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SECRETARY OF THE AIR FORCE**

**AIR FORCE INSTRUCTION 11-2F-15E,  
VOLUME 3**



**5 APRIL 2013**

***Flying Operations***

***F-15E –OPERATIONS PROCEDURES***

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This volume establishes effective and safe operations of the F-15E and implements AFPD 11-2, *Aircrew Operations*; AFPD 11-4, *Aviation Service*; AFI 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*; and AFI 11-202V3, *General Flight Rules*. It establishes the minimum Air Force operations procedures for personnel performing duties in the F-15E. This publication applies to the US Air Force Reserve Command (AFRC). This publication does not apply to the Air National Guard (ANG). Selected paragraphs of this publication do not apply to all Air Force units. When an exception exists to the requirements of a paragraph, the exception is indicated in a parenthetical within the paragraph, or by using subparagraphs directed at specific units. MAJCOMs, Direct Reporting Units (DRU) and Field Operating Agencies (FOA) will forward proposed MAJCOM/DRU/FOA-level supplements to this volume to AFFSA/A3OF, through HQ ACC/A3TO, for approval prior to publication IAW AFI 11-200. Copies of approved and published supplements will be provided by the issuing office to AFFSA/A3OF, ACC/A3TO, and the user MAJCOM/ DRU/FOA offices of primary responsibility (OPR). IAW AFI 11-200, field units below MAJCOM/DRU/FOA level will forward proposed supplements to the lead AFI OPR for review and coordination prior to approval and publication. **NOTE:** The above applies only to those DRUs/FOAs that report directly to HQ USAF. Keep supplements current by complying with AFI 33-360, *Publications and Forms Management*.

Waiver authority to this publication is set out in para 1.3 See para 1.4 for guidance on submitting comments and suggesting improvements.

This instruction requires the collection or maintenance of information protected by the Privacy Act of 1974. The authority to collect and maintain the records prescribed in this instruction are 37 USC 301a, Incentive Pay; Public Law 92-204 (Appropriations Act for 1973), Section 715; Public Law 93-570 (Appropriations Act for 1974); Public Law 93-294 (Aviation Career Incentive Act of 1974); DoD Instruction 7730.57, *Aviation Career Incentive Act of 1974 and Required Annual Report*; AFI 11-401, *Aviation Management*; and E.O. 9397, *Numbering System for Federal Accounts Relating to Individual Persons*. System of records notice F011 AF/XOA, Aviation Resource Management System (ARMS), applies and is available at <http://privacy.defense.gov/notices/usaf/>.

Records Disposition. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located in the Air Force Records Information Management System (AFRIMS). **NOTE:** This instruction contains references to the following field (subordinate level) publications and forms which, until converted to departmental level publications and forms may be obtained from the respective MAJCOM publication distribution office.

### **SUMMARY OF CHANGES**

This document has been substantially revised and must be completely reviewed. Paragraphs have been reorganized to increase standardization with other AFI 11-2MDS Vol 3s and improve logical flow. A thorough review of this instruction is required by all aircrew to understand the implications of the reorganization.

Changes by chapter and paragraph are as follows: **Chapter 2** Listed references for Flight Map Preparation. **2.2.1** Added reference to asymmetry. **2.4.1.3** Updated TO references. **2.4.4.1** References AFMAN 11-217, V2 for low level planning and map guidance. **2.4.4.5** Updated Terrain Following TF Flight Map Preparation; added Terrain at 1NM data, and added Command level-off begins data. **2.6.4** Added FTU guidance for Multiple Sortie Days and changed “missions” to “sorties”. **Chapter 3** **3.7.3** Added asymmetric loading guidance for formation takeoffs. **3.6.9.1** Added TO 1F-15E-1-2-1CL-1 reference for Hot Brakes ops. **3.9.1** Deleted references to AFTTP 3-3.F-15E and AFTTP 3.1.F-15E. **3.13.4** Updated usage of term “US NAS”. **3.17.6.4** Expanded “Show of Force” guidance. **3.17.7** Expanded definition of Low Altitude to include less than 5,000’ AGL. **3.17.10** Updated Low Altitude Target Pod usage guidance. **3.18.5** Updated TO reference. **3.19** Tied Joker/Bingo Fuel guidance to AFI 11-214. **3.22.2** Updated go-around procedures. **3.27** Deleted reference and guidance for Formation Landings. **3.27.1** Added reference to asymmetries greater than 3,000 ft-lbs. **3.31** Updated Night Join-Up verbiage. **3.32.2** Added references to Spatial Disorientation. **3.36** Updated Change of Aircraft Control verbiage. **3.38** Updated F-15E Crew Duties guidance. **3.38.3.1** Added an exception for WSO Flying guidance. **3.39** Updated AAI/EID flight guidance. **Chapter 4** Updated guidance for EADI usage in day/night and IMC. **4.1** Complete revamp of HUD, EADI usage. **4.3.2.1** Replaced AFTTP 3-13.F-15E reference for “Use a minimum of 20 seconds takeoff spacing. Added reference to FDL usage. **Chapter 5** Cleaned up maneuvering limitations and added asymmetry references. **5.2** Updated Simulated Gun Employment guidance. **5.3.3** Clarified maneuvering limits with external wing tanks. **Chapter 6** Revamped Air-to-Surface Weapons

Employment. **6.1** Clarified guidance for Master Arm procedures. **6.2** Added AFI 11-214 guidance/restrictions. **6.3** Added expanded Strafe guidance. **6.6.3.2** Changed “Ballistic” to “Unguided”; updated procedures and systems requirements. **6.7** Added robust Nighttime Targets of Opportunity section. **Chapter 7 7.2.3** Deleted. **7.3.5** Updated Brake Overheat direction. **7.5.3** Expanded/updated Surface Attack NORDO Procedures. **7.6** Updated Severe Weather Penetration guidance. **7.9.2** Added reference to AFI 11-214. **7.11.5.2** clarified Supervisory Requirements and further defined IQT pilot status. **Chapter 8 8.1** Deleted verbiage requiring distribution of Chapter 8.

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## Chapter 1

### GENERAL GUIDANCE

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

**1.2. Responsibilities.** This instruction, in conjunction with other governing directives, prescribes procedures for operating F-15E aircraft under most circumstances. It is not a substitute for sound judgment. Procedures not specifically addressed may be accomplished if they enhance safe and effective mission accomplishment.

**1.3. Waivers.** Unless another approval authority is cited, waiver authority for this volume is MAJCOM/A3, or COMAFFOR for those aircrew and assets under a COMAFFOR's oversight. Waivers are issued for a maximum of one year from the effective date. COMAFFOR will notify HQ ACC/A3 and home station MAJCOM/A3 of waivers within 72 hours of approval.

**1.4. Deviations.** In the case of an urgent requirement or aircraft emergency the pilot in command (PIC) will take appropriate action(s) to safely recover the aircraft. If time permits, specific approval of the MAJCOM/A3 or COMAFFOR will be obtained for one time deviations from these procedures.

**1.5. Processing Changes.**

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

1.5.2. The submitting MAJCOM will forward information copies of AF Forms 847 to all other MAJCOMs that use this publication. Using MAJCOMs will forward comments on AF Forms 847 to the OPR.

1.5.3. OPR will:

1.5.3.1. Coordinate all changes to the basic volume with affected MAJCOM/A3s.

1.5.3.2. Forward change recommendations to AFFSA/A3OF for staffing and AF/A3/5 approval.

## Chapter 2

### MISSION PLANNING

**2.1. Responsibilities.** The responsibility for mission planning is shared jointly by all flight members as well as the Ops and Intel functions in the unit.

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

2.2.1. **Planning.** Accomplish sufficient flight planning to ensure safe mission execution to include fuel requirements, map preparation, takeoff and landing data (TOLD), as well as the lateral asymmetry of the aircraft due to the planned configuration (**USAFE:** For sorties landing at other than home-station, reference AFI 11-202V3\_USAFESUP\_I, Attachment 5, CONTROL OF FIGHTER AIRCRAFT FOR OFF STATION SORTIES/DIVERT). Consider foreseeable safety risks and adopt risk mitigation factors in accordance with Operational Risk Management (ORM).

2.2.2. **Standards.** The SQ/CC is the approval authority for squadron standards. OG/CC may publish and approve group or wing standards. Ops Group Stan/Eval (OGV) will review all standards for compliance with AFI 11-series guidance.

#### **2.3. Unit Developed Checklists and Local Aircrew Aids.**

2.3.1. Unit developed checklists may be used in lieu of flight manual checklists (except -25 checklists) provided they contain, as a minimum, all items (verbatim and in order) listed in the applicable checklist.

2.3.2. Units will produce an aircrew aid that, as a minimum, includes:

2.3.2.1. Briefing guides (reference Briefing Guide Attachments in this volume).

2.3.2.2. Local radio channelization and airfield diagrams.

2.3.2.3. Impoundment procedures, emergency action checklists, and No Radio (NORDO)/divert information.

2.3.2.4. Arresting gear information for divert bases.

2.3.2.5. Bailout and jettison areas and On-Scene Commander (OSC) checklist.

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

2.3.2.7. Other information as deemed necessary by the units (e.g. stereo flight plans, local training area diagrams, local area maps of sufficient detail to provide situational awareness on area boundaries).

#### **2.4. Flight Material Preparation.**

2.4.1. **Mission Data Card.** TOLD will be annotated on mission data cards.

2.4.1.1. The minimum TOLD required is maximum abort speed for expected conditions (i.e. dry/wet/icy), rotation/Nose Wheel Lift Off (NWLO)/takeoff speed, takeoff distance, single engine rotation/NWLO/SETOS, and normal/heavy weight landing distance for



expected conditions. As applicable, the following speeds will also be annotated: Min Go when it is equal to or greater than Max Abort; Adjusted Max Abort if used.

2.4.1.2. OG/CC approval is required for operations when Min Go exceeds Max Abort. Units will provide direction in their local supplements on when Adjusted Max Abort will be used.

2.4.1.3. The most current version of Technical Orders (TO) 1F-15E-1-1, *Flight Manual Performance Data USAF Series F-15E Aircraft*, 1F-15E-1-2-1CL-1 *Flight Crew Checklist USAF Series F-15E Aircraft*, and JMPS are the authorized sources for calculating TOLD.

2.4.1.3.1. Unit developed tabular data must be verified against the TOs and will include a date and signature block of the aircrew verifying it as correct.

2.4.1.3.2. OPR for certification of TOLD in automated systems is ACC/A8IM. OPR for revocation of certification due to TO change is ACC/A3TV. Units will be informed of revocation via MAJCOM Flight Crew Information File (FCIF) message.

2.4.2. **Local Area Maps.** A separate local area map is not required if the unit aircrew aid provides a local area map IAW para 2.3.2.7 (**USAFE:** on flights from a deployed location, each aircrew will have available a local map annotated with designated flying areas, emergency airfields, buffer zones, control zones, and restricted or danger areas if this information is not available in a deploy-location aircrew aid).

2.4.3. **Charts.** Flight Information Publications (FLIP) en route charts may be used instead of maps on navigational flights within areas that are adequately covered by these charts.

#### 2.4.4. **Low Altitude Maps**

2.4.4.1. Reference AFMAN 11-217V2, Chapter 3 for guidance on low-level planning and map preparation.

2.4.4.2. For all flights conducted in the low-level structure (i.e. below 1,000 feet AGL or as defined by host nation), each aircraft in the flight will contain a minimum of one Chart Handbook Manual (CHUM) updated map of the low altitude route or training areas. The map will be of a scale and quality that terrain features, hazards, and chart annotations are of sufficient detail to allow navigation and safe mission accomplishment.

2.4.4.3. Highlight all manmade obstacles at or above the planned flight altitude.

2.4.4.4. IAW AFMAN 11-217V2, Chapter 3, annotate all maps with both an Emergency Route Abort Altitude (ERAA) for the overall route/area and Minimum Safe Altitudes (MSA) for each leg of the intended route of flight.

2.4.4.4.1. Compute the ERAA (a.k.a. Emergency Safe Altitude [ESA]) IAW AFMAN 11-217V2, Chapter 3.

2.4.4.4.2. Compute the MSA at a minimum of 1,000 feet above the highest obstacle/terrain (rounded up to the next 100 feet) within 5NM of the planned course to include the aircraft turn radius.

2.4.4.5. **Terrain Following (TF) Flight Map Preparation.** In addition to the low altitude map requirements listed above:

2.4.4.5.1. Annotate maximum and minimum route structure altitudes if applicable.

2.4.4.5.2. To ensure maps accurately display planned routes, TF turn point bank angles must reflect realistic systems limitations.

2.4.4.5.3. In order to verify proper operation of the TF system, TF letdown corridors for the primary (and planned alternate[s], if applicable) entry points for low level routes will be computed and briefed. As a minimum, compute MSA and Recovery Initiation Altitude (RIA). Also include values for terrain at 1 NM and command level off based on the following calculations.

2.4.4.5.3.1. Terrain at 1 NM equates to  $2000' + \frac{1}{2} \text{ dive angle} \times 100'$ . For example, using  $12^\circ$  dive and 480 GS, terrain at 1 NM equates to 2600'.

2.4.4.5.3.2. Command level-off begins at  $1,000' + \frac{1}{2} \text{ dive angle} \times 100'$ . For example, using  $12^\circ$  dive and 480 GS, command level-off begins at 1,600' AGL (NLT 1,200 AGL).

2.4.4.5.4. For night TF missions select letdown points that avoid initial descents into rugged or mountainous terrain (defined by TO 1F-15E-1-2-1, Section 5, as any vertical change that exceeds 900 ft/NM).

2.4.5. (**CONUS Only**) Aircrew members flying under VFR or inside MTRs will supplement existing mission planning materials (e.g. CHUM, FLIP AP/1B, etc.) IAW AFI 11-202V3\_ACCSUP, Chapter 2, mission planning requirements.

2.4.6. Aircrew members flying outside CONUS will follow gaining MAJCOM, theater, or host nation guidance on mission planning (**USAFE:** reference AFI 11-202V3\_USAFESUP\_I, Chapter 2). If no gaining MAJCOM, theater, or host nation guidance exists, use the best charts or MPS overlay options available to accomplish the above requirements.

**2.5. Fuel Conservation.** Design procedures for optimal fuel use and efficiency throughout all phases of mission execution. Incorporate enroute tasks to maximize use of airborne training opportunities.

## **2.6. Preflight Brief.**

2.6.1. All flight crewmembers and passengers must attend the flight brief unless previously coordinated with unit supervisors.

2.6.2. **Anyone not attending the flight brief must receive, as a minimum,** an overview of the expected mission flow and events as well as a thorough crew brief that includes potential emergency procedures (EP). These requirements must be accomplished prior to aircrew step.

2.6.3. Flight leads/instructors are responsible for presenting a logical brief which will promote safe and effective mission accomplishment.

2.6.3.1. Ensure brief start time provides adequate time to discuss required items and accounts for mission complexity. As a minimum, begin briefs at least 1.5 hours before scheduled takeoff. Alert briefs will start in sufficient time to be completed prior to aircrew changeover.

2.6.3.2. Structure the brief to accommodate the capabilities of each flight member.

2.6.3.3. Ensure contracts, roles, and responsibilities of each flight member are established, briefed, and debriefed.

2.6.3.4. Include mission priorities, significant rules (e.g. Rules of Engagement [ROE], Special Instructions [SPINS], Training Rules [TRs]), task management, weather, NOTAMs, and EPs.

2.6.3.5. Ensure a formation deconfliction, blind, and get well plan for every phase of flight is briefed and every flight member understands the plan (use para 3.10 as a baseline). All flight members are responsible for executing this plan.

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

2.6.3.7. Include the following special subjects:

2.6.3.7.1. Radar and visual search responsibilities during departure/enroute/recovery;

2.6.3.7.2. High density traffic areas;

2.6.3.7.3. Mid-air collision avoidance both from other military aircraft as well as civilian aircraft;

2.6.3.7.4. Lateral Asymmetry considerations (as applicable) to include: takeoff asymmetry, tactical portions based on planned weapons expenditure, lateral asymmetry highlight areas (e.g. external tank fuel imbalance combined with high G/high AOA maneuvering).

2.6.3.8. Include flight responsibilities, proper formation position (to ensure adequate wingtip clearance), and aircraft-unique requirements for each phase of flight when dissimilar aircraft or aircraft configurations are flown in the same formation.

2.6.3.9. For missions using Night Vision Goggles (NVG), emphasize proper tuning, use, and limitations.

2.6.3.10. **Low Altitude (i. e.  $\leq 5,000$  feet AGL) Mission Briefs.**

2.6.3.10.1. Emphasize low altitude flight maneuvering, obstacle and ground avoidance, Low Altitude Warning System (LAWS) and Ground Collision Warning System (GCWS) features and limitations, low altitude comfort level, and complacency avoidance.

2.6.3.10.2. For low altitude training over water and featureless terrain, include specific considerations with emphasis on minimum altitudes and spatial disorientation.

2.6.3.10.3. For low-level missions using TF, emphasize proper setup as well as both ground and air checks of the TF system, procedures for transitioning from medium altitude to low-level TF, and TF maneuvering limitations.

