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Flying Operations

C-17 OPERATIONS PROCEDURES

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This instruction implements AFPD 11-2, *Aircraft Rules and Procedures*. It establishes policy for the operation of the C-17 aircraft to safely and successfully accomplish their worldwide mobility missions. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force. This instruction applies to Air Force Associate Reserve (AFRC) units. It does not apply to Air National Guard (ANG) units.

The Privacy Act of 1974 affects this instruction. The Privacy Act System Number F011 AF XO A, Air Force Operations Resource Management System (AFORMS) covers required information. The Paper Reduction Act of 1974 as amended in 1996 affects this instruction.

This document is new and must be completely reviewed. This instruction contains references to Air Mobility Command (AMC) and Multicommand (MC) Forms, which, until converted to departmental level publications and forms, may be obtained from the AMC publications' web home page or from the AMC Publishing Office:

Publications: AMCI 11-301, AMCMAN 11-211, AMCP 55-25, AMCRs 3-2V2, 28-2, 55-18, 55-20, 55-25, 55-79, and AMCVA 36-2206.

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AFI 11-2C-17V3, ADDENDA A, *Configuration and Mission Planning*

SUPPORTING CHECKLISTS:

AFI 11-2C-17V3CL1, *Formation Air Refueling Procedures*

AFI 11-2C-17V3CL2, *C-17 Loadmaster Passenger Briefings*

AFI 11-2C-17V3CL3, *Pilot Combat Operations Guide*

AFI 11-2C-17V3CL4, *Loadmaster Combat Checklists*

AFI 11-2C-17V3CL5, *C-17 Pilot Airdrop Briefing Guides and Checklists*

AFI 11-2C-17V3CL6, *C-17 Loadmaster Airdrop Checklists*

AFI 11-2C-17V3CL7, *Mission Briefing Guides*

AFI 11-2C-17V3CL8, *Preflight and Post Mission AEC Checklist*

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Chapter 1

GENERAL INFORMATION

1.1. General.

1.1.1. This AFI provides guidelines for C-17 operations and applies to Air Force C-17 aircrews and all management levels concerned with operation of the C-17. It is a compilation of information from aircraft flight manuals, FLIP publications, and other Air Force directives, as well as an original source document for many areas. When specified as the reference, the basic source directive has precedence in the case of any conflicts, revisions, and matters of interpretation. For those areas where this AFI is the source document see paragraph **1.4.** for the appropriate waiver authority. Where areas of this AFI repeats information in other source documents, waiver authority will be in accordance with these source documents.

1.1.2. All units and agencies involved in or supporting C-17 operations will use this AFI. Copies will be current and available to planning staffs from headquarters to aircrew level. Maintain a copy of this AFI at mobility transportation and base operations passenger manifesting agencies.

1.2. Applicability. This AFI is applicable to all individuals and units operating C-17 aircraft. Copies should be available to all aircrew members operating the C-17.

1.3. Key Words Explained.

1.3.1. "Will" and "shall" indicate a mandatory requirement.

1.3.2. "Should" is normally used to indicate a preferred, but not mandatory, method of accomplishment.

1.3.3. "May" indicates an acceptable or suggested means of accomplishment.

1.3.4. "Note" indicates operating procedures, techniques, etc., which are considered essential to emphasize.

1.3.5. “Caution” indicates operating procedures, techniques, etc., which could result in damage to equipment if not carefully followed.

1.3.6. “Warning” indicates operating procedures, techniques, etc., which could result in personal injury or loss of life if not carefully followed.

1.4. Deviations and Waivers. Do not deviate from the policies and guidance in this AFI except for safety, or when necessary to protect the crew or aircraft from a situation not covered by this AFI and immediate action is required. The aircraft commander is ultimate authority and is responsible for the course-of-action to be taken. Report deviations or exception without waiver through channels to MAJCOM Stan/Eval function who, in turn, should notify the OPR (lead command) for follow-on action, if necessary.

1.4.1. Unless otherwise directed in this AFI, waiver authority for the contents of this document is the MAJCOM/DO. MAJCOM/DO staff should forward a copy of approved waivers to the OPR (lead command). Request for a long-term (permanent) waiver must be approved by MAJCOM/DO and listed in MAJCOM supplement (see paragraph **1.5.**).

1.4.2. Short-noticewaiver requests for missions (including missions under TACC operational control) use **Chapter 4**, waiver protocol.

1.5. Supplements. This document is a basic directive. Each user MAJCOM or operational theater may supplement this AFI according to AFPD 11-2, *Aircraft Rules and Procedures.* These supplements will not duplicate, alter, amend, or be less restrictive than the provisions of this AFI or the appropriate C-17 flight manual publication. MAJCOM/DO may initiate a long-term waiver to basic document. When approved, specify long-term waiver approval authority, date, and expiration date in the appropriate MAJCOM supplement.

1.5.1. Combined Operations**.** Use only the basic AFI for planning or operations involving forces from lead and user commands. Commanders may use approved MAJCOM supplement procedures with assigned and/or chopped forces provided these forces receive appropriate training and duration is specified. Commanders should not assume or expect aircrews from another command to perform MAJCOM-specific procedures in their supplements unless these provisions are met. For questions by aircrew, planners, and staff contact the OPR 24-hours via TACC waiver and technical support services (see **Chapter 4**).

1.5.2. Coordination Process. Forward MAJCOM approved supplements (with attached AF Form 673, **Request To Issue Publication**) to HQ AMC/DOV, 402 Scott Dr., Unit 3A1, Scott AFB IL, 62225-5302. AMC/DOV will provide a recommendation to HQ AMC/DO and forward to HQ AFFSA/XOF for approval.

1.5.3. Local Procedures Coordination Process. Units will send one copy of **Chapter 10** (local procedures) to the appropriate NAF (if applicable) for coordination and approval. The NAF will then forward the copy to the parent MAJCOM Stan/Eval function for validation.

1.6. Requisition and Distribution Procedures. Order this AFI through the servicing Publications Distribution Office (PDO). Unit commanders provide copies for all aircrew members and associated support personnel. This publication is available digitally on the SAF/AAD WWW site at http://afpubs.hq.af.mil. Contact your PDO for the monthly CD-ROM or access to the bulletin board system.

1.7. Improvement Recommendations. Send comments and suggested improvements to this instruction on AF Form 847, **Recommendation for Change of Publication**, through channels to HQ AMC/DOV, 402 Scott Drive Unit 3A1, Scott AFB IL, 62225-5302, according to AFI 11-215, *Flight Manual Procedures* and MAJCOM Supplement.

1.8. Definitions. The explanation or definition of terms and abbreviations commonly used in the aviation community can be found in FAR Part 1; *DOD Flip General Planning*, Chapter 2; and Joint Pub 1-02, *The DOD Dictionary of Military and Associated Terms*. See **Attachment 1** for common mobility terms.

1.9. Aircrew Operational Reports. The reporting requirements in this instruction are exempt from licensing in accordance with paragraph 2.11.10 of AFI 37-124, *The Information Collections and Reports Management Program; Controlling Internal, Public, and Interagency Air Force Information Collections.*

Chapter 2

COMMAND AND CONTROL

2.1. General. Command and control (C2) of tanker and airlift forces is exercised through a network of C2 Centers. C2 Centers are executive agents for commanders exercising operational control over mobility forces. The C2 Centers network consists of the AMC TACC, or respective MAJCOM C2 agency for MAJCOM (other than AMC) directed missions, theater Air Operations Centers (AOC), Air Mobility Elements (AME), unit C2s, Air Mobility Control Centers (AMCC), Tanker Airlift Control Elements (TALCE), and special tactics teams (STT).

2.2. Execution Authority. Execution approval will be received through the local command post or command element. The operations group commander will be the executing authority for local training missions. The aircraft commander will execute missions operating outside communications channels.

2.2.1. Supplemental Training Mission (STM). Opportune airlift of cargo and mission personnel may be accomplished as a by-product of crew training missions. STMs may be authorized when minor adjustments can be made to a scheduled training mission or when a productive aircrew training mission can be generated for the airlift. The training mission will not be degraded in any manner to accomplish the STM. Use of STMs for logistical support will be authorized only when normal military or commercial transportation modes are unable to provide required support. The operations group commander, with wing commander coordination, may approve an STM. On STMs, the aircraft commander will release maximum number of space available seats commensurate with mission requirements and safety.

2.2.2. Off Station Training Flights (OSTF). Wing Commanders are the approval authority for off station trainers. Before approval, commanders will carefully review each proposed trainer's itinerary to ensure it justifies and represents the best avenue for meeting training requirements. Commanders approving off station trainers will forward a copy of the planned itinerary to the appropriate NAF/DO, MAJCOM/DOT, and TACC/XOB. Approval authority for AFRC UE off-station trainers is HQ AFRC/DOOM.

2.3. Aircraft Commander Responsibility and Authority. An aircraft commander is designated for all flights on the flight authorizations in accordance with AFI 11-401, *Flight Management* and applicable MAJCOM supplement. Aircraft commanders are:

2.3.1. In command of all persons aboard the aircraft.

2.3.2. Responsible for the welfare of the crew and the safe accomplishment of the mission.

2.3.3. Vested with the authority necessary to manage crew resources and accomplish the mission.

2.3.4. The final mission authority and will make decisions not specifically assigned to higher authority.

2.3.5. The final authority for requesting or accepting any waivers affecting the crew or mission.

2.3.6. Charged with keeping the applicable C2 or executing agencies informed concerning mission progress.

2.3.7. Responsible for ensuring that only activity authorized by the executing authority is accomplished, unless emergency conditions dictate otherwise (for example, unscheduled “bootleg” air refueling or transition training are not authorized without the approval of the executing authority).

2.4. Mission Clearance Decision. The final decision to delay a mission may be made either by the executing agency or the aircraft commander when conditions are not correct to start or continue a mission. Final responsibility for the safe conduct of the mission rests with the aircraft commander. If the aircraft commander refuses a mission, the mission will not depart until the conditions have been corrected or improved so that the mission can operate safely. Another aircraft commander and aircrew will not be asked to take the same mission under the same conditions.

2.4.1. Rerouting or Diverting a Mission. Must be authorized by the execution authority, except in an emergency or when required by en route or terminal weather conditions.

2.4.1.1. The controlling agency directing the rerouting or diversion is responsible for ensuring the aircraft is compatible with departure, en route, and destination requirement and facilities.

2.4.1.2. The aircraft commander will notify the appropriate command center of any aircraft or aircrew limitation that may preclude diverting or rerouting the mission.

2.4.2. When directing an aircraft to an alternate airfield, the C2 Center will ensure the aircraft commander is provided existing and forecast weather for the alternate, NOTAMs, and appropriate airfield information from the ASRR. If the planned alternate becomes unsuitable while en route, the aircraft commander will coordinate with the C2 Center for other suitable alternates. The C2 Center will coordinate with customs and ground service agencies to prepare for arrival. The aircraft commander is final authority on selecting a suitable alternate.

2.5. Aircrew Responsibilities. The aircraft commander is the focal point for interaction between aircrew and mission support personnel. The local C2 Center is the focal point for all mission support activities. Aircraft commanders must inform C2 of any factor that may affect mission accomplishment. When transiting a stop without a C2 Center, it is the responsibility of the aircraft commander to ensure necessary mission information is placed into the C2 system by the most expeditious means available. The aircraft commander will establish a point of contact with the appropriate C2 Center before entering crew rest.

2.6. Operational C2 Reporting. MAF C2 facilities will normally transmit arrival, departure, and advisory messages to the TACC, as appropriate. Aircrews on TACC controlled missions are responsible for transmitting these messages via L-Band SATCOM, HF, DSN, etc., when transiting stations without an C2 (fixed or mobile) presence. Crews on missions not controlled by the TACC will report to their appropriate controlling agency.

2.6.1. High Frequency (HF) Communications. HF is the primary means of worldwide C2 communications.

NOTE: The C-17 is not currently equipped with L-Band SATCOM. Information in 2.6.2, 2.6.3, and 2.6.4 is for future reference.

2.6.2. L-Band SATCOM. The L-Band SATCOM supplements HF communications by providing a worldwide communications capability suitable for *unclassified* C2 transmissions. Currently, messages can only be sent between aircraft and ground stations.

2.6.2.1. Employment. The L-Band SATCOM equipment aboard aircraft will be used as necessary except on local training missions and missions operating under emission control (EMCON) restrictions prohibiting its use. Limit SATCOM communications to operational traffic. The transceiver will be turned on during preflight and remain configured to receive messages at all times until aircraft power down at destination. The laptop computer will be turned off for takeoff, landing, and while operating below 10,000 feet. For missions operating through sensitive or classified locations disable GPS position reporting in the normal message software and, when available, the automatic position reporting function.

2.6.2.2. Responsibility for Equipment and Supplies. Aircraft laptop computers are high theft items and will not be left unsecured on the aircraft.

2.6.2.3. Home station. Operations groups will be responsible for storing, maintaining day-to-day control, and administrative accountability of computers. Laptops will be issued via hand receipt to aircrews before departure from home base.

2.6.2.4. En route. When storing computers at en route locations, care must be taken to maintain original aircraft tail number and laptop computer match. Laptops may be secured aboard aircraft which have been modified with a suitable secure container (e.g. new gun box capable of holding weapons and computers), provided they will not be exposed to extreme temperatures (below -40 or above 149 degrees Fahrenheit). On aircraft lacking a suitable secure container or when temperature extremes cannot be avoided, computers will be stored in the command post or other suitable C2 facility. At locations without an C2 presence, crews should use their best judgment and store computers in the most secure facility or location available.

2.6.3. Staging Operations. Aircrews and C2 Centers will establish procedures to store and control the laptop computers. Control procedures should maintain original aircraft tail number and laptop computer match. Hand-to-hand crew transfer of the computer is the preferred method. If crew transfer is not possible, inbound crews will store the computer on the aircraft, if secure, and turn in the key to C2 before entering crew rest. If the aircraft lacks a secure container or if the temperature extremes (see paragraph **2.6.2.4.**) cannot be avoided, the computer will be stored by C2 Center. C2 will issue the key or computer, as applicable, to outbound crews ensuring the aircraft/computer match is maintained.

2.6.4. L-Band SATCOM Messages and Advisories. The aircrew can send messages by either choosing a pre-formatted template from a menu or composing a free-text message. The following L-Band SATCOM transmissions are required as indicated:

2.6.4.1. On station message. At the beginning of each crew duty day, transmit an on station message during the initial preflight to verify system operation and update TACC with estimated aircraft takeoff times and other mission data. Further on station messages during the same crew duty day are not required.

2.6.4.2. Inbound 3-hour out messages. At locations with a mobile TALCE presence, the inbound aircrew will send a 3-hour out report to the TALCE.

2.6.4.3. Advisories. Transmit (free-text messages) mission delay, in-flight refuel, off/on-load reports as required or directed. ***NOTE:*** The L-Band software acknowledged (A) status code indicates the message was received by the Land Earth Station (LES) and forwarded to TACC. The acknowledged code does not indicate the addressee received the message. If a confirmation is required, specifically request a reply message in the remarks field.

2.6.5. Stations Without C2 Agencies. Report movement information (actual time of departure [ATD], estimated time of departure [ETD], actual time of arrival [ATA], departure load data, delay information, etc.) directly to the AMC TACC (as appropriate) as soon as possible, by any means available. After takeoff, relay pertinent data to the appropriate C2 agency by any means available. L-Band SATCOM, when available, will be the preferred method for passing routine mission movement reports followed by HF, DSN, etc. The following L-Band SATCOM messages will be transmitted to fulfill mission reporting requirements:

2.6.5.1. Block out.

2.6.5.2. Departure message (Aircraft call sign, time of departure, mission status).

2.6.5.3. Arrival/Shutdown. This is currently a free text message. The arrival portion should contain arrival time and any other information the aircrew deems necessary to pass to the TACC. If the L-Band SATCOM system is to be shutdown (crew rest, refueling, mission complete, etc.), inform the TACC that the aircraft can no longer receive messages.

NOTE: For critical C2 communications, i.e. aircraft waiver request, voice communications (HF, DSN, etc.) are still the primary method with L-Band SATCOM as a back up.

2.6.6. Report movement information (departure, arrival, or diversion) and airlift mission recapitulation (recap) reports (number of passengers, pallets, tons of cargo, and special category information) to the appropriate C2 agencies via SATCOM or global high frequency (HF) stations. Provide relay instructions for global HF stations to pass reports to appropriate agencies.

NOTE: All HF transmissions will be restricted to operational traffic, i.e. movement reporting, itinerary revisions, maintenance status, flight plan information, etc.

2.6.7. En Route Reporting. Full time connectivity between C-17s and the TACC is desired. Adhere to the following procedures:

2.6.7.1. CONUS. C2 agencies may advise aircrews via the controlling ATC agency to establish contact when communication is needed. Refer to the flight information publication (FLIP) concerning global HF station procedures in contacting MAINSAIL. Periodic "ops normal" calls or continuous monitoring of L-Band SATCOM or global HF station frequencies are not normally required. TACC may specify increased reporting procedures.

2.6.7.2. OCONUS. TACC will specify increased reporting procedures (if needed) through a communications plan in the OPLAN, OPORD, FRAG, or Mission Directive. Aircrews will transmit L-Band messages or relay calls to global HF stations for relay to the controlling C2 agency as specified in the communications plan. Maintain listening watch on L-Band or US Global HF system as specified in the communications plan.

2.6.8. Not used.

2.6.9. Receiver Air Refueling Report (N/A local training missions which depart and arrive at home station). Report the air refueling information (in the standard format indicated below) to the destination command and control element (if available) after landing. If a local MAF command post is not available, contact TACC/XOC (HILDA control) via HF radio or via land line (1-800-AIR-MOBL). AMC C2 Centers will enter the information in the GDSS system for immediate retrieval. Include all scheduled air refuelings not accomplished. Use the following format:

2.6.9.1. AR Track.

2.6.9.2. Scheduled On-load.

2.6.9.3. Actual On-load.

2.6.9.4. Reason Code.

2.6.9.5. Additional Comments.

2.6.9.6. Reason Codes. Reason codes indicate the outcome of air refueling activity. Use Reason codes when a problem or situation affects the successful accomplishment of the air refueling. Crew should be prepared to provide a short synopsis of the factors impacting the air refueling.

2.6.9.7. RO - Receiver Operations.

2.6.9.8. RM - Receiver Maintenance.

2.6.9.9. RW - Receiver Weather.

2.6.9.10. TO - Tanker Operations.

2.6.9.11. TM - Tanker Maintenance.

2.6.9.12. TW - Tanker Weather.

2.6.9.13. AT - Air Traffic Control.

2.6.9.14. WEATHER - Air Refueling Track Adverse Weather.

2.6.9.15. AC - Air Refueling Complete.

NOTE: Use reason code "AC" when air refueling was completed without delay or mission impact.

2.6.10. Arrival Advisory. Aircrews on operational missions transmit HF arrival advisory to the destination C2 agency or, in the absence of a local C2 agency, to TACC when approximately 2-3 hours from destination. Furnish the following information:

2.6.10.1. Aircraft call sign.

2.6.10.2. Mission number.

2.6.10.3. ETB (estimated time in block).

2.6.10.4. Maintenance status (See the definitions for a list of maintenance status codes, **Attachment 1** in this AFI.)

2.6.10.5. Distinguished visitor (DV) status and honors codes (Transmit the DV code of each DV on board.). Do not pass the name of the DV on board without the consent of the DV. Outside the continental limits of the United States, the name of the DV will not be passed over unsecure radios.

2.6.10.6. Aircrews transmit a UHF or VHF arrival advisory as soon as contact can be established with the destination C2 Center. The following information should be furnished:

2.6.10.6.1. Aircraft call sign.

2.6.10.6.2. Mission number.

2.6.10.6.3. ETB.

2.6.10.6.4. Maintenance status.

2.6.10.6.5. DV code and requirements.

2.6.10.6.6. Number of passengers.

2.6.10.6.7. Additional service required.

2.6.10.6.8. Number of pallets to be downloaded and number that are through manifested.

2.6.10.6.9. Passenger and pallet space and weight available for the next mission segment.

2.6.10.6.10. Fuel Requirements.

2.6.10.6.11. Hazardous cargo and remote parking requirements.

2.6.11. DV Messages. Airborne unclassified messages originated by DV passengers may be transmitted at the discretion of the aircraft commander.

2.7. Mission Commanders.

2.7.1. A mission commander will be required when more than two aircraft are assembled to perform missions away from home station. With more than two aircraft, the tasked unit will designate an aircraft commander for overall mission responsibility, crew duties and crew rest permitting. When conflicts with crew responsibilities exist, a separate mission commander should be appointed to ensure mission coordination is accomplished.

2.7.1.1. For AMC-tasked missions, TACC/XOO will coordinate and designate a lead planning agency when more than one unit is involved in an operation. This planning agency is responsible for coordinating the entire mission with all involved tanker, receiver, and planning agencies. The lead agency will designate the airlift/airborne mission commander. The mission commander will normally be the lead aircraft commander for the entire mission.

2.7.1.2. For all multi-ship operations, tasked units will ensure an appropriate level of ground and flight supervision is provided for the entire mission. Emphasis should be placed on who is the overall airborne commander and subordinate commanders for each type aircraft in the operation.

2.7.2. For airlift missions, the agencies responsible for mission tasking will coordinate a mission commander for all phases of the mission and ensure all participating aircrews are briefed and advised of mission commander assignment.

2.7.3. When non-collocated tankers and receivers are involved, the mission commander (in conjunction with the lead planning agency) will ensure all applicable information, to include rendezvous, formation, abort, and recovery procedures, is relayed to non-collocated aircrews. The mission commander will ensure the TACC and all non-collocated tankers and receivers are informed of all anticipated delays or mission changes.

2.8. C2 Agency Telephone Numbers. Units should publish a listing of telephone numbers to assist crews in coordinating mission requirements through appropriate C2 agencies. It should be made readily available to crews by publishing it in the FCB, Read File, or other appropriate publication.

2.9. Close Watch Missions. Close Watch missions are designated missions *(e.g. CSAR; medevac, PHOENIX BANNERs)* which receive C2 special attention. Close Watch procedures are initiated so that all possible actions are taken to ensure on-time accomplishment and notification to the user when delays occur or are anticipated. Promptly notify the appropriate C2 channels of delays, aborts, or other events

that affect on-time departure and advise them of the ETIC, new ETD, and ETA. Notify the C2 within 10 minutes of event and confirm that the user and OPR have been advised.

2.10. Posse Comitatus. It is the policy of the Department of Defense to cooperate with civilian law enforcement officials to the maximum extent practicable. AFI 10-801, *Assistance to Civilian Law Enforcement Agencies*, provides uniform policies and procedures to support federal, state, and local civilian law enforcement agencies. It establishes specific limitations and restrictions on the use of Air Force personnel, equipment, facilities, and services by civilian law enforcement organizations. Report all requests for assistance and coordinate all requests from civilian law enforcement authorities through the appropriate command and control channels.

Chapter 3

CREW MANAGEMENT

3.1. Aircrew Qualification. Primary crew members or those occupying a primary position during flight must be qualified or in training for qualification for that crew position. If non-current, or in training for a particular event, the crew member must be under the supervision of an instructor while accomplishing that event (direct supervision during critical phases of flight):

EXCEPTION: Senior staff members who have completed the ATS Senior Officer Course may occupy either pilot seat under direct IP supervision. These individuals will log "FP" for Flight Authorization Duty Code on the AFTO Form 781, **AFORMS Aircrew/Mission Flight Data Document**. They may not perform airdrop or SOLL II events.

NOTE: Flight qualification training does not commence until the crew member has successfully completed the required academic and simulator training prescribed for each course.

3.1.1. Pilots:

3.1.1.1. Missions With Passengers. With passengers on board, takeoff, climb-out, flight under actual instrument conditions, either the pilot or the copilot may make the approach, and landing. Only an individual that is qualified (current and valid AF Form 8, **Certificate of Aircrew Qualification**) will occupy a pilot's seat with passengers onboard the aircraft. One of the following conditions must be met:

3.1.1.1.1. Two qualified and current pilots must be at the controls.

3.1.1.1.2. A pilot regaining currency and an IP providing direct IP supervision must be at the controls.

3.1.1.2. Touch and go landings with passengers is prohibited (N/A MAJCOM approved maintenance personnel).

3.1.1.3. Left Seat Training. With squadron commander approval, current and qualified copilots may be allowed to fly in the left seat provided they are under direct IP supervision.

3.1.1.4. Aircraft commanders will only perform air refueling and SAAF landings in the left seat. Both events may be performed in the right seat under direct IP supervision.

3.1.2. Loadmasters. Non-current or unqualified loadmasters may perform in their primary crew position on any mission when supervised by a qualified instructor.

3.2. Crew Complement. Minimum crew complement for basic and augmented flight duty period (FDP).

3.2.1. Minimum crew members for a local training mission are pilot, copilot, and one loadmaster.

3.2.2. Augmented crews are required when a mission cannot be safely completed within a basic FDP. Augmentees must be current and qualified in the aircraft and mission ready in accordance with AFI 11-2C-17V1, *C-17 Aircrew Training*. In those situations requiring augmentation, the crew must be augmented from the start of the duty period. MAJCOM/DO approval is required for additional crew members to join the mission en route for augmentation. If augmentees are added to the crew, the crew's FDP will be computed based on the FDP of the most limited person.

Table 3.1. Crew Complement.

Type Crew	Aircraft Commander	Copilot	Loadmaster
Airland/Airdrop	1	1	1[4,5]
Augmented Airland	1[2]	2[3]	2
Augmented Airdrop	2[1]	1	2[6]
PNAF	See AFI11-299		

NOTES:

1. An augmented airdrop crew may be augmented with a non-airdrop qualified AC. The non-airdrop AC will not be in the seat below 1000 feet AGL or during any portion of the airdrop sequence (Pre-slow-down through DZ escape).

2. Two required if any air-refueling events are planned after 14 hours crew duty time. Fulfills the requirement for an additional copilot.

3. One must be first pilot qualified or above.

4. Two loadmasters are required for any mission scheduled to airlift more than 40 passengers. Aircraft commanders may designate an additional C-17 qualified crew member to fulfill the second loadmaster requirement during those exceptional cases when more than 40 passengers, but no more than 50 passengers, must be moved (except during home station departures). The qualified C-17 crew member must not have other primary duties during the mission leg(s) and both crew members must remain in the cargo compartment for takeoff and landing. Movement priority, mission leg length, number of additional passengers, etc. must be considered before using this option. Personnel airdrop missions scheduled for a basic crew duty day only require one loadmaster. During this mission, the loadmaster will demonstrate how to properly operate the door to the paratroopers seated next to the paratroop doors.

5. One loadmaster and another qualified crew member/physiological technician are required on any tactical mission where planned cabin altitude will exceed 13,000 feet MSL.

6. One loadmaster must be airdrop qualified and the other loadmaster may be airland qualified. Two airdrop qualified loadmasters are required for augmented personnel airdrop missions.

3.3. Scheduling Restrictions. Crew members will not be scheduled to fly nor will they perform crew duties:

3.3.1. When the maximum flying time limitations of AFI 11-202V3, *General Flight Rules*, will be exceeded.

3.3.2. After consuming alcoholic beverages within 12 hours of takeoff or when under the influence of alcohol.

3.3.3. Do not takeoff early (before scheduled departure time) if the early takeoff time would violate these restrictions.

3.3.4. After consuming alcoholic beverages within the 12-hour period before assuming ALFA/BRAVO/J Alert standby force duty.

3.3.5. Within 72 hours of donating blood. The flying unit commander must approve the donation of blood by crew members in a mobility assignment or who are subject to flying duties within this 72 hour period. Crew members should not normally donate blood.

3.3.6. When taking oral or injected medication unless individual medical waiver has been granted by the Command Surgeon. Crew members may not self medicate except IAW AFI 48-123, *Medical Examinations and Standards.* The following is a partial list of medications which may be used without medical consultation:

3.3.6.1. Skin antiseptics, topical anti-fungals, 1 percent Hydrocortisone cream, or benzoyl peroxide for minor wounds and skin diseases which do not interfere with the performance of flying duties or wear of personal equipment.

3.3.6.2. Single doses of over-the-counter aspirin, acetaminophen or ibuprofen to provide analgesia for minor self-limiting conditions.

3.3.6.3. Antacids for mild isolated episodes of indigestion.

3.3.6.4. Hemorrhoidal suppositories.

3.3.6.5. Bismuth subsalicylate for mild cases of diarrhea.

3.3.6.6. Oxymetazoline or phenylephrine nasal sprays may be used by aircrew as "get me downs" should unexpected ear or sinus block occur during flight. These should not be used to treat symptoms of head congestion existing before flight.

3.3.7. Within 24 hours of compressed gas diving (including scuba); surface supplied diving, or hyperbaric (compression) chamber exposure and aircraft pressurization checks that exceed 10 minutes duration.

3.3.8. Within 12 hours after completion of a hypobaric (altitude) chamber flight above 25,000 feet. Personnel may fly as passengers in aircraft during this period, provided the planned mission will maintain a cabin altitude of 10,000 feet MSL or less. For altitude chamber flights to a maximum altitude of 25,000 feet or below, aircrew members may fly without delay as crew members or passengers if their cabin altitude does not exceed 15,000 feet.

3.4. Alerting Procedures.

3.4.1. Crew alerts will normally be 3+15 hours before scheduled takeoff time to allow 1 hour for reporting and 2+15 hours for mission preparation. **EXCEPTION**: Crews scheduled for airdrop or formal training sorties may be alerted 4+15 before takeoff.

3.4.1.1. Self alerting may be requested by the aircraft commander, but is not normally recommended to avoid potential crew duty limitations resulting from mission changes. Early alerting to provide additional reporting or mission preparation time is authorized when absolutely essential for mission accomplishment. Late alerting is also authorized; however, all requests for changes to standard alerting times must be coordinated through the appropriate C2 agency.

3.4.1.2. If no controlling C2 agency or other control agency is available, crews will self-alert. Self-alert procedures may also be used for normal local training missions.

3.4.1.3. With aircraft commander approval, loadmasters may be alerted early when loading requirements (i.e., outsized cargo and dash 9 section VI cargo) dictate a need for early alerting but

no more than 2 hours before the crew alert. If early alerting will be required, the loadmaster must be notified of that intent before entering crew rest. In no case should the loadmaster be alerted more than 1 hour before the commencement of actual cargo loading operations. Aircraft commander and C2 must consider that when the loadmaster reports early, the available flight duty period for the crew will be limited by the loadmaster's show time.

3.4.2. A crew will not be alerted until the aircraft is in commission or there is reasonable assurance that the estimated time in commission (ETIC) will meet the proposed takeoff time.

3.4.3. The aircraft commander may request crew enhancement crew rest (CECR) when he or she desires a later legal for alert time to normalize the crew work-rest cycle or enhance messing options immediately before crew alert. To minimize adverse effects on established schedules, aircraft flow, and capability, CECR requests should be of minimum duration and normally be limited to de-positioning legs. Send requests through C2 Center channels for approval decision. When requests are disapproved, the controlling C2 Center will notify the aircraft commander through C2 channels of the reason for disapproval. CECR is not an alternative to a 'safety of flight' delay and should not be used as such. If the AC deems extra crew rest is necessary for continued safe flight and mission accomplishment, the AC has the responsibility to declare safety of flight when the situation warrants, not after CECR is disapproved.

3.4.4. Aircrew release policy is as follows:

3.4.4.1. On the aircrew's initial entry or reentry into crew rest, the controlling C2 agency will establish an expected alert time. The crew may not be alerted or otherwise disturbed before this time except for emergencies.

3.4.4.2. The latest allowable alert time will be 6 hours after the expected alert time for all missions. If circumstances warrant, the aircraft commander may extend the window to a maximum of 8 hours. (When advised the crew will be deadheading, the aircraft commander may extend the window to 12 hours). Air Reserve Component (ARC) crew members may extend the window as necessary to allow deadhead return to home station within Firm Scheduled Return Time (FSRT). The controlling C2 agency will not request the aircrew accept more than a 6 hour window.

3.4.4.3. If the controlling C2 agency determines a crew will not be alerted in the allowable time span, then at the time of determination (but no earlier than the crew's expected alert time) the controlling C2 agency will reenter the crew into crew rest of not less than 12 hours and establish a new expected alert time.

3.4.4.4. When the latest allowable alert time expires without being alerted, then:

3.4.4.4.1. The crew reenters crew rest of not less than 12 hours.

3.4.4.4.2. The aircraft commander will contact the controlling C2 agency to determine the new expected alert time and establish a new latest-allowable alert time.

3.5. Stage Management.

3.5.1. Stage Posture. Stages operate on a directional basis. Alert sequence is as follows:

3.5.1.1. Crews requiring an emergency return to home station.

3.5.1.2. By the crew's SRT. Returning stage crews will be prioritized by their SRTs.

3.5.1.3. Crews in stage over 48 hours.

3.5.1.4. Crews in sequence of arrival time.

NOTE: If a stage crew is forced to return to crew rest because of a mission delay or abort, that crew becomes first out when legal for alert.

3.5.2. Mechanical Stage. Mechanical stages may be established by the C2 agency where no crews are staged. The stage is created when a mission is delayed or aborted and the crew goes into crew rest. Mechanically staged crews become first out in the same direction when legal for alert. An inbound crew may be bumped from the mission even though they have sufficient duty time remaining to complete that mission. **EXCEPTION**: ARC crews flying unit-equipped aircraft should not normally be mechanically staged.

3.6. Crew Duty Time (CDT) and Flight Duty Period (FDP). CDT is the amount of time an aircrew may perform combined flight and ground duties. FDP is the time period between mission reporting and final aircraft engine shutdown. For planning purposes, CDT normally consists of FDP plus 45 minutes, not to exceed the maximum CDT. When post flight duties exceed 45 minutes, CDT is FDP plus the time required to complete the post-flight related duties.

3.6.1. CDT and FDP both begin 1 hour after alert. **EXCEPTIONS:**

3.6.1.1. Self-alerts: CDT and FDP begin at scheduled or established mission reporting time.

3.6.1.2. ALFA standby: CDT and FDP begin when the crew is told to launch.

3.6.1.3. BRAVO standby: CDT and FDP begin when the crew shows for duty.

3.6.1.4. Crew members performing other duties before flight related duties: CDT and FDP begin when reporting for other duties.

3.6.1.5. Crew members alerted early to perform mission-related duties: CDT and FDP begin when reporting for these duties. Loadmasters may be alerted early when loading requirements dictate a need for early alerting, but no more than 2 hours before the crew alert. In no case should the loadmaster be alerted more than 1 hour before the commencement of actual cargo loading operations. Crews must consider that when the Loadmaster reports early the available FDP for all crew members begins with his or her show time.

3.6.2. The length of FDP will be established by the mission directive or controlling C2 agency when the crew shows for duty and is briefed for the mission. FDP will not be extended to an augmented day after a basic FDP has begun regardless of crew composition. FDP will not be based on crew composition, but rather on mission requirements.

3.6.3. FDP ends at engine shut down following completion of the final mission segment.

3.6.4. Normally, CDT ends 45 minutes after engine shutdown at the end of the mission. If any crew member must perform mission-related duties past 45 minutes, CDT does not end until that crew member completes these duties. These duties include up or down loading, servicing, debriefing, mission planning, etc. Except when authorized by unit commanders at home station or deployed locations, crew members will not be used for post mission duties supporting other missions; i.e., crew loadmasters will not be used as loading supervisors for other aircraft. Post mission duties will not be performed after the maximum CDT has expired.

NOTE: CDT/FDP includes both military duty and civilian work. It begins when the individual reports for his or her first duty period (military or civilian) and ends at engine shutdown at the end of the mission or series of missions.

3.6.5. Basic Crew FDP:

3.6.5.1. The maximum flight duty period for a basic crew is 16 hours provided no tactical or air refueling events are accomplished after 14 hours. Tactical events are defined in **Attachment 1** of this AFI. The basic flight duty period is 12 hours without an operative autopilot.

3.6.5.2. Maximum crew duty time for a basic crew is 18 hours.

3.6.6. Augmented Crew FDP:

3.6.6.1. Maximum flight duty period on all operational missions is 24 hours provided no tactical or air refueling events are accomplished after 18 hours. Tactical events are defined in **Attachment 1** of this AFI. Flight duty period is 16 hours without an operative autopilot . Only the pilot portion of the crew need be augmented when the autopilot is inoperative to complete a 16 hour flight duty period.

3.6.6.2. Basic crews will not be augmented after FDP has started (See Paragraph **3.2.2.**).

3.6.6.3. Maximum CDT for augmented crews is 24+45 hours.

3.6.6.4. Authorized only for a maximum of four intermediate stops and when one of the following criteria is met:

3.6.6.4.1. At least two legs of 4 hours each.

3.6.6.4.2. At least one leg of 6 hours.

NOTE: No more than two intermediate stops are authorized past 16 hours. If air refueling is scheduled, mission planners must ensure the opportunity for inflight rest is not significantly altered by the timing of the air refueling.

3.6.7. Training FDP:

3.6.7.1. The maximum flight duty period for training missions is 16 hours provided no transition (touch and go/pattern training), air refueling or tactical events are accomplished after 12 hours. Tactical events are in defined in **Attachment 1** (terms) of this AFI. This does not prevent missions from continuing to home station or deployed staging base single ship (for a full stop landing) once training events are accomplished. Training duty day begins at the start of CDT.

NOTE: ARC crews may perform transition on C-17 training missions provided time from start duty does not exceed 16 hours and actual flight duty does not exceed 12 hours.

3.6.8. Autopilot. If autopilot fails after departure, consider mission requirements and determine best course of action to preclude further mission delays due to reduced FDP. Best course of action may include divert to an airfield with maintenance capability. Contact C2, coordinate intentions, and comply with the preceding limitations.

3.6.9. Deadhead Time. Duty time for crew members in passenger or ACM status, positioning or de-positioning for a mission or mission support function.

3.6.9.1. Crew members may perform primary crew duties after deadheading if they will not exceed a basic FDP for the mission to be flown beginning at reporting time for the deadhead flight.

3.6.9.2. Crew members may deadhead following primary crew duties if they will not exceed an augmented FDP beginning at reporting time for primary crew duties.

3.6.10. CDT/FDP Extensions. See AFI 11-202 Volume 3 and the following: MAJCOM/DO (AMC/DO for AMC-directed missions through the TACC) is the waiver authority for all CDT/FDP extensions.

3.6.11. Flight examiners administering evaluations will not exceed an augmented FDP.

3.7. Crew Rest. See AFI 11-202V3 and the following: Crew members will enter crew rest a minimum of 12 hours before alert time or, when self alerting, 12 hours before reporting time. MAJCOM/DO may waive all or any part of a crew rest period in accordance with AFI 11-202V3.

3.7.1. Home-Station Pre-departure Crew Rest. All primary and deadhead crew members should enter crew rest 24 hours before planned alert time for missions scheduled away from home station for more than 16 hours. Crew members may perform limited non-flying duties, including mission planning, etc. during the first 12 hours of this period (**EXCEPTION**: AFRC in accordance with AFI 11-202V3). OG/CC is waiver authority for the first 12 hour Pre-departure Crew Rest. Deadhead crew members will not be manifested as passengers to reduce or eliminate crew rest requirements. MAJCOM/DO is waiver authority for minimum 12-hour deadhead crew member crew rest requirement.

3.7.2. En route Crew Rest and Ground Time:

3.7.2.1. Normally, CDT ends 45 minutes after engine shutdown at the end of the mission. If any crew member must perform mission-related duties past 45 minutes, CDT does not end until that crew member completes these duties. These duties include up or down loading, servicing, debriefing, mission planning, etc. After mission completion, crew members will not be used for mission related duties supporting other missions; i.e., loadmasters will not be used to load other aircraft. Post mission duties will not be performed after the maximum CDT has expired.

3.7.2.2. If any crew member must stay at the aircraft past the 45-minute period, crew rest does not begin until he or she has completed these post-flight duties.

3.7.2.3. Minimum crew rest period is 12 hours. This period provides the crew a minimum of 8 hours of uninterrupted rest plus time for transportation, free time, and meals. The crew will not normally be disturbed during this period, except during emergencies. Should the 12-hour crew rest period be infringed upon by official duties, the crew will enter crew rest for an additional 12 hours on completion of the official duties.

3.7.2.4. A minimum 16-hour ground time between engine shutdown and mission takeoff should normally be planned unless extended post flight duties are anticipated.

3.7.2.5. The aircraft commander may modify normal ground time:

3.7.2.5.1. In the interest of safety.

3.7.2.5.2. To no less than 12 hours from the start of crew rest until mission reporting. Before reducing normal ground time consider mission preparation time, time to load cargo, and other factors pertaining to the mission. The controlling C2 agency will not ask the aircraft com-

mander to accept less than a normal ground time. Waivers for exercises and contingencies are according to AFI 11-202V2.

3.7.2.5.3. To a maximum of 36 hours, when the crew has completed three consecutive near maximum FDPs.

NOTE: Flight crews should be afforded crew rest times in excess of the minimum at en route stations, when possible, to give crews the opportunity to overcome the cumulative affects of fatigue while flying on several consecutive days or transiting several time zones.

3.7.3. Post-Mission Crew Rest (PMCR). Note: PMCR is not applicable to AFRC crews.

3.7.3.1. Crew members, returning to their home base, will be given sufficient time to recover from the cumulative effects of their deployed mission and tend to personal needs. PMCR begins immediately on mission termination.

3.7.3.2. Provide one hour of PMCR time (up to a maximum of 96 hours) for each 3 hours TDY when the duty exceeds 16 hours away from home-station. This time is in addition to and will not run concurrently with pre-departure crew rest. (Not applicable to continuing missions.)

3.7.3.3. The OG/CC or acting representative is designated PMCR waiver authority and will not delegate this authority below the OG/CC level. Limit PMCR waivers to extraordinary circumstances only and must not be used for day-to-day operations.

3.7.4. Crews will reenter crew rest if their aircraft or mission (training or operational) is not capable of departure within 4 hours from scheduled takeoff time. Exceptions will be granted only with the concurrence of the AC.

3.7.5. Flying Crew Chief Work and Rest Plan. The crew chief is responsible to the aircraft commander. The aircraft commander, in conjunction with the en route station chief of maintenance, will determine how long the crew chief can safely perform aircraft recovery actions. The crew chief must have the opportunity to sleep 8 hours in each 24-hour period. See AFI 21-101, *Maintenance Operations and Management Policy*, for detailed guidance.

3.7.6. Crew rest waivers approved for exercises and contingencies will be published in the OPORD, OPLAN or CONOP.

3.8. Standby Force Duty.

3.8.1. Types of Standby Forces:

3.8.1.1. ALFA Standby Force. An aircraft and aircrew capable of launching in 1 hour. Crew members are given 12 hours of pre-standby crew rest before or after aircraft preflight. Aircrews must complete all preflight duties within 6 hours of crew show time. An additional 12-hour pre-standby crew rest is required when preflight time exceeds 6 hours. Once an ALFA force is formed, additional pre-flights may be necessary to maintain the ALFA aircraft. Additional pre-flights done during normal waking hours do not interrupt crew rest. A crew will not stay on ALFA standby duty for more than 48 hours. After 48 hours, the crew must be launched, released, or entered into pre-departure crew rest. CDT begins when the unit is told to launch.

3.8.1.2. BRAVO Standby Force. An aircraft or aircrew capable of launching in 3 hours (from the time the unit is told to launch). Crew members are given 12 hours of pre-standby crew rest. Crews are legal for alert after pre-standby crew rest. Preflight duties, if required, interrupt crew

rest. A crew will not stay on BRAVO standby duty for more than 48 hours. After 48 hours, the crew must be launched, released, or entered into pre-departure crew rest. CDT begins when the crew shows for duty. If a crew is pre-flighting when the unit is tasked to launch the mission, CDT will begin when the crew first reported for that duty.

3.8.1.3. CHARLIE Standby Force. An identified aircrew capable of entering crew rest within 2 hours (after their controlling unit is notified). This aircrew would become legal for alert 12 hours after entering crew rest. Charlie alert will not exceed 72 hours. If retained for a 72 hour period, crew members will be released for 12 hours before resuming CHARLIE Standby Force duty, entering crew rest for mission, or entering pre-standby crew rest for ALFA or BRAVO Standby Force duty.

3.8.1.4. J-Alert (JCS-directed alert force). Alert aircrew will be provided 12 hours crew rest prior to alert duty. Alert crew may be considered in crew rest upon termination of a flight, even though remaining on alert. If a crew completes a mission within their alert cycle, they are legal for alert again after 12 hours of crew rest. The length of a J-Alert tour will be determined by the OG/CC, but will not exceed 192 hours/8 days.

3.8.1.4.1. J-Alert crews will not be used as preflight crews for aircraft other than their own alert aircraft or its replacement.

3.8.1.4.2. J-Alert crew members may complete ground currency events and limited office duties at their leisure while on alert; however, they will not accomplish those items that result in DNIF status.

3.8.1.4.3. Flying during alert is authorized with the following restrictions:

3.8.1.4.3.1. At the discretion of the individual, not to exceed a flight duty period of 6 hours.

3.8.1.4.3.2. Crew members fly for individual currency or Special Operations/Boat Drop training. They are not an instructor/examiner pool.

3.8.1.4.3.3. The alert aircraft and crew integrity are not required if recovery and re-launch can be accomplished within 1.5 hours of real world alert launch notification. If this timing cannot be met, the integral alert crew and aircraft must be used to allow airborne diversion.

3.8.1.4.3.4. Special Operations training may be accomplished provided the crew members are allowed to adjust their work/rest cycle.

3.8.1.4.3.5. Crew duty time (CDT) for real world crisis response will begin when the crew shows for the real world mission.

3.8.1.5. Wing Standby Forces. Standby forces are established by unit commanders. Crew members are given normal pre-departure crew rest. Standby duty time is limited to 12 hours. Crews will receive at least 12 hours of crew rest prior to another 12 hours of standby duty.

3.8.2. Standby Force Crew Management:

3.8.2.1. Commanders will not use a standby crew to preflight other than their standby aircraft, or to do any non-mission duties while on standby.

3.8.3. Post-Standby Missions. On completion of standby duty, aircrew members may be dispatched on a mission.

3.8.3.1. Standby duty and pre-departure crew rest may be concurrent if notification is provided at least 12 hours prior to alert.

3.8.3.2. If started, post-standby crew rest must be completed before the start of pre-departure crew rest.

3.8.3.3. If an aircrew member is dispatched on a mission, compute the post-mission crew rest time on standby time plus mission time.

3.8.4. Post-Standby Crew Rest. Aircrew members not dispatched on a mission following standby duty will receive post-mission standby crew rest as follows:

3.8.4.1. If standby duty is performed away from normal quarters, crew rest time is computed from this standby time on the same basis as for mission time.

3.8.4.2. If standby duty was performed in normal quarters, no crew rest time is authorized.

3.8.4.3. J-Alert crews required to stand alert in on-base quarters will be granted crew rest equal to 50 percent of the total time spent on alert up to a maximum of 72 hours.

3.8.5. ALFA Standby and J-Alert Aircraft Security. Each unit will complete a maintenance and aircrew preflight inspection when they put an aircraft on ALFA standby status. The aircraft commander will ensure the aircraft is closed before entering crew rest. Secure all hatches and doors to show unauthorized entry. Close and lock the crew entrance door with the lock box or other controllable device, which will prevent entry without damage to the door or lock. The command post must grant permission before persons entering an aircraft once the plane is sealed. Ensure standby aircraft is resealed any time the aircraft has been opened. The aircraft commander or designated representative must be present if access to his or her assigned aircraft is required.

3.9. Orientation Flights and Incentive Flights. Refer to DoD 4515.13-R, AFI 11-401, and the appropriate MAJCOM supplement.

3.10. Interfly.

3.10.1. Interfly is the exchange and/or substitution of aircrew members and/or aircraft between mobility units to accomplish flying missions. OG/CC, or as specified in the appropriate MAJCOM supplement (AFRC use AFRC/DO approval-level) may authorize the interfly of assigned aircrews and/or aircraft. Normally, interfly should be limited to specific operations, exercises, or special circumstances but, may be used to relieve short-term qualified manpower shortfalls. During contingencies, exercises, or designated “interfly” missions, interfly operations will be conducted under the following conditions or as specified in the OPLAN or CONOPS.

3.10.2. When approved, interfly during normal day-to-day operations under the following conditions:

3.10.2.1. Aircraft ownership will not be transferred.

3.10.2.2. As a minimum, crews will be qualified in the MDS and model as well as systems or configuration required to fly the aircraft and/or mission.

3.10.2.3. During interfly, crew member (s) will follow "basic" operational procedures (see Combined Operations, paragraph **1.5.1.**) and must thoroughly brief MAJCOM-Specific items.

3.10.2.4. Initiate interfly approval request by the unit or agency requesting the agreement by memo or message format to the OG/CC controlling the resource. Each commander involving resources (personnel or aircraft) (or MAJCOM, if appropriate) must concur with interfly proposal. Request must include details of the deployment or mission including; aircrew name(s), duration, or special circumstances.

3.10.2.5. Flight Mishap accountability is MAJCOM designated by PEID code for mishap aircraft.

3.10.2.6. Ground Mishap accountability in accordance with AFI 91-204, *Safety Investigations and Reports*.

Chapter 4

AIRCRAFT OPERATING RESTRICTIONS

4.1. Objective. The ultimate objective of the aircraft maintenance team is to provide an aircraft for launch with all equipment operational (Fully Mission Capable, FMC). Manpower limitations, skills, and spare part availability have a negative and direct impact on accomplishment. However, some redundant systems allow safe operation with less than all equipment operational for certain missions under specific circumstances. The aircraft commander, using the following policies, determines an aircraft's overall status. Use the following maintenance identifiers to effectively communicate an aircraft's status:

4.1.1. Mission Essential (ME). An item, system, or subsystem component essential for safe aircraft operation or mission completion will be designated Mission-Essential (ME) by the aircraft commander in AFTO Form 781A, **Maintenance Discrepancy and Work Document**. Include a brief explanation of the reason for ME status in the AFTO Form 781A discrepancy block. An aircraft commander accepting an aircraft (one mission or mission segment) without an item or system does not commit that aircraft commander (or a different aircraft commander) to subsequent operations with the same item or system inoperative.

4.1.2. Mission Capable (MC). Any discrepancies that are not currently ME, but may become ME (if circumstances change), are designated as MC in the AFTO Form 781A discrepancy block. Every effort will be made to clear the MC discrepancies at the earliest opportunity to the extent that maintenance skills, ground time, and spare part availability permit. If subsequently, in the AC's judgment, mission safety would be compromised by the lack of any component, he may re-designate the said component as ME. However, do not delay a mission to correct an MC discrepancy.

4.1.3. Open Item. Discrepancies not expected to adversely impact the current mission or any subsequent mission are not designated MC or ME. These items receive low priority and are normally worked at home station. Do not accept an aircraft from factories, modification centers, or depots unless all instruments are installed and operative.

4.1.4. Engine performance, aircraft attitude, vertical velocity indications, altitude, speed, and heading instruments should be operative in both pilot positions.

4.2. Policy. It would be impractical to prepare a list that would anticipate all possible combinations of equipment malfunction and contingent circumstances. This chapter lists the equipment and systems considered essential for routine as well as contingency operations. The list does not necessarily include all equipment or systems essential to airworthiness (e.g. rudder, ailerons, elevators, flaps, tires, etc.).

4.2.1. The aircraft commander is responsible for exercising the necessary judgment to ensure no aircraft is dispatched with multiple items inoperative that may result in an unsafe degradation and/or an undue increase in crew workload. The possibility of additional failures during continued operation with inoperative systems or components shall also be considered. This chapter is not intended to allow for continued operation of the aircraft for an indefinite period with systems/subsystems inoperative.

4.2.2. If, after exploring all options, an aircraft commander determines a safe launch is possible with an item inoperable (beyond a particular restriction) the aircraft commander shall request a waiver.

Use C2 channels to notify the appropriate execution agency of intentions. Plan a minimum 1-hour response to the waiver request.

4.3. Waiver Protocol. Waiver to operate with degraded equipment or waiver to USAF policy exceeding this AFI may be granted on a case-by-case basis and only in exceptional circumstances. Waiver authority is based on "who" has operational control and execution of the aircraft performing a specific mission. The aircraft commander determines the need for a waiver and initiates the request.

4.3.1. Local Missions (executed by unit OG/CC or equivalent). Waiver authority for active duty flying local missions is the active duty OG/CC or equivalent.

4.3.2. AMC-Directed Missions. Waiver authority for active duty and AFRC or ANG units flying AMC or AMC-directed missions controlled by the AMC/TACC (includes HQ AMC Operational Readiness Inspections) is HQ AMC/DO. HQ AMC/DOV personnel are the authorized agent and maintain 24 hour watch through the appropriate TACC cell (East or West).

4.3.3. Other Missions (Contingencies). Waiver authority is listed in the OPORD/Tasking Order, etc., or is the DIRMOBFOR (or equivalent) for the agency with C2 of the aircraft. Crewmembers may request additional assistance or confirmation from their home units or MAJCOM/DO through the TACC, or as specified in MAJCOM supplement.

4.3.4. ARC directed missions (executed by HQ AFRC). The appropriate ARC Headquarters maintains C2 and waiver authority for ARC crews performing any ARC-directed mission prior to mobilization.

4.3.5. Non-AMC Missions. For user command assigned aircraft according to Air Force Policy Directive (AFPD) 10-9 (e.g. AETC, AFRC) waiver authority is the appropriate MAJCOM/DO, or as specified in the MAJCOM supplement.

4.4. Technical Assistance Service. The aircraft commander may request (at anytime in the decision process) technical support and additional assistance from their home unit, MAJCOM staff, and maintenance representatives.

4.4.1. Aircraft commanders electing to operate with degraded equipment or aircraft systems (with appropriate waiver) must coordinate mission requirements (i.e. revised departure times, fuel requirements, maintenance requirements, etc.) with the controlling C2 agency prior to flight.

4.4.2. If beyond C2 communication capability, the aircraft commander may deviate from this chapter as specified in **Chapter 1**, paragraph **1.4.** Report deviations (without waiver) through channels to appropriate MAJCOM/DO within 48 hours. Units must be prepared to collect background information and submit a follow-up written report upon request.

4.5. Aerial Delivery Systems.

4.5.1. The PDM, TRM, Rail Bridge Assembly and Ramp Edge Cover will be operational for equipment airdrop missions.

4.5.2. The retrieval winch(es), GRMs and BSA will be operational for CDS airdrop missions.

4.5.3. The retrieval winch(es), Canadian Retrieval System, paratroop door(s), and air deflector door(s)/pod fairing(s) will be operational for personnel airdrop missions.

4.5.4. The ADSC, LFCP, LACP, PADS, and all proximity sensors and indicating systems associated with these items will be fully operational for all airdrop missions.

4.6. AFCS Panel. AFCS panel will be fully operational for all departures.

4.7. Air Conditioning, Pressurization, and Environmental Systems:

4.7.1. Both air conditioning packs will be operational for home station departures. Both air conditioning packs will be operational if patients are carried or for special weapons missions. En route one air conditioning pack will be operational for avionics cooling.

4.7.2. All engine pneumatic supply Shut Off Valves (SOV) will be operational for home station departure. The wing isolation valve will be operational (electrically or manually) for home station departure. If the isolation valve fails closed en route, all engine pneumatic supply SOV will be operational and all en route stops will have the capability to manually reposition the wing isolation valve (i.e. open for engine start and close for takeoff). If a pneumatic supply SOV fails en route, do not plan flight through any area of forecast icing.

4.8. Air Data Computer. All Air Data Computer channels will be operational for home station departures. En route, at least three channels are required before departure. The aircraft will be flown on a one time flight to a station with repair capability with only two channels. (At least one channel of ADC1 must be operational).

4.9. APU. The APU will be operational for home station departures. En route, the APU will be operational for any mission departure into a field without alternate electric/air sources when engine shutdown is planned.

4.10. Cargo Mission Systems:

4.10.1. The following door and ramp systems will be operational for flight:

4.10.1.1. All cargo ramp latches and electrical safety locks.

4.10.1.2. Both cargo door downlatches, 34 sidewall jamb spindles, all ditching locks, and both cargo door uplock assemblies.

4.10.1.3. All proximity sensors and indicating systems associated with the cargo door system.

4.10.1.4. All ramp toes will be operational for home station departures.

NOTE: Must have at least one lower stowage pin in each toe.

4.10.2. The crew entrance door and all indicating systems will be operational for all flights.

4.10.3. Cargo door, ramp, and ditching locks will be operational (without the use of manual override) for heavy equipment, CDS, and other missions which require the inflight use of the cargo door and ramp.

4.10.4. Cargo door, ramp, and ditching locks will operational (without the use of manual override) for all home station departures. En route, manual override procedures may be used to continue the mission to a repair facility.

4.10.5. Cargo Loading Stabilizer Struts. The cargo loading stabilizer struts, as well as all associated proximity sensors and indicating systems, will be fully operational for home station departures.

4.10.6. Cargo Rail System Locks. All rails, locks, vertical lips and roller conveyors (ADS and logistic) will be fully operational for home station departures. En route, a minimum of one lock per pallet per side is required for airland pallets/platforms.

4.10.7. Cargo Winch. The cargo winch will be operational for home station departure.

4.11. Communications and Navigation Systems:

4.11.1. Both CCUs will be operational for home station departures. En route, if a CCU fails, a one-time flight to a facility with repair capability is authorized.

4.11.2. Both CNCs will be operational for home station departures. En route, if a CNC fails, continue the mission to a facility with a repair capability.

4.11.3. Intercom is required at all primary crew positions for all departures.

4.11.4. PA System. Required for passenger missions. No three adjacent speakers may be inoperative.

4.12. Electrical Systems:

4.12.1. AC System:

4.12.1.1. A minimum of three engine driven generators will be operational for home station departures. The AC X-TIE and all AC bus ties will be operational.

4.12.1.2. En route, a minimum of two engine driven generators are required before departure. The AC X-TIE and all AC bus ties will be operational and a comfort pallet shall not be operating. A one time flight to a facility with a repair capability is authorized.

4.12.1.3. The AC X-TIE will be operational for all home station departures. If the AC X-TIE fails en route, continue the mission to a station with a repair capability, provided four engine driven generators and all AC bus ties are operational. If the AC X-TIE fails en route, and only three engine driven generators are operational (or all AC bus ties are not operational), a one-time flight to a facility with repair capability is authorized.

4.12.2. DC System:

4.12.2.1. A minimum of three transformer rectifiers (TR) will be operational before flight. The DC X-TIE and both DC bus ties will be operational.

4.12.3. Emergency Power System. Both batteries, the static inverter, both transfer buses, and the emergency power relays will be operational for flight (i.e. the emergency power check will be satisfactory). The following components are required for flight: ADC1, FCC1 and FCC4, SCEFC1, SED, UHF1/COM1, and WCC1.

NOTE: Redundant components, except FCC and SCEFC, may be swapped into these positions.

4.13. Electronic Displays/Flight Instruments.

4.13.1. BDHI. Both BDHIs will be operational for home station departures. En route, if a BDHI fails, continue the mission to a facility with a repair capability.

4.13.2. Standby Instruments. Both attitude indicators, and altimeter set functions of the standby airspeed/altimeters will be operational for home station departures. En route, one complete set of standby instruments (pilot or copilot) will be operational before flight.

4.13.3. Five of the six displays (HUD/MFDs) will be operational before flight. The HUD used by the pilot flying will be fully functional for visual steep approaches and/or modified contour low-level operations.

4.13.4. MFC. Both MFCs will be operational before home station departure. En route, if one MFC fails, continue the mission to a station with a repair capability.

4.13.5. Three mission computer displays (MCD) and both mission computer keyboards (MCK) will be operational before home station departure. En route, two MCDs (one on each side) and one MCK will be operable before flight. **NOTE**: See **Chapter 6** for full flight instrumentation for IMC approaches.

4.14. Emergency Location Transmitter (ELT)/Cockpit Voice Recorder (CVR)/Standard Flight Data Recorder (SFDR):

4.14.1. The ELT, CVR and SFDR will be operational for all departures.

4.14.2. If either the SFDR or CVR system fails en route, a one time flight to a facility with repair capability is authorized.

NOTE: If involved in a mishap/incident, after landing and the emergency is terminated, open the CVR power circuit breaker.

4.15. Engines:

4.15.1. All engines will be operating in EPR mode before home station departures. En route, if one engine drops to N1 mode and cannot be reset to EPR mode with a subsequent ground restart, continue the mission to a facility with a repair capability. If two or more engines are degraded to N1 mode, or any engine degrades to N2 mode, a one time flight to a facility with a repair capability is authorized.

4.15.2. Both engine ignition channels will be operable before home station departure. En route, if a channel fails, continue the mission to a facility with a repair capability.

NOTE: If Channel A is inoperative, ignition will not be available to the engine with emergency power.

4.15.3. Both electronic engine control (EEC) channels will be operable before home station departure. En route, if a channel fails, a one time flight to a station with repair capability is authorized.

4.16. Flight Controls:

4.16.1. Aircraft will not be flown with a FAIL OP condition or if any EFCS FAIL lights are illuminated.

4.16.2. All FCCs will be operational for flight.

4.16.3. Both SC/EFCs will be operational for flight.

4.17. Fuel System.

4.17.1. At least two of the following valves will be operational for home station departures: L MASTER valve, R MASTER valve, center SEPARATION valve.

NOTE: Failure of the SEPARATION valve closed with a subsequent failure of an inboard tank transfer pump will result in trapped fuel in the inboard tank. In addition, use caution during air refueling to prevent an out of balance condition. The crossfeed valves will not open with a MASTER valve open.

4.17.2. One boost pump per wing may be inoperative if inboard transfer pumps and crossfeed valves are operational.

4.17.3. Both fuel quantity indicating channels will be operational for flight. All fuel quantity displays will be operational for home station departures. En route, a maximum of one fuel quantity display, including the totalizer, may be inoperative.

4.17.4. One ground refuel valve must be operational for all home station departures. One fuel jettison valve must be operational for all departures.

4.18. Hydraulics.

4.18.1. All hydraulic system pumps will be operational for home station departures. En route, six of eight engine driven hydraulic pumps must be operational. Each engine must have at least one engine driven pump and the auxiliary pump operable for flight. Only one engine driven pump on systems 2 and 3 (combined) may be inoperative provided the transfer pump and auxiliary pumps are operable.

4.18.2. The transfer pump will be operational for home station departures. If the transfer pump fails en route, the mission may be continued to a facility with a repair capability as long as all system #2 and #3 pumps are operational.

4.18.3. All auxiliary pumps are required for home station departure. En route, continue the mission with one inoperable auxiliary pump to a station with repair capability (all engine driven pumps/transfer pump for the affected system must be operational).

4.18.4. Ram Air Turbine (RAT). The RAT will be operational and stowed before all departures.

4.19. Inertial Reference Units (IRU).

4.19.1. All IRUs will be fully operational for home station departures.

4.19.2. En route, if a single failure occurs, the mission will continue the mission to a station with repair capability.

4.20. Lighting.

4.20.1. Both wingtip landing lights and both nose landing lights (in the landing position) are required for home station departure.

4.20.1.1. For night SAAF landings, three of the four landing lights (wingtip or nose) must be operational.

4.20.2. All emergency exit lighting will be operational for all departures.

4.21. Mission Computers/CIPs. All three mission computers will be operational for home station departure. En route, if one mission computer fails, continue the mission to a facility with a repair capability. Both CIPs will be operational for flight.

4.22. On-board Inert Gas Generating System (OBIGGS). OBIGGS system will have sufficient generation capability to meet combat mission requirements.

4.23. Overhead Panel. All overhead panel channels will be operational for home station departure. En route, if single channel failures occur, continue the mission to a facility with a repair capability.

4.24. Radar. Radar is required for home station departures, air refueling missions, and when thunderstorms are forecast for the planned route of flight.

4.25. Radar Altimeters. One radar altimeter is required for all departures.

4.26. Smoke Detectors. The following are the minimum smoke detectors required for flight: One AV; all 4 IRU; CAR 9, 10, 13, 14 plus two others in the cargo compartment.

4.27. Warning Systems:

4.27.1. WACS. Both WACS and the Central Aural Warning System (CAWS) will be fully operational before flight.

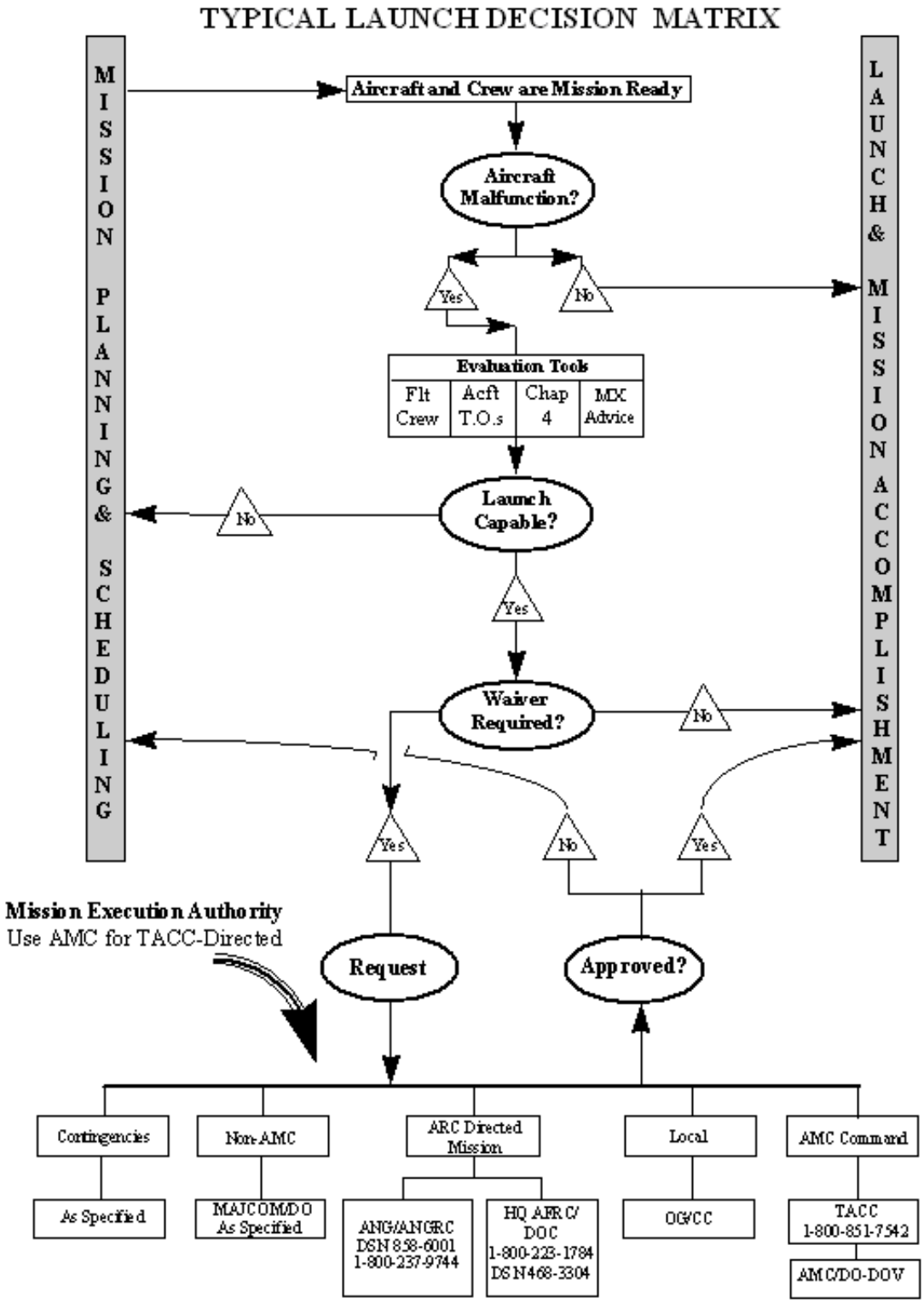
4.27.2. GPWS. The GPWS will be operational before home station departures. En route, if the GPWS fails, turn it off, and continue the mission to a facility with a repair capability. Low level contour flight is not authorized.

4.27.3. Stall Warning System. Both channels will be operational before home station departure. En route, if one channel fails, continue the mission to a facility with a repair capability. Without a stall warning system, a one time flight to a repair facility is authorized. A 3/4 flap landing with CG forward of 32% MAC is advised.

4.27.4. Proximity Sensors. All proximity sensors affecting AFCS operation (landing gear, slats, doors/access hatches, etc.) will be operational for home station departure and all airdrop missions.

4.28. Wheel Brakes. Eleven (ten, block 10) operative brakes are required for all departures.

Figure 4.1. Launch Decision Matrix.



Chapter 5

OPERATIONAL PROCEDURES

5.1. Checklists. A checklist is not complete until all items have been accomplished. Momentary hesitations for coordination items, ATC interruptions, and deviations specified in the flight manual, etc., are authorized. Notes amplifying checklist procedures or limitations may be added to the checklists (in pencil).

5.1.1. Checklist Inserts. Units may supplement T.O. guidance with HQ AMC/DOV approved checklist inserts. These inserts may be placed at the end of the appropriate checklist or in an in-flight guide. All checklist inserts must have a POC.

5.1.2. If any crew member has recommendations or change to the Checklist Instert, contact the POC. The POC will consolidate inputs and submit changes to HQ AMC/DOV for approval. Local in-flight guides and inserts not affecting T.O. guidance and procedures may be locally developed and OGV approved.

5.2. Duty Station. A qualified pilot will be in control of the aircraft at all times during flight. **EXCEPTION**: Unqualified pilots undergoing qualification training and senior staff members who have completed the ATS Senior Officer Course under the direct supervision of an instructor pilot. The aircraft commander, copilot, and loadmaster will be at their duty stations during critical phases of flight:

5.2.1. During other phases of flight, crew members may leave their duty station for brief periods to meet physiological needs and to perform normal crew duties. Only one pilot may be absent from their duty station at a time. Notify the aircraft commander before departing assigned primary duty station. **EXCEPTION**: On augmented AR missions when two or more air refuelings are scheduled and the crew contains more than one air refueling qualified aircraft commander, an aircraft commander (not necessarily the “A” coded aircraft commander on the flight orders) must be in the seat during refueling operations.

5.3. Flight Station Entry. Aircraft commanders may authorize passengers and observers access to the flight station during any phase of flight. In all cases, sufficient oxygen sources must be available to meet the requirements of AFI 11-202V3. Passengers and observers will not be permitted access to primary crew duty station regardless of its availability.

5.4. Takeoff and Landing Policy. After thoroughly evaluating all conditions, the aircraft commander will determine who accomplishes the takeoff and landing and occupy either the left or the right seat during all takeoffs and landings.

5.4.1. A qualified aircraft commander will accomplish all approaches and landings under actual emergency conditions unless specific conditions dictate otherwise.

5.4.2. Aircraft commanders who possess less than 100 hours in command since certification in the C-17 will perform all takeoffs and landings from the left seat.

EXCEPTION: They may allow aircraft commanders (with more than 100 hours in command), or higher to perform takeoffs and landings when required for currency.

5.4.3. Instructor or flight examiner pilots may allow copilots to take off and land from either seat. Otherwise, copilots will take off and land from the right seat.

5.4.4. The aircraft commander will make all takeoffs and landings when carrying special weapons.

5.4.5. The aircraft commander will accomplish all CAT II ILS approaches and landings when weather is less than CAT I minimums.

5.5. Right Seat Procedures. Landing gear will be operated by the pilot in the right seat. All flap operations will be commanded by the pilot flying the aircraft and activated by the pilot not flying the aircraft.

5.6. Outside Observer. When available, use a crew member to assist in outside clearing during all taxi operations and any time the aircraft is below 10,000 feet MSL.

5.7. Seat Belts.

5.7.1. All occupants will have a designated seat with a seat belt. Use of seat belts will be as directed by the aircraft commander and the flight manual. When children under the age of two are accepted as passengers, their sponsor must provide their own approved Infant Car Seat (ICS). Passengers may hand-carry the ICS. The ICS will be secured to a seat using the seat belt.

5.7.2. Crew members occupying pilot, copilot, or loadmaster positions will have seat belts fastened at all times in-flight, unless crew duties dictate otherwise.

5.7.3. All crew members will be seated with seat belts and shoulder harnesses fastened during taxi, takeoff, receiver AR, and landing, unless crew duties dictate otherwise. Additionally, anytime the seat belt advisory sign is illuminated, crew members will be seated with seat belt fastened, unless crew duties dictate otherwise. Crew members performing instructor or flight examiner duties are exempt from seat belt requirements; however, a seat with an operable seat belt will be assigned.

EXCEPTION: Crew members may taxi without the shoulder harnesses fastened for positioning and de-positioning the aircraft.

5.8. Aircraft Lighting. In accordance with AFI 11-202V3 and applicable T.O.s.

5.9. Portable Electronic Devices. See AFI 11-202V3.

5.9.1. Unauthorized equipment (Walkman type radios/tape players, CD players, etc.) will not be connected to the aircraft intercom, PA, or radio systems.

5.10. Smoking Restrictions. Smoking is prohibited on board the aircraft.

5.11. Advisory Calls. The pilot flying will periodically announce intentions during departures, arrivals, approaches, and when circumstances require deviating from normal procedures. The following calls are required by the Pilot-Not-Flying (PNF):

5.11.1. Nonprecision Approaches:

5.11.1.1. 1000 feet above IAF (or holding) altitude.

5.11.1.2. 100 feet above FAF altitude.

5.11.1.3. 100 feet above Minimum Descent Altitude (MDA).

5.11.1.4. "Minimums" at MDA.

5.11.1.5. "Runway in sight" (Call when the runway environment is in sight). (PF or PNF).

5.11.1.6. "Go-around" (Call at missed approach point if the runway environment is not in sight or if the aircraft is not in a position for a safe landing) (PF or PNF).

5.11.2. Precision Approaches:

5.11.2.1. 1000 feet above IAF (or holding) altitude.

5.11.2.2. 100 feet above FAF altitude.

5.11.2.3. 100 feet above Decision Height (DH).

5.11.2.4. "Land" (Call at DH if the runway environment is in sight and the aircraft is in a position for a safe landing.) (PF).

5.11.2.5. "Go-around" (Call at DH if the runway environment is not in sight and if the aircraft is not in a position for a normal landing) (PF or PNF).

5.11.3. Climb Out:

5.11.3.1. Transition altitude.

5.11.3.2. 1000 feet below assigned altitude.

5.11.4. Descent:

5.11.4.1. Transition level.

5.11.4.2. 1000 feet above assigned altitude.

5.11.5. Deviations:

5.11.5.1. Any crew member noting an apparent error in aircraft attitude, altitude, heading or airspeed, or any condition which may impact safety of flight, will immediately notify the pilot flying the aircraft.

5.11.5.2. Deviations from prescribed procedures for the approach being flown will also be announced.

5.12. Communications Policy. The Air Force does not give a promise of confidentiality to aircrews regarding their recorded aircraft crew communications. Crew members are expected to maintain a high degree of cockpit professionalism and crew coordination at all times.

5.12.1. Sterile Cockpit. Limit conversation to that essential for crew coordination and mission accomplishment during taxi, takeoff, air refueling, approach, landing, and any flight below 10,000 feet MSL (except cruise).

5.12.2. Aircraft Interphone: Primary crew members will monitor interphone. Crew members will advise the aircraft commander before checking off interphone.

5.12.3. Command Radios:

5.12.3.1. The pilot not flying the aircraft normally makes all ARTCC radio calls.

5.12.3.2. In terminal areas the pilot, copilot, and loadmaster will monitor the primary command radio unless directed otherwise. The loadmaster or designated crew member should monitor C2 frequencies (if applicable) on the inbound and outbound leg, unless otherwise directed.

5.12.3.3. The pilot operating the command radios will inform the crew when the primary radio is changed.

5.12.3.4. One pilot should record and will acknowledge all ATC clearances.

5.12.3.5. Both pilots will monitor UHF guard (or VHF guard when appropriate) emergency frequency regardless of primary radio.

5.12.3.6. Loadmasters will coordinate with pilots before going ISOL on interphone.

EXCEPTION: Only one pilot crew member (normally the PNF) is required to monitor guard frequencies during rendezvous and AR.

5.12.4. Crew Resource Management (CRM) Assertive Statement “Time Out". "Time Out" is the common assertive statement for use by all crew members. The use of "Time Out" will:

5.12.4.1. Provide a clear warning sign of a deviation or loss of situational awareness.

5.12.4.2. Provide an opportunity to break the error chain before a mishap occurs.

5.12.4.3. Notify all crew members that someone sees the aircraft or crew departing from established guidelines, the briefed scenario, or that someone is simply uncomfortable with the developing conditions.

5.12.5. As soon as possible after a "Time Out" has been called, the aircrew will take the following actions:

5.12.5.1. Safety permitting, stabilize the aircraft.

5.12.5.2. The initiating crew member will voice his or her concerns to the crew.

5.12.5.3. The aircraft commander will provide all other crew members with the opportunity to voice inputs relative to the stated concerns.

5.12.5.4. After considering all inputs, the aircraft commander will direct the aircrew to continue the current course of action or direct a new course of action.

NOTE: The aircraft commander is the final decision authority.

5.13. Transportation of Pets. Transporting pets (dogs and cats) on aircraft operated by or under the control of AMC in conjunction with the sponsors permanent change of station (PCS) is authorized. Other pets or animals are normally prohibited, but may be moved according to DODR 4515.13R, *Air Transportation Management*.

5.14. Alcoholic Beverages. MAJCOM/DO may authorize the dispensing of alcoholic beverages to passengers.

5.15. Runway, Taxiway, and Airfield Requirements.

5.15.1. Minimum runway/taxiway widths for C-17 operations:

5.15.1.1. Runway width: 90 feet (28 meters).

5.15.1.2. Taxiway width: 50 feet (16 meters).

5.15.1.3. Minimum width for 180° turn: 90 feet (28 meters) with star turn.

5.15.2. Takeoff and Landing.

5.15.2.1. Minimum runway length for takeoff is critical field length (CFL) unless a minimum altitude is required at the departure end of runway.

5.15.2.2. Minimum runway length for 3/4 flap landing is computed landing distance, with idle reverse.

5.15.2.3. Minimum runway length for FULL flap landing is computed ground roll, with max reverse, plus 500 feet. Touchdown must be within the first 500 feet of the runway and full flaps will be used. Weather minimums must be circling minimums, no lower than 600/2. Prior to landing at a short field, the aircraft commander must verify takeoff performance to ensure he/she can take off after the planned offload/onload. See **Chapter 17** for assault landing zone operations. Assault landing zones must be marked IAW AFI 13-217. If assault zone procedures are required at an airfield, runway markings/airfield references must be sufficient to determine the 500 foot touchdown zone.

NOTE: Max reverse refers to LSK 3L on the Non-Standard Configuration page of the mission computer. The data computed with this option selected is actually based on 2 engines in max reverse, 2 in reverse idle.

5.15.2.4. Runways less than 3,500 feet require MAJCOM/DO waiver.

5.15.2.5. If approach end overruns are available and stressed or authorized for normal operations, they may be used to increase the runway available for takeoff. Departure end overruns (if stressed and authorized) may also be used for landing if needed.

5.15.3. Aircrews and planning agencies will contact HQ AMC/DOA (Airfield Analysis Branch) for all questions pertaining to airfield weight bearing capability and will review the Airfield Suitability and Restrictions Report (ASRR) before all off-station operations. HQ AMC/DOVS is the waiver authority for all airfield restrictions on AMC-directed missions. Waivers must be obtained before mission execution. Once a mission is executed the aircraft commander is responsible for determining airfield suitability based upon operational need. See ASRR for airfield certification requirements.

5.15.4. Runway Length for Takeoff and Intersection Takeoffs. Normally, takeoffs will be initiated from the beginning of the approved usable portion of the runway. The decision to make intersection takeoffs rests solely with the aircraft commander.

5.15.4.1. Intersection takeoffs may be accomplished provided the operating environment (i.e., gross weight, obstructions, climb criteria, weather, etc.) will allow a safe takeoff and departure.

5.15.4.2. When less than the entire runway is used, takeoff and landing data (TOLD) computations will be based on the actual runway remaining from the point at which the takeoff is initiated.

5.15.4.3. During operations on runways partially covered with snow or ice, takeoff computations will be based on the reported RSC or RCR for the cleared portion of the runway. A minimum of 45 feet either side of centerline should be cleared. If 45 feet either side of centerline is not cleared, then compute data based on the uncleared portion up to 45 feet either side of centerline.

5.15.5. Arresting Cables (does not include recessed cables). When conditions permit (aircraft gross weight, runway length, weather, winds, TOLD, etc.) and the aircraft commander has considered the potential for damaging the aircraft, make takeoffs and landings beyond raised cable barriers. If aircraft commanders determine they need the entire length of runway, use it. Be aware that operations over arresting gear barriers at speeds in excess of taxi speed may result in damage to the aircraft.

5.15.5.1. Do not land on (touchdown on) approach end arresting cables. If the aircraft lands before the cable, the crew should contact the tower to have the cable inspected.

5.15.5.2. Do not takeoff or land over an approach end cable that has been reported as slack, loose, or improperly rigged by NOTAM, ATIS, or ATC.

5.16. Aircraft Taxi Obstruction Clearance Criteria and Foreign Object Damage (FOD) Avoidance.

5.16.1. Without a marshaller and wing walkers, avoid taxi obstructions by at least 25 feet. With a marshaller and wing walkers, avoid taxi obstructions by at least 10 feet. Use extreme caution when attempting to apply this criteria while scanning from inside the airplane. Factors such as winglet angle, wing tip and tail growth in turns, and the distance from the fuselage to the wing tip, make it difficult to determine actual clearance.

5.16.2. When taxi clearance is doubtful, use one or more wing walkers. If wing walkers are unavailable, deplane one or more crew members to maintain obstruction clearance and provide marshalling. Use AFI 11-218, *Aircraft Operation and Movement on the Ground*, signals. The aircraft commander should use marshallers and wing walkers, deplaned crew members, or a crew member on interphone positioned at a door to act as an observer while maneuvering on narrow taxiways. During night taxi operations, marshallers will have an illuminated wand in each hand. Observers should be in a position to see wing walkers at all times (through door or windows) and communicate to the pilot.

EXCEPTION: According to AFI 11-218, aircraft may taxi without marshallers/wing walkers at home station along locally established taxi lines which have been measured to ensure a minimum of 10 feet clearance from any obstruction.

5.16.3. FOD Avoidance. Make every effort to minimize the potential for engine FOD. Crews should:

5.16.3.1. Carefully review airfield layout during mission planning. Be familiar with taxi routes, turn requirements, and areas for potential FOD.

5.16.3.2. Confirm that taxi routes have been swept. If taxi route has not been swept, consider taxiing via an alternate route.

5.16.3.3. Minimize power settings during all taxi operations.

5.16.3.4. Minimize taxi operations which would position an engine over an unprepared or unswept surface. If it becomes necessary to position an engine over an unprepared or unswept surface, the engine should be left in idle (to the maximum extent possible) until the engine is back over an improved surface. Consider increasing power on remaining engines.

5.17. Reverse Taxi:

5.17.1. The pilot will coordinate reverse taxi directions and signals to be used with the loadmaster and marshaller (when available).

5.17.2. Unless briefed otherwise, the following standard terms will be used by the loadmaster when conducting reverse taxi operations:

5.17.2.1. The #1 and #4 engines will be used as turn references, i.e., “More turn towards #1,” “Less turn towards #4.”

5.17.2.2. When the aircraft nears the desired reverse taxi stopping point, the loadmaster will give the following commands: “Prepare to stop, five, four, three, two, one, stop.”

CAUTION: During the entire reverse taxi operation, if the loadmaster states the word “Stop,” the pilot will immediately stop the aircraft. Failure to comply may result in damage to aircraft or injury to personnel.

5.17.3. Ensure all passengers are seated and cargo is secure.

5.17.4. Open aft cargo door and lower the ramp to coplaner position. Paratroop door(s) may be opened in addition to the cargo door and ramp if required. If ramp cargo prohibits easy movement for the loadmaster or the ramp cannot be lowered due to cargo tiedowns, the loadmaster will stand in either troop door to clear the area behind the aircraft.

5.17.5. The loadmaster must have enough maneuverability to observe and direct reverse taxi, and report any hazards. The loadmaster will provide the pilot with continuous interphone instructions on conditions in the maneuvering area. This includes turns, distance remaining (for wingtips, empennage, and main gear), and stopping point. During aircraft backing, if the pilot and loadmaster lose interphone contact the pilot will stop the aircraft.

5.17.6. If deemed necessary by the aircraft commander, the loadmaster will deplane and direct reverse taxi operations from a safe distance behind the aircraft.

5.17.7. When reverse taxiing at night, the pilots and loadmaster will ensure the taxi area is sufficiently lighted. Use the staging lights, retracted landing lights, or any other source that provides adequate lighting of the taxi area.

5.17.8. During reverse taxi operations, stop no less than 25 feet from an obstruction with or without a marshaller/wing walker.

CAUTION: The aircraft tail cannot be seen by the loadmaster from inside the aircraft and could possibly strike an obstruction well before the main gear tires are near the ramp edge. If any doubt exists as to sufficient clearance, stop the aircraft.

5.18. Fuel Jettison Procedures. Fuel jettison is limited to the minimum necessary for safe and effective flight operations. Except in the case of an emergency, before jettisoning fuel, crews will notify the appropriate ATC or flight service facility of intentions, altitude, and location. Inform the appropriate ATC or flight service facility when the operation is complete.

5.18.1. Use designated jettison areas to the maximum extent possible, except when safety of flight would be compromised.

5.18.2. If jettison is accomplished, record all pertinent data to include flight conditions, altitude, airspeed, air temperature, wind direction and velocity, type and amount of fuel, aircraft type and position at time of jettison, time and duration of jettison activity, and reason jettison was accomplished. Retain this information for 6 months as documentation in the event of claim against the government resulting from the fuel jettison.

5.19. Airspeed. In accordance with applicable tech orders, aircraft may exceed 250 KIAS or in-flight minimum maneuver speed below 10,000 feet to accomplish formation departures or as operational performance dictates.

5.20. BASH Programs. BASH programs are centralized unit efforts that provide information cross-feed, hazard identification, and a consolidated course of action. As a minimum, units must implement the following procedures:

5.20.1. Ensure compliance with the following Bird Watch condition restrictions:

5.20.1.1. Bird Condition Low - No operating restrictions.

5.20.1.2. Bird Condition Moderate - Initial takeoffs and final landings allowed only when departure and arrival routes will avoid bird activity. Local IFR/VFR traffic pattern activity is prohibited.

5.20.1.3. Bird Condition Severe - All takeoffs and landings are prohibited. Waiver authority is local OG/CC or equivalent. Parent MAJCOM/DO waiver is required to operate at airfields not controlled by the MAF.

5.20.2. Make every effort to not schedule takeoffs, landings, and low-levels from one hour before to one hour after sunrise and sunset during the phase II period. Total number of missions that fall within this identified bird hazard window will be annotated and approved on the cover of the flying schedule. Also, significant bird hazards will be published in FLIP GP and the IFR Supplement along with the associated airfield operating hour restrictions and avoidance instructions.

5.20.3. When operating at other than an AMC airfield on an AMC assigned mission, the approval authority for launch during a severe bird watch condition is AMC/DO.

5.20.4. When operating at airfields where no BASH program exists, aircraft commander's have the authority to delay takeoffs and arrivals due to bird condition. Coordinate actions through appropriate command and control authority.

5.20.5. Enroute. The aircrew should consider bird migratory patterns during enroute portion of the mission to minimize the potential of an in-flight bird strike. The Bird Avoidance Model (BAM) on HQ AFSC/SEF www site (http://www.afsc.saia.af.mil/AFSC/Bash/home.htm) provides the latest BASH information and including regionalized CONUS bird migration PFPS software overla;y, and latest news. See AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*, for additional information.

5.21. Functional Check Flights (FCF) and Acceptance Check Flights (ACF). FCFs and ACFs will be performed according to T.O. 1-1-300 and applicable MAJCOM instructions (i.e., 21-series). Additional guidance can be found in T.O.s 00-20-6, 1C-17A-6CF-1, and 1C-17A-1.

5.21.1. Terms and Abbreviations:

5.21.1.1. FCF—FCFs are performed after accomplishing inspections or maintenance to assure the aircraft is airworthy and capable of mission accomplishment.

