Scene Commander Procedures.** In event of an aircraft mishap or ejection, immediately attempt to locate the possible survivor and initiate rescue efforts. Expect that the survivor 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 an on-scene commander;

7.13.3. Squawk 7700 to alert ATC/tactical radar control agency of the emergency situation;

7.13.4. Communicate the emergency situation and aircraft/flight intentions immediately to applicable control agencies. Use GUARD frequency as last resort;

7.13.5. Mark the last known position of survivors/crash site using any means available (Mark point, TACAN, GPS/INS, ATC/ radar control agency 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 survivor(s);

7.13.7. Deconflict other aircraft assisting in the SAR by altitude to preclude midair collision. Establish high/low combat air patrol (CAP) as necessary to facilitate communications;

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

7.13.9. Relinquish SAR operation to designated rescue forces upon their arrival; and,

7.13.10. Follow local or briefed procedures.

**7.14. Fuel Dumping:**

7.14.1. Only conduct fuel dumping to reduce aircraft gross weight for safety of flight or when complying with FSD emergency procedures;

7.14.2. When circumstances permit, dump above 10,000 feet AGL over unpopulated areas;

7.14.3. Ensure the dump switch is returned to normal before landing; and,

7.14.4. After landing, make an appropriate entry in the PMA.

## Chapter 8

### LOCAL OPERATING PROCEDURES

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

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

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

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

**8.3. Distribution of Local Supplements.** When published, units will forward copies of the local supplement to MAJCOM and appropriate subordinate agencies, which will review and return comments back to the unit(s). Distribution of local supplements may begin before the review process is complete unless otherwise specified by MAJCOM or appropriate subordinate agency. If a procedure is deemed applicable to all F-35A units, it will be incorporated into the basic AFI volume.

HERBERT J. CARLISLE, Lt Gen, USAF  
DCS, Operations, Plans and Requirements

## Attachment 1

## GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

*References*

- AFI 11-2F-35AV1, *F-35 Aircrew Training*, 13 Sep 2010
- AFI 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*, 19 Jan 2012
- AFI 11-202V3, *General Flight Rules*, 22 Oct 2010
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- AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*, 19 May 1994
- AFI 11-209, *Aerial Event Policy and Procedures*, 4 May 2006
- AFI 11-214, *Air Operations Rules and Procedures*, 22 Dec 2005, 2 Jun 2009
- AFI 11-215, *USAF Flight Manuals Program (FMP)*, 22 Dec 2008
- AFI 11-218, *Aircraft Operations and Movement on the Ground*, 11 May 2005
- AFI 11-301V1\_ACCSUP\_I, *Aircrew Flight Equipment (AFE) Program*, 23 Apr 2010
- AFI 11-401, *Aviation Management*, 10 Dec 2010
- AFI 11-404, *Centrifuge Training for High-G Aircrew*, 28 Oct 2005
- AFI 33-360 *Publications and Forms Management*, 18 May 2006
- AFI 91-202, *The US Air Force Mishap Prevention Program*, 1 Aug 1998
- AFMAN 11-217V1, *Instrument Flight Procedures*, 22 Oct 2010
- AFMAN 11-217V2, *Visual Flight Procedures*, 22 Oct 2010
- AFMAN 33-363, *Management of Records*, 1 March 2008
- AFPAM 10-100, *Airman's Manual*, 1 Mar 2009
- AFPAM 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques*, 1 Feb 2004
- AFPD 11-4, *Aviation Service*, 1 Sep 2004
- AFTTP 3-1.GP, *General Planning*, 11 Nov 2011
- AFTTP 3-1.F-35, *Tactical Employment—F-35A*, TBD
- AFTTP(I) 3-3.F-35/ NTTP 3-22.3-F35, *Combat Aircraft Fundamentals--F-35*, 18 Nov 2010
- ATP-56(B) *Air to Air Refuelling*, [Preliminaries (USA), Pt 1 and Pt 2], 22 Jan 2010
- ATP-56(B) *Air to Air Refuelling*, [Part 5- NATO Nations Annexes], Feb 2010
- AF Form 847, *Recommendation for Change of Publication*, 22 Sep 2009
- F-35 *Flight Series Data*, undated cyclically
- FLIP, *Flight Information Publications*, updated cyclically

***Adopted Form***

AF Form 847, *Recommendation for Change of Publication*

***Abbreviations and Acronyms***

**A/A**—Air-to-Air

**A/G**—Air-to-Ground

**AAI**—Air-to-Air Interrogator

**AAMD**—All Aspect Missile Defense

**AB**—Afterburner

**ACBT**—Air Combat Training

**ACC**—Air Combat Command

**ACCA**—Aircrew Contamination Control Area

**ACDE**—Aircrew Chemical Defense Equipment

**ACM**—Advanced Combat Maneuvers

**AFE**—Aircrew Flight Equipment

**AFFSA**—Air Force Flight Standards Agency

**AFI**—Air Force Instruction

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

**AFTTP(I)**—Air Force Tactics, Techniques and Procedures (Inter-service)

**AFMAN**—Air Force Manual

**AFPAM**—Air Force Pamphlet

**AFPD**—Air Force Policy Directive

**AFRC**—Air Force Reserve Command

**AFRIMS**—Air Force Records Information Management System

**AFRL**—Air Force Research Labs

**AGL**—Above Ground Level

**AGSM**—Anti-G Straining Maneuver

**AHC**—Aircraft Handling Characteristics

**ALIS**—Autonomic Logistics Information System

**ANG**—Air National Guard

**AOA**—Angle of Attack

**AOR**—Area of Responsibility

**ARCPs**—Air Refueling Contact Point

**ARCTs**—Air Refueling Control Time  
**ARIPs**—Air Refueling Initial Point  
**ASR**—Airport Surveillance Radar  
**ATC**—Air Traffic Control  
**ATP**—Allied Tactical Publication  
**AWACS**—Airborne Warning and Control System  
**BASH**—Bird/Wildlife Aircraft Strike Hazard Programs  
**BAQ**—Basic Aircraft Qualification  
**BD**—Battle Damage  
**BDA**—Battle Damage Assessment  
**BFM**—Basic Fighter Maneuvers  
**BMC**—Basic Mission Capable  
**BVR**—Beyond Visual Range  
**C2**—Command and Control  
**CAP**—Combat Air Patrol  
**CAPS**—Critical Action Procedures  
**CBRNE**—Chemical, Biological, Radiological, Nuclear and High Yield Explosive  
**CG**—Center of Gravity  
**COMAFFOR**—Commander Air Force Forces  
**CMR**—Combat Mission Ready  
**CONUS**—Continental United States  
**CRC**—Control and Reporting Center  
**CW**—Chemical Warfare  
**(D)**—Dissimilar [(D)ACBT, (D)ACM, etc.]  
**DAS**—Distributed Aperture System  
**DOD**—Department of Defense  
**DPI**—Designated Point of Impact  
**DRU**—Direct Reporting Unit  
**EFI**—Electronic Flight Instrument  
**EMCON**—Emissions Control  
**EMI/EP/EA**—Electromagnetic Interference/Electronic Protection/Electronic Attack  
**EOR**—End of Runway

