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Flying Operations

F-35A—OPERATIONS PROCEDURES

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This publication implements Air Force Policy Directive (AFPD) 11-2, *Aircrew Operations*, AFPD 11-4, *Aviation Service*, and references Air Force Manual (AFMAN) 11-202, Volume 3 (V3), *Flight Operations.* This publication establishes guidance for the effective and safe operations of the F-35A. This publication applies to all F-35A units in the Regular Air Force, Air National Guard and Air Force Reserve. This publication does not apply to the United States Space Force. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction 33-322, *Records Management and Information Governance Program*, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the Department ofAir Force (DAF) Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. Air Combat Command, Director of Operations (ACC/A3) will coordinate all changes to the basic volume with all MAJCOM Directors of Operations (MAJCOM/A3s). This publication may be supplemented at any level but route all direct supplements to Air Force Flight Standards Agency and ACC Flight Operations and Training Branch (ACC/A3TO) for coordination prior to certification and approval. Field units below MAJCOM/direct reporting unit (DRU)/field operating agency (FOA) level forward copies of their supplements of this publication to their parent MAJCOM/DRU/FOA OPR for post-publication review. Copies of MAJCOM/DRU/FOA-level supplements, after approval and publishing, will be made available on the e-Publishing website at **https://www.e-publishing.af.mil**. The authorities to waive wing equivalent/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See Department of the DAF

Manual (DAFMAN) 90-161, *Publishing Process and Procedures*, Table A10.1 for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the publication OPR for non-tiered compliance items (see **paragraph 1.2**). Compliance with the attachments in this publication is not mandatory.

SUMMARY OF CHANGES

Many items have been changed or removed due to, 1) being contained in other guidance (Air Force Tactics, Techniques and Procedures (AFTTP) 3-3.F-35, *Combat Aircraft Fundamentals*, 2) recent changes to AFI 11-214, *Air Operations Rules and Procedures* and AFMAN 11-202V3, 3) brevity, and 4) clarity. A full review of this publication is recommended. Removed numerous acronyms. The F35A-PCL-001, *Pilot's Checklist* (PCL) is also referred to as the F35A-FCL-001, *Pilot's Checklist* (FCL). Added information from flight crew information files, and special interest items. Changed all references from "BOLT" to "PANTHER."

Chapter 1: F-35A-FM-001, *Flight Series Data* (FSD) guidance simplification, waiver explanation, interfly guidance, mission recording and multiple qualification guidance.

Chapter 2: Added Detailed Digital Terrain Elevation Data (DTED) added, added guidance for flying without paper checklist; added automatic ground collision avoidance system (AGCAS) guidance; added electronic flight bag (EFB) and carriage of electronics in the cockpit; clarified gravity load factor (G)-suit wear; added direction for briefing items for multiple flights moved aircrew chemical, biological, radiological, nuclear and high yield explosive section into chapter (AFMAN requirement).

Chapter 3: Removed all duplicate references to flight/element leads; incorporated external inspection guidance from special interest items; added pilot discretion for ground intercom use when launching; added maintenance interface panel visual signal; removed numerous duplicative signals found in other publications (pubs); added maximum taxi speed; removed minimum taxi runway condition reading (RCR) (dictated in the PCL); added AGCAS setup guidance; removed 1,000 feet over water restriction (500 feet in training), added quick release box disconnect procedures; removed redundant RCR guidance for takeoff (see aircraft operating limits), removed visual flight rules (VFR) definition (redundant to AFMAN 202V3); removed 350 knot requirement on departure and bank angle (technique, AFTTP 3-3.F-35, and instrument flight rules (IFR) rules); low altitude step down training (LASDT) terms changed; clarified formation responsibilities; removed aerial demonstration guidance (redundant to DAFI 11-209, *Participation in Aerial Events*); simplified G-exercise airspace; low altitude guidance and wind/sea state restrictions; refined low altitude weather table; modified external lighting section; defined night vision and minimums high and low illumination; added FUEL CRITICAL Integrated Caution, Advisory and Warning (ICAW); removed Joker and Bingo definitions; removed overhead traffic pattern guidance (AFTTP 3-3.F-35 content); changed the transponder section for Mode S/5, added separate interrogator section; removed flameout pattern guidance (PCL and AFTTP 3-3.F-35 content). **Chapter 4:** Rewritten for clarity, added radio call for trail departure; added airspeed requirement for trail recovery; removed aircraft spacing when "not moving;" removed Category D requirements (AFMAN 11-202V3 content); revised no radio (NORDO) procedures, passing direction to local procedures and flight brief; clarified trail airspeed requirements with spacing and

landing requirements. **Chapter 5:** Incorporated gun safe procedure for simulated gun employment. **Chapter 6:** Reworded live and simulated attack paragraphs for clarity; added night strafe requirements, including distributed aperture system (DAS) to 1,000 feet during low illumination. **Chapter 7:** Clarified aircraft over-G; NORDO procedures simplified; added pilot initiated flyup for spatial disorientation; added AGCAS, physiological event and G-induced loss of consciousness procedures; removed verbose on scene commander checklist, reference Air, Land, Sea Application documents or local guidance. **Chapter 8:** Added rapid pilot swap and EFB requirement to local procedures. **Attachment 2:** Reformatted briefing guides.

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Chapter 1

GENERAL GUIDANCE

1.1. Roles and Responsibilities. This extends guidance from AFMAN 11-202V3, *Flight Operations,* in order to comply while operating an F-35A under normal circumstances.

1.1.1. Commanders. Commanders at their respective tier levels are responsible for complying with guidance in this manual. F-35A flying unit wing commanders, delegated no lower than Operations Group Commander (OG/CC) (or equivalent), are responsible for providing local operating guidance to supplement the requirements of this manual. **(T-1)**

1.1.2. Stan/Eval Function. Comply with AFI 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*, AFMAN 11-202V2, *Aircrew Standardization and Evaluation Program* and AFMAN 11-2F-35AV2, *F-35A-Aircrew Evaluation Criteria*, that provide guidance for unit standardization and evaluation programs.

1.1.3. Pilots. Conduct or lead all aspects of flight (preparation, briefing, execution, debriefing, and documentation (as required)), to comply with this manual, Federal Aviation Regulations and FSD guidance. It is not a substitute for sound judgment. Procedures not specifically addressed may be accomplished if they enhance safe and effective mission accomplishment, or to safety recover an aircraft in an emergency situation.

1.1.4. Supplements. Comply with applicable supplements to all guidance referenced in this Volume. Develop additional supplements IAW DAFMAN 90-161.

1.1.5. Aircraft Operating Limits. This publication does not override restrictions contained in F35A-FM-001, *Flight Series Data (FSD),* and all pilots will be familiar with current aircraft operating limits and flight restrictions prior to flight.

1.2. Waivers. The Commander Air Force Forces, MAJCOM/ Directors of Operations (A3s) (or equivalent) will notify ACC/A3 of waivers within 72 hours of issuance. Wing commanders will notify the publication OPR within 72 hours of waiver approval. **(T-2)** IAW DAFMAN 90-161, Chapter 9, Wiaver Process and Limitations; a copy of the approved waiver must follow within 30 days of issuance. **(T-2)** An email to the waived publication OPR that includes a completed DAF Form 679, *Department of the Air Force Publication Compliance Item Waiver Request/Approval* or equivalent will suffice. Commanders may waive non-tiered requirements but must send a copy of the approved waiver to the OPR of the higher headquarters publication being waived within 30 days of approval. **(T-1)** Tier 1, 2, and 3 waivers may be approved for a period not to exceed the requested waiver period or 30 calendar days after the approving commander's tour length, whichever is shorter. Because waivers are the expression of a specific commander accepting risk, Tier 1, 2, and 3 waivers automatically expire 90 days after the change of command of the approving commander unless the new commander renews the waiver approval.

1.3. Mission Recording. Record from takeoff to landing. **(T-3)** If a mission is longer than flight recording will allow, record pertinent mission times and critical phases of flight.

1.4. Interfly Guidance. The OG/CC is the approval authority for interfly on aircraft under their control. In all cases, interfly pilots will be qualified in the F-35A.

1.5. Multiple Qualification. For ACC pilots and other MAJCOM pilots flying aircraft under ACC control, the differences between F-35A, F-35B and F-35C series aircraft require a formal

course. **(T-1)** A single F-35 variant (i.e., F-35A) with different operational flight programs (i.e., 30Pxx vs. 40Pxx) or technical refresh (TR) levels (2 or 3) is considered the same aircraft and local differences training is allowed. The unit OG/CC may require academics and or a simulator mission prior to the first flight.

Chapter 2

MISSION PLANNING

2.1. Standards. The unit commander is the approval authority for unit standards. Wing Standardization and Evaluation (Stan/Eval) will review standards to ensure compliance with Air Force directives. **(T-2)**

2.2. Flight Material Preparation.

2.2.1. Mission Data Card. The minimum takeoff and landing data (TOLD) required on the mission data card is: 1,000 foot acceleration check speed (if computed takeoff roll exceeds 2,500 feet); maximum abort speed; rotation speed; takeoff speed and distance; normal landing speed and distance; heavy weight (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. **(T-3)**

2.2.2. Local Area Maps. A local area map is not required for the F-35A if the aircraft tactical situation display or unit pilot aid includes jettison areas, divert information, controlled bailout areas, and a local area map of sufficient detail to remain within assigned training areas.

2.2.3. Charts. Department of Defense, *Flight Information Publications* (FLIP) enroute charts may be used instead of maps on navigational flights within areas that are adequately covered by these charts.

2.2.4. Low Altitude Maps.

2.2.4.1. Refer to AFMAN 11-202V3 and MAJCOM guidance for low altitude map requirements, marking and procedures.

2.2.4.2. Outside Continental United States, follow gaining MAJCOM, theater, or host nation guidance on mission planning. **(T-1)** 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. **(T-1)**

2.2.5. Automatic Ground Collision Avoidance System (AGCAS). For F-35As equipped with an operational AGCAS, pilots are responsible for knowing the level and location of F-35 DTED loaded prior to flight to ensure coverage for all operating areas.

2.2.5.1. Mission planning administrators will ensure the best terrain data available is loaded in the anticipated area of operation. In order of preference, load: Level 1 Shuttle Radar Topography Mission (SRTM) Void Filled data (SRT1F) “FULL CELLS” data; DTED 1 “FULL CELLS” data; Level 2 SRTM Void Filled data (SRT2F) “FULL CELLS” data; then DTED2 “FULL CELLS” data.

2.2.5.2. Between 56 South and 60 North degrees latitude load SRT1F “FULL CELLS.” If outside of 56 South and 60 North degrees latitude, or if SRT1F “FULL CELLS” is not available, load DTED1 “FULL CELLS” in the anticipated area of operation.

2.2.5.3. If operation is required outside the coverage of F-35 Level 1 DTED but within F-35 Level 2 DTED, be aware there is a potential for nuisance flyups during any phase of flight in which the system is armed. The operational benefit of AGCAS capabilities must

be weighed against the risk of flyup while using only Level 2 DTED. Use caution when flying in formation as an AGCAS flyup in formation could cause a midair collision.