2.6.3.10.4. For low-level missions using TF in conjunction with NVGs, emphasize the inherent limitations of both systems and the necessary maneuvering restrictions that each imposes.

2.6.3.11. **Alternate Mission Briefs.** Brief an appropriate alternate mission for each flight.

2.6.3.11.1. The alternate mission must be less complex than the primary and should parallel the primary mission (e.g. Basic Fighter Maneuvers as alternate for Air Combat Maneuvers, Basic Surface Attack for Surface Attack Tactics, Tactical Intercepts for Defensive Counter Air).

2.6.3.11.2. If the alternate mission does not parallel the planned mission, brief the specific mission elements that are different.

2.6.3.11.3. Mission elements may be modified and briefed airborne as long as flight safety is not compromised. Flight leads will ensure changes are acknowledged by all flight members.

2.6.3.11.4. Do not fly unbriefed (either on the ground or in the air) missions or events.

2.6.3.12. **Briefing Guides.**

2.6.3.12.1. Reference the attachments to this AFI for basic briefing guide examples.

2.6.3.12.2. Subjects may be briefed in any sequence.

2.6.3.12.3. Those items published in AFIs, Air Force Tactics, Techniques, and Procedures manuals (AFTTP) or unit standards and understood by all participants may be briefed as "standard."

2.6.4. **Multiple Sortie Days.**

2.6.4.1. If all flight members attend an initial or mass flight brief, the flight lead on subsequent flights need brief only those items that have changed from the previous flight(s).

2.6.4.2. On multiple-go days when aircraft turn times do not allow follow-on mission brief(s) and only the initial flight brief is accomplished for all gos, the following guidance applies (FTU B/TX/SOC/I-course missions may be flown as desired in accordance with syllabus guidance):

2.6.4.2.1. Upgrade sorties will be flown on the first sortie (second sortie if the first is non-effective for weather, maintenance, or airspace availability).

2.6.4.2.2. Subsequent sorties missions will be of equal or less complexity with no additional upgrade training, unless approved by OG/CC.

2.6.4.2.3. Participants in continuation training (CT) missions may fly their primary or alternate missions in any sequence.

2.7. **Postflight Debrief.**

2.7.1. All missions will be debriefed.

2.7.2. All flight debriefs will include, at a minimum, the in-flight execution of flight member responsibilities, deconfliction contracts, tactical employment priorities, and task management.

## Chapter 3

### NORMAL OPERATING PROCEDURES

#### *Section 3A—Ground Operations*

#### **3.1. Preflight.**

3.1.1. Do not carry baggage or equipment in an unoccupied rear cockpit (**EXCEPTION:** Forms and maps may be stowed in the map case).

3.1.2. The pilot will brief the ground crew as required. Prior to starting, the pilot will get an “okay” signal from the rear cockpit occupant. Use operational headsets to the maximum extent possible during all engine start and pre-taxi checks as well as when technicians are performing tasks on the aircraft. Hand signals may be used as a last resort or if required during alert scramble or combat operations.

3.1.3. Unless dictated otherwise by superseding guidance (e.g. COMAFFOR guidance, theater SPINS, etc.) flying units will set the ejection seat radio beacon selector switch to AUTO.

3.1.4. Select Pressure Breathing (PBG) as desired. Do not select PBG if using the Aircrew Eye and Respiratory Protection System (AERPS) or Aircrew Chemical Defense Equipment (ACDE).

3.1.5. The use of the COMBAT EDGE vest is optional in the F-15E. If aircrew elect to fly with the COMBAT EDGE vest they will remove the port plug on the CRU-94 (if installed), properly stow the plug during flight to prevent a FOD hazard, then re-install upon completion of the sortie.

3.1.6. During the Before Taxi flight control checks, confirm the proper movement and position of the flight control surfaces with the crew chief.

3.1.7. **Minimum Daytime External Lighting.** Following is the minimum operational external lighting during daytime operations. Reference Section 3E *Night Procedures* for minimum required nighttime external lighting.

3.1.7.1. All anti-collision lights (reference AFI 11-202V3). **EXCEPTION:** Reduced or lights-out operations conducted IAW published guidance or as dictated by real-world tactical considerations.

3.1.7.2. Landing or taxi light.

3.1.7.3. IAW AFI 11-202V3, position lights are not required between sunrise and sunset, however they will be used to the maximum extent practical during daytime operations.

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

- 3.2.1. **Jet Fuel Starter (JFS) Start:** With clenched fist, pilot makes a pulling motion.
- 3.2.2. **Flight Controls Check:** Raise arm, clench fist, and make a stirring motion.
- 3.2.3. **Brake Check:** Hold left or right arm horizontal, open hand and push forward, breaking at the wrist (as in applying rudder pedal pressure with feet).
- 3.2.4. **Digital Electronic Engine Control (DEEC), Improved Digital Electronic Engine Control (IDEEC)/Asymmetric Thrust Departure Prevention System (ATDPS) Check:** With the fingers and thumb of each hand extended and joined at the tips, open and close the fingers and thumbs of both hands simultaneously, simulating nozzle opening and closing.
- 3.2.5. **Target Pod (TGP) Clear:** Extend arm and rotate a closed fist in a circular motion.
- 3.2.6. **Loss of Brakes While Taxiing (to the max extent practical regardless if the Emer Brake/Steer system is successfully engaged):** Lower tailhook.

### 3.3. Taxi and Quick Check/Arming.

- 3.3.1. The minimum taxi interval is 150 feet staggered or 300 feet in trail. Spacing may be reduced when holding short of or entering the runway.
- 3.3.2. Do not taxi during snow or icy conditions until the taxi route and runway have been checked for safe conditions. In this case, taxi on the centerline with a minimum of 300 feet spacing. The minimum Runway Condition Reading (RCR) for taxi operations is 10. OG/CCs may waive this to RCR 8.
- 3.3.3. Maximum taxi speed during sharp turns (more than 45 degrees of turn) is 10 knots. Above 10 knots the aircraft may skid or depart the three point attitude.
- 3.3.4. At non-USAF bases aircrew will make every attempt to coordinate for a rollover/End of Runway (EOR) inspection with the host maintenance unit.
- 3.3.5. Keep hands in view of ground personnel during quick check, arming, and de-arming operations. If the intercom system is not used during EOR checks, the pilot will establish and maintain visual contact with the ground personnel to allow the use of visual signals.
- 3.3.6. Do not taxi in front of any aircraft arming or de-arming forward firing ordnance.

### 3.4. Flight Lineup. Flights will line up as appropriate based on weather, runway conditions, and runway width.

- 3.4.1. When separating elements use a minimum of 500 feet spacing between elements.
- 3.4.2. For formation takeoffs wingmen must maintain wingtip clearance with their element lead.
- 3.4.3. If runway width precludes line-up with wingtip clearance between all aircraft in the flight, use 500 feet spacing between elements or delay run-up until the preceding aircraft or element releases brakes.

### 3.5. Before Takeoff Checks. After arming and prior to takeoff all flight members will inspect each other for proper configuration and any abnormalities.

## *Section 3B—Takeoff and Departure*

### 3.6. Takeoff.

- 3.6.1. Do not takeoff if the RCR is less than 12. OG/CCs may waive this to RCR 8.
- 3.6.2. On training missions, do not takeoff if the computed takeoff roll exceeds 80 percent of the available runway. For single-ship takeoffs, if the single-ship computed mil-power takeoff distance exceeds one-half of the available runway, takeoff using afterburner.
- 3.6.3. When operating from airfields equipped with a compatible, remotely operated cable, ensure the departure end cable is raised for all takeoffs and landings, unless another departure end cable is in place.
- 3.6.4. Use a minimum of 10 seconds (15 seconds when using afterburners) takeoff interval between aircraft or elements.
- 3.6.5. Use a minimum of 20 seconds takeoff interval when carrying live air-to-surface ordnance (N/A for 20mm ammunition) or when performing a trail departure.
- 3.6.6. Pilots will steer toward the center of the runway at the start of the takeoff roll.
- 3.6.7. OG/CCs may approve intersection takeoffs.
- 3.6.8. Do not takeoff over any raised web barrier (e.g. MA-1A, 61QS11) or loose/slack cable (e.g. BAK-12/13/14).

#### 3.6.9. Suspected Hot Brake Speeds.

- 3.6.9.1. Unit commanders will ensure Suspected Hot Brake speeds are re-calculated during Hot Pit or Quick Turn operations using TO 1F-15E-1-2-1CL-1 Brake Energy Limits Chart.
- 3.6.9.2. A takeoff abort made when adequate brake cooling time is not met (usually within one hour of a previous landing) can place the aircraft into the Brake Energy Caution Zone with brake applications as low as 80 knots (TO 1F-15E-1-2-1, *Flight Manual--F-15E* Section 5). Use the following guidance:
  - 3.6.9.2.1. Absorbed energy from landings made one hour or less prior to subsequent takeoffs will be added in full.
  - 3.6.9.2.2. Use a maximum of 20 million foot-pounds to calculate the abort speed where suspected hot brakes will be declared.

### 3.7. Formation Takeoff.

- 3.7.1. Formation takeoffs are restricted to elements of two aircraft.
- 3.7.2. Elements must be led by a qualified flight lead unless an Instructor Pilot (IP) is in the element.
- 3.7.3. Aircraft must be within 3,000 pounds of each other and symmetrically loaded. Consider “symmetrically loaded” as no greater than 8,000 ft-lbs of calculated lateral asymmetry.
- 3.7.4. Do not make formation takeoffs when:
  - 3.7.4.1. The runway width is less than 125 feet.

3.7.4.2. The Runway Surface Condition (RSC) is reported as wet, or ice, slush, or snow is on the runway. OG/CCs may waive this requirement if the center 125 feet of the runway is clear of standing water, ice, slush or snow.

3.7.4.3. The crosswind component exceeds 15 knots.

3.7.4.4. Loaded with live air to ground munitions.

3.7.4.5. Ferrying aircraft from a contractor or Air Logistics Center (ALC) facility.

3.7.4.6. The computed takeoff roll exceeds 50% of the available runway.

### **3.8. Initial Join-up and Rejoins.**

3.8.1. Minimum day weather criteria for a VFR join-up underneath: ceiling 1,500 feet, visibility 3 SM (5 KM).

3.8.2. Flight leads will maintain TO climb speeds until join-up is accomplished unless mission requirements necessitate a different airspeed.

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

3.8.4. For further join-up procedures, see para 3.31 (Night) and para 4.2 (Instruments).

### ***Section 3C—Enroute***

**3.9. Formation, General.** Flight leads/instructors are responsible for ensuring contracts, roles and responsibilities of each flight member are established and executed.

3.9.1. If any flight member cannot fulfill their basic responsibilities, contracts, or other assigned tasks, they will immediately communicate that information to the flight or element lead.

3.9.2. **IMC.** In IMC the maximum flight size is four aircraft except when flying in close formation with a tanker (refer to TO 1-F15E-1-2-1, Section VIII *Air Refueling Procedures* and Allied Tactical Publication (ATP)-56(B), *Air-to-Air Refueling*).

3.9.3. **Maneuvers.** Do not use rolling maneuvers to maintain or regain formation position below 5,000 feet AGL or outside of SUA (**USAFE:** Consider SUA as anytime the aircraft is under Basic, Traffic, or Deconfliction Service).

3.9.4. **Signals.** Airborne visual signals will be in accordance with AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*. For four-ship flights, formation changes will be initiated by radio call when practical. When formation position changes are directed by radio all affected wingmen will acknowledge prior to initiating the change. A radio call is mandatory when directing position changes at night or in IMC.

3.9.5. **Recovery.** When circumstances permit, flight leads will direct a battle damage (BD) check after each mission prior to or during Return to Base (RTB). This check is mandatory following the expenditure of any ordnance (including all types of 20mm ammunition) except at night or in IMC. Brief deconfliction responsibilities and position change procedures.



3.9.6. **Breakups.** Flight leads will not break up formations until each wingman has a positive fix from which to navigate (i.e. visual, Inertial Navigation System [INS], Embedded GPS/INS [EGI], or Tactical Air Navigation [TACAN])

3.9.7. **Changing Leads.** Lead changes require a clear transfer of responsibilities from one flight member to another.

3.9.7.1. Lead changes will be initiated and acknowledged with either a radio call or visual signal.

3.9.7.2. Ensure deconfliction is established before initiating a lead change.

3.9.7.3. The lead change is effective upon acknowledgment.

3.9.7.4. All flight members must continue to ensure aircraft separation during position changes.

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

3.9.7.6. The minimum altitude for a lead change is 500 feet AGL over land or 1,000 feet AGL over water (for night see para 3.32.3, for IMC see para 4.6)

3.9.7.7. When conducting lead changes from fingertip, route, spread, or tactical, do not initiate lead changes with the wingman further aft than 30 degrees from line abreast.

### 3.10. Formation Deconfliction.

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

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

3.10.1.2. Trailing aircraft and elements are responsible for deconfliction from the lead aircraft and elements. Wingmen and elements will deconflict vertically from the lead/lead element to the max extent practical. During maneuvering  $\leq$  1,000 feet AGL, wingmen and trailing elements will deconflict above the lead/lead element.

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

3.10.2.1. When any flight member calls "blind", they will initially maneuver away from the last known position of the other flight member/element (primarily by altering altitude) and await a response. The appropriate flight member will immediately respond with "visual" and a position report or "blind".

3.10.2.2. If the other flight member is also "blind", then the flight lead will take action to ensure altitude separation between flight members and elements.

3.10.2.2.1. The flight lead will specify either AGL or Mean Sea Level (MSL) when directing the formation to deconflict and use a minimum of 500 feet altitude separation.

3.10.2.2.2. Avoid climbs or descents through the deconfliction altitude when possible.

3.10.2.3. If visual contact is still not regained, the flight lead will take additional action to ensure flight path deconfliction within the flight to include a Terminate/Knock-It-Off (KIO) call if necessary. The flight lead should consider scenario restrictions such as sanctuary altitudes and adversary blocks when directing deconfliction.

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

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

3.10.3.1. The wingman is normally responsible for flight path deconfliction.

3.10.3.2. The flight lead becomes responsible for deconfliction when:

3.10.3.2.1. Tactical maneuvering places the lead in the wingman's "blind cone" or forces the wingman's primary attention away from the lead (i.e. wingman becomes the engaged fighter).

3.10.3.2.2. The wingman calls "padlocked" or "blind".

3.10.3.3. Deconfliction responsibility transfers back to the wingman once the wingman positively acknowledges a visual on his lead (except in cases of tactical maneuvering where the flight lead is no longer in the wingman's blind cone).

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

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

3.10.4.2. Trailing aircraft and elements will maintain sufficient spacing so that primary emphasis during formation maneuvering and turns is on low altitude awareness and deconfliction within elements, not on deconfliction between elements.

### 3.11. Chase Formation.

3.11.1. **Restrictions.** Any pilot may fly safety chase for aircraft with a problem or under emergency conditions.

3.11.1.1. 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.

3.11.1.2. Specialized missions (i.e., Operational Test and Evaluation (OT&E), Weapon Systems Evaluation Program (WSEP), live weapons delivery, etc.) and training conducted IAW AFI 11-2F-15EV1 may be chased by Combat Mission Ready (CMR)/Basic Mission Capable (BMC) pilots designated by group or squadron commanders.

3.11.1.3. All other chase events may only be flown by an IP, Stan/Eval Flight Examiner (SEFE), or upgrading IP (UIP) under the supervision of an IP.

3.11.2. **Procedures.**

3.11.2.1. A safety observer in a chase aircraft, except IP/SEFE/specialized mission chase, will maneuver in a 30-60 degree cone and maintain nose/tail separation to effectively clear and provide assistance.

3.11.2.2. IP/SEFE/specialized mission aircraft will maneuver as necessary, but must maintain nose/tail separation.

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

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

**3.12. Show Formation.** Refer to AFI 11-209, *Aerial Event Policy and Procedures* and applicable MAJCOM directives for specific rules and appropriate approval levels to participate in static displays and aerial events.

**3.13. Maneuvering Parameters.**

3.13.1. If flight through wingtip vortices or jetwash is unavoidable or inadvertently encountered, immediately unload the aircraft to approximately 1 G.

3.13.2. Do not extend flaps during Air Combat Training (ACBT).

**3.13.3. Minimum Altitudes.**

3.13.3.1. Nose high, low speed recoveries and Aircraft Handling Characteristics (AHC) vertical maneuvers: 10,000 feet AGL.

3.13.3.2. Aerobatics: 5,000 feet AGL.

3.13.4. **Authorized speeds.** (US NAS) Below 10,000 feet MSL (outside SUA or MTRs) fly no faster than the maneuvering airspeeds as published in TO 1F-15E-1-2-1 (e.g. 300 - 350 KCAS unless in the radar pattern). In order to aid adherence to this guidance, flight leads and aircrew will comply with the following:

3.13.4.1. (US NAS) Accomplish systems checks and TF checks above 10,000 feet MSL to the maximum extent possible. If TF checks must be accomplished below 10,000 feet MSL (i.e. due to weather) aircrew will minimize the time at higher airspeeds.