**EO DAS**—Electro-Optical Distributed Aperture System  
**EO TDA**—Electro Optical Tactical Decision Aid  
**EPs**—Emergency Procedures  
**ETR**—Engine Thrust Request  
**EXCM**—Expendable Countermeasures  
**FAA**—Federal Aviation Administration  
**FAB**—Function Access Button  
**FAM**—Familiarization  
**FCIF**—Flight Crew Information File  
**FE**—Flight Examiner  
**FEBA**—Forward Edge of the Battle Area  
**FL**—Flight Lead  
**FLIP**—Flight Information Publications  
**FMS**—Full Mission Simulator  
**FO**—Flameout  
**FOA**—Field Operating Agency  
**FOD**—Foreign Object Damage  
**FSD**—Flight Series Data (F-35 tech orders)  
**FTU**—Formal Training Unit  
**G**—Gravity Load Factor  
**GCE**—Ground Crew Ensemble  
**GCI**—Ground Controlled Intercept  
**GLOC**—G-Induced Loss of Consciousness  
**GPS**—Global Positioning System  
**HAS**—Hardened Aircraft Shelter  
**HAS**—High Angle Strafe  
**HMD**—Helmet Mounted Display  
**HMD v-HUD**—Helmet Mounted Display Virtual Heads-Up Display  
**IAW**—In Accordance With  
**ICAWS**—Integrated Caution, Advisory and Warning System  
**ID**—Identification  
**IFF**—Identification Friend or Foe

**IFR**—Instrument Flight Rules  
**ILS**—Instrument Landing System  
**IMC**—Instrument Meteorological Conditions  
**INS**—Inertial Navigation System  
**IP**—Instructor Pilot  
**IPE**—Individual Protective Equipment  
**IPP**—Integrated Power Package  
**IQT**—Initial Qualification Training  
**IR**—Infrared  
**JOAP**—Joint Oil Analysis Program  
**KIAS**—Knots Indicated Airspeed  
**KIO**—Knock-It-Off  
**KM**—Kilometers  
**KTAS**—Knots True Airspeed  
**LEP**—Laser Eye Protection  
**LOWAT**—Low Altitude Training  
**LTS**—Launch to Survive  
**MADL**—Multi-waveform Advanced Data Link  
**MAJCOM**—Major Command  
**MAR**—Minimum Abort Range  
**MARSA**—Military Assumes Responsibility for Separation of Aircraft  
**MIL**—Military  
**mm**—Millimeter  
**MOPP**—Mission Oriented Personnel Protection  
**MQT**—Mission Qualification Training  
**MSA**—Minimum Safe Altitude  
**MSL**—Mean Sea Level  
**NAS**—National Airspace System  
**NAVFLIR**—Navigation Forward Looking Infra-Red  
**NLT**—No Later Than  
**NM**—Nautical Miles  
**NORDO**—No Radio

**NOTAMS**—Notices to Airmen  
**NTS**—Next-to-Shoot  
**NVC**—Night Vision Camera  
**NV**—Night Vision  
**OBOGS**—On Board Oxygen Generation System  
**OCONUS**—Outside Continental United States  
**OG/CC**—Operations Group Commander  
**OPR**—Office of Primary Responsibility  
**ORM**—Operational Risk Management  
**PAR**—Precision Approach Radar  
**Pd**—Probability of Destruction  
**PDM**—Programmed Delivery for Maintenance  
**PFR**—Primary Flight Reference  
**Pk**—Probability of Kill  
**PMA**—Portable Maintenance Aid  
**PMD**—Portable Memory Device  
**RAA**—Route Abort Altitude  
**RCR**—Runway Condition Report  
**RDS**—Records Disposition Schedule  
**RNAV**—Area Navigation  
**ROE**—Rules of Engagement  
**RTB**—Return to Base  
**RTO**—Range Training Officer  
**RW/EW**—Radar Warning/Electronic Warfare  
**SA**—Situation Awareness  
**SAM**—Surface to Air Missile  
**SAR**—Search and Rescue  
**SARCAP**—Search and Rescue Combat Air Patrol  
**SEAD**—Suppression of Enemy Air Defenses  
**SD**—Spatial Disorientation  
**SFD**—Standby Flight Display  
**SFO**—Simulated Flameout

**SIF**—Selective Identification Feature  
**SIIs**—Special Interest Items  
**SOF**—Supervisor of Flying  
**SPINS**—Special Instructions  
**SQ/CC**—Squadron Commander  
**SUA**—Special Use Airspace  
**TACAN**—Tactical Air Navigation  
**TOLD**—Takeoff and Landing Data  
**TOTs**—Time over Target(s)  
**TR**—Training Rules  
**UP**—Upgrading Pilot  
**USAF**—United States Air Force  
**USAF WIC**—USAF Weapons Instructor Course  
**VASI**—Visual Approach Slope Indicator  
**VFR**—Visual Flight Rules  
**VID**—Visual Identification  
**VMC**—Visual Meteorological Conditions  
**WBDs**—Weapons Bay Doors

### *Terms*

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

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

**Basic Mission Capable (BMC)**—See AFI 11-2F-35AV1.

**Combat Mission Ready (CMR)**—See AFI 11-2F-35AV1.

**Continuation Training (CT)**—See AFI 11-2F-35AV1.

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

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

**Initial Qualification Training (IQT)**—See AFI 11-2F-35AV1.

**Low Altitude Training (LOWAT)**—See AFI 11-2F-35AV1.

**Mission Qualification Training (MQT)**—See AFI 11-2F-35AV1

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

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

## Attachment 2

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

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

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

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

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

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

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

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

**A2.4.3. Alarm Red (or Theater Equivalent) After Taxi.** Units typically establish procedures for this contingency depending on whether additional protection is available

along the taxi route (empty HAS, for instance). Ideally, ground crew sheltering in such a HAS would be available to assist in normal engine shutdown procedures and to close HAS doors. If protection is not available, the best option may be LTS. Maintain contact with Command and Control (C2) entities (Wing Operations Center, Maintenance Operations Center, Supervisor of Flying, etc.) to ensure unity of effort in the overall plan.