2.2.6. Electronic Flight Bag (EFB). Use of the EFB is permitted IAW AFMAN 11-202V3 and Air Combat Command Instruction (ACCI) 11-270, *Operations Mobile Devices*.

2.2.6.1. Units will establish a standard for what is loaded on the EFBs IAW with Federal Aviation Administration, AFI, and unit standards. **(T-3)**

2.2.6.2. Flight without paper publications is authorized if the following criteria are met:

2.2.6.2.1. The pilot has two EFBs charged greater than 50%, plus 10% for each hour of flight;

2.2.6.2.2. For flights longer than 10 hours, the pilot will ensure EFB charge is sufficient for final approach and landing;

2.2.6.2.3. The pilot has ensured all EFBs are at the baseline configuration, defined on the ACC EFB SharePoint site.

2.2.7. Carriage of Electronics in the Cockpit. Cell phones may be carried by pilots in the cockpit provided they are both powered off and stowed in a pocket. "Airplane mode" is not an acceptable substitute for being powered off. Cell phones will remain stowed even with the aircraft battery and engine off.

2.3. Aircrew Flight Equipment. Pilots will wear anti-G garments on all flights regardless of anticipated Gs. **(T-3)** Refer to F35A-PFE-001, *F-35A Lightning II, Pilot Flight Equipment Configuration* section of FSD for the list of approved safe-to-fly equipment.

2.4. Unit Developed Checklists.

2.4.1. Units are authorized to develop checklists to supplement or replace FSD checklists (except Nuclear, i.e., aircraft and weapons preflight) IAW AFI 11-215, *Flight Manuals Program*, and F-35 Joint Program Office Program Instruction 1512.01, *Flight Manual Product Set*.

2.4.2. Local Pilot Aids. Wing Stan/Eval will ensure that locally produced pilot aids contain:

2.4.2.1. Briefing guides. **(T-2)**

2.4.2.2. Local radio channelization and airfield diagrams. **(T-2)**

2.4.2.3. Emergency information (impoundment procedures, emergency action checklists, NORDO/divert information and search and rescue procedures, etc.) **(T-2)**

2.4.2.4. Appropriate alternate/divert airfield information, to include listing of compatible arresting gear (definitions found in FLIP, IFR Supplement.) **(T-2)**

2.4.2.5. Bailout and jettison areas. **(T-2)**

2.5. 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 AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*. The OG/CC will determine local BASH procedures. **(T-3)**

2.6. Minimum Formation Size Over Water. Pilots will accomplish planned flights over water, outside of the local training area (deployments, cross countries, programmed delivery for maintenance inputs, etc.) with a two-ship as a minimum. **(T-3)**

2.7. Briefing/Debriefing.

2.7.1. Briefings. All pilots attend the flight briefing unless previously coordinated with the flight lead. **(T-3)**

2.7.1.1. Items published in AFIs/AFMANs, AFTTPs, or squadron/wing standards and understood by all participants may be briefed as "standard." **(T-3)**

2.7.1.2. Review TOLD. Place emphasis on takeoff and abort factors during abnormal situations such as short/wet/icy runway, heavy gross weights, and non-standard cable configurations. **(T-3)**

2.7.1.3. 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. **(T-3)**

2.7.1.4. For all low altitude mission briefings, place emphasis on obstacle and ground avoidance, altitude-warning features, low altitude comfort level, AGCAS functionality, and complacency avoidance. **(T-3)**

2.7.1.5. Brief an appropriate alternate mission for each flight. Ensure the alternate mission is less complex than the primary mission. Specific mission elements different than the primary mission should be briefed. Mission events may be modified and briefed airborne if flight safety is not compromised. **(T-3)**

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

2.7.1.6.1. Prioritize flying upgrade missions on the first sortie. If this is not feasible, coordination with squadron commander or designated representative is required. **(T-3)**

2.7.1.6.2. Participants in continuation training missions may fly their primary or alternate missions in any sequence. **(T-3)**

2.7.1.7. Flight leads will debrief safety of flight on all missions. **(T-3)** Debriefs should also address administrative and tactical areas as appropriate: in-flight execution, flight member responsibilities, deconfliction contracts (per AFI 11-214), tactical employment priorities and sensor management. Flight leads will ensure that all appropriate portions of the missions are debriefed and review as much of the tactical portion of each mission as possible. **(T-3)**

2.7.1.8. G-Tolerance Assessment. Aeromedical, flight physiology personnel and flight leads periodically review the tactical portions of the sortie to assess flight member's anti-G straining maneuver (AGSM) effectiveness in order to identify pilots with poor AGSM technique or low G-tolerance. The squadron commander has the option of directing refresher centrifuge training IAW AFMAN 11-404, *Fighter Aircrew Acceleration Training Program*, and will evaluate AGSM effectiveness IAW this regulation. **(T-3)**

2.7.1.9. 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 only brief those items that have changed from the previous flight if within 24 hours.

2.7.2. Briefing Guides. Briefing guides, as listed in **Attachment 2**, 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 manual 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. **(T-2)**

2.8. Aircrew Chemical, Biological, Radiological, Nuclear, and High Yield Explosive(CBRNE). Potential adversary use of CBRNE weapons against a friendly airfield presents a serious threat to flying operations. Although the most effective way for pilots 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. **(T-1)**

2.8.1. 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 protective posture (MOPP) level in effect for relevant sectors of the airfield. Don appropriate aircrew chemical defense equipment or ground crew ensemble to match the appropriate MOPP level (reference AFTTP 3-4, *Airman's Manual*) and carry individual protective equipment as required.) **(T-1)**

2.8.2. Stepping to Fly and Aircraft Preflight. This may entail donning aircrew ensemble or transitioning from ground crew to aircrew ensemble. Take precautions to protect pilots from injury and or contamination while in transit from the squadron facility to the aircraft. **(T-1)** If possible, transport pilots in a vehicle that provides overhead cover (enclosed vehicle). If pilot travel on foot is unavoidable, choose a route that takes maximum advantage of available overhead cover (sunshades, buildings, etc.) to avoid agents that may be settling from the air. If extra pilots are available for preflight duties, consider assigning them to do so wearing ground crew ensemble. This may minimize exposure. If an attack (Alarm Red or theater equivalent) occurs during the step or preflight process, take cover and don appropriate MOPP. **(T-1)** 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.

2.8.3. Engine Start to Takeoff. If a HAS is available, use it to minimize exposure time by accomplishing aircraft arming and end of runway procedures inside it (if local procedures permit) and by delaying taxi time if possible prior to takeoff.

2.8.3.1. Aircraft Launch to Survive. Units will develop local procedures to provide this option to the commander. **(T-1)** In general, aircraft may launch to survive 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 end of runway prior to takeoff or that have just landed.

2.8.3.2. Alarm Red (or theater equivalent) 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.

2.8.3.3. 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). 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 launch to survive. Maintain contact with command and control entities (Wing operations center, maintenance operations center, supervisor of flying, etc.) to ensure unity of effort in the overall plan. **(T-1)**

2.8.4. Takeoff to Landing.

2.8.4.1. Contamination. If chemical warfare 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, etc., consider flying in landing configuration to increase airflow to these areas (when outside threat environment). If contamination to open weapons bays is suspected, consider flying with weapons bay doors (WBDs) open (when outside threat environment). In any circumstances, merely flying the aircraft is unlikely to achieve complete decontamination.

2.8.4.2. Preparing to Land. Pilots should remain aware of the status of primary and alternate landing locations. Do not attempt to land during Alarm Red (or theater equivalent) situations unless there is no other option. Follow command and control 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 command-and-control direction to plan a route from landing to engine shutdown. The liquid deposition phase following a chemical warfare airburst attack can extend up to 1 hour. If landing during Alarm Black, expect a contaminated environment and MOPP 4.

2.8.5. Landing to Engine Shutdown. Take advantage of any protection available, minimizing taxi time and distance. Maintain contact with command and control in order to remain aware of unexploded ordnance and/or damage to airfield movement surfaces. **(T-1)** If a HAS is available and local procedures permit, accomplish aircraft de-arm and end of runway 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.

2.8.6. After Engine Shutdown. Don appropriate MOPP if not already worn. **(T-1)** 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, pilots will process through an aircrew contamination control area. **(T-1)** Accomplish maintenance debriefings under cover to the maximum extent possible.

Chapter 3

NORMAL OPERATING PROCEDURES

3.1. Preflight and Strap-in. Pilots will check both sides of the engine inlet for foreign objects in the inlet ducts and ensure wheel chocks (if used) are removed from the nose wheel. **(T-1)**

3.2. Ground Communications and Visual Signals. The pilot accomplishes the ground crew briefing IAW the briefing guide in **paragraph A2.13** Pilots may make radio transmissions and transmit other radio frequency waveforms only when ground personnel remain outside FSD published danger areas. The pilot and ground crew determine if intercom will be used during ground operations. When ground intercom is not used, use visual signals IAW AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, AFTTP 3-3.F-35, and this manual. All signals pertaining to operation of aircraft systems originate with the pilot. The crew chief repeats 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 AFMAN 11-218 and AFTTP 3-3.F-35:

3.2.1. **CLOSE MAINTENANCE INTERFACE PANEL:** Straighten one arm, and slide opposite hand from shoulder to wrist (implies intercom already disconnected).

3.2.2. **LOSS OF BRAKES WHILE TAXIING.** Lower tail hook.

3.3. Arming and Taxi.

3.3.1. Arming/de-arming will be completed in the chocks. **(T-3)**

3.3.2. The minimum taxi interval is 150 feet staggered or 300 feet in trail. Spacing may be reduced when not moving. Consider increasing taxi spacing when preceding aircraft engine exhaust may be ingested by on-board oxygen generation system.

3.3.3. The maximum taxi speed while not on an active runway is 30 knots ground speed, or slower as locally directed.

3.3.4. Do not taxi when the RCR is unknown during snow and/or icy conditions. **(T-2)** In this case, taxi on the centerline with a minimum of 300 feet spacing. **(T-3)**

3.3.5. Do not taxi in front of any non-F-35 aircraft actively being armed or de-armed with forward firing ordnance.

3.3.6. AGCAS Settings. With appropriate DTED loaded, and no AGCAS DEGD ICAW, set GCAS to AUTO with MAN minimum terrain clearance (MTC) to minimum expected altitude within pilot LASDT category. For pilots certified 300 feet and below, LEVEL – MIN may be set to avoid nuisance fly-ups near or above the LASDT category.

3.4. Quick Release Box.

3.4.1. If the quick release box must be disconnected for any reason on the ground or in the air (adjust straps, bladder relief, etc.), prior to release the pilot will:

3.4.1.1. Ensure they are in a safe location and situation to do so;

3.4.1.2. Notify their wingman;

3.4.1.3. Safe the seat.

3.4.2. After all quick release box straps are reconnected, including the arm restraints, the pilot will:

3.4.2.1. Arm the seat;

3.4.2.2. Notify their wingman.

3.5. Aircraft Lighting.

3.5.1. Position and strobe lights will be on from start to shut down during administrative portions of the sortie. **(T-1)** If anti-collision strobes are inoperative, position lights in flash can be used as a substitute for strobe lights.