3.13.4.2. Aircrew flying outside the US NAS will follow gaining MAJCOM, theater, or host nation guidance on airspeeds (USAFE: Aircrew will operate at airspeeds consistent with TO 1F-15E-1-2-1, AFTTP 3-3.F-15E, and local guidance). If no gaining MAJCOM, theater or host nation guidance exists, use the guidance in this instruction to the maximum extent practical.

**3.14. G-Awareness Exercise.**

3.14.1. G-awareness exercises will be accomplished IAW AFI 11-214, *Air Operations Rules and Procedures*. The Heads Up Display (HUD) will be recorded during G-awareness exercises with hot mic in both cockpits.

3.14.2. During maneuver execution use visual lookout and briefed formation contracts as primary means to ensure aircraft deconfliction. Use onboard systems (i.e. FDL) only as an aid to situational awareness.

3.14.3. Do not use G-awareness turns for systems checks or other items that detract from the intended purpose.

3.14.4. Flight leads will ensure the airspace intended for conducting the G-awareness exercise is free from potential traffic conflicts. Use Air Traffic Control (ATC) services to the maximum extent practical to aid in clearing the airspace. Conduct the G-awareness exercise in the following airspace with preference to the order as listed (**USAFE**: Consider SUA as anytime the aircraft is under Basic, Traffic, or Deconfliction Service):

3.14.4.1. SUA (e.g. Restricted or Warning areas, ATC Assigned Airspace [ATCAA], Military Operating Areas [MOA], or MAJCOM-approved large-scale exercise and special mission areas).

3.14.4.2. Above 10,000 feet MSL outside of SUA.

3.14.4.3. Inside the confines of MTRs and above 5,000 feet AGL.

3.14.4.4. Below 10,000 feet MSL outside of SUA.

### 3.15. Radio Procedures.

3.15.1. Any flight member may make a "Knock-It-Off" or "Terminate" call IAW AFI 11-214. A KIO applies to any phase of flight and any type of mission.

3.15.2. Wingman acknowledgment of flight lead radio calls indicate the wingman understands or that the appropriate action is complete or in the process of being completed.

3.15.3. In addition to the radio procedures outlined in AFI 11-202V3, AFMAN 11-217V1 and V2, *Instrument Flight Procedures*, and FLIP publications, the following radio transmissions are required:

3.15.3.1. All flight members will acknowledge understanding the initial ATC clearance. Acknowledge subsequent ATC instructions as directed by the flight lead.

3.15.3.2. Gear Checks. Each pilot will confirm configuration with crewmate and report gear down IAW the following guidance, but in no case later than crossing the runway threshold IAW AFI 11-202V3:

3.15.3.2.1. Base turn for overhead patterns.

3.15.3.2.2. Prior to 3NM final for VFR straight-in.

3.15.3.2.3. Final Approach Fix (FAF) or glide slope intercept for instrument approaches.

3.15.3.2.4. A wingman or chase ship need not make this call during a formation or chased approach.

**3.16. Air Refueling (AAR).** Reference TO 1F-15E-1-2-1, Section VIII *Air Refueling Procedures* and Allied Tactical Publication (ATP)-56(B), *Air-to-Air Refueling*. During AAR training that involves unqualified student pilots (i.e., "UP" enrolled in a formal IQT course and under the direct supervision of an IP), it is the responsibility of the Flight Lead or IP to inform the tanker that unqualified student training will be conducted.

3.16.1. This applies any time prior to the student pilot successfully completing his/her initial (INIT) or requalification (RQ) INSTM/QUAL evaluation

3.16.2. This also applies prior to the student pilot demonstrating proficiency in AR operations or prior to regaining proficiency if regression occurs even if an INIT/RQ INSTM/QUAL evaluation was successfully completed. Day and night demonstration of proficiency shall be considered two different events.

3.16.3. Regardless of qualified status, pilots will inform boom operators when refueling from a particular type tanker for the first time.

### 3.17. Low Altitude ( $\leq 5,000$ feet AGL) Procedures.

3.17.1. **Formation.** Line abreast formation is only authorized at or above 300 feet AGL. When flying below 300 feet AGL flight leads shall direct the wingman to a wedge formation position.

#### 3.17.2. Terrain and Obstacle Clearance.

3.17.2.1. All obstacle avoidance planning will be based on MSA and ERAA as defined in [para 2.4.4](#), AFI 11-202V3, Chapter 8, and AFMAN 11-217V2, Chapter 3.

3.17.2.2. If unable to visually acquire or ensure lateral separation from known obstacles that could be a factor to the flight, flight leads will direct a climb not later than 3 NM prior to ensure sufficient vertical separation IAW with AFMAN 11-217V2. Do not descend back into the low level environment until visual with the obstacle or positional awareness dictates it is safe to do so.

3.17.2.3. During all descents into and operations in the low-level environment (i.e.  $\leq 1,000$  feet AGL) the LAWS will be set at 90 percent of the briefed minimum altitude or 90 percent of the command-directed minimum altitude, whichever is higher.

3.17.2.4. During all operations in the low-level environment, the immediate reaction to task saturation, diverted attention, KIOs, or emergencies is to climb to 1,000 feet AGL or higher if during the day, MSA or ERAA if at night.

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

3.17.4. **Minimum Airspeed.** The minimum airspeed for low level (less than 1,000 feet AGL) navigation is 300 KCAS. Minimum airspeed for tactical maneuvering in a LOWAT environment is 350 KCAS (except during LOFT recoveries).

3.17.5. **Minimum Weather.** The minimum WX for visual low level training is 1,500 feet ceiling and 3SM visibility (**USAFE:** 1,500 feet/8KM) or as specified in FLIP for MTRs, unit regulations, or national rules, whichever is higher.

#### 3.17.6. Minimum Altitude.

3.17.6.1. 500 feet AGL for Low Altitude Training (LOWAT) Category I qualified aircrew.

3.17.6.2. 300 feet AGL for LOWAT Category II qualified aircrews and F-15E Formal Training Unit (FTU) students with instructors when conducting training IAW an applicable syllabus.

3.17.6.3. 100 feet AGL for LOWAT Category III qualified aircrews. Training in the 100 feet to 300 feet AGL altitude block will be in short segments consistent with real-world risks and realistic tactical considerations.

3.17.6.4. During contingency operations, all low altitude ( $\leq 5,000$  feet AGL) tactical maneuvers not associated with an actual target attack or threat reaction and accomplished in support of ground forces (e.g. "Show of Force") will be flown at or above aircrew LOWAT minimum.

3.17.6.5. For night operations the minimum altitude is MSA unless operating under the conditions of para 3.18 (TF Operations) and/or para 3.34 (Night Vision Goggles Procedures).

3.17.6.6. For over water operation the minimum altitude is 1,000 feet above the surface unless in sight of land or using TF flyup protection. If in sight of land or using TF flyup protection the minimum altitude may be lowered to at or above aircrew LOWAT minimum.

3.17.6.7. For Air to Surface range operations, minimum altitudes will be determined by specific range guidance, AFI 11-2F-15EV1, or AFI 11-214, whichever is higher.

**3.17.7. Entries/Descents into the Low Altitude ( $\leq 5,000$  feet AGL) structure.** Accomplish entry/descent into the low altitude structure or training area under an ATC radar service (e.g. flight following or host nation equivalent) to the maximum extent practical.

**3.17.8. Visual Meteorological Conditions (VMC) Route and Area Abort Procedures.**

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

3.17.8.2. Comply with VFR altitude and national airspace restrictions. Squawk applicable IFF modes and codes.

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

3.17.8.4. Attempt contact with controlling agency, if required.

**3.17.9. IMC Route and Area Abort Procedures.**

3.17.9.1. Immediately climb to (or above) the briefed ERAA.

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

3.17.9.3. Squawk emergency if deviations from normal route or area procedures are required, or if the ERAA or MSA is higher than the vertical limits of the route or area.

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

**3.17.10. Low Altitude Target Pod (TGP) Use.** The TGP may be used down to the PIC's LOWAT category minimum unless under direct supervision of an instructor (either in the aircraft or in chase) on a syllabus ride leading to a lower LOWAT category minimum. This

guidance also applies to use of the LASER if not restricted to a higher altitude by specific SUA guidance, weapons delivery minimums, or host nation rules (if outside the US NAS).

**3.18. General TF System Operations.** (Also see para 3.33 for night TF requirements).

3.18.1. The minimum altitude for TF training will be the higher of MTR minimum altitude, MOA floor, or aircrew LOWAT category.

3.18.2. Unarmed TF operations are prohibited.

3.18.3. The pilot will maintain 400 KCAS minimum airspeed in mountainous terrain (defined by TO 1F-15E-1-2-1, Section 5, as any vertical change that exceeds 900 ft/NM).

3.18.4. In addition to a fully functioning TF system, a properly functioning A/A and A/G radar are required for IMC TF.

3.18.5. Check TF systems in flight using TO 1F-15E-1-2-1, Chapter 2, procedures prior to TF operations. If any feature critical to overall system performance (e.g. RALT, INS) is questionable or disabled and cannot be fixed IAW TO 1F-15E-1-2-1CL-1 or TO 1F-15E-34-1-1CL-1, discontinue the TF portion of the mission.

3.18.6. Each aircrew will confirm with their crewmate that the TF and RALT are on and working properly before descending below the MSA.

3.18.7. Initially set a 1,000 feet AGL Set Clearance Plane (SCP) to verify proper systems operation prior to commencing letdown to a lower SCP.

3.18.8. During operations in the low-level environment conducted solely on TF, the pilot will not operate any heads down sensor while outside of TF system limits. Sole attention will be placed on re-establishing aircraft parameters within TF limits.

3.18.9. Any intentional maneuvering that will put the aircraft outside of TF limits will be at or above the MSA (or ERAA if not within 5NM of course) or within the restrictions of para 3.34 NVG Procedures.

3.18.10. **Abnormal Operation during IMC TF.** Aircrews who experience failure of any portion of the TF system or A/A / A/G radar while flying IMC TF will immediately climb to (or above) the MSA (or ERAA if not within 5NM of course).

3.18.10.1. If the failure(s) can be cleared and safe TF regained, TF operations may resume.

3.18.10.2. If the aircraft position cannot be accurately determined, aircrews will terminate the low level portion of the mission and execute route abort procedures IAW para 3.17.9

**3.19. Fuel Requirements.**

3.19.1. **Joker / Bingo Fuel.** As defined in AFI 11-214

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

3.19.3. **Minimum and Emergency Fuel.** Declare the following to the applicable ATC agency when it becomes apparent that an aircraft may land at the intended destination or alternate, if required, with:

3.19.3.1. Minimum Fuel. 1,900 pounds or less.

3.19.3.2. Emergency Fuel. 800 pounds or less.

### ***Section 3D—Recovery and Landing***

#### **3.20. Overhead Traffic Patterns.**

3.20.1. Overhead patterns may be flown with unexpended A/G practice ordnance (to include inert heavyweight), live air-to-air missiles, and any 20mm ammunition. Overhead patterns may be performed at deployed locations with unexpended live ordnance if required by local force protection arrival procedures or approved by the owning OG/CC.

3.20.2. Initiate the break IAW local procedures or as directed by ATC.

3.20.3. Execute individual breaks at minimum interval of 5 seconds (except IP/SEFE chase or when in tactical formation).

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

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

3.21.1. Executed IAW local ATC procedures.

3.21.2. No more than four aircraft are in the flight.

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

3.21.4. Downwind, base turn, and formation spacing are flown such that aggressive or abnormal pattern corrections are not required.

#### **3.22. Low Approaches.**

##### **3.22.1. Minimum Altitudes.**

3.22.1.1. Normal and no-flap single ship low approaches: So that touchdown does not occur.

3.22.1.2. Practice single-engine go-around: Initiate in sufficient time to ensure the aircraft does not descend below 300 feet AGL.

3.22.1.3. IP/SEFEs flying chase position: 50 feet AGL.

3.22.1.4. Formation low approaches and non-IP/SEFE chase: 100 feet AGL.

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



3.22.2. **Go-Around.** Unless local ATC procedures, missed approach/climb-out procedures, or ATC instructions dictate otherwise, remain no higher than 500 feet below VFR overhead traffic pattern altitude until crossing the departure end of the runway.

### 3.23. Landing.

3.23.1. The desired touchdown point is 500-1,000 feet past the runway threshold for a VFR pattern or non-precision approach, or 500-1,000 feet past the Runway Point of Intercept (RPI) for a precision approach.

3.23.2. Minimum touchdown spacing is IAW AFI 11-202V3, Chapter 5 as supplemented by MAJCOM. F-15A-D and foreign variants are similar fighter type aircraft to the F-15E. Increase spacing whenever wake turbulence or jetwash could be a factor.

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

#### 3.23.4. Landing Restrictions.

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

3.23.4.2. Do not land over any raised web barrier (e.g. MA-1A, 61QS11), or loose or slack cable (e.g. BAK-12/13/14)

3.23.4.3. During the aerobrake portion of a normal, dry runway landing, leave flaps down to provide increased aerodynamic drag and normal nose fall.

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

**3.24. Touch-and-Go Landings.** Fly touch-and-go landings IAW AFI 11-202V3, as supplemented by MAJCOM. Do not fly touch-and-go landings with any of the following:

3.24.1. Live A/A or A/G ordnance (exception: any 20mm ammunition).

3.24.2. Hung ordnance or gun malfunction of any kind.

3.24.3. Fuel remaining in any external tank.

### 3.25. Closed Traffic Patterns.

3.25.1. Initiate the pattern at the departure end of the runway unless directed otherwise by local procedures or ATC.

3.25.2. If executing a formation low approach, a sequential closed may be flown with ATC concurrence.

3.25.3. Plan to arrive on downwind at 200-250 KCAS.

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

### 3.27. Formation Approaches.

3.27.1. Do not practice formation approaches with a combined fuel and stores weight greater than 10,000 pounds (N/A for SEFE Chase). Aircraft must be within 3,000 pounds of each other and symmetrically loaded. Consider “symmetrically loaded” as no greater than 8,000 ft-lbs of calculated lateral asymmetry.

3.27.2. Minimum weather for formation approaches is 500 feet ceiling and 1.5 SM (2.4 KM) or the highest Pilot Weather Category (PWC) in the flight, whichever is higher (exception: an actual emergency requiring a formation landing).

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

### *Section 3E—Night Procedures*

#### **3.29. Night Ground Operations.**

3.29.1. When ground personnel are working under the aircraft, the anti-collision lights should be OFF and the position lights ON and not flashing.

3.29.2. Taxi with a minimum of 300 feet spacing.

3.29.3. Use the taxi light while taxiing unless it might interfere with an aircraft landing or taking off. The taxiing aircraft will come to a stop if the area cannot be visually cleared without the taxi light.

3.29.4. Minimum required operational exterior lighting for night flying operations is: landing and taxi light, both wing-root anti-collision lights, both wingtip position lights, and the Right Vertical Stab (RVS) anti-collision light. Substituting a formation light in lieu of a wingtip position light is not permitted. **EXCEPTION:** Reduced or lights-out operations conducted IAW published guidance or as dictated by real-world tactical considerations.

#### **3.30. Night Takeoff.**

3.30.1. During a night formation takeoff, direct brake release and configuration changes on the radio.

3.30.2. Following takeoff, each aircraft and element will climb on runway heading to 1,000 feet AGL before initiating turns unless directed otherwise by ATC or local procedures.

#### **3.31. Night Join-Up.**

3.31.1. Weather criteria for night join-up underneath a ceiling is a minimum 3,000 feet ceiling and 5 SM (8 KM) visibility.

3.31.2. After join-up, turn the anti-collision lights OFF except for the last aircraft in formation. The last aircraft will keep the anti-collision lights ON unless otherwise directed by the flight lead.

#### **3.32. Night Formation Procedures.**

3.32.1. When in trail formation, whether IMC or VMC, use all available aircraft systems to maintain aircraft spacing backed up with timing. If aircraft spacing cannot be ensured, then establish altitude separation (1,000 feet minimum).

3.32.2. To preclude incidents of Spatial Disorientation as well as ensure proper ground clearance at all time, aircrew will not depend solely on HUD information and ensure they are using a consistent instrument cross-check to include periodic use of an EADI.

3.32.3. Except in case of emergency, do not direct lead or formation changes below 1,500 feet AGL unless on radar downwind. Above 1,500 feet AGL, direct lead or formation changes using the radio and from a stabilized, wings-level attitude.

3.32.4. Prior to a formation break-up at night, the flight lead will transmit attitude, altitude, airspeed, and altimeter setting, which will be confirmed and acknowledged with “good NAVAIDS” by the flight.

3.32.5. Battle damage checks will not be performed at night without NVGs (see para 3.34.6).

### 3.33. Night TF Operations.

3.33.1. A fully functioning TF system is required to conduct night TF operations (VMC or IMC). In addition to the minimum equipment listed in para 3.18.5, a usable Navigation/Forward Looking Infrared (NAV/FLIR) HUD image is required. NVGs may be used in place of the NAV/FLIR.