### **A2.5. Takeoff to Landing.**

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

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

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

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

### Attachment 3

## FLIGHT BRIEFING GUIDES

**A3.1. FLIGHT BRIEFING GUIDES.** These guides are a starting point for developing unit briefing guides. Units are encouraged to consult USAF Weapon School resources and AFTTP 3-1. *General Planning*, (Attachment 6, Integrated Package Commander Checklists), and other MDS 3-1 volumes when developing briefing guides.

### **A3.2. GENERAL BRIEFING GUIDE.**

#### A3.2.1. MISSION DATA

A3.2.1.1. Time Hack and Briefing Classification

A3.2.1.2. EP/Threat of the Day

A3.2.1.3. Mission Objective(s)

A3.2.1.4. Mission Overview

A3.2.1.5. Mission Data Card

A3.2.1.5.1. Mission Commander/Deputy Lead

A3.2.1.5.2. Joker/Bingo Fuel

A3.2.1.5.3. Takeoff and Landing Data

A3.2.1.5.4. Working Area

A3.2.1.6. Weather/Sunrise/Sunset/Moon Illumination

A3.2.1.6.1. Tactical Decision Aid/Transmissivity/Absolute Humidity

A3.2.1.7. NOTAMs/Bird Strike Potential

A3.2.1.8. Personal Equipment

A3.2.1.9. FCIF/Pubs/Maps

#### A3.2.2. GROUND PROCEDURES

A3.2.2.1. Intel Update

A3.2.2.2. Step

A3.2.2.3. Pre-Flight

A3.2.2.3.1. Aircraft

A3.2.2.3.2. Armament

A3.2.2.4. Start/Check-In

A3.2.2.5. Taxi/Marshaling/Arming

A3.2.2.6. Spare Procedures

#### A3.2.3. TAKEOFF

A3.2.3.1. Runway Lineup

- A3.2.3.2. Takeoff/Takeoff Interval
- A3.2.3.3. Abort
- A3.2.3.4. Jettison Procedures
- A3.2.3.5. Low Altitude Ejection
- A3.2.3.6. Landing Immediately After Takeoff

#### A3.2.4. DEPARTURE/ENROUTE

- A3.2.4.1. Routing
- A3.2.4.2. Trail Departure
- A3.2.4.3. Join-Up/Formation
- A3.2.4.4. Systems/Ops Checks

#### A3.2.5. AIRSPACE

- A3.2.5.1. Area
- A3.2.5.2. Times
- A3.2.5.3. Restrictions (EA/EP/Chaff/Flare/Supersonic)
- A3.2.5.4. Bailout (Controlled/Uncontrolled)
- A3.2.5.5. MSA

#### A3.2.6. RECOVERY

- A3.2.6.1. Rejoin
- A3.2.6.2. Battle Damage Check
- A3.2.6.3. Type Recovery
- A3.2.6.4. Flight Break-Up
- A3.2.6.5. Pattern and Landing
- A3.2.6.6. After Landing/De-Arm
- A3.2.6.7. Emergency/Alternate Airfields

### **A3.3. SPECIAL SUBJECTS** (as applicable).

- A3.3.1. General Roles and Responsibilities (EP, IP, Flight Lead, Wingman)
  - A3.3.1.1. Formation Specific Responsibilities and Priorities
  - A3.3.1.2. Flight Member Mission Priorities
  - A3.3.1.3. Task/Sensor Prioritization
  - A3.3.1.4. Deconfliction Contracts
- A3.3.2. Fallout/Late Rejoin
- A3.3.3. Chase Procedures

- A3.3.4. IFF/AAI/Mode S Procedures
- A3.3.5. Radar/Visual Search Responsibilities/Midair Collision Avoidance
  - A3.3.5.1. Sensor/Visual Search Responsibilities
  - A3.3.5.2. Departure/Enroute/Recovery
  - A3.3.5.3. High Density Traffic Areas
  - A3.3.5.4. Mid-Air Collision Avoidance
    - A3.3.5.4.1. From Other Military Aircraft
    - A3.3.5.4.2. From Civilian Aircraft
- A3.3.6. Dissimilar Formations
- A3.3.7. Carriage/Jettison Limitations
- A3.3.8. Terrain Avoidance/Use of Controlled Flight into Terrain Prevention Systems
  - A3.3.8.1. Departure/Enroute/Recovery
  - A3.3.8.2. Altitude Warning Settings
- A3.3.9. Bird Strike Procedures
- A3.3.10. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/ Prioritization, and Complacency)
- A3.3.11. G-Awareness
  - A3.3.11.1. G-Suit connection/G-tolerance/G-Awareness Turn
  - A3.3.11.2. Use of L-1 Anti-G Straining Maneuver (AGSM)
- A3.3.12. Visual Illusions/Perceptions
- A3.3.13. Spatial Disorientation/Unusual Attitudes
- A3.3.14. Lost Wingman
- A3.3.15. Radio Inoperative
- A3.3.16. SAR/On-Scene Commander
- A3.3.17. Recall Procedures
- A3.3.18. SIIs
- A3.3.19. Pilot currencies for events to be flown
- A3.3.20. Training Rules/Special Operating Instructions/Rules of Engagement
- A3.3.21. Operational Risk Management (ORM)
  - A3.3.21.1. ORM assessment, hazards to this flight
  - A3.3.21.2. Factors mitigating risk
  - A3.3.21.3. When to reassess
- A3.3.22. Tactical Portion of Mission

### **A3.4. AIR REFUELING.**

#### A3.4.1. GENERAL

A3.4.1.1. Tanker Call Sign(s)/Receiver Assignments

A3.4.1.2. Refueling Track(s)

A3.4.1.2.1. Altitude

A3.4.1.2.2. Airspeed

A3.4.1.2.3. Airspace Restrictions

A3.4.1.3. ARIPs, ARCPs, ARCTs

A3.4.1.4. Radio Frequencies

#### A3.4.2. BUDDY PROCEDURES

A3.4.2.1. Departure

A3.4.2.2. Join-Up

#### A3.4.3. ENROUTE

A3.4.3.1. Route of Flight

A3.4.3.2. Formation

A3.4.3.3. Ops Checks

#### A3.4.4. RENDEZVOUS

A3.4.4.1. Type Rendezvous

A3.4.4.2. Holding Procedures/Formation

A3.4.4.3. Ground Radar Assistance

A3.4.4.4. Tanker Identification - TACAN/Radar/AAI/Visual

A3.4.4.5. Radar Procedures/Techniques

A3.4.4.6. Wingman/Deputy Lead Responsibilities

A3.4.4.7. Receiver Formation/Join-Up Procedures

A3.4.4.8. Rendezvous Overrun

#### A3.4.5. REFUELING

A3.4.5.1. Checklist Procedures

A3.4.5.2. Radio Calls

A3.4.5.3. Refueling Order

A3.4.5.4. Techniques

A3.4.5.5. Radio Silent Procedures

A3.4.5.5.1. EMCON

A3.4.5.5.2. Visual Signals

A3.4.5.6. Fuel Off-Load

A3.4.5.7. Bingo Fuel (Abort Points/Abort Bases)