3.5.2. During night operations (sunset to sunrise), light settings will be addressed in local standards. **(T-2)**

3.6. Flight Lineup. Flights line up as appropriate based on weather conditions, runway conditions, and runway width. Use a minimum of 500 feet spacing between separated elements. Just prior to takeoff, all flight members inspect each other for proper configuration and any abnormalities.

3.7. Takeoff.

3.7.1. On training missions do not takeoff if the computed takeoff roll exceeds 80 percent of the available runway. Takeoff using afterburner (AB) if the computed military power takeoff distance exceeds 50 percent of the available runway. **(T-3)**

3.7.2. When operating from airfields equipped with a remotely operated cable, ensure the departure end cable is raised for all takeoffs and landings and on the appropriate frequency to call for the cable, unless another departure end cable is in place. **(T-3)**

3.7.3. Use a minimum of 10 seconds (15 seconds when using AB) takeoff interval between aircraft. When carrying live air-to-surface (A/S) ordnance or executing instrument trail departures, use 20 seconds takeoff interval.

3.7.4. During rolling takeoffs, align the aircraft with the runway heading prior to advancing the throttle, then steer toward the center of the runway at the start of the takeoff roll.

3.7.5. OG/CC may approve intersection takeoffs if operational requirements dictate. **(T-3)**

3.7.6. Formation Takeoff. Not authorized.

3.8. Join-up/Rejoin.

3.8.1. Flight members join in sequence. For a straight-ahead rejoin, the number two aircraft joins on the left wing and the second element joins on the right wing. For a turning rejoin, the number two aircraft rejoins on the inside of the turn and second element to the outside. If mission or flight requirements dictate, the flight lead specifically directs the desired formation positions.

3.8.2. Flight leads should direct a battle damage check after each mission except at night or in instrument meteorological conditions (IMC). This check is mandatory following the expenditure of any ordnance unless at night or IMC. To reduce the risk of inflight damage from remaining clips, lanyards, etc., WBDs should normally remain closed during the battle damage check.

3.8.3. For night join-up procedures, see Night Procedures (see **paragraph 3.16** and **Chapter 4**).

3.9. Formation, Visual and Administrative.

3.9.1. In IMC, the maximum flight size in a visual formation is four aircraft except when flying in close formation with a tanker. Reference North Atlantic Treaty Organization (NATO) Allied Tactical Publication (ATP) 3.3.4.2., *Air-to-Air Refueling*; and ATP 3.3.4.2. (D), *US Standards Related Document (SRD)*, Chapter 9 for tanker details.

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

3.9.3.1. A radio call is mandatory when directing position changes at night or under instrument conditions; **(T-3)**

3.9.3.2. A lead change is effective upon acknowledgement;

3.9.3.3. The minimum altitude for a lead change is 500 feet AGL or 1,000 feet AGL over water. For night lead change procedures, see Night Procedures (see **paragraph 3.16** and **Chapter 4**);

3.9.3.4. Do not initiate lead changes (unless in close or route) with the wingman further aft than 30 degrees from line abreast. **(T-3)**

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

3.9.4.1. Flight members call “blind” with call sign and altitude, i.e., “PANTHER 2, blind, 16.9.” The visual flight member responds with “visual” and attempts to talk the pilot’s eyes on to regain visual.

3.9.4.2. If there is no timely acknowledgement of the blind call, or the other member is blind as well, the flight member acknowledging the call will maneuver away from the last known or voiced position of the blind member and ensure deconfliction.

3.10. Chase Formation.

3.10.1. Restrictions. Any pilot may fly safety chase for aircraft under emergency or impending emergency conditions. Qualified pilots (including initial qualification training) or mission qualification training (MQT) pilots who have successfully completed an Instrument and Qualification evaluation, may chase as safety observer for aircraft performing simulated instrument flight or hung ordnance patterns. Specialized missions (test and evaluation, Weapon System Evaluation Program, live weapons delivery, etc.) and training conducted IAW AFMAN 11-2F-35AV1, *F-35A Aircrew Training*, may be chased by combat mission ready (CMR) or basic mission capable (BMC) pilots designated by OG/CC or squadron commanders. All other chase events will only be flown by instructor pilots (IPs) or flight examiners (FE) or upgrading IPs under the supervision of an IP. **(T-3)**

3.10.2. Procedures.

3.10.2.1. A safety observer in a chase aircraft, except IP/FE/specialized mission chase, maneuvers IAW AFTTP 3-3.F-35.

3.10.2.2. Chase aircraft may maneuver as necessary but maintain nose/tail separation until required to transition to close formation when deemed necessary.

3.10.2.3. No chase aircraft may stack lower than lead aircraft when below 1,000 feet AGL. **(T-3)**

3.10.2.4. For live ordnance missions, the chase pilot will maintain own-ship frag deconfliction. **(T-3)**

3.11. Ops Checks.

3.11.1. As a minimum, complete ops checks:

3.11.1.1. During climb or at level off after takeoff;

3.11.1.2. Prior to each engagement, intercept, or attack;

3.11.1.3. Following air refueling.

3.11.2. Minimum items to check are Intergrated Caution Advisory and Warning Systen (ICAWS), fuel, cabin altitude, max-G pulled and oxygen equipment connections and pilot physiology.

3.11.3. The flight lead initiates ops checks by radio call or visual signal and wingmen respond appropriately. Refer to AFTTP 3-3.F-35 and local publications for fuel standards.

3.12. G-awareness Exercise. Execute IAW AFI 11-214, AFTTP 3-3.F-35 and local procedures. Conduct the G-awareness exercise in the following airspace with preference to the order as listed:

3.12.1. Primarily in Special Use Airspace above 10,000 feet mean sea level (MSL). Secondarily in Special Use Airspace below 10,000 feet MSL. Finally, at pilot discretion (use air traffic control (ATC) services to the maximum extend practical to aid in clearing the airspace).

3.12.2. Follow gaining MAJCOM, Theater, or Host Nation guidance on airspace in which G-awareness exercises may be performed.

3.13. Radio Procedures.

3.13.1. Preface all communications with the complete flight call sign unless exempted below or shortened by ATC. Transmit only that information essential for mission accomplishment or safe flight.

3.13.2. 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.

3.13.3. In addition to the radio procedures outlined in AFMAN 11-202V3, as supplemented by AFI 11-202V3_ACCSUP, *General Flight Rules*, also use the following radio transmissions:

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

3.13.3.2. Each pilot reports gear down to the ATC agency or runway supervisory unit after extending the landing gear prior to crossing the runway threshold. A wingman or chase need not make this call during a formation or chased approach.

3.14. General Low Altitude Procedures.

3.14.1. Conduct all obstacle avoidance planning for low altitude map requirements IAW AFMAN 11-202V3. During the briefing, emphasize critical areas where obstacle awareness should be heightened.

3.14.2. If unable to visually acquire or ensure lateral separation from known vertical obstructions which are a factor to the route of flight, flight leads immediately direct a climb no later than 3 nautical miles (NM) prior to the obstacle to an altitude that ensures vertical separation. **(T-3)**

3.14.3. At low altitude, pilots will immediately climb to a pre-briefed safe altitude (minimum 1,000 feet AGL) when experiencing task saturation, diverting attention, after a knock-it-off, or during emergencies (See AFMAN 11-2F-35AV1, Table 6.1.) **(T-1)**

3.14.3.1. When a "PULL-UP-PULL-UP" warning sounds, the pilot will take immediate action to ensure terrain clearance, while referencing the primary flight instruments. **(T-1)**

3.14.3.2. F-35As with only manual ground collision avoidance system. Pilots will set MTC to 75 percent of the low altitude (LOWAT) category minimum altitude for low-level operations. **(T-1)** Wings with significant tall trees in the operating area or low-level routes will account for average tree height when setting MTC altitudes. **(T-1)**

3.14.3.3. F-35As equipped with an operational AGCAS will ensure NORM/MIN mode is selected per LASDT category and expected minimum operating altitude. **(T-1)** AGCAS is not on the minimum essential subsystems list for low altitude operations during the day, but is required for night. If AGCAS is not operational, comply with **paragraph 3.14.3.2** above. **(T-1)**

3.14.4. At altitudes below 1,000 feet AGL and in a visual formation, wingman may not fly at a lower AGL altitude than lead.

3.14.5. When crossing uneven terrain maintain positive G and do not exceed 135 degrees of bank below 5,000 feet AGL.

3.14.6. Minimum airspeeds.

3.14.6.1. Minimum airspeed for low-level navigation is 300 knots calibrated airspeed (KCAS).

3.14.6.2. Minimum airspeed for air defense, low/slow visual identification (ID) procedures is 13 degrees angle of attack.

3.14.6.3. Minimum airspeed during low altitude tactical maneuvering (below 5,000 feet AGL) is 350 KCAS.

Table 3.1. Minimum Altitudes.

Event	Minimum (feet AGL)

Aerobatics/Air Combat Training (ACBT) ACBT/Advanced Handling	5,000 feet - Unlimited maneuvering 1,000 feet – Restricted/Limited maneuvering (see AFI 11-214 Training Rules, Chapter 4)
Lead Change	500 feet; 1,500 feet at night/IMC unless on radar downwind
Chase (Emergency)	300 feet
Chase (FE/IP)	50 feet
Formation Low Approach	100 feet
Low Approach	So as not to touchdown
Knock-it-Off	1,000 feet
Over Water Training	1,000 feet for A-A maneuvering LOWAT: certified minimum altitude if within sight of land. 500 feet when not in sight of land.
Night LOWAT	1,000 feet (aided) or MSA (unaided)
Low/Slow Visual ID	1,000 feet

3.15. Air Refueling.

3.15.1. Pilots undergoing initial or requalification training in air refueling may not refuel with a student boom operator (does not apply to KC-10). Inform boom operators when refueling from a particular tanker type for the first time.

3.15.2. Quick flow procedures are authorized and conducted IAW F-35A FSD, ATP 3.3.4.2. and ATP-3.3.4.2. (D) US SRD.

3.16. Night Procedures.

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

3.16.2. Following takeoff, each aircraft climbs on runway heading to 400 feet AGL before initiating turns, except where departure instructions specifically preclude compliance.

3.16.3. Weather criteria for night join-up underneath is a ceiling of 3,000 feet and 5 statute miles (SM) visibility.

3.16.4. Do not change lead or wing visual formation positions below 1,500 feet AGL at night unless under ATC radar control. **(T-3)**

3.16.5. Lost Sight. Consider highlighting position by increasing exterior lighting level, activating the AB, or deploying flares as airspace allows.