5.21.1.2. ACF—ACFs specify guidelines for accepting new production aircraft and to determine compliance with contractual requirements (e.g. C checks).

5.21.2. FCF Restrictions:

5.21.2.1. Conditions requiring an FCF according to T.O. 1C-17A-6CF include (but are not limited to) major retrofit modifications, removal or replacement of moveable flight control surfaces, major repairs that would affect the flying characteristics of the aircraft, adjustment, removal or replacement of major components of the flight control system for which airworthiness cannot be verified by maintenance operational checks, or removal or replacement of any two engines.

5.21.2.2. The OG/CC is responsible for the wing FCF program. The OG/CC may waive a complete FCF and authorize an FCF to check only systems disturbed by maintenance, inspection or modification. Additional guidance should be published in the local chapter of these instructions.

5.21.2.3. Check flight will be conducted within the designated check flight airspace of the base from which the flight was launched except when the flight must be conducted under specific conditions, not compatible with local conditions and area restrictions.

5.21.2.4. The decision to approve a combined FCF and ferry flight is the responsibility of the NAF/DO.

5.21.2.5. FCFs will be accomplished by the best qualified instructor (Stan/Eval) aircrews which will be designated FCF qualified to their assigned aircrew position by the OG/CC in a letter.

5.21.2.6. FCFs will normally be conducted in daylight, VMC conditions. However, the OG/CC may authorize a flight under a combination of VFR, IFR, and "VFR on Top" conditions. The flight will begin in VFR conditions. If the aircraft and all systems are operating properly, it may proceed IFR to penetrate cloud cover to VFR on top to continue the altitude phase of the flight.

5.21.2.7. FCF aborts—If a malfunction occurs during an FCF and is not related to the condition generating the FCF, and the original condition operationally checks good, the aircraft may be released for flight.

5.21.2.8. OG/CC and deployed mission commander may authorized temporary waivers to these FCF procedures for aircrew qualification when operationally necessary. Permanent waivers require MAJCOM approval.

5.22. Participation in Aerial Events. See AFI 11-209, *Air Force Participation in Aerial Events.* Aerial events must be sanctioned and individually approved by the appropriate military authority and dated with the FAA. AFI 11-209 identifies events sanctioned for support and the approving authority for each type of event. In addition, AFI 11-209 stipulates that units participating in aerial events will ensure aerial activities are coordinated with the FAA through the regional Air Force representative.

5.23. TCAS.

5.23.1. It is imperative to follow resolution advisories (RA) to obtain aircraft separation computed by TCAS. Failure to follow the computed RA may increase the probability of a midair collision. Visually clear the airspace before maneuvering the aircraft in response to a TCAS advisory.

5.23.2. Advise ATC as soon as practical when a deviation becomes necessary due to a TCAS resolution advisory.

5.24. Radar Altimeter.

5.24.1. Any crewmember detecting the illumination of the radar altimeter Low Altitude warning light will immediately notify the PF. Terrain clearance and aircraft position must be verified.

5.25. Ground Proximity Warning System (GPWS) OR Ground Collision Avoidance System (GCAS). The following escape maneuvers and flight crew procedures apply to aircrews flying aircraft equipped with GPWS or GCAS.

5.25.1. When at night or in IMC, and an aural warning is heard or TERRAIN is displayed in the HUD or PFD, the following escape maneuver will be accomplished.

5.25.1.1. Departure/Approach. Immediately and simultaneously rotate the aircraft to at least 7 degrees pitch-up, roll wings level and add maximum power to alter the aircraft's flight path until the warning has ceased and adequate terrain clearance is verified.

5.25.1.2. Enroute. Immediately and simultaneously rotate the aircraft to at least 7 degrees pitch-up, roll wings level and add maximum power to alter the aircraft's flight path until the warning has ceased and adequate terrain clearance is verified.

WARNING: Do not delay pull-up for diagnosis of the low altitude warning.

WARNING: Failure to roll wings level before slowing to the prescribed speeds above will decrease stall margin at heavy aircraft gross weights.

5.25.2. For operations in day VMC conditions, with terrain and obstacles clearly in sight, the PF will call runway and/or terrain in sight, state intentions and visually clear terrain.

5.25.3. Ensure the proper mode of the GPWS is commensurate with the aircraft's phase of flight.

5.26. Buddy Start. Buddy starts may be performed when approved by the OG/CC or DIRMOBFOR. Nonessential crewmembers and all passengers will be loaded after completion of a buddy start**.**

5.27. Not Used.

5.28. Aircraft Recovery From Unprepared Surfaces. Aircrews will normally not attempt to recover an aircraft after inadvertent entry onto unprepared surfaces not suitable for taxi. Using the appropriate equipment, ground crews will accomplish aircraft recovery. Unless an emergency situation dictates otherwise, aircrews may accomplish recovery only if there is no aircraft damage, the surface will support the aircraft, and the AC has coordinated with appropriate AMC headquarters maintenance authorities through the TACC (AFRC NAF/DO for USAFR aircraft or missions and ANGRC/|XO for ANG aircraft or missions).

5.29. Not Used.

5.30. Use of Automation. The C-17A is designed to be operated by three crew members, two pilots and one loadmaster. In order to perform the same demanding worldwide strategic and theater missions currently flown with larger crews, automation is employed. All technical orders, procedures, checklists, training, and supporting documents are designed to support the human operator.

5.30.1. It is the responsibility of the crew to fully understand the operations and limitations of the automation on the aircraft. In flight, the pilot flying (PF) will determine the most desirable level of automation for a given situation. The aircraft commander has the ultimate responsibility and authority for the safety of the aircraft, passengers, and crew. The aircraft commander must manage the workload, set priorities and employ the available resources, including automation, to maintain overall situational awareness.

5.30.2. Use appropriate levels of automation as required by the flight conditions. The first priority is to fly the aircraft. The Automatic Flight Control System (AFCS) and Mission Computer (MC) are intended to aid in workload management, not complicate it. As the flight situation changes, do not feel locked into a level of automation.

5.30.3. Avoid the following common pitfalls associated with over-reliance, misuse, or misunderstanding of automation.

5.30.3.1. Fixating on the automation. One pilot should always remain heads up. Establish clear roles for computer related tasks. Announce “pilot heads down” or “copilot heads down” when the task requires focusing significant attention on the mission computer in flight.

5.30.3.2. Misprioritizing programming tasks. Extensive reprogramming during critical phases of flight or during periods of high workload should be avoided.

5.30.3.3. Mode awareness. The pilot flying (PF) should make AFCS panel changes during coupled operations. During uncoupled flight, the PF should direct the pilot not flying (PNF) to make changes to the AFCS panel. Confirm all mode changes by observing the correct flight mode annunciator (FMA) indications.

5.30.3.4. Assuming automation is programmed correctly. Pilots should back up each other when making AFCS panel settings or programming the MC.

5.30.3.5. Over-reliance on automation. Practice flight operations at all levels of automation to be proficient. If the automation is not performing as expected, take over manually.

5.31. Standard AFCS Terminology. Under certain conditions, complete commands may be required. This would require an action, the proper axis, then the setting, e.g., "SELECT HEADING 060."

5.31.1. SELECT or ENGAGE direct the selection of a value on the AFCS panel which results in the value being placed in the "Engaged" (Top) portion of the FMA. SELECT is normally used with rotary knobs labeled "SEL," however, ENGAGE is acceptable. The FD, TOGA, APPR, ATT, AD, AP, AT are normally engaged. For added clarification, selecting an EPR rating means pressing a thrust rating button on the SED panel; engaging EPR means pressing the AFCS "EPR" pushbutton.

5.31.2. ARM directs the selection of a value on the AFCS panel which results in the value being placed in the "Armed" (Bottom) portion of an FMA.

5.31.3. For LNAV and VNAV selections, command the actual value intended, not "ARM LNAV" or "ENGAGE VNAV." For example, "ARM VOR" or "ENGAGE VPROF" are proper commands.

5.31.4. Standard terminology is very precise, but can unnecessarily congest cockpit communication. Inflight context generally allows simplified direction and execution. For example "ARM 10,000" is obviously an altitude command and does not require the noun "altitude" to clearly communicate the PF's desires. Airspeeds appended with "PITCH" or "THRUST" are sufficiently clear and do not require the use of the noun "speed." VERT SPDS appended with "UP" or "DN" are sufficiently clear. If requested by the PF, ATC vectors (headings) may be automatically selected, and altitudes automatically armed by the PNF. At any time the PNF is unsure of the command, he/she will ask for clarification. If the PF sees an uncommanded FMA, he/she will clearly restate the command and ensure the actual value is made.

Chapter 6

AIRCREW PROCEDURES

Section 6A—Pre-mission

6.1. Aircrew Uniform .

6.1.1. Wear the aircrew uniform, as outlined in AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel*, and the appropriate MAJCOM Supplement, on all missions, unless otherwise authorized. When the Foreign Clearance Guide requires civilian attire, wear conservatively styled civilian clothing.

6.1.2. Each group commander will determine clothing and equipment to be worn or carried aboard all flights commensurate with mission, climate, and terrain involved.

6.1.2.1. All crew members will have Nomex gloves in their possession.

6.1.2.2. It is recommended that primary crew members wear Nomex gloves during engine start, taxi, takeoff and landing.

6.1.2.3. Crew members will remove rings and scarves before performing aircrew duties.

6.1.3. Personnel will have the appropriate items of clothing in their possession when flying in Arctic and Antarctic regions.

6.1.4. See AFI 10-403, *Deployment Planning*, for mobility requirements.

6.2. Personal Requirements .

6.2.1. Passport. Carry a valid passport on all missions outside the 48 conterminous states. **EXCEPTION**: Unit commanders may authorize newly assigned personnel who have applied for, but not yet received, a passport or submitted passports for renewal to act as crew members on missions not scheduled to transit locations where passports are required.

6.2.2. Shot Record. Ensure immunization requirements are met. Carry shot record on all missions outside the 48 conterminous states. C-17 crew members must maintain worldwide shot requirements.

6.2.3. Corrective Lenses. Wear prescribed corrective glasses or contact lenses when performing duties requiring corrected vision. Do not wear contact lenses, on or off duty, unless their wear is approved by the flight surgeon.

6.2.4. Driver's License. A valid state driver's license is required on each TDY where use of US government general purpose vehicles may be required. Contact the local airfield manager if vehicle will be operated on the flight line.

6.2.5. Identification Tags. Two required for all flights.

6.2.6. FOD Hazards. Crew members will not wear wigs, hair pieces, rings, ornaments, pins, clips, other hair fasteners, or earrings in the aircraft or on the flight line.

EXCEPTION: Crew members may wear plain elastic hair fasteners and/or barrettes. These fasteners must not interfere with the wearing of headsets or the donning of oxygen equipment and will be accounted for before and after flight.

6.2.7. Flashlights. Each crew member must carry an operable flashlight for night flights.

6.3. Pre-mission Actions .

6.3.1. Accomplish Theater Indoctrination training before transiting the following areas:

6.3.1.1. Asia, Pacific, Australia, and Indian Ocean.

6.3.1.2. Africa and the Middle East.

6.3.1.3. Europe, Baltics, and Russia.

6.3.1.4. Caribbean, Central America, and South America.

6.3.2. Contents of the theater indoctrination folders should be tailored to the units' specific mission. As a minimum, the following will be included:

6.3.2.1. Mission/Deployment Checklist. A locally developed checklist that includes mobility, training, and personnel requirements that should be accomplished before departure, and personal/professional items the aircrew must take with them.

6.3.2.2. Airspace/Airfield Review. Flip, fir/uir/adiz procedures.

6.3.2.3. Airspace classifications, ASRR, and airport qualification videos (if available).

6.3.2.4. Theater Instrument Procedures. Required instruments and/or procedures for Non-DoD Approaches, course reversal approaches, circling, holding, NDB approaches, Host Nation/Jeppesen Approaches, and Altimeter setting procedures.

6.3.2.5. Organized Track Systems. Minimum Navigation Performance Specifications (MNPS) Airspace requirements; North Atlantic and Pacific Region Track Systems.

6.3.2.6. Communication and Emergency Procedures. Command and Control, Over-water position reporting, lost communications procedures, emergency procedures, and weather information sources.

6.3.2.7. Border Clearance. Foreign Clearance Guide, Customs, Immigration, Agriculture, Insect and Pest Control, and Diplomatic Clearances.

6.3.2.8. Flight planning. DD Form 1801, **DoD International Flight Plan**, Jeppesen Computer Flight Plan, Jeppesen Approach Plates and Charts, Theater Weather Conditions, Fuel Reserves and Alternate Requirements, Equal Time Points/Critical Wind Factors, and International NOTAMs.

6.3.2.9. Special Military Operations. Altitude Reservations, Due Regard, and Formation/Air Refueling Limitations.

6.3.2.10. Other Regulatory Requirements. General navigation procedures, Life Support equipment, hazardous cargo, crew rest/crew duty time, aircraft records/781 procedures, passenger handling, etc.

6.3.2.11. Location Information. Command and control/reporting procedures, maintenance problems, aircraft security, social customs and taboos, billeting, transportation, etc.

6.3.3. Units may consolidate information common to all geographic areas into one folder titled "general deployment information." The remainder of the folders would contain only theater specific information.

6.3.4. Aircrews will review theater indoctrination folders before mission/deployment. This review will be tracked in AFORMS as event G290.

6.3.5. Upon return, the aircraft commander will compile a trip report, when necessary, detailing lessons learned. The trip report will be placed in the theater indoctrination folder, closing the loop on ensuring validity of the folder.

6.3.6. Review tasking, itinerary, and ALTRV requirements.

6.3.7. Review applicable OPORD and FLIP.

6.3.8. Review the Foreign Clearance Guide for areas of operation. Obtain necessary diplomatic clearances where required.

6.3.9. Obtain required customs forms.

6.3.10. Complete TDY order requests (if required).

6.3.11. Obtain computerized flight plans (CFP), as appropriate.

6.3.12. Coordinate with combat crew communications for worldwide FLIPs and sufficient communications security (COMSEC) materials for the duration of the mission.

6.3.13. Review anti-hijacking procedures in AFI 13-207, *Preventing and Resisting Piracy [Hijacking]*, and **Chapter 7**.

6.3.14. Ensure physiological training, annual physical, immunizations, and standardization checks will remain current throughout the TDY period.

6.3.15. Obtain visas, if required.

6.3.16. Obtain terrain charts for unfamiliar destinations, if available.

6.3.17. Compile sufficient spare forms, flight orders, etc. to cover the TDY period.

6.3.18. Release available seats to passenger terminal.

6.4. Aircrew Publications Requirements. Primary crew members will carry the publications specified in **Table 6.1.** on all missions.

Table 6.1. Aircrew Publications Requirements.

Publication	AC	CP	LM
TO 1C-17A-1		X	X
TO 1C-17A-1-1		X	
TO 1C-17A-1-35	X (AR only)		
TO 1C-17A-1-2		X	
Abbreviated Checklist	X	X	X
AFI 11-2C-17V3	X		X

Publication	AC	CP	LM
AFI 11-231	X (Airdrop only)		
AFI 11-299V1	X (PNAF only)		
AFI 13-217	X		
TO 1C-17A-9			X
TO 1C-17A-16-1/2			X (PNAF only)
AFI 11-202V3	X		

Section 6B—Pre-departure

6.5. Airfield Certification. All crew members and staff mission planners will review airport qualification audiovisual slide tape programs as available before operating missions into unfamiliar airfields. In addition, aircrews will review the Airfield Suitability and Restrictions Report (ASRR). Contact HQ AMC/DOVS for updates to airfield operability and weight bearing capability.

6.6. Aircrew Intelligence Briefing. Before leaving home station on missions departing the CONUS, crews will receive an intelligence briefing that will emphasize terrorist, enemy, and friendly political and military development in the area in which they will be flying. Once in theater, aircrews should receive intelligence updates on initial arrival at a forward operating location (FOL) or en route stop and thereafter when significant developments occur. Report information of possible intelligence value to the local intelligence officers at the completion of each mission.

6.7. Flight Crew Information File (FCIF) Procedures .

6.7.1. Review the appropriate FCIF, Volume 1, (index and safety-of-flight files, as a minimum) before all missions or ground aircrew duties according to AFI 11-202V2, *Aircrew Stan/Eval Program* and MAJCOM supplement. Update the FCIF currency record with the latest FCIF item number, date, and crew member's initials, or as specified.

6.7.2. Crew members delinquent in FCIF review or joining a mission en route will receive an FCIF update from a primary aircrew member counterpart on the mission. Instructor pilots who fly with general officers are responsible for briefing appropriate FCIF items.

6.7.3. Crew members not assigned or attached to the unit operating a mission will certify FCIF review by entering the last FCIF number and their initials behind their name on the file copy of the flight authorization or file copy of their crew orders.

6.8. Flight Crew Bulletins (FCB) (As Applicable).

6.8.1. FCBs are issued under provisions of AFI 11-202V2 and MAJCOM supplement. Operations group Stan/Eval are OPR for FCBs. Items in FCBs may include local procedures and policies concerning equipment and personnel generally not found in any other publications.

6.8.2. All crew members should be cognizant of FCB contents.

6.9. Airfield Security. When departing on missions destined outside the CONUS, aircraft commanders should review applicable MAJCOM security publications.

6.10. Mission Kits. Carry mission kits on all operational missions. Suggested items include:

NOTE: * Indicates mandatory for all missions away from home station.

6.10.1. Publications:

6.10.1.1. *AFI 11-401 *Flight Management.*

6.10.1.2. *AFI 23-202 *Buying Petroleum Products Other Supplies and Services Off-Station.*

6.10.1.3. *AFJI 11-204 *Operating Procedures for Aircraft Carrying Hazardous Materials.*

6.10.1.4. *Airfield Suitability and Restrictions Report (ASRR).

6.10.1.5. *AMC Aircrew Border Clearance Guide.

6.10.1.6. *FCB.

6.10.1.7. *AFI 11-289, *PHOENIX BANNER/SILVER/COPPER Operations.*

6.10.2. Forms:

6.10.2.1. DD Form 2131, **Passenger Manifest.**

6.10.2.2. DD Form 1351-2, **Travel Voucher or Sub voucher.**

6.10.2.3. DD Form 1351-2c, **Travel Voucher or Sub voucher** (Continuation Sheet).

6.10.2.4. *CF 6059B, **US Customs Accompanied Baggage Declaration.**

6.10.2.5. *CF 7507, **General Declaration Outward/Inward.**

6.10.2.6. *AF Form 15, **United States Air Force Invoice.**

6.10.2.7. *AF Form 315, **United States Air Force AvFuels Invoice.**

6.10.2.8. AF Form 457, **USAF Hazard Report.**

6.10.2.9. *AF Form 651, **Hazardous Air Traffic Report (HATR).**

6.10.2.10. *AF Form 853, **Air Force Bird Strike Report.**

6.10.2.11. *AF Form 1297, **Temporary Issue Receipt.**

6.10.2.12. AMC Form 38, **Air Mail Crew Resource Management Anonymous Reporting System.**

6.10.2.13. AMC Form 43, **Transient Aircrew Comments.**

6.10.2.14. AMC Form 54, **Aircraft Commander's Report on Services/Facilities.**

6.10.2.15. *AF Form 4091, **Mission Data.**

6.10.2.16. AMC Form 97, **USAF Aircraft Mishap Report Worksheet.**

6.10.2.17. *AF Form 4031, **CRM Skills Criteria Training/Evaluation.**

6.10.2.18. AF Form 4075, **Aircraft Load Data Worksheet.**

6.10.2.19. AF Form 4091, **Airdrop/Tactica1 Airland/Air Refueling Mission Recap,** SKE/ZM Debrief.

6.10.2.20. HMS Customs Declaration.

6.10.2.21. Japanese Customs Declaration.

6.10.3. Orders:

6.10.3.1. DD Form 1610, **Request and Authorization for TDY Travel of DoD Personnel.**

6.10.3.2. AF Form 1631, **NATO Travel Orders** (when required).

6.10.3.3. AMC Form 41, **Flight Authorization.**

6.10.4. Miscellaneous:

6.10.4.1. *Box car seals.

6.10.4.2. *Masking tape.

6.10.4.3. *Printer paper for laptop computer.

6.11. Route Navigation Kits.

6.11.1. A route navigation kit is issued at home station and remains with the aircraft until return. Kits contain sufficient quantities of material to cover the planned mission and global operations as required.

6.11.2. Minimum contents of route navigation kits are in **Table 6.2.**

Table 6.2. Contents of Route Navigation Kit.

ITEM (APPLICABLE TO AREA OF OPERATION (AOR))	**NUMBER**
FLIP GP Planning (sections GP, AP/1, AP/1B, AP/2, AP/3)	1
FLIP IFR Supplement	2
FLIP Flight Information Handbook	1
FLIP En route (high and low)	2
FLIP Instrument Approach Procedures (high and low)	3
Standard Instrument Departures (East and West United States, volumes 1 and 2)	3
Instrument Departures Europe and North Africa (high and low)	3
Standard Terminal Arrival Routes (STAR)	3
Topographical & Sectional Charts for AOR (GNC/OPC/TPC/JNC)	as required
FLIP VFR Supplement	1
DoD Area Arrival Charts	(2) if available
Navigation and Comm Database Disks	as required

6.11.3. Local area navigation kits may be used in lieu of route navigation kits on local unit training sorties. Contents of local kit is a local unit decision.

6.12. Briefing Requirements.

6.12.1. Unit Operations and Mission Commander Briefing. At locations where no AMC command and control center (C2 agency) exists, either the unit operations officer, mission commander, or a designated representative will brief crew members before each mission.

6.12.2. Aircraft Commander Briefings. Cover all applicable items of the operations briefing. Use the briefing guides published in the attached checklists.

6.12.3. C2 Briefing. Contact the local AMC C2, when available, before flight planning to coordinate or confirm mission requirements, and from the aircraft prior to engine start. C2 agencies or units will provide required information. The aircraft commander and C2 agency jointly share the responsibility to identify special briefing requirements.

6.12.4. Weather Briefings. Request a written weather briefing on DD Form 175-1, **Flight Weather Briefing**, AMC Form 181, **Mission Weather Briefing**. **EXCEPTION**: verbal weather briefings are acceptable for local training missions. Obtain a briefing on current weather, trends, and forecast for the proposed route, destination, and alternates. If the flight will transit non-Air Force bases, crews must make arrangements to ensure adequate weather support facilities and services are available. If adequate services are not available crews will obtain weather support through any means available to ensure required weather data is in their possession before mission accomplishment. When face-to-face briefings are not possible, obtain a telephone weather briefing (precedence up to and including IMMEDIATE is authorized). The designated MAJCOM regional briefing stations provide the telephone briefing for CONUS flights.

6.12.5. Buffer Zone. Before operating an aircraft within or adjacent to an established buffer zone, the pilot will ensure primary crew members are briefed on current buffer zone procedures outlined in appropriate directives.

6.12.6. Peacetime and Wartime SAFE PASSAGE Procedures. Pilots must be familiar with peacetime and wartime safe passage of friendly military aircraft (if applicable).

6.12.7. Intelligence Briefings. For missions departing the CONUS, the C2 agency, aircraft commander, and unit intelligence personnel are jointly responsible for ensuring that aircrews receive the necessary intelligence information. Aircraft commanders will be advised (by mission directive, C2 agency, etc.) when formal intelligence briefings and/or debriefings are required. As a minimum, if not formally briefed, review the intelligence read file.

6.12.8. Hazardous Materials. Before accepting hazardous materials, the aircraft commander or designated representative will be furnished a cargo briefing and appropriate forms. The aircraft commander will ensure that crew members thoroughly understand mission requirements and procedures governing the hazardous materials being airlifted (see paragraph **6.29.**).

6.13. Call Signs.

6.13.1. Training Missions. Aircraft will use the unit static call sign prefix followed by a 2-digit suffix assigned by the parent unit.

6.13.2. Operational Missions. Aircraft will use call signs assigned by OPORD, FRAG, or diplomatic clearance. If no call sign has been assigned to the mission, use unit static call signs. When flying AMC channel missions, aircraft will use the “REACH” call sign followed by the last digit of the year the aircraft was built and the last 3 digits of the aircraft tail number (or as required by diplomatic clearance). Complete flight plans as follows:

6.13.2.1. On the DD Form 1801, **DOD International Flight Plan,** item 7, put the letters "rch" followed by the last digit of the year the aircraft was built and the last 3 digits of the aircraft tail number.

6.13.2.2. On the DD Form 1801, item 18, remarks section, put “rem / rch designates Reach call sign.”

6.13.2.3. On the DD Form 175, **Military Flight Plan**, aircraft call sign block, put “rch” followed by the last digit of the year the aircraft was built and the last 3 digits of the aircraft tail number.

6.13.2.4. On the DD Form 175, remarks block, put “rch designates Reach call sign”

6.13.3. During radio transmissions, crews will use "Reach" followed by the last digit of the year the aircraft was built and the last 3 digits of the aircraft tail number.

6.14. Instrument Flight Rules. Conduct flight operations under IFR to the maximum extent possible without unacceptable mission degradation.

6.15. Flight Data Verification.

6.15.1. Aircrews should acquaint themselves with the mission and individual sortie requirements to ensure successful mission accomplishment. Wing and squadron staff should monitor crew activity and be available to resolve problem areas.

6.15.2. Computer Flight Plan (CFP) Use. Contracted CFPs or CFPs available from Air Force Global Weather Central (AFGWC/DOF) are the official sources of performance, navigation, and climatic data, including en route wind information. If stand-alone microcomputer based plans are used, each mission segment should utilize best wind data available. Only current, command validated (HQ AMC/DOV) microcomputer programs will be used for flights involving C-17 aircraft.

6.15.3. Flight crews may manually compute flight plans, use mainframe based or contracted CFPs, or utilize CFPs provided by the staff. CFPs should be utilized to the maximum extent practical. The flight crew has final responsibility for accuracy of the flight plan used.

6.15.4. CFPs will be verified by the flight crew for route definition and fuel computation accuracy before departure. Range summary charts in section 5 of the performance manual or the mission computer fuel plan will be used to determine the validity of CFP fuel burn rates. Pass any flight plan discrepancies to the TACC. When reporting incorrect flight plans to the TACC (Flight Planning Office), include both the CFPI and the plan number.

6.15.5. Regardless of the planning tool used, the mission computer fuel plan is the final tool for determining mission fuel load. The aircraft commander will ensure the MC flight plan is fully programmed with the intended route of flight and all associated leg data. Both pilots will verify the accuracy of all crew-entered data in the mission computer.

6.16. Departure Planning:

6.16.1. Gross Weight (GW). Ensure that the aircraft does not exceed the maximum gross weight, zero fuel weight, or center of gravity limitations specified in the aircraft flight manual. Gross weight may be further restricted by operating conditions such as wind shear, icing, temperature, pressure altitude, runway length and slope, airdrome weight bearing capacity, departure maneuvering, required climb gradients, and obstacles.

6.16.1.1. Climb Gradient. The crew will ensure their aircraft’s takeoff GW will meet or exceed any published rate of climb. If no gradient is published as part of a SID, departure procedure, or given as part of radar vector procedure, takeoff GW must never exceed that which would lower the

rate of climb to less than 200 Feet/NM (3.3 % gradient) with all engines operating or lower the rate of climb to less than 152 Feet/NM (2.5%) with one engine inoperative.

NOTE: Standard instrument departures (SID) may not depict obstacles if a 2.5 percent climb gradient is sufficient to clear them (see **Figure 6.1.**).

6.16.1.2. Critical Field Length (CFL). Takeoff GW must never exceed that which would require CFL in excess of the runway available. In some cases, a minimum altitude is required at the Departure End of Runway (DER). Ensure the aircraft is capable of meeting the DER requirements. Use the following as a guide to determine DER requirements.

6.16.1.2.1. SIDs. Required DER heights depend on the agency that wrote the SID.

USAF, USN, or USMC SID: Zero feet.

US Army and FAA SID: 35 feet.

Foreign Civil or Military SID (must be ICAO member nation in FLIP GP): 16 feet.

6.16.1.2.2. Radar Vector, Published IFR Departure Procedure or VFR Departures.

USAF, USN, or USMC Airfield: Zero feet.

US Army or FAA Civil Airfield: 35 feet.

Joint Use Airfield within the United States: 35 feet.

Foreign Civil or Military Airfield (must be ICAO member nation in FLIP GP): 16 feet.

NOTES:

DER requirements for departures other than those listed above vary. There is no standard or easy way for crews to determine required DER height at some airfields. Therefore, when using departures other than those listed above, plan to cross the DER at 35 feet (minimum) unless you can ascertain a different requirement from the appropriate authority.

If aircraft performance will not allow crossing the departure end of runway at required DER, the proposed route of flight must be examined using a current aeronautical and terrain charts to ensure aircraft performance is sufficient to clear ALL obstacles. The crew must advise the air traffic control (ATC) agency involved that they cannot meet the SID requirement.

6.16.2. Departure Routing/Climbout Performance. Appropriate terrain charts should be reviewed before departure. Regardless of the type of departure flown (SID, Radar Vector, IFR Departure Procedure, or VFR), the aircraft must be able to achieve the published climb gradient (for the runway to be used) with all engines operating, and be able to vertically clear all obstacles within the climbout flight path with one engine inoperative **EXCEPTION**: see paragraph **6.17.6.**). If no minimum climb gradient is published, use 200 ft/NM minimum with all engines operating and 152 ft/NM minimum with one engine inoperative. If a higher required climb gradient is published or required for radar vectors, use that climb gradient as the minimum with all engines operating, and use that climb gradient minus 48 ft/NM as the minimum with one engine inoperative. This only works at fields having an instrument approach. If the field does not have an instrument approach, then no obstacle survey has been conducted. Therefore, you don't know if 200/152 ft/NM is sufficient.

NOTE: At airfields with no instrument approach, an IFR departure is NOT AUTHORIZED.

6.16.2.1. SIDs. OPRs for SIDs are identified on each individual SID. They are either Federal Aviation Administration (FAA), United States Army (USA), United States Navy (USN), United States Marine Corps (USMC), or United States Air Force (USAF). On non-DoD SIDs, the agency that wrote the SID will also be identified (in parentheses immediately to the right of the Chart Reference Number). For example, SL-000.00 (USA) would indicate a DoD SID where the US Army is both the OPR and the agency that wrote the SID. (USAF) SL-000.00 (RAF) would indicate a non-DoD SID where the USAF is the military department that requested publication and serves as the OPR, but the Royal Air Force is the agency that wrote the SID. Use the agency that wrote the SID to determine the required DER height.

6.16.2.2. Published IFR Departure Procedures. Published IFR Departure Procedures are available at some civil and military fields to assist in avoiding obstacles during climb to the minimum en route altitude (MEA). Airfields with Published IFR Departure Procedures will have the inverted triangle with a white "T" symbol printed on the approach plates and SIDS. When using Jeppesen publications, IFR Departure Procedures will be on the airfield diagram page which is typically on the reverse side of the airport's first approach. A climb gradient and/or specific routing and/or alternate takeoff weather minimums will normally be specified with a Published IFR Departure Procedure. When flying a published IFR departure procedure, depicted routing and climb gradients must be flown to avoid obstacles. The alternate takeoff weather minimums allow aircraft to depart with minimum ceiling and visibility. USAF aircrews are not authorized to use these alternate takeoff weather minimums.

NOTE: If the Published IFR Departure Procedure does not include either a routing or a minimum climb gradient (i.e., it includes only alternate takeoff weather minimums) then an IFR departure from that airfield IS NOT AUTHORIZED unless you fly a SID, depart via radar vectors or use a Diverse Departure (per AFI 11-202V3).

6.16.2.3. Specific ATC Departure Instructions (Specific climbout instructions or "radar vectors"). Crews may depart via specific ATC departure instructions, however, the SID prescribes a safe route of flight for a climb to the en route structure, while minimizing radio communication. Even if you plan to depart via specific ATC departure instructions, the crew should still have the SID on board (if published).

6.16.2.4. Diverse Departure. The airfield has been assessed for departure by TERPS personnel and no penetration of the obstacle surfaces exist. An aircraft may depart the field, climb to 400 feet above the departure end of the runway elevation, turn in any direction, and if a minimum climb gradient of 200'/NM is maintained be assured of obstacle clearance. This is normally indicated on DoD/NOAA publications by the absence of any published departure procedures.

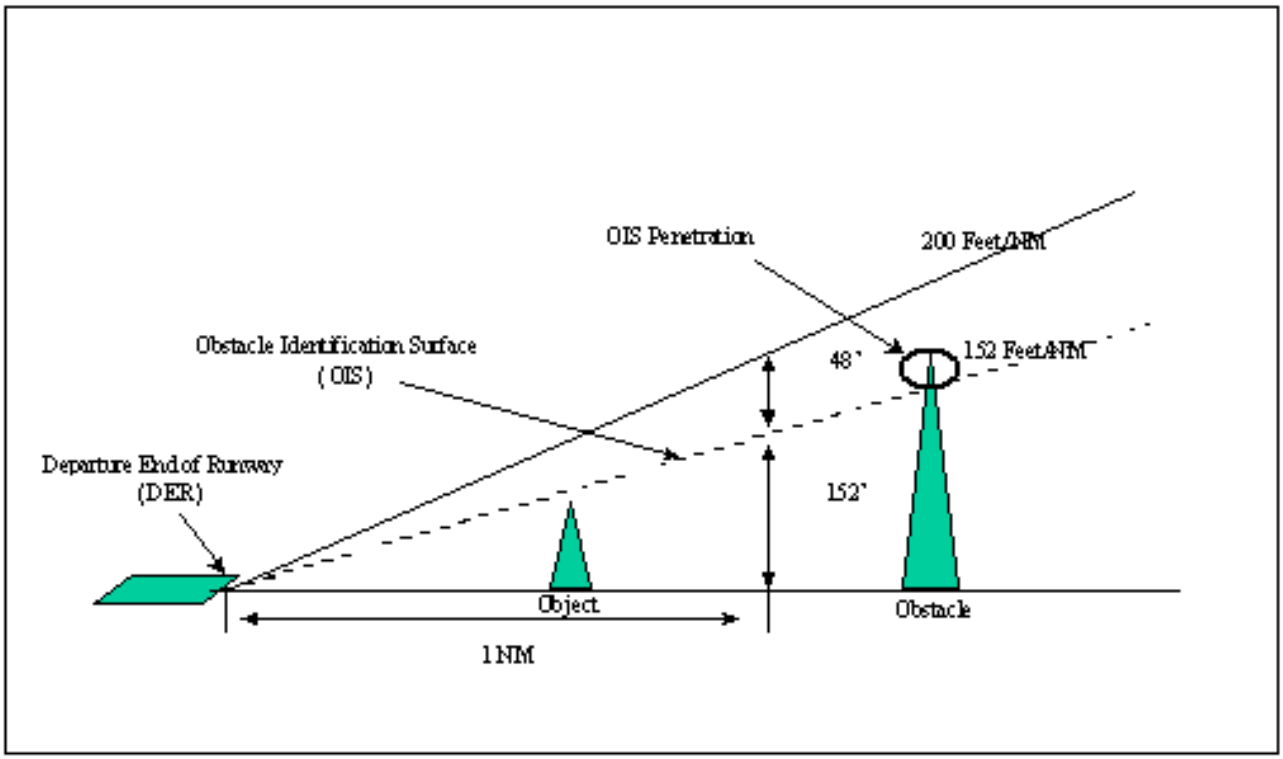
6.16.2.5. VFR Departures. VFR departures are authorized when required for mission accomplishment. The weather at takeoff must permit a VFR climb to an IFR MEA, an appropriate IFR cruising altitude, or an altitude where radar vectors can be provided. NOTE: In no case will VFR departures be flown in lieu of obstacle clearance planning.

6.17. Obstacle Clearance Planning.

6.17.1. Obstacle Identification Surface (OIS). Obstacle identification for SID purposes (FAA Handbook 8260.3B, AFM 55-9, **UV Standard for Terminal Instrument Procedures (TERPS)**, are those objects that penetrate an OIS of 40:1 (152 feet per NM). Calculation of the OIS on a SID continues

until the SID reaches a MEA or until the SID terminates. Climb gradients of 200 feet per NM will provide at least 48 feet per NM clearance above all obstacles that do not penetrate the OIS. Complying with published climb gradients found on a SID or IFR departure procedure will provide at least 48 feet per NM clearance above all obstacles that do penetrate the OIS. The aircraft commander must be aware and thoroughly brief the crew on all obstacles along the departure flight path.

Figure 6.1. Obstacle Clearance.



6.17.1.1. The AMC Airfield Suitability and Restrictions Report (ASRR) is an excellent source for obstacle information, however, it is not a stand-alone document. It is intended to supplement published climb gradients and obstacle information found on SIDs, Published IFR Departure Procedures, GDSS/C2IPS, and terrain charts.

6.17.1.2. Aircrews may call HQ AMC/DOAS for additional airfield obstacle data at DSN 576-6316.

6.17.2. Objects penetrating the OIS may or may not be depicted (they definitely will not be depicted on civil procedures). Objects that do not penetrate the OIS will normally not be depicted.

6.17.3. SIDs simplify ATC procedures while providing safe routing to the en route structure; however, SIDs should not be used as the sole source of obstacle information for departure planning. If used as such, inadequate (engine out) obstacle clearance may result. SIDs, instrument approach plates, and topical sectional charts, must be used to determine the distance and height values for all significant obstacles along the flight path.

6.17.4. The controlling obstacle is defined as the obstacle requiring the greatest climb gradient within the flight path. Obstacles are normally not depicted on SIDs when climb gradients of less than 152 feet per NM are required to clear them.

6.17.5. In order to fly any IFR departure, aircrews must ensure they can meet the published/required climb gradient for the planned departure with all engines operating. In addition, aircrews will accomplish the following to ensure they can vertically clear all obstacles on or reasonably near the climbout/emergency return flight path with one engine inoperative:

6.17.5.1. Use the most restrictive of the following to determine whether engine out climb performance is sufficient to provide obstacle clearance:

6.17.5.1.1. Using applicable obstacle height and distance information from available terrain charts (JOG, TPC, sectional, etc.), the ASRR, base operations, etc. ensure engine out climb performance is sufficient to vertically clear obstacles which are on or reasonably close to the planned departure and emergency return flight path. Use the mission computer “Takeoff Data 2” page, LSK 2R, Obstacle Height and Distance to compute obstacle clearance.

6.17.5.1.2. If a climb rate is published for the planned departure, obtain an "engine out" climb rate by subtracting 48 feet from the published climb rate (if the climb rate is published in feet per minute, use the "60 kts" column, this is the same as feet per nautical mile). Compare this figure with computed airplane climb capability by converting this required climb gradient from feet per nautical mile into a percentage, then entering this percentage into the mission computer on “Takeoff Data 2” page, LSK 3R, Climb Gradient/Climbout Factor. If actual capability is less than required, i.e. scratchpad message "CLIMB GRAD LIM" or “CLB GRD/nnn.nGW”, comply with paragraph **6.17.5.2.**

6.17.5.2. In the event that the "engine out" climb rate is not sufficient to clear all obstacles, the crew will consider the following:

6.17.5.2.1. Downloading cargo.

6.17.5.2.2. Downloading fuel.

6.17.5.2.3. Delaying the mission until weather conditions allow for sufficient performance to clear all obstacles.

6.17.5.2.4. Coordinating alternate departure procedures with the controlling agency that will provide obstacle clearance.

6.17.6. If none of the options in paragraph **6.17.5.2.** are feasible, the crew may depart on an IFR departure only if all the following conditions are met:

6.17.6.1. The aircraft is capable of achieving the minimum published/required climb gradient (200 FT/NM if none published/required) with all engines operating.

6.17.6.2. Day/VFR conditions exist on the entire departure and planned emergency return routing.

6.17.6.3. The aircraft commander has determined through a review of all applicable maps and charts that, in the event of an engine failure, the planned departure and emergency return routing will allow for obstacle avoidance.

6.17.6.4. The planned emergency route is briefed to the entire crew.

6.17.7. In the event of an engine failure, aircrews will advise ATC if they are unable to comply with the published minimum climb. Obtain radar vector or avoid all obstacles visually.

6.17.8. The following procedures apply for all departures:

6.17.8.1. The pilot will determine all relevant obstacle height, distance, and gradient information necessary for performance computations. As a minimum, review the appropriate terrain chart or sectional chart in addition to the SID (if available). The following guidelines should help eliminate obstacles that are not a factor.

6.17.8.2. All obstacles on the SID will be considered. If no distance is published, use appropriate aeronautical chart (if available) to estimate flying distance to depicted obstacles.

6.17.8.3. When utilizing other sources for obstacle information, consider all obstacles which fall within the departure, or emergency return routing.

6.17.8.4. Escape routing must always be planned to ensure obstacle clearance and emergency recovery during engine failure.

6.18. Alternate Planning.

6.18.1. Choose alternates that best meet mission requirements and conserve fuel. Those selected should not be within the same terminal area, if terminal forecasts are marginal. Select alternates that are not restricted by FLIP, Foreign Clearance Guide, or diplomatic clearances and are compatible with the mission load and performance characteristics of the aircraft.

6.18.2. The aircraft commander retains final authority in the choice of alternates; however, selection by support agencies normally should be used if they meet the above criteria and the aircraft has already been serviced.

6.18.3. Alternates selected must meet the alternate airport weather requirements according to AFI 11-202V3.

6.19. Departure Alternates.

6.19.1. A departure alternate is required if ceiling or visibility is below landing minimums for an available approach (at departure aerodrome). Do not use category II ILS minimums to determine if a departure alternate is required.

6.19.2. Suitability of Departure Alternates. When departure alternate is required, the aircraft must be capable of maintaining the MEA or MOCA, whichever is higher, to the alternate using one engine out performance criteria. To qualify as a departure alternate the airfield must meet one of the following conditions:

6.19.2.1. Existing weather at an alternate within 30 minutes flying time must be equal to or better than the published approach minimums and forecast to remain so until 1 hour after takeoff, but in no case forecast to be lower than 200-1/2 (RVR 2400), or;

6.19.2.2. The existing weather at an alternate within 2 hours flying time must be at least 500-1 above the lowest compatible published approach minimums, but in no case lower than 600-2 for a precision approach or 800-2 for a non-precision approach, and forecast to remain so for 1 hour after ETA at the alternate.

6.20. Destination Requirements. (*for filing purposes*). The forecast destination weather will be according to AFI 11-202V3 and the following:

6.20.1. File two alternates when:

6.20.1.1. The forecast visibility (intermittent or prevailing) is less than published for an available DoD or NOAA precision approach.

6.20.1.2. The forecast ceiling OR visibility (intermittent or prevailing) is less than published for all other approaches. For approaches with no published ceiling requirement (for example Jeppesen approaches), the minimum required ceiling shall be computed by taking the published HAA or HAT and rounding it up to the nearest one hundred feet <u>or as determined by MAJCOM TERPS review</u>. For example, a Jeppesen VOR approach with a published HAA of 642 feet would require a forecasted ceiling of 700 feet.

6.20.1.3. The forecast surface winds (intermittent or prevailing) exceed limits corrected for RCR.

6.20.2. File an alternate, regardless of forecast weather, when the departure or destination aerodrome is outside the 48 conterminous states.

6.20.3. When filing to a remote or island destination, aircrews may use 1 + 15 holding fuel (in lieu of an alternate). Compute holding fuel using planned destination gross weight at FL 200. A remote or island destination is defined as any aerodrome which, due to its unique geographic location, offers no suitable alternate (civil or military) within 2 hours flying time. The forecast weather at the remote or island destination must meet the following criteria:

6.20.3.1. The prevailing surface winds, corrected for RCR, must be within limits at ETA and forecast to remain so for 2 hours thereafter, and

6.20.3.2. The prevailing ceiling and visibility must be equal to or greater than published minimums for an available non-precision approach, for ETA plus 2 hours.

NOTE: If a precision approach is available, the ceiling or visibility may be intermittently below non-precision approach minimums, but not below precision approach minimums (for ETA plus 2 hours).

6.21. Adverse Weather.

6.21.1. Do not takeoff under conditions of freezing rain or freezing drizzle.

6.21.2. During flight, use any means available to avoid thunderstorms by at least:

6.21.2.1. 20 NMs at or above flight level (FL) 230.

6.21.2.2. 10 NMs below FL 230.

6.21.2.3. 5 NMs for tactical missions below FL 230 provided outside air temperature is at or above 0 degrees Celsius at flight altitude. Avoid gust fronts and winds preceding a rapidly moving thunderstorm.

6.21.2.4. Aircrews should avoid flying in areas of recently dissipated thunderstorms and advected clouds downwind of thunderstorms. Crew actions should err on side of safety.

6.21.2.5. The use of ground-based radar as a means of thunderstorm avoidance should be used only to assist in departing an inadvertently penetrated area of significant weather. It should never be considered a normal avoidance procedure.

6.21.3. Do not fly directly above (within 2,000 feet) thunderstorms or cumulonimbus clouds. If unable to vertically clear thunderstorms or cumulonimbus clouds by at least 2000 feet, you must avoid them by using the above criteria.

NOTE: Aircraft damage may occur 20 miles or more from any thunderstorms. Aircrews must familiarize themselves with information on thunderstorm development and hazards. Refer to AFH 11-203, Weather for Aircrews.

6.21.4. In order to minimize exposure to thunderstorm hazards when approaching or departing an airport in an area where thunderstorms are occurring or are forecast:

6.21.4.1. Attempt to maintain VMC.

6.21.4.2. Maintain at least five NMs separation from heavy rain showers.

6.21.4.3. Avoid areas of high lightning potential, i.e. clouds within plus or minus 5,000 feet of the freezing level.

NOTE: Approaches or departures may be accomplished when thunderstorms are within 10 NMs. The thunderstorms must not be producing any hazardous conditions (such as hail, lightning, strong winds, gusts fronts, heavy rain, wind shear, or microburst) at the airport, and must not be forecast or observed to be moving in the direction of the route of flight (to include the planned missed approach corridor, if applicable).

6.21.5. Aircrews performing approaches and landings at locations where temperatures are 0 degrees centigrade or below will refer to the Flight Information Handbook, section D, Temperature Correction Chart, to correct minimum descent altitude (MDA), decision height (DH), and other altitudes inside the final approach fix (FAF), if required.

6.21.6. Do not fly into an area of known or forecast moderate or greater mountain wave turbulence. Crews should use good judgment when flying into any area conducive to mountain wave turbulence, and avoid these areas of potential turbulence when possible.

6.21.6.1. Mountain wave turbulence is normally a predictable condition. Forecasters at base weather stations, using guidance products from weather centers, can advise crews of the potential for encountering mountain wave turbulence along planned routes of flight.

6.21.6.2. Weather data availability in mountainous regions and forecast model limitations prevent the prediction of all events.

6.21.6.3. Crews must be familiar with the causes of mountain wave turbulence and the characteristic clouds that generally forewarn its presence.

6.21.7. Flight into areas of forecast or reported severe icing or severe turbulence is prohibited.

6.21.8. SIGMETS. National Weather Service in-flight weather advisories are not limiting to Air Force aircraft, but may indicate a need for the aircrew to contact a military weather facility. Crews will consider all SIGMETs valid for their aircraft until verified as not applicable with a military METRO service.

6.22. Fuel Conservation. See **Chapter 14**.

Section 6C—Preflight

6.23. AFTO Form 781, AFORMS Aircrew/Mission Flight Data Document. Review AFTO Form 781 before applying power to the aircraft or operating aircraft systems. The exceptional release must be signed before flight. A maintenance officer, maintenance superintendent, or authorized civilian normally signs the exceptional release. If one of these individuals is not available, the aircraft commander may sign the exceptional release. Ensure that the Air Force fuel identaplate is aboard the aircraft.

6.24. Aircraft Servicing and Ground Operations.

6.24.1. Aircraft Refueling. Crew members current in ground refueling may perform refueling duties. Aircrews will only refuel in cases when maintenance support is not readily available and the mission would be delayed. Crew members may augment maintenance refueling teams at en route stops.

6.24.2. Concurrent Ground Operations. Concurrent ground operations (simultaneous refueling or de-fueling while cargo or maintenance operations are being performed) are authorized in accordance with T.O. 00-25-172. Aircrews performing dash-1 preflight inspections or cargo loading concurrent with servicing must have cooperation and close coordination with the chief servicing supervisor (CSS). The CSS will remain in continuous intercom contact with fuel servicing team members during the entire servicing operation.

6.24.2.1. Movement into or within the safe area must be under control of the CSS. Individuals must properly ground themselves before boarding the aircraft or handling fuel servicing equipment. Concurrent servicing, loading, and maintenance must be conducted according to T.O. 00-25-172 and current checklists, which will be reviewed before concurrent operations. Current checklist procedures take precedence over T.O. 00-25-172 procedures.

6.24.2.2. Simultaneous fuel and oxygen servicing is not authorized.

6.24.3. The following guidance will be used for fuel servicing (refuel) operations only:

6.24.3.1. Passengers are not allowed on board unless expressly directed by AMC headquarters or in combat. ***EXCEPTION***: See **Chapter 13** of this AFI.

6.24.3.2. Electric and electronic equipment may be on (prior to) provided it does not radiate energy, but do not turn on or off during refueling.

NOTE: Circuit breakers and instrument ground switches are not required to be opened during concurrent servicing operations.

6.24.3.3. Pull circuit breakers for Radar altimeters. TACAN must be turned off.

6.24.3.4. Radar may be in standby but timing permitted should be turned off.

6.24.3.5. IFF SIF may be in standby but timing permitted should be turned off.

6.24.3.6. Winching of rolling stock and non-spark producing pallets is authorized. Driving vehicles equipped with spark arresters is authorized during fuel servicing. When loading vehicles without spark arresters, the vehicles must be completely inside the cargo compartment or outside of the established fuel servicing safety zone before fuel servicing lines can be pressurized.

EXCEPTION: All diesel and turbo-charged (without waste gates) gasoline-powered vehicles can be on-loaded or off-loaded without having to stop fuel flow.

6.25. Aircraft Recovery Away from Main Operating Base (MOB). When an aircraft will land at a base other than the MOB, crew chiefs should accompany the aircraft. The aircraft commander is responsible for ensuring the aircraft is turned to meet subsequent mission taskings. If a qualified aircraft specialist(s) is unavailable, the aircrew is responsible for turning the aircraft to meet subsequent mission taskings.

6.25.1. Recovery items the aircrew may be responsible for include, but are not limited to, the following:

6.25.1.1. Parking and receiving.

6.25.1.2. Aircraft servicing, including AGE usage.

6.25.1.3. Supervision of minor maintenance within local capability.

6.25.1.4. Minor configuration changes to meet mission tasking.

6.25.1.5. Securing the aircraft before entering crew rest.

6.25.1.6. Coordinating aircraft security requirements.

6.25.1.7. AFTO 781-series forms maintenance.

6.25.2. In all cases where aircrews turn aircraft without qualified maintenance specialist assistance, comply with the appropriate maintenance tech order.

6.25.3. Aircrews are not qualified to accomplish the required ground inspections. In those instances where maintenance personnel are not available, the aircrew will enter a red dash symbol in the AFTO Form 781H, **Aerospace Vehicle Flight Status and Maintenance Document,** updating current status and enter a red dash symbol and a discrepancy that reflects that the applicable maintenance inspection (i.e. preflight, thru-flight, basic post-flight) is overdue.

6.26. Life Support Requirements:

6.26.1. Oxygen Requirements: The minimum quantity of oxygen aboard an aircraft before takeoff must be sufficient to accomplish the planned flight from the equal time point (ETP) to a suitable recovery base, should oxygen be required. Calculate crew requirements using the 100 percent Oxygen Duration Chart in the flight manual. Calculate crew and passenger requirements based on flight at FL 250 from the ETP to the nearest suitable recovery base.

6.26.1.1. Crewmembers occupying a crew station will have an oxygen mask connected and readily available for use from before engine start until engine shutdown.

6.26.1.2. Normally, unpressurized flight will not be planned above 18,000 feet cabin altitude (except HALO). Aircrews required to fly unpressurized missions above 18,000 will prebreathe 100 percent oxygen in accordance with **Chapter 19**.

6.26.2. Rafts. On overwater flights do not carry more passengers and crewmembers than life rafts will accommodate.

6.26.3. LPUs. Ensure the appropriate number and type of life preservers are aboard for overwater missions, to include child and infant LPUs.

6.26.4. Parachutes:

6.26.4.1. Parachutes will be carried on aircraft IAW AFI 11-302.

6.26.4.2. Personnel performing duties near an open (or suspected open) door/hatch/ramp in-flight will be restrained by a safety harness, or be wearing a parachute.

6.26.4.3. Either wear, or have pre-fit and pre-positioned parachutes and helmets during combat. Loadmasters will wear a restraining harness instead of a parachute during airdrops below 800 feet AGL or when performing duties near an open exit above 14,000 MSL.

6.27. Fleet Service Equipment. Ensure required fleet service items are aboard. Fleet service items must be aboard early enough to permit inventory 60 minutes before takeoff time.

6.28. Cargo Documentation. Proper cargo documentation must accompany each cargo load. A cargo manifest is required before all departures with cargo aboard. If a computerized cargo manifest is not available at the manifesting station, a cargo listing will accompany the load. The cargo/mail listing may be an abbreviated manifest, but will contain all required MILSTAMP data and 463L pallet information for weight and balance purposes. A Shipper's Declaration for Dangerous Goods is required for hazardous cargo.

6.29. Procedures for Airlifting Hazardous Cargo.

6.29.1. The term "hazardous cargo" as used in conjunction with airlift operations applies to the following classes and types of materials covered by AFJMAN 24-204:

6.29.1.1. Class 1 (Explosives), Class 2 (Compressed gas), Class 3 (Flammable liquid), Class 4 (Flammable solid), Class 5 (Oxidizer and organic peroxide), Class 6 (Poison and infectious substances), Class 7 (Radioactive material), Class 8 (Corrosive material), Class 9 (Miscellaneous dangerous goods).

6.29.2. Procedures in this paragraph apply when aircraft carry any quantity of the following materials:

6.29.2.1. DoD class or division 1.1., 1.2., 1.3. (explosives).

6.29.2.2. Class or division 2.3. (poison gas).

6.29.2.3. Class or division 6.1., (poison) PG I, zone A and B.

6.29.2.4. Class 7 (radioactive yellow III label.).

6.29.2.5. Class 4.3 (dangerous when wet).

6.29.2.6. Nuclear weapons, nuclear components, inert devices.

6.29.2.7. DoD hazard class or division 1.4 explosives that transit the United Kingdom, Italy, or Hawaii.

6.29.3. Procedures apply to nuclear cargo, toxic chemical ammunition, highly toxic substances, hazard division 1.1 through 1.3 explosives, and infectious substances (including biological and etiological materials). In addition it applies to Class 7 (Radioactive materials) which require a yellow III Label, and all other hazard classes or divisions, (except class 9 and other regulated material (ORM-D)) when shipped in quantities of 1,000 pounds (455 Kgs) or more aggregate gross weight.

6.29.4. The following procedures are established to satisfy the reporting requirements of AFJI 11-204, *Operational Procedures for Aircraft Carrying Hazardous Materials*. Nuclear weapons, nuclear components, and inert devices are AFI 11-299, *Nuclear Airlift Operations*:

NOTE: Quantities not covered in paragraphs **6.29.2.** and **6.29.3.** are exempt from these procedures.

6.29.5. The aircraft commander will be briefed on the following information concerning hazardous materials placed on the aircraft. The briefing will cover the following points:

6.29.5.1. Hazard class.

6.29.5.2. Proper shipping name.

6.29.5.3. DoD class or division when any type explosives are involved.

6.29.5.4. Net explosives weight (NEW) for all DoD class or division 1.1, 1.2, and 1.3 explosives and gross weight of blasting agent aboard the aircraft.

6.29.5.5. Gross weight of hazardous materials other than the explosives above.

6.29.5.6. Passenger restrictions (*Written authority must be furnished to cover movement of passengers with P4 or P3-coded materials when applicable).*

6.29.5.7. Written notification indicating "prior permission required" (PPR), obtained from the next base to be transited.

6.29.5.8. Smoking restrictions.

6.29.5.9. Flight plan annotation requirements.

6.29.5.10. Isolated parking and taxiing requirements.

6.29.5.11. Security classification, if appropriate.

6.29.5.12. Notification of the requirement to contact the next base to be transited at least 30 minutes before landing. (Such contact is not required for quantities other than those in paragraphs **6.29.2.** and **6.29.3.**).

6.29.5.13. Placard requirements.

6.29.5.14. Escort team requirement, if applicable.

6.29.5.15. Other special handling requirements.

6.29.6. Cargo documentation. The loadmaster will ensure proper documentation, certification and identification of cargo is furnished. AFJMAN 24-204 contains detailed instructions on packaging, marking, labeling, and certification requirements associated with the airlift of hazardous materials.

6.29.7. Flight Planning. When briefed according to paragraph **6.29.5.** the aircraft commander will:

6.29.7.1. Enter "Hazardous Cargo" and the mission identifier or flight number in the appropriate section of the flight plan. Refer to FCG for country specific requirements concerning over-flight when transporting HAZMAT. (Use remarks section of DD Form 175, **Military Flight Plan,** and other information section of DD Form 1801, **DoD International Flight Plan**.

6.29.7.2. If possible, plan the flight to minimize over-flying heavily populated or otherwise critical areas. Approach, landing, and takeoff tracks are excluded.

6.29.7.3. Prepare a departure message at stations when a command and control center (C2 agency) is not available. The remarks section of the departure message should include the following information:

6.29.7.3.1. Class of hazardous material aboard and the DoD class or division for explosives and NEW. Include the gross weight for the materials in paragraph **6.29.3.**

6.29.7.3.2. Request for special handling; for example, isolated parking, security, technical escort teams, etc.

6.29.8. If estimated time en route (ETE) is less than 1 hour, or if other circumstances preclude timely message receipt at destination, notify the base of first intended landing by priority telephone of the ETA and information listed in paragraph 6.26.4.3.3. Ask the C2 agency at the departure base to relay this information to base operations at the point of first intended landing when a C2 agency is available.

6.29.9. Before engine start. Remove placards, when used, from the aircraft. Give the controlling agency parking location, approximate engine start time, and verify the fire fighting agency has the hazardous materials information; otherwise, request the following be relayed to the fire fighting agency:

6.29.9.1. Class of hazardous material aboard and the DoD class or division for explosive materials aboard.

6.29.9.2. NEW for DoD class or division 1.1, 1.2, and 1.3 explosives.

6.29.9.3. Estimated time of departure.

6.29.10. En route. Normal procedures apply. Comply with paragraph **6.29.7.2.**

6.29.11. Before landing. Unless specifically prohibited by the theater commander or FLIP planning, contact the agency specified in FLIP, base operations dispatcher, control tower or approach control at least 30 minutes (or as soon as practical) before ETA to announce that "hazardous materials" are aboard and to verify that the hazardous cargo message has been received. Transmit the mission number, ETA, and information in paragraph 6.29.4.3.3. Request the information be relayed immediately to base operations or the civil airport manager, crash and fire protection agency, and other support activities. If landing at a CONUS civil airport without a tower, give the above information to the nearest FAA flight service station.

6.29.12. DoD requires aircraft carrying DoD class or division 1.1, 1.2, and 1.3 explosives, hazardous class or division 2.3 or 6.1 zone A materials, and munitions to be parked in areas isolated from non-associated personnel and facilities. When such cargo is aboard, aircraft commanders are responsible for ensuring cargo is correctly identified to the tower or ground control. When aircraft are not directed to an isolated area, identify the cargo again to tower or ground control. When identification is acknowledged, the host is solely responsible for selecting the parking area. Should host procedures be questionable, submit trip reports or hazard reports as appropriate, to document such occurrences.

6.29.13. The military host is responsible for placarding aircraft. When missions operate on non-military bases, the briefing to the aircraft commander will include placarding requirements and, if required, placards will be furnished at the on-load base. The shipper and receiver must make prior arrangements with the airport manager for shipments of hazardous materials requiring placarding.

The shipper and receiver are responsible for cargo identification, fire fighting procedures, and isolated parking requirements.

6.29.14. Unscheduled Landing Due to in-flight Emergency. Transmit unclassified information to the appropriate ATC facility as follows:

6.29.14.1. Nature of emergency and intent to land.

6.29.14.2. Aircraft position and ETA.

6.29.14.3. Number of personnel and location in aircraft.

6.29.14.4. Fuel on board.

6.29.14.5. Hazardous materials aboard, location of the cargo, and applicable information listed in paragraph **6.29.7.3.**

6.29.15. After Unscheduled Landing. Contact the TACC by telephone, HF radio, or message, giving arrival notice, hazardous materials information, and other pertinent information, as required.

6.30. Handling Of Classified Cargo, Registered Mail, NMCS/VVIP/FSS Shipments, and Courier Material.

6.30.1. Receipts will be obtained for classified cargo, NMCS/VVIP/FSS shipments, and registered mail at the on-load and off-load station using the cargo manifest.

6.30.1.1. Defense Courier Service (DCS) couriers coordinating with the aircraft commander are authorized to designate officer or enlisted, (E-5 and above) crewmembers on military aircraft as couriers to escort and safeguard courier material when other qualified personnel are not available. Qualified passengers, if carried, are designated prior to designating crewmembers. The following restrictions apply:

6.30.1.1.1. Primary crew members will not be designated without the consent of the aircraft commander.

6.30.1.1.2. Crew members on aircraft scheduled to stop at locations where DCS couriers cannot provide en route support will not be designated as couriers. This does not relieve the aircraft commander of the responsibility for life and death urgent shipments.

6.30.2. During stops at en route locations supported by DCS stations, DCS couriers are required to meet designated couriers to protect the material.

6.30.2.1. During unscheduled stops, crew members may place courier material in temporary custody of the following agencies listed in descending order of priority:

6.30.2.1.1. DCS courier.

6.30.2.1.2. TOP SECRET control officer of the US armed forces.

6.30.2.1.3. US Department of State diplomatic courier.

6.30.2.1.4. US Department of State activity.

6.30.2.1.5. US military guards.

6.30.2.1.6. US DOD civilian guards.

6.30.3. If unable to follow the itinerary to the destination of the courier material, or if material is lost, stolen, or otherwise compromised, report circumstances to the nearest armed forces courier station and notify the local US military commander or US government activity.

Section 6D—Departure

6.31. On Time Takeoffs. Mission departures are on time if the aircraft is airborne within -20/+14 minutes of scheduled takeoff time.

6.31.1. AR Missions. Scheduled takeoff time may be adjusted to make good the ARCT. Notify controlling agency before takeoff to adjust the scheduled takeoff time.

6.31.2. Early Departures:

6.31.2.1. Home Station. Early departures are authorized to prevent a delay due to weather, ATC restrictions, airfield or aircraft operational limitations, to adjust mission flow during a large scale operation, or if approved through C2 agency.

6.31.2.2. En route Stations. Early departures at en route stations may be authorized through C2 agency, provided the impact on local and downrange facilities and crew duty is evaluated.

6.32. Weather Minimums For Takeoff.

Table 6.3. Weather Minimums.

Mission	Visibility	Remarks
Operational	RVR 1000	When less than RVR 1600, but equal to or greater than RVR 1000, the crew may take off if mission priority dictates, provided the runway has dual RVR readouts and displays (minimum RVR 1000 on both) and runway centerline lighting is operational. For any takeoff below 1600 RVR, the crew must be fully qualified.
All others	RVR 1600	For runways with more than one operating RVR readout, RVR must read 1600 minimum on all.

NOTE: When weather is below approach and landing minimums (ceiling or visibility) a takeoff alternate is required (See paragraph **6.19.**).

Section 6E—En route

6.33. Flight Progress.

6.33.1. Not used.

6.33.2. According to AFI 11-202V3 paragraph 5.8.3.1.1. the C-17 navigation system is approved for en route instrument navigation.

6.33.3. In-Flight, use all available navigational aids to monitor MC performance. Immediately report malfunctions or any loss of navigation capability which degrades centerline accuracy to the controlling ARTCC. Use the following procedures for flight progress:

6.33.3.1. When possible, perform a gross error MC check using available NAVAIDs prior to, or immediately upon entering the Category I Route/overwater segment.

6.33.3.2. When approaching each waypoint, recheck coordinates for the next waypoint.

6.33.4. Aircrews will download all overseas mission histories and, upon return to home station, turn in the applicable computer flight plans and computer disks to squadron Stan/Eval office. Squadrons will retain the computer disks and associated materials for a minimum of three months.

6.33.5. Operations in International/Territorial Airspace. (See FLIP, FCG, AP, and MDS series instruction for further guidance) US military aircraft and DoD personnel entering another nation to conduct US government business therein must have the approval of the foreign government concerned to enter their airspace. Foreign clearances for US international air operations are obtained through US officials known as Defense Attaché Officers (DAOs).

6.33.5.1. There are essentially two types of airspace: international airspace and territorial airspace. International airspace includes all airspace seaward of coastal states' territorial seas. Military aircraft operate in such areas free of interference or control by the coastal state. Territorial airspace includes airspace above territorial seas, archipelagic waters, inland waters, and land territory and is sovereign airspace. Overflight may be conducted in such areas only with the consent of the sovereign country.

6.33.5.2. Consistent with international law, the US recognizes sea claims up to 12 nautical miles. Diplomatic constraints and/or a lack of diplomatic clearances usually result in missions operating in international airspace. Because of this, it is imperative sufficient information be provided far enough in advance to allow compliance with FCG requirements established by the countries concerned. The US does not normally recognize territorial claims beyond 12 nautical miles; however, specific guidance from certain US authorities may establish limits which differ from the standard.

6.33.5.3. Flight Information Region (FIR). An FIR is defined as an area of airspace within which flight information and related services are provided. An FIR does not reflect international borders or sovereign airspace. Aircraft may operate within an established FIR without approval of the adjacent country, provided the aircraft commander avoids flight in sovereign airspace.

6.33.5.4. Aircrews on a flight plan route which takes them from international airspace into territorial airspace for which approved aircraft clearances were obtained should not amend entry point(s).

6.33.5.5. Violations of foreign sovereignty result from unauthorized or improper entry or departure of aircraft. Aircrews should not enter into territorial airspace for which a clearance has not been duly requested and granted through diplomatic channels.

6.33.5.6. Air traffic control agencies are not vested with authority to grant diplomatic clearances for penetration of sovereign airspace where prior clearance is required from the respective country. Aircraft clearances are obtained through diplomatic channels only.

6.33.5.7. In the event air traffic control agencies challenge the validity of a flight routing or attempt to negate existing clearances, pilots must evaluate the circumstances. The normal response will be to attempt to advise the air traffic control agency that the aircraft will continue to planned destination as cleared in international airspace. The key phrase is "in international airspace." Safety of flight is paramount in determining mission continuation. Under no circumstances should aircrews construe a clearance which routes their mission over sovereign airspace

which was not approved through diplomatic channels before mission departure, as being valid authorization.

6.33.5.8. Aircrews operating missions requiring unique or specially developed routing will normally be briefed at home station, onload station, and/or by the last C2 facility transited before performing the critical portion of the mission.

6.33.5.9. Aircrews (except on weather reconnaissance missions) normally are not tasked to and should not fly "due regard" routing unless specifically directed in the mission frag or coordinated with proper authorities by TACC/XOZ. The "due regard" or "operational" option obligates the military aircraft commander to be his or her own air traffic control agency and separate his or her aircraft from all other air traffic. If operational requirements dictate, aircraft commanders may exercise the "due regard" option to protect their aircraft. When the threat has terminated, the aircraft will return to normal Air Traffic Services.

6.33.6. Altitude Reservations. Aircraft commanders will ensure ALTRV approval is received before mission execution. Aircrews needing to check the status of their ALTRV may contact TACC/XOC (24 hours) or XOPSA (normal duty hours.

6.33.6.1. ALTRVs usually include a 1 hour AVANA (ALTRV Approval Void if Aircraft Not Airborne) to account for delays. If a mission delays more than 1 hour, coordination with the appropriate central altitude reservation facility will be required. It may be possible to extend the AVANA time. If not, a new ALTRV will be required. Begin coordination as soon as the delay is known.

6.33.6.2. Requests for ALTRVs do not eliminate the responsibility to obtain diplomatic clearance or file flight plans. The complete route of flight must be included in DD Form 1801, **DoD International Flight Plan**, DD Form 175, **Military Flight Plan**, or other equivalent host nation flight plan.

6.34. Navigational Aid Capability.

6.34.1. Comply with North Atlantic Minimum Navigation Performance Specification (MNPS) airspace and US West Coast and Hawaii route system procedures in FLIP AP/2.

6.34.2. Reduced Vertical Separation Minimum (RVSM) Airspace. Airspace where RVSM is applied is considered special qualification airspace. Both the operator and the specific aircraft type must be approved for operations in these areas. The C-17 is approved for unrestricted use in the full RVSM envelope. Refer to FLIP AP/2 and the following for RVSM requirements:

6.34.2.1. Both primary altimeters, the autopilot, the altitude advisory system, and the transponder must be fully operational before entry into RVSM airspace. Should any of this equipment fail before entering RVSM airspace, request a new clearance so as to avoid this airspace.

6.34.2.2. The autopilot should be engaged during level cruise, except when circumstances such as the need to re-trim the aircraft or turbulence require disengagement.

6.34.2.3. Crosscheck the altimeters before or immediately upon coast out. Record readings of both altimeters and retain for use in contingency situations.

6.34.2.4. Continuously crosscheck altimeters to ensure they agree ± 200 ft.

6.34.2.5. Aircrews should limit climb and descent rates to 1,000 feet per minute when operating in the vicinity of other aircraft to reduce potential effects on TCAS operations.

6.34.2.6. Should any of the required equipment fail after entry into RVSM airspace, immediately notify ATC and coordinate a plan of action.

6.34.2.7. Document malfunctions or failures of RVSM required equipment, including the failure of this equipment to meet RVSM tolerances.

6.34.3. Required Navigation Performance (RNP) Airspace. Airspace where RNP is applied is considered special qualification airspace. Both the operator and the specific aircraft type must be approved for operations in these areas. RNP airspace is being incorporated around the world to increase air traffic capacity by decreasing separation requirements between routes. C-17 aircraft equipped with integrated GPS navigation systems are certified to operate in RNP-10 airspace without time limitations.

6.34.3.1. RNP-10. If all updating capability is lost, C-17 aircraft are certified to operate for 6.2 hours (after entering NAV mode) in RNP-10 airspace. If any in-flight update is accomplished (GPS or Radio Nav), the aircraft may continue in RNP-10 airspace until the figure of merit exceeds “8” (approximately 6 hours after last update).

6.34.3.1.1. Flight Planning. Verify aircraft is approved for RNP operation, access mission impact and verify the letter "R" is annotated in block 10 of the DD Form 1801.

6.34.3.1.2. Enroute. At least two long range navigation systems certified for RNP-10 must be operational at the oceanic entry point. Periodic crosschecks will be accomplished to identify navigation errors and prevent inadvertent deviation from ATC cleared routes. Advise ATC of the deterioration or failure of navigation equipment below navigation performance requirements and coordinate appropriate actions.

6.34.3.1.3. Prior to entering oceanic airspace, the aircraft’s position should be checked as accurately as possible by using external navigation aids (coast out gross error check).

6.34.3.1.4. Document (in the aircraft AFTO Form 781A) malfunctions or failures of RNP required equipment, including the failure of this equipment to meet RNP tolerances.

6.34.4. Basic Area Navigation (BRNAV) Airspace. Airspace where BRNAV is applied is considered special qualification airspace. Both the operator and the specific aircraft type must be approved for operations in these areas. BRNAV navigation accuracy criteria is RNP-5. The C-17 is certified for operations along BRNAV routes with no restrictions. Aircraft with integrated GPS have no BRNAV restrictions. Without GPS, aircraft must auto update every two hours (as required) to maintain actual centerline within +/- 5 NM of ATC cleared route.

6.34.4.1. Minimum equipment to operate in BRNAV airspace is one INS capable of updates or FAA approved GPS with RAIM or equivalent system. Flights entering BRNAV airspace after long overwater flight must be especially aware of BRNAV tolerances and update accordingly.

6.34.4.2. Aircraft unable to maintain BRNAV tolerances must advise ATC immediately and take appropriate coordinated action.

6.34.4.3. Document (in the aircraft forms) malfunctions or failures of BRNAV required equipment, including the failure of this equipment to meet BRNAV tolerances.

6.35. CIRVIS and Other Reports. Report all vital intelligence sightings from aircraft as indicated in FLIP planning or FLIP En route Supplement.

6.35.1. In-Flight harassment or hostile action against C-17 aircraft. Aircraft subjected to harassment or hostile action by foreign aircraft will immediately contact the nearest US Air Force air and ground voice facility and report the encounter. Include aircraft nationality, type, insignia, or any other identifying features; note position, heading, time, speed when harassed, and the type of harassment. Request relay of the report to the nearest C2 Center. Also attempt to contact the nearest command post when in UHF and VHF range.

6.35.2. Other incidents will be reported as indicated in JCS Pub 6, Volume V and AFM 10-206, *Operational Reporting.*

6.36. In-Flight Meals. The aircraft commander and the copilot should not eat meals at the same time, and their meals should consist of different menus.

6.37. Communications.

6.37.1. HF Communications. Confine message traffic to essential operational matters. Perform an HF radio ground check before takeoff when the use of HF radio may be required for ATC or C2 communications. Establish HF contact before going out of UHF and VHF range. If unable to establish HF contact with the controlling HF station and an alternate means of relay of ATC information in oceanic areas is not available, return to the nearest suitable support base.

6.37.2. General. Provide ARTCC position and weather observations when required. If unable to contact an ATC agency, attempt relay through the GLOBAL HF stations.

6.37.3. AF Form 72, **Air Report (AIREP)**. When directed by the departing weather facility, take and record an AIREP at each position report over a Category I Route. Identify inaccurate CFP winds by special report if the average wind for a route segment exceeds either 30 degrees error in wind direction or 25 knots in wind speed. Turn in completed AF Form 72 to the destination USAF weather facility.

6.38. In-Flight Emergency Procedures. Report deviations from directives that may occur as a result of an emergency in accordance with AFI 11-202V3, and this instruction.

6.38.1. Notification of Controlling Agencies. When practical after completing the aircraft emergency action checklists and associated actions crews should furnish the controlling agency and appropriate C2 agency a description of the difficulty, assistance required, intentions, and any other pertinent information.

6.38.2. A CONFERENCE SKYHOOK may be initiated when additional expertise is necessary to cope with emergencies or other conditions. Communications procedures are as follow:

6.38.2.1. Local Area. When in UHF or VHF range, initiate the conference over appropriate frequencies.

6.38.2.2. En route. When out of UHF range, use HF radios to establish a phone patch with the nearest or controlling C2 center as appropriate.

6.38.2.3. Provide the following information when time permits.

6.38.2.3.1. Narrative description of the situation to include actions taken by the crew and the intentions of the aircraft commander.

6.38.2.3.2. Fuel on board and hours of endurance.

6.38.2.3.3. Position.

6.38.2.3.4. Altitude and flight conditions.

6.38.2.3.5. Number of personnel and distinguished visitors (DV) on board.

6.38.2.3.6. Qualification of aircraft commander.

6.38.2.3.7. Planned landing base.

6.38.2.3.8. ETA at landing base.

6.38.3. Turn Around Procedures. Comply with procedures in FLIP. If not specified, maintain VFR, reverse course, climb or descend to a VFR altitude or flight level, and request ATC clearance. If unable to maintain VFR, obtain an ATC clearance before reversing course. A turn around under IFR conditions, without ATC approval, will be made only after a thorough evaluation of the seriousness of the emergency, general traffic density, and known traffic operating in the immediate area. Normally, a climb or descent (with minimum change in altitude) to a VFR altitude or flight level would result in minimal exposure to other aircraft if a turn around is required.

6.39. Need for Medical Assistance. When a person aboard the aircraft requires medical care, inform the station of intended landing in sufficient time so the aircraft may be met by medical personnel. Include the sex, approximate age, and the major complaint in the request.

6.40. Weather Forecasts.

6.40.1. It is the pilot's responsibility to obtain destination weather before descent.

6.40.2. The primary means is any US Air Force base weather station via pilot-to-meteorologist service (PMSV) or through a US Air Force aeronautical station. Check on the latest weather before descent or landing.

6.40.3. For aircraft flying into EUCOM AOR (ENAME Operations), contact USAFE OWS at Sembach AB, GE (DSN 314-496-6745). SOUTHCOM AOR, contact 25th OWS at Davis-Monthan AFB, AZ (DSN 228-1977).

6.40.4. The ATC system can provide weather information to en route aircraft.

6.40.4.1. The ARTCCs have a limited capability to provide weather information to en route aircraft within CONUS.

6.40.4.2. SIGMET (significant meteorological information) advisories will be transmitted from the servicing ATC unit. Crews will consider all SIGMETs valid for their aircraft until verified as not applicable with a military METRO service.

Section 6F—Arrival.

6.41. Descent. Prior to descent into unfamiliar areas, appropriate terrain charts (Operational Navigation Chart (ONC), Sectional Aeronautical Chart, Tactical Pilotage Chart (TPC), or Joint Operations

Graphic (JOG)) should be reviewed to increase aircrew situational awareness of obstructions. Primary crew members will not be involved in duties other than aircraft operations, descent and approach monitoring, and required checklist items from the initial descent point to landing.

6.41.1. No flight crew member may engage in, nor may any pilot in command permit, any activity from start of descent to landing which may distract any flight crew member from the performance of their duties. This includes nonessential conversations and reading of publications not related to proper conduct of the flight which are not required for safe operation of the aircraft.

6.41.1.1. This restriction applies to all ground operations involving taxi, takeoff, and landing, and all other flight operations conducted below 10,000 feet, except cruise flight.

6.41.2. Attempt to accomplish arrival briefings before entering the terminal area. The following altitudes will be included as required arrival briefing items; MEA, MSA, IAF, and the FAF. The VDP must also be briefed if it is available on the approach plate or computed.

6.41.3. Night and Marginal Weather Operations. Fly a precision approach, if available, at night or during marginal weather. If a precision approach is not available, fly any available approved instrument approach. During night VFR conditions, if an approved instrument approach is not available, a visual approach may be flown. On training and evaluation flights at familiar fields, pilots may fly non-precision approaches or VFR traffic patterns to accomplish required training and evaluations. The pilot not flying the approach will monitor a precision approach when practical to enhance safety.

6.42. Instrument Approach Procedures.

6.42.1. Before starting an instrument approach or beginning an en route descent, pilots will confirm that existing weather is reported to be:

6.42.1.1. At or above required visibility for a DoD or NOAA precision approach.

6.42.1.2. At or above required ceiling and visibility for all other approaches. For approaches with no published ceiling requirement (for example Jeppesen approaches), the minimum required ceiling shall be computed by taking the published HAA or HAT and rounding it up to the nearest one hundred feet or as determined by MAJCOM TERPS review. For example, a Jeppesen VOR approach with a published HAA of 642 feet would require an existing ceiling of 700 feet (plus the published visibility) before commencing the approach or en route descent.

6.42.1.3. Visibility minimums will be increased by 1/2 statute mile (or as directed by NOTAMs, ATIS, or approach plates) for instrument approaches conducted at airfields with inoperative approach lighting. This applies only to the approach lighting system (ALS), not to VASIs, PAPIs, or other lights which are not a component of the ALS.

6.42.1.4. For a precision approach, the decision height will provide a height above touchdown of 200 ft or higher. For category CAT II ILS approaches, use the lowest published radar altitude. For PAR approaches, visibility will be no lower than RVR 2400 (730 meters) or 1/2 mile visibility (800 meters) with no RVR readout available.

6.42.1.5. When circling minimums are published, but not by category, circling approach minimums are a ceiling of 600 feet and 2 miles visibility.

6.42.1.6. NDB Procedures. NDB approaches may be flown in daylight, VFR conditions only. Arrival at any airfield with only an NDB approach (published or available) is limited to day, VFR

operations. An NDB may be used at night or in IMC for alignment to a precision final (i.e. procedure turn, holding pattern in lieu of procedure turn, or procedure track to align the aircraft on an inbound course for a precision final approach). Departure from an airfield with only an NDB approach may be accomplished at night or in IMC conditions provided a departure alternate is available which meets the requirements of paragraph **6.19.**

6.42.2. Once established on a published segment of an approach, and the weather is reported or observed to be below the required minimums, the crew will continue to comply with the last clearance received until a revised clearance is obtained.

6.42.2.1. Do not continue the approach below minimums unless the aircraft is in a position to make a safe landing and the runway environment is in sight. CAT II approaches will not be continued if weather is reported below CAT II minimums.

6.42.2.2. The aircraft commander has final responsibility for determining when the destination is below designated minimums and for initiating proper clearance request.

6.42.2.3. If the approach is continued, aircraft commanders should plan to have sufficient fuel available to complete the approach and missed approach and proceed to a suitable alternate with normal fuel reserve.

6.42.3. CAT II Procedures. Maximum crosswind limitation is 10 knots. Crosswind of 15 knots may be used for training approaches (Minimum ceiling/vis: 300 - ¾).

6.42.3.1. The following airfield and aircraft equipment must be operational (AFMAN 11-117, *Instrument Procedures*).

6.42.3.1.1. Approach lights.

6.42.3.1.2. Runway centerline lighting.

6.42.3.1.3. High intensity runway lights or touchdown zone lights.

6.42.3.1.4. Approach end transmissometer.

6.42.3.1.5. ILS FAR field monitor.

6.42.3.1.6. Minimum RVR of 1200.

6.42.3.1.7. HAT of 100 feet minimum.

6.42.3.1.8. Sequence flashers.

6.42.3.2. Aircrews will not execute an actual CAT II ILS to minimums unless both pilots are current in CAT II ILS. The aircraft commander must have logged at least 100 hours in command since the aircraft commander qualification.

6.42.4. Alternate Flight Publications. The following publications are authorized if acceptable DoD FLIP products are not available:

6.42.4.1. United States Department of Commerce National Oceanic and Atmospheric Administration (NOAA).

6.42.4.2. Jeppesen and Host Government Instrument Approaches. May be used if MAJCOM approved according to AFI 11-202V3. Crews will contact the controlling agency to confirm AMC

approval before flying these approaches. If not MAJCOM (AMC) approved, these approaches may not be used.

6.42.5. Circling Approach. If not published by category, minimum ceiling and visibility will be as published, but in no case lower than 500-1 and 1/2 (Cat C) or 600-2 (Cat D).

6.42.6. Instrumentation. If full flight instrumentation is not available, aircraft are limited to a DH or MDA based on a HAT of 300 feet and RVR 40 (3/4 mile visibility with no RVR).

6.42.6.1. Full flight instrumentation for a CAT I ILS includes the flight director, a HUD/PFD and NAV display (ND) at each station, and no shared ADC or IRU.

6.42.6.2. Full flight instrumentation for a PAR includes a HUD/PFD and NAV display (ND) at each station, and no shared ADC or IRU.

6.42.6.3. Full flight instrumentation for a CAT II ILS includes the flight director, a HUD/PFD(at each station) and NAV display (ND) at each station, and no "No CAT II" warning message.

NOTE: For CAT II, a HUD is required at the PF position.

6.43. Classified Equipment and Material.

6.43.1. Equipment. When classified equipment is onboard, ensure the C2 agency or base operations office is aware of the requirement for aircraft security according to **Chapter 7** of this AFI. At bases not under jurisdiction of the Air Force, ensure the aircraft and equipment are protected. AFI 13-401, *Managing the Information Security Program*, provides specific guidance concerning the security of various levels of classified equipment aboard aircraft.

6.43.2. Material. Ensure Communications Security (COMSEC) and other classified materials are turned in at destination and receipts are obtained for COMSEC and classified material. The on-site C2 center will provide temporary storage for COMSEC and other classified materials during en route, turnaround, and crew rest stops. If a storage facility is not available, the aircraft gun storage box may be used for material classified up to and including SECRET. Encrypted COMSEC will only be transferred to authorized DoD personnel.

6.43.3. Aircrews will ensure that they have an operable mode 4 when required for mission accomplishment (e.g., training, etc). Aircrews will conduct an operational ground test of the mode 4 (ground test assets permitting) on the following missions:

6.43.3.1. All missions departing home station.

6.43.3.2. Missions (ATO, OPORD, contingency/exercise tasking) where safe passage procedures are implemented.

6.43.4. Attempt to fix an inoperable mode 4 before takeoff. Do not delay takeoff nor cancel a mission for an inoperable mode 4, except when the aircraft will transit an area where safe passage procedures are implemented.

6.43.5. Conduct an in-flight check of the mode 4 on all missions departing the CONUS for overseas locations. Aircrews can request the mode 4 interrogation check through NORAD on UHF frequency 364.2.

6.43.6. Aircraft with inoperable mode 4 will continue to their intended destinations. Repairs will be accomplished at the first destination where equipment, parts, and maintenance technicians are avail-

able. In theaters where safe passage is implemented, aircraft will follow procedures for inoperable mode 4 as directed in the applicable airspace control order or ATO.

6.43.7. Ground and in-flight checks of the mode 4, when conducted, are mandatory maintenance debrief items. Crews will annotate successful and unsuccessful interrogation of the mode 4 on the aircraft forms (AFTO Form 781A).

6.43.8. Aircrews will carry COMSEC equipment and documents required to operate the mode 4 on missions when required per paragraph **6.43.3.** Prior to departing for any destination without COMSEC storage facilities, crews will contact their local COMSEC managers for guidance.

6.44. Unscheduled Landings. When an unscheduled landing or crew rest occurs at a base without a passenger facility, the aircraft commander should immediately advise the appropriate C2 agency and request assistance in arranging substitute airlift for passengers that are aboard. When obtaining support for service members, in a group travel status, who are transported on AMC organic aircraft (flying a TWCF mission) which incur an unscheduled delay due to weather or maintenance problems thus forcing the members to be lodged at that location until the aircraft can continue its mission.

6.44.1. If the delay is at a location where DoD facilities and AMC TWCF funds are available, payment for lodging (contract or on-base) will be made by the local accounting liaison/OPLOC citing TWCF funds. The appropriate TWCF fund cite may be obtained from the local financial analysis and/or accounting liaison office. Normally, a BPA contract is already established at these locations to charge the routine lodging costs for transient or TDY individuals who are on TWCF funded travel orders.

6.44.2. If the delay is at a location where DoD facilities are available and AMC TWCF funds are not available, the aircraft commander will utilize AF Form 15, **United States Air Force Invoice,** authority to acquire the appropriate lodging accommodations. Upon return to home station, the aircraft commander will turn in the AF Form 15 to the local accounting liaison office. A copy of the service members' group travel orders along with any other pertinent supporting data must accompany the form (e.g., lodging invoice and/or receipts). When the AF Form 15 has been validated, it will be forwarded on to the servicing OPLOC for payment, citing the funds of the unit whose aircraft was delayed.

6.44.3. If the delay is at a location where both DoD facilities and TWCF funds are unavailable, the aircraft commander will utilize AF Form 15 authority to acquire the appropriate meals, quarters, and transportation to support the service members. Upon return to home station, the aircraft commander will turn in the AF Form 15 to the local accounting liaison office. A copy of the service members' group travel orders along with any other pertinent supporting data must accompany the form (e.g., lodging invoice and/or receipts). When the AF Form 15 has been validated, it will be forwarded on to the servicing OPLOC for payment, citing the funds of the unit whose aircraft was delayed.

NOTE: This policy does not apply to those passengers on delayed TWCF organic aircraft who are in a per diem or space available status except for those duty passengers on TWCF funded travel orders delayed at locations where TWCF funds are available.

6.45. Maintenance. Complete the AFTO Form 781 after each flight. After landing, crew members debrief maintenance personnel on the condition of the aircraft, engines, avionics equipment, and all installed special equipment as required. At stations without maintenance support, when a maintenance

requirement exists the AC will ensure a thorough debrief is provided to the C2 agency, and the MAJCOM Logistics Readiness Center is notified before entering crew rest.

6.46. Border Clearance.

6.46.1. Normal Operations:

6.46.1.1. The unit dispatching the mission is normally responsible for the border clearance of all aircraft.

6.46.1.2. When staff support is not available, border clearance is the responsibility of the aircraft commander. Duties may be assigned to ground personnel or to the loadmaster, but the aircraft commander retains ultimate responsibility. When a C-17 aircraft is on-loaded at a base without an air traffic function, the aircraft commander is responsible for ensuring the following:

6.46.1.2.1. Crew members, troops, and passengers possess current passports and valid visas, when required.

6.46.1.2.2. Crew members, troops, and passengers have current certificates of immunization (shot record).

6.46.1.2.3. Cargo entry documents are in proper order.

6.46.1.2.4. Departing or entering the United States through an air base where border clearance can be obtained.

6.46.1.2.5. Obtaining border clearance for aircraft cargo, passengers, crew and baggage, if required, before takeoff to a foreign area or after arrival from a foreign area.