A3.4.5.8. Drop-Off Procedures

A3.4.5.9. Wake Turbulence

A3.4.6. REFORM AND EXIT

A3.4.6.1. Formation

A3.4.6.2. Clearance

A3.4.7. EMERGENCY PROCEDURES

A3.4.7.1. Breakaway Procedures

A3.4.7.2. Systems Malfunctions

A3.4.7.3. Damaged Receptacle

A3.4.8. IMC/NIGHT CONSIDERATIONS

A3.4.8.1. Lost Wingman Procedures

A3.4.8.2. Aircraft Lighting

A3.4.9. SPECIAL SUBJECTS

A3.4.9.1. Fuel Awareness/AB Use/Consumption Rates

A3.4.9.2. Flight Path Deconfliction/Other Receiver Considerations

A3.4.9.3. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

### **A3.5. INSTRUMENT/ADVANCED HANDLING.**

A3.5.1. AIRWORK

A3.5.1.1. Airspace Restrictions

A3.5.1.2. Area Orientation

A3.5.1.3. Instructor Responsibilities

A3.5.1.4. Maneuvers

A3.5.2. APPROACHES

A3.5.2.1. Frequencies

A3.5.2.2. Holding

A3.5.2.3. Penetration

A3.5.2.4. Missed Approach/Climb Out

A3.5.3. SPECIAL SUBJECTS

A3.5.3.1. "G" Awareness

A3.5.3.2. Fuel Awareness/AB Use/Consumption Rates

A3.5.3.3. Special Subjects and Maneuvering Limitations

A3.5.3.3.1. Airspeed and "G"

A3.5.3.3.2. Recognition/Prevention/Recovery From Out of Control

A3.5.3.3.3. Maneuvering at Heavyweight/High Angles of Attack/Asymmetrical Configuration

A3.5.3.3.4. Effects of CG throughout the Flight

A3.5.3.3.5. Time to Ground Impact

A3.5.3.3.5.1. Wings Level

A3.5.3.3.5.2. Overbank/Under G

A3.5.3.4. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

### **A3.6. LOW-LEVEL NAVIGATION.**

A3.6.1. GENERAL

A3.6.1.1. Route/Clearance/Restrictions

A3.6.1.2. Flight Responsibilities

A3.6.1.2.1. Navigation

A3.6.1.2.2. Radar/Visual Search

A3.6.1.3. Entry/Spacing /Holding/Initial Altitude (MSA)

A3.6.2. ROUTE PROCEDURES

A3.6.2.1. Fence Checks

A3.6.2.2. Tactical Formation/Turns

A3.6.2.3. Low Level Navigation

A3.6.2.3.1. Dead Reckoning/Use of Navigation Aids/ Equipment

A3.6.2.3.2. Sensor Procedures/Techniques/Predictions

A3.6.2.3.3. Visual Procedures/Techniques/IR Predictions

A3.6.2.3.4. Updates/Calibrations

A3.6.2.3.5. Time/Fuel Control

A3.6.2.3.6. Terrain Following/Avoidance/Wingman Considerations

A3.6.2.3.7. Leg Altitudes/Obstacle Avoidance (MSL/AGL)

A3.6.2.3.8. Use of Altitude Warning Features

A3.6.2.4. Threat Reactions

A3.6.2.4.1. RW/EW/EXCM

- A3.6.2.4.2. Engagement Criteria
- A3.6.2.4.3. Flight Path Deconfliction
- A3.6.2.4.4. Termination

### A3.6.3. EMERGENCIES

- A3.6.3.1. Aircraft Malfunctions
- A3.6.3.2. Route Abort Procedures (RAA/MSA)/ATC Frequencies

### A3.6.4. TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS/ALTERNATE MISSION (refer to appropriate mission briefing guide)

### A3.6.5. SPECIAL SUBJECTS

- A3.6.5.1. Airspace Restrictions
- A3.6.5.2. Fallout/Late Rejoin
- A3.6.5.3. "G" Awareness/Ops Checks
- A3.6.5.4. Fuel Awareness/AB Use/Consumption Rates
- A3.6.5.5. Flight Path Deconfliction
- A3.6.5.6. Maneuvering Limitations
  - A3.6.5.6.1. Airspeed and "G"
  - A3.6.5.6.2. Recognition/Prevention/Recovery From Out of Control
- A3.6.5.7. Time to Ground Impact
  - A3.6.5.7.1. Wings Level
  - A3.6.5.7.2. Overbank/Under "G"
- A3.6.5.8. Night Considerations
- A3.6.5.9. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

## **A3.7. AIR-TO-SURFACE EMPLOYMENT.**

### A3.7.1. GENERAL

- A3.7.1.1. Intelligence, Threat Scenario
- A3.7.1.2. Operating Area Entry, Description, Boundaries
- A3.7.1.3. FENCE Checks
- A3.7.1.4. En Route Formation(s), Look Out Responsibilities, Low-Level/LOWAT Brief
  - A3.7.1.4.1. Low Observable Considerations
- A3.7.1.5. Ordnance/Weapons Data
  - A3.7.1.5.1. Type, Fusing
  - A3.7.1.5.2. Weapons Settings

- A3.7.1.5.3. Live Ordnance Procedures, Minimum Altitudes
  - A3.7.1.5.3.1. Fuse Arming, Safe Escape, Safe Separation
  - A3.7.1.5.3.2. Frag Avoidance
- A3.7.1.5.4. Laser Operations
- A3.7.1.6. Control Agencies
  - A3.7.1.6.1. Call Signs
  - A3.7.1.6.2. Frequencies
  - A3.7.1.6.3. Authentication, Authority
- A3.7.1.7. Coordination
  - A3.7.1.7.1. Attack Package Times, Support
  - A3.7.1.7.2. Data Gathering, Transmission
  - A3.7.1.7.3. Airspace Restrictions
  - A3.7.1.7.4. Mission Number
  - A3.7.1.7.5. Friendly Forces
  - A3.7.1.7.6. Play Time
- A3.7.2. INGRESS
  - A3.7.2.1. Formation
  - A3.7.2.2. Route of Flight
  - A3.7.2.3. Control Agency Call Sign/Frequency
- A3.7.3. THREAT
  - A3.7.3.1. Type
  - A3.7.3.2. Numbers
  - A3.7.3.3. Threat reactions
    - A3.7.3.3.1. Low Observable considerations
- A3.7.4. AIR-TO-AIR TACTICS
  - A3.7.4.1. Detection
  - A3.7.4.2. ID Criteria
  - A3.7.4.3. Search Responsibilities (Radar/Visual)
  - A3.7.4.4. Targeting Plan
  - A3.7.4.5. Tactic
    - A3.7.4.5.1. Execution
    - A3.7.4.5.2. Formation