3.33.2. **TF failure prior to low-level route entry:** If the TF system fails prior to route entry, aircrew may still enter the route and continue the mission either at the MSA (or ERAA if greater than 5NM from course) or by using NVG procedures IAW para 3.34.

3.33.3. **TF failure while in the low-level environment:** Aircrews who experience failure of any portion of the TF system or NAV/FLIR imagery (or NVGs if used in place of the NAV/FLIR) while flying night TF low level will immediately climb to (or above) the MSA (or ERAA if not within 5NM of course) or transition to NVG procedures IAW para 3.34.

3.33.4. Climb to MSA (or ERAA if not within 5NM of course) when NAV/FLIR transmissivity or NVG visibility (if NVG is used in place of the NAV/FLIR) is insufficient for use as an aid for terrain avoidance (N/A for IMC TF qualified crews and supervised crews in an IMC TF upgrade using IMC procedures).

### 3.34. NVG Procedures.

3.34.1. NVGs must be preflight tested and adjusted by the individual in the unit eyeline prior to NVG operations.

#### 3.34.2. General NVG Use.

3.34.2.1. NVGs must be off and secured during takeoff and landing.

3.34.2.2. Do not don NVGs until at least 2,000 feet AGL in climbing or level flight.

3.34.2.3. Remove NVGs prior to initial, the FAF, or glide slope intercept.

3.34.2.4. Flight members will communicate when donning or doffing NVGs. Only one crewmember per aircraft will don or doff NVGs at a time.

3.34.3. NVGs will not be worn in IMC.

3.34.4. Wingmen will fly no closer than NVG close formation (as defined in AFTTP 3-3.F-15E Chap 8).

3.34.5. NVGs may be worn for tanker rejoins, but will be raised to the up and locked position or removed and stowed no later than the pre-contact position.

**3.34.6. Night BD Checks.**

3.34.6.1. Night BD checks are permitted only when wearing NVGs.

3.34.6.2. The crew performing the BD check will approach with position lights bright and steady and beacons on while the aircraft being checked sets external lights to a minimum (with at least anti-collision beacons off).

**3.34.7. NVG Abnormal Procedures.**

3.34.7.1. During in-flight emergencies, immediately assess whether the NVGs aid or hinder completion of emergency procedures. If they are a hindrance or the emergency may deteriorate into an ejection situation, remove and stow the NVGs.

3.34.7.2. For NVG failure or inadvertent flight into IMC while in formation or close proximity to other aircraft:

3.34.7.2.1. Immediately transition to instruments (see para **4.1.1**).

3.34.7.2.2. Perform appropriate lost wingman procedures if applicable.

3.34.7.2.3. Terminate or KIO as appropriate.

3.34.7.2.4. Move NVGs to the up and locked position or remove and stow completely if practical.

3.34.7.2.5. Maintain or regain VMC as soon as possible.

3.34.7.3. For NVG failure while in the low-level environment, ensure separation from other aircraft and climb to (or above) MSA (or ERAA if not within 5 miles of course) prior to troubleshooting.

3.34.7.4. For inadvertent flight into IMC while in the low-level environment, follow IMC route abort procedures in para **3.17.9**.

**3.35. Night Landing.**

3.35.1. Normally land from an instrument straight-in approach. Refer to AFI 11-202V3, Chap 5, night approaches, as supplemented, for specific procedures.

3.35.2. Only perform night formation landings when required for safe recovery of the aircraft.

**Section 3F—Miscellaneous Procedures**

**3.36. Change of Aircraft Control.** Both aircrew members must know at all times who has control of the aircraft. Use the statement "you have the aircraft" to transfer aircraft control. The aircrew member receiving control of the aircraft will acknowledge "I have the aircraft" and lightly shake the stick. Once assuming control of the aircraft, maintain control until relinquishing it as stated above. **EXCEPTION:** If the intercom fails, the crewmember not flying the aircraft who intends to assume control of the aircraft will lightly shake the stick and assume control of both the aircraft and radios unless otherwise prebriefed (i.e. "shake to take"). With intercom out,

if either crewmember who is in control of the aircraft intends for the other crewmember to assume control, they will lightly push the rudder pedals back and forth (i.e. "push to pass").

### **3.37. Ops Checks.**

3.37.1. Accomplish sufficient ops checks to ensure safe mission accomplishment. Each aircrew should monitor the fuel system carefully throughout the flight to identify low or trapped fuel or imbalance situations as soon as possible. Ops checks are required:

3.37.1.1. After takeoff during initial climbout (to the max extent practical when passing 10,000 feet) and at level-off.

3.37.1.2. A/A. Prior to each ACBT engagement or intercept. In addition, a check for proper operation of all transfer tanks (wing tanks balanced and tank 1 feeding) will be performed prior to and between engagements or planned maneuvering above 30 CPU Angle of Attack (AOA).

3.37.1.3. A/G. Prior to entering an A/G range and at least once after departing the range (at least once on range if multiple passes are flown).

3.37.1.4. Following Air Refueling.

3.37.2. Minimum Ops Check items are engine instruments, total and internal fuel quantities and balance (as well as external fuel quantities and balance, if loaded), G-suit connection, oxygen system, cabin altitude, and Overload Warning System (OWS).

3.37.3. In formation flights, the flight lead may initiate ops checks by radio call or visual signal and wingmen will respond appropriately. The query and response for ops checks will include the following:

3.37.3.1. Pointer over counter readings (e.g. "13 over 25, externals" or "13 over 18, CFTs").

3.37.3.2. Following external wing tank and CFT fuel consumption, ensure tank one is feeding correctly; add a "balanced" call to the normal Ops Check reply when wing tank fuel balance checks are required and the difference is no greater than 200 lbs. (e.g. "8 squared, balanced, tank 1") (EXCEPTION: Total fuel only may periodically be used during high demand phases of flight).

3.37.4. Fighter Data Link (FDL) fuel status will not be used as the primary source of fuel checks.

**3.38. F-15E Crew Duties.** Both crewmembers are responsible for successful sortie completion. A crew brief will be accomplished before each flight to ensure an understanding of all aspects of the mission.

3.38.1. The crew brief will include radar and visual lookout responsibilities, crew coordination, and specific duties for each phase of flight. For night sorties, the crew brief will include expected crew coordination for deviations from planned/expected flight parameters. Aircrew will reference AFTTPs 3-3.F15E and 3-1.F-15E for a thorough discussion of standardized F-15E crew responsibilities and coordination.

3.38.2. Below 10,000' feet MSL, crew members will limit crew interaction and cockpit tasks only to those necessary either for tactical training/employment or safe recovery of the aircraft (to include radio drills).

3.38.3. Unless briefed otherwise, the following duties apply. (EXCEPTION: The restrictions listed in para **3.38.3.1** may not be altered.)

3.38.3.1. **Weapon Systems Officer (WSO) Flying.** WSOs will not fly during:

3.38.3.1.1. Takeoff or landing.

3.38.3.1.2. AAR operations.

3.38.3.1.3. Close formation or rejoins to close formation.

3.38.3.1.4. Tactical maneuvering. **EXCEPTION:** During FTU syllabus missions, student WSOs may practice flying tactical formation turns and position keeping if accompanied by an IP.

3.38.3.1.5. Weapons delivery (actual or simulated).

3.38.3.1.6. Below 1,000 feet AGL (unless flying practice instrument approaches and no lower than non-precision approach minimums, the pilot's weather category, or 500 feet AGL, whichever is higher).

3.38.3.1.7. Overhead patterns

3.38.3.2. **Takeoff.** The WSO will check the Min go/Max abort speed when required, monitor engine and flight instruments, check gear and flaps up prior to their TO speed limits, and advise the pilot of any discrepancies.

3.38.3.3. **Climb/Departure.** The aircrew member flying the aircraft will call altimeter setting to 29.92 when passing the transition altitude.

3.38.3.4. **Cruise, Navigation, and Instrument Flight.** The WSO will relay aircraft attitude, altitude, and airspeed information to the pilot when departing a formation at night or in IMC.

3.38.3.5. **Air Refueling.**

3.38.3.5.1. **Pilot Responsibilities.** Be prepared to immediately use the air refueling release HOTAS if an IP/UIP in the RCP is accomplishing the refueling and either the RCP air refueling release button on the stick doesn't work or safety dictates.

3.38.3.5.2. **WSO Responsibilities.** Advise the pilot of boom position and call when boom is positively disconnected and clear.

3.38.3.6. **Instrument Penetrations and Descents.**

3.38.3.6.1. The aircrew member in control of the aircraft will advise the other crewmember of intentions when performing any penetration or approach.

3.38.3.6.2. Both crewmembers must confirm the Decision Height (DH)/Decision Altitude (DA) or Minimum Descent Altitude (MDA) for an approach, or the ERAA and MSA altitudes for descents into the low-level environment.

- 3.38.3.6.3. Both crewmembers will refer to appropriate FLIP publications during the holding, penetration and approach.
- 3.38.3.6.4. The crewmember not in control of the aircraft will verbally check altimeter settings when passing the transition level.
- 3.38.3.6.5. The crewmember not in control of the aircraft will advise the other crewmember when 1,000 feet above any intermediate level off altitude, 100 feet above DH/DA or MDA for the approach being flown, or when 1,000 feet above the minimum altitude during descents into the low-level environment.
- 3.38.3.7. **Pattern and Landing.** The crewmember not in control of the aircraft will:
- 3.38.3.7.1. Monitor the pattern with emphasis on engine power, altitude, airspeed, landing gear, and flap position.
- 3.38.3.7.2. Visually clear the area.
- 3.38.3.7.3. Monitor ground speed versus runway remaining during the landing roll to assess aerobraking effectiveness and available stopping distance.
- 3.38.3.8. **After Landing.** If an IP/UIP accomplished the landing from the RCP, the pilot in the FCP will assume control of the aircraft as briefed by the pilot in the RCP to perform the taxiing.

**3.39. Air-to-Air Interrogator (AAI), Identification Friend or Foe/Selective Identification Feature (IFF/SIF).** Military use of AAI Mode 4 interferes with ATC and civil Mode 3/C codes. F-15E AAI use in the National Airspace System (NAS) will comply with the following:

- 3.39.1. To reduce the potential for adverse effects on Combat Identification, ATC, and Traffic Collision Avoidance systems, aircrew will limit interrogations to the minimum required for the mission.
- 3.39.2. For AAI operations within the United States and its Possessions (US&P), aircrew will comply with the restrictions as specified in the applicable Radio Frequency Authorization(s) which can be obtained from the base/wing spectrum management office.
- 3.39.3. OCONUS, follow gaining MAJCOM, Theater or Host Nation guidance for AAI.

## Chapter 4

### INSTRUMENT PROCEDURES

#### 4.1. General.

4.1.1. The F-15E HUD is not certified as a Primary Flight Reference (PFR) IAW AFI 11-217V1; therefore, it cannot be used as a sole attitude reference.

4.1.1.1. **IMC Operations.** It is imperative that aircrew use a composite cross-check of all flight instrumentation (to include the HUD) when operating in IMC. IAW with both the FAR/AIM and ICAO definitions of IMC as well as VFR cloud clearance guidance in AFI 11-202V3, if aircrew are operating without a discernible horizon, or are flying inside minimum VFR cloud clearances (FAA or ICAO depending on airspace), “IMC” guidance in this volume applies. The EADI, as the Primary Flight Reference, must be used as the primary attitude source and be central in the aircrew’s instrument cross-check. Aircrew flying in IMC will adhere to the following:

4.1.1.1.1. Display an EADI in both front and rear cockpits at all times.

4.1.1.1.2. Make an inter-cockpit verbalization of “ADI Up” when first entering IMC.

4.1.1.1.3. The rear seat occupant may momentarily scroll off an EADI as needed to facilitate safe mission accomplishment; however, the front seat occupant may only scroll off an EADI for higher priority safety-of-flight purposes.

4.1.1.2. **Night VMC (non-tactical operations).** Both occupants will display an EADI. Verbalization of “ADI Up” is not required. Generally speaking, aircrew will consider themselves executing “Non-Tactical Operations” anytime they are:

4.1.1.2.1. Adhering to ATC instructions during departure, enroute, and approach.

4.1.1.2.2. Executing published IFR procedures (e.g. SIDs, STARs, IAPs, etc.) or receiving vectors for IFR procedures (includes practice IFR procedures).

4.1.1.2.3. **NOTE:** This does not restrict periodic use of displays and sensors during the enroute phase of flight for the purpose of increasing weapons systems proficiency (e.g. RTTs, enroute exercises, systems checks, etc.).

4.1.1.3. **Tactical operations (all flight conditions).** Both occupants will bring up and maintain an EADI as well as verbalize inter-cockpit “ADI Up” as soon as practical in the following situations:

4.1.1.3.1. Aggressive night maneuvering (e.g. threat reactions, vertical maneuvering, etc.). **NOTE:** either occupant may momentarily scroll off their EADI to maintain situational awareness of the tactical environment.

4.1.1.3.2. Night TF recoveries from low altitude weapons deliveries (e.g. Lofts, LATs, etc.)

4.1.1.3.3. Night TF fly-ups



4.1.1.4. **Mandatory EADI use regardless of operations or flight conditions.** In addition to the above circumstances, both occupants will immediately display an EADI as well as verbalize inter-cockpit “ADI Up” in the following circumstances:

4.1.1.4.1. Unusual attitude recoveries

4.1.1.4.2. When executing lost wingman procedures

4.1.1.4.3. Anytime spatial disorientation is suspected, recognized, or confirmed.

4.1.1.4.4. **Note:** If an EADI is not available due to system malfunctions, the HUD will be used as the primary attitude reference backed up by the standby ADI.

4.1.2. The HUD is the primary reference for flight parameters during low level and TF operations.

4.1.3. The F-15E INS and EGI are approved for Enroute Area Navigation (RNAV); however, they are not approved for use on RNAV and GPS approaches. Additionally, they may not be used as a substitute for any NAVAID on an Instrument Approach Procedure.

## 4.2. Takeoff and Join-Up.

4.2.1. The flight lead must get an appropriate ATC clearance (altitude block or trail formation) when a flight join-up is not possible due to weather or operational requirements.

4.2.2. Formation trail departures must comply with instructions for a nonstandard formation flight as defined in FLIP.

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

## 4.3. Trail Procedures.

### 4.3.1. General.

4.3.1.1. The flight lead must brief the flight on spacing, configuration and airspeeds in all phases of flight that trail formations will be flown.

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

4.3.1.3. ATC instructions to the lead aircraft will be for the entire flight.

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

### 4.3.2. Trail Departure.

4.3.2.1. Use a minimum of 20 seconds takeoff spacing.

4.3.2.2. During trail departures, basic instrument flying is the first priority. Strictly adhere to the briefed airspeeds, power settings, altitudes, headings, and turn points. If task saturation occurs, cease attempts to maintain trail, concentrate on flying the instrument departure, and then notify the flight lead. The flight lead will then notify ATC.

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

4.3.2.4. If briefed by the flight lead, the FDL may be used as a backup to the radar once airborne should the radar become suspect or inoperative. However, EGI or RLN PPKS must be used with indication of good PPLIs from preceding flight members.

4.3.2.4.1. FDL will not be used at the detriment of proper instrument flying.

4.3.2.4.2. If at any time, the FDL becomes suspect or inoperative, aircrew will immediately transition to the No radar Contact procedures listed below.

#### 4.3.3. **Radar Contact.**

4.3.3.1. Each aircraft and element will call "tied" when radar contact is established with the preceding aircraft.

4.3.3.2. Once all aircraft are tied, no further radio calls are required unless radar contact is lost.

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

#### 4.3.4. **No Radar Contact.**

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

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

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

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

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

4.3.4.6. 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 or element to meet the requirements of the above paragraph.

4.3.5. **En route Trail.** Flight leads must pre-brief or direct in the air the airspeeds, power settings, and configurations that will be flown.

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

4.3.6.1. Trail recoveries are only authorized at home station, deployed locations (with pre-coordinated procedures through local ATC and/or host nation as applicable), and locally-designated primary divert bases where trail recovery procedures already exist.