6.46.1.2.6. Spraying the aircraft according to *Foreign Clearance Guide* (FCG) and paragraph **6.47.** of this chapter).

6.46.2. Procedures for US Entry:

6.46.2.1. En route, the loadmaster will distribute personal customs declarations (when not accomplished by passenger services) to all passengers, troops, and crew members. The loadmaster will also brief passengers and crew members on customs regulations, and prepare and compile necessary border clearance requirements for the aircraft commander's signature.

6.46.2.2. En route, notify the CC agency at the base of intended landing of any change in ETA to ensure that border clearance is accomplished as soon as possible after landing.

6.46.2.3. Obtain a permit to proceed when military necessities require that an aircraft (which has landed in the United States for customs clearance) proceed to another base in the US to obtain border clearance. The permit to proceed delays customs inspection of cargo, passengers, and crew until arrival at the off-load station and saves intermediate off-loading and reloading normally required for customs inspection. The permit to proceed is valid only to the airport of next landing where the border clearance must be completed or a new permit to proceed issued by a customs official. Do not make intermediate stops between the issue point of the permit to proceed and destination of manifested cargo unless required by an emergency situation or directed by the controlling C2 agency.

6.46.2.4. When an aircraft lands for a US border clearance, a US Customs representative normally will meet the aircraft to obtain the required documents. Do not deplane passengers, troops,

or crew members unless necessary for safety or the preservation of life and property (scanner excepted). Do not unload until approved by customs and agriculture personnel or their designated representatives. This procedure applies to the initial landing in the US and all landings required when operating on a permit to proceed or until all crew, passengers, and cargo complete final border clearance.

6.46.3. Inspections of US aircraft by foreign officials:

6.46.3.1. AMC follows US Air Force policy on status of military aircraft as stated in the *Foreign Clearance Guide (FCG)*, General Information, Chapter 3. In substance, this policy holds that US military aircraft are immune from searches, seizures, and inspections (including customs and safety inspections) by foreign officials. In addition, aircraft commanders must be aware of and adhere to any specific FCG provisions for individual countries.

6.46.3.2. If confronted with a search request by foreign authorities, aircrews should use the following procedures:

6.46.3.2.1. In most cases, search attempts may be halted simply by a statement of the aircraft commander to the foreign official that the aircraft is a sovereign instrumentality not subject to search without consent of US Air Force headquarters or the US Department of State officials in the country concerned. This should be clearly conveyed in a polite manner so as not to offend foreign authorities who may honestly, but mistakenly, believe they have authority to search US Air Force aircraft.

6.46.3.2.2. If foreign authorities insist on conducting a search, the aircraft commander should make every effort to delay the search until he or she can contact US Air Force headquarters (through AMC C2) or the appropriate embassy officials. The aircraft commander should then notify these agencies of foreign request by the most expeditious means available and follow their instructions.

6.46.3.2.3. If foreign officials refuse to desist in their search request, pending notification to US Air Force headquarters or the appropriate embassy, the aircraft commander should indicate that he or she would prefer to fly the aircraft elsewhere (provided fuel, flying time, and mechanical considerations permit a safe flight) and request permission to do so.

6.46.3.2.4. If permission is refused and the foreign authorities insist on forcing their way on-board an aircraft, the aircraft commander should state that he protests the course of action being pursued and that he intends to notify both US Air Force headquarters and the appropriate American Embassy of the intended action. The aircraft commander should not attempt physical resistance, and should thereafter report the incident to US Air Force headquarters and appropriate embassy as soon as possible. The aircraft commander should escort foreign authorities if the inspection cannot be avoided.

6.46.3.3. Other procedures may apply when carrying sensitive cargo or equipment. Follow these procedures and applicable portions of classified FCG supplements.

6.47. Insect and Pest Control.

6.47.1. Responsibility. Aircraft commanders will ensure required spraying is accomplished according to AFI 48-104, *Medical and Agricultural Foreign and Domestic Quarantine Regulations for Vessels, Aircraft, and Other Transports of the Armed Forces (Joint)*, DoD *Foreign Clearance Guide*

(FCG), or as directed by higher headquarters. Certify the spraying on CF Form 7507, **General Declaration (Outward/Inward),** or on forms provided by the country transited. Aircraft should never be sprayed with passengers on-board. The only exception is when the FCG mandates it.

6.47.1.1. When spraying is required, use insecticide, aerosol d-phenothrin-2 percent, National Stock Number (NSN) 6840-01-067-6674 (or equivalent), to spray the aircraft.

6.47.1.1.1. Direct the nozzle toward the ceiling of the compartment or space being sprayed.

6.47.1.1.2. Spray spaces inaccessible from within the aircraft after completely loading fuel, baggage, cargo, and passengers, including baggage compartments, wheel wells, and other similar spaces.

6.47.1.1.3. Spray the cabin, cockpit, and other spaces accessible from within the aircraft after the crew is aboard and after closing all doors, windows, hatches, and ventilation openings.

CAUTION: If the insecticide label directs disembarkation after use, spray before boarding crew or passengers. Close all doors and hatches for 10 minutes after dispensing and ventilate for 15 minutes before allowing anyone on board.

6.47.1.2. Spray for 3 minutes and 20 seconds unless longer periods are specified for the country being transited.

NOTE: Keep used aerosol cans separate from other trash so they may be disposed of safely.

6.47.2. Responsibility of Aircraft Commander In-flight. When seeing any insect or rodent infestation of the aircraft in-flight, notify the destination C2 agency, base operations, or airport manager of the situation before landing so the proper authorities can meet the aircraft.

6.47.3. Procedure at Aerial Port of Disembarkation (APOD). On arrival at an APOD, do not open cargo doors or hatches except to enplane officials required to inspect the aircraft for insect or rodent infestation or to deplane the minimum number of crew members required for block-in duties. Do not on-load or off-load cargo or passengers until the inspection is satisfactorily completed. This procedure may be altered to satisfy mission or local requirements, as arranged by the base air terminal manager or the local C2 organization.

Section 6G—Miscellaneous.

6.48. Dropped Object Prevention. If a dropped object is discovered, the flight crew will:

6.48.1. Notify ATC or the controlling agency as soon as practical; include routing, altitude, weather, etc.

6.48.2. Notify maintenance at the first AMC station transited.

6.49. Cockpit Voice Recorder (CVR). If involved in a mishap or incident, after landing and terminating the emergency, open the CVR power circuit breaker.

6.50. Life Support and Dash 21 Equipment Documentation. The aircraft commander or designated representative will:

6.50.1. Prior to departing home station or en route stations, ensure appropriate serviceable protective clothing, life support, survival, and dash 21 equipment for the entire or remainder of the mission are aboard the aircraft.

6.50.2. Prior to departing home station and following en route crew changes, review AF Form 4076, **Aircraft Dash 21 Equipment Inventory**, to ensure all required dash 21 equipment has been certified as installed by maintenance, the initial check has been signed by maintenance, and configuration documents match mission requirements.

6.50.3. Prior to departing home station and following en route crew changes, review, sign, and date the AFTO Form 46, **Pre-positioned Life Support Equipment**, to ensure all required protective clothing and life support and survival equipment have been certified as installed by aircrew life support and that configuration documents match mission requirements. Ensure appropriate number and type of life preservers are aboard for over-water missions carrying children and infants.

6.50.4. Missing Equipment. Aircrew members discovering equipment missing will accomplish the following:

6.50.4.1. Make an AFTO Form 781A, **Maintenance Discrepancy and Work Document** entry for equipment found missing. Additionally, ensure equipment removed from the aircraft at an en route station is documented in the AFTO Form 781.

6.50.4.2. Annotate AF Form 4076 and AFTO Form 46 in the next vacant column indicating the quantity remaining for the item. Ensure the ICAO location designator is entered above the check number of that column. Leave AF Form 4076 and AFTO Form 46 on board the aircraft in the event of an en route crew change.

6.50.4.3. Advise the aircraft commander and determine whether the missing equipment should be recovered or replaced before mission continuation.

6.50.4.4. Assist, as required, in preparing reports of survey for missing equipment.

6.50.4.5. When possible, advise HQ AMC/DOTL and TACC (or airport management) before mission continuation.

6.50.5. Additional Equipment. If more equipment is discovered during the preflight than is annotated on the AF Form 4076 and AFTO Form 46, annotate the total quantity in the next vacant column for the item. Ensure the ICAO location designator is entered above the check number of that column.

6.51. C-17 HUD/MFD Endorsement. The C-17 MFD is certified as a single medium display, and may be used as a primary flight reference (PFR). Due to the lack of a full-time attitude reference, the heads up display (HUD) is endorsed as a PFR as long as one primary flight display is present on an MFD. To the maximum extent possible, keep a primary flight display (PFD) on one of the MFDs at all times. When mission requirements dictate, the PFD may be replaced with another display for short periods of time.

6.52. Arresting Cables. (does not include recessed cables).

6.52.1. Do not land on approach end arresting cables. If the aircraft lands before the cable, the crew should contact the tower to have the cable inspected.

6.52.2. Do not takeoff or land over an approach end cable that has been reported as slack, loose, or improperly rigged by NOTAM, ATIS, or ATC.

6.52.3. Do not takeoff or land over raised web barriers (MA-1A or similar).

6.53. Airfield Data Reports. Aircrews transiting strange airfields or airfields where conditions may adversely affect subsequent flight will:

6.53.1. Report airfield characteristics that produce illusions, such as runway length, width, slope, and lighting, as compared to standard runways, sloping approach terrain, runway contrast against surrounding terrain, haze, glare, etc.

6.53.2. Debrief the next C2 agency transited.

6.54. Impoundment of Aircraft. If an aircraft is involved in a serious in-flight incident, the aircraft commander should impound the aircraft immediately after landing and contact the controlling C2 agency for further instructions.

6.55. Cockpit Congestion and Loose Objects.

6.55.1. Store only the minimum amount of professional gear required to accomplish the mission on the flight deck. Additional items will be secured in the crew rest area or cargo compartment. All items will be secured before passing the combat entry point through the combat exit point.

6.56. Overflying Enroute Stops. Aircraft commanders will coordinate with C2 for approval to overfly a scheduled enroute stop (AFRC command center for AFRC missions).

6.57. Ordnance Procedures. Conduct the following procedures after the live firing of flares:

6.57.1. After landing, taxi to the de-arm area or another suitable safe location to check for hung ordnance.

6.57.2. The loadmaster or another crewmember will deplane the aircraft and check all dispensers for hung ordnance.

NOTE: Flare squibs that fail to fire are NOT considered hung ordnance.

6.57.3. If hung ordnance is found, identified by a protruding or partially ejected flare cartridge, the aircraft will remain in the de-arm area until Explosive Ordnance Disposal (EOD) personnel meet the aircraft. The aircraft must remain in the designated safe area until EOD personnel can clear all hung ordnance.

6.57.4. If hung ordnance is not found, the aircraft can proceed to the parking location.

Chapter 7

AIRCRAFT SECURITY

7.1. General. This chapter provides guidance on aircraft security and preventing and resisting aircraft piracy (hijacking) of C-17 aircraft. AFI 13-207, *Preventing and Resisting Aircraft Piracy (Hijacking)*, AFI 31-101V1, *Air Force Physical Security Program*, and specific MAJCOM security publications contain additional guidance. Aircrews will not release information concerning hijacking attempts or identify armed aircrew members or missions to the public.

7.2. Security. The C-17 is a priority "C" resource. Aircraft security at non-United States military installations is the responsibility of the controlling agency.

7.3. Air Force Physical Security Program. The following security procedures will implement AFI 31-101, *The Air Force Physical Security Program*, requirements for C-17 aircraft:

7.3.1. The aircraft will be parked in an established restricted area and afforded protection via a roving patrol and a two-person armed response capability within 5 minutes.

7.3.2. When no permanent or established restricted area parking space is available, establish a temporary restricted area consisting of a raised rope barrier, and post with restricted area signs. Provide a one-person mobile patrol, supported by a two-person security response team capable of 5-minute response. Portable security lighting will be provided during the hours of darkness if sufficient permanent lighting is not available.

7.3.3. At non-United States military installations, the aircraft commander determines the adequacy of local security capabilities to provide aircraft security commensurate with this chapter. If he or she determines security to be inadequate, the aircraft will depart to a station where adequate security is available.

7.3.4. The security force must be made aware of all visits to the aircraft.

7.3.5. Security support is a continual requirement and is not negated by the presence of aircrew or ground crew members. Security force support terminates only after the aircraft doors are closed and the aircraft taxies.

7.4. En Route Security. The planning agency must coordinate with the execution agency to ensure adequate en route security is available. Aircraft commanders will receive a threat assessment and en route security capability evaluation briefing for areas of intended operation before home station departure and should request updates from en route C2 agency as required. If required, a PHOENIX RAVEN team will be assigned to the mission.

7.4.1. PHOENIX RAVEN SECURITY TEAM (RST) support mobility operations by providing security protection for aircraft transiting locations where a high threat, where host, or en route security support may be marginal, unreliable, or nonexistent. A daily Threat Working Group (TWG) assesses security requirements for mobility missions and helps determine if a RST is required. When assigned PHOENIX RAVEN support, aircraft commander will:

7.4.1.1. Verify MAJCOM travel status on each RSTs travel orders. The RST reports directly to the aircraft commander, when assigned.

7.4.1.2. Add RST members to the aircrews flight orders (see paragraph **3.4.**).

7.4.1.3. Is responsible for the RSTs welfare (transportation, lodging, etc.).

7.4.1.4. Ensure the RST receives an aircraft mission briefing, aircraft egress/passenger briefing (as appropriate).

7.4.2. Arrival. On arrival, the aircraft commander will assess the local situation and take the following actions as required:

7.4.2.1. Area patrol. Request area security patrols from local security forces. If local authorities request payment for this service, use AF Form 15.

7.4.2.2. Aircrew surveillance. During short ground times, direct armed crew members to remain with the aircraft and maintain surveillance of aircraft entrances and activities in the aircraft vicinity.

7.4.2.3. Inadequate security. If, in the aircraft commander's opinion, airfield security is inadequate and the safety of the aircraft is in question, he/she may waive the flight duty period limits and crew rest requirements and depart as soon as possible for a base considered reliable. Report movement and intentions to the controlling agency as soon as practical. If departure is not possible, the aircrew must secure the aircraft to the best of their ability. In no case, will the entire crew leave the aircraft unattended. Crew rest requirements will be subordinate to aircraft security when the airframe may be at risk. The aircraft commander should rotate a security detail among the crew to provide for both aircraft protection and crew rest until relief is available. Request security assistance from the nearest DoD installation, US Embassy, local military or law enforcement agencies as appropriate.

7.4.3. Entry Control Procedures. Unescorted entry is granted to aircrew members and support personnel assigned to the mission who possess their home station AF Form 1199, **Air Force Entry Control Card**, supported by an entry access list (EAL) or aircrew orders. Aircrew members and assigned crew chiefs are authorized escort authority.

7.4.3.1. Normally, non-United States nationals such as cargo handlers can perform their duties under escort and should not be placed on the EAL.

7.4.3.2. Personnel not on entry control list or crew orders must be escorted within the area.

7.5. Detecting Unauthorized Entry.

7.5.1. When parking on a secure ramp, the aircraft will normally be left unlocked/unsealed to allow ground personnel immediate access. If, in the aircraft commander's judgment, the aircraft needs to be locked and sealed in order to detect unauthorized entry, then:

7.5.1.1. Use available aircraft ground security locking devices.

7.5.1.2. Secure the doors in a manner that will indicate unauthorized entry (e.g. tape inside of doors to airframe so that entry pulls tape loose).

7.5.1.3. Close and lock the crew entry door.

7.5.1.4. Wipe the immediate area around lock and latches clean to aid in investigation of a forced entry.

7.5.1.5. Report any unauthorized entry or tampering to the OSI, security forces or local authorities, and the C2 agency. Have aircraft thoroughly inspected before flight.

7.5.2. Security awareness is crucial to effective mission accomplishment. Aircrews must always remain vigilant to their surroundings, especially at high threat, low security locations. During preflight activities, aircrews will inspect accessible areas, to include aircraft wheel wells, air conditioning compartments, and cargo compartment underfloor area for unauthorized packages, personnel, or other unfamiliar devices. Report any suspicious items to host security forces. Aircrews will maintain a heightened security posture throughout all pre-takeoff activities.

7.6. Preventing and Resisting Hijacking.

7.6.1. The Air Transportation Act of 1974 and the Federal Aviation Act of 1958, as amended, vest the FAA Administrator with exclusive responsibility for the direction of law enforcement activity in aircraft hijacking situations involving all aircraft (civil and military) in-flight in the United States.

7.6.2. In taking action during an aircraft hijacking situation, military forces will act under military command within the scope of their duties.

7.6.3. In the event an aircraft involved in an aircraft hijacking situation is carrying documents, equipment, or material that DoD has determined to be highly sensitive, or weapons of mass destruction, DoD will provide FAA, and where appropriate, the FBI, with all pertinent information. Where possible, the FAA will consult and cooperate with DoD before directing any law enforcement activity.

7.6.4. An aircraft is most vulnerable to hijacking when the aircrew is aboard and the aircraft is operationally ready for flight.

7.6.5. A concerted effort must be made to prevent the hijacking of military or military contract aircraft by detecting potential hijackers before they board the aircraft.

7.6.6. Should preventive efforts fail, any actual attempt to hijack a military aircraft must be resisted in a manner appropriate to the situation.

7.6.7. Since air piracy may be committed by political terrorists or by individuals to whom the threat of death is not a deterrent but a stimulus, ordinary law enforcement procedures may be ineffective. Thus, successful conclusion of a hijacking situation and apprehension of the hijackers may require use of specialized law enforcement techniques and procedures.

7.6.8. Delaying actions have been most successful in overcoming hijackings without loss of life or property.

7.6.9. In the case of an aircraft carrying passengers, the primary concern is the safety of the passengers.

7.6.10. Assistance to hijacked civil or military contract aircraft will be rendered as requested by the pilot in command of the aircraft and the authority exercising operational control of the anti-hijacking effort.

7.7. Preventive Measures. Commanders at all levels must ensure preventive measures are taken to minimize access to the aircraft by potential hijackers. When a C-17 is operating away from home station, the aircraft commander will ensure provisions of this chapter and AFI 13-207, as supplemented, are complied with.

7.7.1. Preventive measures include the following: The host station passenger processing or manifesting facility should conduct anti-hijacking inspections. Do not board passengers until the aircraft commander is fully satisfied with inspection results. In the absence of qualified passenger service representatives, the aircraft commander will ensure the anti-hijacking inspection of passengers and baggage is accomplished.

7.7.2. Medical facility commanders are responsible for anti-hijacking inspection of patients. When patients are delivered to the aircraft by civilian sources, the aircrew will perform required inspections before loading.

7.7.3. During exercises or contingencies in support of combat operations involving the movement of large groups of personnel, the unit being supported should manifest passengers and perform anti-hijacking inspections.

7.7.4. Passengers will not carry weapons or ammunition on their person or in hand-carried baggage aboard an aircraft except special agents, guards of the Secret Service or State Department, and other individuals specifically authorized to carry weapons.

7.7.5. If weapons must be cleared, ask the individual to:

7.7.5.1. Move to a safe, clear area at least 50 feet from any aircraft, equipment, or personnel before unholstering or unslinging their weapons.

7.7.5.2. Clear weapons in accordance with standard safety procedures.

7.8. Initial Response. When an act of air piracy involves an Air Force installation or aircraft within the United States, response will be according to the following guidelines until such time as FAA assumes active direction of anti-hijacking efforts. Resist all attempts to hijack a military aircraft. Resistance may vary from simple discussion through deception and subterfuge, to direct physical confrontation, including the prudent use of weapons.

7.8.1. The following guidelines should be used to counter a hijacking, actual or threatened, while the aircraft is on the ground:

7.8.1.1. Delay movement of the aircraft to provide time for ground personnel and the aircrew to establish communication and execute coordinated resistance actions.

7.8.1.2. The authority for determining when ground resistance will be discontinued is vested in the highest available level of command. When adequate communication cannot be established, or when time does not permit, this authority is delegated in the following order:

7.8.1.2.1. MAJCOM commander exercising operational control of the aircraft.

7.8.1.2.2. MAJCOM commanders in whose area of responsibility (AOR) the airfield lies.

7.8.1.2.3. Senior operational commander on scene.

7.8.1.2.4. Aircraft commander in compliance with MAJCOM directives.

7.8.2. A hijacked aircraft carrying weapons of mass destruction will not be allowed to takeoff. Refer to DoD 5210.41M, paragraph 9B(3), for additional guidance.

7.9. In-Flight Resistance. After airborne, success in thwarting a hijacking depends on the resourcefulness of the aircrew. Many variables of a hijacking preclude use of any specific counter-hijacking proce-

dure. Some key factors should be evaluated before deciding a course of action to be taken, including the nature of the threat, danger to life or crippling damage to the aircraft in-flight, destination indicated by the hijacker, and the presence of sensitive material onboard. Some counter-hijacking actions the aircrew may consider are:

7.9.1. Engage the hijackers in conversation to calm him or her and to evaluate what course of action might be effective.

7.9.2. Dissuade the hijacker.

7.9.3. Use facts or subterfuge to convince the hijacker intermediate stops are necessary.

7.9.4. Propose more favorable alternatives, such as landing in a neutral, rather than a hostile, country.

7.9.5. Exploit any reasonable opportunity to incapacitate or overcome the hijacker physically, including the prudent use of firearms.

7.10. Communications Between Aircrew and Ground Agencies. Crews facing a hijacking threat will notify ground agencies by any means available as soon as practical and follow-up with situation reports as circumstances permit.

7.10.1. If possible, transmit an in-the-clear notification of hijacking to ATC. Controllers will assign IFF code 7500 (does not preclude subsequent selection of code 7700).

7.10.2. If in-the-clear transmissions are not possible, report "am being hijacked" by setting transponder to code 7500. If unable to change transponder code, or when not under radar control, transmit a radio message to include the phrase "(call sign) transponder seven five zero zero."

7.10.3. Controllers will acknowledge receipt and understanding of transponder code 7500 by transmitting "(call sign) (facility name) verify squawking 7500." An affirmative reply or lack of reply from the pilot indicates confirmation and proper authorities are notified.

7.10.4. To report "situation appears desperate; want armed intervention," after code 7500 is used, change to code 7700. If unable to change transponder code to 7700, or when not under radar control, transmit "(aircraft call sign) transponder seven seven zero zero."

7.10.4.1. When changing from code 7500 to code 7700, remain on 7500 for at least 3 minutes or until a confirmation of code 7500 is received from ATC, whichever is sooner, before changing to code 7700. ATC acknowledges code 7700 by transmitting "(call sign) (facility name) now reading you on transponder seven seven zero zero."

7.10.4.2. Aircraft squawking 7700 after squawking 7500, which are not in radio contact with ATC, are considered by ATC to have an in-flight emergency (in addition to hijacking), and the appropriate emergency procedures are followed. Notification of authorities in this case includes information that the aircraft displayed the hijack code as well as the emergency code.

7.10.5. To report "situation still desperate, want armed intervention and aircraft immobilized", leave flaps and slats full down (50 degrees/LAND) after landing, or select flaps 50 degrees while on the ground. To facilitate message distribution, transmit "(aircraft call sign) flaps are full down."

7.10.6. To report "leave alone, do not intervene," retract the flaps/slats after landing. Pilots who retract flaps and slats after squawking 7700 should return to code 7500 and remain on code 7500 for

the next leg of the hijacked flight unless the situation changes. Transmit "(call sign) back on seven five zero zero" to emphasize the fact intervention is no longer desired.

7.11. Forced Penetration of Unfriendly Airspace. These procedures are designed to deter possible hostile action against the hijacked aircraft that has been forced to penetrate airspace of a nation unfriendly to the United States.

7.11.1. If instructions from the unfriendly nation are received either by radio contact or by air intercept before boundary crossing, comply with instructions received.

7.11.2. If no contact with unfriendly nation is made before approaching a boundary:

7.11.2.1. Maintain TAS not more than 400 knots.

7.11.2.2. Maintain an altitude between 10,000 and 25,000 feet, if possible.

7.11.2.3. Fly a direct course toward destination announced by the hijacker, if no course is specified.

7.11.2.4. Transmit the international distress signal, MAYDAY, on any of the international distress frequencies (121.5 MHz, 243.0 MHz, or 2182 KHz) in an effort to establish communications.

7.11.2.5. Set mode 3 code 7700 on transponder.

7.11.2.6. If radio contact cannot be established, follow procedures set forth in FLIP.

7.11.2.7. Consider the presence of classified documents and equipment aboard the aircraft. When a landing in an unfriendly nation is imminent, attempt to dispose of or destroy the equipment or material.

7.12. Arming of Crew members. When crews are directed to carry weapons, the AC will determine which crew members will be armed All crew members should know who is armed. The following procedures apply when arming is directed:

7.12.1. Issue. Before departing home station, obtain weapons, ammunition, box, lock and key. Crew members will be armed according to AFI 31-207, *Arming and Use of Force by Air Force Personnel* and MAJCOM publications. If an armed crew member must leave the crew en route, transfer the weapon to another authorized crew member using AF Form 1297, **Temporary Issue Receipt.**

7.12.2. Wearing of Weapons. Wear weapons in a holster, concealed at all times to prevent identifying armed crew members. Do not wear weapons off the flight line except to and from the C2 agency, armories, and other facilities associated with aircrew activities.

7.12.3. Weapons Storage In-Flight. Crew members will be armed before beginning preflight, on-load or off-load duties and until completion of all post-flight duties. When no passengers are aboard, weapons may be stored in the gun box in-flight after a satisfactory stowaway check. Crew members will rearm before landing. Weapons need not be unloaded before placing them in a gun box.

7.12.4. Crew Rest.

7.12.4.1. Aircrews, including stage crews, will store weapons and ammunition in the most secure facility available, normally the base armory.

7.12.4.2. Non-stage aircrews may store weapons and ammunition in the aircraft gun box.

7.12.5. When storing weapons in the gun box:

7.12.5.1. Weapons should not normally be unloaded.

7.12.5.2. Advise C2 agency as to which crew member has the gun box key.

7.12.6. Crew members will ensure they are reissued the same weapon until mission termination at home station.

7.12.7. Loading and Transfer of Weapons. Load and unload weapons at approved clearing barrels if available. Do not use a hand-to-hand transfer of loaded weapons to another crew member; place the weapon on a flat surface.

7.13. Force Protection. Crews must be alert to possibility of terrorist activities at all times. The following considerations may help crewmembers avoid becoming victims of terrorism when operating in overseas locations:

7.13.1. Personal Conduct. Crews must realize their conduct can make them a target for individuals dissatisfied with US foreign involvement in their national affairs. Local foreign nationals may or may not condone a military presence - crew conduct will be watched and judged. Therefore, utilize the following:

7.13.1.1. Maintain good military bearing both on and off duty.

7.13.1.2. Avoid dressing in clothes that highlight the fact you are an American, i.e., cowboy hats, wide belt buckles, shirts with pro-American slogans, etc.

7.13.1.3. Do not wear clothing displaying profanity.

7.13.1.4. Know where “off-limits” areas are and avoid them.

7.13.1.5. Beware of personnel offering to take you on a “personal” sightseeing tour.

7.13.1.6. Do not get involved with anyone trying to involve you in games of chance.

7.13.1.7. When possible, always travel in groups of two or more.

7.13.1.8. Avoid demonstrations for any cause.

7.13.1.9. Avoid discussion of politics.

7.13.2. Ground transportation security. When traveling to and from billeting, messing facilities, etc. consider the following to minimize drawing attention as a potential target:

7.13.2.1. Select a plain car; minimize the “rich American” look.

7.13.2.2. If possible, consider not using a car that announces Government ownership.

7.13.2.3. Keep the gas tank at least half full at all times.

7.13.2.4. Do a thorough check of the car to look for signs of tampering - look at undercarriage and wheel-wells.

7.13.2.5. Park in well-lighted areas, preferably under US control.

7.13.2.6. Always lock your car. If possible, do not leave it on the street overnight.

7.13.2.7. Only leave the ignition key with parking attendants.

7.13.2.8. Before entering vehicles, check for suspicious objects. Look underneath vehicle seats.

7.13.2.9. Guard against establishing a routine. Vary times, routes, and modes of travel. Avoid late night travel.

7.13.2.10. Travel with companions or in convoys when possible.

7.13.2.11. Avoid isolated roads and dark alleys.

7.13.2.12. Ride with seat belts buckled, doors locked, and windows closed.

7.13.2.13. Do not allow the vehicle to be boxed in. Maintain enough interval between you and the vehicle in front so that you can pass.

7.13.2.14. Circle the block for confirmation of surveillance.

7.13.2.15. Do not stop or take other actions which could lead to a confrontation.

7.13.2.16. Recognize events that could signal the start of an attack, such as:

7.13.2.16.1. Cyclist falling in front of your car.

7.13.2.16.2. Flagman or workman stopping your car.

7.13.2.16.3. Fake police or government checkpoints.

7.13.2.16.4. Disabled vehicle/accident victims on the road.

7.13.2.16.5. Unusual detours.

7.13.2.16.6. An accident in which your car is struck.

7.13.2.16.7. Cars or pedestrian traffic that box you in.

7.13.2.16.8. Sudden activity or gunfire.

7.13.2.17. Know what to do if you are under attack:

7.13.2.17.1. Consider sounding the horn.

7.13.2.17.2. Put another vehicle between you or your pursuer.

7.13.2.17.3. Execute an immediate turn and escape, jump curbs at a 30-45 degree angle, 35 mph minimum.

7.13.2.17.4. Ram a blocking vehicle only as a last resort.

7.13.2.17.5. Go to the closest safe haven and report the incident to security police.

7.13.3. Personal identification. Consider the following actions to avoid advertising the fact you are an American:

7.13.3.1. Don’t discuss our military affiliation with strangers.

7.13.3.2. Avoid military style luggage such as B-4 bags & duffel bags with military logos, etc.

7.13.3.3. Consider placing your official passport and related documents such as military ID, flight orders, club card, dog tags, billeting receipts in your hand-carried luggage and not in your wallet or purse.

7.13.3.4. Wear conservative styled civilian clothing when using commercial transportation.

7.13.3.5. Remember, the key is to maintain a low profile.

7.13.4. Hotel Security. When billeted in commercial hotels, crews need to be aware of the following:

7.13.4.1. If possible, obtain rooms between the second and sixth floors. These rooms are high enough to be less vulnerable to unauthorized entry from the outside and low enough to simplify evacuation if necessary.

7.13.4.2. Always lock interior locks when occupying rooms.

7.13.4.3. Always assume your room is monitored and avoid viewing or discussing classified material.

7.13.4.4. Avoid establishing a predictable routine i.e., vary eating times and locations.

7.13.4.5. Avoid traveling on foot-use a vehicle (hotel shuttle, commercial taxi, etc.).

7.13.4.6. In high threat areas, stay off the streets (use hotel dining facilities if available).

7.14. Protecting Classified Material on Aircraft. The Aircraft Commander is responsible for protection of classified materials aboard their aircraft. See requirements in AFI 31-401, *Information Security Program Management*. As a minimum, insure the IFF equipment is set to zero before leaving the aircraft.

Chapter 8

OPERATIONAL REPORTS AND FORMS

8.1. General. Applicable reports and forms are contained in this chapter.

8.2. AF Form 457, USAF Hazard Report. See AFI 91-202, *The US Air Force Mishap Prevention Program.*

8.2.1. The Air Force hazard reporting system provides a means for Air Force personnel to alert supervisors and commanders to hazardous conditions requiring prompt corrective action.

8.2.2. Special Procedures for Hazard Reports Concerning Weather. Complete the front of an AF Form 457 and address it to the parent wing flying safety office. If a computer flight plan deficiency is involved, attach one copy of the AF Form 72, **Air Report (AIREP),** AF Form 4115, **Flight Plan and Record**, or AF Form 4053, **INS Flight Plan and Log**, and the computer flight plan (CFP) to the report. Send the report so that the parent unit receives the information within 5 days.

8.3. AF Form 651, Hazardous Air Traffic Report (HATR). See AFI 91-202, **Attachment 3**, *Hazardous Air traffic Report (HATR) Program* (RSC HAF-SE (AR) 7602).

8.3.1. The Air Force HATR program provides a means for personnel to report all Near Mid-Air Collisions (NMAC) and alleged hazardous air traffic conditions. Use information in HATR reports only for mishap prevention. AFI 91-202 lists reportable incidents.

8.3.2. Procedures:

8.3.2.1. Make an airborne report of the hazardous condition to the nearest air traffic control agency (e.g., center, FSS, control tower, or aeronautical radio station), and give the following information as appropriate:

8.3.2.1.1. Identification or call sign.

8.3.2.1.2. Time and place (radial/DME of NAVAID, position relative to the airfield, etc.) of the occurrence.

8.3.2.1.3. Altitude or flight level.

8.3.2.1.4. Description of the other aircraft or vehicle.

8.3.2.1.5. Include a verbal statement as soon as possible after occurrence that a written HATR report will be filed upon landing.

NOTE: Air Traffic Control agencies must know if an official report is being filed.

8.3.2.2. File the HATR as soon as possible (within 24 hours) using any available means of communication. Normally, it should be filed at the AF base operations office at the landing airport. If this is impractical and if communications permit, notify the safety office of the AF base where the condition occurred, the safety office at the home base, or as prescribed by the overseas major command. In any case, provide the base or wing safety office with all available information needed to prepare AF Form 651. Turn in a completed copy of AF Form 651 to the wing safety office.

8.3.3. Individuals submitting a HATR are granted immunity from disciplinary action provided:

8.3.3.1. Their violation was not deliberate.

8.3.3.2. They committed no criminal offense.

8.3.3.3. No mishap occurred.

8.3.3.4. They properly reported the incident using the procedures above.

NOTE: HATR reports are not privileged information and may be released outside the US Air Force.

8.4. AF Form 711, USAF Aircraft Mishap Report Worksheet (Aircraft and Personnel Mishaps).

8.4.1. Responsibilities. Notify the appropriate authorities of any mishap involving aircraft or crew.

8.4.2. Reportable Mishaps. Report damage to the aircraft or injury to the crew or passengers. Also, any damage or injury to another organization's equipment or personnel resulting from the movements or actions of an AMC aircraft or crew. Reportable mishaps include:

8.4.2.1. Physiological mishaps.

8.4.2.2. Engine flameout, failure, or required shutdown, after engine start with intent for flight, regardless of damage. Report incidents involving two or more engines immediately. Single-engine incidents may be reported upon landing.

NOTE: Intentional shutdowns for training, FCF, or other non-emergency purposes are excluded; however, report failure to restart, using the criteria above.

8.4.2.3. Loss of thrust sufficient to preclude maintaining level flight at a safe altitude.

8.4.2.4. Engine case penetration by shrapnel from internal engine component failure.

8.4.2.5. Engine case rupture or burn-through, engine bay fire, or massive fuel leakage.

8.4.2.6. Unselected thrust reversal.

8.4.2.7. Flight control malfunction (including AFCS and trim systems) resulting in an unexpected, hazardous change of flight attitude, altitude, or heading. When making the AFTO 781A, **Maintenance Discrepancy and Work Document**, entry, include the flag words "reportable flight control malfunction."

8.4.2.8. Malfunction of landing gear when difficulty is experienced using emergency system or procedures.

8.4.2.9. Cargo door or ramp malfunction when intent for flight exists which could affect the integrity of the system.

8.4.2.10. In-Flight loss of all pitot-static instrument indications or all gyro-stabilized attitude or directional indications.

8.4.2.11. Spillage or leakage of radioactive, toxic, corrosive, or flammable material from aircraft stores or cargo that, in the judgment of the reporting individual, is significant hazard to the crew, passengers, or aircraft.

8.4.2.12. Human factors related situations, e.g., misinterpretation of instruments; crew overload, i.e. tactile, aural, and visual input to the crew at a rate too fast to permit reasonable decisions based on the data received; or too many actions required in too short a period of time; or confusion of

controls such as would be caused by adjacent switches where the actuation of the wrong switch could create a dangerous situation. Anonymous reports of such situations are acceptable.

8.4.2.13. All cases of departure from intended takeoff or landing surface onto a surface not designed to normally support takeoff or landing loads.

8.4.2.14. All in-flight fires regardless of damage.

8.4.2.15. All bird strikes regardless of damage.

8.4.2.16. Any occurrence which does not meet the established criteria for a reportable mishap but, in the judgment of the reporting individual, needs to be emphasized in the interest of safety.

8.4.3. Procedures. Report mishaps as soon as possible to the following offices using the following precedence: MAJCOM flying safety officer (FSO), Any FSO, Nearest C^2, Base Operations.

8.4.3.1. In all cases, retain a copy of all relevant information, and turn it into a home station safety officer.

8.4.4. Required Information. Complete all appropriate areas of the form. Provide as much detail as possible.

8.5. Reports of Violations/Unusual Events or Circumstances. Violations identified in AFI 11-202V3, *General Flight Rules*, alleged navigation errors (including over-water position errors exceeding 24 NMs, border and air traffic control violations) will be reported.

8.5.1. Include the following: Factual circumstances, Investigation and analysis, Findings and conclusions, Recommendations, and Actions taken.

8.5.1.1. Attachments to include:

8.5.1.1.1. Notification of incident.

8.5.1.1.2. Crew orders.

8.5.1.1.3. Statement of crew members (if applicable).

8.5.1.1.4. Documenting evidence (logs, charts, etc.).

8.5.2. In addition to the information listed, the historical flight plan will be downloaded onto a floppy disk and turned in to the command and control facility or owning standardization and evaluation office.

8.5.3. Send the original investigation report within 45 days to the appropriate MAJCOM. AFRC units receiving alleged violations will send the original investigation through channels to arrive at HQ AFRC/IGI within 35 days. HQ AFRC/IGI will send the investigation report to the MAJCOM within 45 days.

8.5.4. The following OPREP-3 reporting procedures for all aircraft notified of navigational errors exceeding 24 NMs will be reported under AFMAN 10-206, *Operational Reporting*.

8.5.4.1. On notification of a navigational position error, the aircraft commander (or agency receiving notification) documents the circumstances surrounding the incident (report content below) and ensures submission of an OPREP-3 report through C2 channels.

8.5.4.2. Report content:

8.5.4.2.1. Name and location of unit submitting report.

8.5.4.2.2. Mission identification number.

8.5.4.2.3. Reference to related OPREPs-3.

8.5.4.2.4. Type of event. (State "Navigation position error.").

8.5.4.2.5. Date, time (zulu), and location (i.e. ARTCC area).

8.5.4.2.6. Description of facts and circumstances. Include aircraft type and tail number, unit (wing or squadron assignment of crew), home base, route of flight, point of alleged deviation, and miles off course.

8.5.5. Aircraft commanders must keep AMC C2 Centers apprised of any unusual events or circumstances impacting their missions. Examples of reportable events include meaconing, jamming, intrusion, interception, fuel dumping, loss of multiple engines, hostile fire, injury to passengers or crew members, etc. This list is not exhaustive. Some events may require the C2 agency to forward OPREP reports to higher headquarters. The old adage, “when in doubt, report it,” applies.

8.6. Petroleum, Oil, and Lubricants (POL)—Aviation Fuels Documentation. This section describes procedures for the aviation fuel program (AVPOL) for all USAF aircraft. Procedures are established for correct documentation, processing of forms and invoices, program oversight, and personnel responsibilities. Reference AFI 23-202, *Buying Petroleum Products, and Other Supplies and Services Off-Station*, AMC decentralization procedures, and AFM 67-1, Volume 1, Part 3. An Into-Plane contract information and Aviation Into-Plane Reimbursement (AIR) card acceptor list is also listed under the air card section on the following web page: www.kelly.af.mil/sfweb.

NOTE: Aviation Into-Plane Reimbursement (AIR) Card. The AIR card is a commercial credit card which allow aircrews to purchase aviation fuel, fuel related supplies, and/or ground services at commercial airports where no DoD/Canadian into-plane contracts exist. Accepted at over 4200 locations, it is intended to replace the AF Form 315, **United States Air Force AV Fuels Invoice,** and AF Form 15 at locations that accept the AIR card. All Air Force aircraft will be issued an AIR card. Additional information is available at SF WEB page: www.kelly.af.mil/sfweb/aircard.htm.

8.6.1. Responsibilities. All aircrew and maintenance personnel will be familiar with the procedures and documentation requirements of this chapter. Purchase of aviation fuel not complying with this instruction may become the financial responsibility of the purchaser.

8.6.2. Aircraft will be refueled or de-fueled at DoD locations unless DoD-owned fuel is not available; in which case, fuel may be procured from other sources using the following priority.

8.6.2.1. Defense Fuel Supply Center (DFSC) or Canadian into-plane contracts.

8.6.2.2. Foreign government air forces.

8.6.2.3. Open market AIR card purchase to include Shell International Trading Company (SITCO) agreement.

NOTE: DoD FLIP en route supplements identify locations with into-plane contracts.

8.6.3. AVPOL Documentation Use and Procedures.

8.6.3.1. AF Form 664, **Aircraft Fuels Documentation Log—**Used to log and store all AVPOL transaction documentation. Log <u>all</u> off station transactions on front of AF Form 664 then insert

the supporting documentation inside the envelope. Turn AF Form 664, with supporting documentation, in at maintenance debriefing (or IAW locally established procedures).

NOTE: When logging in-flight on-load transactions on the AF Form 664, place the 8-digit tail number of the tanker in the block titled "Airfield Name," and the unit number and home station in the block titled "Airfield Address."

8.6.3.2. AF Form 315, **United States Air Force Avfuels Invoice—**Used to purchase aviation fuel at non-DoD activities. See AFI 23-202, *Buying Petroleum and Other Supplies and Services Off-Station*. When completed, log and place inside the AF Form 664.

8.6.3.3. AF Form 15, **United States Air Force Invoice.** This form is used for procurement of items or services required at commercial locations where normal DOD support and supplies are not available. If the vendor will not accept the aircraft identaplate, use AF Form 15 to pay for ground fuels, oils, or services. The accomplished form is returned to the aircraft's home station for payment. See AFI 23-202. When completed, log and place inside AF Form 664.

8.6.3.3.1. If the vendor wants to be paid payment without submitting an invoice, the aircraft commander retains the original AF Form 315 to return to home station for accounting and finance processing. Provide two legible copies of the form to the vendor. If the vendor wants to submit an invoice for payment, give the vendor the original AF Form 315 to attach to the invoice.

8.6.3.3.2. Purchases at Canadian into-plane locations will be documented using the local vendor's invoice. AF Form 15 or 315 <u>will</u> <u>not</u> be accomplished. Hand scribe the information from the aircraft identaplate to the vendor's invoice, and complete a separate sheet with the information listed on the Aviation Issues to DoD and Non-DoD, Aircraft Refueling Tender Sheet. See AFI 23-202. Log and place a copy inside the AF Form 664.

8.6.3.3.3. Purchases at SITCO Agreement locations require presenting the aircraft identaplate. The invoice must include the date of transaction, grade of the product, quantity issued or de-fueled, unit of measure, and signature of the Air Force representative. If the vendor also requires completion of an AF Form 15 or 315 in addition to their invoice, annotate on the vendor's invoice "AF FORMS EXECUTED." Log and place the documentation inside the AF Form 664.

8.6.3.3.4. Purchases at non-contract commercial airfields are accomplished using the AF Form 15 or 315. Refer to AFI 23-202 for guidelines on completing these forms.

8.6.3.3.5. Purchases at foreign military airfields, including replacement-in-kind (RIK) locations, the host country forms are used to record the purchase. Information from the aircraft identaplate should be hand scribed on the local form. Log and place a copy inside the AF Form 664 **Aircraft Fuels Documentation Log**.

8.6.4. Not used.

8.6.5. AF Form 1994, **Fuel Issue/De fuel Document** —Used for purchases at all US Air Force locations using a valid DD Form 1896, **Jet Fuel Identaplate**. Log and place inside AF Form 664.

8.6.6. AFTO Form 781H, **Aerospace Vehicle Flight Status and Maintenance Document**. Complete form per applicable technical directives. When removed from jacket, turn in to maintenance.

Maintenance will retain for 90 days after inter-fund billing to provide a secondary audit trail for fuels issue and flying hours.

8.6.7. DD Form 1896, **Jet Fuel Identaplate**, aircraft fuel and oil charge card.

8.6.8. DD Form 1898, **AV Fuels Into-Plane Sales Slip**, fuel transaction receipt is used for purchases at other DoD locations, including DFSC into-plane contract locations. Log and place inside AF Form 664.

NOTE: If the contractor insists on completing their own invoice in addition to the DD Form 1898, the invoice must be annotated "DUPLICATE DD FORM 1898 ACCOMPLISHED."

8.6.9. AF Form 4091, **Mission Data**. Used to record pertinent data throughout the mission planning, preflight, in-flight, and post-flight phases. Tail number must be include 8-digits. Turn this form in with post mission paper work.

8.6.10. Not used.

8.6.11. Aircraft Commanders. Aircraft commanders will:

8.6.11.1. For local training missions:

8.6.11.1.1. Verify that AFTO Form 781H is completely filled out before maintenance debriefing.

8.6.11.1.2. Turn in AFTO Form 781H to maintenance debriefing.

8.6.11.2. For off station missions:

8.6.11.2.1. Verify that AF Forms 15, 315, 664, 1994, AFTO Form 781H, DD Form 1898, and all associated fuels receipts are completely filled out and placed inside the AF Form 664. (All USAF aircraft must contain an 8-digit tail number).

8.6.11.2.2. Ensure that AF Form 664, all refueling documentation, and the AFTO Form 781H are turned in at maintenance debriefing.

8.6.11.2.3. Ensure that all AF Form 664 information is phoned, faxed, or sent by message back to the ICO if aircraft is to be off station past the last day of the month.

NOTE: When situations arise that preclude the transmission of AF Form 664 data, the information will be relayed on arrival from the first available AMC command post."

8.7. AMC Form 54, Aircraft Commanders Report on Services/Facilities. This is an instrument for aircrews to report that services rendered or conditions encountered were unsatisfactory or detrimental to efficient air mobility operations; services rendered or procedures used are worthy of adoption for all MAJCOM organizations; or a performance rendered by a person (or persons) was commendable and deserves recognition. Attempt to solve problems by contacting appropriate supervisors including the senior commander if conditions and situations warrant. If further action is deemed necessary or the problem requires increased visibility, submit this form.

8.7.1. Submit the form to the originator's squadron commander. Time permitting leave an information copy with the CP or senior AMC representative on station. Forward an information copy to HQ AMC/DOV and AMC NAF/DO. See AMCI 11-208 for processing.

8.8. AMC Form 43, AMC Transient Aircrew Facilities Report. Any crew member may submit this form. The report may be submitted whether or not an unsatisfactory item is included in the aircraft commander's trip report. Complete AMC Form 43 and send to HQ AMC/MWPS.

8.9. AMC Form 196, Aircraft Commander's Report on Crew member. The aircraft commander will prepare an AMC Form 196 on each crew member whose performance was outstanding, below average, or unsatisfactory during a mission. Send the report to the commander of the unit to which the crew member is assigned or attached for flying. Form should fully explain outstanding, below average, and unsatisfactory performance.

8.10. AMC Form 423, MIJI (Meaconing, Intrusion, Jamming, Interference) Incident Report Worksheet.

8.10.1. Purpose. The MIJI reporting system is a program to identify, analyze, and disseminate information concerning MIJI incidents.

8.10.2. Procedures. Comply with Air Force headquarters direction by reporting all incidents through the OPREP (operations reporting) system. Complete the MIJI Incident Report Worksheet, and turn in to base operations upon landing.

8.11. DD Form 1748-2, Airdrop Malfunction Report (Personnel-Cargo). Aircrews will report any aircraft airdrop systems failures to the command post that has operational control of the mission IAW AFR 55-40/AMCSUP1, to be published AFJI 13-210.

8.12. AF Form 4096, Airdrop/Tactical Airland/Air Refueling Mission Recap, SKE/ZM Debrief. To be filled out for all airdrop, tactical airland, air refueling, or SKE/ZM missions. Turn form into home-station tactics office. A command supplement may be substituted for this form.

Chapter 9

TRAINING POLICY

9.1. Qualification Training. Initial qualification, re-qualification, or upgrade training for pilots will not be conducted on missions with passengers onboard. Mission qualification training, Enroute evaluations (OME), line development, and JA/ATTs may be conducted on missions with passengers onboard only if the individual in training is qualified (completed aircraft checkride with a valid AF Form 8).

9.1.1. Touch-and-go landings with passengers aboard are prohibited.

9.1.2. Civilian employees under direct contract to the DoD, engaged in official direct mission support activities, are considered mission essential and may be onboard when touch-and-go landings are performed.

9.2. Not used.

9.3. Touch and Go Landing Limitations.

9.3.1. Touch and go landings will only be accomplished under the direct supervision of an IP or Sq/CC certified AC.

9.3.2. An in-flight evaluation and Sq/CC certification will be accomplished prior to an ACs accomplishing touch and gos without direct IP supervision. The evaluation should occur in conjunction with the initial qualification evaluation. After successful evaluation, ACs must be evaluated on recurring evaluations to maintain touch and go qualification.

9.3.3. AC touch and go certification:

9.3.3.1. ACs must have accumulated a minimum of 200 hours since AC qualification before touch and go certification.

9.3.3.2. The Sq/CC determines touch and go certification requirements for ACs. Certification will be documented by the Sq/CC using the AF Form 1381, **USAF Certification of Aircrew Training** in the individual's FEF.

9.3.3.3. Separate Sq/CC certifications are required for ACs to: 1) Accomplish their own touch and gos. 2) Supervise other pilots' touch and gos.

9.3.4. Current and qualified instructor pilots and SQ/CC certified aircraft commanders are authorized to conduct/supervise touch-and-go landings under the following conditions:

9.3.4.1. Flight manual restrictions and procedures apply.

9.3.4.2. Minimum runway length is 7000' (9000' for AC supervised).

9.3.4.3. Minimum ceiling of 1000 ft and minimum visibility of 2 miles (300 ft and RVR 40 (3/4 SM visibility) if an IP occupies a pilot seat.)

9.3.4.4. Wet runway or RCR must be a measured 12 or higher.

9.3.4.5. Do not accomplish touch-and-go landings on slush covered runways.

9.3.4.6. Maximum crosswind component is 25 knots (15 kts for AC supervised).

9.3.4.7. Touch and go procedures are not authorized for full flap landings. The normal "Missed Approach/Go Around" procedure described in T.O. 1C-17A-1, may be used if the crew plans to abort the full stop.

9.3.4.8. Passengers will not be carried during touch-and-go operations or multiple practice approaches.

9.3.5. Not used.

9.3.6. To provide additional training flexibility, crews may perform multiple approaches, and if qualified, touch and go landings on operational airlift (TWCF) missions provided the following requirements are met:

9.3.6.1. Normal touch and go limitations apply.

9.3.6.2. All transition training will be accomplished during the first 12 hours of the FDP only.

9.3.6.3. Pre-mission coordination requirements. As part of pre-mission planning, aircraft commanders will contact parent wing current operations and obtain training mission number(s) for use at each en route location(s) where training events are planned. In addition, aircraft commanders will coordinate with and receive approval from the airfield(s) where training is to be accomplished. They will then coordinate with the TACC to ensure adequate ground time is available at planned training locations to allow for planned training events, clearing customs, required crew rest, etc. Once complete, wing current operations will coordinate with TACC to re-cut the mission and add the training mission number(s) in GDSS/C2IPS.

9.3.6.4. Upon initial arrival at the training location, close out the current line on the AFTO Form 781 and log the training time on the next line using the appropriate training mission symbol and number.

9.4. Simulated Emergency Flight Procedures. Unless specifically authorized elsewhere in this section, do not practice emergency procedures that degrade aircraft performance or flight control capabilities (in-flight). Emergency procedures training with degraded aircraft performance or non-standard configurations will only be accomplished in the simulator.

9.5. Copilot Air Refueling Training.

9.5.1. Copilots may practice air refueling (to include the contact position) with the following restrictions:

9.5.1.1. Accomplished under direct IP supervision.

9.5.1.2. May be accomplished from either seat.

9.5.1.3. No passengers.

9.5.1.4. Must be First Pilot qualified.

9.5.1.5. Designated training mission only.

9.5.2. Contacts by non-AR qualified pilots will only be made after receiving acknowledgment from the tanker pilot and boom operator.

9.6. Operating Limitations.

9.6.1. In an actual emergency, terminate all training and flight maneuvers practice. Training should be resumed only when the pilot in command determines it is safe.

9.6.2. Option Approach and Visual Low Approaches. Initiate a planned missed approach not later than:

9.6.2.1. Precision approach--DH (or 200-feet HAT, whichever is higher).

9.6.2.2. Non-precision approach—missed approach point (MAP).

9.7. Not Used.

9.8. Prohibited In-Flight Maneuvers . The following maneuvers will not be practiced or demonstrated in-flight: Stalls and approach to stalls, abnormal configuration approaches, and unusual attitudes.

9.9. Instructor Pilot Briefing. Before all training/evaluation missions, aircraft commanders or instructors/flight examiners will brief their crews on the following additional items:

9.9.1. Training/Evaluation requirements. Instructors/evaluators (for each crew position) will outline requirements and objectives for each student or examinee. Brief the training objectives IAW AMC C-17 Aircrew Training System syllabus.

9.9.2. Planned training area and seat changes.

9.10. Debriefing. Review and evaluate overall training performed. Each student or aircrew member should understand thoroughly what training has been accomplished. Ensure all training is documented.

9.11. Simulated Instrument Flight. Artificial vision restricting devices are not authorized for any phase of flight. Simulated instrument flight may be flown and logged without the use of a vision restricting device.

Table 9.1. Flight Restrictions.

Maneuver	Altitude Restriction	Remarks
Engine shutdown	5,000 feet AGL	Performed only on functional check flights.
Missed/low approaches		Initiate practice instrument missed approaches no lower than the minimum altitude for the type of approach executed.
Men and equipment on runway	Initiate above 500 ft AGL	
Steep turns greater than 45 degrees of bank (not applicable to tactical maneuvers)	5,000 ft AGL	Daylight VMC only.
CAT II ILS		15 knot crosswind for training.
Tactical Descents	Complete above 5,000 ft AGL	Instructor required.

Maneuver	Altitude Restriction	Remarks
Combat offloads		Do not accomplish with fuel weights below 30,000 pounds.
Assault Landing Zone Operations		Max brake temperature 150°C.

NOTE: These restrictions do not apply to operational missions.

Chapter 10

LOCAL OPERATING PROCEDURES

10.1. Units define local operations procedures in this chapter.

Chapter 11

NAVIGATIONAL PROCEDURES

Section 11A— General.

11.1. Flight Planning:

11.1.1. Normally, mission planning is accomplished and verified while still in a flight planning facility/base operations and then electronically transferred to the aircraft mission computer. Use the latest weather, description of the load, landing zone/drop zone, and waypoint description information for this planning.

11.1.2. If a computer flight plan is not attainable, compute the flight plan, or use HQ AMC approved programs for assistance. Call the TACC flight planner for assistance, if needed.

11.1.3. Prior to filing a flight plan, verify computer products and overprinted flight planning forms with current charts and FLIP, as well as NOTAMs, organized track messages, etc. If a computer flight plan is not available, complete flight planning and prepare an AFMSS flight plan or AF Form 70, **Pilot's Flight Plan and Flight Log**, for in-flight use as a navigation and fuel management log.

11.1.4. Before filing, complete fuel planning, to include highest acceptable flight level and lowest acceptable constant altitude.

11.1.5. Source documents for obtaining IRU PPOS coordinates will be in the following priority:

11.1.5.1. FLIP/Jeppesen Airfield diagrams or AMC AF approved parking spot handouts.

11.1.5.2. DoD FLIP En Route Supplement.

11.1.5.3. Best available TPC or JOG chart.

11.2. En Route:

11.2.1. Use all available FLIP en route charts, and prior to departures and arrivals, terrain charts, to ensure navigational accuracy and terrain clearance. Periodically crosscheck navigation solution (i.e., MC FOM, GPS ERR).

11.2.2. After loading the flight plan, use the ND CHART format in conjunction with the DEFINE/REVIEW WAYPOINT pages to insure the proper coordinates were loaded for all points in the flight plan, especially the destination.

11.2.3. If a revised clearance is received, revise the flight plan in the mission computer and review the new course on the chart format.

11.2.4. Comply with FLIP for operations in North Atlantic Minimum Navigation Performance Specification Airspace, and US West Coast to Hawaii Route System Procedures. Two IRUs with the GPS functioning and two mission computers are required for entry. If subsequent failures occur, advise ARTCC, comply with track restrictions, and use all means available (HF DR, dead reckoning, etc) to ensure navigation accuracy.

11.2.5. Complete the AF Form 72, **Air Report (AIREP)**, for weather updating according to requirements in **Chapter 6**.

11.3. Post Flight.

11.3.1. For each CAT I mission leg, the aircraft commander will download and retain diskettes containing the mission HISTORY from each leg. Operations Groups will develop simplified numbering systems to identify missions under IDENT. The full mission number will be typed under NOTES on the M-PLAN REVIEW page. Turn into the squadron upon mission completion. Units will maintain all operational mission data on file (hard disk, diskette file, paper copy, etc.) for 90 days.

11.3.2. For legs in which navigational error, procedural deviation, or other abnormality have occurred, retain a copy on the M-PLAN and mission HISTORY and all pertinent forms including, but not limited to DD Form 175, DD Form 175-1, DD Form 1801, CFP, charts, and navigation log.

11.3.3. For airdrop missions, record AIRDROP RECALL information before leaving the aircraft.

Section 11B— Mission Computer Directed Approach Procedures

11.4. General.

11.4.1. The C-17 mission computer directed approach, using the MC APPROACH page of the mission computer, does not ensure obstacle clearance. It only mathematically derives a final approach course and glide path from pilot input data.

11.4.2. Use **Chapter 16** and **Chapter 17**, these instructions, to plan low level ingress/obstacle clearance to the MC directed final segment. AFJMAN 11-226, *United States Standard for Terminal Instrument Procedures (TERPS)* establishes the following planning and flight procedures. NOTE: Using these procedures does not imply these procedures will comply with all TERPS criteria. Approaches into rapidly sloping terrain, or where planning documents have significant errors will still pose potential flight hazards. Thorough planning and precision flying is a must.

11.5. Restrictions.

NOTE: C-17 Mission computer approach procedures are intended to be used only in contingency situations when no other published approach procedure is available. Specific authorization from MAJCOM/DO (HQ AMC/DO) is required before performing these procedures in IMC. All crews are authorized to use these procedures for training when VFR conditions exist.

11.5.1. USAF requirements and procedures for flying published GPS approaches in FAA and ICAO airspace are under development. Until specific equipment and procedural requirements are established, C-17 crews are not authorized to fly published GPS approaches.

11.5.2. If a published non-precision (VOR, NDB, TACAN, etc.) approach exists, the crew may program the MC to mirror the published approach. You may use MC guidance to back-up the ground NAVAIDs. In the event the ground navigation aids become unreliable, the crew is not authorized to continue the approach procedure using MC guidance.

11.5.3. In a contingency, the crew will be provided an approved (TERPS'ed) mission computer approach procedure. All data required to program the MC Approach data in the mission computer will be included on the approach procedure. This will include any high-precision waypoints, weather minimums, and missed approach instructions required to safely execute the approach.

NOTE: The procedures in the following paragraphs are for training use only. Use them only in the simulator or VFR conditions. The intent is to provide experience in programming and flying mission com-

puter approaches. HQ AMC/DO authorization is required to fly any MC approach in actual IMC conditions, regardless of the source of the data used to construct the approach.

11.5.4. If no published approach exists, develop training approaches IAW paragraph **11.6.**

11.5.4.1. Straight-in approaches.

11.5.4.1.1. Ensure the runway is properly defined in either the permanent or custom airfield database.

11.5.4.1.2. Fly the final IAW TO 1C-17A-1, Section II.

11.5.4.1.3. Straight-in minima (DH) will be similar to the IMC Drop Altitude, Volume 21. Minima will be 500 feet above the highest man-made obstacle or terrain feature/spot elevation, or 500 feet plus one contour interval above the highest depicted terrain contour whichever is highest, within three nautical miles from the FAF to the MAP.

11.5.4.2. Circling approaches:

11.5.4.2.1. Determine the geographic center of the airport. Plan the circling maneuver based on airfield restrictions, a threat, etc. Determine a level off point no earlier than 2.5 NM from the center of the airport, along the final course inbound. Plan to be at circling minima at this point. Use the airport coordinates as the MAP.

11.5.4.2.2. Circling minima (MDA) will be 600 feet above the highest obstacle within 5 NM of the geographic center of the airport, or 1000 feet above the airport elevation, whichever is higher.

11.6. Planning the Approach.

11.6.1. Straight-in approaches:

11.6.1.1. Determine the final approach course (note any difference from runway azimuth).

11.6.1.2. Draw a 3 NM corridor along both sides of the final approach course.

11.6.1.3. Plot an IAF, 15 NM from the touchdown zone, along the final approach course.

11.6.1.4. Plot a FAF, 5 NM from the touchdown zone, along the final approach course.

11.6.1.5. Plot the MAP.

11.6.1.6. Determine the controlling obstacle from the FAF to the MAP.

11.6.1.7. Determine the preliminary DH.

11.6.1.8. Using **Chapter 16** criteria, determine the ingress altitude from the IAF to FAF. Use this, or the highest traffic pattern altitude the weather or threat will allow as the GS INTCP ALT.

11.6.1.9. At the aircraft, crosscheck predicted TOLD GS with the GS INTCP ALT and ensure that the FAF distance is 5 NM or less from the touchdown zone. If not, use the MC FAF distance and determine if a new DH is required.

11.6.1.10. Use the predicted times and MC slowdown points for time control. For manual slowdowns from 300 KCAS, using SBK 2, slow down approximately 10 NM from the FAF (4 minutes ETE). For a pop-up from 300 AGL to 1500 AGL, plan 6 NM (2.5 minutes ETE).

11.6.1.11. Plan the missed approach.

11.6.2. Circling approaches:

11.6.2.1. Determine the final approach course (note any difference from runway azimuth).

11.6.2.2. Draw a 5 NM (radius) circle around the geographic center of the airport.

11.6.2.3. Plot an IAF, 15 NM from the airport, along the final approach course.

11.6.2.4. Plot a FAF, 5 NM from the airport, along the final approach course.

11.6.2.5. The airport is the MAP.

11.6.2.6. Determine the controlling obstacle within the 5NM circle.

11.6.2.7. Determine the MDA.

11.6.2.8. Using Volume 21 criteria, determine the ingress altitude from the IAF to FAF. Use this, or the highest traffic pattern altitude the weather or threat will allow as the GS INTCP ALT.

11.6.2.9. Plot a level off point 2.5 NM from the airport, along the final approach course. Using 500 feet/NM (no wind) from the level off point to the GS INTCP ALT, confirm the FAF distance is 5 NM or less from the touchdown zone. If not, compute a new FAF distance (new radius) and determine if a new MDA is required.

11.6.2.10. Plan the circling maneuver.

11.6.2.11. Use the same slowdown factors as before and plan the missed approach.

11.7. Planning the Missed Approach Segment.

11.7.1. Determine the missed approach point.

11.7.2. Determine the missed approach course, and develop a waypoint to fly to 5 NM from the geographic center of the airport.

11.7.3. Determine the altitude required at this first waypoint using Volume 21 low level criteria, MEA or MOCA if applicable, or an ATC required altitude, whichever is higher.

11.7.4. Using 250 feet/NM ensure this altitude can be obtained with one engine inoperative.

11.7.5. At the aircraft, crosscheck coordinates, courses and distances to ensure accuracy.

11.8. Flying the Approach:

11.8.1. Use TO 1C-17A-1 and AFMAN 11-217, *Instrument Flight Procedures*, procedures to the maximum extent possible. If the threat, or unusual terrain require deviations, they must be briefed and understood.

11.8.2. Prior to the IAF, the pilot not flying will build the secondary flight plan to prepare for the missed approach and egress. Ensure the MAP has the same LAT/LON as the primary and/or convert the four letter identifier for an airfield into a three letter waypoint. Ensure the initial waypoint after the missed approach is the same. If the crew goes missed approach, the pilot not flying (PNF) will transition from the primary flight plan to the secondary flight plan on the pilot flying's command en route to the initial waypoint.

Chapter 12

AIRCREW MAINTENANCE SUPPORT TASKS

12.1. General. This volume contains normal procedures for pilots and loadmasters not contained in the flight manual or applicable technical orders. The aircrew normally does not perform routine servicing or maintenance, but are authorized to perform those aircrew maintenance support tasks found in this volume. The aircrew performs these tasks only in the absence of qualified maintenance personnel, and when required for mission accomplishment.

12.2. Authority to Clear a Red X. Refer to T.O. 00-20-5, "Downgrading a Red X for One-Time Flight." Aircraft commanders may clear a red X only in the absence of qualified maintenance personnel, or when required for mission accomplishment. The aircraft commander must obtain authorization from the home station chief of maintenance, or designated representative.

12.3. Refueling/Defueling.

12.3.1. Refer to T.O. 1C-17A-1 and TO 1C-17A-2-12JG-28-1. For normal refueling, two qualified personnel are required. If aircrew refueling is required at a base with AMC support, the aircraft commander will submit an AMC Form 54, describing the circumstances. Only special operations qualified aircrews are authorized to hot refuel/defuel.

12.3.2. Refer to T.O. 00-25-172 for Concurrent Servicing Operations. Crew members may act as Concurrent Servicing Supervisor (CSS).

12.4. Fault Reporting Manual. The aircrew will use the Fault Reporting Manual, TO 1C-17A-2-00FR-00-1. Ground and in flight BIT reported and flight crew detected (Non-BIT) faults are the aircrew's responsibility. Maintenance detected faults, those not displayed to the aircrew (generally found on the Maintenance Monitor Panel, MMP; or MCD) are not the aircrew's responsibility.

12.5. Maintenance Interface Panel. The aircrew will not normally use this panel.

12.6. Maintenance Monitor Panel.

12.6.1. Aircrews will not erase any fault unless specifically directed by maintenance.

12.6.2. COMP FANS will be selected to operate the OBIGGS compressor fans when any crew member needs to go beneath the cargo floor. The upper ON legend is illuminated when the switch is depressed, the lower FANS legend will illuminate when both fans are open. When selected closed, the OPEN light will extinguish when both fans are off, then the ON light will go out.

12.7. Aircraft Servicing Requirements. When adequate maintenance support is not available, the aircrew may need to perform certain maintenance tasks. Use the job guides (JG) in **Table 12.1.** If aircrew servicing is required at a base with AMC support, the aircraft commander will submit an AMC Form 54 describing the circumstances.

Table 12.1. Job Guides.

TO Number	Title
1C-17A-2-10JG-10-1	Ground Handling—Parking/Mooring
1C-17A-2-10JG-30-1	Ground Handling—Quick Turn-Around
1C-17A-2-10JG-50-1	Ground Handling—Launch
1C-17A-2-10JG-60-1	Ground Handling—Servicing Equipment Positioning
1C-17A-2-10JG-70-1	Ground Handling—Mission Reconfiguration of Cargo Compartment
1C-17A-2-12JG-28-1	Servicing—Fuel
1C-17A-2-12JG-29-1	Servicing—Hydraulic
1C-17A-2-12JG-38-1	Servicing—Water/Waste
1C-17A-2-12JG-49-1	Servicing—Auxiliary Power Unit
1C-17A-2-12JG-79-1	Servicing—Engine Oil
1C-17A-2-40JG-20-1	System Integration—Displays (BIT)
1C-17A-2-00FR-00-1	Fault Reporting Manual
1C-17A-2-00GV-00-1	General Vehicle Manual
1C-17A-2-1	Aircraft Cross Servicing Guide
1C-17A-6	Inspection Requirements Manual

Chapter 13

LOADMASTER PROCEDURES

13.1. General. The loadmaster coordinates loading or offloading with air terminal operations or the shipping agency; plans loads; provides in-flight services to passengers; and supervises onloading or offloading operations.

13.1.1. Multiple Loadmaster CRM. Although the C-17 was designed to a one loadmaster requirement, situations will arise when more than one will be on board the aircraft. To ensure good CRM, one loadmaster will assume overall responsibility for checklist completion and ensure there is no confusion about what duties have been accomplished.

13.2. Responsibilities for Aircraft Loading.

13.2.1. AMC Stations:

13.2.1.1. Aerial port personnel are responsible for selecting cargo and mail for airlift, prompt completion of documentation, preparation of cargo for air shipment, and moving cargo to and from the aircraft to meet scheduled departure. They will advise the loadmaster of destination, size, weight, and types of cargo (classified, hazardous, etc.) to permit proper positioning, to coordinate the traffic activities affecting loading and offloading, and to assign sufficient air freight loading personnel for cargo loading. Aerial port personnel are responsible for safe positioning of material handling equipment and cargo to or from the aircraft cargo door, ramp or auxiliary ground loading ramp. Under the supervision of the loadmaster, the load team will prepare the aircraft for loading (stow loading equipment if the aircraft is not to be reloaded), physically load the aircraft, secure cargo and equipment as required, release cargo restraints, and physically offload cargo.

13.2.1.2. The loadmaster is responsible for aircraft preflight, load planning of all cargoes, preparing weight and balance documentation; operating aircraft equipment; tiedown, and coordinating with the loading crew supervisor to check the cargo against manifests. The loadmaster supervises and directs on/offloading and is responsible for safe movement of cargo into and out of the aircraft.

13.2.1.3. Loads planned by qualified load planners will be accepted by the aircraft loadmaster and loaded aboard the aircraft as planned, unless the load or any portion of it will compromise flight safety, does not comply with the applicable aircraft technical orders or USAF/AMC publications. If cargo is refused or rearranged for these reasons, all applicable information, to include a copy of the load plan, will be sent to HQ AMC/DOV through standardization channels.

13.2.1.4. Take care not to load pet containers on the ramp. Pets must have the ability to stand up, turn around, and lie down with a normal posture and body movement. Ramp loading will restrict this normal movement.

13.2.2. At locations without AMC air terminal or traffic personnel, the shipper assumes responsibilities in paragraph **13.2.1.1.** and provides sufficient qualified personnel and handling equipment for loading or offloading. Loadmaster responsibilities and authority are the same as described in paragraph **13.2.1.2.** and **13.2.1.3.**

13.2.3. During joint airborne air transportability training (JA/ATT), special assignment airlift missions (SAAM), and US Air Force mobility missions, the loadmaster can accept DD Form 2133, **Joint**

Airlift Inspection Record, as valid pre-inspection of equipment being offered for air shipment. This form, validated by two joint inspector signatures, may be used in lieu of the applicable portions of the Technical Order (TO) 1C-17A-1Cl-2. The DD Form 2133 will not be used to document preparation of hazardous materials. This will be accomplished using the Shipper's Declaration for Dangerous Goods.

13.3. Emergency Exits and Safety Aisles. No part of the cargo load will extend over the edge of the walkway. Equipment such as spare tires, mirrors, etc., protruding from rolling stock may extend over the walkway. If passengers are seated in side facing seats, the loadmaster will ensure there is sufficient space between the cargo and the seats to permit passenger leg room. Palletized cargo will not extend beyond the vertical stacking line of the pallet. Exceptions are authorized for oversized cargo when pallets are used as a mobility platform. Dunnage may be required to raise the oversized cargo above the pallet to provide restraint rail clearance.

13.4. Air Cargo Restraint Criteria. When the load consists of palletized netted cargo or cargo secured with straps, a 30-inch space will be maintained between the cargo and the nearest forward litter, occupied seat or nuclear cargo. When the cargo, either palletized or unpalletized, is secured with chains, the 30-inch spacing is not required (***EXCEPTION***: Maintain 30 inch spacing on AE missions when carrying litters).

13.5. Preflight Duties.

13.5.1. Cargo Missions:

13.5.1.1. Aerial port personnel establish loading times. Loading times that differ from the normal predeparture sequence must be established before the loadmaster enters crew rest. Loading times are governed by the type of load and complexity of loading procedures, not by port saturation or management of aerial port workload levels. When reporting for duty, the loadmaster checks in with the air terminal operations center or other designated location to obtain load breakdown and assist in load planning.

13.5.1.2. Proper cargo documentation must accompany each load. A consolidated statement (manifest) will be delivered to the aircraft before departure unless one is not available due to a lack or failure of the manifest processing equipment. In this case, a cargo listing or floppy disks containing manifest information must accompany the load.

13.5.1.3. Make every effort to exchange tiedown equipment on a one-for-one basis. If this is not possible, annotate the AF Form 4069, **Tiedown Equipment Checklist**. At non-AMC stations, 463L pallets will normally be exchanged on a one-for-one basis.

13.5.2. Passenger Missions:

13.5.2.1. Passenger Missions. Maximize seat availability on AMC aircraft. It may be necessary for crews to perform passenger service functions at stations that do not have this capability. These functions include manifesting, anti-hijacking processing, and ensuring visa/passport requirements are met. Do not hesitate to contact TACC/TRKO, DSN 576-1755/1758, commercial 618-256-1755/1758, if any questions arise such as to who may travel to specific locations or passport/visa requirements. File a copy of the passenger manifest with the most responsible on-scene agency if there is no base operations or other agency responsible for filing the manifest.

13.5.2.2. Ensure all food items are removed from the aircraft by fleet and returned to the flight kitchen if an extended delay occurs. Ensure that a copy of AF Form 129, **Tally In-Out**, is received from fleet service to relieve the loadmaster of meal accountability.

13.5.2.3. Complimentary snacks and beverages are authorized on Transportation Working Capital Fund (TWCF) funded missions (including AFRC flown missions) for passenger consumption only. Complimentary snacks are not authorized on joint airborne/air transportability training (JA/ATT), Joint Chiefs of Staff (JCS) exercises, or special assignment airlift missions (SAAM). The squadron or port operations officer will ensure snacks and beverages are placed on board when departing AMC stations. When departing from other stations and no snacks or beverages are to be placed onboard, the loadmaster may obtain required snacks and beverages from the local flight kitchen. Direct the flight kitchen to bill the accounting and finance office at the aircraft's home station. Record all unused snacks and beverages on AF Form 129 and return to the flight kitchen for turn-in credit.

13.5.2.4. A passenger service representative or crew member will assist passengers at the bottom of the steps, and the loadmaster will assist in seating passengers. Make every effort to seat families together.

13.5.2.5. All passengers will be assigned a seat. When children under the age of two or below the weight of 40 pounds and under the height of 40 inches are accepted as passengers, the parent or guardian must provide their own FAA approved car/infant seat (ICS). This requirement does not preclude a passenger from temporarily holding an infant during the cruise portion of a flight when safety considerations are not violated. Passenger service will ensure car/infant seat bears one or more labels as follows: (a) seats manufactured to U.S. standards between January 1, 1981, and February 25,1985, must bear the label: "This child restraint system conforms to all applicable federal motor vehicle safety standards."; (b) seats manufactured to U.S. standards on or after February 26,1985,must bear two labels: (1)"This child restraint system conforms to all applicable federal motor vehicle safety standards"; and (2) "This restraint is certified for use in motor vehicles and aircraft" in red lettering car/infant seats that do not qualify under paragraph 2 above must bear either a label showing approval of a foreign government or a label showing that the seat was manufactured under the standards of The United Nations; booster-type child restraint systems (as defined in federal motor vehicle standard no. 213 (49 cfr 571.213)), vest- and harness-type child restraint systems, and lap held child restraints are not approved for use in aircraft.

13.5.2.6. Download the baggage of no-show passengers and those removed from a flight. In the case of SAAMs or exercise missions at a non-AMC location, coordinate with tanker airlift control elements or deploying unit commanders to decide if the downloading of baggage is necessary.

13.5.2.7. Passenger Operation of Emergency Exits. Prior to each flight, loadmasters should formulate a passenger emergency egress plan. Different cargo configurations will dictate procedures to be considered. Loadmasters should consider briefing adult (age 15 and older), English-speaking passengers on proper operation of the troop doors and the forward emergency escape hatch. The intent is to aid loadmasters during a high passenger count mission emergency egress.

13.6. Passenger Handling.

13.6.1. The loadmaster is a key figure in good passenger relations. Comments by the loadmaster and the manner in which they are made often determine passenger attitudes about the flight. At all times,

remember that passengers are individuals; address them collectively only when making announcements. To that end certain rules should be observed:

13.6.1.1. Address passengers by proper titles.

13.6.1.2. Avoid arguments and controversial subjects, national or international politics, criticism of other personnel or organizations.

13.6.1.3. Offer services and perform duties in a manner indicating a personal interest and willingness to help.

13.6.2. In-flight Procedures:

13.6.2.1. Passengers may move about the cargo compartment; however, use good judgment on the number of passengers allowed out of their seats at any one time. Encourage passengers to remain seated with their seat belts fastened.

13.6.2.2. Make frequent checks on cabin temperature, passengers with small children, and cleanliness of the cargo compartment and lavatories.

13.6.2.3. Do not allow passengers to lounge on or tamper with cargo or emergency equipment. Passengers will not be permitted access to checked baggage.

13.6.2.4. On long flights, particularly during hours of darkness, use all possible means to make passengers comfortable. Dim and extinguish unnecessary cargo compartment lights.

13.6.2.5. Passengers may visit the flight deck only when approved by the aircraft commander. Use good judgment when requesting this authority. See **Chapter 5** for appropriate restrictions.

13.6.3. Meal Service:

13.6.3.1. Meals are served at normal hours when practical, based on the local time at point of departure. Avoid waking passengers to offer meals. Ask the aircraft commander about expected flight conditions before meal preparation.

13.6.3.2. Passengers who have a boarding pass AMC Form 148, **AMC Boarding Pass/Ticket**) that shows a meal was ordered are served in the following sequence: Small children requiring assistance, distinguished visitors (DV), and all other passengers.

13.6.3.3. Use the following procedure for box lunches:

13.6.3.3.1. After takeoff, distribute box lunches to passengers who boarded at the previous station. This lessens confusion when flight segments are short and passengers board at subsequent stations.

13.6.3.3.2. Ensure each passenger receives the meal ordered by verifying the passenger's AMC Form 148.

13.6.3.4. Do not serve liquids or hot foods during turbulence.

13.6.3.5. Turn in meals unfit for consumption to the first flight kitchen. If in radio contact with the issuing station, relay aircraft tail number, mission identifier, number of spoiled meals (by menu), issuing organization, and, in the case of frozen meals, the manufacturing agency and the manufacturer's lot number.

13.6.3.6. When authorized meals have not been furnished to passenger(s), annotate the individual's AMC Form 148 to reflect reimbursement is authorized. Inform the passenger(s) they may receive refunds at the passenger service counter at the next station, originating location, or destination terminal.

13.7. Over-Packed Meal Procedures.

13.7.1. Sign for over-packed in-flight meals and supplements delivered to aircraft. These meals have been inventoried and annotated showing the total number of meals in each container. Do not open containers for inventory.

13.7.2. Obtain sufficient blank copies of AMC Form 305, **Receipt for Transfer of Cash and Vouchers**.

13.7.3. At the onload station, contact the troop commander or other individual responsible for the mission. The unit or user is responsible for collecting for the meals before the onload and for turning the money over to the loadmaster with two separate listings. One listing will contain the names of those not on separate rations who are authorized to receive a government meal at no charge. The other list will contain names of those on separate rations and who pay for their meals. Both listings must be certified by the troop commander or individual responsible for the mission. The loadmaster will count the money to ensure the total is correct and issue a receipt (DD Form 1081, **Statement of Agent Officer's Account**) to the user.

13.7.4. At en route, remain overnight, or terminating stations, turn in the money and both listings to the flight kitchen. If a flight kitchen refuses to accept the money or meals, have the aircraft commander report the incident on AMC Form 54, **Aircraft Commander's Report on Services/Facilities**. (See **Chapter 8** for instructions.) Retain the money or meals and turn them in to the next available AMC flight kitchen. When a crew change occurs and the money or meals are transferred to the outbound loadmaster, the inbound loadmaster will retain the signed receipt as proof of money or meals transfer.

13.8. En Route and Post-Flight Duties.

13.8.1. At stations where a crew change is made and loading or offloading is required, the inbound loadmaster is responsible for offloading the aircraft. The outbound loadmaster is responsible for planning and loading the outbound load. When no crew change occurs, the inbound loadmaster is responsible for onloading or offloading cargo.

13.8.2. Assist passengers to deplane. If BLUE BARK, DVs, COIN ASSIST, or couriers are onboard, the loadmaster informs the traffic or protocol representative.

13.9. Emergency Airlift of Personnel. See **Chapter 17**.

13.10. Weight and Balance. Accomplish weight and balance for this airplane according to T.O. 1-1B-50, *Weight and Balance*, and MCI 11-204 (AFI 11-2C-17AA), *C-17 Configuration/Mission Planning*. The unit possessing the airplane maintains the primary weight and balance handbook containing the current airplane status and provides a supplemental weight and balance handbook for each airplane. Enclose the supplemental handbook in a wear-resistant binder (preferably metal), stenciled "Weight and Balance" with the airplane model and complete serial number on the cover.

13.10.1. The supplemental handbook will include the basic weight checklist manual, loading data manual, MCI 11-204 (AFI 11-2C-17AA), *C-17 Configuration/Mission Planning*, sufficient copies of DD Form 365-4, **Weight and Balance Clearance Form F—Transport**, and a certified copy of the current DD Form 365-3, **Chart C—Basic Weight and Balance Record**. Chart C will include the airplane's basic weight, basic moment, and center of gravity. Ensure sufficient computer paper is onboard to complete the mission.

13.10.2. The weight and balance section of the unit possessing the airplane will provide the information required to maintain documents current and accurate to the appropriate agency.

13.11. Loaded Weapons. Weapons are considered loaded if a magazine or clip is installed in the weapon. This applies even though the clip or magazine is empty.

13.11.1. Personnel who will engage an enemy force immediately upon arrival (actual combat) may carry basic combat loads on their person. Weapons will remain clear with magazines or clips removed until immediately before exiting the aircraft. This applies to airborne assaults and airland missions.

13.11.2. Personnel who will not immediately engage an enemy force will store basic ammunition loads in a centralized location for redistribution upon arrival at the objective. Magazines or clips will not be inserted into weapons.

13.12. Cargo Validation Onloading and Offloading Procedures. To assist in the cargo validation process, a cargo validation onloading and offloading format is provided.in this chapter. Use this format when tasked to validate a new loading procedure or when encountering any cargo that you feel requires special or specific onloading, offloading or tie down procedures that are not currently listed in TO 1C-17A-9. After completion, forward through standardization channels to HQ AMC/DOV.

13.12.1. Use the following format when tasked to validate a new piece of equipment or when encountering any cargo that may require special or specific onloading and offloading procedures.

13.12.2. General Loading Data.

13.12.3. Nomenclature of item. Give military or civilian name, national stock number (NSN), and a brief description of the item, i.e., dump truck, medical van, etc.

13.12.4. Dimensions (in inches).

13.12.5. Length, width, and height.

13.12.6. Rough drawing or picture of the unit, pointing out critical dimensions, projections, overhangs, etc.

13.12.7. Weight (in pounds).

13.12.8. Gross weight.

13.12.9. Individual axle weight.

13.12.10. Data plate weight if possible.

13.12.11. Number of loading crew personnel and loadmasters required to onload or offload cargo and their required position to observe clearance, if required.

13.12.12. Equipment and Material Requirements. Special equipment and material required to onload and offload cargo, i.e., cargo winch, prime mover, shoring requirements.

13.12.13. Aircraft Configuration Required.

13.12.14. Preparation of Cargo for Loading. Helicopter struts, components that must be removed, etc.

13.12.15. Loading Procedures.

13.12.16. Tie Down Points.

13.12.17. Offloading Procedures.

13.12.18. Comments.

Chapter 14

FUEL PLANNING

Section 14A—General Procedures

14.1. General. This volume is an interim fuel planning guide, pending certification of computer planning software. It is designed to assist planners and pilots in fuel planning airland and airdrop missions, with or without low level or AR segments. The PFPS (Portable Flight Planning System), AMC, CFP, and TO 1C-17A-1-1 are the primary preflight references. The AFMSS and MC emulator may also be used for preflight planning. At the aircraft, verify preflight planning with aircraft mission computer performance.

14.2. Fuel Planning Profiles.

14.2.1. AMC CFP Fuel Planning Profile. Using the AMC CFP, AMC aircraft plan to be overhead the destination/Begin Descent Point with fuel to proceed to the alternate, holding at the alternate, and descent/approach and landing fuel. Normally, the divert profile is based on LRC speed at 10,000 feet for alternates 200 NM air distance or less, FL310 or 330 for alternates beyond 200 NM. Holding fuel is based on endurance holding at 10,000 feet for 45 minutes, or 20,000 feet for 1+15 at the overhead alternate gross weight. If a visibility only approach is planned, additional fuel is added to compensate for the climb to 10,000 feet. Approach and landing fuel is planned only once.

14.2.2. C-17 Mission Computer Profile. The C-17 mission computer plans a complete climb, cruise, descent and approach and landing based on the pilot inserted ROUTE DATA and PRFM factors. This fuel is “Enroute” fuel. The “Alternate” fuel is a LRC profile climbing from the destination to the highest possible cruise altitude (5 minute cruise), descent and landing at the alternate. “Missed approach” fuel is already included in the alternate fuel. The mission computer calculates actual fuel burn to landing at both the destination and alternate. “Holding” is based on endurance holding at 10,000, 250 KCAS, +10 temp dev, for 45 minutes or 1+15. The planning procedures in this volume approximates this profile.

14.2.3. These profiles were developed to calculate required mission fuel with appropriate reserves, and result in different fuel loads. Flying these profiles result in landing at the alternate (if required) with only stored fuel and unidentified extra fuel. Normally, divert as soon as the situation dictates. Hold at the best altitude /profile possible. Alternate fuel is based on direct routing, which is rarely available. Use the mission computer to develop actual planned profiles while in flight to crosscheck fuel planning.

14.3. Fuel Conservation. Conservation of fuel requires active participation at all levels.

14.3.1. Before certification of the computers software, plan mission with fuel conservation conservatively. However, wing mission planners and aircraft commanders will ensure that fuel in excess of required ramp fuel load (RRFL) is kept to an absolute minimum. If actual ramp fuel exceeds RRFL by more than 10%, the aircraft commander will notify the controlling agency and request defueling assistance. During contingencies or exercises in which ferrying fuel is operationally desired, the OPORD or OPLAN may authorize excess fuel.

14.3.2. Conserve fuel using the following options:

14.3.2.1. Delay engine start.

14.3.2.2. Load to an aft CG.

14.3.2.3. Select the most expeditious taxi route.

14.3.2.4. Cruise at optimum altitudes, using the mission computer performance pages. Flight profiles should be planned using normal cruise speed (310 KCAS/.740 M, whichever is less). Once airborne, use LRC selection of CRUISE page in mission computer as operational conditions and fuel status permits. As a rule of thumb, climb if ground speed is reduced less than eight knots per 1000 feet. Descend if ground speed will be increased more than eight knots per 1000 feet.

14.3.2.5. Plan en route descent profile.

14.3.2.6. Delay configuration when possible (do not alter flight manual procedures).

14.4. General Fuel Planning Procedures. Fuel planning requirements are described in Sections B, C, and D. The MC FUEL PLAN page depicts these requirements. If manual fuel planning is required, use the form appropriate to the mission profile desired. Tailor as required to meet a mission profile.

14.4.1. Fuel Loads. Canned fuel loads will not be used and final servicing will be delayed until accurate fuel requirements are known. Aircraft do not require defueling if the fuel load is 60,000 pounds or less.

14.4.2. Planned Landing Fuel. Plan to land with 16,000 pounds, minimum. Normally, this does not require additional fuel added to the flight plan.

14.4.3. Normally, an accurate CFP (takeoff within valid time, weights accurate, proper route of flight, etc.) satisfies the fuel planning requirements of this regulation. However, the aircraft commander will verify the accuracy of the CFP. Use the actual aircraft mission computer to verify fuel load on the CFP. Using this volume should result in a RRFL not to exceed 110% of the MC FPFL.