3.16.6. Night Vision Procedures.

3.16.6.1. Pilots will be aware of thermal crossover considerations prior to using the DAS for terrain clearance.

3.16.6.2. Ensure distributed aperture system/night vision camera (NVC) (DAS/NVC) operations are not enabled during departure until at least 2,000 feet AGL in climbing or level flight. DAS/NVC assisted landings are not authorized. **(T-2)**

3.16.6.3. Low altitude certified pilots may operate below the minimum safe altitude (MSA) down to a minimum of 1,000 feet AGL using either DAS or NVC. AGCAS must be operational:

3.16.6.3.1. If NVC is used, it must be high illumination.

3.16.6.3.2. If DAS is used, all 4 front hemisphere cameras must be operational (any illumination). **(T-3)**

3.16.6.4. For non-aided night or IMC operation, the minimum altitude is MSA.

3.16.6.5. DAS/NVC may be used for night tanker rejoins, but deselected no later than the astern position.

3.16.6.6. In-flight Emergencies. During in-flight emergencies, night vision devices (NVD) may be used to aid in safely recovering the aircraft.

3.16.6.7. DAS/NVC operations may cause loss of situational awareness and pilot disorientation. If this occurs in flight, ensure separation from other aircraft and the ground, transition to instruments, and notify wingman.

3.17. Fuel Requirements.

3.17.1. Normal Recovery Fuel. The planned fuel quantity at initial or the final approach fix (FAF) at the base of intended landing or alternate (if one is required) is 2,000 pounds or as established locally, whichever is higher.

3.17.2. Low Fuel State. Declare the following when it becomes apparent that an aircraft may land at the intended destination or alternate (if one is required), with less than:

3.17.2.1. Minimum Fuel. 1,600 pounds. This is based on 20 minutes holding at 10,000 feet MSL flying max endurance airspeed (IAW AFMAN 11-202V3), with all internal racks, no internal/external ordnance. If aircraft configuration differs from this assumption, pilots will adjust minimum fuel requirements. **(T-1)**

3.17.2.2. Emergency Fuel. 1,000 pounds or FUEL CRITICAL ICAW.

3.18. Approaches and Landings.

3.18.1. 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.

3.18.2. Land in the center of the runway and clear to the cold side when speed and conditions permit. After achieving a safe taxi speed do not delay clearing to the cold side as this can create a conflict for subsequent landing aircraft.

3.18.3. Landing Restrictions.

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

3.18.3.2. Pilots will not land over any raised web barrier (e.g., BAK-15, MA-1A, 61QSII; definitions found in FLIP, IFR Supplement). **(T-2)**

3.18.3.3. When the RCR at the base of intended landing is less than minimum RCR allowed in the FSD, land at an alternate. If an alternate is not available, consider an approach end or midfield arrestment.

3.18.4. Formation Approaches. Normally accomplish formation approaches from a published instrument approach or a VFR straight-in approach using available glide slope guidance. In all cases, use a rate of descent like a normal precision approach.

3.18.5. Use caution when differences in aircraft weight will cause one aircraft to be outside the landing angle-of-attack bracket symbol.

3.18.6. Formation landings are not authorized.

3.19. Overhead Traffic Patterns.

3.19.1. Overhead patterns can be flown with unexpended live or inert ordnance (internal or external), including 25 millimeter ammunition or flares.

3.19.2. Do not fly overhead patterns with hung or misfired ordnance.

3.20. Tactical Overhead Traffic Patterns. Follow local guidance.

3.21. Touch-and-Go Landings. Reference AFMAN 11-202V3 and applicable MAJCOM and local supplements.

3.21.1. Reduced runway separation is not allowed for a touch and go pattern.

3.21.2. Touch-and-go landings may be flown for training requirements as limited by applicable MAJCOM supplement and outlined in **Chapter 8** local operating procedures.

3.22. Low Approaches.

3.22.1. Observe the following minimum altitudes:

3.22.1.1. Normal single ship low approaches: so that touchdown does not occur;

3.22.1.2. IP/FE flying chase position: 50 feet AGL;

3.22.1.3. Formation low approaches and non-IP/FE chase: 100 feet AGL;

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

3.22.2. 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.

3.23. Closed Traffic Patterns. Initiate the pattern at the departure end of the runway unless cleared 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.

3.24. Wind and Sea State Restrictions. Pilots will not conduct training missions when surface winds along the intended route of flight exceed 35 knots steady state. **(T-1)** Pilots will not conduct over water training missions when surface winds exceed 25 knots steady state or when the sea state exceeds 10 feet. **(T-3)** These rules are not intended to restrict operations when only a small portion of the route is affected.

3.25. Transponder Operations. Operation is IAW AFMAN 11-202V3, and FSD.

3.25.1. Identification Friend or Foe Transponder. Altitude reporting (Mode C) maybe turned off during tactical operations, in special use airspace, or on designated training ranges.

3.25.2. Identification Friend or Foe Interrogator (IFF-I). Outside of special use airspace, pilots limit IFF-I interrogations to mission essential and safety of flight purposes. Pilots may perform an interrogator check momentarily for system verification purposes.

3.25.3. IFF Mode 5. Transponder use is authorized. When certified and authorized, Interrogator may be used (see **paragraph 3.25.2**).

3.26. Weather Minimums. Refer to **Table 3.2** for a summary of weather minimums affecting F-35A operations.

Table 3.2. Weather Minimum Summary (Feet AGL/SM).

Event	Minimum
VFR Rejoin (Day)	1,500 / 3
VFR Rejoin (Night)	3,000 / 5
Low Level Navigation	Ref FLIP (AP/1B) for VR/IR routes, otherwise use 3,000 / 5 off of VR/IR routes
Low Level Intercepts	3,000 / 5
Note: Unless foreign national rules are higher	

Chapter 4

INSTRUMENT PROCEDURES

4.1. Primary Flight Reference.

4.1.1. When flight conditions require sole reliance on instruments for aircraft control, the pilot shall select and continuously display an approved primary flight reference (PFR). **(T-1)** The primary unusual attitude reference is the electronic flight instrument, panoramic cockpit display heads-up display, or standby flight display. Do not use the helmet mounted display alone to recover from an unusual attitude.

4.1.2. When using a single panoramic cockpit display PFR during flight conditions requiring continuous PFR display, pilots are prohibited from covering that PFR with a Function Access Button popup display.

4.2. Takeoff and Join-up. If weather is below 1,500 feet and 3 SM, each aircraft climbs 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. Flight leads brief aircraft spacing and airspeed. Minimum spacing between aircraft when in non-standard formation is 9,000 feet. Flight leads will transmit all speed and configuration changes, and wingman will acknowledge. **(T-1)**

4.3.2. ATC Instructions. ATC instructions issued to the lead aircraft apply to the entire flight. The flight lead should ensure ATC states when trailing wingmen/elements climb or descend. In lieu of guidance, trailing flight members will climb/descend at the same geo-location that flight lead starts a climb or descent. **(T-1)**

4.3.3. Trail Departures.

4.3.3.1. Flight members will call “tied” and/or “visual” (“PANTHER 2 tied,” “PANTHER 3 tied,” “PANTHER 4 visual”).

4.3.3.1.1. Transmit, “negative contact.” The flight lead calls passing each 5,000 feet with altitude passing and heading. The lead aircraft also calls the initiation of any altitude or heading change. Subsequent aircraft delay turns to maintain the desired spacing.

4.3.3.1.2. Each aircraft maintains at least 1,000 foot vertical separation from the preceding aircraft until establishing sensor or visual contact. Pilots may reduce vertical separation to 500 feet if necessary, to comply with MSA restrictions.

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

4.3.4. Trail Recovery.

4.3.4.1. Units will ensure trail recovery procedures are coordinated and approved through the responsible ATC facilities and addressed in a local operating procedure or in the unit supplement to this volume. **(T-2)** Trail recoveries are only accomplished at home station,

local diverts and deployed locations where procedures have been established and briefed. As a minimum, ensure procedures address each recovery profile, missed approach, climb out, lost contact, lost communications, and desired spacing requirements.

4.3.4.2. Limit trail recoveries to a maximum of six aircraft. **(T-3)**

4.3.4.3. Final approach speed will be set at a time to ensure proper touchdown speed before crossing the threshold and allow wingman to slow to appropriate spacing for weather and local procedures. **(T-3)**

4.3.4.4. 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.

4.3.4.5. Trail recoveries will not terminate in simultaneous precision approach radar or airport surveillance radar approaches. **(T-2)** Recoveries to separate radar approaches are authorized, however, ensure flights split prior to final.

4.3.4.5.1. Accomplish the spacing maneuver in visual meteorological conditions (VMC) to the maximum extent possible.

4.3.4.5.2. Unless local procedures establish defined reference points for airspeed and configuration changes, the flight lead directs changes by radio. At the flight lead direction, all flight members acknowledge and comply with the directed change.

4.3.4.5.3. Flight members will acknowledge, in sequence, airspeed and gear changes. If a wingman reaches the FAF without hearing 'C/S, SET APPROACH SPEED', they will state, 'C/S, APPROACH SPEED SET'. All aircraft report the FAF, and gear down before crossing the runway threshold. (This does not prohibit flight leads from following AFTTP 3-3.F-35 guidance about setting APC 3-4 NM from the runway threshold.)

4.3.4.5.4. If contact is lost with the preceding aircraft, the pilot transmits “PANTHER 02, lost contact." The preceding aircraft responds 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 confirm separation via navigation aids. If separation cannot be confirmed, execute missed approach, or climb out as instructed by ATC.

4.4. Flight Split-up. When directed to take spacing, wingmen slow to no less than minimum speeds in **paragraph 3.14.6**.

4.5. Formation Penetration.

4.5.1. Restrict formation penetrations in visual 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 or above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.6. Instrument Approach.

4.6.1. Pilots will not fly any published instrument approach procedure that requires airspeeds less than those specified in the FSD. **(T-1)**

4.6.2. The F-35A is approach category E. Accomplish missed approach IAW FSD procedures and AFMAN 11-202V3 airspeeds.

4.6.3. Only use actual approach category D minimums in IMC where no category E minimums are published. Practice category D approaches may be accomplished in VMC. In both cases, ensure pilots comply with the following restrictions:

4.6.3.1. A straight-in approach is flown;

4.6.3.2. Able to adhere to AFMAN 11-202V3 Category D airspeed restrictions.

4.6.4. The F-35A is not certified for area navigation enroute nor for area navigation approaches. The F-35A is certified and approved for Very High Frequency (VHF) radio 8.33 kilohertz (kHz) frequency spacing and use of the instrument landing system now with frequency modulation immunity protection.

4.7. Simulated Instrument Flight Restrictions. Follow the simulated instrument flight restrictions defined in AFMAN 11-202V3 and applicable MAJCOM supplements.

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. Safe Gun Procedure for Simulated Gun Employment.

5.2.1. Simulated gun employment is defined as engaging a target with the MASTER ARM switch in OFF, stores management system (SMS) in TRAIN, in a master mode with a gun sight, and depressing the trigger to the second detent.

5.2.2. If simulated gun employment is desired, pilots will:

5.2.2.1. Unless prohibited by F-35A FSD, prior to takeoff, load zero (0) rounds in the LIVE SMS (after portable memory device load selected) and verbally confirm on the radio. If unable to load zero rounds in LIVE SMS (FSD prohibition, etc.), simulated gun employment is not authorized (with or without rounds).