- 4.3.6.1.1. Reference AFI 13-204V3 “in-trail” guidance for the minimum procedures that must be described by local guidance (either local supplement to this AFI or local airfield ops guidance).
- 4.3.6.1.2. IAW AFI 13-204V3, trail recovery procedures are not allowed at airfields with FAA ATC unless a Letter of Agreement (LOA) is in effect. At a minimum, the LOA must be agreed upon by local Ops Group leadership and the FAA ATC representatives.
- 4.3.6.1.3. In addition to the below guidance, reference AFI 13-204V3 and local airfield operations guidance for further guidance/restrictions.
- 4.3.6.2. Unless otherwise restricted, limit trail recovery to a maximum of four aircraft.
- 4.3.6.3. Trail recoveries are authorized when weather at the base of intended landing is at or above the highest PWC in the flight or approach minimums, whichever is higher.
- 4.3.6.4. Minimum spacing between aircraft is 6,000 feet and will be maintained using all available aircraft systems (e.g. RADAR, AAI, A/A TACAN, FDL, etc) and NAVAIDS.
- 4.3.6.5. Prior to taking spacing the flight lead must do the following:
  - 4.3.6.5.1. Coordinate the trail recovery with ATC prior to taking spacing.
  - 4.3.6.5.2. Ensure that all wingmen have “good NAVAIDS”.
  - 4.3.6.5.3. Accomplish the spacing maneuver in VMC to the max extent possible.
- 4.3.6.6. Once established on a segment of a published approach, each aircraft must comply with all published altitudes and restrictions while maintaining in-trail separation.
- 4.3.6.7. Unless local procedures establish defined reference points for airspeed and configuration changes, the flight lead must direct changes by radio. At flight lead's call all aircraft must simultaneously comply with the directed change.
- 4.3.6.8. All aircraft must report the FAF or glide slope intercept.
- 4.3.6.9. **Lost Contact.** If contact is lost with the preceding aircraft, the following will be accomplished:
  - 4.3.6.9.1. The pilot will transmit, "Callsign (C/S), lost contact."
  - 4.3.6.9.2. The preceding aircraft will respond with altitude, airspeed, and heading.
  - 4.3.6.9.3. If separation/deconfliction cannot be confirmed the flight lead will establish altitude deconfliction and coordinate a separate IFR clearance with ATC.
  - 4.3.6.9.4. If contact is lost while established on a segment of a published approach, flight members may continue the approach, but must confirm separation via all available aircraft systems and NAVAIDS. If separation deconfliction cannot be guaranteed, the aircrew that lost contact will execute missed approach or climb-out as directed by ATC.

#### **4.4. Formation Split-Up.**

- 4.4.1. Accomplish formation split-ups in VMC to the max extent possible.
- 4.4.2. If IMC, accomplish the split-up in straight and level flight.

4.4.3. Prior to a split-up in IMC, the flight lead must transmit attitude, airspeed, altitude, and altimeter setting which will be acknowledged by wingmen. Wingmen must confirm good NAVAIDS.

#### **4.5. Formation Penetration.**

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

4.5.2. If a formation approach is intended, position the wingman on the appropriate wing prior to weather penetration.

**4.6. IMC Lead Change.** During IMC formation flights, do not change leads below 1,500 feet AGL unless on radar downwind.

#### **4.7. Approach Procedures.**

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

4.7.2. The F-15E is Approach Category E. Approach Category D minimums may be used at an emergency or divert airfield or with OG/CC approval at a planned destination if no Category E minimums are published, provided:

4.7.2.1. A straight-in approach is flown (i.e. circling is not allowed).

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

4.7.2.3. For the missed approach segment, the aircraft is flown at 255 knots true airspeed (KTAS) or less. In those cases where a high density altitude may cause 255 KTAS to equal a KCAS below the speeds specified in TO 1F-15E-1-2-1, Cat D approaches shall not be flown.

## Chapter 5

### AIR-TO-AIR WEAPONS EMPLOYMENT

**5.1. References.** AFI 11-214 contains A/A procedures and restrictions, to include operations with live ordnance applicable to all aircraft. This chapter contains procedures and restrictions specific to F-15E operations.

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

5.2.1. Simulated A/A gun employment is defined as the combined use of Master Arm and trigger actuation.

5.2.2. Always confirm the status of the gun system prior to flight IAW TO 1F-15E-34-1-1CL-1.

5.2.3. Simulated A/A gun employment is permitted with a safed gun (IAW TO 1F-15E-34-1-1CL-1), loaded or unloaded, provided a trigger check is previously accomplished.

5.2.4. Never perform simulated A/A gun employment with a hot gun (one that is not safed IAW TO 1F-15E-34-1-1CL-1). Never perform a trigger check with a hot gun, regardless of Master Arm switch position.

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

5.3.1. Minimum airspeed during LOWAT maneuvering is 350 KCAS.

5.3.2. When configured with three external tanks or two external tanks and an ASQ-236 pod, aircraft will operate under the LIMITED maneuvering category.

5.3.3. When configured with external wing tanks only (i.e. no centerline fuel tank or ASQ-236 pod), maneuvering category is restricted to LIMITED maneuvering until external tanks are empty. Once wing external tanks are empty, UNLIMITED maneuvering is allowed (flight manual AOA restrictions still apply in all cases).

5.3.4. Negative-G guns jinks are prohibited.

5.3.5. When acting as a restricted maneuvering target for low altitude ( $\leq 5,000$  feet AGL) intercepts, the minimum airspeed is 300 KCAS.

5.3.6. All tactical maneuvering that involves rapid AOA onset rates shall be discontinued if the combined lateral asymmetry of the aircraft (e.g. due to a fuel imbalance and/or laterally asymmetric stores loading) results in a 30 CPU restriction IAW TO 1F-15E-1-2-1 Chapter 5. If the asymmetry can be corrected to allow greater than 30 CPU maneuvering, the briefed mission can be continued.

## Chapter 6

### AIR-TO-SURFACE WEAPONS EMPLOYMENT

**6.1. References.** AFI 11-214 contains A/G procedures and restrictions applicable to all aircraft. This chapter contains procedures and restrictions specific to F-15E operations.

6.1.1. IAW AFI 11-214, Chapter 5 restrictions on final switch configurations when expending A/G ordnance, “final switch configuration” is defined as Master Arm “ARM”.

6.1.2. Especially in the employment of live and/or heavyweight inert ordnance on training ranges, aircrew will ensure they are completely familiar with range restrictions regarding Master Arm usage as well as run-in heading adherence and verification/confirmation of targeting (if applicable).

6.1.2.1. For multiple passes, unless otherwise stipulated in range restrictions, do not Master Arm hot until aircraft is in such a position that any inadvertent/unintentional release will be contained within the range boundaries.

6.1.2.2. If in doubt or target situation awareness is lost, priority shall be given to ensuring the Master Arm is “SAFE” to mitigate the change of an inadvertent/unintentional release.

**6.2. Simulated Attacks against Off-Range or Manned Targets.** In addition to AFI 11-214, Chapter 5, restrictions, the following guidance applies (in addition to any host nation restrictions if applicable).

6.2.1. “Simulated attacks” are defined as the combined use of A/G Master Mode, Master Arm “ARM”, and pickle button actuation.

6.2.2. The A/G Training Programmable Armament Control Set (PACS) must be used.

6.2.3. Stations loaded with actual carted ordnance must not be selected on any Training PACS program. This applies to SUU-20s loaded with BDU-33s, but does not apply to empty SUU-20s unless the SUU-20 itself is carted.

6.2.4. The laser shall only be used in approved areas as stipulated in FLIP, Range Guidance, Letters of Agreement, and/or Host Nation guidance as applicable.

### **6.3. Strafe.**

6.3.1. The 17 WPS will manage and publish the F-15E-standard strafe card that will be used by all F-15E aircrew when executing strafe attacks, actual or simulated. Individual units will not modify the card and will forward all recommendations for change directly to the 17 WPS.

6.3.2. Aircrew will execute strafe from a single planned dive angle (e.g. 25°) and not use “window” parameters (e.g. 15° - 30°); however, different deliveries (i.e. High Angle Strafe [HAS] and Low Angle Strafe [LAS]) may be employed on different passes of the same sortie.

6.3.3. Flights will thoroughly pre-brief planned use of and the requirement to honor GCWS alerts during strafe attacks, especially HAS.

6.3.4. Flight members will use all available tools to provide mutual support in the dynamic and high risk HAS environment. Any perceived breakdown in planned/expected attack parameters will result in an immediate Knock-it-off call by the supporting flight member.

6.3.5. Prior to roll-in on all strafe attacks, aircrew will review and confirm inter-cockpit the planned parameters for the strafe attack being executed to include the following items. Confirmation may be accomplished in the flight brief for pre-planned targets and standardized deliveries such as on a training range during a Basic Surface Attack mission.

6.3.5.1. Base Altitude (base roll-in AGL altitude plus target elevation);

6.3.5.2. Base Distance;

6.3.5.3. The existence of active ranging;

6.3.5.4. Open/Cease Fire ranges;

6.3.5.5. Planned abort altitude if no active ranging exists or ceases during the attack.

#### 6.3.6. **Simulated Strafe.**

6.3.6.1. Simulated strafe is defined as the combined use of A/G Master Mode, Master Arm "ARM", and trigger actuation.

6.3.6.2. Simulated strafe is permitted with a safed gun (IAW TO 1F-15E-34-1-1CL-1), loaded or unloaded, provided a trigger check is previously accomplished.

6.3.6.3. Do not perform simulated strafe (as defined in para [6.2.6.1](#)) with a hot gun (loaded or empty).

6.3.7. Flight debriefs of strafe attacks will include reviews of strafe employment to identify trends/problem areas (e.g. release parameters, abort cues, recognition of ranging errors, etc.).

**6.4. Pop-Up Attacks.** Abort pop-up attacks (AUTO or CDIP) if airspeed decreases below 350 KCAS (300 KCAS above 10,000 feet AGL).

#### 6.5. **Night System Delivery Procedures.**

6.5.1. IAW AFI 11-214, the maximum angle of bank during night recovery maneuvers (e.g. from loft, LAT, or climbing safe escape) is 135 degrees.

6.5.2. When performing weapons deliveries on a range using only TF procedures (i.e. NVGs are not used) all maneuvering in the bombing pattern below MSA will be inside TF limits.

#### 6.5.3. **TF Loft and LAT Deliveries.**

6.5.3.1. TF loft and LAT deliveries are instrument maneuvers that exceed numerous TF limits. Aircrew will reference AFTTP 3-3.F-15E for a comprehensive list of delivery and recovery techniques and considerations.

6.5.3.2. **TF Loft Escape Corridor.** The TF loft escape corridor is defined as a 10NM wide corridor centered on planned flight path, starting at the planned roll out point and extending for 8NM along the egress heading. Aircrew will calculate and annotate both an RIA and MSA for every planned escape corridor.

6.5.3.3. Prior to initiating the pull up on a TF loft or LAT delivery, both aircrew will scroll to an EADI on one of their screens, verify accuracy of their standby ADI against an EADI, and verbalize inter-cockpit “ADI up”.

6.5.3.4. If the TF system fails during recovery, maintain the appropriate minimum altitude based on positional awareness (RAA, MSA, or NVG minimum) until the TF system recovers.

6.5.3.5. If at any time during the TF loft or LAT delivery airspeed drops below 300 KCAS, abort the maneuver and recover to level flight. Direct primary emphasis towards aircraft attitude, altitude, and regaining airspeed.

## 6.6. Night and IMC Surface Attack Range Procedures.

6.6.1. For night range weapons deliveries, the weather must allow the Range Control Officer (RCO) (for a class A range), or a flight member or range personnel (for a class B or C range) to clear the target area and spot or score the ordnance impact.

6.6.2. Multiple weapons deliveries may be accomplished at night and/or during IMC if range patterns and procedures that ensure positive aircraft separation are established and briefed.

6.6.2.1. TF altitude and maneuvering restrictions apply throughout the pattern for TF deliveries. If the downwind is flown at MSA or above do not begin a TF descent to the planned delivery altitude until in a position to remain within TF limits.

6.6.2.2. Minimum pattern altitude for non-TF deliveries is MSA or above, range restrictions permitting, unless complying with para 3.34 (NVG Procedures).

6.6.3. For IMC range deliveries through or above the weather comply with the applicable Range Orders and the following restrictions:

6.6.3.1. A fully functional EGI Present Position Keeping Source (PPKS) must be selected for delivery.

### 6.6.3.2. Unguided Ordnance.

6.6.3.2.1. If SYSB is used as the Height above Target HAT calculation source (i.e. SYSG is non-functional or showing as invalid) and MN or INS PPKS is set, a system altitude update must be accomplished within five minutes prior to release.

6.6.3.2.2. Radar designations from an APG-70 or ASQ-236 High Resolution Map (HRM) patch map require a target direct designation (APG-70: .67NM, ASQ-236: 4,000' or better) with correlation verified between the target and at least one offset on a minimum 1.3NM patch map.

6.6.3.2.3. Nav target designation may be used in MN and/or INS PPKS only if a MN and/or INS update has been accomplished within five minutes prior to release. **EXCEPTION:** This restriction is not applicable if AUTO INS UPDT is enabled.

6.6.3.2.4. After successful designation of the planned target, verify designated coordinates against published range coordinates to ensure on-range impact.

### 6.6.3.3. Inertially Aided Munitions (IAM).



6.6.3.3.1. Prior to putting Master Arm “ARM”, verify Smart Weapons Page coordinates that are in the priority weapon match the published range coordinates.

6.6.3.3.2. Verify weapon TXA position quality is reported as “GOOD” or “MARG” and the weapon INU platform quality is a “1” (QUAL GOOD 1 or QUAL MARG 1).

6.6.3.3.3. Release in the IN-ZONE LAR or at the planned DGR if no LAR exists. For any weapon DGRD driving the weapon to INS-only (QUAL MARG 1, NO GPS KEYS, etc), TOF must be  $\leq 70$ ”.

**6.7. Nighttime Targets of Opportunity.** Prior to beginning a nighttime diving attack (to include strafe) against a target of opportunity either in combat or during peacetime training, the following procedures will be applied.

6.7.1. Each aircraft within the formation must make an independent determination of target elevation.

6.7.2. A target area MSA will be calculated by all flight members. The target area MSA will include the highest elevation within at least 5 NM of the planned target (or as briefed by the flight lead).

6.7.3. The lead aircraft will pass target elevation and MSA to the flight (to include open/cease fire range if conducting night strafe). Each flight member will either respond “[C/S] Same” or “[C/S] Shows ###,” where ‘###’ is the target elevation and/or target area MSA calculated IAW [para 2.4.4.4.2](#) that was different.

6.7.4. Weapons deliveries may be conducted below the target area MSA if operating IAW [para 3.34 NVG Procedures](#).

6.7.5. If Yo-Yo operations (detached mutual support) are being employed, to the max extent practical, the verification of target elevation and target area MSA will be made while flight members are still in radio contact. If unable radio contact between flight members or for single-ship operations, the verification will be accomplished inter-cockpit prior to commencing attacks.

6.7.6. For targets that are either provided by a qualified outside agency (e.g. JTAC, JSTARS, FAC-A, etc.) or are preplanned with known coordinates and elevation, ownship determination of target elevation is not required. This also applies to pre-calculated target area MSAs. In this instance, at a minimum, an inter-cockpit confirmation of attack parameters will be accomplished prior to commencing attacks.

## Chapter 7

### ABNORMAL OPERATING PROCEDURES

**7.1. General.** These procedures do not supersede TO guidance.

7.1.1. Do not accept an aircraft for flight with a malfunction addressed in the Emergency Procedures and Abnormal Operations section of the TO until it has been corrected.

7.1.2. Do not use a malfunctioning system unless it is required for safe recovery of the aircraft.

7.1.3. Do not continue in-flight troubleshooting of a malfunction after completing TO emergency procedures and the aircraft may be safely recovered.

**7.1.4. Fuel Dumping.**

7.1.4.1. Follow AFI 11-202V3, Chapter 5 procedures for notification of applicable ATC agencies when fuel dumping is in progress.

7.1.4.2. Only conduct fuel dumping to reduce aircraft gross weight for safety of flight.

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

7.1.4.4. Ensure the dump switch is returned to normal before landing.

7.1.4.5. After landing, make an appropriate entry in the AFTO Forms 781.

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

**7.1.6. Flight Control Malfunctions.**

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

7.1.6.2. If the flight control problem was due to crew member or passenger stick or rudder interference, the crewmember flying the aircraft will take appropriate action to ensure no further flight control interference occurs.

**7.2. Ground Aborts.**

7.2.1. Delayed aircraft may join the flight at a briefed rendezvous point or may fly a briefed alternate single ship mission.

7.2.2. If accomplishing a join-up to spread, route, or fingertip, cease tactical maneuvering until the delayed aircraft is joined and all flight members are ready to continue.

**7.3. Takeoff Aborts.**

7.3.1. If aborting the takeoff, clear to the appropriate side of the runway as expeditiously as possible based on position within the element. If this is not feasible because of possible cable engagement, clear straight ahead.

7.3.2. As soon as practical, give call sign and state intentions on appropriate frequency or frequencies. A "Cable, Cable, Cable" radio call indicates intent for a departure-end arrestment.

7.3.3. Lower the tailhook if there is any doubt about the ability to stop on the runway.

7.3.4. Subsequent aircraft will hold position, abort, or continue to takeoff as appropriate to maintain adequate clearance.

7.3.5. **Brake Overheat.** While the TO indicates that brake overheat should be considered for brake applications above 100 knots, numerous factors (to include gross weight of the aircraft, length of time between initial brake application and taxiing clear of the runway, airflow over the brakes due to current wind conditions, etc.) may be considered that reduce the possibility of actual hot brakes.

7.3.5.1. Anytime the brakes are applied during a takeoff abort above 120 KCAS or any time the aircrew suspect hot brakes declare a ground emergency, taxi the aircraft to the designated hot brake area and follow hot brake procedures.