A3.7.4.5.3. Low Observable Considerations

A3.7.5. ENGAGEMENT

A3.7.5.1. Shot doctrine and mechanics

A3.7.5.2. Base/MAR Crossing Decisions

A3.7.5.2.1. Low Observable Considerations

A3.7.5.3. Recommits

A3.7.6. SEAD PROCEDURES

A3.7.6.1. Target type(s)

A3.7.6.2. Weaponing (required Pd)

A3.7.6.3. Weapon(s) / Fuse settings

A3.7.6.4. DPI sort

A3.7.6.5. Release criteria

A3.7.6.6. Attack Contingency

A3.7.6.6.1. Low Observable Considerations

A3.7.6.6.2. Degraded weapon state (INS only)

A3.7.6.6.3. Re-attack (formation/procedures)

A3.7.7. CAS/MAS/SCAR PROCEDURES

A3.7.7.1. Working Area

A3.7.7.2. Coordination Required

A3.7.7.3. Formations, Working Altitude

A3.7.7.4. Target Types, Threat Array

A3.7.7.4.1. Low Observable Considerations

A3.7.7.5. Attack Tactics

A3.7.8. WEAPONS DELIVERY

A3.7.8.1. Tactics

A3.7.8.1.1. Type Delivery

A3.7.8.1.2. Switchology

A3.7.8.1.3. Attack Parameters

A3.7.8.1.4. Visual Lookout, Mutual Support Responsibilities

A3.7.8.1.5. Egress

A3.7.8.1.5.1. Flow

A3.7.8.1.5.2. Loss of Mutual Support, Rendezvous Point

## A3.7.8.1.5.3. Low Observable Considerations

## A3.7.8.2. BD/Bomb Check

## A3.7.8.3. Mission Reporting (BDA/In-Flight Report)

## A3.7.9. EGRESS

## A3.7.9.1. Tactics

## A3.7.9.1.1. Low Observable Considerations

## A3.7.9.2. Formation

## A3.7.9.3. Rendezvous point

## A3.7.10. COMBAT SAR PROCEDURES

## A3.7.10.1. Downed Aircraft Procedures

## A3.7.10.2. Communications Procedures

## A3.7.10.3. On-Scene Commander

## A3.7.10.4. Fuel Considerations

## A3.7.10.5. Ordnance Considerations

## A3.7.11. CONTINGENCIES

## A3.7.11.1. One/Two/Three-Ship Options

## A3.7.11.2. Code Words, Comm Out Signals

## A3.7.11.3. Weather Back-Up Deliveries

## A3.7.11.4. Degraded Systems

## A3.7.11.5. Reattack

## A3.7.11.6. Asymmetrical Considerations

## A3.7.11.7. Jettison Procedures/Parameters

## A3.7.11.8. Hung/Unexpended Ordnance Procedures

## A3.7.11.9. Wounded Bird, Escort Procedures

## A3.7.11.10. IFF/SIF, Min-risk Routing, Low Observable Considerations

## A3.7.11.11. Low Fuel/Ordnance

**A3.8. NIGHT.** This guide is meant to highlight general EO DAS/NV considerations, and provides a reference for a basic EO DAS/NV briefing. All applicable EO DAS/NV considerations should be incorporated into the specific briefing for the mission being flown.

## A3.8.1. WEATHER/ILLUMINATION

## A3.8.1.1. Civil/Nautical Twilight

## A3.8.1.2. Moon Rise/Set Times/Phase/Elevation/Azimuth

## A3.8.1.3. Ceiling/Visibility

- A3.8.1.4. Lux/EO TDA
- A3.8.1.5. Obscurants to Visibility
- A3.8.2. BEFORE TAKEOFF
  - A3.8.2.1. Cockpit Setup
  - A3.8.2.2. Cockpit Lighting (Leaks)
  - A3.8.2.3. Cockpit FAM
- A3.8.3. AIRBORNE
  - A3.8.3.1. Exterior Lights
  - A3.8.3.2. EO DAS/NV Scan Pattern
    - A3.8.3.2.1. Forward Scan
    - A3.8.3.2.2. Field of View
    - A3.8.3.2.3. Peripheral Vision
    - A3.8.3.2.4. Scan Techniques
    - A3.8.3.2.5. NVC Canopy Bow Obscuration
  - A3.8.3.3. Join-up and Enroute Considerations
    - A3.8.3.3.1. Rejoin/Closure
    - A3.8.3.3.2. MADL/A-A TACAN
    - A3.8.3.3.3. G-Awareness Considerations
      - A3.8.3.3.3.1. Lighting
      - A3.8.3.3.3.2. Deconfliction/Separation
- A3.8.4. MISSION
  - A3.8.4.1. Route Study/Scene Interpretation
    - A3.8.4.1.1. EO DAS/NV Predictions/Albido
    - A3.8.4.1.2. Terrain/Shadowing/Visual Illusions/Visible Horizon
    - A3.8.4.1.3. City/Cultural Lighting
      - A3.8.4.1.3.1. Direction/Orientation of Lighting
      - A3.8.4.1.3.2. Aggressive Formation Maneuvering
      - A3.8.4.1.3.3. Terrain Avoidance
      - A3.8.4.1.3.4. Map Reading
- A3.8.5. TARGET AREA
  - A3.8.5.1. Holding Procedures (EO DAS/NV Differences)
  - A3.8.5.2. EO DAS/NV Lost Wingman

- A3.8.5.3. Deliveries/Pattern Procedures
  - A3.8.5.3.1. Minimum Altitudes
  - A3.8.5.3.2. Flight Member Responsibilities
  - A3.8.5.3.3. Moth Effect
  - A3.8.5.3.4. Deconfliction
  - A3.8.5.3.5. External Lighting/Deconfliction Procedures
- A3.8.5.4. AB, Flares, and IR Detection Considerations
- A3.8.5.5. Threat ID and Reaction
- A3.8.5.6. Egress