5.2.2.2. After takeoff and prior to the cold trigger check, verify and verbally confirm on the radio, “MASTER ARM - OFF, SMS - TRAIN”;

5.2.2.3. Accomplish a cold trigger check prior to simulated employment. **(T-1)**

5.3. Maneuvering Limitations. Negative-G gun jinks are prohibited. (T-3)

Chapter 6

AIR-TO-SURFACE WEAPONS EMPLOYMENT

6.1. References. AFI 11-214 contains air-to-surface procedures, to include operations with live ordnance applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F-35A operations. Weapons proficiency criteria are contained in AFMAN 11-2F-35AV1.

6.2. Definitions.

6.2.1. Simulated Weapon Employment. Engaging a target with MASTER ARM switch in OFF, SMS in TRAIN mode, and in A/S master mode. Do not squeeze the trigger to the second detent unless the gun has been verified as safe IAW the steps within **paragraph 5.2**.

6.2.2. Off-Range or Manned Target. An area or range on which ordnance release is either not authorized or in which unintentional or inadvertent release could result in ordnance impacting an area not authorized.

6.2.3. On-Range Target. An area in which A/S ordnance release is authorized and an unintentional or inadvertent release would not result in ordnance impacting an area not authorized.

6.3. Simulated Weapon Employment.

6.3.1. Gun. Do not squeeze the trigger to the second detent unless the gun has been verified as safe IAW the steps within **paragraph 5.2**.

6.3.2. Do not conduct simulated weapons employment with hung ordnance.

6.3.3. Simulated weapon employment with live ordnance.

6.3.3.1. Simulated weapon employment while carrying live ordnance against off-range targets is not authorized.

6.3.3.2. Simulated weapon employment while carrying live ordnance against on-range targets is authorized with the following restrictions:

6.3.3.2.1. Verbally confirm with the flight prior to first attack, “MASTER ARM - OFF, SMS - TRAIN.”

6.3.3.2.2. There are no target restrictions if the simulated weapon is loaded on a station with no ordnance (empty).

6.3.3.2.3. If intending to employ simulated weapon from a station carrying live ordnance, comply with the range restrictions for weapon/target pairing for actual employment of that weapon.

6.3.4. Simulated weapon employment with inert ordnance, either loaded internal or external.

6.3.4.1. Simulated weapon employment while carrying internal/external inert ordnance is authorized against off-range targets with the following restrictions:

6.3.4.1.1. Verbally confirm with the flight prior to first attack, “MASTER ARM - OFF, SMS - TRAIN” and empty weapon station selected.

6.3.4.1.2. Simulated weapon is loaded on a station with no ordnance.

6.3.4.2. Simulated weapons employment from a station carrying an inert weapon is only authorized against on-range targets. Reference **paragraph 6.3.3.2.1** for simulated attack restriction.

6.4. Live Ordnance Procedures. When carrying live A/S ordnance, and when ground controllers are on class B/C ranges the following procedures apply:

6.4.1. Ensure all pilots are familiar with applicable range weapons delivery procedures, appropriate targets, and weapons footprints. **(T-1)**

6.4.2. Ground personnel locations are briefed and acknowledged by all pilots. **(T-1)**

6.4.3. Do not expend ordnance if any doubt exists as to the ground personnel or intended target locations. **(T-1)**

6.5. Night Strafe Procedures.

6.5.1. Calculate a minimum 5 NM target area MSA. If target MSA unavailable use the most restrictive MSA based on range, airspace sector, kill container, etc. **(T-1)**

6.5.2. Verify target elevation with aircraft systems (e.g., laser ranging) or by using a mission planned target. **(T-1)**

6.5.3. Comply with minimum altitudes in paragraphs **3.16.6.3** and **3.16.6.4**.

6.6. Target Identification. Pilots shall positively identify the target prior to weapons release. For wartime or contingency sorties, comply with 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. Exercise caution when relying on a single cue to confirm target location. For night training sorties when actual training, inert or live weapons will be released via a visual attack mode, do not rely on visual cues alone; confirm visual acquisition of the target with at least one additional on-board/off-board cue before releasing weapons. Cues may include, but are not limited to, radar, global positioning system, marking rounds, electro-optical targeting system, IR pointers or NVD compatible marking devices. **(T-1)**

Chapter 7

ABNORMAL OPERATING PROCEDURES

7.1. Reference. F-35A PCL emergency procedures, FSD guidance, and local **Chapter 8** operating procedures.

7.2. Takeoff Aborts. If an abort occurs during takeoff roll, notify tower and flight members with call sign and intentions when practical. The aborting aircraft should call, "Cable, Cable, Cable" on tower frequency to indicate a departure-end arrestment is planned or this call is directive to inform tower to raise a recessed cable. Following aircraft should abort if safe to do so, alternately select MAX AB and takeoff.

7.3. Air Aborts.

7.3.1. If an abort occurs after takeoff, all aircraft maintain their original numerical call sign for ATC purposes. Tactical renumbering is permitted.

7.3.2. Abort the mission and land out of a straight-in approach, regardless of apparent damage, for any of the following:

7.3.2.1. Bird strike/foreign object damage.

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

7.3.2.3. Over-G.

7.3.2.3.1. If the aircraft shows a latched max G value greater than airframe limits, the PCL procedure is not required, provided there is no OVER-G ICAW. Upon landing, pilots will report this occurrence as an "exceedance" to maintenance.

7.3.2.3.2. Pilots will adhere to PCL limits for aircraft or stores Over-G if hardware modifications, aircraft type version/effectivity codes, or stores restrict aircraft limits.

7.4. Radio Failure.

7.4.1. Individual aircraft experiencing radio failure comply with procedures outlined in FLIP, AFMAN 11-202V3, local directives supplementing **Chapter 8** of this publication, and the flight lead or mission commander's guidance.

7.4.2. The NORDO aircraft, upon recognition of NORDO, will cease all tactical maneuvering and ensure deconfliction.

7.4.3. Recovery. Once deconfliction is ensured, the NORDO aircraft:

7.4.3.1. Will execute local or briefed procedures;

7.4.3.2. If experiencing an emergency, immediately recover the aircraft safely at an appropriate airfield;

7.4.3.3. Depart at local or briefed recovery fuel.

7.4.4. Flight members will attempt to rejoin on the NORDO aircraft and assist by taking the lead to bring the NORDO aircraft home, then passing the lead back to the NORDO aircraft with clearance to land or IAW local or briefed guidance.

7.5. Severe Weather Penetration. If unavoidable, flights should break-up and obtain separate clearances prior to severe weather penetration.

7.6. Lost Wingman Procedures.

7.6.1. Upon losing sight of the leader or if unable to maintain formation, the wingman executes the applicable lost wingman procedures (paragraphs **7.6.2** and **7.6.3**), simultaneously:

7.6.1.1. Transition to primary flight instruments; **(T-1)**

7.6.1.2. Inform lead by transmitting via radio, "PANTHER 4, lost wingman." **(T-1)**

7.6.1.3. After executing a lost wingman procedure, do not attempt rejoining with the flight until obtaining permission from the flight lead; **(T-1)**

7.6.1.3.1. When able, obtain a separate clearance, and; **(T-1)**

7.6.1.3.2. Observe all published terrain clearance limits. **(T-1)**

7.6.2. Two or Three-Ship Flights (for three-ship echelon, refer to four-ship flights, **paragraph 7.6.3**).

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

7.6.2.2. Turns.

7.6.2.2.1. 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.

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

7.6.2.3. Final Approach. Momentarily turn away from lead to ensure clearance and execute the published missed approach procedure as defined on the FLIP instrument approach procedure being flown.

7.6.2.4. Missed Approach. Momentarily turn away from lead to ensure clearance and continue the published or assigned missed approach procedure as defined on the FLIP instrument approach procedure being flown. Climb to 500 feet above published missed approach altitude.

7.6.3. Four-Ship Flights. Aircraft number 2 and 3 follow the procedures outlined above. Number 4's initial action assumes that number 3 has also gone lost wingman. Number 4's procedures are:

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

7.6.3.2. Turns.

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

7.6.3.2.2. 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 only resumes the turn when separation is ensured.

7.6.4. The leader acknowledges the lost wingman's radio call and transmits attitude, heading, altitude and airspeed. When appropriate, lost wingman aircraft transmit attitude, heading, altitude and airspeed.

7.6.5. Only practice lost wingman procedures in VMC.

7.7. Spatial Disorientation. Reference AFMAN 11-202V3 and Air Force Pamphlet (AFPAM) 11-417, *Orientation in Aviation*. Specific actions available in the F-35A to counter spatial disorientation (SD):

7.7.1. Enabling a pilot initiated fly up is an acceptable recovery method from SD induced unusual attitudes. Pilots should ensure deconfliction from other aircraft (primarily above or below their position) prior to pilot initiated fly up activation.

7.7.2. Select the full color electronic flight instrumentation via a "Z-Axis plunge of Comm Switch," even if an alternate PFR is currently displayed.

7.7.3. Use autopilot.

7.8. Armament System Malfunctions.

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

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

7.8.1.2. Safe the armament switches and do not attempt further release. Treat remaining stores as hung ordnance and follow hung ordnance procedures. Refer to the local supplement to **Chapter 8** of this publication.

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

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

7.8.2.1. Hang fire/Misfire. A missile that fires but fails to depart the aircraft is a hang fire. A missile that fails to fire when all appropriate switches were selected is a misfire. If either of these occur, set MASTER ARM – OFF.

7.8.2.2. Hung Ordnance/Hung Flare/Weapons Malfunction Recovery. Follow FSD and local **Chapter 8** guidance. Consider:

7.8.2.2.1. Visually inspect the area for damage to aircraft, WBDs or ordnance.

7.8.2.2.2. Declare an emergency.

7.8.2.2.3. Obtain a chase aircraft, avoid populated areas and close trail formations.

7.8.2.2.4. Land from a straight-in approach.

7.9. Post Arresting Gear Engagement Procedures.

7.9.1. Do not shut down the engine unless directed by the ground crew, PCL direction, or local procedures.

7.9.2. Raise the tail hook on the ground crew's signal.

7.9.3. Do not taxi until directed.

7.9.4. Comply with local directives as outlined in the local supplement to **Chapter 8** of this publication.

7.10. In-flight Practice of Emergency Procedures.

7.10.1. Simulated Emergency Procedure is defined as any procedure that produces an effect that closely parallels an actual emergency.

7.10.2. Aborted Takeoff Practice. Practice aborted takeoffs only in the simulator.

7.10.3. Precautionary Flameout (PFO) Pattern. OG/CCs will establish letters of agreement with appropriate agencies for PFO training. **(T-2)** They will publish those procedures in their supplement to **Chapter 8** of this publication. **(T-2)** General PFO procedures follow:

7.10.3.1. As a minimum call:

7.10.3.2. High Key, Low Key, and gear down.

7.10.3.3. Low angle of attack (AOA) transition to landing. On final, AOA may be lower than the FSD minimum AOA. During a touchdown at less than 9 degrees AOA, pilot commands can quickly result in over-controlling the aircraft. An unrecoverable, dangerous condition could occur during touchdown at less than 9 degrees AOA due to increased control sensitivity and reduced nose gear distance to the runway. Per FSD, touching down at less than 9 degrees AOA is prohibited.