14.4.4. For formation flights, plan using the most restrictive aircraft (i.e., heaviest aircraft for altitude restriction, or any other applicable restriction). Select formation on the CFG/OPER page.

14.5. Airland Fuel Planning. The following steps cover fuel planning for a simple airland mission from a departure to a destination.

14.5.1. See **Section 14B** for a sample airland fuel planning.

14.6. Air Refueling (AR) Fuel Planning.

14.6.1. Computer flight plans are available which incorporate the unique mission requirements of air refueling missions. The CFP system contains aircraft air refueling performance characteristics, which enable it to prepare a fuel computation. Items and terms unique to the AR CFP are explained below.

14.6.1.1. Air refueling information block:

14.6.1.1.1. Departure date/time - Required takeoff time to meet the ARCT.

14.6.1.1.2. Departure/destination - Departure and destination ICAOs.

14.6.1.1.3. Alternate - Primary alternate used to compute flight plan.

14.6.1.1.4. Ramp GW - Total ramp GW (thousands of pounds).

14.6.1.1.5. Ramp fuel - Required ramp fuel load (thousands of pounds).

14.6.1.1.6. Payload - Total cargo/passenger weight (thousands of pounds).

14.6.1.1.7. Operational weight – Pre-stored aircraft operating weight. Should be 276.5.

14.6.1.1.8. ARCT-1/KC-135 Offload - ARCT, type of tanker used, and the fuel offload. Tanker can be a KC-135 or KC-10.

14.6.1.2. The column headings in lines three and four which differ from standard CFPs are listed below.

14.6.1.2.1. ETA/OW - Estimated time of arrival at each checkpoint based on required takeoff time and overwater checkpoint time.

14.6.1.2.2. GWT - Aircraft GW at each checkpoint (thousands of pounds).

14.6.1.2.3. FLREM - Fuel remaining at each checkpoint (thousands of pounds).

14.6.1.2.4. ONLD - Fuel offloaded by tanker (thousands of pounds).

14.6.1.2.5. TDR - Total distance remaining.

14.6.1.3. The body of the computer flight plan contains the ARIP, ARCP, BINGO, and exit point for the appropriate air refueling track. In addition to the waypoints and coordinates for the route of flight, the CFP contains the routing from the BINGO point to the primary air refueling alternate. (The MC profile assumes a BINGO point 150 NM from the ARCP). A separate fuel analysis is provided for each mission segment, departure to ARCP, ARCP to exit, and exit to destination. Numbered time and fuel blocks correspond with the numbers on the AF Form 4052. See **Section 14C** for a sample AR fuel planning.

14.6.2. In-flight Fuel Planning, Single and Multiple AR: The following computations will be made as indicated:

14.6.2.1. Recovery Fuel Confirmation. After reaching the cruise altitude before the AR, estimate the fuel on board at the ARCP and compare this with "Required at ARCP" fuel to ensure that recovery capability from the ARCP exists.

14.6.2.2. Fuel Onload Requirement. Approximately 45 minutes before each ARCP, the fuel onload requirement will be computed. Use the mission computer and the following procedures:

14.6.2.2.1. Single AR. Burnoff behind the tanker (block 15) + fuel required at exit - estimated fuel on board at the ARCP = required fuel onload.

14.6.2.2.2. Multiple AR: AR 1. Burnoff behind the tanker + fuel required at exit - estimated fuel on board at the ARCP = required fuel onload.

14.6.2.2.3. Intermediate ARs. Burnoff behind the tanker (block 36) + fuel required at exit (block 31) - estimated fuel on board at the ARCP = required fuel onload.

14.6.2.2.4. Final AR. Burnoff behind the tanker (block 36) + fuel required at exit (block 52) - estimated fuel on board at ARCP = required fuel onload.

NOTE: When figuring fuel onload requirements on multiple AR missions, consideration must be given to the need to carry/onload stored fuel. Use the mission computer in flight to “what if” various fuel onloads and alternate mixes.

14.7. Tactical Fuel Planning.

14.7.1. For an airland mission, compute backwards from the final destination to determine appropriate gross weights and stored fuels using normal methods. Ensure low level time and ground operations are accounted for. Use the AF Form 4081 for airdrops as an alternate method for airland. The purpose of this paragraph is to illustrate fuel planning an airland mission into a small field with a subsequent recovery to a main operating base. An airdrop followed by recovery is similar.

14.7.2. See **Section 14D** for a sample Tactical Fuel Plan.

Section 14B—Airland Fuel Planning. Use Figure 14.1. through Figure 14.6. and accompanying text to complete AF Form 4053, INS Flight Plan and Log.

Figure 14.1. Airland Fuel Planning (part 1 of 6).

OPERATING WEIGHT (1)	AIRCRAFT NUMBER (1)		MISSION NUMBER (1)	DATE (1)
CARGO/PAX WEIGHT (1)	HIGHEST ACC FL (6)	LO TEMP DEV (5)	CFP NUMBER (4)	
RAMP FUEL (1)	TAKEOFF WEIGHT (3)	ENROUTE TEMP DEV (7)	WINDS VALID (4)	
RAMP WEIGHT (2)	PAGE N/A	TIME	FUEL	

NOTES:

(1) **OPERATING WEIGHT / CARGO PAX WEIGHT / RAMP FUEL / MISSION NUMBER / AIRCRAFT NUMBER & DATE:**

Normally supplied by the command post, but may be extracted from the aircraft forms or determined by the aircrew. Use 276.5 for operating weight. Takeoff GW = actual ramp GW minus taxi and run-up fuel (block 9).

(2) **RAMP WEIGHT**: Sum of operating weight + cargo/pax weight + ramp fuel.

(3) **TAKEOFF WEIGHT**: Ramp weight minus block 9 fuel (normally 2.5). When more than 15 minutes taxi time is anticipated, add 100 lbs/per minute up to 4000 lbs total.

(4) **CFP NUMBER / WINDS VALID**: From the CFP. CFPI number left blank when manually flight planning.

(5) **LO (LEVEL OFF) TEMP DEV**: Obtain the OH temp dev at the departure base (at planned level off altitude) from the weather forecast.

(6) **HIGHEST ACCEPTABLE CONSTANT FL**: Extract from the CRUISE CEILING chart using the appropriate forecast level off temp dev.

(7) **ENROUTE TEMP DEV**: Average en route temp dev from CFP or weather forecast (from initial level off to BDP).

Figure 14.2. Airland Fuel Planning (part 2 of 6).

1. ENROUTE TO BDP	(8) / (9)	(11) / (13)	Level Off GW (12)
2. RESERVE	(10)	(14)	
3. ENROUTE PLUS RESERVE	(10)	(15)	

NOTES:

BLOCK 1: **ENROUTE TO BDP (Time).**

(8) Draw a diagonal in box. Determine climb time from the CFP or appropriate TIME TO CLIMB chart. Place this time in the top half of the box.

(9) Subtract climb time from enroute time and place in lower portion of box.

BLOCK 2 & 3: **RESERVE & ENROUTE PLUS RESERVE (Time).**

(10) From CFP block 2 and 3. Use mission planned enroute times. For mission planning without a CFP block 2 represents 10% of flight time fuel over a Category 1 route / route segment not to exceed 1+00 fuel at normal cruise. Block 3 is the sum of upper and lower block 1 time plus block 2 time.

BLOCK 1: **ENROUTE TO BDP (Fuel) see Figure 14.3. and accompanying text.**

(11) Draw a diagonal in box. Enter FUEL TO CLIMB chart with TOGW, follow guidelines up to pressure altitude line corresponding initial level off altitude. Correct for TEMP DEV.

(12) Subtract climb fuel from takeoff weight and annotate in the remarks column.

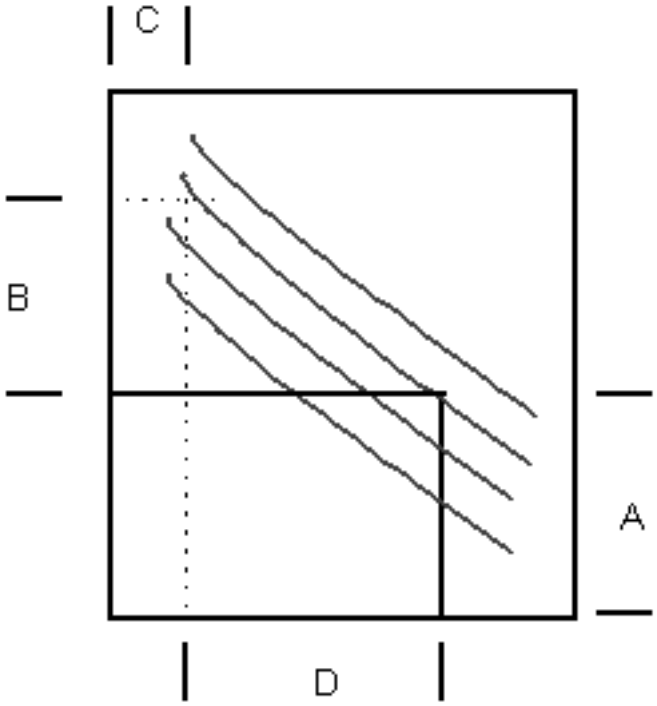
BLOCK 2: **RESERVE (Fuel**).

(14) Multiply block 2 time by 275 lbs/per minute fuel flow. (16,500 PPH , nominal 400,000 pound aircraft).

BLOCK 3: **ENROUTE PLUS RESERVE (Fuel).**

(15) Add upper and lower block 1 fuel to block 2 fuel.

Figure 14.3. Airland Fuel Planning (part 3 of 6). BLOCK 1: Enroute To BDP (Fuel) Illustration.



NOTES:

BLOCK 1: **ENROUTE TO BDP (Fuel).**

(13) (A) Enter appropriate INTEGRATED TIME CHART with level off GW and go vertically to either the constant altitude or STEP CLIMB profile line, move left to read time.

(B) Add the time computed for the lower half of block 1vertically to the time from (A).

(C) Reenter the chart at the new time from (B) and move horizontally to the origonal altitude line (mark this spot as you will need it later in computing your lowest acceptable constant flight level). Then proceed vertically to the bottom of the chart and read the new GW.

(D) Subtract this new GW from the level off GW and that is lower block 1 fuel.

Figure 14.4. Airland Fuel Planning (part 4 of 6).

4. ALTERNATE / MISSED APPROACH AIR DISTANCE _____	(16)	(17)
5. HOLDING AT (18) _____	(19)	(20)

NOTES:

BLOCK 4: **ALTERNATE AND MISSED APPROACH.**

(16) Determine the most suitable (more distant, if filing two) alternate based on weather and NOTAM information. Use CFP ZT.

(17) Multiply block 4 time by 250 lbs/per minute fuel flow (15,000 PPH, nominal 400,000 pound aircraft).

BLOCK 5: **HOLDING.**

(18) Enter ICAO identifier of alternate.

(19) Normally use +45. Use 1+15 if alternate is unavailable, located in Alaska, or at latitudes greater than 59 degrees.

(20) Use 12.0 for +45, and 20.0 for 1+15. These are nominal figures for a 400,000# aircraft holding at 10,000. These fuel numbers are for fuel planning calculations only. If holding is actually accomplished, use MC endurance holding at optimum altitudes and airspeeds, if required.

Figure 14.5. Airland Fuel Planning (part 5 of 6).

6. DESCENT, APPROACH / LANDING	(21)	(22)
7A. IDENTIFIED EXTRA		(23)
7B. STORED FUEL		(24)

NOTES:

BLOCK 6: **DESCENT APPROACH / LANDING.**

(21) As depicted on the CFP (time for descent and 15 minutes for approach). On a manual flight plan, use 35 minutes (descent for 20 minutes plus 15 minutes for approach and landing).

(22) Insert 4.3.

BLOCK 7A: **IDENTIFIED EXTRA.**

(23) Use **Table 14.1.** for identified extra fuel planning:

BLOCK 7B: **STORED FUEL.**

(24) Add for fuel tankering for subsequent mission segments. Add fuel when unavailable at en route stops, compressed ground time, multi-sortie missions where enroute refueling would delay or be detrimental to mission accomplishment. Normally authorized in the mission directive; tankering for aircrew convenience is not authorized.

Table 14.1. Extra Fuel Planning for Airland.

TEMPERATURE CORRECTION	+/- 3% of block 3 fuel for each +/- 10 degree C enroute temprature deviation
KNOWN HOLDING DELAYS	200 lbs/ per minute of expected delay
OFF COURSE MANEUVERING	500 lbs/per minute based on the anticipated increase of flight time (not time spent maneuvering). Examples include terrain or weather avoidance, expected ATC delay, etc.
INSUFFICIENT/UNRELIABLE NAVAIDS (at destination)	5000 lbs
ENGINE ANTI-ICE	450 lbs/hr
WING ANTI-ICE	650 lbs/hr
ENVIRONMENTAL HI-FLOW	100 lbs/hr
GROUND OPERATIONS/ERO	100 lbs/per minute

Figure 14.6. Airland Fuel Planning (part 6 of 6).

8. TOTAL (3 + 4 + 5 + 6 + 7A + 7B) TAKEOFF / FLAPS UP		(25)	(25)
9. TAXI AND ACCELERATION			(26)
10. REQUIRED RAMP			(27)
11. ACTUAL RAMP			(28)
12. UNIDENTIFIED EXTRA			(29)
13. REQUIRED OVER BDP (4 + 5 + 6)			(30)
LOWEST ACC CONSTANT FL (31)		ENDURANCE (11-9) (32)	BURN OFF (3 + 6 + 7A)
TOTAL WIND FACTOR	1ST HALF	2ND HALF	LANDING FUEL (33)

NOTES:

BLOCK 8: **TOTAL (3 + 4 + 5 + 6 + 7A + 7B) TAKEOFF / FLAPS UP.**

(25) Self explanatory.

BLOCK 9: **TAXI AND ACCELERATION.**

(26) Insert 2.5. Add additional fuel as necessary for known ground delays; use 100 lbs/ per minute.

BLOCK 10: **REQUIRED RAMP.**

(27) Block 8 plus block 9.

BLOCK 11: **ACTUAL RAMP.**

(28) Self explanatory.

BLOCK 12: **UNIDENTIFIED EXTRA.**

(29) Block 11 minus block 10.

BLOCK 13: **REQUIRED OVER BDP (4 + 5 + 6).**

(30) Self explanatory.

LOWEST ACCEPTABLE CONSTANT FLIGHT LEVEL.

(31) Enter the INTEGRATED TIME chart at the intersection of lower block 1 time and cruise altitude found in step 13(C). Proceed left with block 12 (unidentified extra fuel). Note level and check for consistency with ATC.

ENDURANCE (11-9).

(32) Use 24.0 for the first hour, and 16.0 for each subsequent hour. Calculate using Block 11 fuel minus Block 9 fuel. In flight use the Mission Computer (MC).

LANDING FUEL.

(33) Actual landing fuel (use is optional).

Section 14C— Air Refueling (A/R) Fuel Planning. Use Figure 14.7.-Figure 14.18. and accompanying text to complete AF Form 4052, Air Refueling (A/R) Fuel Planning.

Figure 14.7. Air Refueling (A/R) Fuel Planning (part 1 of 13).

NAVIGATOR N/A	DATE	OPERATING WEIGHT (1)	
AIRCRAFT NUMBER (1)	MISSION NUMBER (1)	CARGO / PASSENGER WEIGHT (1)	
CFP NO. AND PROFILE (2)	TIME WINDS VALID (2)	RAMP FUEL (1)	
DEPARTURE (1)	DESTINATION (1)	RAMP WEIGHT (3)	
L.O. TEMP DEV (5)	HIGHEST ACC FLT LVL (6)	TAKEOFF FUEL (7)	TAKEOFF WEIGHT (4)

NOTE:

This portion of the fuel card is located in the lower right hand corner.

(1) **OPERATING WEIGHT / CARGO PAX WEIGHT / RAMP FUEL / MISSION NUMBER / AIRCRAFT NUMBER DEPARTURE AND DESTINATION:**

Normally supplied by the command post, but may be extracted from the aircraft forms or determined by the aircrew. Use 276.5 for operating weight. Takeoff GW = actual ramp GW minus taxi and run-up fuel (block 10). Annotate ramp fuel in BLOCK 12: ACTUAL RAMP fuel column.

(2) **CFP NUMBER / WINDS VALID**: From the CFP. CFPI number left blank when manually flight planning.

(3) **RAMP WEIGHT**: Sum of operating weight + cargo/pax weight + ramp fuel.

(4) **TAKEOFF WEIGHT**: Ramp weight minus block 10 fuel (normally 2.5). When more than 15 minutes taxi time is anticipated, add 100 lbs/per minute up to 4000 lbs total. Annotate takeoff weight in the TAKEOFF GROSS WEIGHT block of the departure to AR 1 section (see below).

(5) **LO (LEVEL OFF) TEMP DEV**: Obtain the OH temp dev at the departure base (at planned level off altitude) from the weather forecast.

(6) **HIGHEST ACCEPTABLE FL**: Extract from the CRUISE CEILING chart using the appropriate forecast level off temp dev.

(7) **TAKEOFF FUEL**: Ramp fuel minus block 10 fuel (normally 2.5). When more than 15 minutes taxi time is anticipated, add 100 lbs/per minute up to 4000 lbs total. Annotate takeoff fuel in the TO FUEL block of the departure to AR 1 section (see below).

Figure 14.8. Air Refueling (A/R) Fuel Planning (part 2 of 13).

DEPARTURE TO AR 1			
L.O. ALT (8)	TO FUEL (7)	FCST TD (9)	
TAKEOFF GROSS WEIGHT (4)		ENDURANCE (10)	

NO.	ITEM		TIME	FUEL	GROSS WEIGHT
1	ENROUTE TO ARCP 1	PAGE N/A	(11)		

(8) **LEVEL OFF ALTITUDE**: Enter ALTRV altitude if applicable. If not on an ALTRV, climb to the highest altitude the aircraft is capable of for direction of flight.

(9) **Forecast Temperature Deviation**: Average CFP temp dev from level off to air refueling control point ARCP.

(10) **ENDURANCE:** Use 24.0 for the first hour, and 16.0 for each subsequent hour. In flight use the MC.

BLOCK 1: **ENROUTE TO ARCP 1 (Time).**

(11) From the CFP. Use the time to BDP

Figure 14.9. Air Refueling (A/R) Fuel Planning (part 3 of 13).

2	RESERVE	(12)		
3	(1 + 2) ENROUTE + RESERVE	(13)	(14)	(15)
4	AIR DIST_____ RECOVERY	(16)	(17)	
5	HOLDING AT_____	(18)	(19)	
6	DESCENT APP AND LANDING	(20)	(21)	
7	(3 + 4 + 5 + 6) SUBTOTAL		SE	

NOTE:

BLOCK 2: **RESERVE:**

(12) From CFP block 2. Use mission planned enroute times. For mission planning without a CFP, block 2 represents 10% of flight time fuel over a Category 1 route / route segment not to exceed 1+00 fuel at normal cruise.

BLOCK 3: **ENROUTE PLUS RESERVE:**

(13) Enter total of BLOCK 1 and 2 times.

(14) Use CFP BLOCK 3 fuel . Add 3.0 for additional climb fuel to cruise ceiling.

(15) ARCP GW = takeoff gross weight minus BLOCK 3 fuel.

BLOCK 4: **AIR DIST RECOVERY**:

(16) Determine the most suitable (more distant if filing two) alternate based on weather and NOTAM information. Use associated CFP ZT.

(17) Multiply CFP ZT by 300 lbs/per minute fuel flow. Compare this figure with the CFP planned fuel and use the most restrictive number.

BLOCK 5: **HOLDING AT**:

(18) Normally use +45. Use 1+15 if alternate is unavailable, located in Alaska, or at latitudes greater than 59 degrees.

(19) Use 12.0 for +45, and 20.0 for 1+15. These are nominal figures for a 400,000# aircraft holding at 10,000. These fuel numbers are for fuel planning calculations only. If holding is actually accomplished, use MC endurance holding at optimum altitudes and airspeeds, if required.

BLOCK 6: **DESCENT APP AND LANDING**:

(20) As depicted on the CFP (time for descent and 15 minutes for approach). On a manual flight plan, use 35 minutes (descent for 20 minutes plus 15 minutes for approach and landing).

(21) Insert “4.3”.

Figure 14.10. Air Refueling (A/R) Fuel Planning (part 4 of 13).

8	IDENT EXTRA		(22)	
9	(7 + 8) TOTAL TAKEOFF	SE	SE	
10	TAXI		(23)	
11	(9 + 10) REQUIRED RAMP		SE	
12	ACTUAL RAMP		(1)	
13	(12 - 11) STORED FUEL		SE	
14	(4 + 5 + 6) REQUIRED AT ARCP		SE	

BLOCK 8: **IDENTIFIED EXTRA**:

(22) Use **Table 14.2.** for identified extra fuel planning during AR:

BLOCK 10: **TAXI**:

(23) Insert 2.5. Add additional fuel as necessary for known ground delays; use 100 lbs/ per minute.

BLOCK 12: **ACTUAL RAMP**:

From step (1).

Table 14.2. Identified Extra Fuel Planning for Air Refueling.

TEMPERATURE CORRECTION	+/- 3% of block 3 fuel for each +/- 10 degree C enroute temp deviation
KNOWN HOLDING DELAYS	200 lbs/ per minute of expected delay
OFF COURSE MANEUVERING	500 lbs/per minute based on the anticipated increase of flight time, not time spent maneuvering. Examples include terrain or weather avoidance, expected ATC delay, etc.
ENGINE ANTI-ICE	450 lbs/hr
WING ANTI-ICE	650 lbs/hr
ENVIRONMENTAL HI-FLOW	100 lbs/hr
GROUND OPERATIONS/ERO	100 lbs/per minute

Figure 14.11. Air Refueling (A/R) Fuel Planning (part 5 of 13).

15	MAX FORM ALT (24)	REF ALT (25)	AVG (3 & CFP) (26)
	MIN (27) _____ x	PPM (28) _____ =	FUEL (29) _____

BLOCK 15:

(24) **MAX FORM ALT**: From the appropriate FORMATTING CAPABILITY chart using average refueling temp dev and CFP and receiver GW (may have to adjust IAW (31) below). If end refuel tanker GW is unknown, use 400,000 pounds for a KC-10 and 150,000 pounds for a KC-135.

(25) **REFUELING ALTITUDE**: From the mission directive, CFP or FLIP.

(26) **AVG (3 & CFP)**: To determine average receiver GW during refueling, add ARCP GW (block 3) to planned end AR GW and divide by two. Planned end AR GW comes from the CFP. The end AR GW on the CFP may have to be adjusted depending on the validity of the inputs. See **Table 14.3.** for an example:

Table 14.3. Air Refueling Fuel Planning Steps.

	CFP	Actual	Difference
Op wt	268.0	279.0	+ 11.0
Payload	86.0	92.0	+ 6.0

Ramp fuel	150.0	160.0	+ 10.0
Fuel onload	50.0	50.0	0
		Total Difference:	+27.0

Since there is a difference of 27,000 pounds between the CFP GW and the Actual GW, the end AR GW needs to be adjusted by adding 27,000 to the CFP end AR GW.

(27) **MIN**: CFP time from ARCP to exit.

(28) **PPM**: Use 350 lbs/per minute.

(29) **FUEL**: Multiply MIN x PPM.

Figure 14.12. Air Refueling (A/R) Fuel Planning (part 6 of 13).

	ITEM	FUEL ON BOARD	GROSS WEIGHT
16	TAKEOFF	(7)	(4)
17	(3 + 8 + 15) BURNOFF TO EXIT 1	SE	(30)
18	(16 - 17) AT EXIT W/O TRANSFER	SE	
19	PLANNED TRANSFER	(31)	
20	(18 + 19) AFTER TRANSFER	SE	PLANNED / ACT (32)/(33)

BLOCK 16: **TAKEOFF**:

Enter takeoff gross weight and fuel on board from steps 4 and 7.

BLOCK 17: **(3 + 8 + 15) BURNOFF TO EXIT 1**:

(30) To obtain gross weight subtract burnoff to exit from takeoff gross weight.

BLOCK 19: **PLANNED TRANSFER**:

(31) From CFP or FRAG.

BLOCK 20: **(18 + 19) AFTER TRANSFER**:

(32) PLANNED: Add planned transfer to block 17 gross weight. Annotate this figure in BLOCK 42 EXIT GWT for single air refueling.

(33) ACTUAL: in-flight entry.

FOR SINGLE A/R FUEL PLANNING, SKIP TO BLOCK 42.

Figure 14.13. Air Refueling (A/R) Fuel Planning (part 7 of 13).

NO.	AR 1 EXIT TO AR 2 (When Applicable)				
21	EXIT GWT (32)	CHG IN FL SE	△ CLIMB FUEL (34)	L.O. FUEL (35)	L.O. TEMP DEV (36)
	HIGHEST ACC FLT LVL (37)	LVL OFF ALT (38)	LVL OFF GWT (39)	TEMP DEV (40)	ENDURANCE (41)
NO.	ITEM		TIME	FUEL	GROSS WEIGHT
22	ENROUTE TO ARCP 2	PAGE	(42)		
23	RESERVE		(43)		
24	(1+2) ENROUTE+RESERVE		SE	(44)	(45)
25	△ CLIMB FUEL			(34)	
26	AIR DIST_____ RECOVERY		(46)	(47)	

BLOCK 21:

EXIT GWT: From step 32, enter Block 20 planned exit gross weight.

CHG IN FL: Self Explanatory.

(34) **CLIMB FUEL**: Use 4.0. Annotate in Block 46.

The blocks on the AMC Form 160 to the right of ? CLIMB FUEL should be labeled L.O. FUEL and L.O. TEMP DEV respectively. They a currently each labeled L.O. ALT.

(35) **L.O. FUEL**: Block 20 fuel minus ? climb fuel.

(36) **L.O. TEMP DEV**: Temp dev at level off altitude after AR (from CFP or forecast).

(37) **HIGHEST ACC CONSTANT FL**: Extract cruise ceiling from FUEL TO CLIMB or CRUISE CEILING chart using planned exit GW and the appropriate forecast level off temp dev. Check compatibility with ATC and direction of flight.

(38) **LVL OFF ALT**: ALTRV, CFP, or planned level off altitude.

(39) **LVL OFF GWT**: Exit GW minus delta-climb fuel.

(40) **TEMP DEV**: CFP average temp dev from exit to destination.

(41) **ENDURANCE**: Use 16.0 per hour and convert to time. In-flight use the MC.

BLOCK 22: **ENROUTE TO ARCP 2**:

(42) Verify route of flight. Use CFP en route time.

BLOCK 23: **RESERVE**:

(43) Use CFP time. For manual flight planning calculate 10% of CAT I route if applicable.

BLOCK 24: **(22 + 23) ENROUTE + RESERVE**:

(44) Use CFP fuel.

(45) BDP GW = exit GW minus block 45 fuel.

BLOCK 25: **D CLIMB FUEL**:

From step 34. Use 4.0.

BLOCK 26: **AIR DIST ALTERNATE & MISSED APP**:

(46) Determine the most suitable (more distant, if filing two) alternate based on weather and NOTAM information. Use CFP ZT.

(47) Use CFP fuel plus 5.0. Program the MC with the identical route and compare fuel. If a more restrictive profile is planned add fuel accordingly.

Figure 14.14. Air Refueling (A/R) Fuel Planning (part 8 of 13).

27	HOLDING AT _____	(48)	(49)	
28	DESCENT APP AND LANDING	(50)	(51)	
29	(24 + 25 + 26 + 27 + 28) SUBTOTAL		SE	
30	IDENT EXTRA		(52)	
31	(29 + 30) REQUIRED AT EXIT		SE	
32	(20) PLANNED AT EXIT		SE	
33	ACTUAL AT EXIT		(53)	

BLOCK 27: **HOLDING AT**:

(48) Normally use +45. Use 1+15 if alternate is unavailable, located in Alaska, or at latitudes greater than 59 degrees.

(49) Use 12.0 for +45, and 20.0 for 1+15. These are nominal figures for a 400,000# aircraft holding at 10,000. These fuel numbers are for fuel planning calculations only. If holding is actually accomplished, use MC endurance holding at optimum altitudes and airspeeds, if required.

BLOCK 28: **DESCENT APP AND LANDING**:

(50) As depicted on the CFP (time for descent and 15 minutes for approach). On a manual flight plan, use 35 minutes (descent for 20 minutes plus 15 minutes for approach and landing).

(51) Insert 4.3.

BLOCK 30: **IDENTIFIED EXTRA**:

(52) Use **Table 14.3.** for identified extra fuel planning:

BLOCK 32: **(20) PLANNED AT EXIT**:

From BLOCK 20.

BLOCK 33: **ACTUAL AT EXIT**:

(53) In-flight entry.

Table 14.4. Identified Extra Fuel Planning for Air Refueling.

TEMPERATURE CORRECTION	+/- 3% of block 3 fuel for each +/- 10 degree C enroute temp deviation
KNOWN HOLDING DELAYS	200 lbs/ per minute of expected delay
OFF COURSE MANEUVERING	500 lbs/per minute based on the anticipated increase of flight time, not time spent maneuvering. Examples include terrain or weather avoidance, expected ATC delay, etc.
INSUFFICIENT/UNRELIABLE NAVAIDS (at destination)	5000 lbs
ENGINE ANTI-ICE	450 lbs/hr
WING ANTI-ICE	650 lbs/hr
ENVIRONMENTAL HI-FLOW	100 lbs/hr
GROUND OPERATIONS/ERO	100 lbs/per minute

Figure 14.15. AirRefueling (A/R) Fuel Planning (part 9 of 13).

34	(33- 31) STORED FUEL		SE	
35	(26+ 27 + 28) REQUIRED AT ARCP 2		SE	
36	MAX FORM ALT (54)	REF ALT (55)		AVG (2+&CFP) (56)
	MIN (57) _____ x	PPM (58) _____ =	FUEL (59) _____	

BLOCK 34: **(33 - 31) STORED FUEL**:

Self Explanatory.

BLOCK 35: **(26 + 27 + 28) REQUIRED AT ARCP 2**:

Self Explanatory.

BLOCK 36:

(54) **MAX FORM ALT**: From the appropriate FORMATTING CAPABILITY chart using average refueling temp dev and CFP and receiver GW (may have to adjust IAW (31) below). If end refuel tanker GW is unknown, use 400,000 pounds for a KC-10 and 150,000 pounds for a KC-135.

(55) **REFUELING ALTITUDE**: From the mission directive, CFP or FLIP.

(56) **AVG (3 & CFP)**: To determine average receiver GW during refueling, add ARCP GW (block 3) to planned end AR GW and divide by two. Planned end AR GW comes from the CFP. The end AR GW on the CFP may have to be adjusted depending on the validity of the inputs. For example see **Table 14.5.**

(57) **MIN**: CFP time from ARCP to exit.

(58) **PPM**: Use 350 lbs/per minute.

(59) **FUEL**: Multiply MIN xPPM.

Table 14.5. Air Refueling Fuel Planning Steps Example.

	CFP	Actual	Difference
Op wt	268.0	279.0	+ 11.0
Payload	86.0	92.0	+ 6.0
Ramp fuel	150.0	160.0	+ 10.0
Fuel onload	50.0	50.0	0
		Total Difference:	+ 27.0

NOTE: Since there is a difference of 27,000 pounds between the CFP GW and the Actual GW, the end AR GW needs to be adjusted by adding 27,000 to the CFP end AR GW.

Figure 14.16. Air Refueling (A/R) Fuel Planning (part 10 of 13).

	ITEM	FUEL ON BOARD	GROSS WEIGHT
37	AFTER TRANSFER 1	(60)	(61)
38	(24 + 25 + 30 + 36) BURNOFF TO EXIT 2	SE	(62)
39	(37 - 38) AT EXIT W/O TRANSFER	SE	
40	PLANNED TRANSFER	(63)	
41	(39 + 40) AFTER TRANSFER 2	SE	PLANNED / ACT (64)/(65)

BLOCK 37: **AFTER TRANSFER 1**:

(60) Enter actual fuel on board from BLOCK 20.

(61) In-flight entry.

BLOCK 38: **(24 + 25 + 30 + 36) BURNOFF TO EXIT 2**:

(62) To obtain gross weight subtract burnoff to exit 2 fuel from after transfer 1 gross weight.

BLOCK 40: **PLANNED TRANSFER**:

(63) From CFP or FRAG.

BLOCK 41: **(39 + 40) AFTER TRANSFER 2**:

(32) PLANNED: Add planned transfer to BLOCK 38 gross weight. Annotate this figure in BLOCK 42 EXIT GWT.

(33) ACTUAL: in-flight entry.

CONTINUE WITH BLOCK 42

Figure 14.17. Air Refueling (A/R) Fuel Planning (part 11 of 13).

NO.	AR 1 EXIT TO DESTINATION				
42	EXIT GWT (32)	CHG IN FL SE	△ CLIMB FUEL (34)	L.O. FUEL (35)	L.O. TEMP DEV (36)
	HIGHEST ACC (37)	LVL OFF ALT (38)	LVL OFF GWT (39)	TEMP DEV (40)	ENDURANCE (41)
	ITEM		TIME	FUEL	GROSS WEIGHT
43	ENROUTE TO OH / BDP	PAGE	(42)		
44	RESERVE		(43)		
45	(43 + 44) ENROUTE TO OH / BDP + RESERVE		SE	(44)	(45)
46	△ CLIMB FUEL			(34)	
47	AIR DIST_____ ALTERNATE & MISSED APP		(46)	(47)	

BLOCK 42:

EXIT GWT: From step 32, enter Block 20 planned exit gross weight.

CHG IN FL: Self Explanatory.

(34) **D CLIMB FUEL**: Use 4.0. Annotate in Block 46.

(35) **L.O. FUEL**: Block 20 fuel minus D climb fuel.

(36) **L.O. TEMP DEV**: Temp deviation at level off altitude after AR (from CFP or forecast).

(37) **HIGHEST ACC CONSTANT FL**: Extract cruise ceiling from FUEL TO CLIMB or CRUISE CEILING chart using planned exit GW and the appropriate forecast level off temp dev. Check compatibility with ATC and direction of flight.

(38) **LVL OFF ALT**: ALTRV, CFP, or planned level off altitude.

(39) **LVL OFF GWT**: Exit GW minus delta-climb fuel.

(40) **TEMP DEV**: CFP average temp deviation from exit to destination.

(41) **ENDURANCE**: Use 16.0 per hour and convert to time. In-flight use the MC.

BLOCK 43: **ENROUTE TO OH / BDP**:

(42) Verify route of flight. Use CFP en route time.

BLOCK 44: **RESERVE**:

(43) Use CFP time. For manual flight planning calculate 10% of CAT I route if applicable.

BLOCK 45: **(43 + 44) ENROUTE TO OH / BDP + RESERVE**:

(44) Use CFP fuel.

(45) BDP GW = exit GW minus block 45 fuel.

BLOCK 46: **D CLIMB FUEL**:

From step 34. Use 4.0.

BLOCK 47: **AIR DIST ALTERNATE & MISSED APP**:

(46) Determine the most suitable (more distant, if filing two) alternate based on weather and NOTAM information. Use CFP ZT.

(47) Use CFP fuel plus 5.0. Program the MC with the identical route and compare fuel. If a more restrictive profile is planned add fuel accordingly.

Figure 14.18. Air Refueling (A/R) Fuel Planning (part 12 of 13).

48	HOLDING AT _____	(48)	(49)	
49	DESCENT APP AND LANDING	(50)	(51)	
50	(45 + 46 + 47 + 48 + 49) SUBTOTAL		SE	
51A	IDENT EXTRA		(52)	
51B	STORED FUEL		SE	
52	(50 + 51A + 51B) REQUIRED AT EXIT		SE	

BLOCK 48: **HOLDING AT**:

(48) Normally use +45. Use 1+15 if alternate is unavailable, located in Alaska, or at lattitudes greater than 59 degrees.

(49) Use 12.0 for +45, and 20.0 for 1+15. These are nominal figures for a 400,000# aircraft holding at 10,000. These fuel numbers are for fuel planning calculations only. If holding is actually accomplished, use MC endurance holding at optimum altitudes and airspeeds, if required.

BLOCK 49: **DESCENT APP AND LANDING**:

(50) As depicted on the CFP (time for descent and 15 minutes for approach). On a manual flight plan, use 35 minutes (descent for 20 minutes plus 15 minutes for approach and landing).

(51) Insert 4.3.

BLOCK 50: **(45 + 46 + 47 + 48 + 49) SUB TOTAL**:

Self Explanatory.

BLOCK 51A: **IDENTIFIED EXTRA**:

(52) Use the following **Table 14.6.** for identified extra fuel planning:

BLOCK 51B: **STORED FUEL**:

Self Explanatory.

BLOCK 52: **(50 + 51A + 51B) REQUIRED AT EXIT**:

Self Explanatory.

Table 14.6. Identified Extra Fuel Planning #3.

TEMPERATURE CORRECTION	+/- 3% of block 3 fuel for each +/- 10 degree C enroute temp deviation
KNOWN HOLDING DELAYS	200 lbs/ per minute of expected delay
OFF COURSE MANEUVERING	500 lbs/per minute based on the anticipated increase of flight time, not time spent maneuvering. Examples include terrain or weather avoidance, expected ATC delay, etc.
INSUFFICIENT/UNRELIABLE NAVAIDS (at destination)	5000 lbs
ENGINE ANTI-ICE	450 lbs/hr
WING ANTI-ICE	650 lbs/hr
ENVIRONMENTAL HI-FLOW	100 lbs/hr
GROUND OPERATIONS/ERO	100 lbs/per minute

Figure 14.19. Air Refueling (A/R) Fuel Planning (part 13 of 13).

53	(20 OR 41) PLANNED AT EXIT		SE	
54	ACTUAL AT EXIT		(53)	
55	(54 - 52) UNIDENTIFIED EXTRA		(54)	
56	(47 + 48 + 49) REQUIRED AT DEST		SE	
57	(45 + 46 + 49 + 51A) BURNOFF TO DEST		SE	
58	20 OR 41 - 57) LANDING FUEL		(55)	

BLOCK 53: **(20 OR 41) PLANNED AT EXIT**:

Self Explanatory. Use BLOCK 20 for single A/R flight planning.

BLOCK 54: **ACTUAL AT EXIT**:

(53) In-flight entry.

BLOCK 55: **(54 - 52) UNIDENTIFIED EXTRA**:

(54) In-flight entry.

BLOCK 56: **(47 + 48 + 49) REQUIRED AT DEST**:

Self Explanatory.

BLOCK 57: **(45 + 46 + 49 + 51A) BURNOFF TO DESTINATION**:

BLOCK 58: **(20 OR 41 - 57) LANDING FUEL**:

(55) Subtract block 57 from 20 for single A/R flight planning.

Section 14D—Tactical Fuel Planning. Use Figure 14.19. and Figure 14.20. and accompanying text to complete AF Form 4081, Tactical Mission Fuel Planning.

Figure 14.20. Tactical Fuel Planning (part 1 of 2).

TACTICAL MISSION FUEL PLANNING

WEIGHT (1)	AIRCRAFT NUMBER (1)	DATE *(Day, Month, Year)* (1)
SSENGER WEIGHT (1)	MISSION NUMBER (1)	WINDS VALID (2)
(1)	CFPI NUMBER (1)	INITIAL LEVEL OFF TEMPERATURE DEVIATIO (3)
HT (1)	FUEL PLAN MACR 55-	HIGHEST ACC FL TO TAC (7)
EMPERATURE DEVIATION (1)	NAVIGATOR	

ITEM		TIME	FUEL	GROS
EO FF				
ARTURE TO ORBIT POINT AND RESERVE	PAGE	(8)	(10)	
IT	FUEL FLOW RATE *(1000 lbs/hr)* (12)	(8)	(13)	
/ LEVEL ROUTE	FUEL FLOW RATE *(1000 lbs/hr)* (12)	(8)	(13)	

(1) **OPERATING WEIGHT / CARGO PAX WEIGHT / RAMP FUEL / MISSION NUMBER / AIRCRAFT NUMBER DEPARTURE AND DESTINATION:** Normally supplied by the command post, but may be extracted from the aircraft forms or determined by the aircrew. Use 276.5 for operating weight. Takeoff GW = actual ramp GW minus taxi and run-up fuel (block 10). Annotate ramp fuel in BLOCK 12: ACTUAL RAMP fuel column.

(2) **CFP NUMBER / WINDS VALID**: From the CFP. CFPI number left blank when manually flight planning.

(3) **INITIAL LEVEL OFF TEMP**: Use OH temp dev for estimated level off.

(6) **TAKEOFF GW:** Ramp GW minus block 12 fuel.

(7) **HIGHEST ACC FL TO TAC**: Extract from the CRUISE CEILING chart using the appropriate level off temp dev. Use block 1 GW for "To TAC" highest acceptable, use block 6 GW after low level "After TAC".

(8) **DEPARTURE TO ORBIT POINT AND RESERVE / ORBIT / LOW LEVEL ROUTE / OBJECTIVE AREA TO ASCENT POINT / ASCENT POINT TO RECOVERY BASE AND RESERVE / ALTERNATE FUEL AND MISSED APPROACH / HOLDING**: Same as standard air-

land fuel planning. Calculate climb, en route, and descent time to the low level entry point. Reserve and holding fuel are as in standard airland fuel planning.

The tendency is to "pad" fuel for these operations. This practice severely impacts ACL during contingency operations. Be conservative, not extravagant.

(10) **DEPARTURE TO ORBIT POINT AND RESERVE (Fuel)**: Same as standard airland fuel planning. Add identified extra from **Table 14.1.** to this computation.

(11) **DEPARTURE TO ORBIT POINT AND RESERVE (Gross Weight)**: Block 1 GW minus block 2 fuel.

(12) **ORBIT / LOW LEVEL / OBJECTIVE AREA TO ASCENT POINT (Fuel Flow):** Use 18,000 lbs/hr.

(13) **LOW LEVEL ROUTE (Fuel)**: Multiply fuel flow by time.

(14) **ORBIT (Gross Weight):** Block 2 GW minus block 3 fuel.

(15) **LOW LEVEL ROUTE (Gross Weight):** Block 3 GW - block 4 fuel.

Figure 14.21. Tactical Fuel Planning (part 2 of 2).

5	GROSS WEIGHT AFTER AIRDROP/OFFLOAD	AIRDROP/OFFLOAD WEIGHT		NOTE ROLL (16)	(17)
6	OBJECTIVE AREA WEIGHT TO ASCENT POINT	FUEL FLOW RATE (1000 lbs/hr) (12)	(8)	(13)	(18)
7	ASCENT POINT TO RECOVERY BASE AND RESERVE (At gross weight from Block 6)	PAGE	(8)	(20)	(21)
8	ALTERNATE FUEL AND MISSED APPROACH (At gross weight from Block 7)		(8)	(22)	(23)
9	HOLDING (At gross weight from Block 8)		(8)	(8)	(24)
10	APPROACH AND LANDING		(9)	(9)	(25)
11	FPFL (Add Blocks 2 through 10)			(26)	
12	GROUND OPERATIONS AND TAKEOFF (100 lbs/minute for ground ops plus 500 lbs)		(4)	(5)	
13	REQUIRED RAMP FUEL (11 plus 12)			(26)	
14	ACTUAL RAMP FUEL			(1)	
15	EXTRA FUEL (14 minus 13)			(26)	
16	REQUIRED OVERHEAD DESTINATION FUEL (8 + 9 + 10)			(26)	
17	FUEL BURNOFF (2 + 3 + 4 + 5 + 6 + 7 + 16)			(26)	

TERMINAL ALTERNATE	AIR DISTANCE	TIME	LEVEL OFF TEMP DEVIATION	HIGHEST ACC FL AFTER TAC	ENDURANCE (14 minus 12)
(1)	(1)	(1)	(19)	(8)	(27)

(1) **ACTUAL RAMP FUEL / TERMINAL ALTERNATE / AIR DISTANCE / TIME:** Same as standard airland fuel planning.

(4) **GROUND OPERATIONS AND TAKEOFF (Time):** Time from engine start to brake release.

(5) **GROUND OPERATIONS AND TAKEOFF (Fuel):** Multiply time by 100 pounds per minute.

(9) **APPROACH AND LANDING (Time and Fuel):** If manually computing, use 35 minutes and 4.3 for both descent as well as approach and landing at the final destination.

(13) **OBJECTIVE AREA WEIGHT TO ASCENT POINT (Fuel)**: Multiply fuel flow by time.

(16) **GROSS WEIGHT AFTER AIRDROP/OFFLOAD (Fuel)**: Disregard SOLL note. For airland missions, add fuel for ground operations (100 pounds per minute), missed approach fuel (5.0), objective area holding (if required).

(17) **GROSS WEIGHT AFTER AIRDROP/OFFLOAD (Weight)**: Block 4 GW minus block 5 airdrop/offload weight and block 5 fuel.

(18) **OBJECTIVE AREA WEIGHT TO ASCENT POINT (Weight)**: Block 5 GW minus block 6 fuel.

(19) **LEVEL OFF TEMP DEVIATION:** Average en route temp deviation from CFP or weather forecast (from initial level off to BDP).

(20) **ASCENT POINT TO RECOVERY BASE AND RESERVE (Fuel):** Calculate climb, en route, and descent time to the low level entry point. Reserve is the same as in standard airland fuel planning. Add identified extra fuel as required.

(21) **ASCENT POINT TO RECOVERY BASE AND RESERVE (Weight):** Block 6 GW - block 7 fuel.

(22) **ALTERNATE FUEL AND MISSED APPROACH (Fuel):** Same as standard airland.

(23) **ALTERNATE FUEL AND MISSED APPROACH (Weight):** Block 7 GW minus block 8 fuel.

(24) **HOLDING (Weight):** Block 8 GW minus block 9 fuel.

(25) **APPROACH AND LANDING (Weight):** Block 9 GW minus block 10 fuel.

(26) **FPFL / REQUIRED RAMP FUEL / EXTRA FUEL / REQUIRED OVERHEAD DESTINATION FUEL / FUEL BURNOFF**: Self-explanatory.

(27) **ENDURANCE:** Convert to time, using block 14,12 fuel.

Chapter 15

AIR REFUELING

15.1. AR Limitations. This chapter establishes procedures for aircrews to air refueling aboard the C-17 and is in addition procedures in the flight manual, air refueling manual.

15.1.1. Refueling During Training Missions. AR should not be accomplished during training missions when:

15.1.1.1. Conditions are encountered that, in the opinion of the aircraft commander, result in marginal control of either aircraft or the boom.

15.1.1.2. Either the tanker or the receiver has less than the full number of engines operating.

15.1.2. Tanker Autopilot. Tanker pilots must notify receiver pilots when any axis of the autopilot is not used. If the tanker copilot is required to fly autopilot-off for training, unqualified receiver pilots will not fly the aircraft (N/A CCTS). Tanker pilots must notify the receiver when copilot autopilot-off training is conducted and receive confirmation that the receiver pilot flying the aircraft is qualified.

15.1.3. AR Without Tanker Disconnect Capability. Without tanker disconnect capability means the boom operator cannot trigger an immediate disconnect. AR will not be conducted after a known loss of tanker disconnect capability.

EXCEPTION 1: Fuel emergency situation.

EXCEPTION 2: Contingency missions, JCS alert, ORI or CORI, Prime Nuclear Airlift Force (PNAF) support missions under normal conditions when the refueling is essential for home base recovery, or for any mission when authorized.

NOTE: When conducting AR without tanker disconnect capability, limit contacts to the minimum number necessary to complete mission requirements. Do not accomplish boom limit demonstrations, or practice emergency separations while in the contact position.

15.1.4. Emergency Boom Latching**.** This is an emergency procedure. Tanker automatic disconnect limits and tanker normal and manual disconnect capability is inoperative. Use of this procedure will be authorized in the mission directive.

NOTE: Boom operator and receiver pilot must coordinate all actions as required by applicable directives and checklists when making AR contacts using emergency boom latching procedures.

15.1.5. Reverse AR procedures can be accomplished for operational necessity only.

15.1.6. Practice Emergency Separations:

15.1.6.1. Prior to the actual accomplishment of a practice emergency separation, coordination between the tanker pilot, boom operator, and receiver pilot is mandatory. Coordination must include when the separation will occur and who will give the command of execution.

15.1.6.2. Prior to initiating practice emergency separations from the contact position, the receiver will ensure their AR system is not in the override mode.

15.1.7. Receiver AR Training for Unqualified Receiver Pilots. (This includes copilots, aircraft commander upgrade candidates and aircraft commanders refueling from the right seat.). In-flight training will be accomplished under direct IP supervision. The following procedures apply:

15.1.7.1. The receiver pilot must inform and receive acknowledgment from the tanker. The boom operator operating the boom controls must be qualified for the applicable category receiver. (This restriction does not apply during CCTS training provided the student boom operator is under direct instructor supervision.).

15.1.7.2. If the tanker autopilot is off, the tanker copilot will not fly the aircraft. (This restriction does not apply during CCTS training provided the student receiver pilot and the student tanker copilot are under direct IP supervision.).

15.1.7.3. For receiver pilot initial qualification or requalification, the receiver instructor / examiner pilot will be in one of the pilot seats with immediate access to the controls through all phases of the refueling from pre-contact until post air refueling.

15.1.8. If a change of pilot control is made, the receiver aircraft will move back to at least the pre-contact position except for immediate assumption of control by the instructor pilot.

15.1.9. If a receiver seat change takes place, move back to at least 100 feet in trail of the tanker and to a point where the receiver pilot can maintain visual contact with the tanker until the seat change is completed.

15.1.10. When conducting AR behind a KC-135, tanker disconnect capability must be demonstrated by a boom operator initiated disconnect before conducting a limit demonstration or a practice emergency separation from the contact position.

15.1.11. Weather Limitations.

15.1.11.1. Turbulence: Do not launch if severe turbulence is forecast on the refueling track. Terminate refueling if moderate turbulence is encountered.

15.1.11.2. Visibility: Do not close from 1 NM range (2 NM for receiver cell or tanker cell formations) unless you have visual contact with the tankers. Discontinue refueling if in-flight visibility is insufficient to continue safe refueling operations.

15.1.11.3. Recovery airfield must meet the weather criteria of AFI 11-202V3, for alternate airports.

15.2. Receiver Aircraft Commander Responsibilities.

15.2.1. Receiver aircraft shall squawk normal when separation from the tanker is greater than 3 miles.

15.2.2. Receiver aircraft will maintain two-way radio contact with ATC until cleared to the aerial refueling block altitude, established in that block, and cleared to the AR frequency by ATC.

15.3. ATC Clearance.

15.3.1. Altitude Reservations (ALTRV). Air refueling operations normally are done on tracks or anchor areas published in the DOD Flight Planning Document (FLIP). Certain missions or operational considerations may require air refueling operations in areas not published in FLIP. ALTRVs are often used for this.

15.3.1.1. ALTRVs may include all, a portion, or portions of the route. On operational missions, ALTRVs usually are provided for the refueling portions of the route. In some cases, ALTRVs are provided from the point of departure to a specified point short of the destination.

15.3.1.2. Aircraft operating on an ALTRV must operate within the altitude, time, and areas specified. Actual fix timing will not exceed 10 minutes from ALTRV estimates, otherwise the ALTRV will be cancelled by ATC.

15.3.1.3. The mission must be airborne within a certain time period. The end of this period is the assigned void time (AVANA). This ensures separation between aircraft. Unless otherwise specified, AVANA is 1 hour after ALTRV published departure time.

15.3.1.4. If a mission is delayed beyond AVANA, rescheduling normally is by 24-hour increments based on the original departure time. It may be less provided the Central Altitude Reservation Function (CARF) and affected air traffic control agencies concur.

15.3.1.5. An ALTRV does not preclude ATC from using ALTRV airspace provided standard separation is applied between all aircraft.

15.3.2. ALTRV Format. See FAA 7610.4H, *Special Military Operations.*

15.3.3. Filing:

15.3.3.1. An ALTRV approval includes a complete description of the route, including altitudes to be flown. When filing a DD Form 175, you do not need to repeat this in the route of flight portion of the flight plan. When filing a DD Form 1801, this information is repeated in the route of flight portion. In either case, include the term ALTRV plus the nickname/code name of the ALTRV; e.g., ALTRV VOLANT BOOM 2N3/6, in the remarks section of the flight plan.

15.3.3.2. If the ALTRV is to a point short of destination, the route of flight after the ALTRV must be identified on the flight plan. To complete the route of flight portion of the flight plan, identify the ALTRV as before, immediately followed by end ALTRV coordinates or fix, and a subsequent route description.

15.4. Communications Failure. Aircraft experiencing two-way communications failure during the conduct of AR shall continue flight in accordance with the following procedures:

15.4.1. Squawk code 7600 for at least 2 minutes before exiting the track or anchor.

15.4.2. Aircraft that have not received altitude instructions beyond the exit point shall exit the track or anchor at the lowest altitude specified in the clearance for the refueling portion of the flight and proceed in accordance with "Procedures for Two Way Radio Failure IFR-VFR" set forth in DOD Flight Information Handbook.

15.5. MARSA Applicability for Aerial Refueling. MARSA begins between the tanker and receiver when the tanker advises ATC that it is accepting MARSA. MARSA is not an ICAO recognized term. If in doubt as to what separation is provided by ATC, or what separation the aircrew is responsible for, query the tanker and/or controlling agency.

15.5.1. If MARSA has not been accepted by the tanker before receiver reaching the air refueling initial point (ARIP), the receiver may be required to hold at the ARIP.

15.5.2. Once the rendezvous is completed, headings and altitude assignments may be made with the tanker concurrence with MARSA remaining in effect.

15.5.3. Upon completion of the rendezvous, receiver aircraft will remain within 3 miles of the tanker until MARSA is terminated.

15.5.4. MARSA ends when normal separation standards are established, ATC accepts control at end of refueling and ATC advises MARSA is terminated.

15.6. Operational Reporting. Air refueling command and control reporting will be in accordance with **Chapter 2** of this instruction.

Chapter 16

COMBAT MISSION PLANNING

16.1. General. Airlift crews must be capable of employing a wide range of tactics when operating in hostile areas. This chapter provides combat mission planning guidance for planners and aircrews, standardizing procedures for planning, briefing, and reviewing all missions. Mission planning is normally conducted the day before the mission. Operations group commanders may elect to use a "same day mission plan" option. The aircraft commander is ultimately responsible for the accuracy of the mission materials. Unit mission planning facilities should possess essential mission planning material.

16.1.1. References. See **Attachment 1**.

16.1.2. Mission Tasking. Combined or joint task force operations, combat contingency operations, or actual combat operations require an alteration of standard peacetime mission tasking procedures. Deployed forces will require both intertheater and intra theater airlift support. A Director of Mobility Forces (DIRMOBFOR) will be assigned to the Air Force Component Commander (AFCC) to help facilitate both types of airlift. The DIRMOBFOR commands the Air Mobility Division (AMD) within the Air Operations Center (AOC) which tasks, plans, and controls all intra theater airlift missions, usually performed by units/aircraft which have been "CHOPed" (change of operational control, normally C-130s) to the theater task force commander. An Air Mobility Element (AME), a deployed unit of the TACC, will be co-located within the AMD and functions as a liaison between the TACC and the theater. The AME coordinates and plans intertheater and direct delivery missions and mission support with theater command and control elements and provides required theater information to TACC for distribution to aircrews. For large formation operations, detailed mission planning may be delegated to participating units and aircrews. Refer to Air Force Doctrine Document (AFDD) 2-6, *Air Mobility*, AFDD 2-6.1, *Airlift Operations*, and AFTTP 3-1V1 for more specific information.

16.1.3. Concept of Operation. Joint airborne operations will be initiated by a unified or joint force commander (JFC). When an airborne operation is necessary, the JFC ordering the operation furnishes participating units with an initiating directive or operations order (OPORD). This directive specifies the missions, outlines the command structure, identifies participating ground and air forces, lists supporting forces, and provides a schedule of events based on the ground tactical plan and available airlift capabilities.

16.1.4. Mission Feasibility Study. Prior to specific tasking and detailed mission planning, a preliminary study must be done to develop mission profiles and determine the potential for mission success. Feasibility studies are usually done at the joint command level but may be delegated as low as the individual aircrew. AMCMAN 11-211 contains an outline of considerations to help determine if a mission can be executed as requested.

16.1.5. Mission Commander. **Chapter 2** of this instruction specifies mission commander requirements and qualification criteria. AMCMAN 11-211 and AFTTP 3-1V1 contain a mission commander's checklist that is intended to assist mission commanders with their duties and responsibilities.

16.1.6. Mission Planning Staff. The planning staff should include, as a minimum, the mission commander, pilot, loadmaster, plans/tactics, and intelligence. Other staff functions such as weather, airspace management, communications, logistics, aerial port and special tactics may also be required.

16.1.7. Mission Planning Folders (MPF). Combat mission planning folders contain essential operational and intelligence data required to plan, study, and execute airlift operations. MPFs should be developed and used for peacetime training and wartime tasking. They also provide an historical record for subsequent mission planning. AFTTP 3-1V1, contains a standardized MPF format that may be modified to fit specific tasking. Organizational uniformity of the MPF will be maintained.

16.2. Mission Planning. The first steps in planning are to analyze the tasking, gather all pertinent information, and decide what additional support is required. Having this information on hand before developing the detailed plan will save time in the long run. Planners must thoroughly study en route threats, terrain, ingress and egress routes, target areas, operations and communications security (OPSEC and COMSEC), political and cultural characteristics, climatology, and any other factors which enhance mission success. Intelligence and meteorology and/or climatology requirements must be identified early because this information may not be readily available. Mission support requests must also be processed as soon as possible to allow coordination and planning. The level of coordination is dependent on available time and means of communication. Aircrews must be ready to operate in the joint arena with little or no face-to-face coordination.

16.2.1. Tasking Order Analysis. The theater AOC in coordination with the AME will publish an operations order (OPORD), air tasking order (ATO), airspace coordination order (ACO), fragmentary order (FRAG), and/or air movement table (AMT) to establish mission objectives. ATO contents are discussed in AMCMAN 11-211 and AFTTP 3-11.

16.2.1.1. OPORD. An OPORD usually covers overall concepts of operations and mission requirements to be flown during a future time period (such as a week or more).

16.2.1.2. ATO. An ATO may be issued daily by the AFACC or DIRMOBFOR to supplement the OPORD and avoid repetition. An ATO will task elements of composite forces, provide mission objectives and general guidance, and indicate actions required by individual situations. The AME will normally publish an ATO or air movement schedule (AMS) governing airlift missions planned for the next 24 hours. ATOs and AMSs are normally accompanied by special instructions (SPINS) which provide detailed instructions for composite forces. A standardized ATO format for theater assigned forces can be found in AFP 102-2V1, *Joint Users Handbook—US Message Text Format (JUH-USMTF)*, Air Tasking Order/Confirmation (ATOCONF), and AFTTP 3-1V1. Airspace control procedures may be implemented in the ATO, SPINS, or published in a separate Airspace Coordination Order (ACO). Planners and aircrew must understand and comply with all aspects of current airspace control procedures. The following items can be extracted from the ATO:

16.2.1.2.1. Mission number.

16.2.1.2.2. Security classification.

16.2.1.2.3. Tasking organization.

16.2.1.2.4. Concept of operations and mission description to include type of mission, assault zone description, required aircraft and aircrews, and participating forces and units.

16.2.1.2.5. Schedule of events.

16.2.1.2.6. Rules of engagement (ROE).

16.2.1.2.7. Communications & Electronic Operating Instructions (CEOI).

16.2.1.2.8. Special Instructions (SPINS).

16.2.1.2.9. Command and control instructions.

16.2.1.2.10. Scheduled airlift support (e.g. JSEAD, AWACS, ABCCC, CAP, etc.).

16.2.1.2.11. Airspace management procedures, to include IFF/squawks, airspace control center coordination (e.g. ALCC, TACS, AAGS, ATAF), air defense network procedures, prohibited/restricted area procedures, and route de-confliction.

16.2.1.3. Air Movement Table (AMT). The DIRMOBFOR's transportation staff should develop an AMT as an appendix to the ATO to list equipment and personnel that constitute each aircraft load. An abbreviated ATO or FRAG may be issued to subordinate units to further refine the ATO and air movement plan.

16.2.2. Schedule of Events. After receiving formal mission tasking, planners construct a schedule of events checklist to assist in keeping the mission, from planning through execution, on schedule. Some mission events (e.g., TOTs, available CAF support, etc.) will be specified in the tasking document. AMCMAN 11-211 and AFTTP 3-1V1, provides a suggested list of significant mission events.

16.2.3. Intelligence Requirements. Current intelligence is vital. Incomplete or outdated information reduces the probability of success and survivability. Intelligence personnel will be integrated into the planning cell. They can prepare a reference chart depicting current orders of battle (OB) and significant intelligence/threat information. They predict enemy radar detection capabilities, and obtain imagery of en route or objective area reference points (imagery must be requested early to ensure availability). Targeting specialists can provide radar predictions and target analysis when required.

16.2.4. Meteorology/Climatology Analysis. Weather information will be included in both planning and briefing functions for all missions. The impact of atmospheric and climatic factors depends on the intensity of the condition, the tactics used, and the capability of friendly and enemy forces to operate in degraded weather conditions. Pay particular attention to forecasts of low level winds/turbulence and conditions affecting visibility. AMCMAN 11-211 contains an outline for meteorology/climatology analysis.

16.2.5. Mission Support. Planners need to identify, request, and coordinate additional mission support above that provided in the OPORD and ATO/SPINS. The point of contact for coordination is the AMD and the DIRMOBFOR staff.

16.2.6. Mission Considerations. There is no single, best solution to any tactical situation. The most important concept in developing tactics is to remain unpredictable. Tactical planning must be ingenious and dynamic, while continuing to use sound tactical concepts developed and tested in the past.

16.2.6.1. Enemy Defenses. Avoiding enemy defenses is a critical mission planning factor. The most critical intelligence factors will be the location, capabilities, and limitations of the enemy's OB. Detection may provide the enemy enough warning to deny the objective and direct air defense forces against friendly aircraft.

16.2.6.1.1. Detection. Aircraft can be detected by visual, radar, electronic, and noise signatures. Plan the mission at the highest altitudes that deny detection.

16.2.6.1.2. Radar. Perhaps the most critical detection factor for airlift is radar; however, three vulnerabilities can be exploited: maximum theoretical detection range, degraded low-level

detection (anti-clutter) capabilities, and the masking properties of an obstruction between the antenna and the aircraft.

16.2.6.1.3. Threat Engagement. AFTTP 3-1V2, provides classified threat system information. If a mission is likely to encounter a hostile air defense environment, evaluate threat capabilities and limitations with intelligence personnel.

16.2.6.2. Force Requirements. Planners must provide all support elements (CAP, SEAD, etc.) with the general route, timing, and TOT. Defense suppression and counter-air forces can use this information to seek out and engage enemy defense forces that could pose a threat to the mission. Medium-altitude corridor tactics require more dedicated support, such as brute-force electronic countermeasures (ECM), chaff corridor, and extended counter-air suppression efforts.

16.2.6.3. Navigation. Accurate navigation is crucial. Aircrews must plan to use every resource at their disposal. Carefully evaluate the enemy's capability to detect NAVAID emissions from the aircraft, and plan to navigate without this equipment. On all missions, dead reckoning, map reading, and position awareness are crucial to low-level navigation.

16.2.6.4. Altitude Selection. Selected flight altitude is one of airlift's primary defensive tactics. In a sophisticated air defense network, the lower the aircraft altitude, the lower the probability of detection and engagement. Lower altitude reduces slant range on small arms and AAA systems and may place trees and hills between the aircraft and the threat. The newer tactical SAM systems are capable of attacking targets below 300 feet AGL, so aircrews must be prepared to go to a minimum altitude capable (MAC). In an unsophisticated air defense network having little or no radar coverage, high altitude may be used to avoid small arms, light AAA, and man portable missiles. Plan optimum flight altitudes as high as the threat will allow.

NOTE: The following ranges for low, medium, and high altitude do not correspond to AFTTP 3-1 terminology.

16.2.6.4.1. Minimum Altitude Capable (MAC). MAC is the lowest altitude an aircrew can descend to when they detect or suspect a threat. It is dependent on individual aircrew capabilities, experience level, fatigue factors, terrain clearance, etc. Since maneuvering and navigation capabilities are virtually negated at MAC, descending to this altitude is only warranted as a defensive response to an engaged threat and only for the duration of immediate threat activity.

16.2.6.4.2. Low Altitude (300 feet to 500 feet AGL). Aircraft flying at 500 feet or below may degrade or eliminate a threat system depending on terrain and distance. For airlift aircraft, this altitude range provides optimum terrain clearance for aircraft maneuverability and navigation while countering hostile air defense threat systems. When faced with known threats, every effort must be made to destroy or neutralize them before employing airlift aircraft. Ground controlled intercept (GCI) guided air-to-air engagements will be nearly impossible at low altitudes due to GCI radar limitations and the inability of air interceptors to locate target aircraft and engage air-to-air missiles due to terrain background clutter. Low altitude also reduces an aircraft's IR signature; the lower the altitude, the closer the IR SAM must be to detect the IR radiation. Head-on capabilities of cooled seeker heads are degraded by reducing forward IR signature.

16.2.6.4.3. Middle Altitude (501 feet to 5000 feet AGL). The middle altitude range is the worst threat environment for airlift aircraft because all threats are effective at these altitudes and evasive maneuvers are usually ineffective.

16.2.6.4.4. High Altitude (above 5000 AGL). The high altitude range may negate the small arms threat and decreases the effectiveness of most AAA; however, it dramatically increases the vulnerability to enemy fighter or radar SAM attack and places the aircraft in the worst position to begin evasive maneuvers.

16.2.6.5. Day Versus Night Operations. Night operations degrade optically sighted threat systems and increase the probability that enemy defenses may be in a lowered state of readiness. The disadvantages to night operations are that navigation may be more difficult and, if night vision goggles are not used, the aircraft may be forced up to an altitude where radar tracking is more likely. Additionally, when selecting employment options, consider moonlight that may provide sufficient light for optical threat systems and cockpit/cabin lighting that may increase the probability of acquisition by enemy night vision devices.

16.2.6.6. Rules of Engagement (ROE). The crew must be familiar with the established ROE. CJCSI 3121.10, *Standing Rules of Engagement for US Forces*, applies and may be supplemented for the particular mission. Commanders at all levels may request changes to the ROE through the chain of command. Changes to ROE must be rapidly disseminated to all personnel. The ROE will never limit the inherent right and obligation of individual and unit self-defense. Even if there are no forces declared hostile, commanders will defend their units against a hostile act or hostile intent. The two elements of self-defense are necessity and proportionality. For necessity, a hostile act must occur or there must be a demonstrated intent to commit a hostile act. The threat posed by the hostile act or intent must be imminent. Proportionality infers that the use of force must be reasonable in intensity, duration, and magnitude and must be consistent with the threat to ensure the safety of the force. Individuals will be prepared to act in self-defense. Nothing in the ROE limits crewmembers' rights to take appropriate action to defend themselves.

16.2.6.7. Command and Control (C2). Combat or contingency missions usually follow a sequence of events that affect future missions. Completion of drops, landings, and securing airfields are but a few of the events command and control may need to track. Secure communications and communications counter- measures will be used to the maximum extent possible because radio transmissions in a combat zone can compromise the aircraft's position and the operational security of the objective. Missions should be planned to use minimum radio communications with transmissions made by exception only. Normally, a communications plan or communications and electronic operating instructions (CEOI) will be provided by the user to define communications requirements. In most cases, code words define events and are transmitted when the event occurs or does not occur (through the use of an execution checklist). Radio contact with the drop zone (DZ) should be limited to that required for safety (i.e. ATC directions, range clearance, unsafe surface conditions, and mission changes). DZ winds or other information may be broadcast in the blind at pre-coordinated times before the scheduled TOT. AMCMAN 11-211 and AFTTP 3-1V1, provide guides for C2 considerations during planning.

16.2.6.8. Tactical Deception Planning. Tactical deception is an effective way to mask the mobilization, movement or objectives of friendly forces, protect them during ingress or egress, multiply or hide them. Airlift can be solely a beneficiary of the deception or may be tasked to act as part of an overall plan. Effective deception is executed jointly and must be considered early in the oper-

ational planning process. Tactical surprise and deception enhances combat capability but will not be a condition for its success. Deception tactics are limited only by the imagination of the planner, the enemy's ability to react to the deception, and available resources (see AFI 11-704, *Air Force Tactical Deception*.

16.2.6.9. Formations. In-trail formation is an effective tactic for putting "mass on the DZ" in a small amount of time, a frequent requirement dictated by the ground tactical situation. This is not to say large formations must be flown en route since they are less maneuverable and more susceptible to detection by enemy forces. An alternative is to fly smaller serials or single ship en route and plan to rejoin at a point before the objective area. This allows time compressed operations at the objective area while maintaining tactical surprise and limiting detection. Specific formation procedures are contained in **Chapter 18** of this AFI. When flying multiple station keeping equipment (SKE) formations within 80 NMs, mission planners should use the information in **Table 16.1.** to aid in de-confliction.

Table 16.1. SKE Frequency De-confliction.

SKE Frequency Combinations For Multiple Formations	Minimum Formation Separation Required
Formations on the same frequency (A-A, B-B, C-C, or D-D)	80 NMs
Formations on frequencies separated by 40 MHz (A-C or B-D)	2 NMs
Formations on frequencies separated by 80 MHz (A-D)	2500 ft
Formations on frequencies separated by 120 MHz (A-B or C-D)	300 ft
Formations on frequencies separated by 160 MHz (B-C)	0 ft

NOTE: **Table 16.1.** is based on theoretical limits and not experimental data.

16.2.6.10. Time Control. Select control times without using either extremes of the airspeed envelope to allow maximum flexibility for gaining or losing time. This does not preclude planning high speeds as a tactic to reduce threat exposure time or low speeds to enhance terrain masking or reduce turn radius. Building one or more timing triangles or orbit areas into the route before the objective area is one method of time control; however, factors such as formation size, airspace management, weather, terrain, and threat location must be thoroughly evaluated. Another technique is building a route with optional "timing legs" designed to gain or lose time by cutting corners or extending legs without requiring aircraft to loiter in a defined area and increasing the probability of detection. Regardless of the technique used, the mission must have a briefed time control plan.

16.2.6.11. Airspace Management. Successful employment of airlift in a combat zone demands close coordination and integration with theater airspace managers (including allies). Airspace control requirements will vary depending upon the area or zone of the theater, but are generally more intense and critical the farther forward aircraft are employed in the combat zone. The AMD is responsible for providing this information. Essential airspace management considerations are discussed in AFTTP 3-1V26.

16.2.6.12. Evasion Plan of Action (EPA). Aircrews and/or planners with the assistance of intelligence personnel and life support/survival specialists will develop an EPA. An evasion plan may

be included in the OPORD or SPINS. AMCMAN 11-211 includes suggested EPA planning information.

16.3. Crew Mission Study and Detailed Flight Planning. After mission tasking is analyzed and intelligence, weather, and mission support information is available, detailed mission planning begins. During this phase, the planning staff will study all mission variables to develop a plan that minimizes the threat and optimizes the probability of a successful mission. Route selection should begin at the objective area. Planning should then be done in reverse from the objective to the IP/FAF, then to the low level or combat entry point and then to the departure base. Egress routing is then planned from the objective area to the combat exit point and recovery base. Planning routes with the most detailed scale charts available provide enhanced chart details. JOG (1:250,000) charts, if available, are recommended for planning the route to and from the objective area. Flight planning emphasis should be placed on the topographical features at least 10 NM either side of the intended flight path.

16.3.1. Objective Area Planning. The most important segment of the route is from the IP/FAF to the objective. On this segment threat avoidance, navigation, and timing are most critical. The IP should be an easily definable visual point, unique in appearance and not subject to significant alteration.

16.3.1.1. Plot the objective (target) using the most detailed scale chart available. The area should also be examined using any available imagery.

CAUTION: 1:50,000 and smaller scale maps do not depict aeronautical information, may not show man-made obstacles, and are rarely updated through the CHUM.

16.3.1.2. Evaluate hostile defenses/OBs within the area of operation. Initially plot maximum effective radar/threat ranges for worst case drop altitudes without regard to terrain masking.

16.3.1.3. For airdrop missions, select the IP and pre-initial point (pre-IP) based on the safest approach to the objective area. Plan to cross the IP inbound on extended DZ centerline course. If the run-in can not be accomplished around maximum radar and threat ranges, evaluate terrain around the objective area and determine a flight path and altitude with the least possibility of detection.

16.3.2. Assault Zone Selection. Assault zone (assault landing zone and drop zone) selection and criteria are the joint responsibility of the DIRMOBFOR and the commander of the supported forces; however, planners may be tasked to select usable sites. Detailed assault zone criteria and illustrations can be found in AFI 13-217.

16.3.3. Drop Zone (DZ) Selection. Ground force location, risk to aircraft, and target identification are key factors in DZ selection. Drop zones may or may not be marked, depending on the type of mission, tactical situation, or reception committee capabilities (reference AFI 13-217 and AFI 11-241).

16.3.3.1. Planners will attempt to ensure that the DZ is long enough to avoid multiple passes in a hostile environment. If multiple passes become necessary, they may be accomplished by planning a racetrack, an abbreviated route, or a racetrack. In any case, multiple passes will not be performed unless they have been coordinated with the user, they have been planned and briefed, and they have been annotated on navigational charts (including the racetrack flight path).

NOTE: Units should develop and publish multiple pass procedures for established drop zones used during routine joint and unilateral training. Choice of abbreviated route or racetrack procedures is at the unit's discretion.

16.3.3.2. Multiple Points of Impact (MPI) provide an aerial delivery employment procedure to disperse airdropped loads to predetermined locations. Locate the subsequent MPI a minimum of 500 yards from the previous PI. If MPIs are placed laterally, increase the width of the DZ accordingly. Ensure the PI distance from leading edge complies with AFI 13-217. Compute minimum size DZ required for the most restrictive aircraft in each element relative to their PI to ensure it fits within the surveyed DZ boundaries. Limit the number of MPIs to three without MAJCOM approval. All aircraft within an element must drop on the same PI. The coordinates for each PI must be provided to the aircrews. Use the most accurate PI altitude available. For SKE airdrops using a zone marker, ensure aircrews are briefed on zone marker location relative to each PI. Ensure zone marker placement is within 1,500 yards of all points of impact. Thoroughly deconflict and brief all salvo and escape procedures as well as DZ markings before mission execution. Only the first PI will be marked. The user accepts responsibility when employing MPI for all injury/damage to personnel/equipment.

16.3.3.3. The following types of drop zones are authorized for MAF employment missions:

16.3.3.3.1. Marked DZ. Authenticated drop zone that has the point-of-impact or release point marked with a precoordinated signal. Markings may be overt (e.g. block letter, flares, smoke, mirror, raised angle marker, etc.) or covert (e.g. IR strobe, radar beacon, zone marker, etc.). No other markings are required (e.g. timing lights or flanking lights). Unless radio communications are specifically required, any precoordinated marking displayed on the DZ indicates clearance to drop.

16.3.3.3.2. Unmarked DZ. Drop zone not authenticated with any type of marking. This includes both visual and electronic signals. DZ authentication, if required, is possible via radio communications. The DZ may not be supported by a reception team. Use of unmarked DZs requires OG/CC approval for unilateral training missions, and MAJCOM/DO approval for all other missions.

16.3.3.3.3. Area DZ. Consists of a start point, end point, and a prearranged flight path over a series of acceptable drop sites between these points. The distance between these points should not exceed 15 NMs; changes in ground elevation along the flight path should not exceed 300 feet; and drop sites along the flight path should not exceed 1/2 NM on either side.

16.3.3.3.4. Circular/Random Approach DZ. A circular DZ with multiple run-in headings. Size of the DZ will be governed by mission requirements and usable terrain. Normally, the point-of-impact will be at the DZ center. The size of a circular/random approach DZ must be large enough for the prescribed minimum size rectangular DZ to fit inside.

16.3.3.3.5. Water DZ. Normally a circular/random approach drop zone which may be marked or unmarked. CARP, GMRS, VIRS, or jumpmaster directed airdrop procedures may be used. For GMRS, the position of the recovery/safety boat usually marks the intended release point. Other options include three or more boats in formation to form an inverted "L" or a floating smoke pot to indicated the point-of-impact.

NOTE: Certain tactical situations may prevent marking the DZ. Aircrews may be required to airdrop on unmarked DZs; however, supported units must be made aware that drop accuracy may be reduced. When DZs are supported by STT, consider using verbally initiated release system (VIRS) procedures to enhance drop accuracy. Planners and aircrews must thoroughly develop run-ins with good visual points for timing.

Specific airdrop procedures and reception committee capabilities are in **Chapter 19** of this instruction and AFI 13-217.

16.3.4. Assault Landing Zones (ALZ). Assault landing zone operations are conducted to introduce or evacuate personnel and/or equipment to or from hostile, denied, or unsecured territory. As a general rule, DZ selection considerations also apply to ALZ selection. Aircraft performance limitations must be taken into account when selecting an ALZ location. ALZ size and composition criteria are contained in AFI 13-217.

16.3.4.1. Plan approaches to the ALZ IAW **Chapter 17** of this instruction and the airfield identification procedures published in the OPORD or SPINS. Where multiple options are available, select the approach which best minimizes exposure to the threat while still allowing a high probability of landing on the first approach. Remain unpredictable. If no published approach exists, mission computer approaches may be built and flown IAW **Chapter 11** of this instruction.

16.3.5. Route Planning. Threats, terrain, and aircraft limitations dictate route selection. Evaluate all possible ingress and egress routes for features such as terrain composition and cover, relief features, contour lines, population centers, lines of communication, and other hazardous or compromising areas. Low- altitude masking tactics are essential for penetration operations in a threat environment. The following factors significantly influence route development:

16.3.5.1. In selecting navigation routing, the planner must consider safe passage corridors/procedures and the location of friendly defenses. In this regard, the aircraft must be constantly aware of the status of friendly C3 and procedures for degraded operation. When the friendly C3 structure degrades, the common denominator of friendly defenses will be their own self-preservation. When planning the route, do not assume the aircraft is safe from friendly lines of defense. Plan accordingly and use IFF, communication discipline, and approved safe passage procedures.

16.3.5.2. Threat avoidance is the best line of defense. Select high, rugged vegetated terrain where possible. Rough terrain decreases threat mobility, heavy vegetation restricts the field of fire, and low altitudes enhance terrain masking. Evaluate passive and acoustical detection devices: border guards, observation posts, fire towers, road/river traffic, railroads, military maneuvers/exercises, military aircraft training, airways, airports, surveillance/patrol boats, fishing vessels, shipping LOCs, festival/holiday/vacation gathering places, and satellite schedules. Plan routes to avoid SAMs and AAA concentrations, both of which are usually along lines of communication, intersections, populated areas, and industrial centers. Canals, roads, railroads, and rivers should be crossed at right angles to minimize detection by hostile forces.

16.3.5.3. Plan the route using maximum radar/threat detection ranges and worst case route/leg minimum safe altitude (MSA) without regard to terrain masking. If routing cannot be accomplished around maximum radar/threat ranges, evaluate significant terrain between the aircraft and the threat and maximum detection free altitudes must be evaluated to determine a flight path and altitude with the least possibility of detection.

16.3.5.4. Flights should be planned at the highest altitude that precludes detection. If detection is probable, select flight altitudes that degrade threat engagement effectiveness.

16.3.5.5. Dead reckoning (DR) navigation is enhanced by prominent landmarks with good vertical development. Natural terrain features are preferable to man-made features that may no longer exist, may be indistinct, or may be newly erected and not portrayed. Use of features that could be masked by intervening terrain should not be used.

16.3.5.6. Do not plan direct flight over built-up areas.

16.3.5.7. When unable to avoid hostile areas, select specific tactics, such as terrain masking, night operations, random approaches, or use of support aircraft, which can best counter anticipated threats.

16.3.5.8. Avoid large bodies of water and dry lake beds except in known friendly areas. Camouflage is less effective, sound travels farther and radar detection is more likely.

16.3.5.9. Coastal Penetration. The tactics used to penetrate a coastline depend on the locations and elevations of coastal radar sites. Passive detection is usually enhanced over water. Minimize use of aircraft radar and other emitters.

16.3.5.10. Remain unpredictable. The route of flight will consist of relatively short legs between waypoints that are easily identifiable, either visually or by airborne radar. Select waypoints that minimize detection and maximize threat avoidance and terrain masking. Numerous course changes protect the aircraft and also the objective area by delaying enemy attempts to predict the flight path. The time and distance of each leg should vary and not exceed 10 minutes in the threat environment.

16.3.5.11. Avoid being skylighted. Go around hills rather than over them. If a ridge must be crossed, do so at a low point and, ideally, at a 45-degree angle.

16.3.5.12. Missions operating in or near a threat environment should be planned to transit that environment during early morning or late afternoon. The low sun angles will separate the shadow from the aircraft, improving masking. Hide the aircraft shadow in a ridgeline, ridge shadow, cloud shadows or dark vegetation if possible. Plan to fly in shadows whenever possible. Missions flown at night or in the clouds can significantly degrade certain threat systems. Knowledge of enemy threat system shift changes and scheduled preventive maintenance times may prove invaluable when considering these options.

16.3.5.13. Turns should not be made into significantly higher terrain or other hazards without thorough analysis of aircraft engine-out climb performance.

16.3.5.14. Transit areas defended by small arms at their narrowest or least defended point.

16.3.5.15. If detection is unavoidable, compute the first possible point at which fighters could attack the aircraft. Intelligence personnel should have information on command and control time (from acquisition to launch), aircraft speed and capabilities, and ground control intercept (GCI) limitations.

16.3.5.16. If flight over or near threat sites is unavoidable, attack aircraft should be part of the employment support package.

16.3.5.17. Vertical and horizontal depiction inaccuracies will exist in virtually all chart products. Many charts list the probable errors in their legend.

16.3.5.18. Define abort corridors for the ingress route. Depending on threats and other aircraft following the same ingress route, the planned route over the objective and egress may be the safest abort route.

16.3.6. Target Detection and Radar Coverage Prediction Guide**.** Flights should be planned through areas that preclude radar detection. Radar has three vulnerabilities that can be exploited during mis-

sion planning; limits on maximum detection range, degraded low-level detection capabilities because of curvature of the earth (radar horizon distance), and the masking properties of obstructions between the antenna and the aircraft.

16.3.6.1. Maximum Range. The theoretical maximum range (MTR) of a radar is dependent on the radar's pulse repetition frequency (PRF). The higher the PRF, the shorter the range. Use the radar's lowest PRF in the following formula to compute the MTR in nautical miles. MTR = 80,000/PRF.

16.3.6.2. Radar Horizon Distance. A radar may have the theoretical range to detect an aircraft, but will be limited by the horizon (curvature of the earth) for a given aircraft altitude. Based on the line of sight limitation, flying at a distance greater than the RHD will prevent aircraft detection under normal atmospheric conditions. The following formula is primarily use to determine low altitude coverage of a radar over water or flat terrain; however, planning a route which exceeds RHD in any type of terrain should prevent detection. **Table 16.2.** will aid in quickly determining RHD. Enter the table with the aircraft's planned MSL altitude at the top of the table and move down to the radar antenna's MSL altitude to determine RHD in NMs. RHD = 1.06 (square root of RA + square root of AA) where RA = radar antenna elevation (AGL) and AA = aircraft altitude (AGL) RHD will be expressed in NMs. To express RHD in statute miles, use 1.23 instead of 1.06.

NOTE: This computation assumes a smooth earth. Masking effects from obstructions between the radar and the aircraft are not considered. Atmospheric ducting can greatly increase the RHD at some altitudes. Always check with weather personnel for the presence or potential of ducting in the area of operations. Passive detection of aircraft emissions may occur far beyond the RHD regardless of ducting.

Table 16.2. Radar Horizon Distance (RHD)--Nautical Miles (NM).

		AIRCRAFT ALTITUDE (ft)																	
		200	300	500	750	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	15000	20000	25000	30000
R	**50**	22	26	31	37	41	55	66	75	82	90	96	102	106	113	137	157	175	191
A	**100**	26	29	34	40	44	58	69	78	86	93	99	105	111	117	140	161	178	194
D	**150**	28	31	37	42	47	60	71	80	88	95	102	108	114	119	143	163	181	197
A	**200**	30	33	39	44	49	62	73	82	90	97	104	110	116	121	145	165	183	199
R	**250**	32	35	41	46	50	64	75	84	92	99	105	112	117	123	147	167	184	200
	300	33	37	42	47	52	66	76	85	93	100	107	113	119	124	148	168	186	202
A	**350**	35	38	44	49	53	67	78	87	95	102	109	115	120	126	150	170	187	203
N	**400**	36	40	45	50	55	69	79	88	96	103	110	116	122	127	151	171	189	205

T	**450**	37	41	46	52	56	70	81	90	97	105	111	117	123	128	152	172	190	206
E	**500**	39	42	47	53	57	71	82	91	99	106	112	119	124	130	154	174	191	207
N	**550**	40	43	49	54	58	72	83	92	100	107	114	120	125	131	155	175	192	208
N	**600**	41	44	50	55	59	73	84	93	101	108	115	121	127	132	156	176	194	210
A	**650**	42	45	51	56	61	74	85	94	102	109	116	122	128	133	157	177	195	211
	700	43	46	52	57	62	75	86	95	103	110	117	123	129	134	158	178	196	212
H	**750**	44	47	53	58	63	76	87	96	104	111	118	124	130	135	159	179	197	213
E	**800**	45	48	54	59	64	77	88	97	105	112	119	125	131	136	160	180	198	214
I	**850**	46	49	55	60	64	78	89	98	106	113	120	126	131	137	161	181	199	215
G	**900**	47	50	56	61	65	79	90	99	107	114	121	127	132	138	162	182	199	215
H	**950**	48	51	56	62	66	80	91	100	108	115	121	127	133	139	163	183	200	216
T	**1000**	49	52	57	63	67	81	92	101	109	116	122	128	134	140	163	183	201	217
	2000	62	66	71	76	81	95	105	114	122	130	136	142	148	153	177	197	215	231

16.3.6.3. Detection Free Altitude (DFA). Radar detection is degraded or denied by terrain and obstacle between the radar antenna and the target aircraft. The following formula is used to determine the highest altitude an aircraft can transit a point and remain below a radar's coverage. It is based on the line of sight limitation when obstacles or terrain lie between the radar and the aircraft. See **Figure 16.1.**

DFA = [(B - A) / C + (D - C) / 15] x D + A

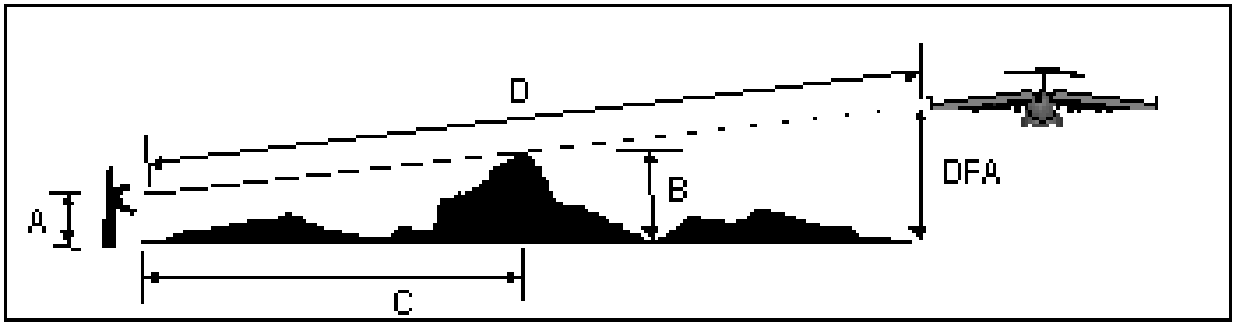
where DFA = Detection Free Altitude (feet MSL); A = Antenna elevation (feet MSL);

B = Terrain elevation (feet MSL); C = Terrain distance from antenna (NM); and

D = Aircraft distance from antenna (NM).

NOTE: Flying below the DFA will deny detection by that radar only at the point for which the calculation is made. Passive detection of aircraft emissions may occur even when the aircraft is terrain masked.

Figure 16.1. Detection Free Altitude.