#### A3.8.6. RTB

- A3.8.6.1. EO DAS/NV off for landing

#### A3.8.7. EO DAS/NV SAFETY

- A3.8.7.1. EO DAS/NV Lost Sight
- A3.8.7.2. EO DAS/NV Lost Wingman
- A3.8.7.3. Depth Perception
- A3.8.7.4. Visual Illusions
- A3.8.7.5. EO DAS/NV Failure
  - A3.8.7.5.1. Transition to/from EO DAS/NV and degraded acuity operations
- A3.8.7.6. Overconfidence in EO DAS/NV Capabilities
- A3.8.7.7. Entering Weather/Transition to Instruments
- A3.8.7.8. Disorientation/Misorientation/Vertigo
- A3.8.7.9. Deconfliction contracts
- A3.8.7.10. Transference
- A3.8.7.11. Target Fixation
- A3.8.7.12. Fatigue
- A3.8.7.13. Aircraft Emergency and EO DAS/NV battle damage check considerations
- A3.8.7.14. Laser Eye Protection (LEP) Use

### **A3.9. ADVERSARY COORDINATION.**

- A3.9.1. Time Hack and Classification of Briefing
- A3.9.2. Call Signs, Number and Type Aircraft
- A3.9.3. Scenario/AOR discussion
- A3.9.4. Objective(s)-Blue, C2, Intel/Space, Red

A3.9.5. Weather/NOTAMS

A3.9.6. Mission Overview

A3.9.7. Ground Ops

A3.9.7.1. Taxi/Marshall/Arming deconfliction and timing

A3.9.7.2. Check-in time/Freq

A3.9.7.3. Minimum numbers

A3.9.7.4. How much delay available

A3.9.8. Takeoff

A3.9.8.1. Times

A3.9.8.2. MARSA options

A3.9.9. Departure

A3.9.9.1. Routing

A3.9.9.2. Weather Check

A3.9.9.3. Late entries

A3.9.10. Area

A3.9.10.1. Airspace times

A3.9.10.2. Restrictions

A3.9.10.2.1. Altitude

A3.9.10.2.2. Supersonic

A3.9.10.2.3. Chaff/Flare

A3.9.10.2.4. Noise Sensitive

A3.9.10.3. Points/Marshall and Cap Limit Lines

A3.9.10.4. Average terrain (Controlled/Uncontrolled bailout altitudes)

A3.9.10.5. Ground references

A3.9.10.6. Emergency airfields

A3.9.11. Recovery

A3.9.11.1. Order/MARSA

A3.9.11.2. Dissimilar formations

A3.9.12. Abnormal Procedures

A3.9.12.1. EPs (Like/dissimilar aircraft)

A3.9.12.1.1. Cruise/Gear/Final Approach Airspeeds

A3.9.12.2. NORDO

- A3.9.12.3. Lost Wingman
- A3.9.12.4. SARCAP
- A3.9.13. Special Subjects
  - A3.9.13.1. Mid-Air Collision Avoidance
  - A3.9.13.2. "G" Awareness
  - A3.9.13.3. Fuel Awareness/AB Use/Consumption Rates
  - A3.9.13.4. Flight Path Deconfliction
  - A3.9.13.5. Channelized Attention, Task Saturation/Prioritization, and Complacency
- A3.9.14. Special Interest Items
- A3.9.15. Ladder
- A3.9.16. SPINS/Setups
  - A3.9.16.1. Red-air replications
  - A3.9.16.2. Regeneration criteria
- A3.9.17. Fight Administration
  - A3.9.17.1. Desired Setup Range (if applicable)
  - A3.9.17.2. Fight's On/Knock-it-off per engagement or Continuous Vul
  - A3.9.17.3. Vul times (if applicable)
  - A3.9.17.4. Timeout/Kill ROE
    - A3.9.17.4.1. RTO/Non-RTO option
    - A3.9.17.4.2. Pk Option (IAW 3-1)
    - A3.9.17.4.3. Timeout, Timeout Tally and Kill Passage, acknowledgement, relays and repeats
    - A3.9.17.4.4. Kill removal procedures
  - A3.9.17.5. Terminate (reasons and procedures)
  - A3.9.17.6. Knock-it-off (reasons and procedures)
- A3.9.18. Training Rules
  - A3.9.18.1. IAW AFI 11-214
  - A3.9.18.2. Highlights
    - A3.9.18.2.1. Maneuvering limits (limited/unlimited)
    - A3.9.18.2.2. Bubble
    - A3.9.18.2.3. Blocks
    - A3.9.18.2.4. LOWAT transition altitude (if applicable)
    - A3.9.18.2.5. Floor

A3.9.19. Contingencies

A3.9.19.1. Weather

A3.9.19.2. GCI/AWACS/CRC control fallout

A3.9.19.3. Aircraft fallout (min numbers)

A3.9.19.4. Alternate missions

A3.9.20. Debrief

A3.9.20.1. Time/Location

A3.9.20.2. Required information

A3.9.21. Questions

**A3.10. GCI/AWACS AND TACTICAL INTERCEPTS.**

A3.10.1. GENERAL

A3.10.1.1. Area Information

A3.10.1.1.1. CAP Points

A3.10.1.1.2. Target Locations

A3.10.1.1.3. Bullseye location and cuts of critical points

A3.10.1.1.4. Radar and Communication blind zones

A3.10.1.1.5. Safe Areas/FEBA/Ground Threats

A3.10.1.1.6. Friendly SAM Locations

A3.10.1.2. Threat Type and Simulation

A3.10.1.3. ID Criteria

A3.10.1.4. Communications

A3.10.1.4.1. Requirements (other than 3-1)

A3.10.1.4.2. Type/Level of Control

A3.10.1.4.3. Frequencies

A3.10.1.4.4. IFF/SIF squawk and procedures

A3.10.1.5. Training Rules

A3.10.1.5.1. Blocks

A3.10.1.5.2. Floor/Transition altitude

A3.10.2. FLIGHT/ELEMENT TACTICS

A3.10.2.1. Fill-ins

A3.10.2.1.1. Contrail altitude

A3.10.2.1.2. Winds aloft

- A3.10.2.1.3. Ordnance
- A3.10.2.1.4. Reload criteria for training
- A3.10.2.1.5. ID criteria and method(s)
- A3.10.2.1.6. EMCON procedures
- A3.10.2.2. Avionics Set-up
  - A3.10.2.2.1. Radar Elevation
  - A3.10.2.2.2. Waypoints/Route
  - A3.10.2.2.3. IFF
  - A3.10.2.2.4. MADL
  - A3.10.2.2.5. RW/EW Scan Schedules/Search Volumes
- A3.10.2.3. CAP
  - A3.10.2.3.1. Formation/Altitude/Airspeed
  - A3.10.2.3.2. Search Responsibilities
  - A3.10.2.3.3. Commit
    - A3.10.2.3.3.1. Criteria/Range
    - A3.10.2.3.3.2. Procedures
    - A3.10.2.3.3.3. Low Observable Considerations
- A3.10.2.4. Intercept Phase
  - A3.10.2.4.1. Formation/Altitude/Airspeed
  - A3.10.2.4.2. Detection
  - A3.10.2.4.3. ID Criteria
  - A3.10.2.4.4. Search Responsibilities (Radar/Visual)
  - A3.10.2.4.5. Targeting Plan
  - A3.10.2.4.6. Tactic
    - A3.10.2.4.6.1. Execution
    - A3.10.2.4.6.2. Formation
    - A3.10.2.4.6.3. Low Observable Considerations
- A3.10.2.5. Engagement Phase
  - A3.10.2.5.1. Shot doctrine and mechanics
  - A3.10.2.5.2. Base/MAR Crossing Decisions
  - A3.10.2.5.3. Recommits
  - A3.10.2.5.4. Egress Formation/Responsibilities