7.11. Search and Rescue (SAR) On-Scene Commander Procedures. Follow local, theater special instructions, or Air, Land, Sea Application document guidance.

7.12. Fuel Dumping.

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

7.12.2. When circumstances permit, dump above 5,000 feet AGL over unpopulated areas. Consideration should be given to commencing fuel dumping no later than 10,000 feet AGL during recovery to ensure completion prior to descending below 5,000 feet AGL.

7.12.3. The dump cut off setting should not be set to lower than the BINGO fuel amount.

7.13. AGCAS Event. If any pilot experiences an AGCAS activation, allow the aircraft to perform the recovery, recover to a safe altitude, and assess the situation.

7.13.1. If the pilot determines this was a valid fly-up (auto recovery required to prevent flight into terrain) or is uncertain of validity:

7.13.1.1. Advise lead, or wingman of the fly-up;

7.13.1.2. Discontinue the mission and return to base (RTB);

7.13.1.3. Archive the mission recording of the entire sortie for review;

7.13.1.4. Complete and submit an AGCAS Class E report to the flight safety office;

7.13.1.5. Notify unit leadership of the incident and have the details reported as soon as possible to the F-35 joint program safety office. **(T-1)**

7.13.2. If the pilot determines the fly-up was not required to prevent flight into terrain—a "nuisance fly-up"—the mission may be continued at the flight lead's discretion. Report the fly-up post-flight to **F-35SystemSafety@jsf.mil**.

7.13.3. Despite the presence of nuisance fly-ups, the intent is for pilots not to become desensitized to ACGAS fly-ups. For this reason, pilots will not real-time assess and paddle off AGCAS unless safety of flight is a factor (nuisance fly-up on takeoff, converging flight paths during a BFM engagement, etc.).

7.14. Physiological Event. If an event occurs or is suspected:

7.14.1. If part of a formation, advise lead, or wingman of the physiological event;

7.14.2. Known or suspected physiological event. IAW FSD, activate back-up oxygen supply and control rate and depth of breath (e.g., 1 breath every 5 seconds) to address aircraft breathing system sequence issues (e.g., insufficient partial pressure of oxygen, rapidly changing oxygen concentrations, mask pressure/flow timing, valve malfunctions, cabin pressure fluctuations, regulator pressure/flow lag). In a purely hypoxic situation, expect recovery within 30 seconds of backup oxygen system activation. If symptoms remain, drop mask if aircraft is below 10,000 feet cabin altitude to optimize normal breathing. Outcomes of irregular breathing (hypocapnia, hypercapnia, etc.) can manifest as hypoxia-like symptoms, and may take 5-15 minutes to resolve. If able, consider autopilot/holding while symptoms subside before entering critical phases of flight;

7.14.3. Restrict flight to no more than 2Gs and 60 degrees of bank; **(T-1)**

7.14.4. Declare an emergency and advise ATC; **(T-1)**

7.14.5. Recover the aircraft utilizing a straight in approach. If known or suspected physiological event, only taxi to clear the runway, do not taxi to parking; **(T-1)**

7.14.6. Await the arrival of Medical, Safety, and aircrew flight equipment personnel after landing. Unless medically necessary, leave pilot flight equipment switches and connections in place until documented by Medical, Safety and aircrew flight equipment personnel; **(T-1)**

7.14.7. Report any suspected or confirmed aircraft system malfunctions to maintenance and any pilot flight equipment issues to aircrew flight equipment personnel; **(T-1)**

7.14.8. Pilots will archive the mission recording of the entire sortie for review or aid in root cause analysis (Safety, F-35 Joint Program Office, Aerospace Physiologist, Flight Surgeon, etc.); **(T-1)**

7.14.9. Complete and submit an in-flight emergency report to the flight safety office and; **(T-1)**

7.14.10. Notify unit leadership of the incident. **(T-1)**

7.15. G-Induced Loss of Consciousness. If an event occurs or is suspected:

7.15.1. If part of a formation, advise lead, or wingman of the loss of consciousness event;

7.15.2. Follow guidance in **paragraph 7.14.3** through **paragraph 7.14.10** above.

Chapter 8

LOCAL OPERATING PROCEDURES

8.1. General. This chapter provides a consolidated framework for wings to supplement (IAW DAFMAN 90-161) local operating procedures. Units composed of multiple aircraft types may publish guidance in a single, stand-alone local operating instruction instead of supplementing this publication. Added or stand-alone procedures may 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. Rapid pilot swap and health reporting code procedures;

8.2.12. Bird/Wildlife Aircraft Strike Hazard program guidance IAW AFI 91-202 and AFI 91-212.

8.2.13. Environmental Restrictions to Flight Operations (winds, sea state, temperature, etc.) applicable to unit operating locations.

8.2.14. Unit standard load for EFB.

8.2.15. Guidance for intentional touch and go landings IAW MAJCOM supplement.

8.3. Distribution of Local Supplements. When published, units will forward copies of the local supplement to MAJCOM and appropriate subordinate agencies, which in turn review and return comments back to the unit(s). **(T-2)** 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 is incorporated into the basic AFMAN volume.

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Deputy Chief of Staff, Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 11-2, *Aircrew Operations,* 31 January 2019

AFPD 11-4, *Aviation Service,* 12 April 2019

AFMAN 11-202V3, *Flight Operations,* 10 January 2022

AFI 33-322, *Records Management and Information Governance Program,* 23 March 2020

DAFMAN 90-161, *Publishing Process and Procedures,* 15 April 2022

AFTTP 3-3.F-35, *Combat Aircraft Fundamentals*—F-35, 9 December 2019

AFI 11-214, *Air Operations Rules and Procedures*, 15 June 2021

F35A-PCL-001 (F35A-FCL-001), *Pilot's Checklist*, 6 April 2021, Change 2

F35A-FM-001, *Flight Series Data*, 6 April 2021, Change 2

DAFI 11-209, *Participation in Aerial Events*, 20 May 2021

AFMAN 11-202V2, *Aircrew Standardization and Evaluation Program*, 30 August 2021

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ACCI 11-270, *Operations Mobile Devices*, 9 October 2019

F35A-PFE-001, *F-35A Lightning II, Pilot Flight Equipment Configuration*, 20 July 2021

AFI 11-215, *Flight Manuals Program,* 25 March 2019

F-35 Joint Program Office Program Instruction 1512.01, *Flight Manual Product Set*, 4 February 2019

AFI 91-202, *The US Air Force Mishap Prevention Program*, 12 March 2020

AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program,* 31 May 2018

AFMAN 11-404, *Fighter Aircrew Acceleration Training Program,* 27 November 2019

AFTTP 3-4, *Airman's Manual*, 11 January 2019

AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, 5 April 2019

NATO ATP 3.3.4.2., *Air-to-Air Refueling, Edition D Version 1,* April 2019

ATP 3.3.4.2. (D), *US Standards Related Document (SRD)*, 9 March 2020

AFMAN 11-2F-35AV1, *F-35A Aircrew Training*, 13 February 2019

AFI 11-202V3_ACCSUP, *General Flight Rules,* 3 March 2020

AFPAM 11-417, *Orientation in Aviation,* 9 April 2015

AFTTP 3-1.F-35, *Tactical Employment—F-35,* 13 December 2019

Adopted Forms

DAF Form 847, *Recommendation for Change of Publication*

DAF Form 679, *Department of the Air Force Publication Compliance Item Waiver Request/Approval*

Abbreviations and Acronyms

A/S—Air to Surface

AB—Afterburner

ACBT—Air Combat Training

ACC—Air Combat Command

ACC/A3—Director of Operations

ACC/A3TO—ACC Operations and Training Branch

ACCI—Air Combat Command Instruction

ACCSUP—Air Combat Command Supplement

AF—Air Force

AFI—Air Force Instruction

AFTTP—Air Force Tactics, Techniques and Procedures

AFMAN—Air Force Manual

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AGCAS—Automatic Ground Collision Avoidance System

AGL—Above Ground Level

AGSM—Anti-G Straining Maneuver

AOA—Angle of Attack

APC—A

ATC—Air Traffic Control

ATP—Allied Tactical Publication

AWACS—Airborne Warning and Control System

BASH—Bird/Wildlife Aircraft Strike Hazard

BFM—Basic Flight Manuvers

BMC—Basic Mission Capable

CAP—Combat Air Patrol

CBRNE—Chemical, Biological, Radiological, Nuclear and High Yield Explosive

CMR—Combat Mission Ready

CRC—Control and Reporting Center

(D)—Dissimilar

DACBT—Dissimlar Air Combat Training

DAFI—Department of the Air Force Instruction

DAS—Distributed Aperture System

DAS/NVC—Distributed Aperture System-Night Vision Camera

DRU—Direct Reporting Unit

DTED—Digital Terrain Elevation Data

EA—Electronic Attack

EFB—Electronic Flight Bag

e.g.—exempli gratia (for example)

EMCON—Emissions Control

EMI—Electromagnetic Interference

EP—Electronic Protection

etc.—etcetera

EXCM—Expendable Countermeasures

FAF—Final Approach Fix

FCIF—Flight Crew Information File

FCL—Flying Checklist

FE—Flight Examiner

FLIP—Flight Information Publications

FOA—Field Operating Agency

FSD—Flight Series Data (F35A-FM-001)

G—Gravity Load Factor

GCI—Ground Controlled Intercept

HAS—Hardened Aircraft Shelter

IAW—In Accordance With

ICAW—Integrated Caution, Advisory and Warning

ICAWS—Integrated Caution, Advisory and Warning System

ID—Identification

IFF—Identification Friend or Foe

IFF-I—Identification Friend or Foe - Interrogator

IFR—Instrument Flight Rules

IMC—Instrument Meteorological Conditions

IP—Instructor Pilot

IR—Infrared

KCAS—Knots Calibrated Airspeed

kHz—Kilohertz

LASDT—Low Altitude Step Down Training

LOWAT—Low Altitude Training

MADL—Multi-waveform Advanced Data Link

MAJCOM—Major Command

MAR—Minimum Abort Range

MARSA—Military Assumes Responsibility for Separation of Aircraft

MOPP—Mission Oriented Personnel Protection

MQT—Mission Qualification Training

MSA—Minimum Safe Altitude

MSL—Mean Sea Level

MTC—Minimum Terrain Clearance

NATO—North Atlantic Treaty Organization

NM—Nautical Miles

NORDO—No Radio

NOTAMS—Notices to Airmen

NVC—Night Vision Camera

NVD—Night Vision Device

OG/CC—Operations Group Commander

OPR—Office of Primary Responsibility

Ops—Operations

PCL—Pilot Checklist

PFO—Precautionary Flameout

PFR—Primary Flight Reference

Pubs—Publications

RAA—Route Abort Altitude

RCR—Runway Condition Reading

ROE—Rules of Engagement

RTB—Return to Base

RTO—Range Training Officer

SAR—Search and Rescue

SARCAP—Search and Rescue Combat Air Patrol

SD—Spatial Disorientation

SM—Statute Miles

SMS—Stores Management System

SRD—Standards Related Document

SRTM—Shuttle Radar Topography Mission

SRT1F/SRT2F—SRTM Void Filled Data (Levels 1 & 2)

Stan/Eval—Standardization and Evaluation

T—Tier

TACAN—Tactical Air Navigation

TOLD—Takeoff and Landing Data

TR—Technical Refresh

V—Volume

VFR—Visual Flight Rules

VHF—Very High Frequency

VMC—Visual Meteorological Conditions

WBDs—Weapon Bay Doors

Terms

Arresting Gear—detailed list of definitions are found in FLIP, IFR Supplement.