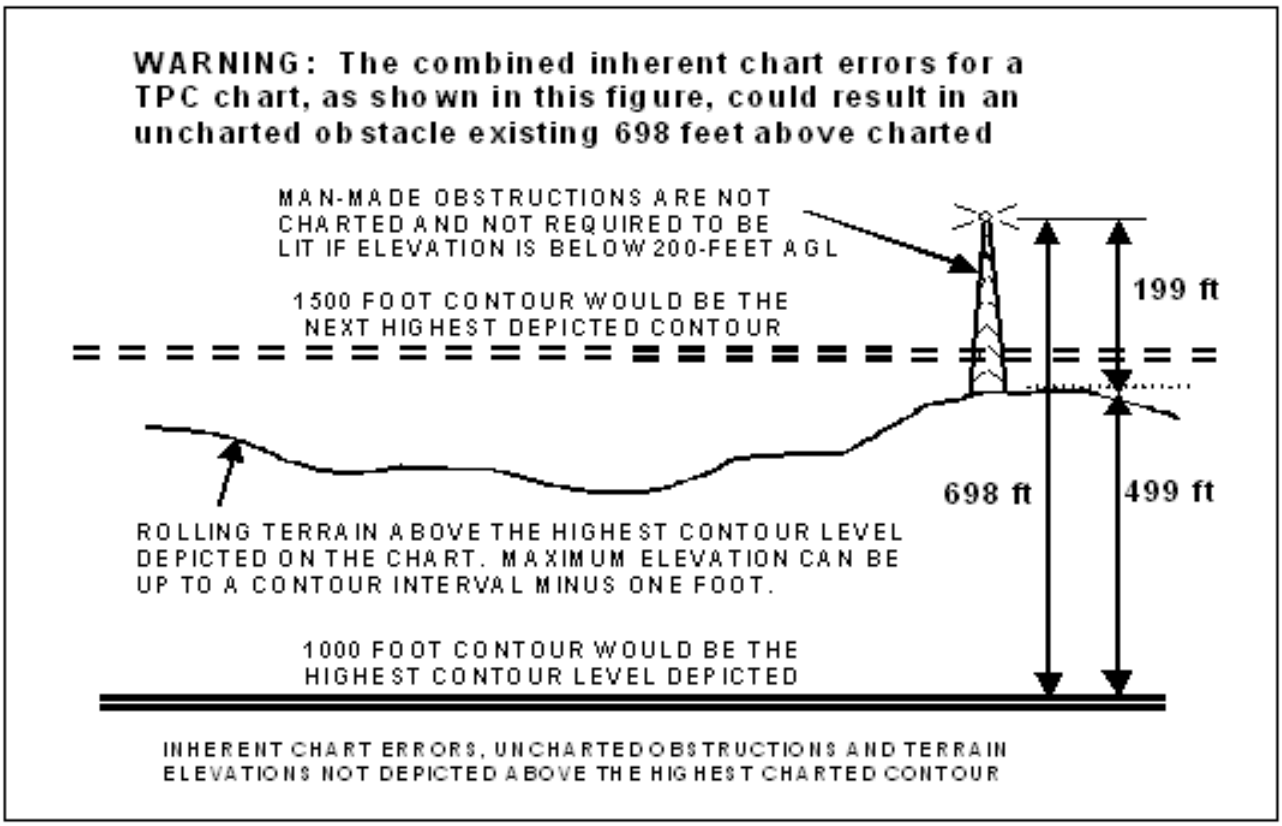
16.3.6.4. Range Planning. For planning purposes, mission aircraft should be routed outside the maximum theoretical radar range. If this is not possible, plan the route outside the RHD or below the DFA.

16.3.7. Low Level Altitude Restrictions. Low level altitudes will depend upon conditions such as terrain, threat, the necessity to avoid detection, and equipment limitations. The following minimum altitudes are established for MAF airlift operations. Higher altitudes may be dictated by FLIP/ICAO procedures, training considerations, terrain, or operational directives.

WARNING: Aeronautical charts do not depict man-made obstacles less than 200 feet AGL or a change in terrain until it exceeds the chart contour interval. The worst situation would occur if a 199-foot tower sat on terrain with an elevation just below the next higher contour. For a TPC (1:500,000) with a contour interval of 500-feet, this results in an uncharted obstacle existing 698 feet above charted terrain. Additionally, the highest spot elevation on any given leg may not be the highest terrain as in the case of gradually rising elevations. Planners must ensure accurate terrain analysis by evaluating both spot elevations and the highest contour level. Refer to **Figure 16.2.**, Inherent Chart Errors.

CAUTION: Some charts may depict terrain and obstacle altitudes in meters versus feet (e.g. JOG and TLM charts in some areas of the world).

Figure 16.2. Inherent Chart Errors.



16.3.7.1. Day VMC Enroute. Plan a minimum of 500 feet AGL (300 feet AGL on approved routes) modified contour altitude above the terrain using visual references, HUD, and radar altimeter.

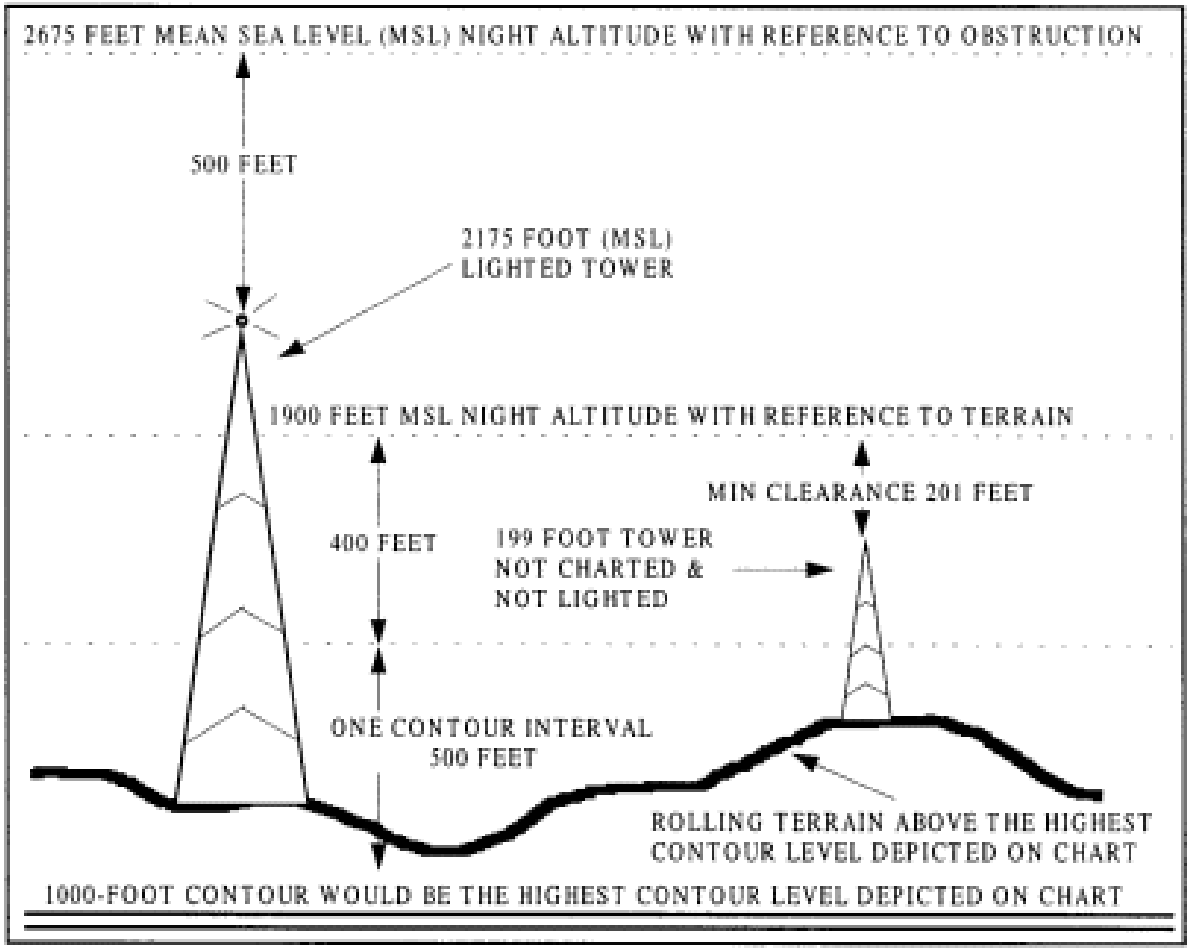
16.3.7.2. Night VMC Enroute. Plan en route legs at an indicated altitude of 500 feet above the highest obstruction to flight (man-made obstacle, terrain feature, or spot elevation), or 400 feet plus one chart contour interval above the highest depicted terrain contour, whichever is highest, within 5 NMs of route centerline to include the aircraft turn radius over each turnpoint (10 NMs outside of the U.S.). If the altitude for the next leg is higher than the current leg altitude, climbs will be completed before the turnpoint. If the altitude for the next leg is lower, do not initiate descent until after the turnpoint. Legs may be segmented to allow flight closer to the ground. Once the obstruction is visually identified and the aircraft is confirmed well clear, the crew may descend to the next segmented altitude, if lower. See **Figure 16.3.**

NOTES:

A MC FOM of 5 or better is required in order to fly lower than MSA.

Planning a route on a JOG chart, if available, significantly reduces night enroute altitudes. If the route has been planned on a JOG and night altitudes are verified, the route may be flown with the lower altitudes when flying with reference to a TPC.

Figure 16.3. Night VMC Enroute Altitude.



16.3.7.3. Minimum Safe Altitude (MSA). MSA is an initial VFR altitude that provides additional terrain clearance while the aircrew analyzes situations that require interruption of low-level operations (route orientation and aircraft malfunctions or when either pilot must leave the seat during low-level operations, etc). An MSA will be computed for each leg or route segment or entire low level route. The MSA is 1000 feet above the highest obstruction within 5 NMs.

16.3.7.4. Minimum IFR En Route Altitude. Compute Minimum IFR En Route Altitude by adding 1000 feet (2,000 feet in mountainous terrain) above the highest obstruction to flight (man-made obstacle, terrain feature, or spot elevation) within 5 NMs of route centerline (10 NMs outside the US). This altitude should be rounded off to the next higher 100-foot increment. If the altitude for the next leg is higher than the current leg altitude, climbs will be completed before the turnpoint. If the altitude for the next leg is lower, do not initiate descent until after the turnpoint.

16.3.7.4.1. Minimum altitudes for IFR operations within published Military Training Routes (MTRs) in US sovereign airspace will be computed leg Minimum IFR En Route Altitude unless a higher altitude is required by FLIP AP/1B. The Min IFR altitude may be above the top of the MTR leg altitude. In this case, the aircraft will slow to 250 KCAS or less, contact ATC and coordinate an alternate clearance.

EXCEPTION: After thorough route planning by the crew and approval from the wing tactics office and OG/CC, aircraft may fly the top of the block on an MTR when that altitude is less than min IFR en route altitude. For multiple use, local MTRs, OGV will issue local approval and restrictions in their unit supplement to **Chapter 10** of this instruction.

16.3.7.5. Emergency Safe Altitude (ESA). ESA is designed to provide positive IMC terrain clearance during emergency situations that require leaving the low level structure. Several ESAs may be computed for route segments transiting significant terrain differentials or a single ESA may be computed for the entire low level route. To compute ESA, add 1,000 feet (2,000 feet in mountainous terrain) to the elevation of the highest obstruction to flight within 22 NMs of planned route centerline.

NOTES:

Climbing to ESA may put the aircraft or formation in a controlled (i.e., IFR) altitude structure requiring coordination with Air Traffic Control agencies.

Pressure altimeters are calibrated to indicate true altitudes under International Standard Atmospheric (ISA) conditions. Any deviation from these standard conditions will result in erroneous readings on the altimeter. This error becomes important when considering obstacle clearances in temperatures lower than standard since the aircraft's altitude is below the figure indicated by the altimeter. Refer to the flight information handbook to determine correction.

16.3.8. Airdrop Altitudes and Airspeeds. Minimum airdrop altitudes and airspeeds for specific loads and parachutes are defined in AFI 11-231. If minimum terrain clearance cannot be satisfied during descent to drop altitude, change the run-in course, delay descent, step down to drop altitude, or airdrop at a higher altitude. Airdrops will not be conducted below the following altitudes:

WARNING: Drop zone surveys do not assure terrain and obstruction clearance (that responsibility is incumbent upon planners and aircrew through thorough mission planning and chart updating).

NOTE: Altitudes on DZ run-in may be segmented to allow for lowest possible run-in/drop altitude. Once the limiting obstruction (man-made obstacle, terrain feature, or spot elevation) is visually identified and the aircraft is confirmed well clear, the crew may descend to the next segment altitude, if lower.

16.3.8.1. Day VMC Drop Altitude. Plan minimum day VMC airdrop altitudes as specified in AFI 11-231, visually avoiding high terrain and obstacles in the vicinity of the drop zone.

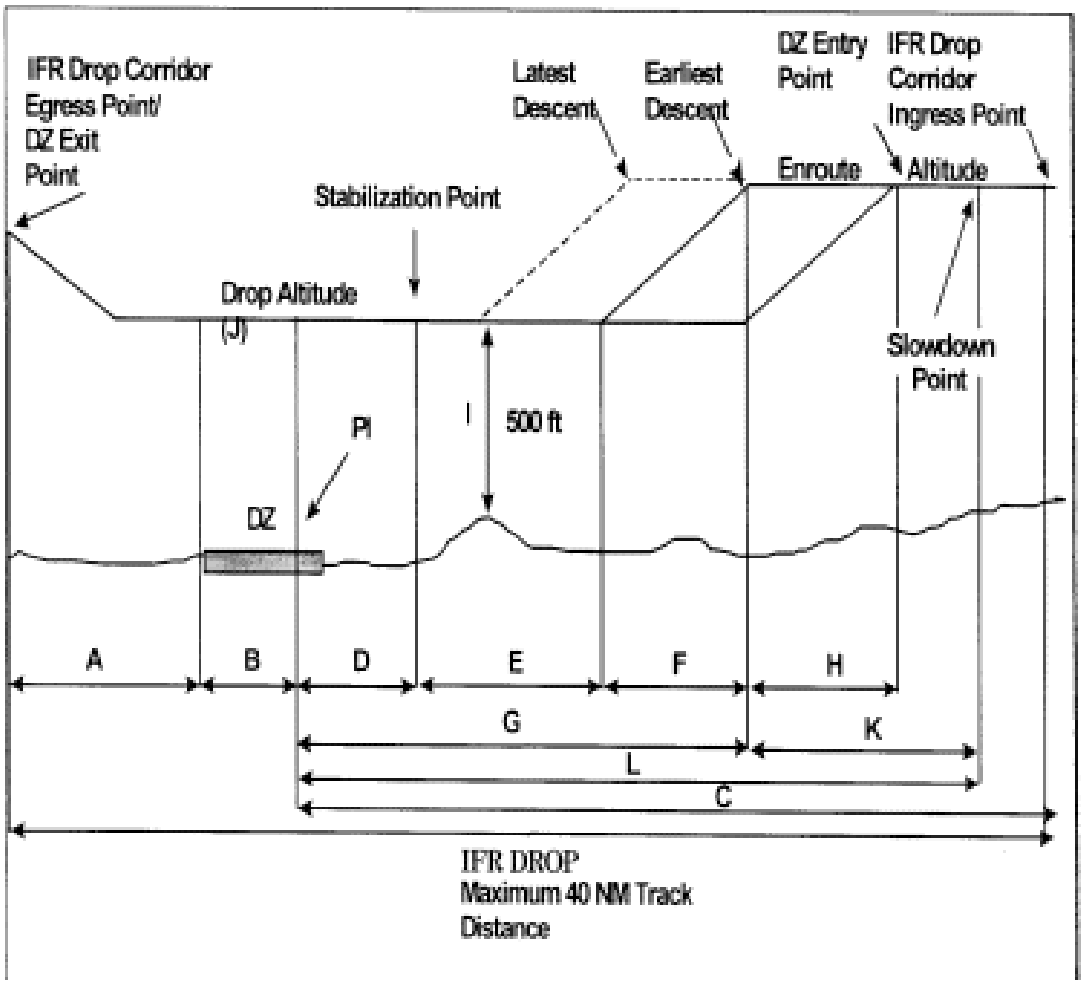
16.3.8.2. Night VMC Drop Altitude. Plan minimum night VMC airdrop altitudes, from slow-down through escape, at an indicated altitude of 500feet above the highest obstruction to flight (man-made obstacle, terrain feature, or spot elevation), or 400 feet plus one contour interval above the highest depicted terrain contour, whichever is higher, within 3 nautical miles of run-in center-line, or as specified in AFI 11-231, which ever is higher.

16.3.8.3. IMC Drop Altitude. Plan minimum IMC drop altitude at 500 feet above the highest obstruction to flight (man-made obstacle, terrain feature, or spot elevation), or 400 feet plus one contour interval above the highest depicted terrain contour, whichever is highest, within 3 nautical miles either side of the run-in centerline from DZ entry point to DZ exit point or as specified in AFI 11-231, whichever is higher.

NOTE: A MC FOM of 5 or better or "ZM Valid" displayed on the PPI is required prior to departing IMC en route altitude for IMC drop altitude.

16.3.8.4. IMC Drop Profile. See **Figure 16.4.**

Figure 16.4. IMC Drop Profile.



16.3.8.4.1. IFR Drop Corridor. As defined in FAR Exemption 4371, the corridor where aircraft may operate below IFR enroute altitude. The beginning of the corridor, the IFR Drop Corridor Ingress Point, is a maximum of 40 miles from the IFR Drop Corridor Egress Point (co-located with the DZ Exit Point). Plan segmented corridor altitudes not lower than 500 feet above the highest obstruction to flight (man-made obstacle, terrain feature, or spot elevation), or 400 feet plus one contour interval above the highest depicted terrain contour, whichever is highest, within 3 nautical miles either side of centerline.

16.3.8.4.2. DZ Entry Point. A fixed point in the IFR Drop Corridor where an aircraft or formation may safely begin descent from IFR enroute altitude or a segmented altitude to IMC drop altitude. Formation descent will not begin until the last aircraft is at or past the DZ entry point.

16.3.8.4.3. Earliest Descent Point (EDP). Earliest point in the IFR Drop Corridor where the formation lead may descend the entire formation to IMC drop altitude and be assured of terrain clearance for the entire formation. Computed by subtracting formation length (e.g., a 4-ship is

2 NMs long) from the computed DZ entry point. The EDP provides, as a minimum, a 6 NM IMC stabilization point.

16.3.8.4.4. IMC Stabilization Point. The point after the DZ entry point where the lead aircraft will **plan** to be stabilized at IMC drop altitude and airspeed.

16.3.8.4.5. Latest Descent Point (LDP). Latest possible point in the IFR corridor where formation lead may begin descent to IMC drop altitude and be assured of terrain clearance for the entire formation. This is the latest point that ensures all aircraft in the formation are stabilized on altitude and airspeed IAW **Chapter 19** of this AFI.

NOTE: Descending at the LDP does not provide a 6 NM IMC stabilization point.

16.3.8.4.6. DZ Exit Point. A fixed point on the DZ escape flight path centerline where each aircraft will be at minimum IFR enroute altitude. Calculate the exit point based upon three-engine performance at airdrop gross weight. This point will be a minimum of 4 NMs track distance from the trailing edge of the DZ. Also referred to as the IFR Drop Corridor Egress Point.

Table 16.3. IMC Drop Profile Calculation.

A	**DZ Exit Point**. Compute this distance as 1 minute at 160 KCAS + climb at 1000 FPM or as briefed (no greater than 3 engine climb performance). Cannot be less than 4 NM. Example: (160 KCAS/60 min/hr)+(500'/1000 VVI) = 2.7 + 1.4 = 4.1 NM	Write Here
B	**DZ Length** (Total DZ Length-Leading edge to PI Distance/2025 yd/NM) Example: (1688-550)/2025 = .6 NM	
C	**IFR Drop Corridor Entry Point**. Computed by subtracting distances A and B above from 40 NM. Example: (40 NM - A - B) 40 - 4.1 - .6 = 35.3 NM	
D	**IMC Stabilization Point**. Normally at least 6 NM from the PI, the mission commander may extend this distance. Example: 6 NM	
E	**Slowdown from 160 KCAS to Drop Speed.** Example 160 to 145 KCAS = .7 NM (See attached slowdown distance table)	
F	**Descent from IFR enroute to IFR drop altitude.** Example Descent from 2000' to 1000' MSL = 2.7 NM (@ 160 GS and 1000 FPM see attached distance table)	

G	**DZ Entry Point.** To extract this distance compute the slowdown point for the lead aircraft and subtract the initial deceleration distance, or add D + E + F above. Example (D +E+ F) 6 + .7 +2.7 = 9.4 NM**NOTE:** After computing this distance add the formation length and verify the result is not greater than the IFR Drop Corridor Entry Point. This ensures the last aircraft is within the IFR Drop Corridor. Example (G + H, [below]) 9.4 + 1.3 = 10.7 is not greater than 2035.3 (from C above)	
H	**Formation Length** (3-ship elements, no ghosts) 2-ship .7 NM 3-ship 1.3 NM 4-ship 2.0 NM 5-ship 2.6 NM 6-ship 3.3 NM Example: 3-ship 1.3 NM	
I	**Minimum IFR Drop Altitude**. Example: 716 +500 = 1216’	
J	**Planned Drop Altitude.** Highest point on DZ plus AGL drop altitude. Must not be less than IFR Drop Altitude. **Example: 289 + 800 = 1089’ (use higher of min IFR and planned drop alt) = 1216’ (Min IFR) (Not Shown)**	
K	**Initial Slowdown Distance.** Distance needed to slow from enroute airspeed to 160 KCAS* (see attached table) Example 240 KCAS to 160 KCAS = 4.7	
L	**Slowdown Distance**. Total distance from initial slowdown to PI. Item K + Item F + Item E + Item D	
	Example (from 240 KCAS to drop airspeed, 2000’ to 1216’) 4.7 + 2.7 +.7 + 6 = 14.1 NM	

NOTES:

A: 1 Min @ 160 + Climb to IFR Alt @ 1000 fpm (**Table 16.4.** A).

B: DZ Length = (Total DZ Length - Leading Edge to PI).

C: 40 - (A+B).

D: IMC Stabilization Point.

E: Slow from 160 to Drop Speed (**Table 16.4.** C).

F: Descent to Drop Altitude (**Table 16.4.**B).

G: DZ Entry Point (D+E+F).

H: Formation Length.

I: IFR Drop Altitude.

J: Planned Drop Altitude (No Lower than IFR Drop Altitude).

K: Initial Slowdown Distance (**Table 16.4.** A).

L: Slowdown Distance (Items K + F + E + D).

The C-17 mission computer calculates slowdown based on a deceleration of .05 G. To calculate this distance use the following formula:

$$\frac{(GS1 - GS2) * (GS1 + GS2)}{6825}$$

Where GS1 = Starting Ground Speed and GS2 = Ending Ground Speed e.g., 240 kts starting speed with 160 kts ending speed. See **Table 16.4.**, **Table 16.5.**, **Table 16.6.** for the values already computed.

For time computations, as a rule of thumb, the C-17 slows at approximately 1 knot per second. 6,825 foot is an example shown for 3-ship SKE 800' AGL LVAD at North Field.

Table 16.4. Slowdown Distance (part 1of 3).

		ENDING GROUNDSPEED									
			130	140	150	160	170	180	190	200	210
S	**G**	370	17.5	17.1	16.7	16.2	15.7	15.2	14.7	14.1	13.5
T	**R**	360	16.4	16.0	15.6	15.2	14.7	14.2	13.6	13.1	12.5
A	**O**	350	15.4	15.0	14.6	14.1	13.6	13.1	12.6	12.0	11.4
R	**U**	340	14.4	14.0	13.6	13.1	12.6	12.1	11.6	11.0	10.4
T	**N**	330	13.4	13.0	12.6	12.1	11.7	11.2	10.6	10.0	9.4
I	**D**	320	12.5	12.1	11.6	11.2	10.7	10.2	9.7	9.1	8.5
N	**S**	310	11.5	11.2	10.7	10.3	9.8	9.3	8.7	8.2	7.6
G	**P**	300	10.7	10.3	9.8	9.4	8.9	8.4	7.9	7.3	6.7
	E	290	9.8	9.4	9.0	8.5	8.0	7.5	7.0	6.4	5.8
	E	280	9.0	8.6	8.1	7.7	7.2	6.7	6.2	5.6	5.0
	D	270	8.2	7.8	7.3	6.9	6.4	5.9	5.4	4.8	4.2
		260	7.4	7.0	6.6	6.1	5.6	5.1	4.6	4.0	3.4
		250	6.6	6.3	5.8	5.4	4.9	4.4	3.8	3.3	2.7
		240	5.9	5.5	5.1	4.7	4.2	3.7	3.1	2.6	2.0
		230	5.2	4.9	4.4	4.0	3.5	3.0	2.4	1.9	1.3
		220	4.6	4.2	3.8	3.3	2.8	2.3	1.8	1.2	0.6
		210	4.0	3.6	3.1	2.7	2.2	1.7	1.2	0.6	0.0
		200	3.4	3.0	2.6	2.1	1.6	1.1	0.6	0.0	

TABLE A (SLOWDOWN DISTANCES)

Table 16.5. Slowdown Distance (part 2of 3).

		GROUNDSPEED								
D	1000 FPM	200	190	180	170	160	150	140	130	120
E	1000	3.3	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.0
S	2000	6.7	6.3	6.0	5.7	5.3	5.0	4.7	4.3	4.0
C	3000	10.0	9.5	9.0	8.5	8.0	7.5	7.0	6.5	6.0
E	4000	13.3	12.7	12.0	11.3	10.7	10.0	9.3	8.7	8.0
N	5000	16.7	15.8	15.0	14.2	13.3	12.5	11.7	10.8	10.0
T	6000	20.0	19.0	18.0	17.0	16.0	15.0	14.0	13.0	12.0
D	**1500 FPM**	200	190	180	170	160	150	140	130	120
I	1000	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.4	1.3
S	2000	4.4	4.2	4.0	3.8	3.6	3.3	3.1	2.9	2.7
T	3000	6.7	6.3	6.0	5.7	5.3	5.0	4.7	4.3	4.0
A	4000	8.9	8.4	8.0	7.6	7.1	6.7	6.2	5.8	5.3
N	5000	11.1	10.6	10.0	9.4	8.9	8.3	7.8	7.2	6.7
C	6000	13.3	12.7	12.0	11.3	10.7	10.0	9.3	8.7	8.0
E										
S	**2000 FPM**	200	190	180	170	160	150	140	130	120
	1000	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0
	2000	3.3	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.0
	3000	5.0	4.8	4.5	4.3	4.0	3.8	3.5	3.3	3.0
	4000	6.7	6.3	6.0	5.7	5.3	5.0	4.7	4.3	4.0
	5000	8.3	7.9	7.5	7.1	6.7	6.3	5.8	5.4	5.0
	6000	10.0	9.5	9.0	8.5	8.0	7.5	7.0	6.5	6.0

TABLE B (SLOWDOWN DISTANCES)

Table 16.6. Slowdown Distance (part 2of 3).

			ENDING GROUNDSPEED									
			100	110	120	130	140	145	150	160	170	180
	G	190	3.8	3.5	3.2	2.8	2.4	2.2	2.0	1.5	1.0	0.5
S	**R**	180	3.3	3.0	2.6	2.3	1.9	1.7	1.4	1.0	0.5	0.0
T	**O**	170	2.8	2.4	2.1	1.7	1.4	1.1	0.9	0.5	0.0	
A	**U**	160	2.3	2.0	1.6	1.3	0.9	0.7	0.5	0.0		
R	**N**	150	1.8	1.5	1.2	0.8	0.4	0.2	0.0			
T	**D**	140	1.4	1.1	0.8	0.4	0.0					

I	**S**	130	1.0	0.7	0.4	0.0						
N	**P**	120	0.6	0.3	0.0							
G	**E**	110	0.3	0.0								
	E	100	0.0									
	D											

TABLE C (SLOWDOWN DISTANCES)

16.3.9. Peacetime Route Restrictions. In addition to restrictions in AFI 11-202V3, specific country or theater of operations publications, and FLIP area planning, routes should not be planned or flown:

16.3.9.1. With less than 1 NM separation (3 NMs when in excess of 250 KCAS) when below 2000 feet AGL from known sensitive environmental (i.e., hospitals, fish hatcheries, large poultry complexes, recreation areas, institutions, etc).

16.3.9.2. With less than 3 NMs separation from prohibited airspace.

16.3.9.3. With less than 3 NMs separation from nuclear power plants.

16.3.9.4. Through restricted airspace, except transition or termination in such areas where the planning unit is a primary using agency or has approval of the controlling agency.

16.3.9.5. In weather conditions less than those specified in this instruction and AFI 11-202V3.

16.3.9.6. Below 1000 feet AGL within a 2000 feet radius over cities or towns shown as magenta shaded areas on 1:500,000 (TPC) scale charts.

16.3.9.7. Over or through active live fire or impact areas that may not be specifically designated as prohibited or restricted areas.

16.3.9.8. Below 500 feet AGL unless:

16.3.9.8.1. Host nation rules specifically allow such VFR operations.

16.3.9.8.2. Routes or training areas have been environmentally assessed and surveyed for 300-foot AGL operations. This restriction does not apply to one-time-use routes. Consult FLIP AP/1B for published Military Training Route restrictions.

16.3.9.9. For the airdrop portion of all SKE missions in uncontrolled airspace, the mission command unit must comply with the current Federal Aviation Administration (FAA) Exemption 4371. A Letter of Agreement between local ATC and the military is required when operating under this exemption. Also, provide a Notice to Airmen (NOTAM) to the FAA Flight Service Station nearest the objective area at least 48 hours in advance of the intended activity, regardless of actual or forecast weather. NOTAM information will include:

16.3.9.9.1. Name of the nearest city or town and state.

16.3.9.9.2. Date and time period of intended activity.

16.3.9.9.3. Number and type of aircraft.

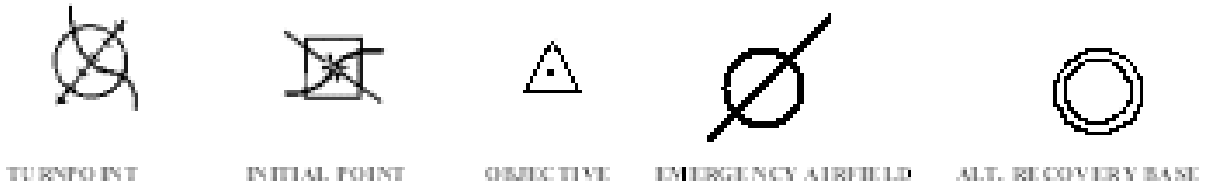
16.3.9.9.4. Altitudes.

16.3.9.9.5. IFR Drop Corridor Ingress and Egress points of the route segment expressed in radial and DME from a VORTAC.

16.3.10. Navigation Chart Preparation. Mission planners will construct a master chart for mission briefings and aircrew reference. Planners may construct the chart using computerized mission planning systems if available. Sectional charts depict controlled airspace. Low-level navigation charts will be annotated with any added, deleted, or changed information in the most recent CHUM or supplement. In no case will CHUM coverage be less than 22 NMs either side of the entire planned route of flight. Crews may trim charts to no less than 10 NMs after establishing the ESA. Color copies, if available, of a master chart reduce the probability of missing or misplotted data on aircrew charts.

16.3.10.1. Chart Annotation. The chart annotations and symbols in **Figure 16.5.** are recommended for the master planning chart; however, individual chart annotations should have, as a minimum, turnpoints, IP, DZ, course line, course data, CHUM data and date, ESA and chart series/date.

Figure 16.5. Chart Annotation and Symbols.



16.3.10.1.1. Turnpoint/Waypoint. A circle will depict both en route turnpoints and key en route navigation waypoints. Points may be lettered, numbered, or code-named to facilitate identification.

16.3.10.1.2. Initial Point (IP). Annotated as a square, this is normally a visually significant geographic point that marks the beginning of the course to the objective.

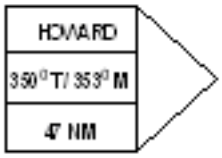
16.3.10.1.3. Objective. Annotated as a triangle, this point is significant as the target of the airlift mission (normally a DZ or ALZ).

16.3.10.1.4. Emergency Airfield. An airfield which is not planned as the primary or alternate recovery base but may be used for landing. A circle with a diagonal line placed along axis of the primary landing runway identifies emergency airfields suitable to mission aircraft. Optimum emergency airfields are located within 50 NMs of intended route approximately every 100 NMs.

16.3.10.1.5. Alternate Recovery Base. Two concentric circles identify an airfield suitable for unit aircraft recovery should the primary recovery base be unusable due to weather, damage, or other reason. Plot a course from either a planned divert point or from the primary recovery base to the alternate.

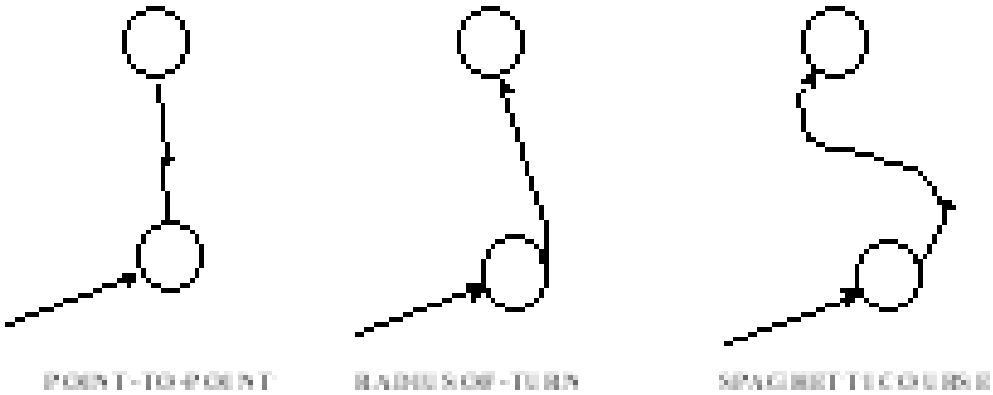
16.3.10.1.6. Recovery Arrow Box. See **Figure 16.6.** A horizontally divided box pointing in the general direction of the alternate recovery base, providing base name, true/magnetic course, and distance to the alternate.

Figure 16.6. Recovery Arrow Box.



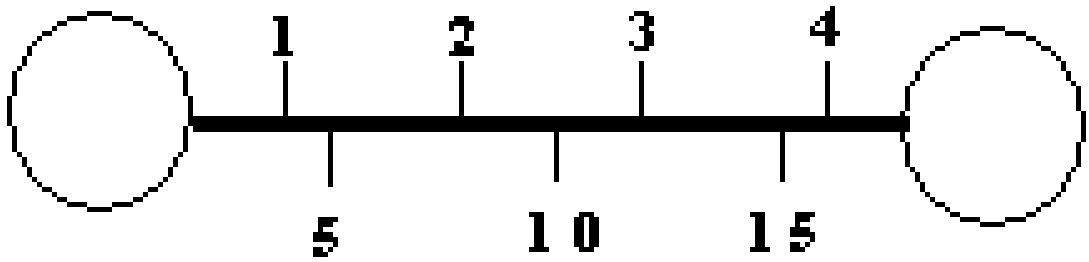
16.3.10.1.7. Course Line. See **Figure 16.7.** The route of flight may be plotted using point-to-point, radius-of-turn, or spaghetti course. Point-to-point usually assumes turning short of the waypoint, however it may be modified to overfly the waypoint and intercept the waypoint and intercept the next point-to-point course. Radius-of-turn results in waypoint overflight, followed by a direct course to the next waypoint. Spaghetti routes reflect the aircrew's preplanned terrain masking/threat avoidance flight path. Course data is normally segmented along the route.

Figure 16.7. Course Line Annotations.



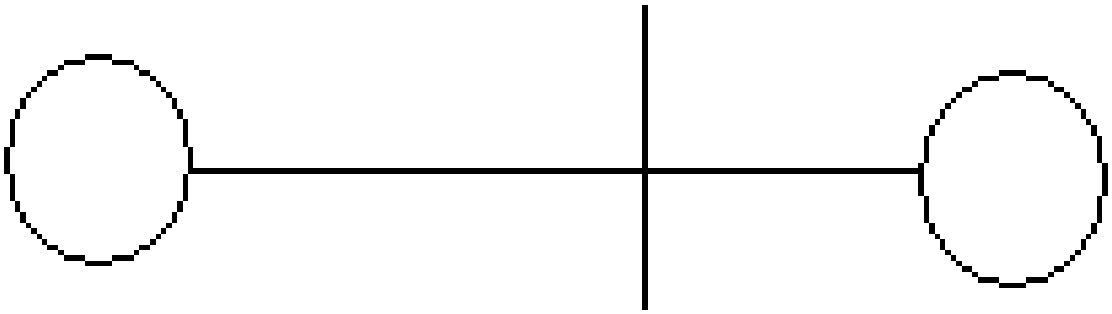
16.3.10.1.8. Time and Distance Marks. See **Figure 16.8.** Small tick marks along each leg to show time or distance to go to the next turnpoint/waypoint.

Figure 16.8. Time and Distance Mark Annotations.



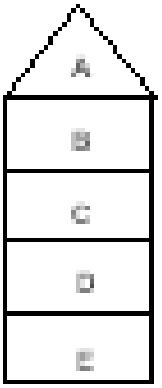
16.3.10.1.9. Combat Entry (CEP) or Exit Point. See **Figure 16.9.** A heavy line crossing perpendicular to the course, locating the earliest or latest point at which the threat can detect or intercept the aircraft.

Figure 16.9. Combat Entry (CEP) or Exit Point Annotations.



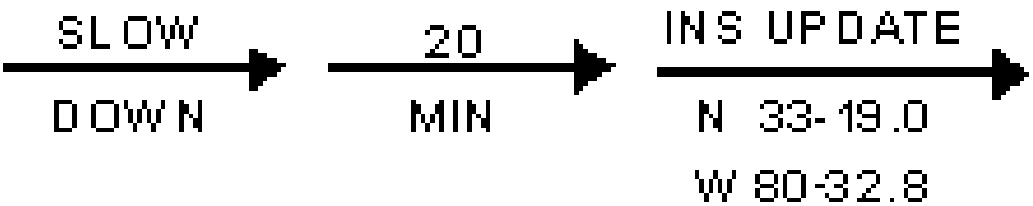
16.3.10.1.10. Navigation Information Block. See **Figure 16.10.** Provides navigation information for each leg of the route. It is normally placed to the right of each turnpoint, or at the beginning of each strip chart leaf if the route leg extends beyond one leaf. As a minimum, true or magnetic course, leg distance, day or night enroute altitude, and MSA will be annotated along each leg of the route. Data blocks may be modified for mission requirements, however, the standard block contains items A through E as follows: A = true or magnetic course (after rollout) to the next waypoint/objective, B = distance (in NM or total distance to go) to the next waypoint or objective, C = day altitude (AGL), D = night altitude (MSL), and E = MSA.

Figure 16.10. Navigation Information Block Annotations.



16.3.10.1.11. Operational Advisory Arrows. See **Figure 16.11.** Annotations concerning operational aspects of the mission, located where the enroute maneuver should be performed. Examples of these maneuvers are start climb, or begin descent. Advisory arrows may also be used to denote locations of airdrop checklist execution. Avoid chart annotations that may compromise the mission.

Figure 16.11. Operational Advisory Arrows Annotations Examples.



16.3.10.1.12. Emergency Safe Altitude (ESA). ESA will be conspicuously annotated.

16.3.10.1.13. Multiple Passes. Depict racetracks or abbreviated routes associated with multiple passes over the drop zone. Multiple passes can be flown three different ways:

16.3.10.1.13.1. Racetrack. A racetrack is accomplished by turning 180 degrees and paralleling DZ course outbound for a set distance before turning back inbound for a second run-in to the DZ.

16.3.10.1.13.2. Abbreviated route. An abbreviated route is accomplished by executing the planned escape maneuver and entering a short, multiple leg circuit back to the IP for a second run-in to the DZ.

16.3.10.1.13.3. Re-attack. A re-attack is accomplished by extending along DZ centerline for a set distance, turning, and approaching the DZ from the opposite direction or perpendicular to course.

16.3.10.1.14. Order of Battle (OB). Denote location, type, and effective radii of enemy systems. Mark charts with appropriate classification if required and handle accordingly.

16.3.10.1.15. The location of the IFR Drop Corridor, EDP, LDP, DZ Entry Point, IMC Stabilization Point, and DZ Exit Point.

16.3.10.1.16. Strip Chart Booklets. These booklets of navigational charts provide a continuous depiction of a route and are normally prepared in one of two formats. The exact format and information required may be standardized within wings.

16.3.10.1.16.1. Format 1 consists of a booklet with a hinge at the bottom. The chart segments are stripped and glued to present a continuous route of flight.

16.3.10.1.16.2. Format 2 is constructed with a vertical hinge on the left side as in a normal book. Preferably, pages are enclosed in suitable vinyl envelopes. Normally, when the booklet is opened, the right hand page displays a segment of the strip chart and the left hand page displays navigation leg information.

16.3.11. Mission Forms and Logs.

16.3.11.1. AF Form 4093, **Pilot's Information**. The planning staff will complete a Pilot's Information sheet.

16.3.11.2. AF Form 4051, **Low Level Flight Plan and Log**. An AF Form 4051 should be used when planning tactical low level missions. A MAJCOM approved computer-generated flight plan (such as an AFMSS-generated plan) may be used in lieu of completing the AF Form 4051. When the flight plan is properly loaded into the mission computer, the aircraft map Navigation Display (ND), and the MCD flight plan become the primary sources of navigation information for tactical low-level missions.

16.3.12. Aircrew Flimsy. Aircrew flimsies are a standardized collection of essential operational information required by aircrews to complete mission planning, conduct route study, fly the mission, and comply with post-mission ground procedures and debriefing requirements.

16.3.13. Route Study. Crew route study is mandatory before accomplishing flight in the low level environment. An intensive review of the ingress, objective area, and egress routing by the entire crew leads to superior crew coordination and safe mission execution. Aircraft turns planned into higher terrain, critical obstacles that do not meet three-engine climb performance, terrain analysis, threat locations, terrain masking and tactics must be discussed. Special emphasis should be placed on the run-in and objective area for the locations of visual and radar features that will assist in proper identification. The importance of route study cannot be overemphasized.

16.3.14. Tactical Aircrew Coordination. Effective crew coordination is crucial to the success of any flight, especially during tactical operations, and will be discussed prior to executing the mission. A convenient time for the entire aircrew to discuss who is going to do or say what during each phase of the mission is during route study and/or the mission briefing. Assigning specific in-flight duties, such as who is going to fly the drop and who is going to hit the drop lights, will reduce confusion at the wrong time. While there is no clear cut definition of crew coordination, the concept deals with the ability of the aircrew to handle a rapidly changing environment and successfully perform the task at hand. This requires maintaining a high level of situational awareness through the crossflow of information between various crew positions. Information should be relative, accurate, complete, timely, and concise, particularly for the objective area and threat reaction maneuvers. Crew coordination discussions should also encompass individual technique, limitations, emergency procedures, and previous lessons learned.

16.3.15. Final Review. As both a final and on-going step, planners and aircrews should conduct "what if" sessions to detect and solve potential problem areas (e.g. aircraft aborts, recall procedures, weather deterioration, breakdown in various parts of the plan, unscheduled resistance, secondary mission objectives, etc.). "What ifs" must be planned and briefed as thoroughly as the primary scenario. Additionally, limiting factors which impact mission accomplishment and aircrew survivability should be addressed and briefed to the appropriate chain of command. Document "what ifs," limiting factors, planning and aircrew concerns in Section J (Miscellaneous) of the mission planning folder.

16.4. Airlift Support Forces Coordination. Ensure airlift and supporting forces have coordinated the following information and that the information is presented in the briefings outlined in 16.5. below:

16.4.1. Airlift and support forces takeoff times.

16.4.2. Rendezvous location, altitude, and times.

16.4.3. Courses of action if airlift is late.

16.4.4. Course of action if support elements are late.

16.4.5. Airlift ingress and egress routes.

16.4.6. TOT/TOA and DZ /ALZ (including alternates).

16.4.7. Call signs.

16.4.8. Radio frequencies, radio silence procedures, chattermark procedures, and authentication procedures.

16.4.9. Airlift formation geometry.

16.4.10. Method(s) support aircraft will use to transmit threat warnings.

16.4.11. Areas of ground CAPS and EW support coverage (including times of coverage).

16.4.12. Communication with AWACS.

16.4.13. Electronic warfare support procedures (if any).

16.5. Briefings.

16.5.1. Mission Planning Pre-Brief. The purpose of the mission planning pre-brief is to familiarize all crewmembers with the general aspects of the mission. The group or squadron commander, combat support group staff specialists, all crewmembers of each participating crew, and other personnel concerned with the mission should attend. The mission planning pre-briefing may include all information pertinent to the mission and eliminate the need for later specialized briefings. In cases where highly specialized information or techniques require additional explanation or review (such as formation procedures), schedule a specialized briefing. During the briefing, indicate what preparation has been accomplished and what is yet to be accomplished. Use the following as a guide in conducting a briefing:

16.5.1.1. Security classification and roll call for the briefing and mission.

16.5.1.2. Purpose of the mission, forces required (including number of aircraft) and a statement of mission requirements in sufficient detail to ensure all crewmembers understand all the information.

16.5.1.2.1. Operations plan.

16.5.1.2.2. Ground objectives.

16.5.1.2.3. Supported forces requirements: in-flight rigging, SATCOM, FM radio, alibi decision matrix (who decides to re-attack and when), secondary objectives, etc.

16.5.1.3. Mission Requirements:

16.5.1.3.1. Crew composition.

16.5.1.3.2. Crew alerting and reporting.

16.5.1.3.3. Minimum ground times.

16.5.1.3.4. Crew duty times.

16.5.1.3.5. Command waivers.

16.5.1.3.6. Rules Of Engagement (ROE).

16.5.1.3.7. EMCON level directed for each phase of flight.

16.5.1.4. Intelligence information (AF and Joint Services).

16.5.1.5. Weather information.

16.5.1.6. Timing and control times to include:

16.5.1.6.1. Stations, start times, taxi, and takeoff.

16.5.1.6.2. Force Rejoin, ARCT, TOT, and TOA.

16.5.1.6.3. Landing time.

16.5.1.7. Review taxi, takeoff, and departure plans to include communications requirements and frequencies.

16.5.1.8. Navigation and altitude reservation flight plan.

16.5.1.9. Air refueling information and procedures.

16.5.1.10. Threat, special mission tactics.

16.5.1.11. Cargo load information.

16.5.1.12. Recall and diversion procedures.

16.5.1.13. Recovery and alternate base.

16.5.1.14. Announcements to include technical order status and changes, flying safety, specialized briefing times and locations, debriefing and interrogation location and procedures, messing, transportation, personal equipment, radio, and communications procedures and crew questions.

16.5.2. Pre-Deployment Briefing. Prior to deployments, the operations officer, mission commander, or designated representative should assemble the crew and brief description and purpose of the mission, tentative itinerary, aircraft configuration, special equipment, fuel load, clothing required, anticipated housing and messing facilities, sufficient money to defray individual's anticipated expenses, personal equipment/field equipment requirements, special clearance requirements, and flying safety.

16.5.3. Joint Mission Briefing or Mission Briefing. Joint representation is desirable when more than one service is participating. Briefings should be clear, concise and provide only mission essential information. Requirements of particular missions will determine sequence and content of individual briefings. AMCMAN 11-211 provides a recommended outline. Planners should adjust the format and extract (or add) items to conform to specific mission profiles. Conduct after each individual crewmember has completed their mission preparation. All crewmembers will be present unless excused by the mission commander. Crewmembers not present must be briefed by the aircraft commander prior to takeoff. The mission commander, or mission planning staff, must re-brief the mission when the time interval from initial aircrew briefing to mission takeoff exceeds 72 hours.

16.5.4. Tactical Mission Briefing. Required if applicable items are not briefed in the Joint Mission Briefing/Mission Briefing. A mission briefing for participating pilots, loadmasters, and other personnel as directed by the mission commander, is required prior to all low-level and formation missions. Brief applicable items in sufficient detail to ensure clear understanding of mission objectives and procedures. The aircraft commander is responsible for ensuring all crewmembers are briefed on applicable mission items.

16.5.5. Specialist Briefing. Conduct specialist briefings to detail operating procedures or special interest items. The mission commander determines the requirement for this briefing. When appropriate, hold specialist briefings at the completion of the Tactical Mission Briefing for pilots, loadmasters, aeromedical personnel, jumpmasters, assault zone control officers, STT, and DZST personnel.

16.5.6. Serial Lead Briefing. The serial leader will assemble the pilots participating in the serial to cover any changes or additions arising after the formal mission briefing. Only applicable items need be briefed. Conduct this briefing as appropriate, to allow sufficient time to complete necessary aircraft inspections and jumpmaster, loadmaster, or parachutist briefings before station time.

16.5.7. Other Briefings. In addition to the briefings above, mission participants will also conduct briefings as required in Section 6.12. of this AFI. These include C2 Center Briefing, Aircraft Commander Briefing, Specialized Briefings (Airdrop, Air Refueling, Load Briefing, etc.), Weather Briefing, Intelligence Briefing and Hazardous Materials Briefing.

16.6. Mission Debriefings. Hold immediately after the mission if practical. Include the following:

16.6.1. Aircrews should attend the operations and maintenance debriefings as directed by unit or mission commander. Maintenance debrief should be conducted ASAP after flight.

16.6.2. Intelligence debriefings must be accomplished as soon as practical after mission recovery, normally within 30 minutes. Debriefings will be as prescribed in USTRANSCOMR 200-3, Intelligence Debriefing and Reporting.

16.6.3. Aircrew Debrief. Mission critiques and debriefings are perhaps the most important learning tool available to aircrews and will be done after each mission. All crewmembers should attend. Use this time to review the entire mission. This is the time to learn. Undue concern about crewmembers feelings may prevent them from learning something that may save future missions. The critique must be done objectively. Bring out the positive as well as the negative. Review techniques, offer suggestions for improvement, and correct mistakes.

16.6.4. For formation flights, a post-mission debrief should be conducted by the mission commander or formation leader.

Chapter 17

MISSION EMPLOYMENT/TACTICAL AIRLAND PROCEDURES

Section 17A—General Procedures

17.1. General. Tactical airland operations play an important role in moving and resupplying ground forces. Airland is the preferred method of delivering troops, equipment, and supplies into objective areas. Airland operations minimize risk of equipment damage or personnel injury, maximize aircraft capacity, reduce load rigging requirements, and provide equipment that cannot be airdropped.

17.1.1. Each unit will have a tactics ground training program tailored to the unit's wartime taskings. Tactics and intelligence staff should join forces in this area to ensure success. Using a building block approach, the ground tactical training program forms the base of the unit's tactics program. Each unit's tactics ground training program may be different because of the differences between unit mission taskings; however the overall objectives should be the same.

17.1.2. Crews should operate in accordance with this chapter when operating into austere airfields or tactical assault landing zones (ALZ), or when operating into locations with hostile threat environments. ALZ operations are described in AFI 13-217.

17.1.3. Austere airfields are normally operated by non-airlift units. They range from small, austere airfields (SAAF) with runways as short as 3,000 feet, taxiways as narrow as 50 feet, small ramps, and limited facilities, to operational fighter bases with unrestricted runways, but limited and congested ramps and limited support for airlift aircraft.

17.1.4. Aircraft can use air refueling to increase flexibility, optimize cargo capacity, reduce dependence on en route airfield availability, extend range, reduce intratheater cycle times, and reduce demands on theater fuel supplies.

17.1.5. Crews should be prepared to adjust their mission plan based on en route mission updates. In a potential threat situation, crewmembers must understand their limitations and those of their equipment. Since the procedures contained in this chapter are not all encompassing, aircrews are expected to use good judgement, innovation, and sound airmanship to successfully accomplish the mission.

17.2. Passengers on Tactical Flights. Passengers are allowed, including Space-A passengers, on any flight, single ship or formation that:

17.2.1. Is not airdropping, or conducting NVG operations on that sortie.

17.2.2. Meets the provisions of AFJMAN 24-204 concerning passengers with hazardous cargo.

17.2.3. Is not prohibited by international agreement.

17.2.4. If on a SAAM, the user does not object to Space-A passengers.

17.2.5. Personnel tasked for JA/ATT airdrop and/or airland operations are allowed on airdrop missions.

NOTE: Passengers will be advised of the planned low-level and given the opportunity to deplane prior to departure.

17.3. Restrictions. Non-airdrop qualified crews are limited to either single-ship operations or two-ship SKE formations as defined in **Chapter 18**.

17.4. Communications. The ability to smoothly transition through the various echelons of the C^3I systems is essential for successful mission accomplishment. Use secure and jam resistant communications to the maximum extent possible. In a threat environment, limit radio transmissions with the objective area to those required for safety of flight or factors affecting force employment.

17.5. Airfield and ALZ Requirements. Markings required for assault landing zone (ALZ) operations are depicted in AFI 13-217. These markings are desirable for tactical airland operations; however, full markings are not mandatory on hard-surfaced runways that are permanently marked (or lighted) so as to make the touchdown zone and runway distances readily identifiable, or if the tactical situation does not permit full markings. Communication and navigation aids provided by special tactics units are based on operational requirements, capability, and the specific threat environment.

17.6. Tactical Checklists. Amplified tactical checklists are included in this chapter. Abbreviated checklists will be carried by individual crewmembers. The pilot flying (PF) calls for the specific checklist to be accomplished and the pilot not flying (PNF) reads all checklists. Combat Entry and Combat Exit checklists will be executed at the appropriate times/locations for airdrop and tactical airland missions. Combat offload checklists are used when dictated by the mission.

17.6.1. All primary crewmembers should be on interphone from the Combat Entry checklist until completion of the Combat Exit checklist (unless operations require otherwise). If a pilot must leave the seat or go off interphone, climb to either MSA for that leg or ESA for the route.

17.7. Rear Vision Device (RVD).

17.7.1. Units will comply with the following procedures when conducting RVD training.

17.7.1.1. RVD training is restricted to tactical training/exercise missions only.

17.7.1.2. Avoid use of the RVD in areas of medium or high bird concentrations.

17.7.1.3. Plan training missions to avoid terrain that birds congregate near: shoreline, marshes, and large bodies of water.

WARNING: Birds pose a potentially significant hazard to the RVD observer. Aircrews should consider the bird hazard potential when deciding to utilize the RVD.

17.7.1.4. Crews must plan and brief stop-use ROE for the RVD during mission planning.

17.7.1.5. Crewmembers must wear helmets at all times while in the RVD.

WARNING: The RVD observer will inform the pilot about terrain clearance when possible, especially during turns.

17.8. Energy Management. Performance data must be carefully considered and prior planning of energy management is essential when planning low level operations. This is particularly necessary in mountainous terrain, at heavy gross weights, or with less than full engine power capability. Aggressive maneuvering, even at relatively high airspeeds, can place the aircraft into an approach-to-stall condition or require a go-around. Abrupt control inputs and/or uncoordinated flight should be avoided. These

inputs are particularly hard on the airframe; and, in some instances, may increase airframe structural loading beyond design limits, possibly resulting in structural failure.

WARNING: Uncoordinated flight reduces stall margins and can cause an abrupt departure from controlled flight. Uncoordinated flight increases airframe structural loading and should be avoided unless an actual threat exists.

Section 17B—En Route Procedures

17.9. Planning. Threat analysis, planning, and flexibility are key factors in combat airland operations. Normally, plan the route as far from the threat as possible. Refer to **Chapter 16** of this instruction and AMCP 55-25 and AFTTP 3-1V1 for specific mission planning procedures.

17.9.1. Any given approach into an objective area offers advantages and disadvantages. If it is not possible to select an approach that avoids the threat, attempt to minimize aircraft exposure time as much as possible. When more than one aircraft is involved, using multiple routes, altitudes, and traffic patterns may hamper enemy targeting efforts. The entry, slowdown, and traffic pattern must ensure a successful landing on the first attempt, but still leave adequate margins for the unexpected.

17.9.2. Planning cannot be overemphasized. Analyze factors such as visibility, weather conditions, altitude and surface winds, and take full advantage of the terrain. Consult applicable ALZ surveys, Airfield Suitability and Restrictions Report (ASRR), VFR/IFR Supplements, NOTAMS, airfield surveys, and flight information publications. Consider decision points, emergency escape plans, and alternate approaches. Decision points are times, positions, or events that should commit the crew to one course of action. An emergency escape plan and a plan for alternate courses of action will enhance survival.

17.10. Low-Level Navigation. Threat and emission control requirements permitting, use all available aids (e.g. mission computer data, navigational aid fixes, map reading) to remain position oriented.

17.10.1. While aircraft systems provide a self-contained adverse weather, day/night, worldwide navigation capability, pilots assume ultimate responsibility for en route navigation, terrain avoidance, and time control. During low level operations, attention should be focused outside the aircraft, emphasizing threat detection and situational awareness. Limit duties that distract attention from outside the aircraft to mission essential items only.

17.10.2. A navigation display (ND) map format should be displayed on at least one MFD at all times.

17.10.3. Time of Arrival (TOA) control is primarily accomplished by airspeed adjustments. If necessary and appropriate to the situation, use planned alternate legs to gain or lose time, use timing triangles, fly inside or outside course line (within mission computer route parameters), or use time control holding patterns.

17.10.4. Means of Navigation.

17.10.4.1. The mission computer navigation solution, backed-up with map reading, is the primary means of navigation on VFR low level routes. If conditions permit, ground-based navigational aids can be used as additional information sources.

17.10.4.2. The mission computer is the primary means of route navigation in IMC. If conditions permit, onboard radar, ground-based radar, and/or bearing/distance fixes can be used as backups.

17.10.5. Flight at low altitude can be an effective defensive tactic; however, never fly lower than the altitude dictated by the threat or mission. Navigation and objective area identification become increasingly difficult when threat avoidance requires low ingress/egress altitudes, operations at night, or operations during marginal weather conditions.

17.10.6. Low level modified contour flight is flown with momentary deviations above and below the base altitude for smoothness of flight. The radar altimeter used by the pilot flying must be operational and the radar altimeter altitude reference marker will be set to 50 feet below base contour altitude. The pitch command bar will be parked at the top of the PFD flight director scale by setting ALT to the MSA or ESA and VERT SPD to UP 6000.

17.10.7. During IMC or night operations, maintain en route altitude by using the best available barometric altimeter setting and radar altimeter information. If reported barometric settings are unavailable, use GPS barometric settings (found on the MC APPROACH PAGE). When the next leg (or segment) altitude is higher than the leg (or segment) being flown, cross the waypoint at the highest altitude. If the next leg (or segment) altitude is lower than the leg (or segment) being flown, descend when past the waypoint.

Section 17C—Threat Avoidance Arrival/Departure (TAA/D) Procedures.

17.11. Arrival Procedures General. Factors such as hostile activity, weather (winds or visibility), aircraft weight, or terrain may require modifications to normal traffic patterns. This chapter (and Figure 17.2.) provides some examples and techniques; however, proper planning, pilot ingenuity, proficiency and judgement are keys in determining the type of pattern flown. Normal habit patterns should be used as much as possible when flying these approaches. Regardless of the type of approach, the aircraft will be aligned with runway centerline and established on approach glide path no less than 1/2 mile from the touchdown zone.

17.12. Tactical Descents. If necessary, reverse engine idle thrust and speed brakes can be used to obtain rapid descents from high altitudes. Initial descent rates of over 12,000 fpm may be achieved. Tactical descents are always flown single ship and use of the flight director for guidance is recommended.

17.12.1. High-Speed Rapid Descent. Use the following procedures:

17.12.1.1. Select "320 PCH" (or .800 Mach when above 28,000 feet) on the AFCS panel. Disconnect the autopilot, extend the speedbrakes, and deploy reverse idle thrust (if desired).

17.12.1.2. The PF follows the pitch bar to maintain desired speed, and follows the roll bar for lateral navigation guidance.

17.12.1.3. At the briefed "start level off" point, the PNF will make an advisory call to the PF. The level off should be initiated approximately 2,000 feet above the desired altitude.

17.12.1.4. Stow thrust reversers (if used) and speed brakes prior to leveling off. Select desired speed (IAS on THR) on the AFCS panel and establish en route airspeed.

17.12.2. Spiral Descent. This maneuver can be accomplished using a range of airspeeds. It allows entry to the low level route structure or airfield environment at high speeds, or it can provide a tight spiral down at slow airspeeds (limited by the minimum maneuver speed for a given aircraft configuration).

17.12.2.1. The crew will insert spiral descent data into the mission computer flight plan.

17.12.2.2. The pilot will fly the maneuver on the flight director using the entered/displayed turn direction, spiral radius, and altitude termination.

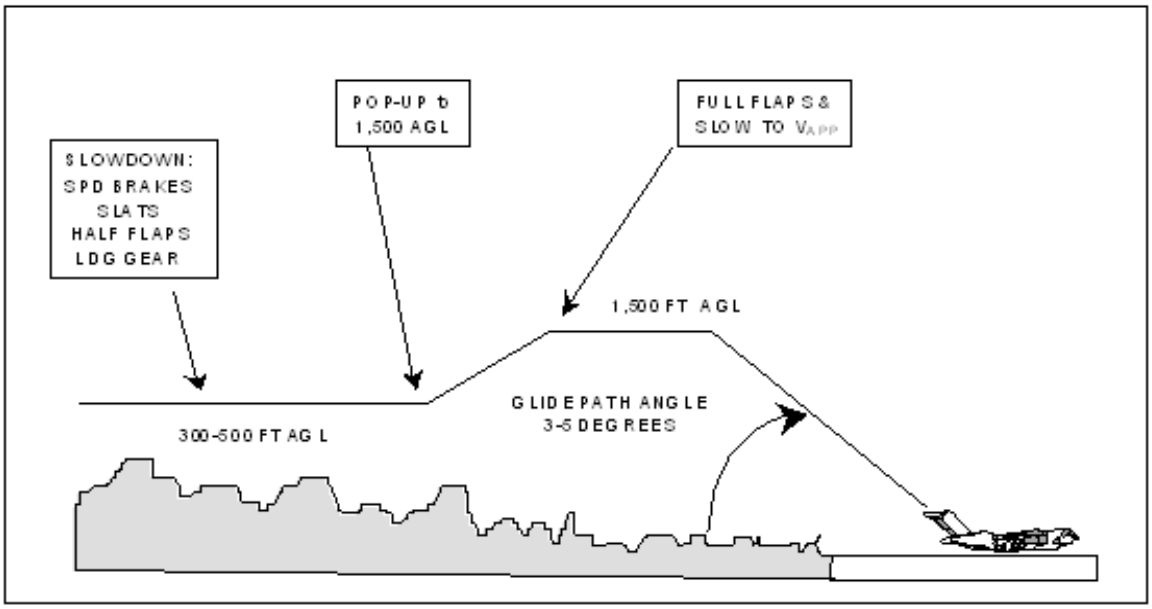
17.13. Low Altitude Approaches. A variety of tactics can be used when low altitude ingress is necessary to minimize the probability of hostile detection near the destination airfield. If the threat situation dictates, terrain masking procedures may be required until very close to the airfield. All maneuvering may need to be accomplished at low altitudes (typically at or below 1,000 ft AGL). Low altitude approaches can be entered from any direction at en route altitude and airspeed. If the situation permits, plan to slow and configure for landing prior to arrival at the field. Generally, the mission computer provides primary navigation guidance to the field, then the pilot performs the final portion of the maneuver using circling approach techniques.

17.13.1. The Straight-In. This approach appears to be the simplest, but is one of the most difficult to execute consistently. Accurate navigation is critical since the field is usually small and the runway environment is often sparsely populated and poorly defined. The lack of turns means energy dissipation is one dimensional, making slowdown timing critical.

17.13.1.1. The key to a successful approach is ensuring the slowdown maneuver provides adequate time to obtain proper landing configuration.

17.13.1.2. Delaying slowdown reduces the time an aircraft is at approach airspeed and altitude. Approximately six nautical miles are required to slow from 300 KCAS to approach speed. Tailwinds or heavy gross weights may require earlier slowdowns. The approach can vary with an angling final (offset straight-in), dog leg, or even a base turn entry using straight-in techniques. Events and actions included in a time-compressed slowdown maneuver are depicted in **Figure 17.1.**. This figure can be used as a planning guide; however, slowdown maneuver timing and actions should be designed to meet specific mission requirements.

Figure 17.1. Pop Up Maneuver.



EVENT	ACTION
1. Start Slowdown (from 250-350 KCAS)……..	Full SPD BRKs and fwd idle throttles
2. Pop-Up (if necessary)……...	Climb to Glide Path Intercept Altitude
3. Slat Placard (280 KCAS)…….	Extend Slats
4. Half Flap Placard (250 KCAS)……	Lower Half Flaps
5. Landing Gear Placard (225 KCAS)…….	Lower Landing Gear
6. Glide Path Intercept Altitude……	Level Off
7. Full Flap Placard (175 KCAS)…….	Set Full Flaps; Slow to Approach Speed.

17.13.2. Reciprocal Teardrop. This approach allows the pilot to convert from a straight-in to land in the opposite direction using a circling approach maneuver. Enter at en route airspeed, and dissipate airspeed throughout the approach. Start slowing about one NM from the departure end, and offset to the side of the runway. Another variation to this approach is a 90/270 maneuver. The key reference for the approach is maintaining airspeed no lower than V_{MMA}, with half flaps and landing gear down before the base turn. Initiate the base turn and complete the circling maneuver.

17.13.2.1. Advantages. This pattern allows adjustments to manage energy while staying close to the airfield. Runway acquisition is about the same as a straight-in, but less precision is needed due to the more flexible pattern.

17.13.2.2. Disadvantages. Like a circling approach, low altitude maneuvering may create an unusual picture and result in a tight pattern and overshoot. Maneuvering at low altitude and airspeed allows little margin for error.

17.13.3. Downwind Approach. Entering a high-speed downwind will allow use of the same base turn used on the teardrop approach. Normally enter downwind at 1000 feet AGL, maintaining 230 KCAS. No later than mid-field downwind, retard throttles to idle, extend slats and flaps 1/2, then landing gear in sequence, and slow to no lower than V_{MMA}. On the base turn attempt to adjust for winds and make a continuous turn to final. After commencing the turn from downwind to final, extend flaps to the landing configuration (3/4 or full). When established on final, slow to final approach airspeed.

17.13.4. The Beam (Crosswind Entry) Approach. This approach offers the flexibility to land in either direction and allows reconnaissance of the field as the aircraft flys overhead. Cross the airfield at no lower than V_{MMA}, with slats, half flaps, and landing gear extended, and complete the circling maneuver.

17.13.4.1. Advantages. Maintains ingress airspeed until near the airfield. Constant turning degrades acquisition of the aircraft by enemy systems. The precision required for navigation is reduced by approaching from the beam and ALZ acquisition is easier. It allows for landing in either direction.

17.13.4.2. Disadvantage. Considerable maneuvering in close proximity to the ground, with changing configuration and airspeed requires extreme vigilance.

17.13.5. Approaches in IMC. The mission computer can provide approach guidance to an airfield or ALZ in IMC. Terminal approach aids are not necessary for this approach, provided the accuracy of the MC navigation solution is adequate. In IMC, do not initiate descent from the last en route altitude until inside the approach entry point (as defined in **Chapter 11** of this instruction), established on course, with the aircraft's position positively known. Refer to the flight manual and **Chapter 11** of this instruction for special planning factors, restrictions, and additional information on self-contained, mission-computer directed approaches.

17.14. High Altitude Approaches. These are used primarily when high or medium altitude ingress is required. The objective may include a small arms environment and a permissive high or medium altitude threat environment which allows some reconnaissance of the field when the aircraft flys overhead. Initial altitude, airspeed, and heading are based on the threat. VFR weather is required and traffic patterns are above 1,000 ft AGL.

17.14.1. Overhead Approach. Normally maintain 230 KCAS, at 1500 feet AGL until over the landing threshold (or as briefed). Make a level pitchout using approximately 45 degrees of bank and retard power to idle once bank is established, extend slats, half flaps and landing gear in sequence. On downwind establish a minimum of 160 KCAS or V_{MMA}, whichever is higher. On the base turn, adjust for winds (using no more than 45 degrees of bank) to make a continuous turn to final. After commencing the turn from downwind to final, extend flaps to the landing configuration (3/4 or full). When established on final, slow to final approach airspeed. Variations to this pattern include low altitude ingress with a pitch up maneuver, or an offset overhead.

17.14.1.1. Advantages. Expedites arrival and keeps airspeed high until overhead the airfield.

17.14.1.2. Disadvantage. Aircraft is more easily observed at higher altitudes.

17.14.2. Random Steep Approach. This maneuver can be entered from any direction at an altitude based on the threat, pilot judgement, and aircraft performance. A common entry is accomplished

from a spiral descent. Extend slats, half flaps, and landing gear, and maneuver with a minimum of V_{MMA} to intercept final. Upon starting the turn to final, set final flaps (3/4 or full).

17.14.2.1. Advantages. This approach is effective when the primary threat is small arms. It requires unpredictability, maneuvering within protected territory, and allows adjustments for energy management. The high altitude makes it easier to establish and maintain visual contact with the runway and the turning descent degrades targeting of the aircraft by enemy systems.

17.14.2.2. Disadvantages. The aircraft is relatively slow throughout the approach and is easily observed. There is the possibility of high sink rates close to the ground with relatively low power settings.

17.15. Steep Approaches. A steep approach is accomplished with full flaps and an approach glide path in excess of 3 degrees. A steep approach may help avoid small arms fire, reduce touchdown speed and landing distance, minimize touchdown point dispersion, and afford the pilot a better view of the runway and touchdown point.

17.16. Departure Procedures General. When departing consider the same factors used for arrival planning. Plan the departure to minimize the time spent within the threat environment, either egressing at low level or spiraling up to altitude.

17.16.1. Low Escape. Low level departures are used when low altitude is necessary to avoid early warning coverage or radar guided SAMs. A typical low escape profile is a maximum EPR takeoff to a high speed, 300-500 feet AGL egress segment. Some threats may require low altitude/low airspeed maneuvering.

17.16.2. High Escape. This departure is used when a high or medium altitude escape is necessary (i.e., a small arms environment and a permissive high or medium altitude threat environment exists). Fly a climbing spiral at V_{mfr} with half flaps. Upon reaching a safe altitude, accelerate, retract flaps, and continue climb at technical order climb speeds. Since actual time to climb will increase proportionally with bank angle, use the minimum bank required to remain within the confines of protected airspace.

Section 17D—Ground Operations.

17.17. General. This section outlines procedures to follow when conducting specific ground operations at forward operating locations. Maneuvering in confined areas, reverse taxi operations, performing engine running onloads and offloads, and combat offloads all require a high degree of crew coordination. A thorough briefing and prior preparation are essential to quick and safe operations. Appropriate ground personnel and subsequent aircrews should be briefed on any hazards encountered during takeoff or landing (e.g., dust, winds, hostile activity).

17.18. Loading of Rucksacks. The following procedures apply to loading of rucksacks.

17.18.1. In all cases, rucksacks will be loaded on the same aircraft as the individual.

17.18.2. Transported units must ensure that adequate space is provided on the load plan and aircraft to ensure all personnel have an unobstructed path to evacuate the aircraft during an emergency.

17.18.3. During administrative deployments, rucksacks may be loaded on deploying vehicles, palletized, or floor loaded. Placing rucksacks on the aircraft floor may increase loading and offloading times. Also, this method may require more space and reduce the number of personnel or equipment airlifted.

17.18.4. During tactical deployments into a FOB/OB, rucksacks not loaded on vehicles will be carried by the individual onto the aircraft. Normally, floor space will be allocated on the aircraft load plan for floor loading rucksacks.

17.18.4.1. When a flight is planned for a short duration, the following procedures apply:

17.18.4.1.1. The troops may wear the rucksacks in the seat provided the seats are placed in the paratroop configuration.

17.18.4.1.2. All troops must have quick release straps on their rucksacks.

17.18.4.1.3. Troops will be briefed to leave their rucksacks on the seat if an emergency evacuation is necessary.

17.18.4.2. The following procedures apply to transporting hazardous materials in rucksacks.

17.18.4.2.1. Personnel will only be permitted to carry their basic combat load or individual issue of hazardous material when they will engage an enemy force immediately upon arrival. Personnel may retain small arms ammunition (cartridge for weapons, DOT 1.4) and nuclear, biological, and chemical equipment as long as it is retained in a carrier (i.e., bandoleers, pouches, bags). Weapons will remain clear until the aircraft has landed or as directed by the loadmaster.

17.18.4.2.2. Munitions and other hazardous materials placed in rucksacks, field packs, or other authorized containers, removed from their shipping container, must be adequately protected from accidental functioning. For airland troops and airdrop troops who are not rigged prior to takeoff, all carriers will be consolidated in one central location on the aircraft (as directed by the loadmaster) and distributed to personnel after landing. Paratroopers rigged prior to takeoff may retain individual carriers containing hazardous materials.

17.18.4.2.3. The troop commander or load team chief will brief the loadmaster concerning the individual issue of hazardous materials. The loadmaster will brief the aircraft commander.

17.18.4.2.4. Hazardous materials identified for sustainment must be prepared and certified according to AFJMAN 24-204.

17.19. Engine Running Onload and Offload (ERO) Procedures. Use ERO procedures when necessary to expedite aircraft or cargo movement, meet time requirements of unit moves, joint training exercises, and contingencies or enhance crew duty day. The aircraft commander is responsible for prior coordination with TACC or the controlling agency for early takeoffs. The aircraft commander is also responsible for coordination with the onload/offload base to ensure the ERO is conducted in a safe manner. With the exception of small arms ammunition (Hazardous/Division 1.4), do not use ERO procedures when explosive cargo is involved unless authorized in the JA/ATT, exercise operation or contingency air tasking order. These ERO procedures may be used for any mix of personnel or cargo. Material handling equipment should be used if palletized cargo is to be onloaded or offloaded. Aircraft commanders must assess prevailing weather, lighting and parking location to ensure safe operations. General procedures follow.

17.19.1. T.O. 1C-17A-1 operational stop checklist will be accomplished when performing ERO procedures.

17.19.2. Unless threat conditions dictate otherwise, use wing leading edge, taxi, and staging lights to enhance safety at night.

17.19.3. The aircraft commander will brief the crew on all aspects of intended ERO operation, emphasizing specific crewmember duties.

WARNING: Do not onload or offload through the crew entrance door and cargo ramp and door at the same time. Paratroop doors will not be used.

17.19.4. Prior to the loadmaster directing onload/offload operations, aircraft parking brake will be set and at least one pilot will monitor brakes, engines, interphone, and radios.

17.19.5. The loadmaster will direct all onload/offload operations. Prior to onload/offload operations, personnel in the cargo compartment will be briefed regarding their location, duties, and responsibilities during the ERO. No doors will be opened without coordinating with the loadmaster. As per load configuration, the briefing will include:

17.19.5.1. Exact offload procedures and applicable signals for vehicle drivers.

17.19.5.2. Drivers will be told to assume their positions during taxi-in. They will actuate brake pedals sufficiently to ensure vehicle brakes are operational, and they will not start engines until directed by the loadmaster. The loadmaster will not direct engine starts until the aircraft comes to a complete stop, and the door and ramp are open and positioned for offload.

WARNING: If a combat offload is to be accomplished before offloading vehicles do not remove restraint until after the combat offload is completed.

17.19.5.3. Vehicle parking brakes will not be released until all restraint is removed and cleared by the loadmaster.

17.19.5.4. Personnel to be offloaded will be briefed to secure baggage aboard vehicles (if applicable).

17.19.5.5. Vehicles and all personnel exiting via the ramp will proceed directly aft of the aircraft at least 25 feet before turning and at least 200 feet before stopping.

17.19.6. After the aircraft is slowed to taxi speed, the loadmaster may remove all tiedowns except one forward and one aft. After ensuring the ramp toes are in the appropriate position, open the cargo door, and lower the ramp to an approximate horizontal position.

17.19.7. Ensure the crew rest window to the cargo compartment is clear of obstructions for cargo door and ramp ERO operations.

17.19.8. After clearance from the pilot to start off/onloading operations, the loadmaster positions the ramp for off/onloading, extends the stabilizer struts (if required) and directs the off/onload.

WARNING: When EROs are accomplished through the cargo ramp and door, engines will be placed in reverse idle prior to the pilot giving clearance for off/onload operations. If a thrust reverser will not extend, consideration should be given to shutting down the affected engine.

NOTE: When accomplishing off/onloading operations comply with T.O. 1C-17A-1 and T.O. 1C-17A-9 procedures.

17.19.9. The loadmaster will direct all onload and offload operations using briefed signals. Other qualified loadmasters (TALCE, aerial port) may perform these duties; however, the crew loadmaster retains overall responsibility for the operation. Passengers will be escorted by a crewmember, TALCE, Aerial Port, or airfield control (e.g., STT, DACG) personnel when enplaning or deplaning. Deplane passengers before removing cargo and enplane after loading cargo unless cargo size and location dictates otherwise.

17.19.10. Load Data. If cargo/passenger onload information can be obtained prior to landing/onload, complete the DD Form 365-4 for the subsequent sortie. The loadmaster may use the load plan total weight and load center of balance (CB) for entry on the DD Form 365-4 provided these procedures are followed:

17.19.10.1. The load plan data must be checked by a qualified load plan validator (i.e. aircraft loadmaster, TALCE loadmaster, aerial port specialist, or any individual who has completed the AMC Affiliation Program Airlift Planners Course).

17.19.10.2. The load plan validator will legibly sign the signature block on the load plan with name, rank, and organization.

17.19.10.3. The load must be placed on the aircraft exactly to load plan.

17.19.10.4. Prior to flight, if there is any doubt as to the accuracy of the load plan weight or CB, the loadmaster must accomplish the DD Form 365-4 by station loading each individual item.

NOTE: If downloading to an empty aircraft, a DD Form 365-4 is not required for the subsequent sortie.

17.19.11. After off/onloading is completed, resume taxi after coordination with the loadmaster.

CAUTION: The stabilizer struts will be stowed and the ramp raised to at least the horizontal position prior to taxi.

17.19.12. The copilot will ensure that the next flight plan leg is available and TOLD has been updated (to include operating weight and CG). The copilot is also responsible for updating ATC clearances (as required).

17.19.13. Crew Entrance Door ERO Procedures. The aircraft commander may approve the offload or onload of personnel and small cargo through the crew entrance door. In this instance, the throttles may be positioned to idle or reverse idle, open only the crew entrance door, and deplane the loadmaster to assure safety of deplaning/enplaning of personnel.

CAUTION: Ensure personnel use hearing protection and all loose articles are secured.

17.19.13.1. Crew changes during local training missions are authorized provided the enplaning crew does not approach the aircraft until a deplaning crewmember is positioned on headset outside the aircraft.

17.19.13.2. After the off/onloading operation, ensure the crew entrance door is closed and the cargo compartment is secured prior to resuming taxi.

17.20. Combat Offload Procedures. Combat offload procedures are used to rapidly offload CDS containers, airdrop platforms, or single, multiple, or married pallets when material handling equipment (MHE) is not available or the situation dictates. This can involve either of the cargo rail systems (logistic

or ADS). The controlling NAF/DO or the DIRMOBFOR may authorize combat offload when conditions warrant.

NOTE: Maximum weight is 110,000 pounds.

WARNING: Many explosive items have a specific "drop" criteria that, if exceeded, render the item useless or dangerous to the user. With the exception of small arms ammunition (Hazard Class/Division 1.4), explosives and munitions shall not be combat offloaded without approval of MAJCOM/DO.

***EXCEPTION*:** Explosives and munitions rigged for airdrop may be combat offloaded without MAJCOM/DO approval.

CAUTION: Excessively rough, sharply undulating or battle damaged surfaces may cause damage to the aircraft ramp during combat offload operations. Reducing forward taxi speed on these surfaces will reduce aircraft oscillation. The aircraft commander must ensure the offload area will permit the offload operation to be conducted without damage to the aircraft.

17.20.1. Prior to commencing combat offload operations, the aircraft commander will brief each crewmember on the procedures to be used. If possible these procedures should be briefed during mission planning since some checklist items may be accomplished prior to arrival at the offload location. Ensure the offload area will not block other aircraft.

17.20.2. All crewmembers participating in the combat offload will refer to the Combat Offload checklist (Checklists 3 and 4 of this instruction). Report any problem to the aircraft commander immediately. Expanded Combat Offload Checklist information is contained in this chapter.

17.20.3. Ensure other individuals assisting the crew receive a thorough safety and procedures briefing for the entire offload sequence.

17.20.4. If space is limited and the offload environment permits, normal aircraft backing procedures may be used to provide maximum offload space.

CAUTION: To combat offload, a surface of at least 1,000 feet is required; however, 1,500 feet is desired to provide a margin of safety.

17.20.5. All obstructions to the pilot's cargo compartment viewing window will be removed.

17.20.6. The loadmaster will be on interphone with hot mike selected and maintain constant contact with both pilots during combat offload operations.

17.20.7. Set interior lighting to the minimum required to perform the mission.

17.20.8. When performing a combat offload, the loadmaster will open the cargo door, and lower the ramp to 3.8 degrees below horizontal when combat offloading single 463L pallets or CDS containers. Install short ADS links to position the ramp to horizontal when combat offloading married 463L pallets or airdrop platforms. If ground personnel are present, the loadmaster will make contact with the individuals to ensure no one disrupts the operation. After the area is clear and secure, the loadmaster positions for the offload.

17.20.8.1. All combat offloads will be accomplished from the forward loadmaster station.

NOTE: If combat offloading to an empty aircraft, a DD Form 365-4 is not required for the subsequent sortie.

17.20.9. The copilot will update the mission computer (as necessary) to ensure the next flight plan leg is available and TOLD has been updated (to include new operating weight and CG). The copilot is also responsible for updating ATC clearances (as required).

17.21. Emergency Airlift of Personnel. Use these procedures for emergency airlift of personnel from areas faced with enemy siege or hostile fire; or use these when directed by the controlling NAF/DO or DIRMOBFOR (AFRC NAF/DO for AFRC aircraft on AFRC missions). Airlift will normally be accomplished without the use of individual seats, seat belts, or litter stanchions. The number of personnel seated on the cargo floor will vary. Personnel may be loaded in groups of 12 to 16 (depending on size). The following procedures apply.

17.21.1. Rails and roller conveyors will be stowed.

17.21.2. When available, mattresses or other cushioning material may be used for seating.

17.21.3. Troops, passengers, and ambulatory patients may be seated facing forward on the cargo floor, sidewall seats, or ramp.

17.21.3.1. Attach the hook end of tiedown straps to left and right outboard tiedown rings. Position personnel laterally between attached straps.

17.21.3.2. After personnel are seated, route straps laterally across their legs and secure ratchet end of straps to the tiedown ring in D row. Ensure ratchet has at least 1 1/2 turns to guard against slippage, but is loose enough to provide for proper blood circulation. This will provide forward restraint and body stability for each row of personnel.

17.21.3.3. Number of personnel carried may be limited by the amount of tiedown equipment carried.

17.21.4. Secure baggage on the ramp when excess baggage and cargo secured on the cargo floor (or a pallet) may decrease the number of troops, passengers, and patients proportionately.

NOTE: Aircrews should be ready for aeromedical evacuation taskings at anytime, especially when in a combat area. If time and conditions permit the loadmaster may rig litter stanchions but should use caution when rigging en route in the event of turbulence or threat evasive maneuvers.

17.21.5. The maximum altitude for emergency airlift will not exceed FL250.

17.21.6. For airlift of patients, see **Chapter 20** of this instruction.

17.22. Expanded Combat Entry Checklist. Complete this before entering a threat environment, initiation of an airdrop checklist or entry into a low level route. These checklist items are intended to enhance survivability (based on specific mission requirements). All checklists are initiated by the pilot flying the aircraft (PF); however, individual items may be accomplished prior to starting the respective checklist. Accomplish applicable items as required for subsequent routes. Use specific crew positions (i.e., "pilot," "copilot," or "loadmaster") when a verbal response is required.

Table 17.1. Expanded Combat Entry Checklist.

PILOTS	LOADMASTER
1. "CREW, COMBAT ENTRY CHECKLIST" (PF) "ACKNOWLEDGED" (PNF, LM). 2. Crew Briefing - "COMPLETE" (PF) The PF will brief any changes to intentions, altitudes, airspeeds, crew coordination, threat locations, radios, and aircraft configuration. Review any mission items needing special emphasis. 3. Altimeters - "SET, _____" (PNF, PF) If actual baro setting is unavailable, use GPS baro altimeter setting. 4. Personnel Warning Signs - ON (PNF) Includes no smoking and seat belt signs. 5. Cockpit - SECURE (PNF) Ensure all loose items are secure. Ensure all personnel not involved with the mission remain seated with seat belt fastened. 6. Emitters - SET (PNF) Set Nav/Comm radios. To reduce emissions turn all nonessential items to non-emit mode. Use EMCON if required. 7. LM Panel Power - As Required Activate the PWR AVAIL switch, if the loadmaster requires electrical power for systems operation. 8. Defensive Systems – "ARMED" (PNF) a. MWS – ON b. CMDS – SET 1. JETT SW – OFF 2. MWS SW – ON 3. FL SW – ON 4. MODE SW – STBY 5. SELF TEST – GO	1. "CREW, COMBAT ENTRY CHECKLIST" (PF) "ACKNOWLEDGED" (PNF, LM) 2. Forward Loadmaster Station - As Required a. Radios and interphone - SET Turn on only the radios and interphone system, briefed to be used. **NOTE:** If required, position JUMP Light Switch to AFT PANEL for jump light dimming control. b. Lighting controls - SET Set interior lighting to the minimum required to perform the mission. Red lighting will be turned on per mission requirements or at the discretion of the Jumpmaster. Ensure that all white lighting is turned off if red lights are turned on. 3. Crew Rest/Cargo Compartment/Personnel - Secure Ensure all items/personnel are secure. Security of the items/personnel in the cargo compartment can be checked while completing the checklist. Ensure all personnel not involved with the mission remain seated with seat belt fastened. 4. Galley Lights - SET Lights will be turned off if red lights are to be used. 5. Cargo Compartment Windows - Configured Windows will be covered if mission requires. 6. Aft Loadmaster Station, Left Side - As Required

6. MODE SW – AUTO c. Safety Pins – Removed d. DISPENSE ARM SWITCH – ARMED 9. Flap Index - SET (PNF) Ensure flap index for airdrop or intended destination is set. 10. IFF - SET (PNF) IFF modes will be set as dictated by mission requirements. 11. Radar Altimeters - "SET ___ FEET" (PNF, PF) For low level ops, set the RA MKR 50 feet below intended route altitude for both pilots. 12. AFCS Panel - SET (PNF) Set ALT to MSA or ESA (if IMC) and VERT SPD to UP6000. 13. Cabin Press Panel - SET (PNF) Set LDG ALT window and depressurize as required. 14. Radar - AS REQUIRED (PNF) Radar will be set as dictated by mission requirements. 15. GPWS - SET (PNF) For low level operations, select TACTICAL mode and set the GPWS altitude 100 feet below intended route altitude. 16. Environmental Panel - SET (PNF) Ensure depressurization is complete. Set compartment airflow switch "OFF" if required for CW environment. Set avionics cooling override switch "OPEN" if required for additional avionics cooling. 17. Fuel Panel/Ignition Switch - SET (PNF) Close separation valve, turn off cross feeds, and select A & B ignition. 18. Electrical Panel - SET (PNF) Set the AC and DC X-TIES OFF if the electrical system is fully functional.	a. Radios and interphone - SET Turn on only the radios and interphone system to be used.***NOTE*:** Ensure that the Staging Lights are turned off. b. Lighting controls - SET Set interior lighting to the minimum required to perform the mission. Red lighting will be turned on per mission requirements or at the discretion of the Jumpmaster. Ensure that all white lighting is turned off if red lights are turned on. 8. Survival Equipment - "READY" (PNF, PF, LM) Ensure the following equipment is functional and immediately available or donned if required. a. Parachute/Restraint Harness b. Survival Vest c. Flak Vest/Body Armor d. Chemical Defense Ensemble e. Life Preserver f. Protective Headgear/Oxygen Mask 9. Loadmaster's Report - "CHECK COMPLETED" (LM)

19. Lights - "SET" (PNF, PF) Set interior lights to the minimum required. Set exterior lights as required. 20. Survival Equipment - "READY" (PNF, PF, LM) Ensure the following equipment is functional and immediately available or donned if required. a. Parachute/Restraint Harness b. Survival Vest c. Flak Vest/Body Armor d. Chemical Defense Ensemble e. Protective Headgear/Oxygen Mask f. Life Preserver 21. Loadmaster's Report - "CHECK COMPLETED" (LM) 22. LM Panel Power - PWR AVAIL OFF (PNF) If the PWR AVAIL switch was activated, deactivate switch. 23. Combat Entry Checklist - "COMPLETE" (PNF)	

This checklist returns the aircraft to normal cruise configuration upon departing the threat environment, completion of an airdrop, or exit from a low level route. The checklist is initiated by the pilot flying the aircraft (PF).