7.3.5.2. See TO 1F-15E-1-2-1 Section 3 for list of brake overheat considerations.

#### 7.4. Air Aborts.

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

7.4.2. If a chase is desired by the aircrew experiencing an airborne emergency, the chase aircraft will follow the problem aircraft to the field of intended landing unless cleared off sooner. The flight lead will determine if a chase is required for non-emergency aborts.

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

7.4.3.1. Birdstrike or Foreign Object Damage (FOD).

7.4.3.2. Flight control system anomalies (not including flight control system lights that reset IAW TO procedures).

7.4.3.3. Engine flameout, stagnation, or shutdown.

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

7.4.4.1. Immediately terminate maneuvering and call up the OWS matrix to analyze the displayed parameters.

7.4.4.2. If level "1" (one) is displayed in any column of the matrix except Mass Items (MIT), perform a BD check with emphasis on the overall condition of the aircraft. If no abnormalities are noted, the flight lead may continue the briefed mission. If a subsequent level "1" or greater over-G occurs, terminate the mission, perform a BD check, RTB, and fly a straight-in approach.

7.4.4.3. If level "1" (one) is displayed in the MIT column, or level "2" (two) or greater is displayed in any column of the matrix, terminate the mission, perform a BD check, RTB, and fly a straight-in approach.

7.4.4.4. After landing, document all over-Gs in the AFTO Form 781.

#### 7.5. Radio Failure.

7.5.1. **General.** In addition to this volume, individual aircraft experiencing radio failure will comply with procedures outlined in FLIP, AFI 11-202V3, Host Nation, and local directives. As able, NORDO F-15Es will enter the Voice Call Sign "NRDO" into their Link-16 system to alert other Link-capable aircraft. Aircraft experiencing any difficulty or emergency in addition to NORDO will proceed as required by the situation.

7.5.2. **Formation.**

7.5.2.1. **Close or Route.**

7.5.2.1.1. Flight members who experience total radio failure while in close or route formation will maneuver within formation parameters to attract the attention of another flight member and give the appropriate visual signals.

7.5.2.1.2. Terminate the mission as soon as practical and lead the NORDO aircraft to the base of intended landing or a divert base.

7.5.2.1.3. Perform a formation approach to a drop-off on final unless safety considerations dictate otherwise.

7.5.2.2. **Other Than Close or Route.**

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

7.5.2.2.2. The NORDO aircraft is responsible for maintaining clearances from other flight members until his presence is acknowledged by a wing rock, signifying clearance to join.

7.5.2.2.3. Once joined, the NORDO aircraft will give the appropriate visual signals.

7.5.2.2.4. If pre-briefed, the NORDO aircraft may proceed to a rendezvous point and hold.

7.5.2.2.5. NORDO aircraft will proceed to the base of intended landing or a divert base upon reaching the minimum fuel required for a NORDO recovery (not below BINGO) regardless of rejoin status.

7.5.3. **Surface Attack NORDO Procedures.** In all cases, applicable Range or Host Nation procedures take precedence.

7.5.3.1. **Class A/Manned Class B Ranges**

7.5.3.1.1. Attempt contact with the RCO on the appropriate backup frequency.

7.5.3.1.2. If unable to re-establish contact, make a pass by the range control tower on the attack heading while rocking wings, and turn in the direction of traffic. The flight leader will either rejoin on the NORDO aircraft, or direct another flight member to rejoin on the NORDO aircraft, in order to escort the NORDO aircraft to a recovery base.

7.5.3.1.3. If the NORDO aircraft has an emergency, make a pass by the range control tower, if practical, on the attack heading while rocking wings, turn opposite the direction of traffic, and proceed to a recovery base. The flight leader will either rejoin

on the NORDO aircraft, or direct another flight member to rejoin on the NORDO aircraft, in order to escort the emergency aircraft.

7.5.3.1.4. If the RCO experiences radio failure, the flight will hold high and dry and maintain spacing while attempting contact on primary and backup frequencies.

7.5.3.2. Unmanned Class B and Class C Ranges:

7.5.3.2.1. Make a “high and dry” pass on the target, if possible, while rocking wings.

7.5.3.2.2. The leader will either rejoin the flight in sequence and recover, or direct another flight member to escort the NORDO aircraft to a recovery base.

7.5.3.2.3. If the NORDO has an emergency, aircrew will, if practical, make a pass on the target, rocking wings, turn opposite direction of traffic, and proceed to a recovery base. The flight lead will either rejoin on the NORDO aircraft, or direct a flight member to rejoin on the NORDO aircraft, in order to escort the emergency aircraft.

7.5.3.3. **Jettison of Unexpended Ordnance.** If radio failure occurs and circumstances preclude landing with unexpended ordnance, accomplish a safe jettison of the ordnance provided the following conditions are met:

7.5.3.3.1. The NORDO aircraft joins on another flight member that has radio contact with the remainder of the flight and the RCO (on a manned range).

7.5.3.3.2. Stores jettison visual signals specified in AFI 11-205 (hold fist at top of canopy and make several pumping motions) are relayed to the NORDO aircraft to initiate jettison.

7.5.4. **NORDO Recovery.**

7.5.4.1. **Go-around.**

7.5.4.1.1. The chase aircraft will go-around, pass the NORDO aircraft, and rock his wings.

7.5.4.1.2. The NORDO aircraft will go-around if in a safe position to do so.

7.5.4.1.3. If the NORDO aircraft is in formation as a wingman, the lead will initiate a gentle turn into the wingman and begin the go-around.

7.5.4.2. **Approach End Arrestment.**

7.5.4.2.1. The NORDO aircraft will signal intent for an approach-end cable engagement to the chase aircraft by extending the tailhook.

7.5.4.2.2. The pilot of a non-escorted NORDO aircraft intending to make an approach-end cable engagement will fly a straight-in approach flashing the landing light on final to signal the tower.

**7.6. Severe Weather Penetration.** Do not attempt flight through severe weather. However, if unavoidable, obtain separate clearances prior to severe weather penetration. If not feasible, flights may assume an in-trail formation with a minimum of 1 NM separation between aircraft/elements. Obtain ATC clearance for a non-standard formation.

**7.7. Lost Wingman Procedures.** In any lost wingman situation, immediate separation of aircraft is essential.

### 7.7.1. General Procedures.

7.7.1.1. Upon losing sight of the flight/element lead or if unable to maintain formation the wingman will simultaneously:

7.7.1.1.1. Transition to instruments.

7.7.1.1.2. Execute the applicable lost wingman procedures.

7.7.1.1.3. Inform lead by transmitting "C/S, lost wingman."

7.7.1.1.4. After executing lost wingman procedures, wingman will not attempt to rejoin with the flight until the flight lead clears the wingman to do so.

7.7.1.2. Flight/Element lead must acknowledge the lost wingman's radio call and, when appropriate, transmit attitude, heading, altitude, airspeed, and other parameters necessary for safe separation. When practical and if required, the flight lead will obtain separate clearances.

7.7.1.3. At all times, all aircraft involved shall observe all published terrain clearance limits.

7.7.1.4. If a wingman becomes separated and any aircraft experiences radio failure, the aircraft with the operational radio will obtain a separate clearance for both aircraft.

7.7.1.4.1. The NORDO aircraft will squawk code 7600 while proceeding with the last known clearance.

7.7.1.4.2. If an emergency situation arises along with radio failure, the NORDO aircraft will turn the IFF to EMERGENCY for the remainder of the flight.

7.7.1.5. Only practice lost wingman procedures in VMC.

7.7.2. **Two and Three-Ship Procedures** (NOTE: For three-ship echelon, refer to four-ship procedures):

7.7.2.1. **Wings-Level Flight (Climbing, Descending, or Straight and Level).** Turn away using 15 degrees of bank for 15 seconds, then resume original heading.

7.7.2.2. **Turns.**

7.7.2.2.1. 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.

7.7.2.2.2. 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 lead may only resume the turn when separation is ensured.

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

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

**7.7.3. Three-Ship Echelon and Four-Ship Procedures.** Number 2 and 3 follow the procedures outlined above. Number 4's initial action assumes that number 3 has also gone lost wingman:

**7.7.3.1. Wings-Level Flight (Climbing, Descending, or Straight and Level).** Turn away using 30 degrees of bank for 30 seconds, then resume the original heading.

**7.7.3.2. Turns.**

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

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

**7.7.4. Fighter – tanker lost wingman procedures** are governed by ATP-56(B), *Air-to-Air Refueling*.

**7.8. Spatial Disorientation (SD).** Conditions which prevent a clear visual horizon or increase pilot tasking are conducive to SD. To prevent SD, the pilot must make a conscious effort to increase the instrument cross-check rate. Execute the following procedures if SD symptoms are encountered and until symptoms abate:

**7.8.1. Single Ship.**

**7.8.1.1.** Concentrate on flying basic instruments. Ensure an EADI is displayed IAW **para 4.1.1.4**. If able, communicate to the other crewmember that SD symptoms are being experienced. The HUD will only be referenced as a backup to the EADI or if the EADI is unavailable due to system malfunctions.

**7.8.1.2.** Consider turning on the autopilot or transferring control to the other crewmember.

**7.8.1.3.** If symptoms persist and conditions permit, fly straight and level until symptoms abate.

**7.8.1.4.** If necessary, declare an emergency and advise ATC.

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

**7.8.2. Flight/Element Lead.**

**7.8.2.1.** Advise the Wingmen of the disorientation and comply with procedures in **para 7.8.1**

**7.8.2.2.** Use the Wingmen to confirm attitude and provide verbal feedback.

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

**7.8.3. Wingman.**

**7.8.3.1.** Advise lead of the disorientation and comply with procedures in **para 7.8.1**

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

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

7.8.3.4. If the above procedures are not effective flight lead should consider passing the lead to the wingman, provided the flight lead will be able to maintain situational awareness from a chase position.

7.8.3.4.1. Change leads while in straight and level flight.

7.8.3.4.2. Once assuming the lead, maintain straight and level flight for at least 60 seconds if practical.

7.8.3.5. If necessary, terminate the tactical mission and recover by the simplest and safest means possible.

#### 7.8.4. **Greater Than Two-Ship Formation.**

7.8.4.1. Lead should separate the flight into elements to more effectively handle a wingman with persistent SD symptoms.

7.8.4.2. Accomplish split-up IAW para 4.4 (Formation Split-up).

7.8.4.3. Plan to keep the element with the SD pilot straight and level while the other element separates.

### 7.9. **Armament System Malfunctions.**

7.9.1. **General.** Aircrew will not attempt to expend ordnance with a known weapons release malfunction.

#### 7.9.2. **Inadvertent Release or Firing (i. e. not due to aircrew error).**

7.9.2.1. IAW the AFI 11-214 definition of an inadvertent release, if commanding a single release, do not consider a double bomb release as inadvertent if the release occurs from a practice bomb dispenser (e.g. BDU-33s from a SUU-20).

7.9.2.2. Note switch positions at the time of inadvertent release or firing and provide to armament and safety personnel. Record the impact point if known.

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

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

7.9.3. **Failure to Release, Failure to Fire, or Hung Ordnance.** Note switch positions and PACS settings. If ordnance delivery failed with proper setup, proceed as follows:

#### 7.9.3.1. **Live Bombs.**

7.9.3.1.1. Attempt to release store(s) using an alternate delivery mode.

7.9.3.1.2. If unsuccessful, attempt to jettison store(s) using selective jettison procedures.



7.9.3.1.3. Lastly, consider attempting to selectively jettison the pylon if ordnance is unsecured or status of the weapon cannot be determined.

7.9.3.1.4. All release and fuze settings should be noted, then safe the system.

7.9.3.1.5. If bombs remain on the aircraft, follow the Hung Ordnance and Weapons Malfunction Recovery procedures.

#### 7.9.3.2. **Practice or Inert Bombs.**

7.9.3.2.1. Re-check switch positions and make an additional attempt to expend.

7.9.3.2.2. If no release occurs, select an alternate delivery mode in an attempt to expend.

7.9.3.2.3. If the secondary release mode fails, bombs from other stations and dispensers may be released providing the aircraft remains within symmetrical load limits. Upon RTB, follow the Hung Ordnance and Weapons Malfunction Recovery procedures.

#### 7.9.4. **Missile Malfunctions.**

7.9.4.1. When abnormal missile launch or erratic missile flight is noted after launch, visually inspect the launching aircraft to determine if any damage has occurred.

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

7.9.4.3. A missile that fails to fire when all appropriate switches were selected is a misfire.

7.9.4.4. For either a hangfire or misfire safe the Master Arm switch and follow the Hung Ordnance and Weapons Malfunction Recovery procedures.

#### 7.9.5. **Gun Malfunctions.**

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

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

7.9.5.3. If the HUD gun cross is on after selecting Master Arm "SAFE" or the gun cannot be verified safe, upon landing recover to a designated Hot Gun area.

7.9.5.4. Follow the Hung Ordnance and Weapons Malfunction Recovery procedures.

#### 7.9.6. **Hung Ordnance and Weapons Malfunction Recovery.**

7.9.6.1. If practical, obtain a chase aircraft and visually inspect the aircraft for damage.

7.9.6.2. Declare an emergency when carrying hung or malfunctioning live ordnance, to include 20mm HEI.

7.9.6.3. Declaration of an emergency for hung practice or inert ordnance, 20mm TP, or live unexpended ordnance is IAW local directives and aircrew discretion.

7.9.6.4. Avoid populated areas and trail formations.

7.9.6.5. Land from a straight-in approach.

**7.10. Post Arresting Gear Engagement Procedures.**

- 7.10.1. Do not shut down the engine(s) unless directed by the ground crew, there is a fire, or safety dictates.
- 7.10.2. Raise the tailhook only on the ground crew's signal.
- 7.10.3. Do not taxi until directed.

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

- 7.11.1. A Simulated Emergency Procedure is defined as any procedure that produces an effect which closely parallels an actual emergency, such as retarding the throttle to simulate a flamed out engine.
- 7.11.2. Only practice aborted takeoffs in the simulator, Cockpit Procedures Trainer (CPT), or, if the trainer is unavailable, a static aircraft.
- 7.11.3. Simulated in-flight loss of both engines is prohibited.
- 7.11.4. Practice in-flight engine shutdown is prohibited.
- 7.11.5. Emergency Landing Patterns (also refer to AFI 11-202V3).
  - 7.11.5.1. **Field Requirements.** Practice of emergency landing patterns at active airfields is authorized provided that crash rescue and ATC facilities are available and in operation.
  - 7.11.5.2. **Supervisory Requirements.** IQT pilots prior to the initial or requalification (INIT or RQ) qualification (QUAL) evaluation require an IP on board the aircraft or in chase. After the INIT or RQ QUAL evaluation, supervision will be an IP/IWSO on board the aircraft or in chase. Initial MQT pilots (i.e. pilots in training for an INIT mission (MSN) evaluation, does not apply to pilots in training for an RQ MSN) require a SOF in place and an IP or flight lead monitoring from the traffic pattern.
  - 7.11.5.3. **Pattern Procedures.**
    - 7.11.5.3.1. Include the type of practice emergency pattern in the gear down call.
    - 7.11.5.3.2. Practice Single-Engine Go-Around.
      - 7.11.5.3.2.1. Initiate practice single-engine go-around in sufficient time to ensure the aircraft does not descend below 300 feet AGL.
      - 7.11.5.3.2.2. Simulated single-engine approaches may descend below 300 feet AGL provided the approach terminates in a full stop landing or the go-around from a low approach or touch and go landing is performed with both engines.

**7.12. Search and Rescue (SAR) Procedures.** If an aircraft crashes, immediately attempt to locate possible survivors and initiate rescue efforts. Expect that the aircrew may initially suffer from shock or have delayed reactions due to ejection injuries. The following procedures are not exhaustive and should be adjusted to meet each unique search and rescue situation.

- 7.12.1. Knock off maneuvering.
- 7.12.2. Establish an On-Scene Commander (usually the wingman of the aircraft that is down).

7.12.3. Notify ATC or Ground Controlled Intercept (GCI) of the emergency situation. Squawk 7700 if requested by control agency.

7.12.4. Communicate the emergency situation, aircraft involved, and flight intentions immediately to applicable control agencies. Use GUARD (UHF and/or VHF) if necessary.

7.12.5. Mark the last known position of survivors (and the crash site if practical) using any means available (e.g. TACAN, EGI/INS, ATC/GCI, visual references).

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

7.12.7. Deconflict other aircraft assisting in search and rescue (SAR) by altitude to preclude midair collision. Establish high and low CAPs as necessary to facilitate communications.

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

7.12.9. Relinquish SAR operation to designated rescue forces upon their arrival.

7.12.10. Follow local or briefed procedures.

**7.13. Lateral Asymmetry.** Reference TO 1F-15E-1-2-1, Section 5 for restrictions associated with lateral asymmetry and Section 6 for detailed information on lateral asymmetry flight characteristics.