Basic Mission Capable (BMC)—The status of a pilot who has satisfactorily completed training prescribed to be fully qualified to perform the basic unit operational missions but does not maintain CMR status (AFMAN 11-2F-35AV1).

Call sign—The 2-way radio identification of an aircraft (i.e., PANTHER 01 (flight lead), PANTHER 02 (wingman)), required for flight in the National Airspace System, and AFI 11-214 training.

Combat Mission Ready (CMR)—A status of a pilot who has satisfactorily completed MQT prescribed to be fully qualified to perform the basic unit combat missions, and maintains qualification and proficiency in these missions (AFMAN 11-2F-35AV1).

Continuation Training—Training to maintain proficiency and improve pilot capabilities to perform unit missions (AFMAN 11-2F-35AV1).

Air Combat Training (ACBT) 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 air combat training (AFMAN 11-2F-35AV1).

Flight Lead—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 flight lead may lead formations and missions in excess of four aircraft, unless restricted by the unit commander. A 2-ship flight lead is authorized to lead an element in a larger formation (AFMAN 11-2F-35AV1).

Initial Qualification Training—Training to qualify the pilot in basic aircraft flying duties without specific regard to a unit operational mission (AFMAN 11-2F-35AV1).

Low Altitude Training (LOWAT)—Operations in a certified low altitude block as defined in AFMAN 11-2F-35AV1.

Mission Qualification Training (MQT)—Training required to achieve a basic level of competence in unit's primary tasked missions (AFMAN 11-2F-35AV1).

Attachment 2

FLIGHT BRIEFING GUIDES

Table A2.1. General Briefing Guide.

MISSION DATA	SPECIAL SUBJECTS (as applicable).
Time Hack and Briefing Classification	General Roles and Responsibilities (FE, IP, Flight Lead, Wingman)
Emergency Procedure/Threat of the Day	Formation Specific Responsibilities and Priorities
Mission Objective(s)	Flight Member Mission Priorities
Mission Overview	Task/Sensor Prioritization
Mission Data Card	Deconfliction Contracts
Mission Commander/Deputy Lead	Fallout/Late Rejoin
Joker/Bingo Fuel	Chase Procedures
Takeoff and Landing Data	IFF/IFFI/Mode S Procedures
Working Area	Radar/Visual Search Responsibilities/Midair Collision Avoidance
Weather/Sunrise/Sunset/Moon Illumination	Sensor/Visual Search Responsibilities
Tactical Decision Aid/Transmissivity/Absolute Humidity	Departure/Enroute/Recovery
Notices to Airmen (NOTAMs)/Bird Strike Potential	High Density Traffic Areas
Personal Equipment	Mid-Air Collision Avoidance
Flight Crew Information File (FCIF)/Pubs/Maps	From Other Military Aircraft
GROUND PROCEDURES	From Civilian Aircraft
Intelligence Update	Dissimilar Formations
Step	Carriage/Jettison Limitations
Pre-Flight	Terrain Avoidance/Use of Controlled Flight into Terrain Prevention Systems
Aircraft	Departure/Enroute/Recovery
Armament	Altitude Warning Settings
Start/Check-In	Bird Strike Procedures
Arming/Taxi/Marshaling	Hazards Associated with Human Factors (e.g., Channelized Attention, Task Saturation/ Prioritization, and Complacency)
Spare Procedures	G-Awareness
TAKEOFF	G-Suit connection/G-tolerance/G-Awareness Turn
Runway Lineup	Use of L-1 Anti-G Straining Maneuver
Takeoff/Takeoff Interval	Visual Illusions/Perceptions
Abort	Spatial Disorientation/Unusual Attitudes
Jettison Procedures	Lost Wingman
Low Altitude Ejection	Radio Inoperative
Landing Immediately After Takeoff	SAR/On-Scene Commander
DEPARTURE/ENROUTE	Recall Procedures
Routing	Special Interest Items
Trail Departure	Pilot currencies for events to be flown
Join-Up/Formation	Training Rules/Special Operating Instructions/Rules of Engagement
Systems/Ops Checks	
AIRSPACE	
Area	
Times	

Restrictions (Electronic Attack/Electronic Protection (EA/EP)/Chaff/Flare/Supersonic) Bailout (Controlled/Uncontrolled) MSA RECOVERY Rejoin Battle Damage Check Type Recovery Flight Break-Up Pattern and Landing After Landing/De-Arm Emergency/Alternate Airfields	Operational Risk Management Assessment, hazards to this flight Factors mitigating risk When to reassess Tactical Portion of Mission

Table A2.2. Additional Briefing Items, Air Refueling.

GENERAL Tanker Call sign(s)/Receiver Assignments Refueling Track(s) Altitude Airspeed Airspace Restrictions Air refueling initial point(s), contact point(s), contact time(s) Radio Frequencies BUDDY PROCEDURES Departure Join-Up ENROUTE Route of Flight Formation Ops Checks RENDEZVOUS Type Rendezvous Holding Procedures/Formation Ground Radar Assistance Tanker Identification – Tactical air navigation (TACAN)/Radar/IFFI/Visual Radar Procedures/Techniques Wingman/Deputy Lead Responsibilities Receiver Formation/Join-Up Procedures Rendezvous Overrun REFUELING Checklist Procedures Radio Calls Refueling Order Techniques Radio Silent Procedures	REFORM AND EXIT Formation Clearance EMERGENCY PROCEDURES Breakaway Procedures Systems Malfunctions Damaged Receptacle IMC/NIGHT CONSIDERATIONS Lost Wingman Procedures Aircraft Lighting SPECIAL SUBJECTS Fuel Awareness/AB Use/Consumption Rates Flight Path Deconfliction/Other Receiver Considerations Hazards Associated with Human Factors (e.g., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Emissions control (EMCON) Visual Signals Fuel Off-Load Bingo Fuel (Abort Points/Abort Bases) Drop-Off Procedures Wake Turbulence	

Table A2.3. Additional Briefing Items, Instrument/Advanced Handling.

AIRWORK Airspace Restrictions Area Orientation Instructor Responsibilities Maneuvers APPROACHES Frequencies Holding Penetration Missed Approach/Climb Out	SPECIAL SUBJECTS "G" Awareness Fuel Awareness/AB Use/Consumption Rates Special Subjects and Maneuvering Limitations Airspeed and "G" Recognition/Prevention/Recovery From Out of Control Maneuvering at Heavyweight/High Angles of Attack/Asymmetrical Configuration Time to Ground Impact Wings Level Overbank/Under G Hazards Associated with Human Factors (e.g., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Table A2.4. Additional Briefing Items, Low-Level Navigation.

GENERAL Route/Clearance/Restrictions Flight Responsibilities Navigation Radar/Visual Search Entry/Spacing /Holding/Initial Altitude (MSA) ROUTE PROCEDURES Fence Checks Tactical Formation/Turns Low Level Navigation Dead Reckoning/Use of Navigation Aids/ Equipment Sensor Procedures/Techniques/Predictions Visual Procedures/Techniques/Infrared (IR) Predictions Updates/Calibrations Time/Fuel Control Terrain Following/Avoidance/Wingman Considerations Leg Altitudes/Obstacle Avoidance (MSL/AGL) Use of Altitude Warning Features Threat Reactions EA/EP/Expendable Countermeasures (EXCM)	EMERGENCIES Aircraft Malfunctions Route Abort Procedures (RAA/MSA)/ATC Frequencies TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS/ALTERNATE MISSION (refer to appropriate mission briefing guide) SPECIAL SUBJECTS Airspace Restrictions Fallout/Late Rejoin "G" Awareness/Ops Checks Fuel Awareness/AB Use/Consumption Rates Flight Path Deconfliction Maneuvering Limitations Airspeed and "G" Time to Ground Impact Wings Level Overbank/Under "G" Night Considerations Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Engagement Criteria Flight Path Deconfliction Termination	

Table A2.5. Additional Briefing Items, Air-to-Surface Employment.

GENERAL Intelligence, Threat Scenario Operating Area Entry, Description, Boundaries FENCE Checks Enroute Formation(s), Look Out Responsibilities, Low-Level/LOWAT Brief Low Observable Considerations Ordnance/Weapons Data Type, Fusing Weapons Settings Live Ordnance Procedures, Minimum Altitudes Fuse Arming, Safe Escape, Safe Separation Frag Avoidance Laser Operations Control Agencies Call signs Frequencies Authentication, Authority Coordination Attack Package Times, Support Data Gathering, Transmission Airspace Restrictions Mission Number Friendly Forces Play Time INGRESS Formation Route of Flight Control Agency Call sign/Frequency THREAT Type Numbers Threat reactions Low Observable considerations AIR-TO-AIR TACTICS Detection Identification (ID) Criteria Search Responsibilities (Sensor/Visual) Targeting Plan Tactic Execution	CLOSE AIR SUPPORT/MARITIME AIR SUPPORT/STRIKE CONTROL AND RECONNAISANCE PROCEDURES Working Area Coordination Required Formations, Working Altitude Target Types, Threat Array Low Observable Considerations Attack Tactics WEAPONS DELIVERY Tactics Type Delivery Switchology Attack Parameters Visual Lookout, Mutual Support Responsibilities Egress Flow Loss of Mutual Support, Rendezvous Point Low Observable Considerations Mission Reporting (Bomb damage assessment /Hit assessment/In-Flight Report) EGRESS Tactics Low Observable Considerations Formation Rendezvous point COMBAT SAR PROCEDURES Downed Aircraft Procedures Communications Procedures On-Scene Commander Fuel Considerations Ordnance Considerations CONTINGENCIES One/Two/Three-Ship Options Code Words, Comm Out Signals Weather Back-Up Deliveries Degraded Systems Reattack Asymmetrical Considerations Jettison Procedures/Parameters Hung/Unexpended Ordnance Procedures

Formation Low Observable Considerations Shot doctrine and mechanics Minimum Abort Range (MAR) Penetration Decision Recommits SUPPRESSION OF ENEMY AIR DEFENSE PROCEDURES Target type(s) Weaponeering (required probability of destruction) Weapon(s) / Fuse settings Designated Point of Impact sort Release criteria Attack Contingency Low Observable Considerations Degraded weapon state (inertial nav only) Re-attack (formation/procedures)	Wounded Bird, Escort Procedures IFF, Min-risk Routing, Low Observable Considerations Low Fuel/Ordnance

Table A2.6. Additional Briefing Items, Night.