Table 17.2. Expanded Combat Exit Checklist.

PILOTS	LOADMASTER
1. "CREW, COMBAT EXIT CHECKLIST" (PF) "ACKNOWLEDGED" (PNF, LM) 2. Lights - "SET" (PNF, PF, LM) Set internal and external lights as required. 3. Battle Damage Assessment - "COMPLETE" (PNF, PF, LM) Scan cockpit and all instruments for aircraft damage indications. 4. Emitters - SET (PNF) Set EMCON off, NAV/COMM radios on and turn on any additional equipment required to continue the mission. 5. Defensive Systems – DEARMED (PNF) a. Dispense Arm Switch – OFF b. Safety Pins – INSTALLED c. CMDS – SET 1. MODE SW – OFF 2. FL SW – OFF 3. MWS SW – OFF 4. JETT SW – OFF d. MWS Power - OFF 6. Radar - SET (PNF) Select OFF, STBY or OPR as required. 7. GPWS - SET (PNF) Place mode switch to NORMAL if entering high level environment. 8. Personnel Warning Signs - SET (PNF) 9. Pressurization - “SET” (PNF, PF) Pressurize the aircraft in the 1 AUTO or 2 AUTO mode and set pressurization controls to the destination field elevation. Monitor the cabin altitude with the scale shown on the panel to ensure normal pressurization.	1. "CREW, COMBAT EXIT CHECKLIST" (PF) "ACKNOWLEDGED" (PNF, LM) 2. Lights - "SET" (PNF, PF, LM) Set interior lights to desired levels. 3. Cargo Compartment Windows - Configured If windows were covered, remove covers so outside area can be scanned. 4. Battle Damage Assessment - "COMPLETE" (PNF, PF, LM) Scan cargo compartment, wings, engines, and all indicators for possible aircraft damage. Report any discrepancies. 5. Survival Equipment - "STOWED" (PNF, PF, LM) Remove and stow all nonessential survival equipment. 6. Loadmaster's Report - "CHECK COMPLETED" (LM)

To remain depressurized through landing, select 1 or 2 SEMI MODE and ensure the altitude selected in the LDG/CABIN/ALT window is above actual aircraft altitude at all times. 10. Environmental Panel - SET (PNF) Return system to normal operations. Use avionics cooling override as required. 11. Fuel Panel/Ignition Switch - SET (PNF) Separation valve, crossfeeds, boost pumps as required. Reset ignition switch as required. 12. Electrical Panel - SET (PNF) Set AC and DC cross ties "AUTO". 13. Survival Equipment - "STOWED" (PNF, PF, LM) Remove and stow all non-essential survival equipment. 14. IFF - SET (PNF) IFF modes will be set as dictated by the mission requirements. 15. Loadmaster's Report - "CHECKCOMPLETED" (LM) 16. Combat Exit Checklist - "COMPLETE" (PNF)	

17.23. Loadmaster Combat Offload Preparation Checklist. This loadmaster will silently accomplish this checklist in **Table 17.3.** in preparation for a combat offload.

Table 17.3. Loadmaster Combat Offload Preparation Checklist (Steps 1 through 6 may be performed before landing).

1. Pallet End Stops - As Required
The pallet end stops will be raised if using number 1 pallet position(s).

2. ADS Links and Plugs - Checked
Install long ADS links with plugs to position the ramp 3.8 degrees below horizontal when combat offloading 463L pallets or CDS containers. Install short ADS links to position the ramp to horizontal when combat offloading married 463L pallets or airdrop platforms.

3. Ramp Toes - Stowed

4. Roller Conveyors - Configured
Ensure roller conveyors are configured as appropriate for intended offload. As a minimum, rails, rollers, and two pairs of locks (one pair left and right) will be available for use forward of all combat offloads as a forward barrier.

5. Airdrop Systems - As Required

   a. Drogue Parachute and Line - De-Rigged/Secured
   Open the PDM backplate restraining hooks using the cocking handle on top of the backplate and removethe drogue parachute.

b. Extraction Parachute(s), Extraction Line(s)/ Bag(s) - De-Rigged/Secured

c. EFTC Actuator Arm(s) - Stowed

d. Platform(s) - Disconnected

e. CDS Static Line(s) - Disconnected

6. Logistic Rail Supplemental Restraint - As required
When the logistic rail system is used for combat offload, apply 1 G forward and aft supplemental restraint with aircraft tiedown equipment to all platform(s)/pallet(s) not to be offloaded this pass.
Steps 7 thru 10 will be performed after the aircraft has slowed to taxi speed.

7. Supplemental Restraint - Removed (As Required)
Remove all supplemental restraint for platform(s), pallets(s) and/or container(s) to be combat off-loaded.

CAUTION

Ensure all straps, chains, devices, and nets that must remain on cargo for restraints are secured so that they will not impede the exit during the offload.

8. Cargo Compartment Offload Area - Checked

CAUTION

Ensure that nothing is between, adjacent, or aft of platform(s), pallet(s) and/or container(s) that will impede the offload.

9. LM FWD CONTR Panel - SET (As Required)

a. ELEC PWR Switch - ON

b. ADS L and R LOCK SELECT Rotary Switches - SET
If combat off-loading from the ADS rails ensure the L and R LOCK SELECT rotary switches are selected for the appropriate pallet(s)/platform(s) to be combat off-loaded.

c. ADS LOCK STATUS Annunciators - Checked (As Required)
Ensure rail locks/lips are engaged in all pallet(s)/platform(s) loaded in the ADS rail system.

d. LOGISTIC PALLET POS Annunciators - Checked (As Required)
Ensure rail locks/lips are engaged in all pallet(s)/platform(s) loaded in the logistic rail system. Retract unused lips and locks as required.

e. CDS GATE SELECT Rotary Switch - SET (As Required)
Ensure the CDS GATE SELECT rotary switch is positioned for the appropriate container(s) to be combat offloaded.

10. Cargo Door and Ramp - OPEN
Ensure the DOOR UP/LKD, RAMP NOT LOCKED, and RAMP AIRDROP POS annunciators are illuminated.

NOTE: Cargo door and ramp will be opened after receiving clearance from the PF.

17.24. Expanded Combat Offload Checklist. Use the checklist in **Table 17.4.** after the aircraft is positioned and stopped.

Table 17.4. Combat Offload Checklist.

PILOTS	LOADMASTER
1. "CREW, COMBAT OFFLOAD CHECKLIST" (PF)- "ACKNOWLEDGED" (PNF, LM) 2. Crew Briefing – “COMPLETE” (PF) NOTE: Normally, do not apply parking brakes. 3. Hot Mike - "SET" (PF, PNF) 4. Taxi Clearance - "READY TO OFFLOAD" (LM) The aircraft commander is responsible for ensuring that the offload area is clear. If required, deplane the Loadmaster to check offload area. 5. Power - "STABILIZED" (PF) Advance power to <u>charted break-away EPR</u> (per Part 10, T.O. 1C-17A-1-1) while holding brakes. This setting will vary depending upon surface conditions, slope, wind, aircraft weight, and cargo weight. **WARNING:** If for any reason prior to brake release the operation becomes unsafe, state "ABORT - ABORT - ABORT". **WARNING:** During offload, the nose of the aircraft may pitch due to shifting center of gravity. Do not retard throttles or apply brakes, except in an emergency or until the loadmaster reports the load is clear or there is a malfunction. **CAUTION:** Ensure brakes are not released until charted EPR is set and stabilized and loadmaster has stated "RELEASE". **CAUTION:** Taxi aircraft in a straight line. Any attempt to turn aircraft during offload may damage the aircraft. 6. “STANDBY...BRAKES...RELEASE” (LM)**WARNING:** If "MALFUNCTION" is stated by the loadmaster, the pilot maneuvering the aircraft will bring the aircraft to a gradual stop.	1. "CREW, COMBAT OFFLOAD CHECKLIST" (PF) ACKNOWLEDGED" (PNF, LM) 2. L LOCK ADS GANG CONTR REL Switch - REL (As Required) When utilizing the ADS rail system, activate the L LOCK ADS GANG CONTR REL switch to remove left rail locks/lips for pallet(s)/platform(s) to be offloaded. 3. Hot Mike - ON Hot Mike will be turned on when connected to a HRP. **WARNING:** Ensure all personnel in the cargo compartment who are not directly involved with the offload operation are seated with seat belts fastened prior to brake release. Failure to comply may result in injury to personnel. 4. Taxi Clearance - "READY TO OFFLOAD" (LM) 5. Power - "STABILIZED" (PF) **WARNING:** If for any reason prior to brake release the operation becomes unsafe, state "ABORT - ABORT - ABORT". If all locks have been released, GANG LOCK the locks. 6. “STANDBY...BRAKES...RELEASE” (LM) a. If using the ADS rail system, press the ADS LOCK GANG CONTR R LOCKS switch to REL at “STANDBY.” Ensure all lock annunciators are blank or blinking for a cargo floor offload and blank for a ramp offload before stating “RELEASE”.

PILOTS	LOADMASTER
7. Pilot Notified - "LOAD CLEAR" or "MALFUNCTION" (LM) 8. Cargo Door and Ramp - CLOSED (PNF) 9. Loadmaster's Report - "CHECK COMPLETED, READY TO TAXI" (LM) 10. Combat Offload Checklist - "COMPLETE" (PNF) **NOTE:** Return to the Operational Stop Checklist.	b. If using the logistic rails, press the LOG LOCK GANG REL L/R LOCKS RAMP/FLOOR switch (es) to REL at "STANDBY". Ensure all lock annunciators are blank before stating "RELEASE". c. ADS BACKUP Panel, CDS Release Switch - REL (As Required) **WARNING:** If locks fail to release or load stops moving aft, ensure that all pallet(s)/platform(s)/ containers that are moving have exited, GANG LOCK the locks, then state "MALFUNCTION". 7. Pilot Notified - "LOAD CLEAR" or "MALFUNCTION" (LM) Advise the pilot when all pallets/platform are off-loaded. If locks cannot be reengaged into the pallet(s) or platform(s), secure the pallet(s) or platform(s) with tiedown equipment. Do not apply tiedown equipment until aircraft has stopped. If the GRM fails to release, state "MALFUNCTION". Secure the load with tiedown equipment after the aircraft has stopped. 8. Cargo Door and Ramp - CLOSED Cargo Door and Ramp can be closed from either the Fwd or Aft Loadmaster station. 9. LOG LOCK GANG REL RAMP/FLOOR Switches - LOCK (As Required) Upon completion of a partial offload of pallets/platforms from the logistics rails, activate the LOG LOCK GANG REL RAMP/FLOOR switches to LOCK and ensure rail locks/lips are engaged in all pallet(s)/platform(s) remaining on the aircraft. 10. ADS L and R LOCK SELECT Rotary Switches - Safe 11. Hot Mike - OFF 12. Cargo Compartment - Secured 13. Loadmaster's Report - "CHECK COMPLETED, READY TO TAXI" (LM)

Chapter 18

AIRCRAFT FORMATION

Section 18A—General Procedures

18.1. General. This chapter prescribes formation procedures. The airlift resources available, the threat, the mission objectives, and mission priorities must be weighed in determining the use of formations. C-17 formations normally use SKE procedures for IFR flights. Once in the low level environment, aircraft might transition to single ship, visual formation flight for mutual support in VMC, or the formation might remain with SKE procedures in IMC. Safety, aircrew capability, proficiency, survivability and user requirements must be considered when planning any formation.

WARNING: Vortices generated during departure, airdrop, and recovery can be significant in size, duration, and velocity. Due to the potential hazards, aircrews must be aware of their existence and attempt to avoid them.

NOTES:

Aircraft may alter position slightly to avoid vortices from preceding aircraft.

Non-airdrop qualified pilots are restricted to single element, 2-ship SKE formations at or above the minimum IFR enroute altitude.

18.2. Specified Times. The mission commander determines the sequence of events and mission times based on staff input, fuel requirements, passenger comfort, taxi distances, briefing requirements, etc.

18.3. Weather Minimums. Formation takeoff and landing weather minimums are the published minimums for the airport navigation aid used, but no lower than 200 feet and one-half mile visibility (RVR 24). If the departure ceiling or visibility is below published approach minimums, the formation aircraft may takeoff single ship if the requirements for a departure alternate (in accordance with **Chapter 6** of these instructions) are met. See **18.54.6.** for formation air refueling weather minimums.

18.4. Ground Operations. The standard taxi interval is one aircraft length. Lead may increase the taxi interval if circumstances dictate.

18.5. Takeoff. For takeoff, aircraft feed onto the runway individually. Each aircraft uses the minimum power required for taxi onto the runway to minimize possible damage to following aircraft. Using lead's "start takeoff roll" point, position one aircraft on the runway at a time. As the preceding aircraft commences its takeoff roll, the next aircraft moves into takeoff position. Judicious application of power at the start of takeoff roll is necessary to prevent damage to succeeding aircraft. The takeoff EPR rating (i.e., DRT or MAX) should be briefed and all aircraft should takeoff with the same EPR rating.

18.5.1. The takeoff interval is as briefed; however, the minimum takeoff interval is 30 seconds. It is possible at high power settings to cause a FOD hazard to following aircraft, so plan departure spacing accordingly. Consider extending the takeoff interval for low visibility, gross weights requiring maximum EPR takeoffs, wet/icy runways, or other adverse conditions. Begin timing for takeoff interval when the preceding aircraft starts its roll.

18.5.2. For aborts during takeoff, the loadmaster immediately transmits position number aborting three times on interplane frequency (i.e., "Number two aborting, number two aborting, number two aborting."). The PNF transmits the same abort call on the primary frequency (after completing emergency procedures requiring immediate action). The aborting aircraft clears the runway as safety allows. Succeeding aircraft, if not on takeoff roll, hold until the runway is clear and a new takeoff clearance is obtained. Any aircraft on takeoff roll will abort their takeoff.

NOTE: Use of HAVE QUICK or secure interplane may inhibit reception of an abort call. Consider using “in the clear” communications for takeoff in case an abort call is necessary.

18.6. Altimeter Setting. Formation leaders will pass altimeter changes throughout the mission.

18.7. Bank Angles, Airspeeds, and Rates of Ascent/Descent. Flight leads will fly the airspeeds and rates of ascent/descent depicted in **Table 18.1.** (or as briefed). Lead and element leads are limited to 20 degrees of bank when using Station Keeping Equipment.

Table 18.1. Bank Angles, Airspeeds, and Rates of Ascent/Descent.

	Below 10,000 ft MSL (7)	**At or Above 10,000 ft MSL (7)**
Assembly	200 KCAS	
	1000 FPM	
Climb	250 KCAS	250 KCAS / .74 M
	2000 FPM (1)	2000 FPM (1)
Cruise	250 KCAS (3)	310 KCAS / .74 M (3)
	(300 KCAS on MTR’s)	
En Route Altitude Change	Cruise Speed	Cruise Speed
	2000 FPM (2)	2000 FPM (2)
Descent	250 KCAS	310 KCAS / .74 M (4)
	1000 FPM (5)	2000 FPM (4)(5)(6)
Acceleration / Deceleration	Thrust Flight Director	Thrust Flight Director

NOTES:

(1) Lead will initially maintain 250 SPD on THR, 2000 FPM VS (with MCT rating limit). As EPR approaches .05 below the MCT limit, lead will reduce VS in 500 fpm increments until reaching cruise altitude. Wingmen normally select INT. Lead indicates each VS ascent rate change using SKE FCIs (i.e., # 15, # 10, # 05) or radio commands.

(2) Normally, for climbs and descents greater than 2000 feet, use 2000 FPM (or previous rate, if lower). For 2000 feet or less, use 1000 FPM (or previous rate, if lower).

(3) Because MCT, INT, and MAX are the same above approximately 24,000 feet, upon reaching cruise altitude, lead normally sets a manual EPR limit of .02 below MCT (while followers maintain INT). When the formation is level at cruise altitude, lead will accelerate the formation to cruise airspeed.

(4) Unless briefed otherwise, establish a 2000 FPM descent rate to accelerate to 310 KCAS.

(5) Slow to 250 KCAS by 10,000 feet. At 13,000 feet, reduce rate of descent to 1000 FPM, slow to 250 KCAS, then maintain 1000 FPM (or briefed descent rate).

(6) 3000 FPM max. Lead indicates each VS descent rate change using SKE FCIs (i.e., # 15, # 10) or radio commands.

(7) If briefed, the parameters in this figure may be changed to meet particular mission requirements.

18.8. Radio Discipline. Limit transmissions to those required for safety or control of the formation. HAVE QUICK and secure communications will be used when available.

18.9. Airborne Aborts (Departure, Enroute and Element Lead Abort. Any aircraft that cannot maintain formation position and must abort the formation will notify lead of the nature of the emergency and intentions. If the emergency does not permit maintaining position until an individual clearance is obtained, establish a safe heading away from the formation and maintain SKE contact. If unable to use SKE, the use of air-to-air TACAN, radar beacon, or skin paint may aid in maintaining separation from the formation.

18.9.1. Departure. Aircraft aborting during assembly will execute the briefed emergency procedures, hold clear of departing traffic, maintain VMC if possible, notify lead, and contact the appropriate controlling agency. If possible, the aborting aircraft will remain clear until a landing can be made without interfering with the remainder of the departing formation.

18.9.2. En Route**.** Aircraft that abort after assembly will turn away from the formation and, with lead's concurrence, may proceed to a suitable recovery airfield or rejoin at the end of the formation.

18.9.3. Element Lead. If a formation is flying a three-ship element, aircraft within the element may move up to maintain a one-two relationship. Element leads maintain their briefed position. Normally, call signs and slot numbers do not change.

18.10. Not Used.

18.11. Not Used.

18.12. Forms. The AF Form 4096, **Station Keeping Equipment/Zone Marker Debrief/Airdrop/Tactical Airland/ Air Refueling Mission Recap**, will be completed by a pilot on each aircraft following all SKE, airdrop, assault landing zone, or air refueling missions and will be turned in to home station tactics office.

18.13. Not Used.

Section 18B—Visual Procedures

18.14. General. Visual formation geometry will be driven by the tactical situation, which is determined by the threat environment, terrain, mission requirements and other factors. The most common geometries are discussed in Section C of this chapter. Choose the formations that give the best tactical advantage. Different formation geometries may be required through the course of the mission. Flight leadership is critical to the success of these tactics.

18.15. Departure and Assembly. After crossing the field boundary, wingmen adhere to air traffic control requirements and close to en route position. Lead maintains assembly airspeed (200 KCAS or as briefed), until briefed acceleration time/point.

18.16. Acceleration. Commence timing for acceleration when lead starts his takeoff roll. At briefed acceleration time, lead accelerates using flight director thrust to attain climb/en route airspeed. Other methods, such as acceleration at a geographical point or place/bearing/distance may be used if dictated by the mission.

18.17. Late Take Off. Aircraft joining a formation en route will contact lead and rejoin as briefed/directed. The rejoining aircraft will remain at least 500 feet above or below the formation until the formation is in sight and clearance to rejoin is granted.

18.18. En Route Procedures:

18.18.1. Altitude.

18.18.1.1. Day VFR Low Level Altitude. Element leads maintain altitude by visual reference to the terrain, backed-up by the radar altimeter. Wingmen use a combination of radar altimeter, reference to the other aircraft, and terrain.

18.18.1.2. Night VFR Low Level Altitude. Element leads maintain altitude by reference to the pressure altimeter. Wingmen will use a combination of barometric altimeter and reference to preceding aircraft.

18.18.2. Airspeed. At night, lead will announce unplanned airspeed changes greater than 10 knots, unless otherwise briefed.

18.18.3. Inadvertent Weather Penetration. If clouds and/or areas of poor visibility are inadvertently entered by a formation operating under VFR, the primary concern of the flight lead is to extricate the formation from the weather by providing safe aircraft separation and terrain clearance. Wingmen should immediately notify lead of deteriorating visual conditions if they occur. The following procedures apply to formations operating in accordance with visual flight rules if no other procedure is briefed.

WARNING: It may be necessary to modify these procedures due to formation geometries other than visual in-trail, terrain, airspace restrictions, etc. Inadvertent weather penetration in mountainous terrain using these procedures may be hazardous. Mission planners should brief procedures that best suit the situation.

NOTES:

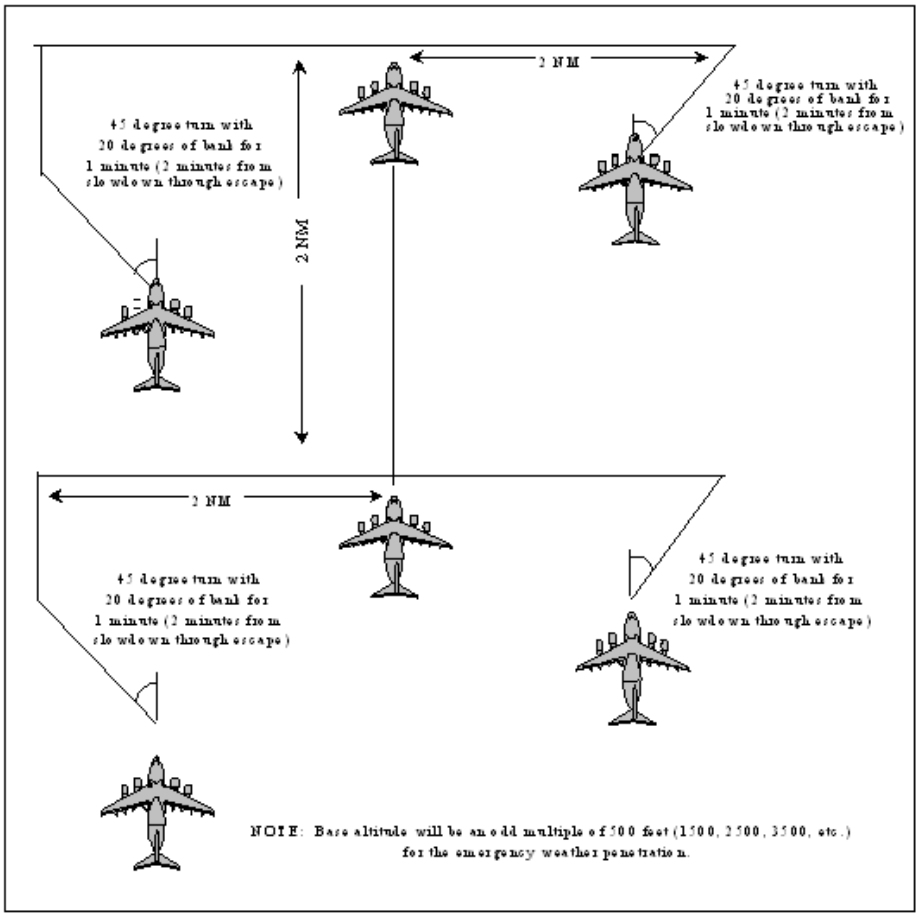
The following procedures are for emergency use and do not constitute authority to violate AFI 11-202V3 or Federal Aviation Regulations (FAR). Exercising these procedures under actual weather conditions is a violation subject to appropriate action by USAF and FAA. Individual aircraft should maintain VFR if there is sufficient warning to take evasive action. Flight leads will take all practical measures to avoid entering controlled airspace without clearance.

Attempt to avoid leveling at IFR cruise altitudes by 500 feet to minimize the possible conflict with IFR traffic.

18.18.3.1. Inadvertent weather penetration with station keeping (SKE) capability. Immediately upon penetrating the weather, formation lead will announce, "XXXX flight, execute inadvertent weather penetration procedures with SKE now, base altitude XXXX, base heading XXXX, base airspeed XXXX. Acknowledge." The formation then climbs to a base altitude at or above the ESA for the route. Wingmen initiate climb, select SKE, set cross-track to 1,000 feet left or right as appropriate, and continue climb to the base altitude on the base heading at base airspeed and 1,000 feet per minute while maintaining SKE separation. If visual conditions cannot be promptly reestablished, lead will contact ATC, declare an emergency, and request necessary airspace clearance or individual clearances. When level at the base altitude, lead will announce "assume SKE interval now." At this command, followers will reduce airspeed 20 knots and drift back to establish appropriate SKE in-trail intervals. Followers will then reset the appropriate cross-track distance.

18.18.3.2. Inadvertent weather penetration without station keeping (SKE) capability (**Figure 18.1.**). Immediately upon penetrating the weather, formation lead will announce, "XXXX flight, execute inadvertent weather penetration procedures without SKE now, base altitude XXXX, base heading XXXX, base airspeed XXXX. Acknowledge." The formation climbs to a base altitude at or above the ESA for the route. Climb at cruise speed and 1,000 feet per minute. After the element wingmen establish a 1,000 feet per minute climb, they will use 20 degrees of bank to turn to a heading 45 degrees right and left, respectively, from the base heading. They maintain this divergent heading for 1 minute (2 minutes from slowdown through escape for airdrop missions) before resuming the base heading. The use of air-to-air TACAN, radar beacon, or skin paint may aid in maintaining separation from other members of the formation. The last element in the formation will occupy the base altitude. All other elements will stack 1000 feet higher than the following element, with the first element occupying the highest altitude. Do not change base heading while in IMC. If visual conditions cannot be promptly reestablished, lead will contact ATC, declare an emergency, and request necessary airspace clearance or individual clearances.

Figure 18.1. Inadvertent Weather Penetration Without SKE.



18.19. Not used.

18.20. Not used.

18.21. Not used.

18.22. Recovery. Determine the type of recovery based upon the formation geometry, threat, traffic pattern, traffic flow, etc. The following are two possible methods: the overhead and the downwind. Other recovery methods can be flown if briefed. If aircraft weights differ significantly, the heaviest aircraft will dictate the speeds flown.

18.22.1. Formation Downwind Recovery:

18.22.1.1. Wingmen echelon on formation lead's command. On command to echelon left or right (opposite base turn direction), the wingmen may climb slightly to cross over the preceding air-

craft's jetwash and assume the new position. The desired position after the echelon is wingtip-to-wingtip lateral separation, with 2,000 feet longitudinal spacing, and out of wake turbulence.

18.22.1.2. Enter the downwind leg for the active landing runway, maintaining 230 KCAS (or as briefed) with slats extended and 1,000 feet above field elevation or traffic pattern altitude, whichever is higher. The wingman parallels the same track as the leader. Position the downwind to allow for a continuous turn to final.

18.22.1.3. At mid-field or as briefed, retard power to idle, lower half flaps and landing gear in sequence, and slow to160 KCAS or Vmma whichever is higher. Aircraft break with sufficient spacing to provide a desired 60 second landing interval (45 seconds minimum). Roll out on final at no less than 1/2 mile from the end of the runway on normal glide path. Aircraft will not descend below preceding aircraft during the recovery. When approaching a position to establish a normal glide path, extend final approach flaps, and slow to V_{APP}. Runway distance permitting, wingmen will shift FPV aimpoint 100 feet down runway to aid in wake turbulence avoidance.

18.22.2. Formation Overhead Recovery:

18.22.2.1. Wingmen echelon on formation lead's command. On command to echelon left or right (opposite break turn direction), the wingmen may climb slightly to cross over the preceding aircraft's jetwash and assume the new position. The desired position after the echelon is wingtip-to-wingtip lateral separation, with 2,000 feet longitudinal separation, and out of wake turbulence.

18.22.2.2. Establish the initial approach on the runway extended centerline and fly the entry at traffic pattern altitude or 1,500 feet above field elevation, whichever is higher, normally at 230 KCAS with slats extended. Wingmen parallel the same track as the leader.

18.22.2.3. Aircraft break as the tactical situation permits with approximately 45° of bank. Wingmen should break no earlier than lead's point. For tactical considerations, wingmen may delay the break to attain required separation for landing. This additional spacing on initial will allow all aircraft to use the same perch point for turn to base, eliminating long finals. Ensure the procedure to be used is thoroughly briefed. After bank is established, retard power to idle, lower half flaps and lower the landing gear in sequence. Make a level turn until reaching V_{MMA} or 160 KCAS, whichever is greater. Maintain V_{MMA} (no lower than 160 KCAS) on downwind. Turn to allow for a continuous turn to final. Succeeding aircraft turn with sufficient spacing to provide a desired 60 second landing interval (45 seconds minimum). Roll out on final at no less than 1/2 mile from the end of the runway on normal glide path. Aircraft will not descend below preceding aircraft during the recovery. When approaching a position to establish a normal glidepath, extend final flaps, and slow to final approach speed. Runway distance permitting, wingmen will shift FPV aimpoint 100 feet down runway to aid in wake turbulence avoidance.

18.23. Formation Landings. All aircraft land on the runway centerline with the same flap detent setting, and use reverse thrust and brakes as briefed. Continue to the end of the runway (or briefed turnoff) without stopping in any position that would prevent succeeding aircraft from clearing the runway. The desired landing interval is 60 seconds (45 seconds minimum), but consider extending the interval for strong winds, icy runway conditions, short/narrow runways, or other adverse conditions.

WARNING: Aircraft will not perform touch and go landings out of formation recoveries.

18.24. Lead Changes. To accomplish a visual lead change, the leader will signal or command the lead change (if it does not occur at a briefed point). The aborting leader will maneuver in the safest direction (as briefed) to assume the new position.

18.25. Orbit For Rejoin. At a briefed point, the joining aircraft will descend to 1,000 feet above the briefed orbit altitude. Joining aircraft must be VMC before the orbit point, and if not, should follow the briefed plan. Maintain 250 KCAS (or briefed airspeed) at the orbit point. When beginning the first turn outbound in the orbit, descend to and maintain 500 feet above the orbit altitude until preceding aircraft are in sight. The formation orbits until all aircraft are joined. The tactical situation may require modification of these procedures; therefore exceptions will be thoroughly briefed.

18.26. Visual Formation Geometries. The most survivable formation geometry will depend on the tactical situation. This may require a transition from one geometry to another as the terrain or threat changes. Thorough mission planning and briefings, and imaginative leadership are essential. Although not required, SKE can assist in flying visual formations (tactical situation permitting). Each element lead is specifically responsible for clearing the flight's 12 o'clock. Secondary priorities are the right and left quadrants toward the wingmen. Wingman lookout priorities will change depending upon their position.

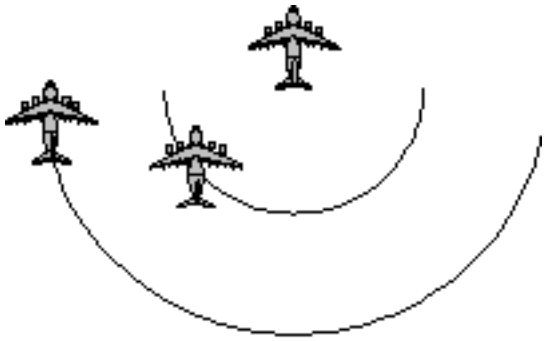
18.26.1. Mutual Support. Visual formation elements may consist of any number of aircraft. The most common element sizes are the two and three ship elements. These elements have several tactical advantages and mutual support benefits.

18.26.1.1. Two-ship Elements. A two-ship is the most common (and preferable) element size. A fluid wingman position may be required to provide a degree of lookout in left, right, and rear quadrants.

18.26.1.2. Three-ship Elements. These provide less flexibility and are more detectable. The wingman to the right of lead is primarily responsible for the left quadrant toward and beyond the flight. The secondary responsibility is the right quadrant away from the flight and tertiary responsibility is the front quadrant. The wingman to the left of lead is primarily responsible for the right quadrant toward and beyond the flight. The secondary responsibility is the left quadrant away from the flight and tertiary responsibility is the front quadrant. Wingmen should strive to avoid being on the same side of lead since this degrades visual coverage. Mission commander should identify which aircraft are primarily responsible for lookout to the flight's six o'clock.

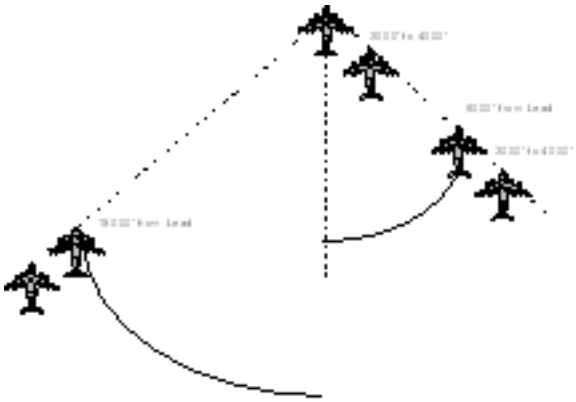
18.26.2. Fluid Trail (**Figure 18.2.**). This tactic allows wingmen to optimize terrain masking, provides more freedom for evasive maneuvers, and breaks up the symmetrical visual pattern of the in-trail formation. It provides wingmen with maximum flexibility. Wingmen maneuver in a designated arc from the 3 o'clock to the 9 o'clock position with respect to lead. Tactically, the 6 o'clock position should be avoided. Spacing between aircraft (between and within elements) is dependent upon mission requirements, terrain and number of aircraft and will be prebriefed.

Figure 18.2. Fluid Trail.



18.26.3. Modified "V" (**Figure 18.3.**). This tactic is designed to improve fighter escort coverage, while retaining the advantages of a dispersed flexible formation. A modified "V" formation normally is flown as three two-ship elements. Aircraft within each element maintain a 2,000 to 4,000 foot interval. Number two element flies approximately 9,000 feet behind and to the right of the lead element and number three element flies approximately 18,000 feet behind and to the left of the lead element. Element wingmen maintain a fixed position on each element lead, but each follower element is free to maneuver on an arc behind the lead element. Although this tactic normally is used when a wide lateral dispersion (almost five miles) is acceptable, the formation can rapidly transition to in trail geometry to pass through a narrow corridor.

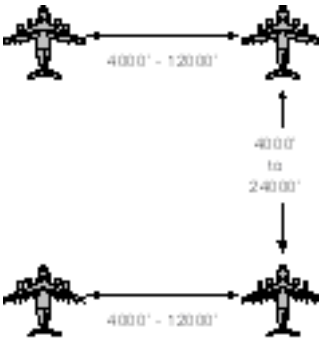
Figure 18.3. Modified "V."



18.26.4. Line Abreast. This formation geometry is useful over areas that provide minimal terrain masking such as a desert area or a coastal penetration from over water, and in situations where aircraft are flying to laterally spaced IPs. It is also useful where a large valley or line of communications must be crossed, since the formation will be exposed for a shorter time. Planning turn points at the entry and exit of the line abreast leg allows for easy transition to and from trail. Line abreast is ideally flown in single or multiple two-ship element(s). The wingman (or element leads) can fly abeam lead with 4,000 to 12,000 feet lateral spacing or drop back into a box geometry. Line abreast for multiple legs allows little flexibility during turns or for fighter evasion. Refer to AFTTP 3-1 for other turning methods.

18.26.5. Box (**Figure 18.4.**). This geometry combines the advantages of a line abreast formation while providing more in the way of mutual support.

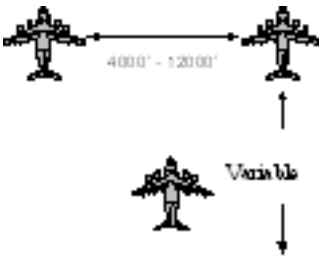
Figure 18.4. Box.



18.26.5.1. Wingmen maintain 4000' to 12,000' spacing from their respective leaders. The second element lead maintains 4,000 to 24,000 feet spacing behind the formation lead.

18.26.6. Inverted Vic (**Figure 18.5.**). This geometry is designed to exploit a limited number of rear vision devices (RVD) to enhance visual lookout for the formation. It is a variation of line abreast, with a three-ship element. The first two aircraft fly line abreast, with the third aircraft in trail. The third aircraft should be outfitted with an RVD to improve lookout for the flight. Spacing for the third aircraft may be variable depending on the number of elements, terrain, and other factors.

Figure 18.5. Inverted Vic.

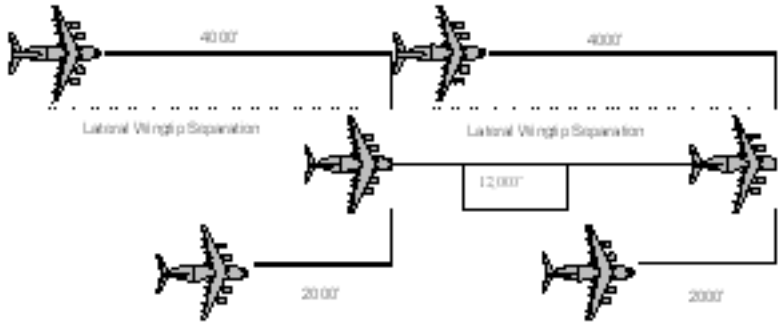


18.26.7. Extended Trail. Extended trail is a modification of fluid trail in which separation between individual aircraft is significantly increased. Reduced visibility and terrain may not permit followers to navigate with visual or electronic reference to lead; therefore, followers must rely upon their own navigation.

18.26.8. Visual In-Trail (**Figure 18.6.**). The visual in-trail formation is a tactic designed primarily for mass airborne assault operations to large drop zones. It is useful for massing a large number of aircraft over an objective or flying to a split-up point to minimize the impact on airspace. It also permits a rapid transition to other geometries, including SKE. Employing flexible geometries or using individual ingresses to an in-trail rendezvous point short of the objective may improve survivability. The in-trail geometry during an airdrop simplifies the user's crossloading plan and puts the formation into a narrow corridor for Joint Suppression of Enemy Air Defenses (J-SEAD). The visual in-trail formation normally contains elements of two aircraft (no more than three aircraft) with an interval of approximately 2,000 feet between aircraft within elements and approximately 12,000 feet between element leaders. The tactical situation may dictate closer spacing to shorten total exposure time. All

aircraft maintain the same altitude and element wingmen maintain wingtip-to-wingtip lateral separation out of wake turbulence to the right and left respectively.

Figure 18.6. Visual In-Trail.



18.26.9. Separate Ingress. This tactic degrades the ground threat by varying the flight track each aircraft or element flies within a formation. It is particularly useful in avoiding detection, confusing/saturating enemy C2, and delaying enemy identification of mission objectives. Depending on the tactical situation, the threat and the availability of joint support, mission commanders will determine the best course of action. Each aircraft or element may fly a separate route to a rendezvous point for possible rejoin and a common run across the DZ or to individual IPs for random DZ run-ins. Additionally, a common route to a break-up point for individual random run-ins may be flown.

18.26.9.1. In multi-ship, multi-direction run-ins, timing is critical to avoid conflict with other aircraft/elements.

18.26.9.2. Although SKE is useful to track aircraft during multiple run-ins from different IPs or during rejoins at a single point, threat systems may detect SKE emissions. Consider leaving the SKE in standby until a predetermined point or time, turning it on briefly for aircraft acquisition.

Section 18C— SKE Procedures

18.27. General. SKE is a multipurpose, time-ordered, avionics system that provides the capability for up to 18 C-17 aircraft (or up to 16 aircraft and a zone marker) to maintain a fixed formation position in either visual or instrument meteorological conditions. It is also a flexible aid for integrating large formations close to an objective in minimum visual conditions (e.g., VMC at night). SKE equipment, in conjunction with GPS, a ground radar beacon, or a zone marker, allows precise navigation in IMC for formation airdrops and formation approaches with minimal radio communications.

NOTE: When in actual IMC, aircrews should use an alternate method of identifying other aircraft in the formation (e.g., A/A TACAN, weather skin paint, radar beacon, TCAS) in the event of a SKE malfunction.

18.28. SKE Operating Procedures. The following normal operating parameters apply to SKE operations.

18.28.1. Consider positioning the master in the middle of the formation to ensure maximum coverage for large formations.

NOTE: C-17 slots consist of two C-141 or C-130 slot numbers. Mixed C-17/C-141 or C-17/C-130 formations will require slot number selections IAW TO 1C-17A-1-2 slot pairings.

18.28.2. When required, formation members will enable all slot numbers to be used on the flight.

18.28.3. Due to limitations of the SKE system, all formation aircraft should be within 10 NM of the master for the SKE to function properly and be within 4 NM of the selected leader for the flight director to function properly.

18.28.4. Prior to each formation turn, appropriate FCI messages should be transmitted by element leaders and received by followers. If element leaders turn without passing FCI data, followers will still receive flight director turn guidance; however, accuracy and performance will not be as precise.

18.28.5. When changing masters, the aborting master deselects “MASTER" and the new master selects "MASTER." Prebrief or verbally coordinate this procedure.

18.28.6. Aircraft SKE frequency changes may be accomplished with no time delay. Zone marker frequency changes require a minimum of 90 seconds.

18.28.7. For ZM drops the master aircraft is normally the lead aircraft. This allows maximum range ZM reception without master changes. However, master placement may be dictated by other factors such as formation size, departure and arrival requirements, or equipment degradation. For departures, placing the master in the middle of large formations (five aircraft or more) will help ensure the best signal reception during this phase of flight.

NOTE: ZM reception is dependent on the master aircraft being within 20 NMs of ZM position and within line of sight of the transmitter.

18.28.8. SKE Guidance Function. The SKE guidance function provides roll and speed commands to the flight control computer to maintain desired along and cross track positions relative to a leader. The formation flight control function detects and “time tags” turns, speed changes, airdrop slowdown, and CARP points from received FCIs.

18.28.8.1. The relative trajectory of the lead aircraft is estimated by the system and station keeping deviation determined. These deviations, together with FCI messages, are used to initialize time-to-turn and CARP countdown timers.

18.28.8.2. SKE capture criteria requires less than 500 feet cross track deviation, heading within 15 degrees of leader’s heading, true airspeed within 18 knots of leader’s true airspeed, and SKE long track within 1500 feet of lead.

18.28.9. Use of the Flight Command Indicators (FCI). Use the FCI to signal maneuvers after the turn to departure heading. Use the FCI to signal SKE formation turns after all aircraft attain formation position or the departure (climbout instructions or SID) is accomplished, whichever occurs first. When directed by ATC to immediately change altitude or heading, lead depresses the appropriate preparatory FCI signal and after a short pause depresses the "E" before beginning the commanded maneuver. When established in the maneuver, signal the new heading or altitude. A radio call may be used to signal the new heading/altitude if the tactical environment permits. Priority of signals is altitude, heading, and airspeed. When a complete flight plan is loaded in the mission computer, planned SKE changes are automatically highlighted on the SKE PRIMARY page and sent by SKE lead to SKE followers.

NOTE: Turn data is lost if "E" is not given within one minute of the preparatory command. Also, "E" will not be transmitted if passed more than 12 seconds after the preparatory command. If the FCI "E" button does not light up, retransmit the preparatory command. Each command should be displayed for at least 5 seconds prior to the next command wingmen may not receive the information.

18.28.9.1. Lead must be prepared to manually transmit information when unprogrammed changes are required. If an unbriefed maneuver is required, lead should highlight the new value on the SKE PRIMARY page, transmit it, then send a preparatory command approximately seven seconds prior to executing the maneuver. Element leaders should retransmit signals as required. If required for safety, lead/element lead may transmit commands verbally over interplane.

18.28.9.2. Wingmen should follow flight director guidance. When the desired HDG is attained, the flight director returns to wings level. The flight director assumes a three second rollout.

18.28.9.3. The following special signals may be passed to the formation using the SKE primary page:

18.28.9.3.1. A frequency change using the frequency or a coded number (i.e., chattermarks).

18.28.9.3.2. A new TOT: the MC automatically transmits the entered TOT. The last three digits are transmitted by the leader's SKE, and the receiving MC supplies the leading digit.

18.28.9.3.3. A new barometric altimeter setting by entering the four digit altimeter setting.

18.28.9.3.4. Mission unique items may be signaled using the "#" symbol (i.e., pilot defined parameters such as climb/descent rates).

18.28.9.3.5. A change or cancellation to any of the above or other signals after they have been relayed but prior to their execution may be signaled by pressing "CNX XMIT."

18.28.9.4. The mission computer allows at least 14 seconds between successive transmissions of FCI commands and any associated FCI numeric. If a new FCI command/FCI numeric must be transmitted within a shorter time period, use MCK SKE XMIT or transmit SKE FCI commands from the CNC.

18.28.9.5. Speed and slowdown commands from formation lead are immediately retransmitted by element leads. Left or right turn preparatory FCIs are transmitted approximately seven seconds before the time-to-turn.

18.29. Departure and Assembly. After takeoff each aircraft will fly an independent departure, i.e. climbout instructions or SID, while maintaining formation integrity using the PPI until all aircraft attain formation position or the departure is accomplished, whichever occurs first. At this point, begin SKE formation turns. Assembly altitude should be as low as possible. After positive identification of all preceding aircraft, wingmen normally accelerate to 250 KCAS to close to en route spacing as soon as possible. Lead maintains a 1000 fpm climb while accelerating to assembly airspeed and climbing to assembly altitude. If lead elects to assemble the formation in a climb, lead should consider using a reduced rate of ascent to ensure all wingmen have sufficient power advantage to attain the proper formation position and climb profile. Formation lead will signal acceleration with the FCI "+", then "E" as aircraft attain position. Lead accelerates to enroute airspeed using flight director thrust guidance and then sets VERT SPEED to UP to begin climb.

18.30. Late Takeoffs and SKE Rejoins. Aircraft that do not take off with the formation may rejoin using the following procedures. Ensure ATC is aware of the formation intentions prior to initiating rejoin of aircraft.

NOTE: These may be modified to fit specific mission conditions if thoroughly briefed and understood.

18.30.1. Set leader number as required to join at the end of the formation and enable all formation slot numbers.

18.30.2. Set MFC SKE range interval to 16 (maximum range).

18.30.3. Approach the formation from 1,000 feet above or below the formation altitude.

18.30.4. Establish radio contact with the lead. Confirm SKE frequency and appropriate leader's slot number.

18.30.5. When the lead appears on the PPI MFD display, check that the master lost indications have extinguished and no Caution or SKE messages are present.

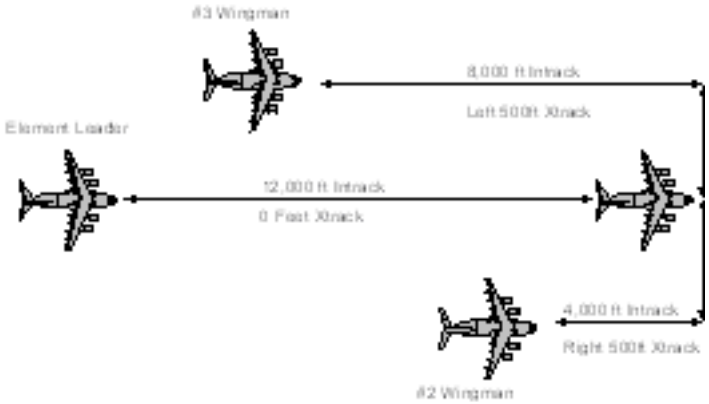
18.30.6. Upon positive identification of lead, lead completes an FCI check prior to the rejoin.

18.30.7. Join in position while maintaining 1,000 feet altitude separation. When stabilized in position and the last aircraft in formation is positively identified, request rejoin clearance from lead and climb or descend to formation altitude.

NOTE: If in VMC, formation lead may direct rejoin in a position other than the end.

18.31. En Route Procedures. Wingmen maintain position with SKE selected for thrust and roll flight director guidance. Wingmen will periodically crosscheck deviation indicators and the PPI SKE format. The primary altitude reference will be the aircraft barometric altimeter.

Figure 18.7. Standard SKE Enroute Formation.



18.31.1. Climb and Descent. Use the GSI to monitor the selected leader's altitude during climb or descent. This may require adjusting the GSI scale to 50X to ensure it remains active. Formation followers are expected to climb, descend, and level off at the same time and rate as lead. Followers will report significant altitude deviations to lead. If the formation leader requests a level off report, all aircraft will report reaching assigned altitude in sequence to the formation leader.

CAUTION: SKE in-track indicates slant-range distance (i.e., if 4000 feet directly above the leader, the in-track will indicate 4000 feet in-track when 4000 feet above or below the selected leader.

18.31.2. Airspeed Changes. Normally, airspeed changes will be in increments of 10 knots. Lead will signal/announce all changes of 10 knots or greater from the established base airspeed. For accelerations or decelerations, advance or retard throttles using flight director thrust guidance. Lead will announce/signal all airspeed changes during recoveries unless otherwise briefed.

18.31.3. En Route Turns. Plan en route turns to be less than 90°. Turns exceeding 90°, while not prohibited, may require considerable distance after the turn to stabilize the formation.

NOTE: The turn computer heading difference between present heading and new heading must be greater than 0o and less than 180o.

18.32. Spacing.

18.32.1. Wingman**.** The second and third aircraft of each element maintain 4,000 and 8,000 feet spacing, respectively, from their element lead. Maintain spacing with reference to the element lead to reduce telescoping effects. The standard offset distance for en route navigation is 500 feet right for the number 2 aircraft, and 500 feet left for the number 3 aircraft.

18.32.2. Element lead. Each element lead normally maintains 12,000 feet separation from the preceding element lead, co-altitude, and maintains "00" cross-track separation.

18.32.3. Long Missions. During long missions, mission commanders may extend en route spacing and/or cross track to reduce fatigue, as required.

18.32.4. Position errors. Formation aircraft detecting a significant position error will immediately notify the offending aircraft to determine if the error is known. The subject aircraft will immediately confirm or establish position by radar or other available means.

18.33. Loss of SKE.

18.33.1. Single aircraft. Any aircraft that loses SKE will notify lead immediately. If IMC, establish a safe heading away from the formation. If last aircraft in the formation loses SKE, an airspeed reduction may be used to obtain immediate separation. The use of air-to-air TACAN, radar beacon, or skin paint may aid in maintaining separation from the formation. Lead will coordinate a separate IFR clearance for the malfunctioning aircraft as needed.

18.33.2. Entire formation. If the entire formation loses SKE, attempt to correct the malfunction by changing the master or accomplishing a frequency change provided an alternate means of maintaining formation position is being used (A/A TACAN, weather radar skin paint, radar beacon, TCAS). If the entire formation loses SKE and is unable to correct the malfunction or transition to a visual formation, execute the inadvertent weather penetration procedure without SKE as described in 18.18.3.2.

18.34. Overrun Procedures. When executing an overrun keep in mind the goal is to establish safe separation between aircraft and to reacquire formation position.

18.34.1. Element Overrun. Overly aggressive maneuvers by formation leaders will adversely affect their followers. An element overrun should be made in the safest direction based on airspace restrictions, flight path, and terrain obstructions. When an overrun occurs, the element lead immediately

turns in the safest direction to avoid the preceding aircraft. The element lead will then select "Overrun Left/Right" on the SKE PRIMARY page. This places the default overrun cross track in the scratchpad. Accepting this (by activating LSK 6L) allows the MC to provide flight director guidance to this value and passes the "Overrun" annunciation. The flight director commands a 45 degree turn (20 degree bank, 3 second roll-in/roll-out) toward the direction announced by the FCI. After the correct spacing has been attained, the element will re-establish proper formation position.

18.34.2. Wingman Overrun. When a wingman overruns the preceding aircraft, the wingman immediately turns in the safest direction to avoid the preceding aircraft. The wingman will then select "Overrun Left/Right" on the SKE PRIMARY page. This places the default overrun cross track in the scratchpad. Accepting this (by activating LSK 6L) allows the MC to provide flight director guidance to this value and passes the "Overrun" annunciation. Unless operations require radio silence, overruns will also be announced over interplane frequency, by formation position. After the correct spacing has been attained, the wingman will re-establish proper formation position.

NOTE: Unless operations require radio silence, overruns will also be announced over interplane frequency, by formation position.

18.35. Lead SKE Position Change. The aborting leader commands the lead change and the new leader acknowledges receipt of this command. If briefed, the change may be accomplished silently at a planned point or time. Do not accomplish lead changes in turns or descents.

18.35.1. In IMC, the aborting leader turns 30° away from base heading in the safest and most logical direction until at least 1 NM from the formation. Reset appropriate crosstrack, range, and leader number. Drift back to rejoin at the end of the formation. If VMC, he may join at a coordinated position within the formation.

18.35.2. The follower aircraft will select the new lead's slot number and reset crosstrack and range as required to maintain a one-two relationship within elements.

18.35.3. The new leader may increase airspeed to expedite the lead change, and he will give an FCI check as soon as practical.

18.36. Not Used.

18.37. Not Used.

18.38. Not Used.

18.39. Not Used.

18.40. Not Used.

18.41. Not Used.

18.42. Not Used.

18.43. Not Used.

18.44. Not Used.

18.45. Recoveries. When performing formation recoveries, prior coordination with the air traffic control facility servicing the airfield may be necessary for specific mission requirements. The aircraft acting as master for the formation must not turn the SKE/master off until all other aircraft in the formation have landed. If aircraft weights differ significantly, the heaviest aircraft will dictate the speeds flown. The formation may proceed visually to the field for a visual recovery, maintain SKE spacing, and assume SKE in-line formation procedures, fly ATC locally approved SKE approach, or ASLAR approach, or break up for individual approaches.

18.45.1. SKE Straight-In Approach. (No holding and no procedure turn). Take SKE separation for a straight-in final (90 degree or less turn to final). If required, receive ATC approval for a non-standard formation and squawk separate IFF codes. On lead's command to establish approach separation, wingmen will slow 30 KCAS from base airspeed, no lower than V_{MMA}, to gain 12,000 feet separation between aircraft. Wingmen set "00" crosstrack" and follow lead's ground track through FCIs and SKE timing. Normally on base leg, lead will direct a slowdown to V_{MMA} or 160 KCAS, whichever is greater. Lead will extend 1/2 flaps at 250 KCAS (placard) and gear in sequence. One NM from the FAF for non-precision approaches, or 1/2 dot below the glide slope for an ILS, lead will signal slowdown to approach airspeed and extend flaps to 3/4. All aircraft will slow to approach speed and execute an individual final. Set NAV select switch in VOR/ILS when intercepting final for SKE approaches. Desired aircraft interval upon landing is 12,000 feet, 10,000 minimum.

NOTE: Approach spacing may also be achieved with a box pattern by delaying each aircraft's turn to base to gain 12,000 feet separation between aircraft.

18.45.2. Holding Pattern, Holding Pattern in Lieu of Procedure Turn, or Procedure Turn Approach.

18.45.2.1. Do not fly 45/180 ground tracks. Holding Pattern, Holding Pattern in Lieu of Procedure Turn, or Procedure Turn pattern entry will be within 70 degrees of the published inbound course on the non-maneuvering side or within 20 degrees on the maneuvering side and a minimum of 1,000 feet above procedure turn or GCA pickup altitude. Lead may use a teardrop entry, if conveniently aligned with the selected teardrop course. Do not enter from the quadrant requiring a turn to the non-maneuvering side. Reduce airspeed to holding speed if holding is required. Request 2-minute holding legs with more than 3 aircraft in formation. When holding is not required and within three minutes of the IAF, or when in the holding pattern and cleared for the approach, reduce airspeed to V_{MMA} or 160 KCAS, whichever is greater. Extend 1/2 flaps as briefed and gear in sequence. Start the approach over the IAF. Lead will transmit a drift-corrected heading to fly on the outbound leg and must navigate precisely to the holding or procedure turn fix, while followers maintain formation position.

18.45.2.2. Lead signals his turn outbound over the IAF with the FCI at station passage. All follower aircraft delay the turn outbound based on SKE timing, maintain formation interval, and complete the approach in accordance with AFI 11-217. Approach separation (12,000 feet between aircraft) is obtained by delaying the turn inbound. Element leads signal with the FCI when beginning the turn to final. Number two and three maintain the outbound track for 25 seconds and 50 seconds respectively, or as briefed, before turning. Succeeding element leaders turn 75 seconds after the previous leader. Formation lead must insure all aircraft will stay in the remain within distance for the approach or coordinate with ATC for additional airspace.

18.45.2.3. One NM from the FAF for non-precision approaches, or 1/2 dot below the glide slope for an ILS, lead will signal slowdown to approach airspeed and extend flaps to 3/4. All aircraft will slow to approach speed and execute an individual final. Desired aircraft interval upon landing is 12,000 feet, 10,000 minimum.

18.45.3. Formation Mission Computer Directed Approaches. The mission computer-directed approach (as described in **Chapter 11** of these instructions) is a method of instrument recovery into an austere airfield. This procedure allows aircraft to land at one-minute minimum intervals (or longer) and is limited to formations of six or less aircraft. Turn to final is limited to 90 degrees or less, and aircraft must overfly a common waypoint on the extended final approach course prior to the FAF. Position the master in the center of the formation. The master must remain in operation until all aircraft have landed. All aircraft except lead and the formation master must turn the SKE to standby after landing.

18.45.3.1. Separation Procedures. Prior to reaching the terminal area, the formation will establish 12,000 feet spacing (or more as briefed) between aircraft. On lead's command, all wingmen use flight director thrust guidance to reduce airspeed by 30 knots, or as briefed, (no slower than V_{MMA}) until briefed separation is attained. All aircraft set crosstrack at "00."

18.45.3.2. Final Approach. Prior to reaching the FAF, slow, configure, and fly the MC Approach.

18.45.4. Missed Approach. Aircraft executing a missed approach fly the published or directed procedure and contact the controlling agency for instructions. If the airfield is reported below minimums after the approach is started, the formation executes a missed approach, maintaining 160 KCAS or minimum flap retract (whichever is higher) and approach separation. Formation lead requests individual approaches, if possible. Coordinate for holding if required. In a radar environment, give the controlling agency the order in which aircraft are to depart the flight. Use caution as loss of SKE may occur when the master departs the formation. If individual approaches cannot be obtained or approach control is not available, the formation will proceed to an alternate airfield.

WARNING: Aircraft will not perform touch and go landings from formation recoveries.

18.46. Not Used.

18.47. Not Used .

Section 18D—Combination SKE And Visual Procedures

18.48. General. At times, a transition between visual and SKE procedures may be advantageous or necessary. The following procedures are designed to transition between visual in-trail and SKE. Other visual geometries will require additional modifications.

18.48.1. From visual formations, lead directs the formation to assume SKE procedures on interplane. The second and third aircraft in each element then assume 4,000 and 8,000 feet spacing respectively (as briefed through airspeed reduction of 20 KCAS or through delayed acceleration) behind their element lead; element leads maintain 12,000 feet interval behind preceding element leader.

18.48.2. From SKE formation, lead directs the formation to assume visual formation procedures on interplane. Each element then assumes the briefed visual geometry. FCIs are used as briefed, but primary formation reference is the lead aircraft.

Section 18E—Formation Air Refueling Procedures.

NOTE: The tanker lead is responsible for the entire formation (both tanker and receiver aircraft) from rendezvous through the end of air refueling operations.

18.49. General. The procedures contained in this section cover only the most common receiver/tanker formations and do not cover all possible situations. The procedures contained in this section do not relieve the mission commander and section leader of the responsibility to thoroughly plan and brief these procedures and cover all possible combinations.

18.50. Briefing. The lead pilot briefs all aircraft commanders within the receiver cell. This briefing will be in sufficient detail to cover all phases of cell operations. The briefing includes, but is not limited to, the following:

18.50.1. Communication.

18.50.2. ATC frequency.

18.50.3. Interplane frequency, if required.

18.50.4. AR frequency.

18.50.5. ARCT.

18.50.6. Early/Late arrivals of tankers or receivers.

18.50.7. Type of rendezvous and use of navigation aids.

18.50.8. Radar/SKE Procedures.

18.50.9. AR Formation procedures.

18.50.10. Tanker formation.

18.50.11. Receiver formation.

18.50.12. Transition to AR formation.

18.50.13. Maneuvering during refueling.

18.50.14. Overrun procedures.

18.50.15. Post A/R formation procedures.

18.50.16. Box Pattern/180 Degree Turnaround Procedures, if used.

18.50.17. End A/R separation requirements and ATC clearance.

18.50.18. Breakaway/emergency procedures.

18.51. Terms. The following terms are unique to air refueling formations:

18.51.1. Air Refueling (AR) Echelon. A 60 degree right echelon on formation lead with 1 NM separation nose-to-nose.

18.51.2. Post Air Refueling Position. The position a receiver proceeds to after completing refueling with the tanker.

18.51.2.1. Receiver one's (R1) post air refueling position is a 60 degree left echelon with the respect to the lead tanker (measured from the lead tanker's longitudinal axis) with 2 NM nose-to-nose separation, stacked 1,000 feet below the tanker, refer to the Formation Air Refueling (FAR) checklist.

18.51.2.2. The post air refueling positions for element wingmen are depicted in FAR checklist.

18.51.3. Refueling Element. Receivers which share a common tanker(s).

18.51.4. Refueling Element Base Altitude. An altitude 1000 feet below the element's lead tanker (T1).

18.51.5. Awaiting Air Refueling Position. A 60 degree right echelon position from the respective tanker with 1 NM nose-to-nose separation, stacked 500 feet above. When multiple aircraft are in the awaiting AR position, maintain SKE inline (or normal SKE) position stacked out of wake turbulence but no higher than 50 feet.

18.51.6. Receiver Rejoin Altitude. An altitude the wingman maintains while rejoining on the receiver element after air refueling is complete. SKE: 500 feet above element lead until established in proper horizontal formation position, then stack level with element or section lead.

18.52. Preflight Procedures:

18.52.1. Confirm the following information with the lead tanker crew:

The tanker vertical stack and horizontal separation.

Tanker and receiver beacon (BCN) and air-to-air (A/A) TACAN operating during the RZ.

Base refueling airspeed.

Tanker will announce new base headings after the RZ.

Receiver offload amount from each tanker.

18.52.2. Aircraft will have operable SKE and radar systems for formation air refueling flights. It is the intent of this chapter that these systems be fully operational during FAR operations. However, operational necessity dictates, this decision will be left to the mission commander.

18.53. Prior to Air Refueling Initial Point (ARIP).

18.53.1. Normally the formation will descend to cross the ARIP at Rendezvous (RZ) altitude. Descent or ascent rates will be as briefed by section lead. RZ base altitude will ensure a minimum of 1000 feet vertical separation between receivers and the lowest tanker.

18.53.2. During refueling, receivers will address themselves as "Receiver 1 (R1)", Receiver 2 (R2)", and "Receiver 3 (R3)."

18.53.3. R1 will confirm any changes to the following with T1 (if required):

The tanker vertical stack and lateral separation.

Which tanker will have Beacon (BCN) and Air-to-Air (A/A) TACAN operating during the RZ.

Base refueling airspeed.

That the lead tanker will announce new base headings after the RZ.

18.53.4. When possible, receiver lead will use an interplane frequency other than AR primary to lead the formation to an in-trail position prior to 3 NMs.

18.54. Rendezvous Procedures:

18.54.1. Accomplish the RZ IAW TO 1C-1-35. Consideration should be given to using an en route RZ for large receiver/tanker formations.

18.54.2. After the ARIP, the receiver lead will announce all heading and airspeed changes. No acknowledgements/FCIs required; e.g., "XXXX FLIGHT NEW BASE HEADING/AIRSPEED,____, NOW." ***EXCEPTION***: Planned radio silent rendezvous.

18.54.3. To expedite the RZ, lead will normally use MCT for accelerations; normally forward idle thrust for decelerations. Wingmen normally use INT. Formation lead pilot may request the tanker lead to reduce airspeed to increase closure rate during the RZ.

18.54.4. Formation lead (R1) is responsible for weather avoidance. R2 may assist in monitoring track weather.

18.54.5. Only R1 or T1 calls an RZ overrun.

18.54.6. Normally the formation should transition to AR echelon when established in a position from which a closure can be directed with minor heading changes. Normally, this transition will be initiated no later than 2 NM from the tankers. RZ closure will not be continued inside 2 NMs unless visual contact is established with the tanker.

18.55. Transition to AR Echelon:

18.55.1. To initiate the transition to AR echelon, the lead pilot states: "XXXX FLIGHT, PREPARE FOR AR ECHELON, BASE AIRSPEED ____, BASE HEADING_____, BASE ALTITUDE _____, ACKNOWLEDGE." Follower aircraft should check navigation cross-track for use as an aid in determining target cross-track. “XXXX FLIGHT, EXECUTE AR ECHELON NOW." Following the command of execution:

18.55.2. All aircraft transitioning to echelon positions turn right 10 degrees from base heading. All aircraft that will remain in the in-trail position station keep off the preceding aircraft.

NOTE: Lead should keep heading and airspeed changes to a minimum during transitions to or from AR echelon.

18.55.3. Wingmen set INT and accelerate as required (as a general, 10 kts for each aircraft in the element). Do not exceed base airspeed plus 50 knots or 325 KCAS/.80 Mach, whichever is lower.

18.55.4. Approaching target cross-track, aircraft in echelon position roll out on lead's base heading. Aircraft in the in-trail position continue to station keep off the preceding aircraft.

18.55.5. Approaching the 60 degree echelon line, slow to base airspeed and move laterally to obtain desired nose-to-nose separation if appropriate.

18.55.6. When the formation is in AR echelon, R1 adjusts the formation airspeed to complete the rendezvous.

18.55.7. During the closure, receiver formation lead (R1) will transition the formation to AR primary frequency and check wingmen in. When tankers are positively identified in front of the formation, R1

may direct a climb to refueling element base altitude to expedite closure. After climb to refueling element base altitude, R1 will clear the formation to conduct air refueling when appropriate. During refueling, receivers will address themselves as "Receiver 1 (R1)," "Receiver 2 (R2)," "Receiver 3 (R3)."

18.56. Refueling Operations:

18.56.1. The first receiver per tanker will always proceed directly to a position one NM in-trail of the tanker. Close and refuel IAW TO 1-1C-1-35.

18.56.2. If there is no respective tanker for a receiver, (i.e. 3-on-1 or 3-on-2), then the affected receiver(s) proceeds to the awaiting AR position.

18.56.3. In a 3-on-1 formation, R3 will maintain an in-line position from the preceding receiver (R2).

18.56.4. SKE will be left on throughout refueling.

18.56.5. The copilot or ACM seat occupant will monitor UHF guard, AR primary and formation interplane. Keep the transmissions on AR primary brief and to an absolute minimum.

18.56.6. A 180 degree turn on track with multiple tankers and/or receivers must be accomplished with all receivers established in a single in-line formation with 1000 feet vertical separation between the receivers and the lowest tanker and at least two nautical miles in-trail of the lead tanker.

NOTES:

Transitioning to an in-line formation behind T1 must be initiated with all receivers in their respective post AR positions.

***EXCEPTION*:** For 2-on-1 only, with prior permission from the tanker, a receiver in contact may remain in the contact position during the turn. The other receiver will maintain the current altitude and move from either awaiting A/R or post A/R to the in-trail position for the duration of the 180 degree turn. The in trail aircraft will return to either awaiting-A/R or post A/R, whichever is appropriate, once the course reversal is complete (tanker is wings level, less than 30× intercept heading to track). Before maneuvering, the receiver in the contact/pre-contact position will remain in the contact/pre-contact position until the other receiver is reestablished in the awaiting A/R or post A/R position.

18.57. Refueling Complete:

18.57.1. After receiving scheduled onload and established in the post AR position each receiver will announce "(Receiver Number) ESTABLISHED IN POST AR" when it is clear for the subsequent receiver to close on that tanker and refuel. If receivers must transit from one tanker to another (i.e., 3-on-2), once the respective receiver has maneuvered behind the new tanker, 500’ below and in-line, they will announce "(Receiver Number) CLEAR." At this point it is clear for the subsequent receiver to maneuver behind and below their tanker.

NOTE: If you are the last receiver to refuel from your tanker, call "REFUELING COMPLETE" when finished refueling.

18.57.2. Once established in your post air refueling position, announce "RECEIVER NUMBER, ESTABLISHED IN POST A/R." This indicates the next receiver is cleared to begin his post air refueling re-assembly when ready.

WARNING: It is imperative all aircraft (including tankers) are in their correct positions when receivers are transitioning to their post air refueling positions.

WARNING: When maintaining altitude and moving directly aft of the tanker, use caution for wake turbulence.

WARNING: When transitioning to the post A/R position, you must attain positive radar/SKE/visual identification on all other receiver aircraft in the post A/R position (at an altitude 500 feet above receiver lead). When aft of all receivers in the post AR position, move left and into the SKE position and then stack level. A minimum spacing of 4,000 feet will be maintained. Attempt to square off this maneuver as depicted in Annex A of this chapter; do not make a large diagonal maneuver.

EXCEPTION: The first receiver in each element may proceed directly to their post air refueling position after obtaining 500 feet altitude separation.

18.58. Re-assembly Procedures: This procedure is designed to reassemble multiple elements after air refueling. Each element will air refuel in separate block altitude using X on X procedures IAW this instruction, not to exceed 3 on 3. At the completion of air refueling, each element will rejoin in the post AR position off of their respective tankers. When cleared by formation lead, 2nd element will descend to formation lead's base altitude + 500' and establish normal SKE spacing. Once in position, 2nd element will descend to base altitude. Once at base altitude, 3rd element will begin to rejoin on the formation in the same manner.

18.59. Emergency Actions:

18.59.1. Breakaway. Follow procedures in IAW TO 1-1C-1-35. When separation between receiver and tanker has been effected, the receiver pilot advises the tanker "WELL CLEAR" and states altitude passing. When the situation has stabilized, coordinate clearance back to precontact.

18.59.2. Lost Wingman Procedures. These procedures are to be used when visual, radar, SKE, or radio contact cannot be maintained and altitude separation can not be ensured. In any lost wingman situation, immediate separation of aircraft is essential to ensure safety. Upon losing all contact with the tanker lead or the respective tanker, or if unable to maintain formation due to disorientation, the wingman will simultaneously execute the applicable lost wingman procedure while transitioning to instruments. When tanker lead is notified of a lost wingman, tanker lead will take appropriate action, as the situation dictates, until positive separation is assured.

18.59.3. Loss of Visual Meteorological Conditions (VMC) after rendezvous. In the event any aircraft momentarily and inadvertently enters into Instrument Meteorological Conditions (IMC), loses sight of other receivers or their respective tanker in the formation, it is imperative the lead tanker be informed immediately. If continuous station-keeping ability, radar skin paint off of the respective tanker and SKE position off of all other receivers, can be maintained, all aircraft will maintain their current position (awaiting AR, Pre-contact, post AR, etc.) until the formation reenters VMC. If visual conditions do not return sufficiently to safely complete the formation AR procedures, the lead tanker, in coordination with the lead receiver, will take action to ensure both altitude and lateral separation from all receivers and tankers. Climbs, descents, and turns should be made in the safest direction in all cases at the direction of the lead tanker in coordination with the lead receiver. Tanker lead will obtain separate clearances from ATC if VMC cannot be maintained. Subsequent receiver rendezvous

may be coordinated with ATC after obtaining proper separation from the tanker formation (i.e. minimum of 2 NM and 1000 feet between the lowest tanker and highest receiver).

18.59.4. Loss of station keeping ability in IMC. The loss of SKE or radar in IMC conditions after beginning the transition to AR echelon until completion of formation AR procedures will require immediate action by R1 and T1. R1, with prior coordination with T1, should brief possibilities in the mission brief, but must always thoroughly analyze each situation as they occur.

18.59.4.1. Lead receiver, with the approval of the lead tanker, will direct the appropriate action for the affected receiver to ensure both lateral and vertical separation from all other receivers and tankers. This action may involve a climb, descent, or turn, depending on the location of the affected receiver and all other aircraft in the formation. Climbs, descents, and turns should be made in the safest direction in all cases at the direction of the lead receiver and lead tanker.

18.59.4.2. All other receiver aircraft with station keeping ability will maintain their current position (awaiting AR, post AR, etc.) until reentering VMC and subsequently cleared by R1 and T1.

18.59.5. Lost Wingman Procedures During Receiver AR. Depending on the makeup of the AR formation, it is possible that in the event of a breakaway, receiver aircraft may find themselves co-altitude with another aircraft in the formation. If, during a breakaway, the receiver aircraft loses sight of the tanker aircraft, the receiver aircraft is required to descend to an altitude 500 feet below their respective tanker. In the event this places the receiver aircraft co-altitude with another aircraft in the formation, immediately coordinate a de-conflicted altitude with tanker lead. Immediately contact tanker lead and establish visual, A/A TACAN, radar, SKE, or radio contact with the co-altitude aircraft. If visual, A/A TACAN, radar, SKE, or radio contact cannot be established or maintained, descend to an altitude that will provide positive separation from other aircraft and decrease airspeed to ensure lateral separation.

Chapter 19

AIRDROP

Section 19A— General Procedures

19.1. General. When airland operations are impractical, or when the tactical situation dictates, aerial delivery of equipment, personnel, containers, and other items is used to re-supply friendly forces or help ground forces secure key objectives. This chapter prescribes C-17 employment procedures for single-ship and multi-ship airdrop operations. Operations or procedures which are not specifically addressed may be performed if they enhance safe, effective mission accomplishment.

19.2. Identification of Airdrop Items. It may be necessary to identify items that are not dropped or land off the DZ in unsecured areas.

19.2.1. Identify supplies or equipment by the following class numbering system:

19.2.1.1. Class I - Subsistence.

19.2.1.2. Class II - Individual equipment.

19.2.1.3. Class III - POL.

19.2.1.4. Class IV - Construction materials.

19.2.1.5. Class V - Ammunition (include the type):

19.2.1.5.1. Type "A" - Small arms.

19.2.1.5.2. Type "B" - Mortars.

19.2.1.5.3. Type "C" - Artillery.

19.2.1.6. Class VI - Personal demand items.

19.2.1.7. Class VII - Major end items. (Vehicles, Howitzers, etc.)

19.2.1.8. Class VIII - Medical supplies.

19.2.1.9. Class IX - Repair parts.

19.2.1.10. Class X - Non-military programs. (i.e. agricultural supplies).

19.2.2. Airdrop loads may also be identified by the following internationally recognized color coding system for combined operations:

19.2.2.1. Red - ammunition and weapons.

19.2.2.2. Blue - fuel and lubricants.

19.2.2.3. Green - rations and water.

19.2.2.4. Yellow - communications equipment.

19.2.2.5. White (or red cross on white background)- medical supplies.

19.2.2.6. Black and white stripes - mail.

19.3. Airdrop Kits. The loadmaster will ensure enough equipment is included to satisfy load or mission requirements. Minimum contents of the airdrop kit will include cloth-backed pressure sensitive tape, 1/2-inch tubular nylon cord, 550 cord, 5 cord, and 80 pound cotton webbing.

19.4. Joint Airdrop Inspection. The loadmaster will complete the Joint Airdrop Inspection Records (applicable DD Form 1748) before takeoff and verify the accuracy of cargo and troop documentation (see AFR 55-40, to be published AFJI 13-210, for specifics). Reject loads with inaccurate or unavailable weights, or loads hazardous to flight. If inflight rigging required, the loadmaster will use the applicable DD Form 1748 as a checklist to ensure all items are completed.

NOTE: Equipment not rigged IAW 13C-series TOs or Joint Special Operations Command (JSOC) 350 series manuals, requires a waiver from MAJCOM tactics.

19.4.1. If loads to be airdropped and loads to be airlanded are carried at the same time refer to the restrictions listed in **Table 19.1.** These restrictions are designed to prevent airland loads from interfering with airdrop rigging equipment.

Table 19.1. Airdrop Loads With Airland Cargo.

RESTRICTIONS[1]	MINIMUM DISTANCE IN INCHES
ANCHOR CABLE HEIGHT FROM AIRCRAFT FLOOR	81” AT MIDSPAN
DISTANCE BETWEEN ANCHOR CABLES (a) CDS OR EQUIPMENT (b) PERSONNEL AT[2]FORWARD BULKHEAD INTERMEDIATE SUPPORTS	182” 122” INBOARD, 182” OUTBOARD 155” INBOARD, 182” OUTBOARD
AIRLAND CARGO WIDTH/HEIGHT	CANNOT INTERFERE WITH INSTALLED ANCHOR CABLES, OR AIRDROP RIGGING EQUIPMENT
AIRLAND CARGO WIDTH ON PERSONNEL AIRDROPS	144” OR LESS WITH ADP 1 CONFIGURATION. MAY BE INCREASED TO 178” OR LESS IF ONLY USING ONE TROOP DOOR
CDS AIRDROPS (WHEN DROPPING ONE SIDE ONLY) (a) MAXIMUM WIDTH OF AIRLAND CARGO (b) POSITION OF AIRLAND CARGO	110” OR LESS AFT END OF AIRLAND CARGO FORWARD OF FS 1280
PERSONNEL DISTANCE FROM AIRDROP RIGGING EQUIPMENT[3]	30” MINIMUM

NOTES:

1. Restrictions will not be exceeded.
2. Personnel airdrops may be performed with only one troop door configured for airdrop.

3. Personnel seated adjacent to heavy equipment platforms will have an operational seat belt. Ensure all floor loaded rucksacks are secured.

WARNING: Static line personnel airdrops over the ramp are prohibited.

19.5. Verification of Load Information. The pilot and loadmaster will review the DD Form 1748(s) prior to station time. The pilot and loadmaster verify actual number/type of parachutes, load weight, sequence of extraction, lowest L/R lock number engaged in platform for heavy equipment, and position of loads in the aircraft agree with the CARP data entered into the mission computer. If an individual load has a different type or number of parachutes from other loads, compute a CARP for each load to ensure all loads will land on the DZ. Base drop altitude on the item requiring the highest drop altitude.

19.5.1. Do not mix parachute types on an individual airdrop platform. For example do not accept a single platform rigged with both a G-11A and a G-11B parachute. However, separate platforms or separate loads rigged with different types (or different quantities) of parachutes may be airdropped together from the same aircraft. Drop altitude will be determined by the load requiring the highest drop altitude. Adjust CARP, if required, to ensure all loads land on the DZ. Adjust drop score for forced CARP displacement due to load mixing.

19.6. Marking Airdrop Loads. A pilot will mark the aircraft call sign and date on all airdropped items. For platform rigged loads, place marking on the extracted end of the load, and mark drogue and extraction line(s) between their attachment points. If more than one load is dropped on the same pass, mark loads with order of exit from aircraft. If multiple CDS containers are dropped on the same pass, mark only the first container out.

19.7. Drop Zone Markings. Plan and coordinate DZ markings IAW AFI 13-217.

19.8. Night Vision Goggles. Specific night vision goggle (NVG) procedures are located in **Chapter 24** of this AFI. NVGs may be used by any C-17 crew upon completion of initial NVG training program. If authorized by MAJCOM/DO, NVG-aided takeoffs, approaches, landings and airdrops may also be accomplished upon completion of required training programs. NVG cockpit lighting must be operational during NVG use.

19.8.1. Only HUD-compatible NVGs (i.e. Type II, Class B NVGs IAW Military Specification MIL-L-85762) will be used with the HUD.

19.8.2. Base weather stations can provide environmental illumination data (i.e., moonrise, moonset, percentage of moon illuminated, beginning/ending of civil twilight sunrise, sunset) upon request. Electro-optics support (e.g., tactical decision aids for weapon systems using NVGs) is also available if required.

19.9. Safety Equipment.

19.9.1. Protective Headgear. Personnel performing duties required to be mobile in the cargo compartment during airdrop, low level operations, or threat environments must wear protective headgear (except personnel performing water jumps). All other personnel in the cargo compartment will be seated with seat belts fastened. Check the serviceability of protective headgear prior to flight. During paratroop missions, loadmasters will lower their helmet visor before opening the troop doors and keep them lowered until the troop doors are closed.

19.9.2. Parachutes/Restraint Harnesses Requirements. All occupants of the cargo compartment will either wear a parachute or an attached restraint harness, or be seated with a seat belt fastened before a troop door and/or the cargo door and ramp is opened. ***EXCEPTION:*** Loadmasters not required to perform duties aft of FS 1027 are exempt from wearing parachutes/restraint harnesses/seat belts. For static line jumps, static lines are attached to anchor cables before troop door(s) are opened. ***EXCEPTION:*** Jumpers exiting on subsequent passes may stand and hook up with door(s) opened if they are forward of FS 1027.

WARNING: During the aircrew briefing, the aircraft commander will brief the loadmaster(s) when the mission profile requires flight below 800 feet AGL with the door(s) open.

WARNING: Except for an actual contingency, towed trooper, or emergency that threatens the survivability of the aircraft and crew, the restraint harness will not be disconnected or lengthened to a point that would allow the loadmaster to fall outside the aircraft.

WARNING: If a troop door and/or the door/ramp is open and the aircraft is below 800 feet AGL or above 14,000 feet MSL, loadmaster(s) must wear a restraint harness when performing airdrop duties.

NOTE: For operations overwater, when parachute(s) are required, LPU(s) will be worn.

19.9.3. Restraint Harness Operation. The restraint harness will be fitted and adjusted prior to flight. The lifeline will be 18 feet 6 inches long. After the lifeline has been adjusted, disconnect the hook, roll and secure the lifeline, and stow on the restraint harness.

19.9.3.1. Restraint Harness Procedures. Prior to opening troop door(s) and/or the ramp/door in-flight (or for airdrops that require the loadmaster to be positioned at the aft loadmaster station), attach the restraint harness at FS 1188 and adjust the life line as follows:

19.9.3.1.1. Troop door airdrop operation: Adjust to allow mobility only to the troop door(s) and air deflector controls.

19.9.3.1.2. Ramp bundle/CDS airdrop operation: Adjust to allow mobility to FS 1403.

19.9.3.1.3. Troop door and ramp bundle airdrop operations: Adjust to allow mobility only to the troop door(s) and air deflector controls.

19.9.3.2. Three additional parachutes, not including those required for aircrew will be aboard the aircraft for training missions performing personnel airdrops. Two will be available for Army safety personnel use. User safety personnel will provide their own parachutes for contingency missions.

19.10. Not Used.

19.11. Airdrop Weather. For unilateral airdrop operations, actual drops will not be made when weather conditions over the DZ are less than 300-foot ceiling and one-half statute mile visibility. During joint operations, weather minimums are at the discretion of the using agency. During contingency/combat operations, weather minimums are at the discretion of the theater or task force commander. Wind limitations are contained in AFI 11-231 and AFI 13-217.

NOTE: Airdrops in heavy precipitation are not recommended.

19.12. Forms. AF Form 4096, **Station Keeping Equipment/Zone Marker Debrief/Airdrop/Tactical Airland/ Air Refueling Mission Recap**, will be completed by a pilot on each aircraft following all SKE, airdrop, assault landing zone or air refueling missions and will be turned in to home station tactics office.

Section 19B— Flight Procedures

19.13. General. Mission requirements and the threat situation determine tactics needed for DZ ingress and egress. Navigation and DZ identification become more difficult when threat avoidance requires very low ingress/egress altitudes, operations at night, or operations during marginal weather conditions. Careful coordination is essential to accurately position the aircraft over the release point on time.

19.14. Airdrop Checklists. The Combat Entry and Combat Exit checklists, in **Chapter 17** of this instruction, will be executed at the appropriate times and locations. Amplified airdrop checklists are located at the end of this chapter. The Pilots Airdrop Checklist covers personnel,, heavy equipment, and CDS airdrops in one column. The Loadmaster Airdrop Checklist has separate columns for personnel, heavy equipment, and CDS airdrops. The Amplified Airdrop Checklist covers both low altitude and high altitude operations.

19.14.1. The checklist is divided into the following sections:

19.14.1.1. Cabin Altitude (Drops over 10,000' MSL).

19.14.1.2. Pre-Slowdown.

19.14.1.3. Slowdown.

19.14.1.4. Release Point.

19.14.1.5. Post Drop.

19.14.1.6. Loadmaster's Malfunction.

19.14.2. Before takeoff, the aircraft commander and crew will coordinate times or geographical locations to execute all tactical checklists. The time the loadmaster needs to complete individual checklist items depends on the load being airdropped. The time required by the loadmaster will determine when checklists must be accomplished enroute. Complete all items of the preceding checklist before beginning the next checklist.

NOTE: Unless used in conjunction with drop execution, avoid use of the word GREEN after the Combat Entry Checklist and until completion of the post drop checklist. "GREEN LIGHT" must be seen or heard by the loadmaster for all drops.

19.14.3. For personnel airdrops, the loadmaster will coordinate the jumpmaster's visual green light requirement during the pilot, loadmaster, jumpmaster briefing.

19.14.4. Advisory calls augment checklists. For all airdrops the Central Aural Warning System (CAWS) will transmit a tone (chime) followed by airdrop alerts: 30, 20, 10, (6 for personnel airdrops), and one-minute advisories. When the ADS select switch is in the AUTO mode, the computer will also provide a 10-second time advisory (for personnel drops only), followed by a count down from 4-seconds to green light. When in the MANUAL mode, the pilot not flying the aircraft will make all calls

after the one-minute advisory through red light. The loadmaster will advise the jumpmaster of the necessary advisories.

19.14.5. If a racetrack/re-attack is flown, re-accomplish all checklists beginning with the Pre-Slowdown Checklist.

19.14.6. The loadmaster will advise the pilots when an emergency condition exists in the cargo compartment, complete the required emergency checklist, and report status. The PF will attempt to fly a smooth, stable platform until the loadmaster has completed the emergency actions.

19.15. En Route. Pilots are ultimately responsible for en route navigation and time control. Time control to the objective area should be accomplished primarily by varying airspeed with secondary methods of flying alternate legs, cutting corners, or extending legs.

NOTE: At night in VMC, a MC FOM of 5 or better is required in order to fly lower than MSA.

19.15.1. Loadmasters will make a visual inspection of the cargo compartment prior to the initiation of the Pre-Slowdown Checklist to ensure that nothing has fallen between or aft of the airdrop load(s) as a result of takeoff or evasive maneuvering. A visual inspection of each extraction system, to include the security of recovery parachutes, will also be accomplished.

19.15.2. All primary crewmembers will be in their respective crew positions and on interphone from the combat entry point until completion of the combat exit checklist unless operations require otherwise. During non-combat operations, if a pilot must leave his/her crew position, climb to an appropriate altitude to minimize terrain avoidance tasks. Warnings and advisories are normally provided to the aircrew by the mission computer.

19.15.3. Normally, depart the IP on course, using a drift-corrected heading to the CARP. If the threat situation dictates, terrain masking procedures may be required until stabilized on drop altitude.

19.15.3.1. In IMC, do not initiate descent from the minimum IFR en route altitude to IMC drop altitude until all aircraft are inside the DZ entry point, on course, with lead's position positively known.

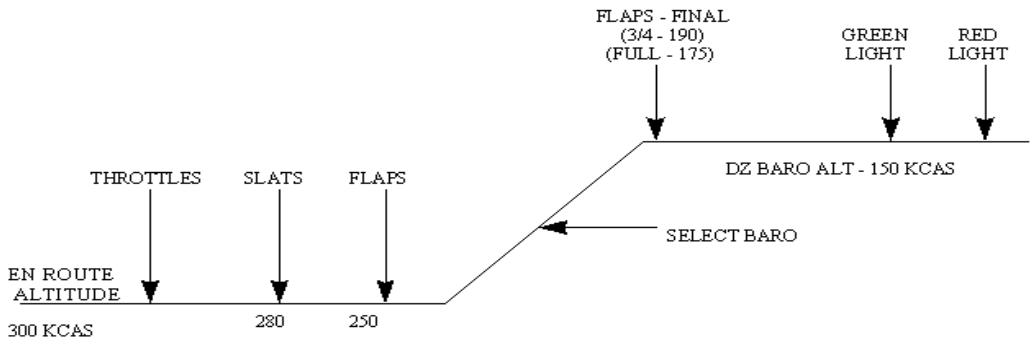
NOTE: In IMC, descent from minimum IFR enroute altitude to IMC drop altitude requires a MC navigation FOM of 5 or better or "ZM Valid" displayed on the PPI.

19.15.4. The mission computer adjusts the slowdown point (if necessary) for TOT control. This adjustment assumes a constant deceleration rate of - 1.6 fps^2 (or .05 G). To maintain this constant rate during slowdown, thrust adjustments will be directed by the flight director.