7.13.1. When an unplanned lateral asymmetry is encountered due to weapons configuration and/or fuel imbalance, aircrew will maintain awareness of their condition using CRM and all available tools to include the Lateral Asymmetry calculator provided in the TO checklist ("N" pages).

7.13.2. At OG/CC discretion, units may provide aircrew with rule-of-thumb (ROT) lateral asymmetry calculation worksheets based on TO-derived information.

7.13.3. When the calculated lateral asymmetry exceeds Dash 1 limits for maneuvering above 30 CPU, terminate maneuvering and investigate. To the maximum extent possible, set the cockpit-selectable AOA tone at 25 CPU until it is determined that the asymmetry is less than 10,000 ft-lbs.

7.13.4. For non-contingency operations, restrict flight operations to the events listed below if a calculated lateral asymmetry exceeds 10,000 ft-lbs and is caused in whole or in part by either: 1) a fuel imbalance due to a slow feeding CFT/external/internal wing tank (restriction only applies while imbalance exists), or 2) trapped fuel. If, due to trapped fuel, the calculated lateral asymmetry exceeds 20,000 ft-lbs, terminate the mission and land as soon as practical (events listed below may be used to reduce gross weight). NOTE: even though external wing tank fuel imbalances up to 1,500 lbs is considered "normal" IAW the TO, fuel imbalances of as little as 400 lbs when combined with weapons configurations resulting in greater than 10,000 ft-lbs require increased aircrew vigilance and maneuvering finesse.

7.13.4.1. Instrument procedures;

7.13.4.2. Deployment/Redeployment and PDM missions (i.e. CORONET);

7.13.4.3. Level training weapons deliveries;

7.13.4.4. RESTRICTED A/A maneuvering IAW AFI 11-214.

7.13.5. For contingency operations, if mission necessity dictates continued flight with lateral asymmetries above 20,000 ft-lbs, aircrew should consider reducing the asymmetry of the aircraft as much as practical (e.g. tank/stores jettison).

7.13.6. If the computed lateral asymmetry is equal to or greater than 40,000 ft-lbs, aircrew shall limit their AOA to 25 CPU until the asymmetry is reduced.

**7.14. Engine Malfunctions.** Report all engine anomalies during maintenance debrief.

## Chapter 8

### LOCAL OPERATING PROCEDURES

**8.1. General.** This chapter is reserved for unit local operating procedures. IAW AFI 33-360, the paragraph method is the only authorized way to supplement an AFI and added material must be arranged according to the basic publication. Units composed of dissimilar aircraft may publish guidance in a single, stand-alone local operating instruction (OI) or field instruction instead of supplementing this AFI. Added or stand-alone procedures will not be less restrictive than those contained elsewhere in this volume. This chapter is not intended to be a single source document for procedures contained in other directives or regulations. Avoid unnecessary repetition of guidance provided in other established directives; however, reference to those directives is acceptable when it serves to facilitate location of information necessary for local operating procedures. Units may supplement the following paragraphs for local operating guidance:

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

**8.2. 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. SAR and On-Scene Commander Procedures.
- 8.2.11. Bird/Wildlife Aircraft Strike Hazard (BASH) program guidance IAW AFI 91-202, *The US Air Force Mishap Prevention Program* and AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*.

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

**8.3. Distributing Guidance.** When published, units will forward copies of the local guidance to MAJCOM and appropriate subordinate agencies, who will review and return comments back to the unit(s). Distribution of local guidance 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-15E units, it will be incorporated into the basic AFI volume.

BURTON M. FIELD, Lt Gen, USAF  
DCS, Operations, Plans and Requirements

## Attachment 1

## GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

**References**

- Allied Tactical Publication (ATP)-56(B), *Air-to-Air Refueling*, 22 Jan 2010
- AF Records Disposition Schedule*
- AFI 11-2F-15EV1, *F-15E--Aircrew Training*, 31 Mar 2011
- AFI 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*, 19 Jan 2012
- AFI 11-202V3, *General Flight Rules*, 22 Oct 2010
- AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*, 19 May 1994
- AFI 11-209, *Aerial Event Policy and Procedures*, 4 May 2006
- AFI 11-214, *Air Operations Rules and Procedures*, 14 Aug 2012
- AFI 11-218, *Aircraft Operations and Movement on the Ground*, 28 Oct 2011
- AFI 33-360, *Publications and Forms Management*, 18 May 2006
- AFI 91-202, *The US Air Force Mishap Prevention Program*, 5 Aug 2011
- AFMAN 11-217V1, *Instrument Flight Procedures*, 22 Oct 2010
- AFMAN 11-217V2, *Visual Flight Procedures*, 22 Oct 2010
- AFMAN 33-363 *Management of Records*, 01 Mar 2008
- AFPAM 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques*, 1 Feb 2004
- AFPD 11-2, *Aircrew Operations*, 19 Jan 2012
- AFPD 11-4, *Aviation Service*, 1 Sep 2004
- AFTTP 3-1.F-15E, *Tactical Employment—F-15E (Secret)*, 4 Nov 2011
- AFTTP 3-3.F15E, *Combat Aircraft Fundamentals--F-15E* 4 Nov 2011
- CFR Part 95, IFR Altitudes
- FLIP, *Flight Information Publication*
- TO 1F-15E-1-2-1, *Flight Manual--F-15E*, 15 Jan 2012
- TO 1F-15E-1-1, *Flight Manual Performance Data USAF Series F-15E Aircraft*, 15 May 2012
- TO 1F-15E-1-2-1CL-1, *Flight Crew Checklist USAF Series F-15E Aircraft*, 15 May 2012
- TO 1F-15E-34-1-1CL-1, *Flight Crew NonNuclear Weapon Delivery Checklist*, 15 Jan 2012

**Adopted Forms**

- AF Form 847, *Recommendation for Change of Publication*
- AFTO Form 781, *ARMS Aircrew/Mission Flight Data Document*

AFTO FORM 781 A, *Maintenance Discrepancy and Work Document*

***Abbreviations and Acronyms***

**AAI**—Air-to-Air Interrogator

**AB**—After Burner

**ACBT**—Air Combat Training

**ACDE**—Aircrew Chemical Defense Equipment

**ACMI**—Air Combat Maneuvering Instrumentation

**ADI**—Attitude Direction Indicator

**AERPS**—Aircrew Eye and Respiratory Protection System

**AFI**—Air Force Instruction

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

**AGL**—Above Ground Level

**AHC**—Aircraft Handling Characteristics

**ALC**—Air Logistics Center

**AOA**—Angle of Attack

**ASR**—Airport Surveillance radar

**ATC**—Air Traffic Control

**ATDPS**—Asymmetric Thrust Departure Prevention System

**AWACS**—Airborne Warning and Control System

**BMC**—Basic Mission Capable

**CAP**—Combat Air Patrol

**CG**—Center of Gravity

**CHUM**—Chart Update Manual

**CMR**—Combat Mission Ready

**COMAFFOR**—Commander, Air Force Forces

**CONUS**—Continental United States

**CPT**—Cockpit Procedures Trainer

**CPU**—Cockpit Units

**C/S**—Callsign

**CSAR**—Combat Search and Rescue

**CT**—Continuation Training

**DA**—Decision Altitude



**DEEC**—Digital Electronic Engine Control

**DGR**—Designated Ground Range

**DGRD**—Degraded

**DH**—Decision Height

**DoD**—Department of Defense

**DRU**—Direct Reporting Unit

**EADI**—Electronic Attitude Director Indicator

**ECM**—Electronic Counter Measures

**EGI**—Embedded GPS INS

**EMCON**—Emissions Condition

**EOR**—End of Runway

**EP**—Emergency Procedure

**ERAA**—Emergency Route Abort Altitude

**ESA**—Emergency Safe Altitude

**FOA**—Field Operating Agency

**FAF**—Final Approach Fix

**FCIF**—Flight Crew Information File

**FCP**—Front Cockpit

**FDL**—Fighter Data Link

**FENCE**—Firepower, Emitters, Navigation, Communications, and Electronic Countermeasures

**FLIP**—Flight Information Publications

**FMP**—Flight Manual Program

**FOD**—Foreign Object Damage

**FTU**—Formal Training Unit

**FW**—Fighter Wing

**FTIT**—Fan Turbine Inlet Temperature

**G**—Gravitational Load Factor

**GCI**—Ground Controlled Intercept

**GPS**—Global Positioning System

**HRM**—High Resolution Map

**HUD**—Heads Up Display

**IAM**—Inertially Aided Munition

**IAW**—In Accordance With  
**IDEEC**—Improved Digital Electronic Engine Control  
**IFF**—Identification Friend or Foe  
**IFR**—Instrument Flight Rules  
**IMC**—Instrument Meteorological Conditions  
**IP**—Instructor Pilot  
**IQT**—Initial Qualification Training  
**IR**—Infrared or IFR Route  
**JFS**—Jet Fuel Starter  
**JOAP**—Joint Oil Analysis Program  
**KCAS**—Knots Calibrated Airspeed  
**KIO**—Knock-It-Off  
**KM**—Kilometer  
**KTAS**—Knots True Airspeed  
**LANTIRN**—Low Altitude Navigation and Targeting Infrared for Night  
**LAR**—Launch Acceptability Region  
**LAWS**—Low Altitude Warning System  
**LOWAT**—Low Altitude Training  
**LVS**—Left Vertical Stab  
**MAJCOM**—Major Command  
**MDA**—Minimum Descent Altitude  
**MIT**—Mass Item  
**MOA**—Military Operating Area  
**MPS**—Mission Planning Systems  
**MQT**—Mission Qualification Training  
**MSA**—Minimum Safe Altitude  
**MSL**—Mean Sea Level  
**MTR**—Military Training Route  
**N/A**—Not Applicable  
**NAF**—Numbered Air Force  
**NAS**—National Airspace System  
**NAV/FLIR**—Navigation Forward Looking Infrared

**NLT**—Not Later Than  
**NM**—Nautical Miles  
**NORDO**—No Radio  
**NWLO**—Nose Wheel Lift Off  
**NVG**—Night Vision Goggles  
**OGV**—Operations Group Stan/Eval  
**OPR**—Office of Primary Responsibility  
**OSC**—On-Scene Commander  
**OT&E**—Operational Test and Evaluation  
**OWS**—Overload Warning System  
**PACS**—Programmable Armament Control Set  
**PAPI**—Precision Approach Path Indicator  
**PBG**—Pressure Breathing  
**PFR**—Primary Flight Reference  
**PGM**—Precision Guided Munition  
**PIC**—Pilot in Command  
**PPKS**—Present Position Keeping Source  
**PWC**—Pilot Weather Category  
**RALT**—Radar Altimeter  
**RCO**—Range Control Officer  
**RCP**—Rear Cockpit  
**RCR**—Runway Condition Reading  
**RDS**—Records Disposition Schedule  
**RIA**—Recovery Initiation Altitude  
**RNAV**—Area Navigation  
**RPI**—Runway Point of Intercept  
**RSC**—Runway Surface Condition  
**RTB**—Return to Base  
**RVS**—Right Vertical Stab  
**RWR**—Radar Warning Receiver  
**SAC**—Sectional Aeronautical Chart  
**SAR**—Search and Rescue

**SCP**—Set Clearance Plane  
**SD**—Spatial Disorientation  
**SEFE**—Stan/Eval Flight Examiner  
**SIF**—Selective Identification Feature  
**SM**—Statute Mile  
**SUA**—Special Use Airspace  
**TACAN**—Tactical Air Navigation  
**TAS**—True Airspeed  
**TOLD**—Takeoff and Landing Data  
**TF**—Terrain Following  
**TFR**—Terrain Following Radar  
**TO**—Technical Order  
**TOT**—Time On Target  
**VFR**—Visual Flight Rules  
**VMC**—Visual Meteorological Conditions  
**WSEP**—Weapon Systems Evaluation Program  
**WSO**—Weapon Systems Officer

## Attachment 2

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

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

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

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

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

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

**A2.4.1. Aircraft Launch to Survive.** Units will develop local procedures to provide this option to the commander. 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 the end of runway (EOR) prior to takeoff or that have just landed.

**A2.4.2. Alarm Red (or Theater Equivalent) Prior to Taxi.** If in a HAS, the normal procedure is to shut down. Ensure ground personnel are aware of the alarm warning, as engine noise may preclude effectiveness of normal alert notification procedures. Use hand signals if necessary to be sure that ground personnel assume proper MOPP and close HAS doors. If not in a HAS, procedures may include launch to survive.

**A2.4.3. Alarm Red (or Theater Equivalent) After Taxi.** Units typically establish procedures for this contingency depending on whether additional protection is available along the taxi route. For instance, if empty HAS are available, taxiing aircraft may be directed to shelter there. 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 (C2) entities (Wing Operations Center, Maintenance Operations Center, Supervisor of Flying, etc.) to ensure unity of effort in the overall plan.

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

**A2.5.1. Contamination.** If Chemical Warfare (CW) agent contamination occurs prior to takeoff, flying the aircraft will dissipate the agent to some degree. The greatest dissipation will occur during flights at lower altitudes and longer airborne times. Because the agent may have entered wheel wells, flaps, etc., consider flying in landing configuration to increase airflow to these areas. However, merely flying the aircraft is unlikely to achieve complete decontamination.

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

**A2.6. Landing to Engine Shutdown.** Take advantage of any protection available, minimizing taxi time and distance. Maintain contact with C2 in order to remain aware of unexploded ordnance and/or damage to airfield movement surfaces. If a HAS is available and local procedures permit, accomplish aircraft de-arm and EOR procedures there. If Alarm Red (or Theater Equivalent) occurs between landing and engine shutdown, considerations are similar to those in para [A2.4](#)

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

**Attachment 3**  
**GENERAL BRIEFING GUIDE**

**A3.1. Mission Data:**

- A3.1.1. Time Hack
- A3.1.2. Classification
- A3.1.3. EP/Threat of the Day
- A3.1.4. Mission Objective(s)
- A3.1.5. Mission Overview
- A3.1.6. Mission Data Card/Takeoff and Landing Data
- A3.1.7. Weather/Sunrise/Sunset/Moon Illumination
- A3.1.8. Transmissivity/Absolute Humidity/Thermal Crossover
- A3.1.9. NOTAMs/Bird Strike Potential
- A3.1.10. Personal Equipment
- A3.1.11. FCIF/Pubs/Maps

**A3.2. Ground Procedures:**

- A3.2.1. Pre-Flight:
  - A3.2.1.1. Aircraft.
  - A3.2.1.2. Armament.
- A3.2.2. Check-In.
- A3.2.3. Taxi/Marshaling/Arming.
- A3.2.4. Spare/Red Ball Procedures.

**A3.3. Takeoff:**

- A3.3.1. Runway Lineup.
- A3.3.2. Formation Takeoff/Takeoff Interval.
- A3.3.3. Abort.
- A3.3.4. Jettison Procedures.
- A3.3.5. Low Altitude Ejection.
- A3.3.6. Landing Immediately After Takeoff.

**A3.4. Departure/En Route:**

- A3.4.1. Routing.
- A3.4.2. Trail Departure.
- A3.4.3. Join-Up/Formation.

A3.4.4. NVG Donning (Night).

A3.4.5. Systems/Ops Checks.

A3.4.6. TFR Checks (Night).

**A3.5. Recovery:**

A3.5.1. Rejoin.

A3.5.2. BD Check.

A3.5.3. Type Recovery.

A3.5.4. Flight Break-Up (if applicable).

A3.5.5. Pattern and Landing.

A3.5.6. After Landing/De-Arm.

A3.5.7. Emergency/Alternate Airfields.

**A3.6. Special Subjects.**



**Attachment 4****SPECIAL SUBJECT BRIEFING GUIDE (AS APPLICABLE)****A4.1. ROE, Special Operating Instructions.****A4.2. Instructor Responsibilities.****A4.3. Chase Procedures.****A4.4. IFF/Mode S Procedures.****A4.5. Lateral Asymmetry.**

A4.5.1. Takeoff Configuration

A4.5.2. Tactical portions based on planned weapons expenditure

A4.5.3. Lateral asymmetry highlight areas (e.g. external tank fuel imbalance combined with high G/high AOA maneuvering).

**A4.6. Midair Collision Avoidance.**

A4.6.1. Radar/Visual Search Responsibilities.

A4.6.2. Departure/Enroute/Recovery High Density Traffic Areas.

A4.6.3. Deconfliction plan.

A4.6.3.1. From Other Military Aircraft.

A4.6.3.2. From Civilian Aircraft.

**A4.7. Flight Member Roles and Responsibilities.**

A4.7.1. Formation and Deconfliction Contracts.

A4.7.2. Sensor Management/Prioritization.

A4.7.3. Tactical Employment Priorities.

**A4.8. Dissimilar Formations.****A4.9. Terrain Avoidance.**

A4.9.1. Departure/En Route/Recovery.

A4.9.2. Use of RALT/MSL Floor Settings.

**A4.10. Bird Strike Procedures, Use of Visor(s).****A4.11. Hazards Associated with Human Factors (e. g. Channelized Attention, Task Saturation/Prioritization, and Complacency).****A4.12. G-Awareness:**

A4.12.1. G-Suit connection/G-tolerance/G-Awareness Turn.