A3.10.2.6. Contingencies

A3.10.2.6.1. Avionics Malfunction (Radar/MADL)

A3.10.2.6.2. RW

A3.10.2.6.3. EXCM

A3.10.2.6.4. IFF/SIF and Min-risk Routing

A3.10.2.6.5. Low Fuel/Ordnance

A3.10.2.6.6. Rendezvous point

A3.10.2.7. Live Missile/Hot Gun Safety Procedures

A3.10.2.8. Additional Considerations

A3.10.2.8.1. Threat Reaction

A3.10.2.8.2. Codewords

A3.10.2.8.3. EMI/EP/EA Effects

**A3.11. ESCORT.** (Enroute to Rendezvous/Post-mission Navigation)

A3.11.1. GENERAL

A3.11.1.1. Formation

A3.11.1.2. Route of Flight

A3.11.1.3. Control Agency Call Sign/Frequency

A3.11.2. RENDEZVOUS

A3.11.2.1. Protected Force Call Sign

A3.11.2.2. Altitude

A3.11.2.3. Airspeed

A3.11.2.4. Number of Aircraft

A3.11.3. ESCORT PROCEDURES

A3.11.3.1. Striker Ingress

A3.11.3.1.1. Route(s)

A3.11.3.1.2. Formation

A3.11.3.1.3. Altitude

A3.11.3.1.4. Airspeed

A3.11.3.1.5. Primary/Secondary target locations and TOTs

A3.11.3.1.6. Tactics/EMCON

A3.11.3.2. Type Formation

A3.11.3.3. Tactics

- A3.11.3.3.1. Low Observable Considerations
- A3.11.3.4. Commit
  - A3.11.3.4.1. Criteria/Range
  - A3.11.3.4.2. Procedures
- A3.11.3.5. Escort Route
- A3.11.3.6. Contracts
  - A3.11.3.6.1. Targeting Strikers
  - A3.11.3.6.2. Lean/Spin procedures
- A3.11.3.7. Egress
  - A3.11.3.7.1. Tactics
  - A3.11.3.7.2. Formation
- A3.11.3.8. Contingencies
  - A3.11.3.8.1. Avionics Malfunction (Radar/MADL)
  - A3.11.3.8.2. RW
  - A3.11.3.8.3. EXCM
  - A3.11.3.8.4. IFF/SIF and Min-risk Routing
  - A3.11.3.8.5. Low Fuel/Ordnance
  - A3.11.3.8.6. Rendezvous point
- A3.11.3.9. Additional Considerations
  - A3.11.3.9.1. EMI/EP/EA Effects

### **A3.12. AERIAL GUNNERY TOW COORDINATION.**

- A3.12.1. Ground/T.O./Departure
- A3.12.2. Rendezvous
- A3.12.3. Airspace Data
- A3.12.4. GCI Support
- A3.12.5. Target Launch/Chase
- A3.12.6. Shooter Order
- A3.12.7. Type Pattern
- A3.12.8. Tow Altitude Block(s)/Flight Parameters
- A3.12.9. Intercept Phase/Pattern Set-Up
- A3.12.10. Arming Procedures
- A3.12.11. Timing

- A3.12.12. Tow Maneuvering Parameters
- A3.12.13. Shooter/Firing Plan
- A3.12.14. Radio Procedures
- A3.12.15. Termination
  - A3.12.15.1. Timing
  - A3.12.15.2. Minimum Altitude
  - A3.12.15.3. Joker/Bingo Fuel
  - A3.12.15.4. Winchester
  - A3.12.15.5. Fouls
- A3.12.16. Armament Safety Check
- A3.12.17. Scoring
- A3.12.18. Subsequent Set-Ups
- A3.12.19. Target Drop Procedures
- A3.12.20. Recovery Order
- A3.12.21. Abnormal Procedures
  - A3.12.21.1. Erratic Target
    - A3.12.21.1.1. During Deployment
    - A3.12.21.1.2. During Employment
  - A3.12.21.2. Target Drag-Off
  - A3.12.21.3. Recovery with Target/Cable
  - A3.12.21.4. NORDO
    - A3.12.21.4.1. During Engagement
    - A3.12.21.4.2. Target Drop
    - A3.12.21.4.3. Visual Signals
    - A3.12.21.4.4. Recovery

### **A3.13. AERIAL GUNNERY.**

- A3.13.1. GENERAL
  - A3.13.1.1. Formation
  - A3.13.1.2. Area Information
    - A3.13.1.2.1. Controlling Agency
    - A3.13.1.2.2. Airspace Restrictions
    - A3.13.1.2.3. Frequencies

- A3.13.1.3. Switch Positions
- A3.13.1.4. Arming Procedures
- A3.13.1.5. Intercept/Set-Up
- A3.13.1.6. Shooter Sequence
- A3.13.1.7. Position Changes
- A3.13.1.8. Chase Procedures
- A3.13.1.9. Timing

A3.13.2. EMPLOYMENT

- A3.13.2.1. Firing Parameters
  - A3.13.2.1.1. Minimum Range
  - A3.13.2.1.2. Overtake
  - A3.13.2.1.3. Angle-Off
  - A3.13.2.1.4. Error Analysis
- A3.13.2.2. Contingencies
  - A3.13.2.2.1. Avionics Malfunctions
  - A3.13.2.2.2. Gun Malfunctions
  - A3.13.2.2.3. Range Estimation without Radar
- A3.13.2.3. Safety Considerations
  - A3.13.2.3.1. Target Fixation
  - A3.13.2.3.2. Debris Avoidance
  - A3.13.2.3.3. Fouls

A3.13.3. TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS/ALTERNATE MISSION