19.15.5. For equipment or CDS AUTO drops, the aircraft will be at drop altitude and drop airspeed by ten seconds (five seconds for MANUAL drops) prior to the computed air release point. For SKE equipment or CDS drops, wingmen will be at drop altitude and drop airspeed prior to receiving lead/element lead's drop execute signal to allow for accurate SKE timing if required. During personnel drops (SKE and visual), the aircraft should be at or above drop altitude and stable not later than one minute out (2 minutes for jumpmaster –directed drops) to allow the jumpmaster(s) access to the paratroop doors. The pilot should attempt to minimize excessive pitch or bank changes when paratroopers are standing in the cargo compartment. The slowdown through escape sequence is depicted in **Figure 19.1.**

19.15.6. A slowdown maneuver executed late in the run-in sequence can reduce the time an aircraft is vulnerable at a slow airspeed and high altitude in a hostile environment. However, accomplish slowdowns early enough to ensure safe drop execution.

Figure 19.1. Slowdown Maneuver.



EVENT	ACTION
1. Start Slowdown (from 250-350 KCAS)	1. Throttles--Fwd Idle; Extend SBKs
2. Pop-Up/Descent (as necessary)	2. Initiate Climb
3. Slat Placard (280 KCAS)	3. Extend Slats
4. Cargo Door/Ramp Placard (250 KCAS)	4. Open Cargo Door/Ramp
5. Half Flap Placard (250 KCAS)	5. Lower Half Flaps (SBKs retract)
6. Final Drop Flap Setting Placard (190 KCAS or 175 KCAS)[1]	6. Set 3/4 or Full Flaps
7. 10 Seconds Before Green Light	7. Depress Ready/Drogue
8. Green Light (CARP)	8. Deliver Load
9. Load Clear & Red Light (Start of Escape)	9. Set Half Flaps, Start Ramp and Door Closure Accelerate to Below Door Placard
10. Ramp and Door Closed	10. Retract Flaps & Slats; Accelerate to Egress Airspeed (250-350 KCAS)

NOTE: For a descending slowdown, descend at 160 KCAS with half flaps. When reaching drop altitude, set drop flaps & airspeed.

19.16. Airdrop Altitudes and Airspeeds. Airdrop airspeeds and altitudes are planned IAW this chapter, **Chapter 16** of this instruction and AFI 11-231. The barometric altimeter should be cross checked with the radar altimeter during the run-in to the DZ to ensure the aircraft is at or above the minimum drop altitude. During combat operations, the MAF mission commander, in coordination with the airborne commander, determines altitude for equipment and personnel drops. Refer to **Chapter 16** of this instruction for the minimum IMC drop altitude.

19.17. Drop Zone Communications. Limit radio transmissions with the DZ to those required for safety of flight or essential to force employment. DZ wind and weather information may be broadcast in the blind at a pre-coordinated time.

19.17.1. Drop clearance is normally inherent with mission clearance. Drop clearance in VMC is confirmed with proper DZ markings. In IMC, ZM reception, radar beacon reception, or other briefed/coordinated methods are considered clearance to drop.

19.17.2. In VMC, no-drop or mission cancellation is communicated by the absence of coordinated markings, observation of the block letter "X", red smoke, red flares, an authenticated radio transmission from the STT/DZCO, or other coordinated method. The temporary postponement of an airdrop may be indicated by placing into two parallel bars formed by panels at the base of the block letter identifier parallel to the DZ axis, or another coordinated signal. In IMC, a no drop, postponement, or mission cancellation is communicated by an authenticated radio transmission or other coordinated method.

19.17.3. During joint airborne operations, the Army ground commander must be able to determine the number and identity of personnel who did not jump. The procedures established below are for peace time exercises only and not intended for contingencies or when radio silence is directed. If relay of this information conflicts with formation procedures or in any way jeopardizes safety, delay the report as necessary. Collect and relay the information as follows:

19.17.3.1. At the completion of the final pass over the DZ, the onboard Army safety determines the total number of personnel and the manifest number of key personnel (if any) who did not jump.

19.17.3.2. The loadmaster obtains this information and passes it to the pilot. The pilot, or at the pilot's discretion, the loadmaster communicates this information to the ground party.

19.17.3.3. Pass the information by formation position, beginning with lead, to the last aircraft in the formation. The copilot/loadmaster in the last aircraft matches aircraft formation position number to Army chalk number and relays by chalk number, the total number of personnel remaining on board and manifest line numbers of key personnel to the STT.

19.17.3.4. The STT passes this information to the DZSO.

19.18. Navigating to the Release Point. Accurately positioning the aircraft to the release point is the most critical phase of the airdrop mission.

19.18.1. The mission computer determines the release point based on desired point of impact, desired airspeed/altitude, payload and parachute information, and atmospheric data entered for the airdrop. The computed location is then provided to the flight plan. For active flight plan airdrops, warning cues are normally controlled according to the Time To Go (TTG) indicated on the Airdrop Progress Page. Inside of one minute, the warning cues are controlled according to the TTG indicated by the selected airdrop timer. The PF is responsible for ensuring the aircraft is positioned at the release point at green light and for maintaining drift-corrected track through red light. The PNF is responsible for ensuring a count down to green light, the green light call and the red light call are given.

19.18.2. Crew coordination is of the utmost importance to ensure all advisories and checklists are completed, proper DZ line-up is maintained, the point-of-impact (PI) is identified (if VMC), and time

over target (TOT) is within established tolerances. The loadmaster will advise the crew when the load is clear, or any delay or malfunction occurs.

19.18.3. When the ADS indicates Green Light, actual time of release, actual release position (relative to the computed coordinates), altitude, heading, drift, and ground speed are stored on the AIRDROP (ADXX) RECALL page for subsequent review and analysis.

19.19. No Drop Decisions. Prior to the one minute advisory, any crewmember observing a condition that would jeopardize a safe drop will identify the condition to the aircraft commander. After the one-minute advisory, any crew member observing a condition that would jeopardize a safe drop will state "NO-DROP" on interphone. The PNF and loadmaster will immediately acknowledge the "NO-DROP" call and confirm illumination of the red light. The pilot will de-arm Auto Drop (if used). The crew will accomplish the appropriate procedure for the type airdrop being made IAW amplified checklist. No airdrop will be accomplished on that pass. The crew will then accomplish the Post Drop Checklist.

19.19.1. During Heavy Equipment and CDS airdrop missions, the loadmaster will not attempt to re-arm the PDM, TRM, or CDS airdrop system after initiation of the Release Point Checklist. This situation constitutes a “NO-DROP”. Further attempts to airdrop the equipment may be accomplished IAW paragraph **19.41.** of this chapter.

NOTE: Checklists may still be in progress after the one minute advisory. A no-drop will be called if checklist items are not complete prior to the Release Point Checklist (prior to activating Ready/Drogue Switchlight).

19.19.2. On personnel airdrops where surface winds are unknown, e.g., blind drops to unmanned DZs, the jumpmaster and/or Army airborne mission commander (if designated) will be advised when drop altitude winds exceed 30 knots. In this instance, the decision to drop will be at user's discretion.

19.19.3. During training operations, the drop zone safety officer (DZSO) will determine when surface conditions on the DZ are hazardous for personnel drops. The DZSO will make the decision to suspend or cancel personnel drops, and inform the AF Drop Zone Controller (DZC) no later than one minute prior to the drop. In the event conditions are unsafe for drop operations, the DZC ensures: (1) Red smoke/light/flares are displayed; and (2) Cancelled drop information is radioed to aircraft concerned as soon as possible. This call will be authenticated if conditions permit.

19.19.4. During a joint mission, the user is responsible for determining the suitability of surface conditions.

19.20. Drop Zone Escape Procedures. The latitude and longitude of the DZ escape waypoint are computed according to the release point location, DZ size and orientation, aircraft ground speed, and the escape maneuver time after red light. The escape maneuver should not begin until the loadmaster calls "LOAD CLEAR". Turn to escape heading, set flaps as required, increase airspeed to no more than 250 KCAS (until doors are closed) and climb or descend as appropriate. Retrieve static lines, close all doors, retract flaps and slats, and accelerate as soon as conditions permit. Refer to section G of this chapter for formation DZ escape procedures.

19.21. Drop Zone Race Track Procedures. Race tracks are not recommended for combat operations. If race tracks must be flown, accomplish all checklists beginning with the Completion of the Post Drop Checklist followed by the Pre-Slowdown Checklist. The aircraft commander must ensure the loadmaster

has adequate time (normally 10 minutes) to complete all items before the drop is initiated. The one minute advisory is always given on time. Procedures for contingency or combat operations depend on mission requirements and tactical situation. All racetracks will be thoroughly briefed.

Section 19C—Methods of Aerial Delivery

19.22. General. Drop zone locations and release points are determined by a combination of aircraft navigation systems and visual geographic reference points. The primary method for airdrop delivery is using a MC-calculated release solution updated with GPS and/or SKE zone marker inputs. Alternate airdrop methods (using radar beacons, GRADS, VIRS, pilot-directed visual releases) are available, provided ground forces are willing to accept less airdrop accuracy.

19.22.1. When sufficient data has been entered by the pilot and the corresponding pre-stored ballistic and extraction data has been retrieved from the mission airdrop data base, the mission computer determines the air release point in accordance with AFI 11-231. Data necessary to define the ballistic parameters with sufficient precision to meet overall accuracy requirements is stored in non-volatile MC memory.

19.22.2. The mission computer compares the current estimate of aircraft position (based on best available navigation sensors) with the flight plan and generates course deviation data, flight director guidance, and automatic flight path control (autopilot and autothrottles).

19.22.3. The mission computer adjusts the slowdown point to make TOT (within pilot-constrained slowdown point parameters). During the run-in, the mission computer provides visual and aural annunciations to the crew.

NOTE: Aural drop annunciations will not be provided after the one-minute advisory through the escape when the ADS MODE Switch is set to MANUAL drop mode.

19.22.4. The mean effective wind (MEW) for CARP airdrops is either entered by the pilot or calculated by the MC. If MEW is not specified by the pilot, the MC averages surface and drop altitude winds.

19.22.5. A single-stage model using the MEW is used for CARP airdrops. Total time of fall is the sum of two components: (1) the time from aircraft exit to stabilization (excluding the forward travel deceleration time) and (2) the time to reach the surface from the stabilization altitude. Derived altitude and elevation parameters are based on the CARP's height above the highest point within the drop zone. Drift due to wind is calculated as the product of the average wind and the total time of fall divided by a constant.

19.22.6. The MC will direct the aircraft to within 100 meter CEP of an air release point for a specified point of impact provided: (1) Valid GPS (3 or more satellites) or zone marker data is used for position fixing; (2) Parachute/load ballistic data and atmospheric conditions (winds, temperature, pressure) do not deviate from specified/entered values; and (3) Stable aircraft attitude and accurate drop speed/altitude is maintained during the aerial release.

19.23. Auto Airdrops. The primary method of accomplishing an airdrop is engaging the autopilot/autothrottles to the flight director (in MSN LNAV navigation mode) for automatic, MC-initiated airdrops. Once an airdrop flight plan is entered into the MC, selecting and engaging MSN LNAV (i.e. MSN in the roll FMA only) allows the AFCS to provide guidance to position the aircraft on a drift-corrected track to

the release point. PFD and ND Map formats provide drift and ground speed information, and the pilot not flying confirms drop altitude and airspeed. In the AUTO delivery mode, the "GREEN LIGHT" command issued by the MC automatically releases the TRM or GRM and delivers the load.

19.23.1. The system will automatically revert to the MANUAL mode if the MC determines that an accurate AUTO delivery is unlikely.

19.23.1.1. In the AUTO mode, the MC performs a position check 30 seconds before the release point to determine if the aircraft's run-in position is sufficient for a cross track ground impact error of 300 yards or less. If the predicted error is greater than 300 yards, a NO AUTO DROP message is immediately displayed on the MCD, and both AUTO DROP caution lights illuminate on the cockpit instrument panel.

19.23.1.2. At 15 seconds, another reasonableness check is performed. If the check fails again, the NO AUTO DROP message and AUTO DROP caution lights remain on, and the ADS mode goes to MANUAL. If the check passes at 15 seconds, the message and lights go out and the ADS mode remains in AUTO.

NOTE: If a pilot switches the ADS mode from MANUAL to AUTO at less than 30 seconds prior to the release point, the position check is not performed, the MC does not override the delivery mode to MANUAL, the MCD NO AUTO DROP message is disabled, the AUTO DROP warning lights are extinguished, and the countdown to green light annunciations are not inhibited.

19.23.2. Backup Timers. The guidance identifier (GI) must be MSN or SKE in order to provide a backup timer. The airdrop timer source is always indicated on the HUD and MFD timer.

19.23.2.1. A visual airdrop timer is the backup if the GI is MSN. The visual timer is based on a pilot-entered distance from a pre-determined topographical point (or timing panels/lights) to the point of impact.

19.23.2.2. A SKE airdrop timer is the backup if the GI is SKE. The SKE timer is based on element lead's airdrop "EXECUTE" FCI. Refer to section 19G of this chapter for information on SKE formation airdrop procedures.

19.24. Pilot-Directed Airdrops (PDA). In VMC, a pilot-directed drop may be accomplished in MANUAL ADS mode if dictated by the mission. As soon as the DZ is visible and identified by both pilots, they jointly confirm the release point location. The pilot flying controls the offset distance and assumes responsibility for maintaining the required track across the DZ. The PNF backs up the PF on the proper offset/track, identifies the release point, and normally controls the time of green light and red light.

19.24.1. During the final seconds of the approach to the release point, the pilot not flying the aircraft places a hand near the ADS jump/release button. Five seconds prior to release, the pilot not flying will give a preparatory call "FIVE SECONDS" and initiate a countdown sequence. At this call, if either pilot feels the aircraft location is not within their pre-coordinated parameters of the CARP box, a "NO DROP" condition will be announced.

19.24.2. At the release point the pilot not flying will simultaneously state "GREEN LIGHT" and depress the ADS jump/release button.

19.24.3. Both pilots will monitor the time to red light, and the PNF will announce "RED LIGHT" and depress the ADS red light button at the appropriate time.

19.24.4. The loadmaster will advise the pilot when the load is clear (or of any delay or malfunction).

19.25. Ground Marked Release System (GMRS). Airdrops may be made using the Visual Ground Marked Release System. In this system, supported ground forces are responsible for computing a release point and providing ground markings (panels or lights). The airdrop will be made abeam a flanker marker as determined during joint planning.

NOTE: During GMRS airdrops, the parent service of the supported ground forces accepts responsibility for the point of impact for the airdrop.

19.25.1. Aircrew procedures are the same as those employed during a Pilot-Directed Visual Airdrop. The pilots will confirm the mission computer CARP to predict the approximate location of the release point and facilitate initial line up during the run-in to the DZ.

19.25.2. There are several possible DZ marking patterns (e.g., inverted L, T, H, - See AFI 13-217); although, the T should be used to the maximum extent possible since it provides better visual references to the aircrew during the drop. If the authentication light is used, it will be placed 15 meters (16 yards) to the right of the bottom panel. Execute the drop when the aircraft arrives directly opposite and 100 meters to the right of the corner marker panel on the pre-briefed inbound heading. (See AFI 13-217 for more information.)

19.25.3. GMRS airdrops are normally single ship operations; however, this does not preclude formation airdrops. The difficulty with formations using these procedures is the possibility of last minute marker acquisition and maneuvering for the drop.

19.26. Verbally Initiated Release System (VIRS). VIRS is an airdrop method by which ground personnel provide verbal steering guidance to an aircraft and call the release when the aircraft arrives over a predetermined point on the ground. This option may be selected if: (1) CARP procedures cannot be used, (2) it is tactically impractical to mark the DZ, or (3) the DZ release point is located in an area where the normal GMRS markings would not be visible from the aircraft. The following procedures will be used:

19.26.1. The ground controller will compute the release point.

19.26.2. The ground controller will position on the intended release point, provide the aircrew with verbal steering guidance, and call the release when the aircraft reaches this point.

19.26.3. The ground controller should use the following terminology:

19.26.3.1. "TURN LEFT/RIGHT" - use a half standard rate turn unless specified otherwise.

19.26.3.2. "STOP TURN" - self explanatory.

19.26.3.3. "STANDBY" - indicates approximately ten seconds prior to the release point.

19.26.3.4. "EXECUTE, EXECUTE, EXECUTE" - directs release of the load.

19.26.4. Upon hearing the term "STANDBY," the pilot not flying will turn on the amber light, state " TEN SECONDS" on interphone, and place a hand near the ADS jump/release button. On the first "EXECUTE," the

19.26.5. PNF states "GREEN LIGHT” and turns on the green light.

19.26.6. The authentication procedures to be employed will be pre-briefed; however, procedures should be simple and short so as not to interfere with the approach to the DZ. Attempt radio contact as early as feasible.

19.26.7. The ground controller must maintain positive visual contact with the aircraft at all times during the inbound approach. If, in a training situation, doubt exists that the airdrop can be safely executed, or if the DZ cannot be positively identified by the aircrew, a no drop will be called by either the ground controller or the aircrew. In a combat situation, the lack of visual acquisition of the DZ by the aircrew will not, by itself, constitute grounds for calling a no drop. During VIRS airdrops, the ground party providing the verbal steers accepts responsibility for the accuracy of the airdrop.

19.26.8. VIRS is restricted to single aircraft operations during all training and exercises.

19.27. Jumpmaster Directed Airdrops (JDA). Jumpmaster directed airdrops may be conducted by qualified jumpmasters (or trainees under supervision of qualified personnel). The following procedures will be used to direct the aircraft to a release point and determine the exit point for the parachutists:

19.27.1. Restricted to single-ship Special Operations Forces (SOF), Pararescue, Combat Control Teams (CCT), and Special Tactics Teams (STT) conducting military free fall and approved static line missions.

19.27.1.1. Air Force static line JDAs are authorized for jumpmaster training including CCT, SST, Pararescue, and SOF teams. Conduct this training in preparation for jumps from allied aircraft not equipped with navigation or CARP capability. All other JDAs require MAJCOM tactics approval. Normally, this approval will be available through TACC/XOOMJ.

19.27.1.2. Army Special Forces static line JDAs are authorized: however, they require their headquarters' approval for all static line JDAs.

19.27.2. Personnel will not exit the aircraft unless the green light is illuminated.

19.27.3. Pilots ensure a CARP/HARP is calculated by the mission computer for each drop.

19.27.4. Inflight visual signals, verbal signals, and interphone procedures between the jumpmaster, loadmaster, and pilots are coordinated prior to the drop.

19.27.5. After the slowdown check is completed, the loadmaster permits the jumpmaster to begin spotting procedures. The jumpmaster visually relays steering signals to the loadmaster, who verbally relays them to the pilot. The jumpmaster may spot from the aircraft ramp or a paratroop door; however, the aircraft ramp and paratroop doors are not to be open simultaneously for spotting. At the one minute warning on the PFD, the pilot not flying turns on the green light to indicate clearance for the jumpmaster to determine the exact exit point. When further exit of jumpers becomes unsafe (aircraft emergency or similar circumstances), turn on the red light.

19.27.6. The jumpmaster's parent service accepts responsibility for the parachutists' impact point.

NOTE: When using the paratroop doors, jumpmasters may find that spotting procedures are made more difficult due to the size and shape of the gear pods and air deflectors.

19.28. Zone Marker (ZM) Airdrops. SKE ZM airdrops may be accomplished in IMC provided the ZM is physically located at the DZ. The ZM must be placed within 1500 yards of the PI, but as close as possible for maximum accuracy.

19.28.1. Valid ZM signal reception by the mission computer is indicated by ZM VALID on the SKE PPI MFD. The SKE ZM symbol will also be displayed on the PPI, but the symbol may appear intermittently and should not be used as a means of validating ZM reception. IMC airdrop with a MC navigation solution updated by ZM requires a MC FOM of 3 or better.

19.28.2. Do not assign slot numbers 01 or 02 to aircraft. The ZM uses both of these slots for synchronization and to extend its range from the master.

19.28.3. If a ZM is defined, entered, and selected in the MC airdrop pages, the mission computer will automatically enable ZM updating at 24 NM.

19.28.4. SKE wingmen receiving a valid ZM signal will maintain formation cross-track position and drop using the MSN timer. Wingmen may drop using the SKE timer if they do not receive a valid ZM reception.

19.29. Not Used.

19.30. Radar Beacon Airdrops (RBA). Radar beacons provide an alternate means of performing IMC airdrops by using a radar beacon located on the DZ. The mission computer directs the aircraft to the DZ using aircraft radar beacon data as an additional input to the MC navigation solution. Procedures are similar to using a ZM as a drop zone reference.

19.30.1. These procedures can be used by lead, element lead, and single ship aircraft for IMC beacon airdrops. Wing aircraft will maintain formation position by reference to SKE crosstrack, using flight director steering. Wingmen may initiate release based upon SKE or individual MSN timing.

19.30.2. The beacon will be located on the PI. Display the radar beacon mode (by enabling the BCN pushbutton on the MFC) and attempt to identify beacon data on the MFD as soon as possible. A positive identification of the beacon and verification that the MC mix includes the beacon in the nav solution must be accomplished for IMC radar beacon airdrops.

NOTE: The C-17's AN/APS-133 weather radar is compatible with the SST-181, PPN-19, and PPN-20 ground radar beacons. The aircraft radar can receive two (B & G) out of the seven codes transmitted by the PPN-19 (or PPN-20); and it can receive six (1, 2, 4, 6, 8, 10) of the 10 codes used by the SST-181. Mission commanders should ensure that ground forces use the appropriate codes for C-17 radar beacon airdrops.

19.30.3. In order to provide valid beacon data for an airdrop, the active flight plan must contain at least one airdrop segment, and the crew must enter a beacon code and type from the mission airdrop data base for each selected radar beacon airdrop. If multiple airdrops are planned, the beacon code/type will correspond to the crew-entered value for the next airdrop in the flight plan each time a DZ Escape waypoint is sequenced.

19.31. Ground Radar Aerial Delivery System (GRADS). GRADS is an IMC airdrop method using fixed radar facilities to provide navigational guidance and positioning of the aircraft over the desired release point. Precision instrument flying, standard airdrop procedures, and proper responses to the radar controller's instructions are primary pilot considerations for GRADS deliveries.

CAUTION: Airdrops in heavy precipitation are not recommended.

19.31.1. Aircraft radar, MCs, TACAN, and IFF transponder should be operational.

19.31.2. Drop altitude is based on the type parachute used, type of drop system employed, terrain features and enemy threat.

19.31.3. All voice procedures are the same as those used for GCA. When within range, contact ground radar giving heading, altitude, and ETA to the PIP. Squawk IFF as directed.

19.31.4. Inbound to the IP, the mission computer will compute a release point based on latest wind information and the pilot not flying will relay this point to the ground controller. Report release point data in true bearing and distance from the point of impact.

19.31.5. The ground controller will provide the following information on aircraft position: Pre-IP, IP, 6 minutes out, 2 minutes out, 1 minute out, 30 seconds out, countdown from 5 seconds and "MARK" when over release point. Upon hearing "MARK," the pilot not flying will state "GREEN LIGHT."

19.31.6. Standard pilot directed visual drop procedures and checklists are used.

19.31.7. If practical, a dummy load will be dropped to determine actual drift and release point adjustment for succeeding passes.

19.31.8. When operating single ship and voice contact is lost, the pilot should immediately execute the pre-briefed lost communications procedures. If within a corridor and operating at a safe altitude, the pilot may continue on the briefed route and attempt to reestablish communications. If contact cannot be established, execute lost communications procedures.

19.32. Not Used.

19.33. GPS Airdrop. GPS airdrops rely on high precision coordinates to accurately position the aircraft at the CARP. GPS airdrop accuracy is not affected by night or IMC conditions. When visual references are available, crews will ensure the airdrop load will impact the DZ or call a no drop. A preflight “drop box” will be computed and updated on the route as needed. IMC airdrop with a MC navigation solution updated by GPS requires a MC FOM of 3 or better.

Section 19D— High Altitude Airdrop Procedures

19.34. General. Airdrops conducted above 3,000 feet AGL are considered high altitude drops. High altitude personnel and equipment drop procedures may be employed during clandestine operations or in areas where small arms threats preclude conventional low altitude deliveries. Only essential personnel who have accomplished appropriate physiological training described in AFI 11-403 are permitted on mission aircraft for airdrops above 10,000 feet MSL.

19.35. Preflight. In addition to the normal mission planning requirements, the following are unique to high altitude operations:

19.35.1. During joint and unilateral training, the operating unit must ensure that air traffic control coordination is accomplished and applicable NOTAMs published prior to mission execution.

19.35.2. Aircrews should be aware that they may not have visual contact with the drop zone at the high altitude release point (HARP). Verify the release point by visual references, airborne radar, or by reference to ground-based navigation aids (TACAN or VOR/DME).

19.35.3. During HALO missions, the inbound course should be into the wind whenever possible. Plan HAHO missions to ensure that the objective area is not overflown. The run-in track will be jointly agreed upon by the aircrew and the user.

19.35.4. The pilot and jumpmaster will jointly agree on the release point. The pilot will use the MC to recompute the release if the two computed points differ by more than 330 yards (300 meters).

19.36. Oxygen Requirements. A continuous supply of 100 percent oxygen will be used by all personnel during unpressurized operations above 10,000 feet MSL. (**EXCEPTION**: Parachutists may operate without supplemental oxygen during unpressurized flights up to 13,000 feet MSL provided time above 10,000 MSL does not exceed 30 minutes each sortie). Jumpmasters may operate without supplemental oxygen for an additional 60 minutes within the 10,000 to 13,000 foot envelope provided their duties during this period do not include jumping. A continuous supply of supplemental oxygen must be used in all instances for unpressurized flights above 13,000 feet MSL. When dropping from 18,000 feet MSL or higher, pre-breathing procedures will be used.

NOTE: A waiver to AFI 11-202 is required from HQ AFFSA/XO through HQ AMC/DOK for unpressurized flights, when conducting airdrops above 25,000 feet MSL.

19.36.1. In addition to aircrew connectors, each of the 54 sidewall troop seats have a connector suitable for pre-breathing oxygen. All personnel will pre-breathe 100 percent oxygen at or below 10,000 feet pressure altitude or cabin altitude on any mission scheduled for a drop at or above 18,000 feet MSL for times shown in **Table 19.2.** The likelihood of decompression sickness depends on three primary factors: altitude, rate of ascent, and time of exposure at altitude.

Table 19.2. High Altitude Airdrop Pre-breathing Requirements.

Altitude	Pre-breathing Times For Aircrew/Jumpers	Maximum Exposure Time Per Sortie	Maximum Sorties Per 24 Hour Period
From FL 180 - 249	30 min/30 min	2 Hours	2
From FL 250 - 299	45 min/30 min HALO 45 min/45 min HAHO	1 Hour	1
From FL 300 - 349	60 min/60 min	30 min	1
From FL 350 or Higher	75 min/75 min	30 min	1

19.36.2. Pre-breathing must be completed before the cabin altitude ascends through 10,000 feet. All personnel will remain on 100 percent oxygen until cabin altitude is below 10,000 feet. A break in pre-breathing requires the pre-breathing period to be re-started or the individual whose pre-breathing interrupted be removed from the flight. When pre-breathing is required, a launch crew may assist the primary crew, as needed, to assure the pre-breathing requirements are met. Portable oxygen bottles may not be used for pre-breathing. Pre-breathing will be conducted with a personally fitted oxygen mask attached to either protective headgear or approved adjustable head harness IAW AFI 11-301.

NOTE: Quick-don oxygen masks are emergency equipment and are not approved for pre-breathing or high altitude operations (at or above 18,000 feet MSL).

19.36.3. Parachutists transfer from the aircraft oxygen system to personal oxygen system at approximately one minute before green light.

19.36.4. Maintain cabin pressure at or below 10,000 feet until the Pre-Slowdown Checklist (time for check may have to be adjusted) and until pre-breathing is complete. De-pressurization will not exceed 3,000 feet per minute. Slower rates are recommended if time allows. Ensure zero pressure differential before clearing doors to be opened.

19.37. Aircrew Requirements. The following are required crew qualifications for high altitude airdrop missions:

19.37.1. All Altitudes. Any airdrop qualified aircrew may perform personnel HALO or HAHO drops (including jumpmaster released door bundles) at all altitudes. A HARP solution will be computed for all drops.

19.37.2. Zero to 5,000 feet AGL. Any airdrop qualified crew may accomplish equipment or CDS airdrops up to and including 5,000 feet AGL.

19.37.3. Above 5,000 feet AGL. Any airdrop qualified crew may accomplish equipment and CDS drops above 5,000 feet AGL provided they use one of the following methods: GRADS, radar beacon, or a GPS-aided navigation mix. A wingman may accomplish a SKE timing drop provided his leader navigates to the HARP by GRADS, radar beacon, or a GPS-aided navigation mix.

19.38. Physiological Technician (PT) Requirements. PTs will support high altitude airdrop missions whenever requested by the mission frag order, the aircrew, or the user. PTs will be required under the following conditions:

19.38.1. A minimum of 2 PTs will be on all airdrops conducted at 18,000 feet MSL or above. If a waiver is granted to exceed exposure limitations of **Table 19.2.**

19.38.2. When PTs need training.

NOTE: The Command Coordinator Aerospace Physiology, HQ ACC/SGOP, Langley AFB VA (DSN 574-7827) may authorize variations to the PT-to-jumper ratio. Command Coordinator for Aerospace Physiology for USAFE is HQ USAFE/SGPA, DSN: 480-6284. Command Coordinator for Aerospace Physiology for ACC is HQ ACC/SGPA, Langley AFB, VA, DSN: 574-7827.

19.39. Physiological Technician (PT) Duties. PTs will fly as crewmembers as stated on aeronautical orders. When missions require a PT, a PT will be on interphone when pre-breathing starts until cabin altitude pressure is below 10,000 feet. PT flight duty stations will be as required to monitor crewmembers, jumpers and oxygen equipment. PTs will:

19.39.1. Advise the aircraft commander and crew on use of oxygen equipment and on the de-pressurization schedule.

19.39.2. Preflight aircraft oxygen equipment.

19.39.3. Prior to the first mission, brief the crew and jumpers on; physiological problems that may be encountered, the importance of pre-breathing, and on any special requirements.

19.39.4. Monitor personnel, aircraft oxygen equipment, and life support equipment.

NOTE: The aircrew or the mission PT will notify HQ USAF/SGPA (DSN 480-6284), and HQ AMC/SGPA (DSN 576-2303), of any physiological incident by the most expedient manner.

19.40. Conduct Of Operations. All high altitude drop operations will be conducted IAW the amplified checklist contained in this chapter.

19.40.1. The mission computer determines the HARP for all high altitude drops. A two-stage model is used to calculate wind drift for HARP airdrops. The total wind drift is obtained by adding the drift encountered in the free fall/high velocity stage to that from the high drag/deployed stage. Drift due to wind is calculated as the product of the average wind and the total time of fall divided by a constant for each stage. HARP uses ballistic wind and deployed wind. Both values must be calculated and entered by the pilot.

19.40.2. Maintain interphone contact between the cockpit and cargo compartment from takeoff until execution of the drop checklist and descent below 10,000 feet cabin altitude.

19.40.3. Briefing Requirements. Brief in accordance with Jumpmaster Briefing.

19.41. High Altitude Personnel Airdrop Procedures. Drop zone requirements and markings are determined by the user. However, drop zones must be established to ensure accurate navigation to the HARP.

19.41.1. There are no altitude wind restrictions for personnel HALO/HAHO operations. Surface wind restrictions are contained in AFI 13-217.

19.41.2. Drop altitude is based on mission requirements, terrain features, weather conditions and the threat; however, should be less than 25,000 feet MSL unless the requirements of paragraph 19.23.3 are met.

19.41.3. The following configurations are required:

19.41.3.1. Drop Airspeed: 138 - 145 KIAS (with aircraft in airdrop sub-mode).

19.41.3.2. Deck Angle: less than 5 degrees.

19.41.3.3. Flaps as required.

19.41.3.4. Air deflector in full open position with paratroop door open.

19.41.3.5. Cargo ramp and door or paratroop door(s) open.

19.41.4. Complete the slowdown and configure not later than three minutes prior to scheduled drop time. Use computed flap setting.

19.41.5. Troop Door Exit: Air deflectors must be operational if paratroop doors are used. If an air deflector does not extend, do not open the affected troop door.

19.41.6. Ramp Exit: Cargo door open, ramp in coplanar position.

19.41.7. Airdrop Procedures. Drops may be performed as either HARP or jumpmaster directed. Direct communications will be available between the jumpmaster and the pilot during jumpmaster directed drops.

19.41.8. At the thirty-minute advisories the pilot not flying the aircraft should provide updated winds and weather conditions to the jumpmaster. Notify the jumpmaster of any deviations from the plan such as altitude, run-in track or release point. Depressurize the cabin to 10,000 feet so that parachut-

ists can arm parachutes. Repressurization after the drop will be consistent with mission requirements. Normally the cabin altitude should return below 10,000 feet as soon as practical.

CAUTION: Ensure any paratroopers remaining on board de-arm their chutes before cabin altitude descends below 10,000 ft.

19.41.9. As a backup, the loadmaster will coordinate and use the following hand signals:

Time warnings may be given to the jumpers by the loadmaster pointing at his watch and indicating the correct warning/advisory with his fingers.

Wind velocity on the DZ will be indicated by cupping one hand in front of oxygen mask/mouth, then indicating with upturned fingers the speed of the wind.

Indicate a no-drop by passing the forefinger across the throat.

19.41.9.1. Carry pencil and paper to write out messages that cannot be understood with hand signals. Write out messages from the jumpmaster for the loadmaster to relay to the pilot.

19.41.10. For jumpmaster directed HALO drops the green light may be turned on one minute prior to the planned release point. The MC will provide a standard "GREEN LIGHT" call at the jointly agreed upon release point.

NOTE: User accepts responsibility for accuracy of team employment once a release point has been jointly agreed upon.

19.41.11. When the departure base is located near the drop zone, the pilot should average climb winds to update the release point. Ascertain wind data in 1,000-foot increments from surface to 10,000 feet and in 2,000-feet increments from 10,000 feet to drop altitude. If climb to drop altitude in the objective area is not possible, the release will have to be based on preflight or best known winds.

19.42. High Altitude Container Delivery System. High altitude CDS drops are conducted when it is operationally or tactically more advantageous than low altitude operations. High altitude CDS containers are rigged with special parachutes and other equipment to reduce drift effect and total time of fall. Parachutes on the container(s) are rigged to be airdropped from a High Altitude with a High Opening (HAHO) or High Altitude with a Low Opening (HALO). The different types of delivery used for high altitude CDS airdrops are:

19.42.1. High Velocity - CDS loads are rigged with a ring slot parachute and descend at approximately 65-100 feet per second. Loads normally consist of non-destructible type supplies which can withstand the high velocity impact. Individual bundle weights should be within ten percent of other bundle weights dropped on the same pass.

19.42.2. Low Velocity:

19.42.2.1. Staged Delivery. This system consists of a standard A-22 container rigged with a 15-foot ring slot parachute (reefed with a 148-inch reefing line) which stabilizes the container as it descends at approximately 200 feet per second. At a predetermined height above the ground, an altitude sensing device actuates a pyrotechnic cutter. The cutter releases the 15-foot stabilizing chute from the load and, in turn, deploys the second stage G-12D cargo parachute. This allows the container to impact at the standard rate of descent.

19.42.2.2. Confined Ballistic System (CBS). This system consists of a standard A-22 container rigged with a 22 or 28 foot ring slot parachute or a G-12D cargo parachute. The parachute is reefed down to a specific diameter and equipped with one or two CBS de-reefing devices which activate and cut the reefing line after the predetermined burn time. This allows the load to descend in the reefed condition at approximately 130 feet per second. Upon activation of the CBS cutter and full chute deployment, the descent rate slows to 70 feet per second for 22 and 28 foot chutes and 26 feet per second for G-12 cargo parachute. The drop altitude for CBS is determined by the specific burn time of the de-reefing device. Prior to takeoff, the aircraft commander will determine the total number of CBS de-reefing devices installed on the loads. During the Pre-Slowdown Checklist the loadmaster will arm the CBS devices by removing the safety pins.

Section 19E—Airdrop Load Information

19.43. Personnel Airdrops. Personnel airdrops are accomplished by the use of static lines or by using free fall procedures. Static line drops are normally performed at low altitudes (typically 800 feet AGL), through the paratroop doors. Aircraft used for personnel airdrop will have all associated equipment required by T.O. 1C-17A-9 and AFI 11-2C-17, Addendum A, *C-17 Configuration/Mission Planning*, installed and operational.

NOTE: When using the paratroop door for airdrops, ensure all required sidewall seats are operational to the stowed up position.

19.43.1. Pilots, loadmaster, and jumpmaster(s) will accomplish associated briefings prior to the takeoff.

19.43.2. The following configurations are required to support static line personnel airdrop form the paratroop door:

19.43.2.1. 20-foot static lines are the only authorized static lines for use on the C-17. 15-foot static lines are prohibited.

19.43.2.2. Total aircraft gross weight will not exceed 385,000 pounds at green light.

19.43.2.3. Airspeed will be 130 +/- 3 KCAS and aircraft deck angle will be between 6 and 7 degrees.

19.43.2.4. Maximum number of jumpers, or combination of jumpers and door bundles, is limited to 51 per door for a single pass.

19.43.2.5. All door bundles must be equipped with a 20-foot static line.

19.43.2.6. Canadian Retrieval System must be installed.

NOTE: In certain cases the mission computer may not compute the proper flap index for the desired deck angle. If this happens, adjust the flap index to achieve the desired deck angle. This should be accomplished when at the established drop airspeed and configuration and may require 3 to 5 NM to reach the desired deck angle.

19.43.3. Jumpmaster-Loadmaster Paratroop Door Procedures. After accomplishing the slowdown check, the loadmaster will allow the jumpmaster access to the paratroop doors not later than 1 minute. If a troop door or air deflector malfunctions after takeoff, the door on the affected side will not be opened. Troops may be safely dropped from the operational side of the aircraft only with the concur-

rence of the primary jumpmaster. If repairs can not be accomplished, subsequent drop sorties will be at the discretion of primary jumpmaster. The loadmaster will take a position so as to provide maximum maneuverability for jumpmaster(s) and safety personnel to perform their duties. Upon seeing the red jump lights illuminate, the loadmaster will notify the jumpmaster(s) or safety personnel of the red light condition. The loadmaster will take no further action to stop any of the remaining parachutists. The loadmaster will count (if possible) all parachutists that exit the aircraft while the red light is illuminated.

WARNING: Do not attempt to physically stop or hinder jumpers from exiting the aircraft if jumpers continue to exit after "Red Light."

19.43.3.1. Access to the paratroop door will revert back to the loadmaster after all parachutists have either exited or have been stopped by the jumpmaster(s)/safety personnel and cleared from the paratroop door area. For racetracks, the loadmaster will not allow access to the doors until completion of the next slowdown check.

19.43.4. Mass Paratroop Airdrop Procedures. Coordinate all in-flight procedures between the loadmaster and jumpmaster during the pilot/jumpmaster/loadmaster briefing. Cover items such as approximate number of paratroopers jumping per pass, how and when sidewall seats are raised.

19.43.5. Static Line Retrieval. Do not increase airspeed above 250 KCAS until all static lines are retrieved, air deflectors are stowed, and troop doors are closed. Retrieve static lines as soon as possible after personnel and/or door bundles are dropped. The paratroop retrieval system is only used for retrieval of a fouled paratrooper. If only D-bags are being retrieved, the standard aircraft retriever cable rigging should be used. Manual static-line retrieval may be used to retrieve no more than ten static lines per door, per pass with one loadmaster, or 20 static lines per door, per pass with two people (combination of loadmasters, jumpmasters or safety personnel). Use the cargo winch only as an emergency backup and do not preposition the cable. During training, if static lines cannot be retrieved, cut them over government property. During contingency operations, immediately cut them free if they can't be retrieved.

19.43.6. Free fall airdrops. These may be conducted from the paratroop doors or from over the ramp. Anchor cable installation is not required for free fall operations.

WARNING: Static line personnel airdrop over the ramp is prohibited.

19.44. Not Used.

19.45. Not Used.

19.46. Combination Airdrops. Combination drops are those during which parachutists exit from the aircraft immediately after the airdrop of ramp bundles.

19.46.1. During unilateral operations, combination drops are restricted to a single ship. During joint operations, the Army Airborne Commander determines the requirements for combination airdrops from any or all aircraft.

NOTE: Preflight Center of Gravity computations must be made to determine the number of paratroopers that may exit if ramp airdrop bundles can not be dropped.

19.46.2. Personnel/ramp bundle combinations are referred to as COMBO drops by the mission computer. COMBO drops require two sets of computations-- one associated with the personnel to be released and the other with the airdropped bundle(s). The mission computer determines whether the ramp bundle PI is located within the DZ. A "Bundles Off DZ" annunciation on the MCD indicates the personnel CARP will cause the airdropped bundles to fall outside the drop zone. In this case, the pilot must accept the off-DZ Bundle PI or adjust the personnel PI location to ensure the bundle(s) land on the DZ. Inform jumpmaster if PI falls within 150 yards of the DZ boundary. Jumpmaster is approval authority.

19.47. 90/270 Maneuver. These airdrops provide a method for personnel to follow an extracted or gravity release of equipment at low altitude. This maneuver consists of a 90 degree turn initiated after the airdrop load clears the ramp, followed by a 270 degree opposite direction turn that positions the aircraft over the original drop point, headed in the opposite direction. Although primarily developed for static line personnel airdrops following watercraft drops (boats rigged for heavy equipment and CRRC), the maneuver may also be used for free fall jumpers and CDS.

19.47.1. Restrictions:

19.47.1.1. Restricted to SOLL II crews due to current software limitations resulting in the requirement for PDA.

19.47.1.2. Gravity release drops are restricted to CRRC, or single stick CDS.

19.47.1.3. Single-ship operations only.

19.47.1.4. Drop altitude is determined by the item (personnel or equipment) requiring the highest drop altitude.

19.47.2. Procedures. While approaching the drop zone, the aircraft is configured as required for the drop. At the pre-slowdown checklist, the jumpers stand up and hook up to the left anchor cable forward of the equipment. The equipment is extracted or released on the "GREEN LIGHT" call. Upon hearing "ALL CLEAR," the PNF turns the red light on. Simultaneously:

19.47.2.1. The PF turns 90 degrees.

19.47.2.2. The loadmaster retrieves the deployment bags, closes the door and ramp, and then prepares the left troop door for personnel drop. The jumpmaster then moves the jumpers to the troop door.

19.47.2.3. The PF then performs a 270 degree opposite direction turn to reposition the aircraft over the DZ. A second "GREEN LIGHT" indicates to the jumpmaster clearance to drop.

19.47.2.4. Jumpers exit the aircraft on jumpmaster's command. The initial pass should be made downwind if operational constraints allow; however, if the initial pass is made into a headwind, the 90 degree turn should be delayed one second for each knot of headwind to ensure the turn back to the target area provides time to configure the troop door and acquire the DZ. The time from load exit to paratroop exit is two to three minutes, depending on the type of equipment dropped.

19.48. Door Bundle Airdrops. A-7A or A-21 containers weighing up to 500 pounds (excluding the weight of the parachute) are referred to as door bundles and may be dropped from the aircraft through the paratroop door using the personnel airdrop checklist. Door bundles may be dropped independently or in conjunction with personnel. When airdropping multiple bundles from the same exit, bundles will be

dropped one at a time. When dropped with personnel, the bundle(s) will be the first object(s) to exit the aircraft. A maximum number of 102 paratroopers may be airdropped preceded by one A-7A or A-21 bundle per door utilizing 20' static lines. All paratroop personnel will follow applicable service procedures. Remove restraint and position the bundle(s) in the paratroop door prior to completion of the slowdown checklist. If jumpers are to follow the door bundle(s), the user will be responsible for ejecting the bundle(s) out of the troop door(s). Ensure door bundles are not rigged with breakaway static lines. The dimension including the parachute, must not exceed 48 inches by 30 inches by 66 inches (unless authorized in a specific rigging T.O.). When the container is placed in the door for airdrop, the largest dimension will be placed in the vertical/upright position.

NOTE: The mission computer can be used to determine a CARP for door bundles (the same as for CDS) by using the door exit option on the AD COMBO page.

19.48.1. When door bundles are dropped with personnel, compute the CARP for first paratrooper exiting after the bundle and an additional CARP for the door bundle to ensure that it will impact within DZ boundaries. Release the bundle at the personnel CARP, followed by the parachutists when the door is clear. When a door bundle is the only object being dropped, base the release on the CARP for the bundle.

19.48.2. Drop Restriction for Unilateral Training. No door bundle will exit an aircraft after a paratrooper has jumped.

19.48.3. Drop Restriction for Joint Operations. During joint training or contingency/emergency operations, the Army airborne commander determines the requirement to airdrop door bundles from any or all aircraft.

19.49. Heavy Equipment Airdrops. The aerial delivery unit supporting the load movement will ensure current publications are available for loadmaster reference during joint inspections.

19.49.1. Use the following configurations for heavy equipment airdrops:

19.49.1.1. Airspeed: 145(+/-5) KCAS.

19.49.1.2. Deck Angle: 3.5 to 5 degrees.

19.49.1.3. Flaps: As required.

19.50. Container Delivery System (CDS) Airdrops. CDS is designed to airdrop single or double A-22 type containers. Single A-22 type containers may be rigged for low velocity, high velocity, or high altitude low opening (HALO) airdrops. Double A-22 type containers are normally rigged for low velocity airdrops only. The system can be rigged for individual or multiple container airdrops. The weight of each container will be IAW T.O. 13C7-1-11/FM 10-501.

NOTE: When A-7A or A-21 containers are rigged in place of A-22 containers they must be rigged on skid boards that are 48 inches wide.

19.50.1. The aircraft rail system allows drops of up to 40 containers on 48 by 48-inch skid boards, 20 from each side of the ADS rails with the enhanced center vertical restraint (ECVR) system installed or 30 without. Containers may be rigged and airdropped singularly or in any combinations of up to 20 from either side or in even number combination up to 40 from both sides on a single pass or multiple airdrops.

NOTE: Double A-22 containers, each mounted on 48 inch wide by 96 inch long skid boards, may be dropped from each side of the ADS rails in single or double stick configuration.

19.50.2. Standard Parachute Configurations:

19.50.2.1. G-12, G-13, or G-14 parachutes are used for low velocity drops.

19.50.2.2. High velocity airdrops use specially rigged containers equipped with energy dissipating material under them and a stabilizing device, such as a 22 foot ring slot extraction parachute, a 26 foot ring slot parachute, or small 68 inch pilot parachute(s).

19.50.3. Forward Restraint. If the combined weight of the containers (per side) is 9,400 lbs or less, the CDS forward buffer stop assembly (BSA) is not required. The ramp forward restraint gate(s) may be used instead of the BSA.

19.50.4. Vertical/Lateral Restraint. The ADS rails used in conjunction with the inboard logistic rails provide all necessary vertical and lateral restraint provided the container is secured to the skid board for 2 g's. Vertical restraint must be applied to containers resting on cargo ramp and the last 60" of the cargo floor.

19.50.5. Final aft restraint is provided by the Gate Release Mechanism(s) GRM(s) and Type XXVI release gate(s). The number of release gate(s) is based on the combined rigged weight of the containers to be dropped on a single pass.

19.50.6. Use the following configurations for CDS airdrops:

19.50.6.1. Max of 30 bundles (40 bundles ECVR) from rails with vertical restraint (forward of F.S. 1100).

19.50.6.2. Airspeed: 145 (+/-5) KCAS.

19.50.6.3. Deck Angle: 6-9 degrees.

19.50.6.4. Flaps: As required.

19.50.6.5. At the green light, the mission computer (in AUTO) or the pilot not flying the aircraft (in MANUAL mode) releases the GRM(s).

19.50.6.6. The Electronic Flight Control System (EFCS) minimizes pitch up as the load exits the aircraft. The pitch up is anticipated and countered by the EFCS to prevent excessive nose-up attitudes and avoid negative "G" forces while the load is exiting the aircraft.

CAUTION: During load exit, aircraft turns will not be initiated. Failure to maintain wings level may cause improper exit of bundles.

19.50.6.7. Loadmasters are authorized to conduct CDS airdrop operations from the Aft Loadmaster Control Panel. When this procedure is used, the loadmaster will preflight the aft station and the pilot will ensure the ADS arm light is illuminated.

19.50.6.8. Manual retrieval of up to 10 static lines is authorized for single stick airdrops only. This does not eliminate the need to rig the retrieval system.

19.51. Not Used.

19.52. Combat Rubber Raiding Craft (CRRC) Airdrops. The CRRC is employed in a variety of missions: unconventional warfare, special warfare, and amphibious operations.

19.52.1. CRRC procedures will be released after ground and flight testing.

19.53. Free Fall Airdrops. The delivery of certain type supplies, containers, or weapons can be accomplished without the use of parachutes. Free fall airdrops are used when the drop zone size, load composition, or the tactical situation renders other methods of delivery impractical. The pallet, skid boards, or containers used will depend on the load composition. Normally skid boards are rigged for standard CDS delivery with the exception that parachutes are not used. Loads that do not exceed door bundle dimensions may be dropped from the troop doors. The terrain, wind, load being dropped, and tactical situation will determine the drop altitude. Use normal CDS airdrop checklists and emergency procedures for ramp and door airdrops, and personnel airdrop checklist for door bundles.

19.54. Not Used.

19.55. Not Used.

Section 19F— Emergency Procedures

19.56. General. All crew members should review the applicable emergency procedures for the airdrop to be performed before takeoff. If a malfunction occurs during an airdrop, the loadmaster immediately notifies the pilot by stating "MALFUNCTION". The pilot not flying the aircraft will immediately turn on the red light and state "RED LIGHT ON." The pilot flying will immediately de-arm the autodrop mode (if engaged) and maintain drop altitude and airspeed. After the loadmaster has competed the appropriate Malfunction Checklist, the Post Drop Checklist will be initiated.

19.57. Emergency Parachutist Bailout Procedures. Under satisfactory conditions (static line exit) the minimum acceptable bailout altitude is 400 feet above the terrain. When an aircraft emergency occurs during static line airdrops, the pilot maintains an acceptable attitude for the parachutists to evacuate the aircraft. If the jump must be made at an airspeed in excess of 150 KCAS, advise the parachutists of the airspeed and altitude. Order evacuation by turning on the green light and giving the briefed alarm bell signals.

19.57.1. Minimum emergency bailout altitude for free-fall parachutists is 2,000 feet AGL.

19.57.2. If conditions are unsuitable for aircraft evacuation, turn the red light on until exit doors are closed. The aircraft commander advises the jumpmaster through the loadmaster to have the parachutists unhook, take their seats, and fasten seat belts.

19.58. Towed Parachutist. When notified of a malfunction during a personnel airdrop, the pilot flying the aircraft will maintain drop airspeed, at least the minimum drop AGL altitude (if possible) for the type parachute being used, and avoid flying over or up wind of water or built-up areas. Avoid turning the aircraft in the direction of the towed parachutist as this often starts him/her swinging violently and increases the possibility of injury. All turns should be shallow and coordinated to reduce the severity of parachutist's oscillation.

19.58.1. The aircraft commander will make the final decision whether or not to cut the parachutist free. The first priority is to retrieve the parachutist whether he/she is conscious or unconscious. However, if the parachutist cannot be retrieved and indicates consciousness, cut the parachutist free. Towed parachutists indicate consciousness and that reserve parachute is ready by maintaining a tight body position with both hands on reserve parachute. This indicates the jumper is prepared to be cut away. If parachutists does not signal, cannot be observed, or if a condition exists that prevents cutting the static line, the parachutist will be retrieved.

WARNING: If the decision is to cut the parachutist free, the loadmaster will cut the static line on the aircraft commander's command.

NOTE: The jumpmaster/safety observer is responsible for identifying how the parachutist is entangled. If being towed by anything other than the static line, the jumpmaster/safety will attempt to free the parachutist. If being towed by the static line, the jumpmaster/safety will make a recommendation to the aircraft commander, through the loadmaster, whether to retrieve the parachutist or cut him/her free. If all parachutists have exited and there are no safety personnel onboard, this responsibility rests with the loadmaster.

19.58.2. Towed Parachutist. If a parachutist becomes entangled and is being towed after exiting the aircraft, the loadmaster will state "MALFUNCTION" and complete the Personnel Airdrop Malfunction Checklist.

19.58.3. Parachutist Retrieval. The loadmaster will take the following action:

19.58.3.1. Install the retrieval system.

19.58.3.2. Initiate retrieval using the static line retriever winch. Use the opposite retriever winch if first retriever winch fails. Use the cargo winch as an emergency backup only after both retriever winches have failed. Do not preposition the cable.

19.58.3.3. When the parachutist is adjacent to the open doorway, pull the paratrooper into the aircraft and secure the paratrooper forward of the paratroop door.

WARNING: The loadmaster, safety observer(s), and jumpmaster(s) should remain clear of the line of travel of the static line retriever cable until the parachutist has been retrieved to the door area. During retrieval attempts, take all possible action to ensure the parachutist does not slip back at any time. Once the Personnel Airdrop Malfunction Checklist has been completed by the loadmaster, the Post Drop Check will be initiated.

CAUTION: Manual retrieval of a towed parachutist is the last resort.

19.59. Heavy Equipment Emergency Procedures. When notified of a malfunction, the pilot flying the aircraft will maintain drop airspeed, maintain safe altitude, avoid yawing the aircraft, avoid flying over populated areas, and ensure the cargo ramp and door remain in the airdrop position until the malfunction is corrected. The aircrew will complete the following procedures as required.

19.59.1. Loose Platform. A loose platform occurs when the ADS locks release the platform prior to green light or after a malfunction has occurred. If this condition exists, state "MALFUNCTION" and complete the Heavy Equipment Malfunction Checklist. No further attempt will be made to airdrop the platform(s).

19.59.2. Parachute Deployment Mechanism (PDM) Malfunction. If the drogue chute does not deploy automatically or with the manual backup switch, the loadmaster will state "MALFUNCTION" and complete the Heavy Equipment Malfunction Checklist. The airdrop may be made using the opposite PDM only if it had been checked during preflight and the ADS GANG LOCK BACKUP switch(s) were not actuated.

19.59.3. Drogue Jettison/Malfunction. If the drogue chute has deployed but not inflated the loadmaster will state "MALFUNCTION" and activate the DROGUE JETTISON switch. (If the drogue chute fails to jettison the loadmaster will activate the EMERG DROGUE (Jettison) switch.) Loadmaster states, "DROGUE JETTISONED" and complete the Heavy Equipment Malfunction Checklist. The airdrop may be made using another drogue parachute only if the EMERG DROGUE (Jettison) or ADS GANG LOCK BACKUP switch(s) were not actuated.

19.59.4. Tow Release Mechanism (TRM) Malfunction. If the extraction link fails to release from the Tow Release Mechanism automatically or with the manual backup switch, the loadmaster will state "MALFUNCTION" and activate the DROGUE JETTISON switch. (If the drogue chute fails to jettison the loadmaster will activate the EMERG DROGUE (Jettison) switch.) Loadmaster states, "DROGUE JETTISONED" and complete the Heavy Equipment Malfunction Checklist. No further attempt will be made to airdrop the platform.

19.59.5. Load Extraction Malfunction. If the extraction parachutes have exited the aircraft and the platform fails to move, activate the R LOCKS GANG RELEASE switch. If the platform still fails to exit state “MALFUNCTION” and complete the Heavy Equipment Malfunction procedures. No further attempt will be made to airdrop the platform.

NOTE: The platform will move slowly if there is no extraction force due to malfunctioning extraction chutes. Do not attempt to restrain the platform once the right locks have been released.

19.60. CDS Emergency Procedures. When notified of a CDS malfunction, the pilot flying the aircraft will maintain drop airspeed and AGL altitude (if possible) and avoid flying over populated areas. Also, the pilot will avoid yawing the aircraft until the malfunction is corrected. The PF should not change deck angle unless requested by the loadmaster. The loadmaster will complete the following procedure as required.

19.60.1. GRM Fails to Release/Load Fails to Move. If the GRM(s) fail to release or load stops moving aft, ensure that all containers that are moving have exited, then state "MALFUNCTION" and complete the CDS Malfunction Checklist. No further attempt will be made to airdrop the container(s).

19.60.2. A flap index change and/or nose down trim may be required to ensure the load remains in the aircraft.

19.61. CRRC Emergency Procedures. This procedure will be developed during future ground and flight testing.

19.62. Not Used.

19.63. Not Used.

19.64. High Altitude Emergency Procedures. If a physiological incident occurs, the aircraft commander will:

19.64.1. Abort the mission/drop.

19.64.2. Begin a descent (pressurization and descent will be determined by the type and degree of sickness or pain).

19.64.3. Ensure the affected person remains on 100 percent oxygen until a medical doctor determines the type of treatment required.

19.64.4. Proceed to the nearest base at which qualified medical assistance is available. Advise the control tower of the emergency and request an ambulance and doctor meet the aircraft.

19.64.5. Advise attending physician to call Brooks AFB Hyperbaric medicine (DSN: 240-3278; Commercial: 512-536-3278).

Section 19G—Amplified Airdrop Checklists

19.65. All crewmembers should be familiar with all amplified checklist procedures prior to using the abbreviated annexes.

Section 19H—Airdrop Formation Procedures

19.66. General. This section contains information applicable to airdrop formations. Procedures specific to personnel airdrop formations are found in paragraph **19.81.**

19.66.1. Consider safety, aircrew capability, proficiency, survivability and user needs when planning formation tactics. When missions require more than six aircraft, consider reassembling smaller sections as close to the objective area as possible.

19.67. En Route Spacing. Refer to **Chapter 18** for descriptions and illustrations of SKE and visual formation geometries.

NOTE: Aircraft may alter position slightly to avoid vortices from preceding aircraft.

19.68. Visual Formation Slowdowns. The slowdown point is normally based on mission computer navigation position, but an easily identified geographic point, or briefed timing procedure may be used. The planned slowdown point will be prebriefed and, for day drops, may be accomplished without being signaled. Lead may alter the briefed point provided the new slowdown point is passed to the formation and the slowdown signal is clearly discernible by formation followers. Unless the tactical situation dictates otherwise, all night slowdowns will include an aural or visual signal. Some options for signaling slowdown include SKE signals (tactical situation permitting), briefed UHF tones, radio calls, etc.

NOTE: When using the MC to determine the slowdown point, aural/visual slowdown signals are critical since the MC will make automatic slowdown adjustments to meet lead's TOT tolerances.

19.68.1. Lead retards throttles as necessary, and, depending on the tactical situation, maintains altitude or climbs immediately. At 280 KCAS (placard) extend slats; at 250 KCAS (placard) set half flaps. Continue slowing to 160 KCAS. If descent is required, descend at 160 KCAS. Until establishing half flaps, wingmen may use speed brakes as required to prevent overruns.

19.68.2. Aircraft within an element should slowdown at the same time as lead to maintain 2000 feet spacing. Succeeding elements normally slow at the same point established by formation lead.

NOTE: The desired spacing across the DZ is 2000 feet between all aircraft. Mission planners need to take into consideration planned aircraft airspeed at slowdown to ensure succeeding elements close to the proper spacing. Mission commanders must ensure slowdown techniques to be used are thoroughly briefed and understood. Refer to **Chapter 16** of this regulation for slowdown techniques.

19.68.3. All aircraft fly the same drop altitude until beginning the escape maneuver.

19.69. SKE Formation Slowdowns. The IFR slowdown point is normally based on mission computer navigation. The following are SKE formation slowdown guidelines.

NOTE: The formation uses echelon turn procedures (all aircraft turn at the same time) between the IP and the DZ escape.

19.69.1. The entire formation slows down simultaneously. Slowdown is based on lead's mission computer derived slowdown point. The slowdown signal is automatically sent back on the FCI's and displayed on the PFD's. After initiation of the slowdown, element leads proceed to their own CARP. Element lead will call the direction of turn and the roll-out heading on interplane frequency when performing echelon turns. Normal, timed turns will commence with the DZ escape maneuver.

19.69.2. Element leads are limited to 10 degrees of bank after the slowdown is initiated until the escape maneuver.

19.69.3. Follow flight director guidance. At slowdown, aircraft reduce power as necessary and maintain level flight.

NOTE: The thrust guidance is based on a constant rate slowdown, so power or drag devices may have to be added to maintain position.

19.69.4. During the SKE slowdown, the element leaders will extend slats at 280 KCAS (placard), lower half flaps at 250 KCAS (placard), and descend or climb (if required) at 160 KCAS. If necessary, wingmen may delay configuring as required to help maintain position. When arriving at 160 KCAS and the planned descent point (based on pilot input to SLOW DN LMTS on the AD WAYPOINTS page), lead will pass a down prep and "E" and begin the descent to airdrop altitude. These signals will be relayed by element leads unless the situation dictates otherwise (i.e., terrain, restricted area limitations, planned individual element descents, etc.). If lead arrives at 160 KCAS before the planned descent point, the mission computer/flight director will delay the descent. If IMC, do not descend below 1000 feet (2000 for mountainous terrain) above the highest obstacle within 5 NM unless the following conditions all exist:

19.69.4.1. Lead's position is positively known as determined by the mission computer with a MC FOM of 5 or better or "ZM Valid" displayed on the PPI.

19.69.4.2. The entire formation is within 3 NM of planned DZ run-in centerline course.

19.69.4.3. The last aircraft in the formation is at or past the DZ entry point.

19.69.5. To manually signal a SKE slowdown, press "Slow Prep" on the SKE primary page thirty seconds prior to slowdown. At seven seconds prior to slowdown pass the "-" prep on the FCI followed by the "E" prep at the slowdown point. If the slowdown is <u>manually</u> initiated, the MC is inhibited from auto transmission of the slowdown sequence. After passing the DZ entry point and 160 KCAS

is achieved, lead must be sure to transmit a DOWN PREP FCI and 7 seconds later an EXECUTE (E) FCI to indicate a descent from en route to drop altitude.

NOTE: If slowdown "E" is delayed more than 12 seconds after passing the seven second prep, the "E" will not be transmitted. A new seven second prep and then an "E" must be passed, or make a verbal slowdown call.

19.69.6. Each element stacks 100 feet above the preceding element. Wingmen maintain the same drop altitude as their element lead using the barometric altimeter. After reaching drop altitude, extend flaps (if required), and slow to airdrop airspeed. Lead must keep in mind the size of the formation when slowing from 160 KCAS to drop airspeed. The slowdown from 160 KCAS to drop airspeed will be signaled by lead. Lead may consider delaying the slowdown to drop airspeed to ensure all elements are at drop altitude before slowing to drop airspeed. If lead elects to delay slowing to drop speed, lead should be stabilized at drop airspeed no later than two NM from the PI. Lead will check drift information and pass updated drift to the formation as needed.

19.69.7. If pitch stabilization is desired for the drop, lead and element leads select MSN/MSN/MSN after reaching drop altitude and airspeed. At DZ escape, they reselect IAS select and continue normal SKE operations.

19.70. SKE Drift Offset.

19.70.1. After stabilizing at drop altitude and airspeed, lead will confirm drift and relay to the formation. All aircraft will use the same drift for computing drift offset. The new drift must be selected by the PNF to become effective. Once selected, the MC will continuously display updated cross track settings on the MCD. After red light, wingmen should clear the airdrop crosstrack and return to enroute crosstrack prior to beginning a turn at the escape point.

19.71. Clearance to Drop. If required, lead confirms clearance to drop at least two minutes prior to release with the entire formation monitoring this call. When radio contact is not required, zone marker reception, radar beacon reception, or other coordinated visual or electronic signal is clearance to drop. Clearance to drop in combat/contingency operations is as briefed.

19.72. No-Drop Decisions. All aircraft must monitor the DZ primary frequency in the event conditions on the DZ require a "no drop" after receiving initial clearance. When a situation requiring a formation no-drop arises, lead will notify the formation by use of the FCI “no drop” button. If radio silence is not required by the tactical situation, lead will transmit “XXX Flight, no drop, acknowledge.” over interplane frequency and all aircraft will acknowledge. Element lead's transmission must be explicit when the "no drop" is for an element only. Do not transmit individual no-drops outside the individual aircraft until the formation has departed the drop zone.

19.73. Formation Airdrop Execution. WARNING: Vortices generated in the airdrop configuration are significant in terms of size, velocity, and duration. Aircrews will not fly lower than the preceding aircraft from slowdown through escape. Impact of airdrop loads or parachutes with the aircraft is possible.

WARNING: Analyze pre-airdrop gross weight to determine if obstructions can be cleared with one engine inoperative. If obstruction clearance criteria cannot be met, consider reducing the number of aircraft, revising the run-in course, or increasing the drop altitude.

19.73.1. Visual Formation Airdrop. For visual airdrops, wingmen maintain formation position but release independently, using individual mission computer timing and visual backup. To avoid vortices and wake turbulence, with no crosswind, wingmen maintain normal formation position. In a crosswind condition (greater than 3° drift), wingmen adjust their lateral formation position to maintain the same relative ground track as the element lead over the DZ, avoiding wake turbulence from the preceding aircraft.

19.73.2. SKE Formation Airdrop.

19.73.2.1. Element Lead. Each element lead flies an independent approach to the drop zone (DZ) after initiating slowdown until beginning the escape maneuver. Leads will drop off their mission computer's CARP. At the computer's "ONE MINUTE" advisory, element leads ensure the FCI down prep has been relayed. Inside thirty seconds, the aircraft should be stabilized on altitude and airspeed to permit accurate timing by wingmen. At the computer's "FIVE SECONDS" call, the pilot ensures the FCI down prep is relayed and, at the computer's "GREEN LIGHT" call, ensures the execute FCI "E" has been sent to the element.

NOTE: IMC airdrop requires a MC FOM of 3 or better.

19.73.2.2. Element Wingmen. Wingmen will use flight director guidance for position. Normally, the mission computer will countdown and release at each aircraft's computed CARP. Wingmen who are not GPS, radar beacon or ZM capable will accomplish an IMC drop using SKE timing (based on their element leader's FCI "E" signal.

NOTE: For airdrops without ZM operations, normally position the master in the center of the formation. The master aircraft for ZM operations normally is the lead aircraft, depending on the size of the formation and type of recovery planned. This allows maximum range ZM reception (24 NM) without master changes. However, master placement may be dictated by other factors such as large formation departure requirements or equipment degradation.

19.74. Visual Formation DZ Escape. After load clear and red light, begin timing (if required), accelerate to 200 KCAS (or as briefed), climb/descend (if required), and turn to escape heading. Retrieve static lines and close all doors. At the briefed acceleration point or time, the element will retract flaps and slats, accelerate to briefed en route airspeed, and perform Post Drop checklist.

CAUTION: Do not begin the DZ escape maneuver until the loadmaster reports "load clear" or condition.

19.74.1. Combat Escape. An alternate DZ escape procedure allowing aircraft to begin the escape maneuver at "load clear" may be used if briefed.

NOTE: Aircraft having difficulty retrieving static lines, closing doors or air deflectors must notify lead. The formation will not exceed 250 KCAS until the aircraft has corrected the problem or departed the formation.

19.75. SKE Formation DZ Escape. Each element lead maintains drop heading, altitude and airspeed for one minute after "red light", before commencing the escape maneuver. Each element lead signals approximately seven seconds prior to the escape with the FCI "+" prep, and initiates the escape with the FCI "E" prep. Subsequent element leads disregard this signal.

19.75.1. At escape, each element independently begins climbing to reassembly altitude (using 1000 fpm or as briefed), accelerates to 160 KCAS (or as briefed) and turns to the DZ escape heading. Plan

escape heading changes to be as small as possible (not to exceed 90 degrees). On element lead's "E," wingmen accelerate to 160 KCAS or as briefed, begin climbing, and start timing for the turn to departure heading. If there is a significant turn, it is essential that wingmen reset crosstrack and attempt to regain normal SKE wing position. Subsequent elements should attain formation position as soon as possible (arm/engage SKE XTRK/LTRK). The formation lead maintains 160 KCAS or as briefed at reassembly altitude until all aircraft are in position, then accelerates (at briefed time/point) and climbs to briefed recovery route profile.

NOTES:

Ensure airspeed is at or above Vmma (half flaps) before retracting flaps to half.

Aircraft having difficulty retrieving static lines, closing doors or air deflectors must notify lead. The formation will not exceed 250 KCAS until the aircraft has corrected the problem or departed the formation.

19.75.2. Emergency Salvo. For an equipment drop malfunction, notify lead and try to secure the load. If the load requires jettison, depart the formation to the salvo area. If the emergency aircraft is formation lead or an element lead, perform a lead change and depart the formation for the salvo area.

NOTE: In an actual threat environment, it may be more advisable to remain with the formation and salvo as soon as possible during the escape or egress route.

19.76. Aircraft Aborts (Airdrop). For airdrop missions, in the event an element lead aborts, the second aircraft of that element moves to the element lead position. The third aircraft of that element (if a three aircraft element is dictated by the mission) assumes the second aircraft position. The appropriate follower aircraft select the new lead's slot number, positively identify the new leader on the SKE MFD, reset cross-track and range as required, and request an FCI check (as time allows) from the new element leader.

19.76.1. In the event the second aircraft within an element aborts, the third aircraft of that element (if a three aircraft element is dictated by the mission) assumes the second aircraft position, mission requirements permitting. After departing the formation, the aborting aircraft will climb or descend out of the formation altitude prior to maneuvering across the flight path of the formation. Normally, slot numbers and call signs do not change due to an aircraft abort.

19.77. Recovering Large Formations. If recovering a large SKE formation and the planned approach is not a straight-in, obtain a minimum of five minutes separation between sections of six or less aircraft prior to reaching the recovery base. The airspace must be available for each section of six or less to hold upon arrival at the recovery base if immediate landing is not possible.

19.78. Overrun Procedures.

19.78.1. Element Overrun. Refer to paragraph **18.34.1.** for overrun procedures. If not in position by one minute prior to TOT, the element aborts the drop.

19.78.2. Wingman Overrun. Refer to paragraph **18.34.2.** for overrun procedures. . If not in a safe drop position by one minute prior to TOT, the wingman aborts the drop.

19.79. Rendezvous. These procedures are intended to join multiple sections into one formation. Each section will converge on a briefed geographic point or radio fix that is referred to as the Start Rendezvous

Point (SRP). Each section will use a different SKE frequency, arriving at the SRP two minutes apart with a minimum altitude separation of 1,000 feet. (The rendezvous track should be at least 50 NM long for two sections, and adjusted by planners for more than two sections.)

19.79.1. Aircrew Procedures. The first section decreases airspeed to 250 KCAS two minutes past the SRP. The first section lead will transmit a discrete radar beacon code. The last aircraft in the first section will be Master for the rendezvous, and will also transmit a discrete radar beacon code. The second section continues to fly en route airspeed upon reaching the SRP and the same track as the first section. The second section executes a chase-type rendezvous. When the second section is approaching position based on radar beacon acquisition, subsequent sections switch to the first section's SKE frequency. Subsequent leads then directs selection of formation lead's master aircraft. When all SKE systems are synchronized, the subsequent section leads positively identify the last aircraft of the preceding section and continue to close to en route spacing. The joining section slows to 250 KCAS as necessary to stabilize in position. The new lead will be SKE identified and an FCI check will be accomplished. After established in the proper position, the second section climbs or descends to the formation altitude on section lead's FCI signal.

19.79.2. Ensure aircraft do not have duplicate slot numbers. Join only one section to the formation at a time.

19.80. Multiple Points of Impact (MPI). This procedure disperses unit equipment and personnel laterally and/or longitudinally on the DZ. The using agency is responsible for crossloading the aircraft. The element leaders must understand the crossloading plan.

19.80.1. The pilot not flying must manually adjust the CARP if the PI is other than the surveyed PI.

19.80.2. An alternate method of MPI for the C-17 is to load high-precision GPS coordinates of the separate PIs, and each individual aircraft fly a separate run-in and CARP. Element leads must clearly brief when and how the formation "separates" after slowdown, and "rejoins" after load clear.

19.81. Personnel Formation Airdrop Procedures.

19.81.1. Formation geometry. Personnel airdrop formations are limited to three elements due to SKE limitations, with the SKE master normally positioned in the center of the formation. The mission commander will determine the overall formation geometry to be employed enroute based upon the threat, weather, and army requirements. Although SKE is required to position the aircraft for personnel airdrop, mission commanders may plan to use normal SKE or visual formation procedures.

NOTE: #3 wingman can expect an "AUTODROP" warning due to formation position. Consider using manual drop procedures to prevent having to re-engage autodrop during the run-in.

19.81.1.1. Spacing between elements. 40,000-feet separation is required between element leaders.

19.81.1.2. Spacing within elements. The second aircraft in each element will be positioned 3000 feet aft and 650 feet right for a right echelon, 650 feet left for a left echelon (**Figure 19.3.**). The third aircraft in each element will be positioned 6000 feet aft and 1500 feet right for a right echelon, 1500 feet left for a left echelon. Lead will signal the direction of echelon and expected drift prior to the pre-IP. Wingmen will reset longtrack and crosstrack on lead's command. Compression to 3000/6000-feet spacing should be initiated not later than the slowdown point. Element wingmen will be established in echelon geometry by 1 minute prior to the drop.

19.81.1.3. All elements fly the same drop altitude.

19.81.2. Element Spacing.

19.81.2.1. Formation personnel airdrop requires a minimum of 40,000 feet separation between element leads. Attain this separation prior to slowdown. Mission commanders will brief the method used to achieve this separation. The following options are recommended:

19.81.2.1.1. Individual TOTs. Fly separate single element formations to TOTs separated by a minimum of 5 minutes. Five minutes guarantees 40,000-feet element spacing and allows for plus/minus 1 minute TOT deviation between each element.

19.81.2.1.2. Orbits. The formation enters a planned orbit at a pre-briefed time/location. Each element departs the orbit to achieve 40,000-feet spacing from preceding element. Alternately, depart the orbit as required for individual element TOTs to achieve the required spacing (refer to paragraph **19.81.2.1.1.**).

19.81.2.1.3. Alternate routing/timing triangles. The second and third elements delay their turn at a pre-planned turn point as required to attain 40,000-feet spacing.

19.81.2.1.4. Enroute driftback. Subsequent elements decrease airspeed by 30 knots (or as briefed) to establish 40,000 feet intrack distance. This technique requires approximately 10 minutes per element. Initiate this maneuver on lead's command (radio call, SKE FCI, geographic point, or as briefed).

19.81.3. Wingmen Spacing.

19.81.3.1. Element leads will direct the transition to personnel airdrop LTRK spacing by radio call, SKE FCI, geographical point, or as briefed. This transition should be initiated no later than slowdown. If slowdown occurs prior to the IP, every effort should be made to limit any turn at the IP to run-in heading.

19.81.4. Personnel Formation Echelon.

19.81.4.1. Lead will signal the expected drift, echelon direction, and offset PI direction (if applicable) prior to the pre-IP. Element wingman will establish an upwind echelon crosstrack as depicted in **Figure 19.3.** using drift tables in **Figure 19.4.**. Drift tables are good to a maximum of 1 degrees of downwind drift (i.e., if right drift is passed to the formation, the maximum acceptable downwind drift at "green light" is 1 degree left drift). Lead will update drift as on the run in as required. Wingmen will begin the echelon maneuver upon lead's pre-briefed signal (normally during the transition to drop altitude). Do not begin the echelon maneuver until established on the run-in heading and established in 3000/6000 feet along track. Do not echelon in conjunction with the slowdown to 160 KCAS. All maneuvering will be completed one minute prior to the drop.

NOTES:

The slowdown point may need to be adjusted to allow time to echelon the formation.

CAUTION: Wingmen must climb slightly to avoid the wake turbulence from the previous aircraft when crossing over to echelon position.

19.81.4.2. Offset PIs (**Figure 19.4.**). Offset PIs are surveyed PIs 250 yards left and right of the surveyed PI. When using offset PIs, the left PI/right echelon is used for left drift, and the right PI/ left echelon is used for right drift.

19.81.5. Restrictions.

19.81.5.1. Aircraft will no-drop if not within the following tolerances at green light:

19.81.5.1.1. Element leads must maintain a minimum of 37,500 ft to preceding element lead.

19.81.5.1.2. Wingmen restrictions are plus/minus 500' fore/aft, plus/minus 200' left/right of position as described in paragraph **19.81.1.2.**

WARNING: If the second aircraft is not within these tolerances, a no-drop will be called for both wingmen by the second aircraft.

19.81.6. Escape.

19.81.6.1. Escaping to visual formation. Element wingmen will reposition to normal visual enroute formation position at each aircraft's red light and load clear. All aircraft must use the same useable DZ length to determine red light timing. All aircraft will maintain DZ heading for one minute after lead's red light and then proceed with normal visual escape procedures. Escape speed is 160 KCAS or as briefed.

19.81.6.2. Escaping to SKE formation. Element wingman will reset crosstrack to attain normal SKE enroute formation crosstrack (500 R/500L) at each aircraft's red light and load clear. All aircraft must use the same useable DZ length to determine red light timing. One minute after element lead's red light, lead will commence the escape maneuver. Element wingmen maintain 3000/6000-feet spacing. Escape speed is 160 KCAS or as briefed. Upon reaching IFR enroute altitude, element leads will direct their element to "establish SKE enroute spacing." Element wingmen then reduce airspeed by 10 knots and drift back to 4000/8000-feet spacing.

19.81.7. Reassembly.

19.81.7.1. If required for SKE formations, element leaders maintain 160 KCAS (or as briefed) until subsequent elements are re-joined to normal enroute element spacing. Elements rejoining to visual in trail formations rejoin as briefed.

19.81.7.2. Alternate routings/timing triangles may also be used to rejoin elements.

19.81.8. Racetracks. Racetracks are not recommended. If required, extensive planning, briefing, and coordination between elements are required.

19.81.9. Drop Zone Width Requirements. For a SKE formation, requirements for drop zone (DZ) width provide a 400 yard buffer for aircraft/SKE positioning error. The minimum width DZ for a single-element, three-ship personnel formation is 1,800 yards using standard (centerline) PI and 1,300 yards using offset PIs.

Section 19I—Mixed Formation Airdrop Procedures

19.82. C-17/C-130 Mixed Formations. Procedures to be determined after formal testing.

19.83. C-17/C141 Mixed Formations. Procedures to be determined after formal testing.

Figure 19.2. Personnel Airdrop Geometry.

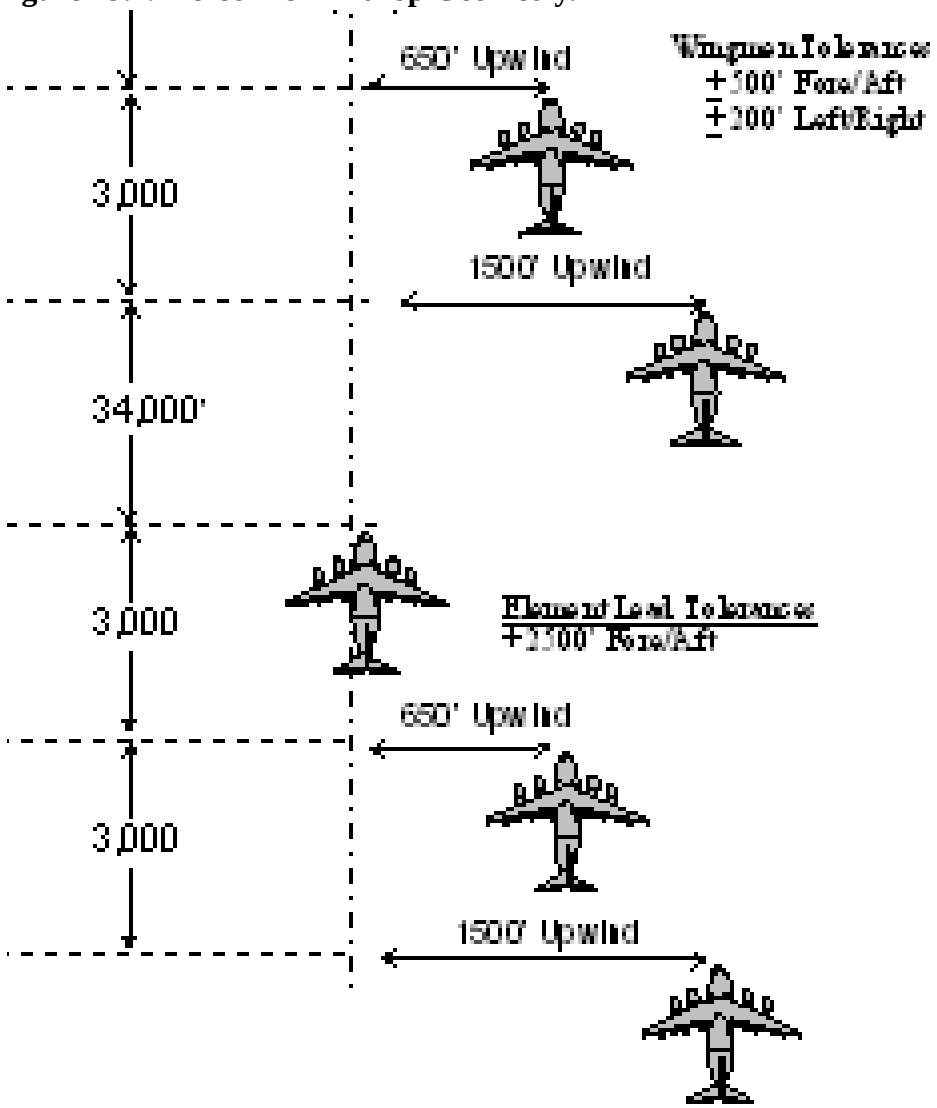


Figure 19.3. Offset Points of Impact.

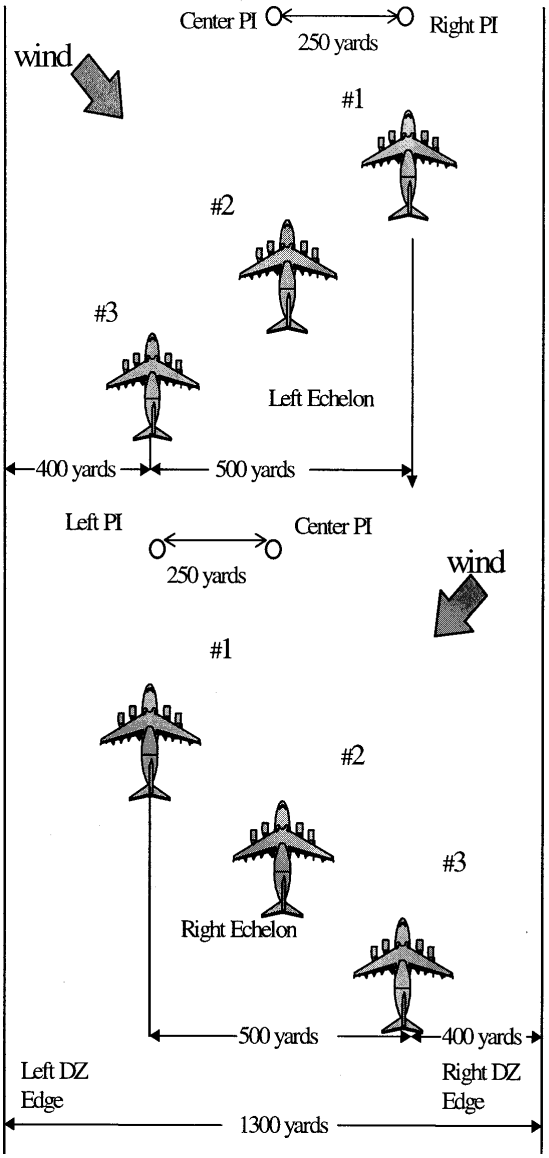


Figure 19.4. Personnel Formation Drift Table.

Left Drift		
Drift	**#2 Wing**	**#3 Wing**
0L		
1L	650R	1500R
2L	650R	1500R
3L	650R	1500R
4L	650R	1500R
5L	650R	1500R
6L	650R	1500R
7L	650R	1500R
8L	650R	1500R
9L	650R	1500R
10L	650R	1500R
11L	650R	1500R
12L	650R	1500R
13L	700R	1500R
14L	750R	1500R
15L	800R	1600R
16L	850R	1750R
17L	950R	1850R
18L	1000R	1950R
19L	1050R	2050R
20L	1100R	2200R

Right Drift		
Drift	**#2 Wing**	**#3 Wing**
0R		
1R	650L	1500L
2R	650L	1500L
3R	650L	1500L
4R	650L	1500L
5R	650L	1500L
6R	650L	1500L
7R	650L	1500L
8R	650L	1500L
9R	650L	1500L
10R	650L	1500L
11R	650L	1500L
12R	650L	1500L
13R	700L	1500L
14R	750L	1500L
15R	800L	1600L
16R	850L	1750L
17R	950L	1850L
18R	1000L	1950L
19R	1050L	2050L
20R	1100L	2200L

19.84. AMPLIFIED AIRDROP CHECKLIST. When the Pilots ADS Panel is set in the AUTO mode, the Central Aural Warning System (CAWS) will transmit a tone (chime) followed by airdrop alerts: 30, 20, 10, 6 (for personnel airdrops only) and 1-minute advisories, a 10-second time advisory (for personnel airdrops only), followed by a count down from 4-seconds to Green Light, and Red Light. When in the MANUAL mode, the same warnings will be given up through the one-minute advisory. After that, a pilot will have to make all aural calls after the one-minute warning through Red Light. The loadmaster will advise the jumpmaster of the necessary advisories.

19.85. CABIN ALTITUDE CHECKLIST. Accomplish this checklist prior to exceeding a cabin altitude of 10,000 feet MSL. The "OXYGEN CHECK" Step of the checklist will be accomplished at a cabin altitude of 10,000 and 15,000 feet. At a cabin altitude of 20,000 feet, this step will be accomplished every 15 minutes or with each 5,000 foot increase in altitude, whichever is first, and will be accomplished every 5 minutes above 30,000 feet. The PF initiates the Cabin Altitude Checklist.

WARNING: When cabin altitude exceeds 10,000 feet MSL all crew members will continuously breathe 100 percent oxygen from available regulator panel or walk-around bottle.

Table 19.3. Cabin Altitude Checklists.

PILOTS AIRDROP CHECKLIST	LOADMASTER PERSONNEL AIRDROP CHECKLIST	LOADMASTER HEAVY EQUIPMENT AIRDROP CHECKLIST	LOADMASTER CDS AIRDROP CHECKLIST
1. "CREW, CABIN ALTITUDE CHECKLIST" (PF)-"ACKNOWLEDGED" (PNF, LM) **NOTE:** Anytime the cabin altitude exceeds 10,000 feet, press (OPEN) the AVIONICS COOL ORIDE switch-light. 2. Cabin Press Panel -"SET"(PNF,PF) If depressurization is required, set LDG ALT window and depressurize the aircraft.	1. "CREW, CABIN ALTITUDE CHECKLIST" (PF)-"ACKNOWLEDGED" (PNF, LM) 2. Fwd Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - OFF Ensure the manual shutoff levers are pulled to the OFF position.	1. "CREW, CABIN ALTITUDE CHECKLIST" (PF)-"ACKNOWLEDGED" (PNF, LM) 2. Fwd Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - OFF Ensure the manual shutoff levers are pulled to the OFF position.	1. "CREW, CABIN ALTITUDE CHECKLIST" (PF)-"ACKNOWLEDGED" (PNF, LM) 2. Fwd Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - OFF Ensure the manual shutoff levers are pulled to the OFF position.