A4.12.2. Use of AGSM.

**A4.13. Visual Illusions, Perceptions.****A4.14. Spatial Disorientation, Unusual Attitudes.**

**A4.15. Lost Wingman.**

**A4.16. Radio Inoperative (NORDO).**

**A4.17. SARCAP and On-Scene Commander Procedures.**

**A4.18. Recall Procedures.**

**A4.19. SIIs.**

**A4.20. Training Rules.**

**A4.21. Lateral Asymmetry Severity.**

**A4.22. Operational Risk Management (ORM).**

A4.22.1. ORM assessment, hazards to this flight.

A4.22.2. Factors mitigating risk.

A4.22.3. When to reassess.

**Attachment 5**

**ADVANCED HANDLING BRIEFING GUIDE**

**A5.1. Airwork.**

A5.1.1. Airspace Restrictions.

A5.1.2. Area Orientation.

A5.1.3. Planned Maneuvers.

A5.1.4. Maneuvering Limitations.

A5.1.4.1. Airspeed and "G".

A5.1.4.2. Recognition/Prevention/Recovery From Out of Control.

A5.1.4.3. Maneuvering at Heavyweight/High AOA/Asymmetrical Configuration.

A5.1.4.4. Effects of Center of Gravity (CG) Throughout the Flight.

**Attachment 6****AIR REFUELING BRIEFING GUIDE****A6.1. General.**

- A6.1.1. Tanker Call Sign(s)/Receiver assignments.
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- A10.1.5. Formation.
- A10.1.6. Sequence of Events.
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  - A10.2.2.7. Backup Deliveries.
- A10.2.3. Pop-Up to Dive Delivery.
  - A10.2.3.1. Entry Airspeed, Altitude.
  - A10.2.3.2. Pop Point, Pull-Up Angle, Power Setting.
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  - A10.2.3.4. Pull Down, Apex Altitudes.
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A10.2.4.3. Roll-Out, Wind Effect.

A10.2.5. Dive Final.

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A10.2.5.3. Airspeed.

A10.2.5.4. HUD Depiction.

A10.2.5.5. Sight Picture, Corrections, Aim-Point.

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A10.2.5.7. Release Indications.

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A10.3.1.1. Fuse Arming, Safe Escape, Safe Separation.

A10.3.1.2. Frag Avoidance.

A10.3.2. Laser Operations.

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A10.4.2. Radio Calls.

A10.4.3. Target ID, Range Lighting.

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A10.5.1.1. Depth Perception, Reduced Visual Cues.

A10.5.1.2. Distance/Altitude Estimation.

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A10.5.1.3.1. Timing.

A10.5.1.3.2. Visual and System References to Establish Pull-Up Point.

A10.5.2. Special Considerations.

A10.5.2.1. Adjusted Minimum Altitudes.

A10.5.2.2. Training Rules, Special Operating Procedures.

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A10.6.2. Rejoin.

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A10.6.4. Jettison Procedures, Parameters.

A10.6.5. Hung/Unexpended Ordnance.

A10.6.6. Inadvertent Release.

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A11.1.2. Operating Area Entry, Description, Boundaries.

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A11.1.5.2. TOT.

A11.1.5.3. Target Area Weather.

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A11.1.5.3.2. Winds, Altimeter.

A11.1.5.3.3. Sun Angle, Shadows.

A11.1.5.3.4. IR Considerations.

A11.1.6. Threat Array.

A11.1.6.1. Type, Capabilities.

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A11.1.6.3. Countermeasures.

A11.1.6.3.1. ICS, Chaff, Flare.

A11.1.6.3.2. Terrain masking.

A11.1.6.3.3. Radio Silent Procedures.

A11.1.6.3.4. Authentication, Comm-Jamming, Chattermark Procedures.

A11.1.6.4. Threat Reactions.

A11.1.6.4.1. LOWAT.

A11.1.6.4.2. IP to Action Point.

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A11.1.7. Ordnance, Weapons Data.

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A11.1.7.2. Weapons Settings.

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A11.1.7.4. Specific Aim Points.

A11.1.7.5. Minimum Altitudes.

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A11.1.7.5.2. Frag Avoidance.

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A11.2.1.1. Overview.

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A11.2.1.3. Weapons Delivery.

A11.2.1.3.1. Type Delivery.

A11.2.1.3.2. Switchology.

A11.2.1.3.3. Attack Parameters.

A11.2.1.3.3.1. Action Point, Pop Point.

A11.2.1.3.3.2. Altitudes (Pull-Down/Apex/Release/Minimum).

A11.2.1.3.4. Visual Lookout, Mutual Support Responsibilities.

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A11.2.1.5. A/A Gameplan.

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A11.4.2. Two/Three Ship Options.

A11.4.3. Tactical Lead Changes.

A11.4.4. Air-to-Air TACAN.

A11.4.5. Codewords.

A11.4.6. Weather Backup Deliveries.

A11.4.7. Degraded Systems.

A11.4.8. Reattack.



A11.4.9. Wounded Bird, Escort Procedures.

## Attachment 12

### **AIR-TO-SURFACE WEAPONS EMPLOYMENT BRIEFING GUIDE (CLOSE AIR SUPPORT / ARMED RECCE)**

#### **A12.1. General Information.**

- A12.1.1. Intelligence, Threat Scenario.
- A12.1.2. Operating Area Entry, Description, Boundaries.
- A12.1.3. FENCE Checks.
- A12.1.4. En Route Formation(s), Look Out Responsibilities, Low-Level/LOWAT Brief.
- A12.1.5. Ordnance/Weapons Data.
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  - A12.1.5.2. Weapons Settings.
  - A12.1.5.3. Live Ordnance Procedures, Minimum Altitudes.
    - A12.1.5.3.1. Fuse Arming, Safe Escape, Safe Separation.
    - A12.1.5.3.2. Frag Avoidance.
    - A12.1.5.3.3. Missile Launch Parameters.
  - A12.1.5.4. Laser Operations.
- A12.1.6. Control Agencies.
  - A12.1.6.1. Call Signs.
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  - A12.1.6.3. Authentication, Authority.
- A12.1.7. Coordination.
  - A12.1.7.1. Attack Package Times, Support.
  - A12.1.7.2. Data Gathering, Transmission.
  - A12.1.7.3. Airspace Restrictions.
  - A12.1.7.4. Mission Number.
  - A12.1.7.5. Friendly Forces.
  - A12.1.7.6. Play Time.

#### **A12.2. Close Air Support / Armed RECCE Procedures.**

- A12.2.1. Working Area.
- A12.2.2. Formations, Working Altitudes.
  - A12.2.3. Target Types, Threat Array.
  - A12.2.4. Attack Tactics.

**A12.3. Weapons Delivery.**

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A12.3.1.1. Type Delivery.

A12.3.1.2. Switchology.

A12.3.1.3. Attack Parameters.

A12.3.1.3.1. Action Point, IP, Pop Point.

A12.3.1.3.2. Altitudes (Pull-Down/Apex/Release/Minimum).

A12.3.1.4. Visual Lookout, Mutual Support Responsibilities.

A12.3.1.5. Egress.

A12.3.1.5.1. Recovery to CAP Point, Return to Low Altitude.

A12.3.1.5.2. Loss of Mutual Support, Rendezvous Point.

A12.3.2. BD/Bomb Check.

A12.3.3. Mission Reporting (BDA/In-Flight Report).

**A12.4. Combat SAR Procedures.**

A12.4.1. Communications Procedures.

A12.4.2. Downed Aircraft Procedures.

A12.4.3. On-Scene Commander.

A12.4.4. Fuel Considerations.

A12.4.5. Ordnance Considerations.

**A12.5. Contingencies.**

A12.5.1. One/Two/Three-Ship Options.

A12.5.2. Tactical Lead Changes.

A12.5.3. A/A TACAN, TIDS SA.

A12.5.4. Code Words, Comm Out Signals.

A12.5.5. Weather Back-Up Deliveries.

A12.5.6. Degraded Systems.

A12.5.7. Reattack.

A12.5.8. Asymmetrical Considerations.

A12.5.9. Jettison Procedures/Parameters.

A12.5.10. Hung/Unexpended Ordnance Procedures.

A12.5.11. Wounded Bird, Escort Procedures.

**Attachment 13**  
**ALERT BRIEFING GUIDE**

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- A13.1.1. Time Hack.
- A13.1.2. Mission Data Card.
  - A13.1.2.1. Call Signs.
  - A13.1.2.2. Aircraft, Location, Status.
  - A13.1.2.3. Takeoff/Landing Data (Worst Case).
  - A13.1.2.4. Joker/Bingo Fuel.
- A13.1.3. Actual and Forecast Weather.
  - A13.1.3.1. Homebase.
  - A13.1.3.2. Alternates.
  - A13.1.3.3. Individual Weather Category, Mandatory Status.
- A13.1.4. NOTAMs.
- A13.1.5. FCIF, Pubs, Maps.
- A13.1.6. Personal Equipment.
- A13.1.7. Alert Packet.
  - A13.1.7.1. Authenticators, Duress Code.
  - A13.1.7.2. Security Procedures.
- A13.1.8. Airfield Status.
  - A13.1.8.1. Actual versus Max Allowable Tailwind.
  - A13.1.8.2. Barriers.
  - A13.1.8.3. Navigation Aids.
  - A13.1.8.4. Hazards to Taxi/RCR.

**A13.2. Ground Procedures.**

- A13.2.1. Aircraft/Armament Preflight.
- A13.2.2. Cockpit Set-Up.
- A13.2.3. Engine Run, Hot Preflight.
- A13.2.4. Ground Crew Brief.
- A13.2.5. Quick Check Procedures.

**A13.3. Launch Procedures.**

- A13.3.1. Notification, Frequencies, Authentication Requirement.

## A13.3.2. Status.

A13.3.2.1. Airborne Order.

A13.3.2.2. Battle Stations.

A13.3.2.3. Runway Alert.

A13.3.2.4. Scramble.

## A13.3.3. Taxi.

## A13.3.4. Takeoff/Runway Lineup/Interval/Formation.

A13.3.4.1. Day VMC.

A13.3.4.2. Day IMC.

A13.3.4.3. Night VMC.

A13.3.4.4. Night IMC.

## A13.3.5. Formation (Join-Up/Trail), Power Settings, Airspeeds.

**A13.4. In-Flight Procedures.**

A13.4.1. Formation.

A13.4.2. Airspeeds.

A13.4.3. Weapons Safe Checks.

A13.4.4. Radar Search Responsibilities.

A13.4.5. Degraded Fire Control System.

A13.4.6. Transfer of Lead Procedures.

A13.4.7. Ops Checks.

A13.4.8. EMCON Procedures.

A13.4.9. Region Minimum Safe Altitude.

A13.4.10. VID Procedures.

A13.4.10.1. Authority Required to Close.

A13.4.10.2. Formation, Tactics.

A13.4.10.3. Range/Altitude Separation Requirements on Target Prior Permission to Close (With and Without Visual Contact).

A13.4.10.4. Radar Lock-On Requirements.

A13.4.10.5. Maximum Closure Speed.

A13.4.10.6. Minimum Airspeed.

A13.4.10.7. Loss of Contact Procedures.

A13.4.10.8. Breakaway Procedures.

A13.4.10.9. Restrictions.

A13.4.11. Aircraft in Distress.

A13.4.11.1. Minimum Closure Distance.

A13.4.11.2. Visual Signals - Day/Night.

A13.4.11.3. Escort Procedures.

A13.4.11.4. Recovery/Landing Visual Signals.

A13.4.11.5. Dissimilar Formation Procedures.

A13.4.12. Jettison Procedures.

A13.4.13. Lost Wingman.

A13.4.14. SARCAP.

A13.4.15. Emergency Airfields.

**A13.5. Special Subjects Brief.**

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A14.1.1. Pre-Flight.

A14.1.1.1. Ejection Seat, Associated Equipment.

A14.1.1.2. Oxygen System.

A14.1.2. Prohibited Items.

A14.1.3. Cockpit Layout, Setup.

A14.1.4. Flight Maneuvering Parameters.

A14.1.5. Mission Duties.

A14.1.6. Change of Aircraft Control.

A14.1.7. WSO Flying Parameters.

A14.1.8. Rear Seat Landing Procedures.

A14.1.9. Emergencies.

A14.1.9.1. Runway Departure.

A14.1.9.2. Canopy Loss.

A14.1.9.3. Ejection/Egress (With and Without Intercom), Command Selector Valve Position.

A14.1.9.4. Loss of Intercom.

A14.1.9.5. Bird Strike Procedures, Use of Visor(s).

A14.1.10. Flight Control Interference.

A14.1.10.1. Rudder Interference.

A14.1.10.2. Rudder Pedal Adjustment.

A14.1.10.3. Stick Interference.

**A14.2. Ground Crew.**

A14.2.1. Act only on pilot's or WSO's instructions.

A14.2.2. Ground Emergency Procedures.

A14.2.3. Hand Signals.

A14.2.4. Aircraft Danger Areas.

**Attachment 15****NIGHT VISION GOGGLE (NVG) BRIEFING GUIDE****A15.1. Weather, Illumination.**

- A15.1.1. Civil/Nautical Twilight.
- A15.1.2. Moon Rise and Set Times, Phase, Elevation, Azimuth.
- A15.1.3. Ceiling, Visibility.
- A15.1.4. LUX, EO TDA.
- A15.1.5. Obscurants to Visibility.

**A15.2. NVG Preflight.**

- A15.2.1. Check Adjustments, Helmet Fit and Security.
- A15.2.2. Batteries.
- A15.2.3. Adjust Resolution, Focus (Eyelane Use).
- A15.2.4. NVG Compatible Flashlight, Finger/Mask lights, Chem Sticks.

**A15.3. Cockpit Preflight.**

- A15.3.1. Cockpit Setup.
- A15.3.2. Cockpit Lighting (Leaks), Mirrors Up.
- A15.3.3. Check Focus And Stow For Taxi/Takeoff.

**A15.4. Airborne.**

- A15.4.1. Crew and Flight NVG Don Procedures.
- A15.4.2. Exterior Lights.
- A15.4.3. Scan Techniques, Considerations.
- A15.4.4. Join-Up And Enroute Considerations.
- A15.4.5. G-Awareness Check Considerations.

**A15.5. Mission.**

- A15.5.1. NVG Visual Lookout and Threat Reactions.
- A15.5.2. Route Study, Scene Interpretation, Terrain Avoidance.
  - A15.5.2.1. NVG predictions, albedo.
  - A15.5.2.2. Terrain, Shadowing, Visual Illusions, Visible Horizon.
  - A15.5.2.3. City, Cultural Lighting.
- A15.5.3. Terrain Following System Procedures.
- A15.5.4. Map Reading.

**A15.6. Target Area.**



A15.6.1. NVG Target Study, Search and Acquisition Techniques.

A15.6.2. Delivery, Pattern Procedures.

A15.6.2.1. Minimum Altitudes.

A15.6.2.2. Flight Member Responsibilities.

A15.6.2.3. Moth Effect.

A15.6.2.4. External Lighting, Deconfliction Procedures.

A15.6.3. Laser, IR Pointer Operations.

A15.6.4. Mutual Support, Egress, Rendezvous.

### **A15.7. NVG Recovery, Doff Procedures.**

### **A15.8. NVG Contingencies.**

A15.8.1. Aircraft Emergency.

A15.8.2. Ejection.

A15.8.3. Lost Sight, Lost Wingman.

A15.8.4. Inadvertent WX Entry.

A15.8.5. NVG Failure, Battery Swap Out.

A15.8.6. Safety Considerations.

A15.8.6.1. Depth Perception.

A15.8.6.2. Visual Illusions.

A15.8.6.3. Disorientation, Misorientation, Vertigo.

A15.8.6.4. Target Fixation, Lack of Dive Information.

A15.8.6.5. Fatigue.

A15.8.6.6. Overconfidence in NVG Capabilities.

A15.8.7. Transition To Instruments.

A15.8.8. Correct Lighting of Primary/Secondary Flight Instruments.

A15.8.9. Laser/IR Pointer Use, Safety.

A15.8.10. Laser Eye Protection (LEP) Use.

A15.8.11. NVG/IR Pointer FOD Considerations (Batteries, Equipment, etc).

**Attachment 16****MISSION DEBRIEFING GUIDE****A16.1. Ground Procedures.****A16.2. Takeoff, Join-Up, Departure.****A16.3. En Route Procedures.****A16.4. Recovery, Landing, After Landing.****A16.5. General.**

A16.5.1. SIs.

A16.5.2. Radio Procedures.

A16.5.3. Flight Discipline, Effectiveness.

**A16.6. Mission Accomplishment, Analysis.**

A16.6.1. Mission Reconstruction.

A16.6.2. Mission Support.

A16.6.3. VTR/Film Assessment.

A16.6.4. Anti-G Straining Maneuver Effectiveness.

A16.6.5. Learning Objectives Achieved.

A16.6.6. Lessons Learned.

A16.6.7. Recommendations for Improvement.

**A16.7. Comments, Questions.**