- A3.13.3.1. Type Mission (refer to appropriate mission briefing guide)
- A3.13.3.2. Mission Objectives

A3.13.4. SPECIAL SUBJECTS

- A3.13.4.1. Minimum Altitudes
- A3.13.4.2. "G" Awareness
- A3.13.4.3. Fuel Awareness/Ops Checks/AB Use/Consumption Rates
- A3.13.4.4. Maneuvering Limitations
  - A3.13.4.4.1. Airspeed/"G"/Stress
  - A3.13.4.4.2. Recognition/Prevention/Recovery From Out of Control

A3.13.4.5. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

**A3.14. DEFENSIVE COUNTER AIR/AIRSPACE CONTROL ALERT.** 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.

#### A3.14.1. MISSION DATA

A3.14.1.1. Time Hack and Classification of Briefing

A3.14.1.2. Mission Data Card

A3.14.1.2.1. Call Signs

A3.14.1.2.2. Aircraft/Location/Status

A3.14.1.2.3. Takeoff/Landing Data (Worst Case)

A3.14.1.2.4. Joker/Bingo Fuel

A3.14.1.3. Actual/Forecast Weather

A3.14.1.3.1. Home base

A3.14.1.3.2. Alternates

A3.14.1.3.3. Individual Weather Category/Mandatory Status

A3.14.1.4. NOTAMs

A3.14.1.5. FCIF/Pubs/Maps

A3.14.1.6. Personal Equipment

A3.14.1.7. Alert Packet

A3.14.1.7.1. Authenticators/Duress Code

A3.14.1.7.2. Security Procedures

A3.14.1.8. Airfield Status

A3.14.1.8.1. Actual versus Max Allowable Tailwind

A3.14.1.8.2. Barriers

A3.14.1.8.3. Navigation Aids

A3.14.1.8.4. Hazards to Taxi/RCR

#### A3.14.2. GROUND PROCEDURES

A3.14.2.1. Aircraft/Armament Preflight

A3.14.2.2. Cockpit Set-Up

A3.14.2.3. Engine Run/Hot Preflight

A3.14.2.4. Crew Chief Briefing

A3.14.2.4.1. Act only on pilot's instructions

A3.14.2.4.2. Ground emergency procedures

A3.14.2.4.3. Hand signals

A3.14.2.4.4. Aircraft danger areas

A3.14.2.5. Quick Check Procedures

### A3.14.3. LAUNCH PROCEDURES

A3.14.3.1. Notification/ Frequency/Authentication Requirement

A3.14.3.2. Status

A3.14.3.2.1. Airborne Order

A3.14.3.2.2. Battle Stations

A3.14.3.2.3. Runway Alert

A3.14.3.2.4. Scramble

A3.14.3.3. Taxi

A3.14.3.4. Takeoff/Runway Lineup/Interval/Formation

A3.14.3.4.1. Day VMC/IMC

A3.14.3.4.2. Night VMC/IMC

A3.14.3.5. Join-up/Trail Formation/Power Settings/Airspeeds

### A3.14.4. IN-FLIGHT PROCEDURES

A3.14.4.1. Formation

A3.14.4.2. Airspeeds

A3.14.4.3. Weapons Safe Checks

A3.14.4.4. Radar Search Responsibilities

A3.14.4.5. Degraded Fire Control System

A3.14.4.6. Transfer of Lead Procedures

A3.14.4.7. Ops Checks

A3.14.4.8. EMCON Procedures

A3.14.4.9. Region MSA

A3.14.4.10. VID Procedures

A3.14.4.10.1. Authority Required to Close

A3.14.4.10.2. Formation/Tactics

A3.14.4.10.3. Range/Altitude Separation Requirements on Target Prior Permission to Close With/Without Visual Contact

A3.14.4.10.4. Radar Lock-On Requirements

A3.14.4.10.5. Maximum Closure Speed

- A3.14.4.10.6. Minimum Airspeed
  - A3.14.4.10.7. Loss of Contact Procedures
  - A3.14.4.10.8. Breakaway Procedures
  - A3.14.4.10.9. Restrictions
  - A3.14.4.11. Aircraft in Distress
    - A3.14.4.11.1. Minimum Closure Distance
    - A3.14.4.11.2. Visual Signals - Day/Night
    - A3.14.4.11.3. Escort Procedures
    - A3.14.4.11.4. Recovery/Landing Visual Signals
    - A3.14.4.11.5. Dissimilar Formation Procedures
  - A3.14.4.12. Jettison Procedures
  - A3.14.4.13. Lost Wingman
  - A3.14.4.14. SARCAP
  - A3.14.4.15. Emergency Airfields
  - A3.14.5. SPECIAL SUBJECTS
    - A3.14.5.1. Emergency of the Day
    - A3.14.5.2. Fuel Awareness
    - A3.14.5.3. Maneuvering Limitations
    - A3.14.5.4. Recognition/Prevention/Recovery from Loss of Control
    - A3.14.5.5. Spatial Disorientation
    - A3.14.5.6. Recall Procedures
    - A3.14.5.7. Rules of Engagement
    - A3.14.5.8. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)
    - A3.14.5.9. SIIs
    - A3.14.5.10. Operational Risk Management
      - A3.14.5.10.1. ORM assessment, hazards to this flight
      - A3.14.5.10.2. Factors mitigating risk
      - A3.14.5.10.3. When to reassess.
- A3.15. GROUND CREW BRIEFING.**
- A3.15.1. Act only on pilot's instructions
  - A3.15.2. Ground emergency procedures
  - A3.15.3. Hand signals

A3.15.4. Aircraft danger areas

**A3.16. MISSION DEBRIEFING.**

A3.16.1. GENERAL

A3.16.1.1. Ground/Takeoff/Join-Up/Departure

A3.16.1.2. Enroute Procedures

A3.16.1.3. Recovery/Landing/After Landing

A3.16.1.4. SIIs/TR/ROE issues

A3.16.1.5. Radio Procedures

A3.16.1.6. Flight Discipline/Effectiveness

A3.16.2. MISSION ACCOMPLISHMENT/ANALYSIS

A3.16.2.1. Mission Reconstruction

A3.16.2.2. Debrief Focus Point(s)

A3.16.2.3. PMD Assessment

A3.16.2.4. Anti-G Straining Maneuver Effectiveness

A3.16.2.5. Objectives Analysis

A3.16.2.6. Debrief Focus Points/Root Cause/Instructional Fixes (as applicable)

A3.16.3. COMMENTS/QUESTIONS

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

**A4.1. General.** There are no Critical Action Procedures (CAPs) or Boldface items established for the F-35A. Reference FSD and unit FCIF program for EPs of Interest as the F-35 flight test program continues.