WEATHER/ILLUMINATION Civil/Nautical Twilight Moon Rise/Set Times/Phase/Elevation/Azimuth Ceiling/Visibility Illumination/Electro optical tactical decision aid Obscurants to Visibility BEFORE TAKEOFF Cockpit Setup Cockpit Lighting Cockpit Familiarization AIRBORNE Exterior Lights NVD Scan Pattern Forward Scan Field of View Peripheral Vision Scan Techniques NVC Canopy Bow Obscuration Join-up and Enroute Considerations Rejoin/Closure Multi-waveform Advanced Datalink (MADL)/air-to-air TACAN G-Awareness Considerations Lighting Deconfliction/Separation MISSION Route Study/Scene Interpretation NVD Predictions/Albedo	TARGET AREA Holding Procedures (NVD Differences) NVD Lost Wingman Deliveries/Pattern Procedures Minimum Altitudes Flight Member Responsibilities Moth Effect Deconfliction External Lighting/Deconfliction Procedures AB, Flares, and IR Detection Considerations Threat ID and Reaction Egress RTB NVD off for landing NVD SAFETY NVD Lost Sight NVD Lost Wingman Depth Perception Visual Illusions NVD Failure Transition to/from NVD and degraded acuity operations Overconfidence in NVD Capabilities Entering Weather/Transition to Instruments Disorientation/Vertigo Deconfliction contracts Transference Target Fixation

Terrain/Shadowing/Visual Illusions/Visible Horizon City/Cultural Lighting Direction/Orientation of Lighting Aggressive Formation Maneuvering Terrain Avoidance Map Reading	Fatigue Aircraft EP and NVD battle damage check considerations Laser Eye Protection Use

Table A2.7. Additional Briefing Items, Adversary Coordination.

GENERAL Time Hack and Classification of Briefing Call signs, Number and Type Aircraft Scenario/area of responsibility discussion Objectives Weather/NOTAMS Mission Overview GROUND OPS Taxi/Marshall/Arming deconfliction and timing Check-in time/Freq Minimum numbers How much delay available TAKEOFF Times Military assumes responsibility for separation of aircraft (MARSA) options DEPARTURE Routing Weather Check Late entries AREA Airspace times Restrictions Altitude Supersonic Chaff/Flare Noise Sensitive Points/Marshall and Cap Limit Lines Average terrain (Controlled/Uncontrolled bailout altitudes) Ground references Emergency airfields RECOVERY Order/MARSA Dissimilar formations ABNORMAL PROCEDURES EPs (Like/dissimilar aircraft) Cruise/Gear/Final Approach Airspeeds	SPECIAL INTEREST ITEMS LADDER Special Instructions/SETUPS Red-air replications Regeneration criteria FIGHT ADMINISTRATION Desired Setup Range (if applicable) Fight's On/Knock-it-off per engagement or Continuous Vulnerability window Vulnerability window times (if applicable) Timeout/Kill rules of engagement (ROE) Range training officer (RTO)/Non-RTO Probability of kill Option (IAW AFTTP 3-1.F-35, *Tactical Employment*) Timeout, Timeout Tally and Kill Passage, acknowledgement, relays and repeats Kill removal procedures Terminate (reasons and procedures) Knock-it-off (reasons and procedures) TRAINING RULES IAW AFI 11-214 Highlights Maneuvering limits (limited/unlimited) Bubble Blocks LOWAT transition altitude (if applicable) Floor CONTINGENCIES Weather Airborne Warning and Control System (AWACS)/ Control and Reporting Center (CRC) control fallout Aircraft fallout (minimum numbers) Alternate missions DEBRIEF Time/Location Required information QUESTIONS

NORDO Lost Wingman SAR combat air patrol (SARCAP) SPECIAL SUBJECTS Mid-Air Collision Avoidance "G" Awareness Fuel Awareness/AB Use/Consumption Rates Flight Path Deconfliction Channelized Attention, Task Saturation/Prioritization, and Complacency	

Table A2.8. Additional Briefing Items, AWACS/CRC and Tactical Intercepts.

GENERAL Area Information CAP Points Target Locations Bullseye location and cuts of critical points Radar and Communication blind zones Safe Areas/forward edge of the battle area/Ground Threats Friendly Surface to Air Missile Locations Threat Type and Simulation ID Criteria Communications Requirements (other than AFTTP 3-1.F-35) Type/Level of Control Frequencies IFF squawk and procedures Training Rules Blocks Floor/Transition altitude FLIGHT/ELEMENT TACTICS Fill-ins Contrail altitude Winds aloft Ordnance Reload criteria for training ID criteria and method(s) EMCON procedures Avionics Set-up Radar Elevation Waypoints/Route IFF MADL Scan Schedules/Search Volumes CAP	Intercept Phase Formation/Altitude/Airspeed Detection ID Criteria Search Responsibilities (Radar/Visual) Targeting Plan Tactic Execution Formation Low Observable Considerations Engagement Phase Shot doctrine and mechanics MAR Penetration Decision Recommits Egress Formation/Responsibilities Contingencies Avionics Malfunction Electronic Warfare Fail/Degrade EXCM IFF and Min-risk Routing Low Fuel/Ordnance Rendezvous point Live Missile/Loaded Gun Safety Procedures Additional Considerations Threat Reaction Code words Electromagnetic Interference (EMI)/EP/EA Effects

Formation/Altitude/Airspeed Search Responsibilities Commit Criteria/Range Procedures Low Observable Considerations	

Table A2.9. Additional Briefing Items, Aerial Gunnery Tow Coordination.

Ground/Takeoff/Departure Rendezvous Airspace Data GCI Support Target Launch/Chase Shooter Order Type Pattern Tow Altitude Block(s)/Flight Parameters Intercept Phase/Pattern Set-Up Arming Procedures Timing Tow Maneuvering Parameters Shooter/Firing Plan Radio Procedures Termination Timing Minimum Altitude Joker/Bingo Fuel Winchester Fouls	Armament Safety Check Scoring Subsequent Set-Ups Target Drop Procedures Recovery Order Abnormal Procedures Erratic Target During Deployment During Employment Target Drag-Off Recovery with Target/Cable NORDO During Engagement Target Drop Visual Signals Recovery

Table A2.10. Additional Briefing Items, Aerial Gunnery.

GENERAL Formation Area Information Controlling Agency Airspace Restrictions Frequencies Switch Positions Arming Procedures Intercept/Set-Up Shooter Sequence Position Changes Chase Procedures Timing EMPLOYMENT Firing Parameters Minimum Range	TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS/ALTERNATE MISSION Type Mission (refer to appropriate mission briefing guide) Mission Objectives SPECIAL SUBJECTS Minimum Altitudes "G" Awareness Fuel Awareness/Ops Checks/AB Use/Consumption Rates Maneuvering Limitations Airspeed/"G"/Stress Recognition/Prevention Hazards Associated with Human Factors (e.g., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Overtake Angle-Off Error Analysis Contingencies Avionics Malfunctions Gun Malfunctions Range Estimation without Radar Safety Considerations Target Fixation Debris Avoidance Fouls	

Table A2.11. Additional Briefing Items, Aerospace Control Alert.

MISSION DATA	IN-FLIGHT PROCEDURES
Time Hack and Classification of Briefing	Formation
Mission Data Card	Airspeeds
Call signs	Weapons Safe Checks
Aircraft/Location/Status	Sensor Search Responsibilities
Takeoff/Landing Data (Worst Case)	Degraded Fire Control System
Joker/Bingo Fuel	Transfer of Lead Procedures
Actual/Forecast Weather	Ops Checks
Home base	EMCON Procedures
Alternates	Region MSA
Individual Weather Category/Mandatory Status	Visual ID Procedures
NOTAMs	Authority Required to Close
FCIF/Pubs/Maps	Formation/Tactics
Personal Equipment	Range/Altitude Separation Requirements on Target
Alert Packet	Prior Permission to Close With/Without Visual Contact
Authenticators/Duress Code	Sensor Lock-On Requirements
Security Procedures	Maximum Closure Speed
Airfield Status	Minimum Airspeed
Actual versus Max Allowable Tailwind	Loss of Contact Procedures
Barriers	Breakaway Procedures
Navigation Aids	Restrictions
Hazards to Taxi/RCR	Aircraft in Distress
GROUND PROCEDURES	Minimum Closure Distance
Aircraft/Armament Preflight	Visual Signals - Day/Night
Cockpit Set-Up	Escort Procedures
Engine Run/Hot Preflight	Recovery/Landing Visual Signals
Crew Chief Briefing	Dissimilar Formation Procedures
Act only on pilot's instructions	Jettison Procedures
Ground emergency procedures	Lost Wingman
Hand signals	SARCAP
Aircraft danger areas	Emergency Airfields
Quick Check Procedures	SPECIAL SUBJECTS
LAUNCH PROCEDURES	Emergency of the Day

Notification/ Frequency/Authentication Requirement Status Airborne Order Battle Stations Runway Alert Scramble Taxi Takeoff/Runway Lineup/Interval/Formation Day VMC/IMC Night VMC/IMC Join-up/Trail Formation/Power Settings/Airspeeds	Fuel Awareness Maneuvering Limitations Recognition/Prevention/Recovery from Loss of Control Spatial Disorientation Recall Procedures Rules of Engagement Hazards Associated with Human Factors (e.g., Channelized Attention, Task Saturation/Prioritization, and Complacency) Special Interest Items Operational Risk Management Assessment, hazards to this flight Factors mitigating risk When to reassess

Table A2.12. Additional Briefing Items, Escort (Enroute to Rendezvous/Post-mission).

GENERAL Formation Route of Flight Control Agency Call sign/Frequency RENDEZVOUS Protected Force Call sign Altitude Airspeed Number of Aircraft ESCORT PROCEDURES Striker Ingress Route(s) Formation Altitude Airspeed Primary/Secondary target locations and time over targets Tactics/EMCON Type Formation Tactics Low Observable Considerations	Commit Criteria/Range Procedures Escort Route Contracts Targeting Strikers Lean/Spin procedures Egress Tactics Formation Contingencies Avionics Malfunction Electronic Warfare Fail/Degrade EXCM IFF and Min-risk Routing Low Fuel/Ordnance Rendezvous point Additional Considerations EMI/EP/EA Effects

Table A2.13. Additional Briefing Items, Ground Crew Briefing.

GENERAL Act only on pilot's instructions Ground emergency procedures Hand signals Aircraft danger areas	

Table A2.14. Mission Debriefing Guide.

GENERAL Ground/Takeoff/Join-Up/Departure Enroute Procedures Recovery/Landing/After Landing Special Interest Items/Training rules/ROE issues Radio Procedures Flight Discipline/Effectiveness	MISSION ACCOMPLISHMENT/ANALYSIS Mission Reconstruction Debrief Focus Point(s) Portable Memory Device Assessment Anti-G Straining Maneuver Effectiveness Objectives Analysis Debrief Focus Points/Root Cause/Instructional Fixes (as applicable)