PILOTS AIRDROP CHECKLIST	LOADMASTER PERSONNEL AIRDROP CHECKLIST	LOADMASTER HEAVY EQUIPMENT AIRDROP CHECKLIST	LOADMASTER CDS AIRDROP CHECKLIST
3. Oxygen Check - "COMPLETE" (PNF, PF, LM) Before responding, each pilot will check the following oxygen equipment items: a. Mask - Fitted b. Regulator - On/Set c. Mask/Hose - Connections Prior to calling the check complete, the pilot in the right seat will ensure the quantities of the aircraft oxygen systems are within required limits. Before responding, the PNF will ensure additional crewmembers and/or personnel in the cockpit have completed oxygen checks. 4. Loadmaster's Report - "CHECK COMPLETED" (LM) 5. Cabin Altitude Checklist - "COMPLETE" (PNF)	3. HALO/THER Regulator Levers and Pressure Gauge - ON and CHECKED (as required) Ensure regulator levers are on and system pressure is checked. 4. Oxygen Check - "COMPLETE" (PNF, PF, LM,) Before responding, check the following oxygen equipment items: a. Mask - Fitted b. Regulator - On/Set/Pressure c. Mask/Hose - Connections Inform the jumpmaster of oxygen check and ensure the jumpmaster has completed troop oxygen check before responding. Ensure additional crewmembers and or personnel in the cargo compartment have completed oxygen checks before responding. 5. Loadmaster's Report - "CHECK COMPLETED" (LM)	3. HALO/THER Regulator Levers and Pressure Gauge - ON and CHECKED (as required) Ensure regulator levers are on and system pressure is checked. 4. Oxygen Check - "COMPLETE" (PNF, PF, LM,) Before responding, check the following oxygen equipment items: a. Mask - Fitted b. Regulator - On/Set/Pressure c. Mask/Hose - Connections Inform jumpmaster of oxygen check and ensure the jumpmaster has completed troop oxygen check before responding (as required).. Ensure additional crewmembers and or personnel in the cargo compartment have completed oxygen checks before responding. 5. Loadmaster's Report - "CHECK COMPLETED" (LM)	3. HALO/THER Regulator Levers and Pressure Gauge - ON and CHECKED (as required) Ensure regulator levers are on and system pressure is checked. 4. Oxygen Check - "COMPLETE" (PNF, PF, LM,) Before responding, check the following oxygen equipment items: a. Mask - Fitted b. Regulator - On/Set/Pressure c. Mask/Hose - Connections Inform jumpmaster of oxygen check and ensure the jumpmaster has completed troop oxygen check before responding (as required). Ensure additional crewmembers and or personnel in the cargo compartment have completed oxygen checks before responding. 5. Loadmaster's Report - "CHECK COMPLETED" (LM)

19.86. PRE-SLOWDOWN CHECKLIST. Perform the Combat Entry Checklist (as specified in **Chapter 17** of these instructions) before initiating the Pre-Slowdown Checklist. The loadmaster will make a visual inspection of the cargo compartment prior to initiation of the Pre-Slowdown Checklist to ensure that nothing has fallen between or aft of the airdrop load(s) as a result of takeoff or evasive maneuvering. If in-flight rigging required, the loadmaster will use the applicable DD Form 1748 as a checklist to ensure all items are completed.

Complete this checklist prior to Slowdown. Coordination between PF and Loadmaster will determine the time required to prepare the load for airdrop and the pre-slowdown point. The PF initiates the Pre-Slowdown Checklist.

Table 19.4. Pre-Slowdown Checklists.

1. "CREW, PRE-SLOW-DOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) If a "NO DROP" or “MALFUNCTION” situation occurs, the PNF will ensure the autodrop is de-armed, the Red Light is on, and state "RED LIGHT ON." If a racetrack or another drop is attempted, re-accomplish all checklists beginning with the "Pre-Slowdown Checklist." 2. LM Panel Power - ON (PNF) Activate the LM PNL PWR, switchlight and confirm it illuminates. 3. Door Arming Switch - As Required (PNF). If the cargo door and ramp are to be opened, activate the DOOR SYS ARM switchlight and ensure it illuminates.	1. "CREW, PRE-SLOW-DOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) If a "NO DROP" situation occurs after initiation of the Pre-Slowdown Checklist, notify the jumpmaster and accomplish the Post Drop Checklist. If a racetrack or another drop is attempted, re-accomplish all checklists beginning with the "Pre-Slowdown Checklist." 2. Jumpmaster - Alerted 3. Helmet - On	1. "CREW, PRE-SLOWDOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) If a "NO DROP" situation occurs after initiation of the Pre-Slowdown Checklist, accomplish the Post Drop Checklist. If another airdrop is attempted, re-accomplish all checklists beginning with the "Pre-Slowdown Checklist." 2. Helmet - On 3. Pole Knife - Positioned Position pole knife near the fwd LM station. Ensure the knife is ready for immediate use and secured.	1. "CREW, PRE-SLOW-DOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) If a "NO DROP" situation occurs after initiation of the Pre-Slowdown Checklist, accomplish the Post Drop Checklist. If another airdrop is attempted, re-accomplish all checklists beginning with the "Pre-Slowdown Checklist." 2. Helmet - On 3. Cargo Compartment Lights - SET

4. Red Light - ON (PNF) Activate the RED LT Switchlight and ensure switchlight illuminates. 5. ADS Mode Switch - SET (PNF). Set the MODE switch as briefed by the PF for either automatic or manual air-drop mode. 6. Cabin Press Panel -“SET”(PNF,PF) Schedule depressurization to be complete prior to door opening by setting door opening altitude. 7. NAV Solution - CHECKED (PNF) Check MC FOM on AD PROGRESS page. Inform PF if the FOM is less than required. (PNF) (Heavy Equipment only) “SET __/__” LM)	4. Remote Winch Control - As Required If static line retrieval is required, ensure controller/ transmitter (C/T) is positioned for immediate use after drop. 5. Ramp and Door Area - As Required If airdropping over the cargo ramp, ensure the cargo ramp and door area and equipment/ storage compartments are secured. 6. Cargo Compartment Lights - SET 7. ELEC PWR Switch - ON 8. DOOR SYS ARMED Annunciator - Illuminated (As Required) 9. No. 2 HYD PRESS Annunciator - Illuminated (As Required) 10. Jump Platform Lights - As Required If airdropping from troop door(s) at night, ensure lights are turned on.	4. Item Marker Lights - As Required For night airdrops ensure lights are attached and on. 5. Cargo Compartment Lights - SET 6. ELEC PWR Switch - ON 7. DOOR SYS ARMED Annunciator - Illuminated 8. No. 2 HYD PRESS Annunciator - Illuminated Set the DROP GP and L LOCK / R LOCK SELECT Rotary Switches on the lowest number lock engaged in the platform(s) to be released this pass. Verify that the corresponding ADS left and right rail lock annunciators agree with the selected rotary switch positions. 9. ADS DROP GP SELECT Rotary Switch - SET 10. ADS LOCK GANG CONTR, L/R LOCK SELECT Rotary Switches - SET	4. ELEC PWR Switch - ON 5. DOOR SYS ARMED Annunciator - Illuminated 6. No. 2 HYD PRESS Annunciator - Illuminated 7. CDS GATE SELECT Rotary Switch - SET Ensure switch is positioned to release bundle(s) for this pass. 8. Remote Winch Control - As Required. If static line retrieval is required, ensure controller/ transmitter (C/T) is positioned for immediate use after drop. 9. High Altitude CDS Safety Pin(s) - Removed (As Required) Ensure safety pin(s) are removed. 10. Container Marker Lights - As Required For night airdrops ensure marker lights are attached and turned on.

8. BCN or ZM - SET (PNF) 9. DZ Baro - SET Set on ADxx DATA page (5R). The MC will automatically enable ZM/BCN updating at 24 NM from the PI. If a ZM/BCN is defined and selected on the MC Air-drop pages and the PF does not desire the update, the PNF must disable the update after it has been enabled. Update DZ Baro on ADXX DATA (2/4) page. Flap Detent/Index - "____FLAP, _____INDEX" (PNF) State airdrop flap position and index and set flap index. 11. Altimeters - "SET, _____" (PNF, PF) If actual baro altimeter setting is unavailable, use GPS baro altimeter setting.. SELECT" (PNF)	11. JUMP SIGNAL DIM Switch - As Required Set dimming control switch as appropriate for day or night operations 12. Bundle Marker Lights - As Required For night drops ensure marker lights are attached and turned on. 13. Parachute/Safety Harness - On Ensure all personnel in the cargo compartment who are involved with the airdrop operation have donned a parachute or safety harness. 14. Seat Belts- On Ensure all personnel in the cargo compartment who are not involved with the airdrop operation are seated with a seat belt fastened 15. Red Light - On Ensure red lights are illuminated. 16. Loadmaster's Report - "CHECK COMPLETED" (LM)	11. ADS LOCK STATUS Annunciators - Checked a. Left Locks in Platform(s) - Engaged b. Right locks in Platform(s) - ARMED. **NOTE:** Because the left rail locks operate in pairs, a lock may be engaged forward, between or aft of airdrop platform(s). If this condition exists, the locks will be retracted during the Slowdown Checklist. c. Locks between and aft of platform(s) - Retracted 12. Parachute/Safety Harness - On Ensure all personnel in the cargo compartment who are involved with the airdrop operation have donned a parachute or safety harness. 13. Seat Belts- On Ensure all personnel in the cargo compartment who are not involved with the airdrop operation are seated with a seat belt fastened. 14. Red Light - On Ensure red lights are illuminated. 15. Drop Group Select - "SET __/__" (LM)	11. Parachute/Safety Harness - On Ensure all personnel in the cargo compartment who are involved with the airdrop operation have donned a parachute or safety harness. 12. Seat Belts - On Ensure all personnel in the cargo compartment who are not involved with the airdrop operation are seated with a seat belt fastened 13. Red Light - On Ensure red lights are illuminated. 14. Loadmaster's Report - "CHECK COMPLETED" (LM)

12. Airdrop Display - "SET" (PF) The pilot will set A/D on PFDs. **WARNING:** Ensure the drop group select number stated by the loadmaster is the same as identified during the crew briefing and by the pilot. 13. “DROP GROUP 14. Loadmaster's Report - "CHECK COMPLETED" (LM) 15. Pre-Slowdown Checklist - "COMPLETE" (PNF)		16. Loadmaster's Report - "CHECK COMPLETED" (LM)	

19.87. SLOWDOWN CHECKLIST. The PF will initiate the slowdown checklist upon arrival at the slowdown point (when annunciated on PFDs, when indicated on the SKE PPI MFD and/or MAP Navigation Display, when indicated on the SKE FCI panel, or as briefed). If a visual formation slowdown is conducted without SKE, aural/visual slowdown warnings must be coordinated between formation lead and wingman. The mission computer will display an adjusted slowdown point, within preflight entered limits, in order to accomplish precise TOT control.

Table 19.5. Slowdown Checklists.

1. "CREW, SLOWDOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) Lead or Element Leads do not normally use speed brakes during formation airdrop slowdowns.	1. "CREW, SLOWDOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM)	1.“CREW, SLOWDOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM) If a "NO DROP" situation occurs after initiation of the Slowdown Checklist, accomplish the Heavy Equipment Malfunction Checklist.	1. "CREW, SLOWDOWN CHECKLIST" (PF) - "ACKNOWLEDGED" (PNF,LM)

2. Slats/Flaps - "SLATS EXTENDED, FLAPS ONE HALF, INDEX ___" (PNF) PNF extends slats and half flaps on command of PF. SKE slowdown will be accomplished by slowing to 160 KCAS prior to descending to drop altitude. 3. Thrust Rating - SET (PNF) Normally set EPR MCT. Set EPR MAX when dropping heavy loads or any time the flaps are positioned to the 3/4 detent or greater. **NOTE:** Verify that the aircraft is depressurized prior to opening doors.. 4. Doors - "CLEAR TO OPEN" (PNF). Clear doors to open after airspeed is below door open placard speed. 5. RA/BA Switch - "SET" (PNF,PF) If radar altitude (RA) was being used for low level flight, select BARO prior to reaching drop altitude.	2. Jumpmaster - Alerted **WARNING:** The cargo door and ramp will not be opened until the PNF clears the doors to be opened. 3. Door(s) - "CLEAR TO OPEN" (PNF) **NOTE:** On the first troop door opened, deploy air deflector between 10 and 15 degrees, ensure the DEFL DEPLOYED annunciator light illuminates, open the troop door, then fully deploy the air deflector. Fully deploy the air deflector for the opposite door and check annunciator prior to opening. **NOTE:** Cargo door and ramp or troop doors may not open if aircraft is pressurized. **WARNING:** Troop door(s) and air deflector will not be opened until the PNF clears the doors to be opened. **WARNING:** If an air deflector door fails to open or faring fails to retract, the respective paratroop door will not be used for airdrop. 4. Air Deflector(s)/Troop Door(s) - Deployed/Open (As Required)	2. HOT MIC - ON **WARNING:** The cargo door and ramp will not be opened until the PNF clears the doors to be opened. Door(s) - "CLEAR TO OPEN" (PNF) **NOTE:** Cargo door and ramp or troop doors may not open if aircraft is pressurized. 4. Ramp And Door - Open Open the cargo door and ramp. Ensure the DOOR UP/LKD, RAMP NOT LOCKED and RAMP AIRDROP POS annunciators are illuminated. 5. Drogue Chute Video System - ON **WARNING:** If platform(s) become loose prior to GREEN LIGHT, state "MALFUNCTION" and accomplish the Heavy Equipment Malfunction Checklist **WARNING:** Verify the corresponding lock annunciators on the ADS LOCK STATUS Panel have extinguished to correspond with Left Lock and Drop Group Select rotary switch position. 6. ADS LOCK GANG CONTR, L LOCKS Switch - REL Release the ADS left locks on platform(s) to be airdropped on this pass.	2. HOT MIC - ON **WARNING:** The cargo door and ramp will not be opened until the PNF clears the doors to be opened. Door(s) - "CLEAR TO OPEN" (PNF) **NOTE:** Cargo door and ramp or troop doors may not open if aircraft is pressurized. 4. Ramp And Door - Open Open the cargo door and ramp. Ensure the DOOR UP/LKD, RAMP NOT LOCKED and RAMP AIRDROP POS annunciators are illuminated. 5. CDS ARM Switch - ARM Ensure the CDS ARMED Annunciator is illuminated 6. ADS ARM Annunciator - As Required Ensure the annunciator is illuminated when conducting the drop from the Loadmasters Forward Control Panel. 7. Loadmaster's Report - "CHECK COMPLETED" (LM)

6. AFCS Panel - "SET FOR AIRDROP" (PF) Single ship - To provide flight director guidance to the drop, the PF should direct selection of: MSN LNAV and MSN VNAV or ALT HLD and drop airspeed IAS hold.SKE mission - Element lead pilots will direct selection of MSN LNAV, ALT HLD and drop airspeed IAS hold for guidance to the CARP. 7. ALT/XTRK - SET (PNF) Update when level and stable at drop altitude. Relay/reset new baro altitude and XTRK (SKE only) on the SKE Primary page. 8. Doors - OPEN (PNF) Verify doors open on WAP 9. ADS ARM Annunciator - Illuminated (PNF) 10. Loadmaster's Report - "CHECK COMPLETED" (LM)	5. Ramp and Door - Open (As Required) Open the Cargo Door and Ramp. Ensure the DOOR UP/LKD, RAMP NOT LOCKED and RAMP AIRDROP POS annunciators are illuminated. 6. TROOP ARM/DISARM Switch - ARMED Ensure the TROOP ARMED annunciator light is illuminated. 7. Parachutist(s)/Paratroop Door Bundle(s) - Positioned (As Required) Ensure parachutist(s) are in position for paratroop door or cargo ramp airdrop. Cleared exits will be turned over to Jumpmaster no later than the one-minute warning. 8. Loadmaster's Report- "CHECK COMPLETED" (LM)	7. L or R CHUTE ARM Switch - ARMED Activate the DROGUE CHUTE ARM switch for PDM rigged for platform(s) to be dropped on this pass. Ensure the L or R DROGUE CHUTE ARMED annunciator illuminates. 8. TOW REL ARM Switch -ARMED Ensure the TOW REL ARMED annunciator illuminates. 9. ADS ARM Annunciator - Illuminated 10. Loadmaster's Report - "CHECK COMPLETED" (LM)	
11. Final Flaps - "FLAPS SET ___" (PNF) After reaching drop altitude, PNF extends drop flaps (half, 3/4, or full) on command of PF, then state flap position. PF slows to drop airspeed after drop flaps are set. 12. Slowdown Checklist - "COMPLETE" (PNF)			

19.88. RELEASE POINT CHECKLIST. The following actions will be accomplished during the AMBER-GREEN-RED light sequence. The release sequence is the same for both AUTO and MANUAL delivery modes. In MANUAL, the PNF will press the JUMP/RELEASE light, and in AUTO the PNF will observe the proper sequence (and intervene if required).

Table 19.6. Release Point Checklists.

1. "STAND BY DROGUE "or "STANDBY READY LIGHT"(PNF) Approximately 5 seconds prior to deploying the drogue or turning on the ready light, the PNF will state "STANDBY DROGUE" or "STANDBY READY LIGHT" as required. **NOTE:** At 10 seconds TTG, in VNAV MSN, VNAV PROF, or SKE MSN, the aircraft will go to the deck angle commanded by the mission computer and roll wings level. **WARNING:** If a "NO DROP" or "MALFUNCTION" situation occurs, the PNF will ensure the autodrop is de-armed, the Red Light is on, and state "RED LIGHT ON." If a racetrack or another drop is attempted, re-accomplish all checklists beginning with the "Pre-Slowdown Checklist."	1. Amber Light - On 15 Seconds prior to the TOT, the PNF will turn on the amber light and state "READY LIGHT ON". Ensure Amber lights are illuminated. 2. "FIVE, FOUR, THREE, TWO, ONE, GREEN LIGHT" (MC/PNF) If a paratrooper or door bundle becomes entangled during exit and towed behind the aircraft, notify the pilot by stating "MALFUNCTION", and complete the Personnel Airdrop Malfunction Checklist. **NOTE:** Crew will initiate the Post Drop Checklist after the loadmaster calls "LOAD CLEAR" and the RED LT is on. 3. Pilot Notified - "LOAD CLEAR" or "MALFUNCTION" (LM) 4. "RED LIGHT" (MC/PNF) - ON Ensure Green lights are extinguished and Red lights are illuminated. 5. Jumpmaster – Alerted Notify jumpmaster of red light activation.	1. Amber Light - On 15 Seconds prior to a TOT, the PNF will turn on the amber light and state "DROGUE DEPLOYED". Ensure Amber lights are illuminated. 2. "DROGUE DEPLOYED" (PNF) If the L/R DROGUE CHUTE ARM annunciator fails to extinguish, actuate the L/R DROGUE CHUTE Switch to DEPLOY. a. LEFT/RIGHT DROGUE CHUTE Switch - DEPLOY (As Required) **Accomplish remaining substeps if drouge chute does not deploy**. b. Pilot Notified - "MALFUNCTION" (LM) c. HVY EQUIP Malfunction Checklist - Initiated 3. Status of Drogue - "DROGUE OK" or "MALFUNCTION" (LM) **Accomplish substeps for drogue malfunction or 'NO DROP".** a. DROGUE JETTISON Switch - JETT b. EMERG DROGUE Switch - JETT (As Required) c. "DROGUE JETTISONED" (LM) d. HVY EQUIP Malfunction Checklist - Initiated	1. Amber Light - On 15 Seconds prior to the TOT, the PNF will turn on the amber light and state "READY LIGHT ON" Ensure Amber lights are illuminated. 2. "FIVE, FOUR, THREE, TWO, ONE, GREEN LIGHT" (MC/PNF) **NOTE:** If the CDS ARMED annunciator fails to extinguish or the load fails to move, activate the ADS BACKUP CDS Switch. a. ADS BACKUP CDS Switch - REL (As Required) If the GRM(s) fail to release or load stops moving aft, ensure that all containers that are moving have exited, then state "MALFUNCTION" and complete the CDS Malfunction Checklist **NOTE:** Crew will initiate the Post Drop Checklist after the loadmaster calls "LOAD CLEAR". 3. Pilot Notified - "LOAD CLEAR" or "MALFUNCTION" (LM) 4. "RED LIGHT" (MC/PNF) - On

2. Pilots ADS Panel - "DROGUE DEPLOYED" or "READY LIGHT ON" (PNF) a. Ready/Drogue Switch-light - ACTIVATED (PNF) b. RED LT Switchlight -EXTINGUISHED (PNF) For Heavy Equipment air-drops, the PNF will activate the Ready/Drogue switchlight 15 seconds prior to the TOT and state "DROGUE DEPLOYED". Ensure DROGUE annunciator illuminates and Red Light extinguishes. For Personnel or CDS air-drops, the PNF will activate the Ready/Drogue switchlight 15 sec onds prior to the TOT and state "READY LIGHT ON". Ensure READY light illuminates and verify the Red Light extinguishes. PF should maintain a stable deck angle from 10 seconds TTG to Red Light. A stable run-in is especially important when in		4. "FIVE,F OUR, THREE, TWO, ONE, GREEN LIGHT" (MC/PNF) If the TOW REL ARMED annunciator fails to extinguish, position the TOW PLATE Switch to the REL position. a. TOW PLATE Switch REL (As Required) **Accomplish remaining substeps if the TRM still fails to release.** b. Pilot Notified - "MALFUNCTION" (LM) c. DROGUE JETTISON Switch - JETT d. EMERG DROGUE Switch - JETT (As Required) e. "DROGUE JETTISONED" (LM) f. HVY EQUIP Malfunction Checklist - Initiated **WARNING:** If the extraction parachute(s) have exited the aircraft and the platform fails to move, ensure the ADS R LOCK SELECT Rotary Switch is set to the lowest lock number setting which is engaged in the platform that failed to move, and activate the R LOCKS GANG REL switch. 5. ADS LOCK GANG CONTR, R LOCKS REL Switch - REL (As Required)	Ensure Green lights are extinguished and Red lights are illuminated.

WARNING: If a "NO DROP" is announced after the Drogue Chute has been deployed, the Load master will jettison the Drogue Chute and state "DROGUE JETTISONED" and complete the Heavy Equipment Malfunction Checklist. 3. Status of Drogue (Heavy equipment only)- "DROGUE OK" or “MALFUNCTION” (LM) 4."FIVE, FOUR, THREE, TWO, ONE, GREEN LIGHT" (MC/PNF) 5. Green Light - On (PNF) The PNF will verify proper sequencing of lights in AUTO mode, or press the JUMP/REL switch at "Green Light" for MANUAL mode. a. AUTO mode airdrop - Green Light Confirmed (PNF) Ensure READY/ DROGUE switch-light extin guishes, and JUMP or RELEASE switchlight annunciator light (as appropriate) illuminates.		**Accomplish substeps if platform still fails to exit.** a. Pilot Notified - “MALFUNCTION” (LM) b. HVY EQUIP Malfunction Checklist - Initiated **NOTE:** Crew will initiate the Post Drop Checklist after the loadmaster calls "LOAD CLEAR" and the RED LT is on. 6. Pilot Notified -“LOAD CLEAR” (LM) 7. "RED LIGHT" (MC/PNF) - ON Ensure Green lights are extinguished and Red lights are illuminated.	

b. MANUAL mode air-drop Green Light Activated (PNF) Activate the JUMP/ RELEASE switchlight. Ensure theREADY/ DROGUE switchlight extinguishes, and JUMP or RELEASE switchlight annunciator light (as appropriate) illuminates. **WARNING:** If the Load-master calls a Malfunction the PNF will immediately turn on the Red Light and state "RED LIGHT ON", and verify the drop mode select switch is in MAN. **WARNING:** When noti-fied of a malfunction, the pilot flying the aircraft will maintain drop airspeed, maintain safe altitude, avoid yawing the aircraft, avoid flying over popu-lated areas, and ensure the cargo ramp and door remain in the airdrop posi-tion until the malfunction is corrected.***NOTE:*** Crew will initiate Post Drop Checklist after the load-master calls "LOAD CLEAR" or "MALFUNC-TION			

CHECKLIST COM-PLETE" and the RED LT is on. 6. Airdrop Condition - "LOAD CLEAR", or "MALFUNCTION" (LM) 7. "RED LIGHT" - (MC/PNF) - ON Activate the RED LT Switchlight and ensure it illuminates. MC will not automatically turn on/off the Red Light. PNF must manually turn on/off the Red Light.			

POST DROP CHECKLIST

The Post drop Checklist will be followed by the Pre-Slowdown Checklist for multiple personnel drops. After completing this checklist, perform the Combat Exit Checklist (included in **Chapter 17** of these instructions) prior to landing.

NOTE: Items marked with an * Asterisk are re-accomplished for race tracks.

Table 19.7. Post Drop Checklists.

* 1. RA/BA Switch - "SET" (PNF,PF) Set radar alt for low level environment. Set BARO for high level. * 2. SKE XTRK - Set (PNF) (Applies to SKE formations only). * 3. NAV SEL SW/AFCS Panel - SET (PNF) SKE missions--Element lead pilots will direct NAV SEL to SKE, LNAV, SPD NAV engaged. Set DZ escape Heading, Altitude, and Vertical speed as briefed on AFCS panel. 4. "RAMP AND DOOR(S) CLOSED" (PNF) (As Required) Before exceeding 250 KCAS, ensure LM has closed the door(s)/ramp by ensuring the DOOR(S)/ RAMP open annunciators extinguished. 5. Air deflector(s) - "CLOSED"(LM) (Personnel Airdrops Only) 6. Mission Computer - UPDATED (PNF)	* 1. Static Line Retrieval - As Required If static line(s) were used, retrieve all lines into aircraft. **NOTE:** If static line(s) will not retrieve, notify the pilot, cut static line(s) on pilot's command. 2. Ramp and Door Closed (As Required) Close the cargo ramp and door. Ensure the Cargo Door & Ramp, DOOR NOT LKD and RAMP NOT LOCKED annunciators extinguish. 3. Troop Door(s)/Air Deflector(s) - Closed (As Required) Close troop door(s) and air deflectors, ensure the Aft Loadmaster Station, Left/ Right, TROOP DOOR NOT LOCKED and DFTR DEPLOYED annunciator lights extinguish. 4. Air Deflector(s) - "CLOSED" (LM) * 5. Static Line Retriever Cables - As Required Ensure cables are re-rigged for multiple drops. 6. HALO Safety Check - As Required	1. Ramp and Door - Closed Close the cargo ramp and door. Ensure the Cargo Door & Ramp, DOOR NOT LKD and RAMP NOT LOCKED annunciators extinguish. 2. HOT MIC - OFF 3. Drogue Parachute Video System - OFF **WARNING:** Any remaining platform(s) not airdropped must have left and right locks engaged prior to completion of the Post Drop Checklist. If locks will not engage in platform(s), secure with aircraft tiedown equipment. 4. Platform(s) - Secured (As Required) 5. ADS LOCK GANG CONTR, L/R LOCK SELECT Rotary Switches - SAFE 6. ADS DROP GP SELECT Rotary Switch - SAFE **NOTE:** After the last airdrop, complete the remaining steps. The Loadmasters Post Drop Check may be called complete prior to completing these steps. 7. Aircraft Equipment - As Required	1. Static Line Retrieval - As Required If static line(s) were used, retrieve all lines into aircraft. 2. Ramp and Door - Closed Close the cargo door and ramp. Ensure the Cargo Door & Ramp, DOOR NOT LKD and RAMP NOT LOCKED annunciators extinguish. 3. HOT MIC - OFF 4. CDS GATE SELECT Switch - SAFE **WARNING:** Any remaining container(s) not airdropped must be restrained prior to completion of the Post Drop Checklist. 5. Container(s) - Secured (As Required) 6. Forward Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - As Required If the aircraft has been pressurized, ensure the manual shutoff levers are pushed to the on position.

a. Drop Complete (WT/CG) Activate drop complete on A/D Progress Page. At "Green Light," flight data such as actual position and time of release was recorded and is available for later review on the MCD ADxx Recall Page. Ensure weight, balance and CG has been updated.. b. Next TOT - FIX Change the next TOT to FIX (if applicable) 7. Loadmaster's HALO Safety Check - COMPLETE (As Required) The Loadmaster will complete this check if altitude activated equipment requires resetting prior to the aircraft being pressurized or descending to an altitude that activates the equipment. The Loadmaster will State "HALO SAFETY CHECK COMPLETED" when check is completed.	a. Jumper(s) Equipment De-armed - Checked b. Pilot Notified - "HALO SAFETY CHECK COMPLETED" (LM) Ensure jumper(s) have been notified to de-arm altitude activated equipment prior to the aircraft being pressurized or descending to an altitude that activates the equipment. State "HALO SAFETY CHECK COMPLETED" when check is completed. 7. Forward Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - As Required If the aircraft has been pressurized, ensure the manual shutoff levers are pushed to the on position. 8. HALO/THER Regulator Levers - As Required If the aircraft has been pressurized, ensure regulator levers positioned to off.	a. TRM Cover - Installed b. Ramp Edge Cover - Stowed c. Rail Bridge Assembly - Stowed 8. Forward Loadmaster Station Oxygen System Panel, Center Seat and Lavatory Emergency Regulators - As Required If the aircraft has been pressurized, ensure the manual shutoff levers are pushed to the on position. 9. HALO/THER Regulator Levers - As Required If the aircraft has been pressurized, ensure regulator levers positioned to off. 10. Cargo Compartment Lights - As Required 11. Loadmaster's Report - "CHECK COMPLETED" (LM)	7. HALO/THER Regulator Levers - As Required If the aircraft has been pressurized, ensure regulator levers positioned to off. 8. Cargo Compartment Lights - As Required 9. Loadmaster's Report - "CHECK COMPLETED" (LM)

8. Cabin PRESS Panel - “SET” (PNF,PF) Set to AUTO mode, set LDG ALT window, and pressurize aircraft if required. For HALO air-drops the PNF will notify the crew when oxygen masks are no longer required. **NOTE**: To remain depressurized through landing, select 1 or 2 SEMI MODE and ensure the altitude selected in the LDG/ CABIN/ALT window is above actual aircraft altitude at all times. 9. Loadmaster's Report- "CHECK COMPLETED" (LM) * 10. Slats/Flaps - "AS REQUIRED" (PF) On command of the PF, reset slats/flaps to the appropriate configuration for the next phase of flight. 11. Thrust Rating - SET (PNF) Set EPR rating as necessary. 12. Air Drop Display - "SET" (PF) The pilot will deselect A/D on PFD's	9. Cargo Compartment Lights - As Required Set cargo compartment lighting after last pass is accomplished 10. Jump Platform Lights - As Required 11. Loadmaster's Report- "CHECK COMPLETED" (LM)		

13. DOOR SYS ARM Switchlight - OFF (PNF)De-activate the DOOR SYS ARM switch-light, ensuring light extin-guishes. 14. LM Panel Power - SET (PNF) Leave Panel Power on, if the Loadmaster requires panel power to accomplish in-flight rigging or for multiple airdrop passes. 15. Red Light - OFF (PNF) De-activate RED LT Switch-light and ensure switchlight extinguishes. * 16. "POST DROP Checklist Complete" (PNF)			

19.89. LOADMASTER'S MALFUNCTION CHECKLISTS. When notified of a malfunction the PNF will turn on the red light. After appropriate malfunction items/actions have been completed, perform the applicable Post Drop Checklist.

Table 19.8. Malfunction Checklists.

PERSONNEL AIRDROP MALFUNCTION CHECKLIST	HEAVY EQUIPMENT MALFUNCTION CHECKLIST	CDS MALFUNCTION CHECKLIST
1. Jumpmaster Notified - Stop Remaining Parachutists 2. "RED LIGHT ON" (PNF) Ensure Red Lights are illuminated. 3. CARGO OVERHEAD LIGHT ORIDE Switch - As Required Position the CARGO OVERHEAD ORIDE Lights switch to WHITE if all fluorescent and incandescent lights are desired. **NOTE:** The parachutist will indicate consciousness and that a reserve parachute is ready by maintaining a tight body position with both hands on the reserve chute. Notify pilot of jumper's condition. 4. Jumper's Condition/Nature of Malfunction - Pilot Advised***NOTE:*** The jumpmaster/safety is responsible for identifying how the parachutist/ door bundle is entangled. If being towed by anything other than the static line, the jumpmaster/safety will attempt to free the parachutist/ door bundle. If a parachutist is being towed by the static line, the jumpmaster/safety will make a recommendation to the pilot through the loadmaster whether to retrieve the parachutist or cut them free. The aircraft commander makes the final decision whether or not to cut the parachutist free.	1. "RED LIGHT ON" (PNF) Ensure Red Lights are illuminated. **NOTE:** Left ADS locks adjacent to platform(s) may not re-engage. The left locks aft of the platform(s), should indicate locked. 2. ADS LOCK GANG CONTR, L LOCKS LOCK Switch - LOCK **WARNING:** If the ADS LOCK GANG CONTROL, LEFT LOCKS LOCK Switch fails, platform(s) continues to move, or you intend to cut the extraction parachute activate the ADS GANG LOCK BACKUP Switch. If the ADS GANG LOCK BACKUP Switch is used, no further drops will be attempted. a. ADS GANG LOCK BACKUP Switch - LOCK POSITION AND HOLD 2.5 SECONDS (As Required) **WARNING:** If the extraction line is outside the aircraft, proceed aft along side the load and cut the extraction line immediately aft of the EFTC Connector Link.	1. "RED LIGHT ON" (PNF) Ensure Red Lights are illuminated. 2. Static Line Retrieval - As Required Retrieve all static lines into the aircraft. 3. Ramp and Door - Closed **WARNING:** If the GRM(s) fail to release, apply emergency aft restraint (5000 pound tiedown strap) to the container at the release gate location(s). **WARNING:** If the GRM(s) have released and the container(s) has/have shifted, apply forward and aft restraint to the container(s) using aircraft tiedown equipment. 4. Containers - Secured **NOTE:** After Completion of the Malfunction Checklist, perform the Post Drop Checklist. 5. Pilot Notified - "MALFUNCTION CHECKLIST COMPLETE" (LM)

PERSONNEL AIRDROP MALFUNCTION CHECKLIST	HEAVY EQUIPMENT MALFUNCTION CHECKLIST	CDS MALFUNCTION CHECKLIST
If parachutist is conscious and the decision is to cut the parachutist or door bundle free, the loadmaster will cut the static line on the pilot's command.. 5. Towed Parachutist/Door Bundle - Retrieve/Cut (As Required) **WARNING:** Personnel should remain clear of the static line retriever cable until the parachutist has been retrieved to the door area. **WARNING:** During retrieval, take all possible actions to ensure the parachutist does not slip back at any time.***NOTE:*** Should one retriever winch become inoperative, the remaining operable winch may be used as a backup to retrieve static lines/hung parachutists from the inoperative side. If both retriever winches fail, the cargo winch may be used as an emergency backup.***NOTE:*** When the parachutist is in the door area and is being controlled by personnel within the aircraft, slightly unwind the static line retriever to relieve tension on the line so the parachutist may be brought into the aircraft. 6. Paratroop Retrieval System - Installed (as required). 7. Accomplish Retrieval - As Required **NOTE:** After Completion of the Malfunction Checklist, perform the Post Drop Checklist 8. Pilot Notified - "MALFUNCTION CHECKLIST COMPLETE" (LM)	**WARNING:** Use extreme caution when proceeding aft and do not position yourself in the path of the load when cutting the extraction line. **WARNING:** Do not close the ramp and door until the extraction line is cut free. **NOTE:** An attempt should not be made to restrain the load(s) with chains and devices. 3. Extraction Line - Cut (As Required) **NOTE:** After completion of the Malfunction Checklist, perform the Post Drop Checklist 4. Pilot Notified - "MALFUNCTION CHECKLIST COMPLETE" (LM)	

Chapter 20

AEROMEDICAL EVACUATION

Section 20A—General Information

20.1. Mission:

20.1.1. The primary function of the C-17 aircraft for AE is transport of ill or injured DoD members and their dependents requiring medical support. These AE missions may be directed at any time. The C-17 aircraft will be used with the concurrence of the appropriate medical validating authority.

20.1.2. AE personnel will utilize the procedures in applicable AFI/H 11-2 series and 41-series, in conjunction with this publication, to accomplish the AE mission.

20.2. Not Used.

20.3. Waivers and Revisions:

20.3.1. Waivers. Use **Chapter 4** waiver protocol for AE related questions or waivers.

20.3.2. Revisions. Use **Chapter 1** protocol for improvement recommendations.

20.4. Not Used.

Section 20B—Aeromedical Evacuation Command and Control

20.5. Operational Control and Reporting of Aeromedical Evacuation Forces:

20.5.1. HQ AMC is lead command for AE. The aircraft commander is responsible for ensuring the safety of the flight crew, AE crew, and all patients and passengers. The MCD is responsible for providing medical care to the patients. In matters concerning flight safety, decisions of the aircraft commander are final; in matters of patient care, decisions of the MCD are final.

20.5.2. Operational control of AE missions is the same as for other airlift missions.

20.5.3. The AMC Command Surgeon (HQ AMC/SG) is responsible for providing standards and procedures concerning the treatment of patients in-flight, and for approval of any medical equipment used on AE missions.

20.5.4. The MCD will advise the aircraft commander when a patient's condition or use of medical equipment may affect aircraft operations.

20.5.5. The AEOO, if available, is responsible for supervising flight line execution of AE missions. The MCD is directly responsible for the safety and medical well being of patients on the aircraft and coordinates enplaning and deplaning procedures with the AEOO and supporting agencies.

20.6. Aircraft Commander Responsibilities:

20.6.1. Assist the MCD in obtaining patient support requirements based on local availability. The MCD will coordinate with the aircraft commander for integration of the flight and Aeromedical Evac-

uation Crew Members (AECM) for continuing missions in which no crew changes take place including en route transportation, dining, billeting, etc.

20.6.2. Brief the AE crew on the mission, flight plan, flight profile, and current threat (if applicable).

20.6.3. Maintain cabin altitude at the level requested by the GPMRC/TPMRC, tasking AE command element, or MCD.

20.6.4. Coordinate with the MCD to determine if any flight restrictions are necessary due to patient conditions and if passengers and cargo may be carried.

20.6.5. Coordinate with the MCD to insure mission required equipment is available/installed as necessary.

20.6.6. Advise the AECMs of intentions to start engines, taxi, itinerary changes, in-flight difficulties, etc.

20.6.7. Brief the MCD on additional responsibilities of the flight crew.

20.6.8. During Aeromedical Readiness Missions (ARM), coordinate with the Mission Clinical Coordinator (MCC) on planned simulated emergencies and training activities.

20.6.9. Patients or passengers may visit the flight crew compartment per **Chapter 5** of this instruction. The control of patients rests with the MCD, while control of the passengers is the responsibility of the flight crew, in conjunction with the MCD.

20.6.10. Transmit load messages and radio transmissions to GPMRC/TPMRC or tasking AE command element/ground personnel as requested by the MCD.

20.6.11. Coordinate Crash/Fire/Rescue (CFR) unit requirements when transiting airfields that are unfamiliar with AE requirements. CFR vehicle will stand by per AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*, and T.O. 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*.

20.7. Flight Crew Responsibilities:

20.7.1. Assist the AE crew with aircraft systems.

20.7.2. Provide AECMs who are not qualified in the C-17 with information identified in paragraph **20.10.1.**

20.7.3. Coordinate an emergency evacuation plan with the MCD.

20.7.4. Operate aircraft systems, i.e., doors, ramps, emergency exits, etc.

20.7.5. Assist the AE crew as necessary, providing such assistance does not interfere with primary duties.

20.7.6. Operate galley and prepare food and beverages for food service provided to patients by AECMs.

20.7.7. Assist with aircraft configuration for AE operations.

20.7.8. Complete pre-flight/emergency briefings.

20.7.9. Assist with and perform applicable roles during engine running onload (ERO) procedures per AFI 41-312, Volume 1, and paragraph **20.24.** of this chapter.

20.8. Aeromedical Evacuation Crew Responsibilities:

20.8.1. Primarily responsible for patient activities.

20.8.2. Assist flight crew/maintenance with aircraft configuration for AE operations.

20.8.3. Install and remove medical equipment/supplies.

20.8.4. Assist the loadmaster with observation and care of passengers when it doesn't interfere with primary duties.

20.8.5. The MCD or designated AECM should be on aircraft inter-phone (headset) for all phases of flight, and will be on aircraft inter-phone during critical phases of flight to include takeoff and landing.

20.8.6. If C-17 qualified/certified, provide AECMs who are not qualified/certified in the C-17 with information identified in 20.10.1.

20.9. Patient Death In-Flight. When a suspected death occurs in-flight, the planned itinerary will not be interrupted if the next scheduled stop is a US military airfield. If the next stop is a civilian airfield that does not service a US military medical facility, or a foreign military airfield, that stop will be over flown (mission requirements allowing). Coordination with command and control agencies is essential. The GPMRC/TPMRC or tasking AE command element must ensure that the MTF anticipating the aircraft's arrival at the civilian/foreign military airfield is informed of the cancellation.

Section 20C—Aeromedical Evacuation Crew Complement and Management

20.10. Aeromedical Evacuation Crew Complement:

20.10.1. Aircrew Qualification. AECMs must be fully qualified on at least one of the following aircraft; the C-9, C-17, C-130, or C-141, and are authorized to log primary flight time while performing duties on AE missions. Prior to being utilized as a certified AECM on C-17 aircraft, AECMs must receive training as directed in AFI 11-2AE, Volume 1. A flight crewmember is ultimately responsible for emergency egress and cabin safety.

20.10.2. Crew Complement. A basic AE crew consists of two FNs and three AETs. An alert crew consists of one FN and two AETs. An augmented AE crew consists of one additional FN and AET. The group/squadron chief nurse can adjust the crew complement. The group/squadron chief nurse is the final authority for increasing or decreasing the number of AECMs assigned to AE missions. Physicians, nurses, medical technicians, or other personnel designated as medical attendants (i.e., Critical Care Air Transport Team (CCATT) members) to specific patients does not constitute an augmented AE crew and does not extend crew duty time. Basic crews will not be augmented after crew duty has started.

20.10.3. The appropriate GPMRC/TPMRC or tasking AE command element will notify the command and control agencies or flying organization operations officer of the AE crew complement for each AE mission on C-17 aircraft.

20.11. Aeromedical Evacuation Crew Management. AECMs will be managed per **Chapter 3** of this instruction.

Section 20D—Aeromedical Evacuation Aircrew Procedures

20.12. Checklists.

20.12.1. General. This instruction and AFI 11-215, set policy and provide guidance for the standardization of contents and maintenance of flight crew checklists. Checklists will be maintained per AFI 11-215 and applicable MAJCOM supplement.

20.12.2. Applicability. This instruction applies to all AECMs assigned to AMC and AMC-gained AE units. It also applies to theater assigned AECMs performing AE duties on the C-17 aircraft.

20.12.3. During all aircraft operations, AECMs will carry and use the guidance contained in their current abbreviated flight crew checklist.

20.12.4. Only MAJCOM/DO and SG approved inserts/briefings pertaining to crew positions will be kept in the abbreviated flight crew checklist binders.

20.12.5. Information in the AECM checklists will not be changed except by published revisions or changes.

Section 20E—Aeromedical Evacuation Airlift Operations

20.13. General:

20.13.1. Determining Factors. Consider the following factors when transporting patients on the C-17 aircraft; patient's diagnosis, condition, equipment, oxygen requirements, in-flight time, in-flight patient care requirements, and the number of medical personnel required. Emphasis must always be on providing quality and appropriate care while minimizing potential risks during transport.

20.13.2. Patient Load Planning Factors. The GPMRC/TPMRC or tasking AE command element determines the size/composition of the patient load on AE missions. AE mission planning factors will be per applicable AFI/H 11-2 and 41- series publications.

20.13.3. Patient Preparation. A flight surgeon, if available, will determine the patient's suitability for AE on the C-17 aircraft. Medical authorities requesting the patient's evacuation must be informed of the in-flight physical stress on the patient. If the MCD determines the patient's medical condition is beyond the capability of the AE crew or aircraft, they will contact the GPMRC/TPMRC or tasking AE command element for further guidance. The MCD, in coordination with the appropriate theater medical validating authority, may refuse to accept any patient whose medical condition is beyond their capability. The MCD will advise the aircraft commander when a patient's condition or use of medical equipment may affect aircraft operation.

20.13.4. Equipment for AE Missions. Prior to use onboard AE missions, all medical equipment must be tested and deemed air worthy, and then approved for use by HQ AMC/SGX. For those unique patient moves requiring equipment that has not met the above criteria, contact GPMRC/TPMRC or tasking AE command element. GPMRC/TPMRC or tasking AE command element will obtain approval prior to use onboard the aircraft (applies to that specific mission only). AECMs are responsible for all medical supplies and equipment.

20.13.5. Aircraft Security. See **Chapter 7** of this instruction.

20.14. En Route Diversions:

20.14.1. The MCD is the medical authority onboard all AE missions and has the responsibility to determine what is beneficial or detrimental to the patient(s). If a physician is onboard, as an attendant to a patient, they will make decisions involving that specific patient's care and may be consulted for advice as appropriate. Specific procedures are contained in applicable AFI/H 41-series.

20.14.1.1. Should a diversion become necessary due to a change in patient's condition, the aircraft commander will make every effort to comply with the requests of the MCD. Establish communications with the responsible command and control agencies, who will relay the information to the appropriate GPMRC/TPMRC or tasking AE command element.

20.14.2. Should an en route diversion become necessary for reasons other than a change in patient's condition, the aircraft commander will coordinate with the MCD before deciding the point of landing. The welfare of the patients is a prime consideration in all such decisions; however, safety is the final determinant. The aircraft commander notifies the responsible command and control agencies of the diversion and requests the appropriate medical agencies be notified.

20.14.3. Normally, patients will be advised of changes in itinerary and reasons for the diversion.

20.14.4. If the MCD determines the diversion will be detrimental to a patient, or the aircraft commander determines the diversion to be unsafe, the command and control agencies will be advised and guidance requested.

20.14.5. ARM (Aeromedical Readiness Mission (trainer)) are the primary means of preparing for AE airlift. These missions can be diverted to fulfill "real" versus "simulated" patient airlift requirements. All medical equipment/kits will be kept operationally ready at all times.

20.14.6. Opportune Airlift. Opportune airlift is preferred to launching a special airlift aircraft. The appropriate GPMRC/TPMRC or tasking AE command element and airlift agency should direct the move. Use of opportune airlift is considered an unscheduled AE mission, and managed/reported in the same manner as any other AE mission, to include the change of the mission number when patient(s) is/are onboard. AECMs on these missions will either be qualified/certified or under supervision while gaining qualification/certification in the affected aircraft.

20.15. Ground Operations. Engines should be shut down during enplaning and deplaning of patients.

20.16. Refueling Operations:

20.16.1. Refueling normally begins after deplaning patients are off the aircraft and prior to enplaning that station's patients. This minimizes the number of souls on board in case of an emergency. Servicing will be per AFI 32-2001 and T.O. 00-25-172.

20.16.2. Concurrent servicing may be accomplished with patients onboard provided:

20.16.2.1. The Chief Servicing Supervisor (CSS) coordinates with all personnel involved prior to beginning concurrent operations.

20.16.2.2. Prior to starting concurrent servicing, the total number of patients, passengers, and crew on board the aircraft will be given to the fire department.

20.16.2.3. Loading ramps/stairs are in place for immediate use and exits (excluding overhead escape routes) are opened for egress.

20.16.2.4. The aircraft is thoroughly ventilated.

20.16.2.5. At least two AECMs (one must be a FN) remain onboard to observe patients and assist patients in the event of an egress.

20.16.3. If cabin lights, lavatories, electrical power to operate medical equipment and aircraft inter-phone are operating prior to refueling, use may be continued during servicing operations. Only those systems, switches or electrical circuits needed to operate equipment to sustain life, may be turned on and used during refueling.

20.16.4. Patients and passengers will not enter or exit the aircraft during servicing. Crewmembers may enter or exit the aircraft only when performing essential duties associated with the concurrent servicing operation.

20.16.5. A member of the flight crew must be positioned in the passenger compartment and have intercom contact with the CSS during refueling operations.

20.16.6. Activities around the aircraft will be kept to a minimum during the refueling process. Onload/offload patient and passenger baggage prior to or after refueling.

20.17. Aircraft Pressurization. Normally altitude restrictions are passed from the GPMRC/TPMRC or tasking AE command element to command and control agencies for flight planning purposes. The MCD will advise the aircraft commander of any new cabin altitude or rate of cabin altitude change restrictions during the pre-flight briefing update.

20.18. Aircraft Configuration:

20.18.1. On dedicated AE missions, configure the aircraft during pre-flight, per T.). 1C-17A-9 and AFI 11-2C-17V3, Addenda A.

20.18.2. Litter Support Provisions. Litter support provisions on this aircraft are available.

20.18.2.1. The C-17 has an integral capability of three litter stations capable of moving nine litter patients. Maximum capacity is 12 litter stations capable of moving 36 litter patients. Each litter station will hold a maximum of three litters.

20.18.2.2. Litter patients will be enplaned feet first and deplaned head first due to minimal degree of ramp incline. This eliminates the need to turn litter patients around on the cargo ramp prior to placing them in the litter tier.

20.18.3. Available litter spaces and ambulatory seating will depend on the aircraft cabin's mission configuration.

20.18.4. Therapeutic Oxygen. Therapeutic oxygen for patient use is available on the aircraft.

20.18.5. Patient and passenger emergency oxygen is available on the aircraft. Patients and passengers will use the applicable passenger emergency oxygen system.

20.18.6. AECMs will have portable oxygen available. AECMs will use an MA-1 portable oxygen bottle, or equivalent, which will be secured near their assigned seat.

20.18.6.1. AE units will not maintain MA-1 portable oxygen bottles. MA-1 portable oxygen bottles must be functionally located to ensure proper maintenance, servicing, and storage. Dash 21/ Alternate Mission Equipment (AME) shops ensure MA-1 portable oxygen bottles are serviceable

and properly maintained, tested, and stored. Dash 21/AME personnel ensure additional MA-1 portable oxygen walk around bottles are available for each AE crew member flying in a primary crew position on AE missions.

20.18.7. Do not secure aircraft or medical equipment adjacent to an emergency exit in a manner that will prevent or impede egress.

20.18.8. Life Preservers. MB-1 flotation devices should be used for litter patients. If unavailable, use the Adult/Child life preserver for litter patients.

20.18.9. Patients not normally transported on the C-17 aircraft:

20.18.9.1. Floor loaded patients with external devices dependent on gravity, i.e.; foley catheters or chest drainage systems.

20.18.9.2. High risk neonates without special medical supervision from a neonatal team.

20.19. Passengers and Cargo.

20.19.1. The aircraft commander, with the concurrence of the MCD, will ensure maximum aircraft utilization for passengers and cargo. Passenger restrictions based upon patient considerations will be identified when seats are released. At stations with a GPMRC/TPMRC or tasking AE command element, the AEOO/GPMRC/TPMRC or tasking AE command element will advise the appropriate command and control agencies on the number of seats available for passengers.

20.19.2. Cargo and passengers may be carried with patients unless a clear detriment to the health and well being of the patient or passengers can be demonstrated. The decision will be made by the MCD, considering the need for maximum utilization of the aircraft. Conflicts will be referred to the respective GPMRC/TPMRC or tasking AE command element for a decision. Litters will be positioned forward of cargo pallets (if possible). If cargo is in place, and the aircraft commander and MCD agree, patients may be transported aft of the cargo.

20.19.3. Cargo will not be bumped except in unusual/abnormal cases, and only after the MCD has coordinated with the aircraft commander and notified the local GPMRC/TPMRC or tasking AE command element.

20.19.4. Do not move ambulatory patients to litters in order to provide seating for additional patients or passengers.

20.19.5. When required/mission load permits, a minimum of one seat will be reserved for every three litter patients on all AE missions. A minimum of two litters will be set up for ambulatory patient use on mission legs scheduled to exceed four hours in length. In addition, an emergency litter will be set up on all AE missions.

20.19.6. Hazardous cargo will not normally be transported aboard AE missions except in extreme circumstances.

20.20. Crash/Fire/Rescue.

20.20.1. Aircraft carrying patient(s) will be provided CFR protection per T.O. 00-25-172. Stand-by CFR vehicle is not necessary during normal operations. A CFR vehicle can be available upon request. The flight crew will coordinate CFR requirements.

20.20.2. At non-AMC bases, non-U.S. military bases, and civilian airfields, the controlling agency will coordinate the CFR coverage, as necessary. The request for CFR vehicle coverage may be denied. This will not prevent refueling operations from occurring.

20.21. AE Call Sign/Use of Priority Clearance.

20.21.1. For AE missions, use the call sign "Air Evac" followed by the five digit aircraft number (i.e., Air Evac 12345) or mission designator (as required by FLIP). Revert to standard call sign when the AE portion of the mission is completed.

20.21.2. The AE "priority clearance" will be used when carrying patients classified as "urgent" or "priority," who require urgent medical attention. AE priority will only be used for that portion of the flight requiring expedited handling. Aircraft commanders will request priority handling if AE missions are experiencing long delays during takeoff or landing phases, that will affect a patient's condition.

20.21.3. This does not allow use of AE priority status simply to avoid Air Traffic Control (ATC) delays, make block/departure times, or avoid inconveniences. ATC agencies do not question the motive when an AE priority is declared. Use this status judiciously.

20.22. Load Message.

20.22.1. At military bases, the flight crew will pass inbound load messages to the proper command and control personnel. At civilian airfields, ground control will be notified.

20.22.2. The MCD will complete an AF Form 3858, **C-130/C-141 Aeromedical Evacuation Mission Offload Message**, per procedures in applicable AFI/H 41-series.

20.23. Change in Patient Status. Change in patient status will be managed per applicable AFI/H 41-series.

Section 20F—Contingency Operations

20.24. Engine Running Onload (ERO) Procedures.

20.24.1. ERO procedures are outlined in AFI 41-312V1. ERO procedures for loading patients are authorized for all contingency operations when a time critical environment exists (i.e. non-secure landing zones, etc.), and minimum ground time is essential. ERO procedures can be practiced/trained during ARMs, joint training operations, exercises, etc.

20.24.1.1. Loadmaster will be positioned on the left side, at the foot of the ramp and on headset during actual onload procedures. The loadmaster will observe for aircraft threats, and will enforce compliance with safety requirements.

20.24.1.2. Vehicle supervision is the loadmaster's responsibility.

20.24.1.3. If duties permit, loadmasters will assist AECMs in securing patients.

20.25. Floor Loading Procedures.

20.25.1. Floor Loading Procedures. Floor loading procedures are outlined in AFI 41-312, Volume 1. Floor loading procedures for loading patients are authorized for all contingency operations when a

time critical environment exists (i.e. non-secure landing zones, areas faced with enemy siege/hostile fire, humanitarian reasons, etc.), and minimum ground time is essential. Floor loading procedures can be practiced/trained during ARMs, joint training operations, exercises, etc.. The cargo area floor will be configured with all rollers stowed. Two crewmembers are required to work simultaneously in securing the opposite sides of the litters to the floor (applies when securing two or three litters together). See AFI 41-312, Volume 1, for enplaning sequence.

20.25.1.1. Ambulatory Patients: If available, any cushioning material may be used for seating, to prevent the patient from having to sit on the bare cargo area floor. Seat ambulatory patients so they face forward in the aircraft. Attach a tiedown device (cargo tiedown strap) for each row of patients, in a manner that it will provide forward restraint and body stability. See T.O. 1C-17-9 for proper use of the tiedown device. This procedure is similar to the procedure outlined in paragraph **17.23.**

20.25.1.2. Litter Patients: Position litters side-by-side and longitudinally on the cargo area floor, with the patient's head toward the aft of the aircraft. A total of 48 litter patients can be floor loaded on the C-17. This is comprised of 8 rows of two groups of three litter patients. First row of litters start at FS 360. Additional 12 litter patients can be placed on the ramp for maximum utilization of the aircraft.

20.25.1.2.1. Position outside litters as close to Row B and F as possible to create a center aisle. Hook cargo strap to row B or F. Pass over first handle, wrap center handles, pass strap over last handle and then hook ratchet into row D. Ensure ratchets have 1 ½ turns.

20.25.1.2.2. Side wall seats remain usable with this floor load configuration. Inflight kits, medical equipment, and baggage will need to be tied in side wall seats. Equipment litters may be used if factored into 48-60 floor loaded litter capacity. Enough side wall seats must be maintained for AECMs.

20.25.1.2.3. Maximum altitude for floor loaded patients is flight level 250.

20.26. Aerial Refueling (AR). Aerial refueling is an option, which should be considered when planning urgent, or priority patient airlift missions. AR is not desirable in all medical situations, and in some cases may be detrimental to patient(s). Approval of AR must be obtained from HQ AMC/SG prior to mission set up.

Chapter 21

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21.1. This chapter is reserved for future C-17 operations (Search and Rescue).

Chapter 22

EMERGENCY NUCLEAR AIRLIFT (ENAF)

Section 22A— Mission Preparation

22.1. Emergency Nuclear Airlift. Airlift of nuclear weapons may be tasked at any time. The amount of preparation and assistance required will depend entirely on the length of time AMC has to move the weapons. If feasible, use the Emergency Nuclear Airlift Operations Guide (attached).

NOTE: Use of these procedures requires SECDEF approval.

22.2. Conduct of Operations. Crews will be briefed on and receive detailed instructions from a specific OPLAN or mission directive. If there is a conflict between this regulation and the instructions in an OPLAN or mission directive, use the OPLAN or mission directive.

22.3. Emergency Nuclear Airlift Standards. In an emergency, the objective is to move the weapons safely in a short time. Crews are expected to use sound judgment and common sense in what may be a turbulent or tense environment. Comply with as many of the nuclear weapons system safety rules in AFI 11-299, *Nuclear Airlift Operations*. Pay particular attention to the following areas:

22.3.1. Nuclear weapons must be handled safely. The most immediate hazard is the high explosive that can be set off by shock or heat in most nuclear weapons. Use standard aircraft dash-9 loading procedures. Keep the loading controlled and orderly at all times. Load or handle only one item or pallet at a time. Crews may ask shipper or receiver personnel to help, but the overall aircraft loading responsibility still belongs to the aircrew. Time permitting, crews should refer to Technical Order (TO) 1C-17A-16-1 or -16-2, section I, II, III, or IV, for specific instructions that could help crews during onload or offload. Step-by-step use of the dash-16-1 is not necessary.

22.3.2. Load plan: See AF Form 4114, **C-17A Nuclear Floor Plan Worksheet**.

22.3.2.1. If crews are required to move the maximum number of one type of weapon, section VI of the dash-16-1 is the best guide to determine where to position the weapons. Use the maximum tested figure.

22.3.2.2. For mixed loads (more than one type of weapon), base the load plan on how many weapons can be properly restrained using dash-9 criteria. Do not allow weapons to rub or touch each other when tied down.

22.3.2.3. Crews may use the dash-9 to compute shoring requirements or section VI of the dash-16-1, which shows parking and rolling shoring requirements for each weapon. For winching operations, the dash-16-1 is a good guide for positioning approach shoring.

22.3.3. Use standard dash-9 restraint criteria. Crews may use the tiedown patterns in the dash 16-1, which may exceed dash-9 criteria. The tiedown patterns will aid crews in floor planning a maximum tested load.

22.3.4. The route of flight must not violate restrictions in the classified United States Air Force Special Weapons Overflight Guide (SWOG). Overflying a foreign country with nuclear weapons is an extremely sensitive issue, even in an emergency airlift. Comply with the SWOG at all times. If crews don't have access to the SWOG, request a route of flight that complies with the SWOG through com-

mand and control center (C2 agency) channels. The C2 agency must ensure the route of flight is provided to the aircrew by the most expeditious means available. If no route of flight is provided, fly normal air traffic control (ATC) routings to the destination. Do not divulge the nature of cargo to any en route ATC facility or country to obtain a specific clearance.

22.3.5. United States military custody of nuclear weapons is required. Normally, the copilot is the courier who has custody of the nuclear cargo for the flight. Under certain conditions, the shipper may furnish United States military couriers who will retain custody of the weapons in flight.

22.4. Aircrew Selection. All C-17 active duty aircrews may be used for ENAF. Time permitting, AMC will use a sliding scale of options, which may be one or more of the following:

22.4.1. Assign Prime Nuclear Airlift Force (PNAF) loadmasters (LM) and pilots so as to have one or the other on each aircraft.

22.4.2. Place PNAF pilot and LM teams at the onload bases to assist with the loads and flight plans.

22.4.3. Use non-PNAF crews in a prepared OPLAN scenario with planned, organized loads.

22.4.4. Use non-PNAF crews in a short notice, bare-base environment with little or no advance preparation or assistance.

22.4.5. Use ARC crews with Secretary of Defense (SECDEF) approval.

22.5. Aircrew Requirements.

22.5.1. Crew complement will be according to the OPLAN or specific mission directive. If not specified, use a normal crew complement (basic crew, only one LM required).

22.5.2. The crew will be armed IAW AFI 11-299V1.

22.5.3. If crews are tasked for a mission that has a higher security classification than personnel security clearance, crews will be authorized emergency access to enough information to complete the mission. Approval authority rests with a general officer, wing commander, or wing commander equivalent and cannot be delegated.

22.6. Aircrew Briefings.

22.6.1. Crews should be briefed on the following:

22.6.1.1. Purpose of the mission.

22.6.1.2. Classification of the mission, cargo, and locations.

22.6.1.3. Itinerary, including confirmation of prior coordination for hazardous material as required by instrument flight rule (IFR) supplement and alternate airfields.

22.6.1.4. Cargo. TO 11N-20-11 line numbers should be included. Obtain line numbers from the fire department prior to loading. TO 11N-20-11 is a classified technical order that assigns an unclassified line number to each nuclear weapon.

22.6.1.5. "No lone zone," two-person concept, and security requirements.

22.6.1.6. Personnel authorized to sign for nuclear weapons at the destination.

22.6.1.7. Current intelligence, including threat analysis.

22.6.1.8. SWOG route of flight restrictions.

22.6.1.9. Airborne intercept (SWOG).

22.6.1.10. Jettisoning (SWOG).

22.7. Emergency Mission Kit.

22.7.1. The emergency mission kit is a set of unclassified tech orders that are part of the aircrew trip kit.

22.7.1.1. TO 1C-17A-16-1, *Loading and Air Transport of Nuclear Weapon Cargo (Nonpalletized).* Section VI, Emergency Logistic Movement Procedures, has tables of maximum tested loads and load plans for each item.

22.7.1.2. TO 1C-17A-16-2, *Loading and Air Transport of Nuclear Weapon Cargo (Palletized).* Section VI has tables that list the number of items for each pallet, shoring (under wheel or under frame), maximum tested load, pallet overhang, and comments for each item. The comments will refer crews to an appropriate figure if off-pallet tiedowns are required.

22.7.2. The dash-16-1 basically amplifies the dash-9. Crews may use any or all of the portions of the dash-16-1 and be in compliance with the dash-9.

22.7.3. Five copies of AF Form 4114, should be included in the mission kit. The emergency mission kit may contain a nuclear weapons template kit.

Section 22B—En Route Procedures

22.8. General. Use these procedures in addition to the normal operating procedures in the rest of this regulation.

22.8.1. Flight Plans. Enter "hazardous cargo" and the mission number in the "other information" section of the flight plan. If crews are carrying inert weapons, trainers, or other items that could be mistaken for real weapons by crash or rescue personnel in an emergency, enter "inert devices."

22.8.2. Radio Calls:

22.8.2.1. Departure (onload) base. Before starting the onload, tell the tower to notify the fire department the “onload is commencing.” Prior to engine start, give the controlling agency (ground or tower) the parking location and approximate engine start time and announce there is hazardous cargo aboard the aircraft. Ensure a fire truck is standing by the aircraft for engine start.

22.8.2.2. En route or offload base. At least 30 minutes prior to landing, contact one of the following: base operations, command post, or control tower. Pass mission number and verify that the hazardous cargo information has been received. If the arrival base does not have hazardous cargo information, request the following be relayed immediately to the crash or fire protection agency and other support agencies as appropriate:

22.8.2.2.1. Aircraft call sign, type, and mission number.

22.8.2.2.2. Estimated time of arrival (ETA).

22.8.2.2.3. Department of Transportation (DOT) explosives hazard class or division (normally 1.1).

22.8.2.2.4. Net explosive weight (NEW).

22.8.2.2.5. Line numbers from TO 11N-20-11 if requested. Obtain line numbers from the base fire department prior to starting the load at the onload location.

22.8.2.2.6. A request for isolated parking and security forces to meet the aircraft.

22.9. Custody of Nuclear Cargo. Appoint a commisioned officer to be the courier officer (a copilot or third pilot is the preferred option). The courier officer is responsible for receipt, custody, security, safety, and delivery of nuclear weapons to authorized receivers.

22.9.1. Before accepting and loading nuclear weapons, the shipper briefs the crew (at least the AC, courier officer, and primary LM) on the nature and hazards of the cargo. If anyone on the crew does not get the briefing, give them the appropriate information before the flight. Ask the shipper to point out any specifics crews may need to handle the weapon, i.e. tiedown points, forklift stirrups, command disable system (CDS) procedures, etc. The specific procedures in sections II, III, and IV to the dash-16 can also provide helpful information on how to load specific weapons.

22.9.2. Time permitting, the courier and LM will inspect the cargo before accepting custody. The courier should have the shipper verify the integrity of a weapons case and replace any broken seals. Crews may be held responsible for damage at the receiving end if crews accept a damaged weapon without documentation. Document damage or broken seals on the DD Form 1911, **Materiel Courier Receipt**, prior to signing for the weapon.

22.9.3. The courier accepts custody of the weapon by signing the DD Form 1911 provided by the shipper. Use this form to transfer cargo custody to replacement couriers.

22.9.4. Release custody of the cargo only to a replacement courier or someone authorized to sign for nuclear material. Authorized receivers are identified by the shipper, by message, or through the AMC command and control system.

22.9.5. Time permitting, refer any questions through the TACC Command Center to TACC/XOOMS, DSN 576-2597 for resolution.

22.10. Security Procedures. The host base is responsible for providing security for the aircraft and the nuclear cargo. The courier officer (who has custody of the weapons) is the final authority on security matters; however, crews should follow the advice and procedures of the host security force as much as possible. If the situation is serious and crews must load and depart quickly, use judgment and dispense with the formalities. Prior to takeoff, the AC will ensure security support at all stations being transited that day through the TACC Command Center.

22.10.1. Home Station. Time permitting, conduct a thorough visual search of the aircraft for unauthorized explosives or stowaways. Use a bomb detection dog if available. If time is critical, do not delay the mission to "sanitize" the aircraft.

22.10.2. Onload Base. The host base should set up a restricted area, normally with ropes and stanchions, around the aircraft.

22.10.2.1. Entry Control. Use one entry point to maintain strict control of entry into the area. The entry controller will have a roster of all personnel allowed to enter. Use a copy of the flight orders for the aircrew. Instruct the entry controller to coordinate with the aircrew courier before allowing

anyone into the area. ***EXCEPTION:*** Allow the weapons convoy to enter the restricted area without delay.

22.10.2.2. "No lone zone." Do not allow anyone to be alone in the restricted area or aircraft when nuclear weapons are present (inside either the area or the aircraft). The purpose of a "no lone zone" is to prevent any one person from tampering with a nuclear weapon. The easiest way to enforce a "no lone zone" is to always be in pairs inside the restricted area (for example, two aircrew members, two shippers, or one aircrew member and one shipper).

22.10.3. In-flight. Maintain the two-person concept throughout the flight. Do not allow anyone to be alone in the cargo compartment.

22.10.4. Arrival or En Route Base. As soon as the engines are shut down, deploy sufficient armed crew members around the aircraft to control access to the aircraft. Until the host base security force is established, the only personnel authorized near the aircraft are aircrew members and those support personnel necessary to install landing gear pins, ground power, and wheel chocks. Monitor these people at all times. Keep doors closed and be prepared for an immediate departure until the host base establishes security.

22.11. Emergency Procedures.

22.11.1. Security Emergencies. If confronted with a hostile force, crews may use deadly force to protect nuclear cargo. To the fullest extent possible crews will resist any attempt by a hostile force to capture a nuclear weapon. Consider any attack on an aircraft loaded with nuclear cargo, including a hijacking attempt, as an attack against the nuclear weapons. Should hostages be used to gain access to, as cover for removal, or to thwart recovery of a nuclear weapon; the welfare and safety of the hostages should be considered in determining actions to be taken. However, the presence of hostages shall not deter the taking of decisive, prompt, and effective action that includes the use of deadly force to recover a nuclear weapon and to prevent unauthorized access to or removal of a nuclear weapon. If crews are attacked, take the following actions:

22.11.1.1. Make an immediate takeoff, with the cargo if possible.

22.11.1.2. If the attack occurs during onloading or offloading, load the weapons as fast as possible, even if improper procedures must be used. Ensure effective cargo restraint and take off immediately.

22.11.1.3. Some weapons have a CDS that internally destroys the capability of a weapon to achieve a significant nuclear yield. The CDS will be used when capture of a weapon is imminent.

22.11.1.4. Aircrews will not use emergency destruct procedures on nuclear weapons. Emergency destruction (ED) of weapons by shaped charges requires SECDEF approval and will be accomplished by qualified personnel who have the capability to receive, authenticate, and carry out ED orders. When two properly identified shipper or receiver personnel concurrently request custody of the cargo for ED purposes, release the cargo using appropriate custody transfer procedures.

22.11.2. Jettisoning Nuclear Cargo. The LM will identify which cargo is and is not jettisonable according to the dash-1. In an emergency, the aircraft commander bears a moral obligation to jettison cargo or crash-land where the least amount of damage will result. Use the CDS, if applicable, prior to jettisoning or crash-landing. Record the coordinates of each jettisoned item. Observe the jettison restrictions in the SWOG.

22.11.3. Landing in Foreign Countries. Be prudent and keep things very low key. If confronted with demands to board or inspect the aircraft, refer to the status of United States military aircraft in the DoD Foreign Clearance Guide (FCG), which states: "United States military aircraft are sovereign instrumentalities. When cleared to overfly or land in a foreign territory, it is United States policy to assert that military aircraft are entitled to the privileges and immunities which customarily are accorded warships. These privileges and immunities include, in the absence of stipulations to the contrary, exemption from duties and taxation; immunity from search, seizure, and inspections (including customs and safety inspection); or other exercise or jurisdiction by the host nation over the aircraft, personnel, equipment, or cargo on board. Air Force aircraft commanders will not authorize search, seizure, inspection, or similar exercises of jurisdiction enumerated above by foreign authorities except by direction of HQ USAF or the American Embassy in the country concerned." Diplomatically, but firmly, refuse any requests to board or inspect, and get help through any available United States channel. Flash priority is authorized.

22.12. Maintenance on Aircraft Loaded with Nuclear Cargo.

22.12.1. Maintenance on an aircraft loaded with nuclear weapons must not violate safety rules normally used with aircraft loaded with conventional explosives. As much as possible, have maintenance and servicing completed before loading nuclear weapons on the aircraft. Do not allow maintenance, such as the following, that could increase the possibility of a fire:

22.12.1.1. Using flame or uncontrolled heat-producing items.

22.12.1.2. Repairs on the fuel system, cell, and tank or other maintenance where significant fuel spills are likely to result from disconnected lines, ruptured components, etc.

22.12.2. Aircraft will not be jacked. The temporary lifting of one set of landing gear for minor maintenance (tire change, brake change, bogie maintenance, etc.) is not considered jacking.

22.12.3. Do not refuel, defuel, or service oxygen while loading or offloading nuclear weapons. Have a fire truck standing by at the aircraft during refueling, defueling, or oxygen servicing.

22.12.4. All maintenance on the aircraft while nuclear cargo is on board will be monitored by the loadmaster, copilot or crew chief.

Section 22C—Emergency Nuclear Airlift Operations Guide

22.13. General. This guide describes recommended actions for courier and crew during emergency nuclear airlift operations. It is designed for those missions diverted en route to an onload site where the crew does not have the opportunity to receive a formal tanker airlift control element (TALCE), home station, or command post briefing. However, even if a formal briefing is given, this guide may be used as a refresher. Security, time, and ground support may not be sufficient to allow using this guide during emergency operations. In such cases, the courier and crew must discuss all factors and use their judgment on the best course of action to accomplish the mission. Paramount in all decisions is the safety and security of nuclear cargo.

22.14. Prior to Onload (either at home station or enroute to the onload site).

22.14.1. Review crew responsibilities and the procedures to be used during onload (loading method, security setup, cargo receipt, two-person concept). Do not discuss classified information over interphone.

22.14.2. If time permits, review the applicable section of the dash-16-1. Using the dash-16-1 is not mandatory, but it may provide useful loading information for the cargo, such as parking and rolling shoring requirements and tiedown patterns.

22.14.3. En route and 30 minutes prior to landing, contact the onload site and notify them of estimated time of arrival (ETA). Make support requirements known (fuel, materials handling equipment [MHE], transportation, security, etc.) at this time.

22.15. Arrival and Onload.

22.15.1. Contact the senior security official and comply with the following: If crews have nuclear cargo on board, establish a restricted area and keep everyone off the aircraft. Provide armed security until the host security forces assume responsibility.

22.15.1.1. A restricted area will be established around the aircraft. Ropes and stanchions are normally used to denote the restricted area. However, depending on the situation, crews may see additional guards, security vehicles, etc., rather than ropes. Be flexible. The key is whether the host base is furnishing enough security to protect the nuclear cargo.

22.15.1.2. A single entry control point will be established.

22.15.2. The entry controller must allow only those individuals into the restricted area who have been cleared by the courier. Tell the entry controller which individuals are authorized into the area and, time permitting, back it up in writing using crew orders, entry authorization lists (EAL) and prepared shipper lists.

22.15.3. After security is established, verify shipper identification and accomplish the following with the shipper: (NOTE: Accomplish the shipper briefing and cargo inspection if time and the security environment permit.)

22.15.3.1. Shipper briefing to include the following:

22.15.3.1.1. Nature, hazard, and safety regarding shipment of nuclear weapons cargo, including line numbers from TO 11N-20-11, DOT class, DOT explosive hazard class or division, and net explosive weight (NEW).

22.15.3.1.2. Courier escort requirements.

22.15.3.1.3. Items requiring the two-person concept.

22.15.3.1.4. Items that are command disable system (CDS) equipped and if the CDS has been activated (weapon not operational).

22.15.3.1.5. Items exposed to an abnormal environment or not operational.

22.15.3.1.6. Special handling or unique requirements particular to the cargo.

22.15.3.1.7. Individuals required to assist during onload or offload. Pass the information to the entry controller.

22.15.3.1.8. Authorized recipients at offload station. Get this information in writing.

NOTE: If the primary LM and the AC were not present for the shipper briefing, the courier must brief them on the applicable items.

22.15.3.2. Cargo inspection:

22.15.3.2.1. The primary LM, courier, and shipper will inspect the cargo for broken seals, exterior damage, security to carrier, wheel and casters, tiedown points, etc. If discrepancies are found, have the shipper annotate them on the DD Form 1911, **Materiel Courier Receipt**.

NOTE: Before accepting the cargo, ensure everything is ready for the onload.

22.15.3.2.2. After the inspection, accept custody of the cargo by signing the DD Form 1911.

22.15.4. During onload or offload monitor the operation, assist as necessary, and ensure personnel comply with the two-person concept.

22.15.5. After the onload is complete and the crew is ready for engine start, the armed courier will deplane and tell the host base security to break down security and maintain surveillance until aircraft departure. The courier will monitor access to the crew entrance door during engine start if possible.

22.16. En Route to Offload.

22.16.1. Maintain the two-person concept.

22.16.2. Notify the TACC Command Center of departure time and ETA at the offload station. Be prepared to encode this information.

22.16.3. If time permits, review the security and handling procedures to be used at the offload station. Do not discuss classified information over the interphone.

22.16.4. Contact the agency specified in flight information publications (command post, base operations, or tower) 30 minutes prior to landing; ask if they have hazardous cargo information. If they don't, pass the following information:

22.16.4.1. Call sign, type aircraft, and mission number.

22.16.4.2. ETA.

22.16.4.3. Line numbers from TO 11N-20-11 and DD Form 1911.

22.16.4.4. If line numbers were not provided, pass on the following information:

22.16.4.4.1. DOD explosive hazard class or division (normally 1.1).

22.16.4.4.2. NEW.

22.16.4.5. A request for isolated parking and for their security forces to meet the aircraft.

22.16.4.6. Inert devices, if applicable.

22.17. Offload.

22.17.1. Upon arrival, deploy the armed courier (minimum) and team (if required). Provide security until the host security forces assume responsibility and establish the restricted area. Ensure security is provided. Keep all doors closed and all ground personnel off the aircraft until security is established.

22.17.2. Maintain the two-person concept.

22.17.3. Brief the receiver on the cargo, and transfer custody.

22.17.4. Briefing includes:

22.17.4.1. Nature, hazard, and safety regarding shipment of the nuclear weapon cargo, including line numbers from TO 11N-20-11, DOT explosive hazard class or division, DOT class, and NEW.

22.17.4.2. Courier escort requirements.

22.17.4.3. Items requiring the two-person concept.

22.17.4.4. Items that are CDS-equipped and if the CDS has been activated (weapon not operational).

22.17.4.5. Items exposed to an abnormal environment or not operational.

22.17.4.6. Special handling or unique requirements applicable to the cargo.

22.17.4.7. Individuals required to assist during the offload. Pass this information to the entry controller.

22.17.5. The receiver and courier will conduct an inspection of the cargo for broken seals, exterior damage, etc. If discrepancies are found and they have not been previously noted, the courier will annotate them on the DD Form 1911.

22.17.6. Transfer custody of cargo. (Receiver signs DD Form 1911).

22.17.7. Offload cargo.

Chapter 23

AIRCREW CHEMICAL OPERATIONS AND PROCEDURES

23.1. Wear of Aircrew Chemical Defense Ensemble (ACDE). Wearing the ACDE will constrain normal aircraft operations. The ACDE includes the newer Aircrew Eye-Respiratory Protection System (AERPS) above the shoulder system and the CWU-66/P or -77/P Integrated Aircrew Chemical Coverall (IACC). Procedures and equipment have been tested under restricted conditions, and "business as usual" will not be possible. Individual situations dictates what can and cannot be done. To properly adapt, aircrews must understand hazards involved and the limitations of their chemical defense equipment.

23.1.1. This volume is intended to enhance other aircrew chemical defense training and provides the crew member a basic understanding of utilizing ACDE in a chemical-biological threat area (CBTA). It combines information from technical orders and unit inputs to form a single source document.

23.1.2. This volume briefly describes the nature of the chemical threat and agents that may be faced. Secondly, it discusses some of the situations and problems the aircrew may encounter in a CBTA. Preparatory actions and countermeasures are examined so the crew member can make optimal use of the ACDE and fly the mission safely. While the information presented may need to be modified, the specific objectives of this volume will help prepare the aircrew member for the unique challenges imposed by chemical weapons.

23.2. Factors Influencing the Chemical Warfare (CW) Agent Hazard.

23.2.1. The major instances in which a crew may be exposed to chemicals is through inhalation, absorption through the skin, eyes, and ingestion. Contaminated drink and food are considered harmful, but immediate concerns must be contamination avoidance to the maximum extent, limit exposure of the skin and eyes, as well as avoid breathing the contaminants. Factors affecting persistence are weather, agent physical characteristics, method of dissemination, droplet size, and the terrain.

23.2.2. Weather. Factors include temperature, wind, humidity, precipitation and atmospheric stability. For example, high winds and heavy rains reduce the contamination hazard. Conversely, lack of wind, overcast-skies, and moderate temperatures favor persistence.

23.2.3. Agent Dissemination. Disseminated as vapors, aerosols, or liquids. Solids seem unlikely, but agents may become solids at lower temperatures.

23.2.4. Agent Droplet Size. Persistence factor is determined by droplet size. Agents may be mixed with other chemicals ("thickeners"), and form large drops making removal more difficult.

23.2.5. Surface and Terrain. CW agent clouds tend to follow the terrain, flowing over countryside and down valleys. Chemicals persist in hollows, depressions, and other low areas. Rough terrain retards cloud movement. Flat countryside allows a uniform, unbroken cloud movement. Vegetated areas are more contaminated than barren terrain. Liquid agents soak into porous surfaces, making evaporation much slower than for nonporous surfaces.

23.3. Categories of Chemical Warfare Agents. CW agents having military significance may be categorized as nerve, blister, choking, and blood. Because they are produced biologically, toxins technically are not chemical agents. However, they are considered a potential CW threat.

23.4. Nerve Agents.

23.4.1. Military Significance. Nerve agents are the most lethal and fastest acting of the standard CW agents. These agents affect the nervous system and are highly toxic whether inhaled, ingested, or absorbed through the skin. Persistency ranges from hours to many days.

23.4.2. Symptoms of Exposure. Nerve agent exposure is difficult to distinguish. Normally, symptoms of nerve agent exposure appear in the following order. Initial exposure includes a runny nose, tightness of the chest, dimness of vision, and pinpointing of the pupils. These symptoms are usually followed by difficulty in breathing, drooling, involuntary defecation and urination. Finally, exposure will lead to confusion, drowsiness, convulsions, coma and death.

23.4.3. Onset of Symptoms. Lethal respiratory dosages will cause death in 1 to 10 minutes and liquid exposure to the eyes will kill almost as rapidly. Depending on factors such as the amount and type of nerve agent, absorption through the skin may cause death anywhere from 1 to 2 minutes to 1 to 2 hours. Nerve agents are retained by the body for an extended period; thus intermittent, cumulative exposure to low amounts can lead to the same ultimate effect as a single exposure to a higher amount.

23.4.4. Protection. The full protective ensemble is effective against nerve agents. When properly worn, the various chemical protective masks prevents inhalation of nerve agents. Both the aircrew coveralls and ground crew ensemble provide limited protection to the skin. All layers of the outer garment must be protected against saturation of liquids, chemical agents, water, or petroleum.

23.4.5. Antidotes/Prophylaxis. Antidotes are effective in combating effects of nerve agent exposure. These antidotes may be effective if given to a victim having advanced symptoms, and as long as the victim is made to continue breathing. People who use the antidotes must be seen by medical personnel and may not be combat-ready for several days. Currently, nerve agents are the only agents there is an available field antidote. This antidote can be self-administered by the exposed individual or through self-aid buddy care. In addition, medical personnel have more specialized treatments available.

23.5. Blister Agents.

23.5.1. Military Significance. Blister agents are dispensed as vapors or liquids, and may be encountered as solids. These agents primarily affect the eyes, respiratory tract, and the skin.

23.5.2. Symptoms of Exposure. Placed on the skin, a drop the size of a pinhead can produce a blister one inch in diameter. This action is accentuated by moisture; hence, a more severe danger is present during periods of sweating. The groin and armpits, which tend to be sweaty, are especially susceptible to blister agents. Blister agents which come in contact with the eyes lead to redness, watering of the eyes, blurring of vision, sensitivity to light, and frequently, blindness. Inhalation causes serious damage due to burns and blisters to the mouth, nose, throat, and lungs. Incapacitation may last for days or weeks; aircrews will probably be unable to fly for indefinite periods. After hospitalization, complications from blister agent exposure can arise and may be fatal.

23.5.3. Onset of Symptoms. Blister agents are quickly absorbed through the skin. However, it usually takes several minutes (up to five minutes and as long as several hours) for the symptoms to appear. They act most rapidly in liquid form, but are also effective in vapor form.

23.5.4. Protection. The full protective ensemble is effective against blister agents. Exposed areas must be cleaned thoroughly immediately after exposure. Blister agents are easily transferred from contaminated surfaces, thus great care must be taken to avoid contact with any contamination.

23.6. Choking Agents.

23.6.1. Military Significance. These agents are disseminated as vapors and when inhaled affect the respiratory system by damaging the lungs. Persistence is very brief, and dissipate rapidly (within minutes) under most field conditions.

23.6.2. Symptoms of Exposure. Choking agents cause coughing, choking, tightness of the chest, nausea, headache, and watering of the eyes. Choking agents can be lethal, with death normally from the lungs filling with fluids, making breathing difficult or impossible.

23.6.3. Onset of Symptoms. Exposure to choking agents has an immediate effect. Victims experience slightly delayed effects, such as painful cough, breathing discomfort, and fatigue.

23.6.4. Protection. Both the aircrew and ground crew protective mask is extremely essential to protect against exposure; the entire protective ensemble should be used as directed.

23.7. Blood Agents.

23.7.1. Military Significance. Blood agents are usually dispensed as vapor or aerosol and inhaled. Under most field conditions they may briefly persist on target (up to 10 minutes).

23.7.2. Symptoms of Exposure. Exposure to a single breath of blood agent causes giddiness, headaches, confusion, and nausea. As dose increases, breathing becomes more difficult. The victim will have deep, uncontrollable breathing and cramps, then loss of consciousness. Death is certain if the victim receives no medical aid.

23.7.3. Protection. Blood agents are breathing hazards. The full ensemble is most effective because the mask provides the breathing protection needed.

23.7.4. Additional Threats. Blood agents will damage mask filters. All personnel must change mask filters at the earliest possible opportunity after a blood agent attack.

EXCEPTION*:* Filters installed in aircrew CRU-80/P filter packs will be removed and replaced by aircrew life support (ALS) personnel (AFSC 1T1X1).

23.8. Aircrew Operations. Performance of duties while wearing chemical defense equipment can be extremely physically and mentally demanding. Special preparation and crew coordination are required to operate under chemical conditions. The information presented here will enable the aircrew to successfully operate in a chemical environment by recognizing limits and exploiting the capabilities of the chemical defensive equipment.

23.8.1. Planning:

23.8.1.1. Non-flying Ground Operations. Ground operations can represent the highest threat to aircrew safety. Protection from enemy attacks and exposure to liquid chemical agents is paramount. Aircrew should be advised to limit activities to essential duties only, and to separate ground duties from air duties. The ground ensemble is designed for quick donning and heavier levels of concentrations that can be more evident during ground operations. The aircrew ensemble

is designed for the unlikely event of light concentration levels, that could be found during flying operations and transmitted to and from the aircraft. Also, ACDE requires care during donning using "buddy dressing" procedures and ALS expertise during aircrew contamination control area (ACCA) processing.

23.8.1.2. Equipment Limitations. Due to thermal stress and the degraded performance associated with wearing of the ACDE, it is highly desirable to minimize the time and number of personnel exposed to chemical agents. Aircrew members must be familiar with the limitations of the ACDE and properly plan their duties. ACDE is designed to protect against vapor agents only and the mask and hood assembly can not be donned quickly in time of attack.

23.8.1.3. Body Temperature/Fluids Control. Heat stress and dehydration are serious hazards while wearing the ACDE. Aircrew members need to control perspiration rates and limit activities to essential duties only. The need to consciously slow the work pace while performing physical labor, share workloads and monitor each other's physiological condition is essential.

23.8.1.4. Breathing Restrictions. One of the inherent characteristics of the filter assembly is moderate breathing resistance. Normally, this is most noticeable during high flow rates. For example during physical exertion, users should be aware of the possibility of hyperventilation. During flying operations resistance can be reduced by using the EMERGENCY position on the oxygen regulator. The valsalva maneuver cannot be performed while wearing the MBU-13/P mask, therefore alternate means such as yawning or chewing can be used. If these are unsuccessful, attempt to clear ears by holding the oxygen regulator in the TEST MASK position and forcefully exhale or yell against the regulator pressure. The new AERP mask/hood assembly incorporates a blower system that presents less-than-moderate breathing resistance. However, in the event of a blower system failure, aircrews will experience an increase in breathing resistance.

23.8.1.5. Limited Dexterity. Wearing three pairs of gloves restricts dexterity, therefore visual confirmation of switch selection/positioning becomes very important.

23.8.1.6. Restricted Communications. Normal communications are limited while wearing the chemical defense mask. Communications can be enhanced by using the mini-amplifier/speaker with the AERP and some of the newer ground masks may be issued with a built-in amplifier. Otherwise, visual signals and the aircraft's public address system can be used to compensate.

23.8.1.7. Peripheral Visions Limits. The aircrew chemical defense mask may reduce peripheral vision as much as 15 percent.

23.9. Limitations. Aircrews must be mentally prepared to face the dangers of chemical weapons. Flight planning must be thorough and aircraft commanders should emphasize chemical defensive operations during mission planning, hazards and countermeasures, plans for onload/offload in the event of a ground attack, and plans for the return leg in the event of a contaminated aircraft. Alternate scenario plans should also be considered in the event conditions change.

23.9.1. Fuel Requirements. Extra fuel may be needed to compensate for altitude restrictions as the result of chemical agent exposure. If the aircraft has contamination, follow procedures outlined in paragraph **23.16.** During purge periods, the aircraft will be unpressurized. Although the aircrew can use the aircraft oxygen systems, passengers wearing the ground crew ensemble (GCE) cannot. This restricts the aircraft cruise altitude and increases fuel requirements.

23.9.2. Oxygen Requirements. Operating into a CBTA will increase oxygen requirements. The aircrew may be required to rely on the aircrew chemical defense mask and aircraft oxygen system to counter actual/suspected chemical contamination. Using the 100 percent oxygen setting offers the greatest protection in a contaminated environment. Appropriate oxygen reservoir levels must be planned to meet higher consumption rates. Use the aircraft -1 charts to calculate the required reservoir levels.

23.9.3. Mask/Filter Assembly Limitations. Wearing any of the chemical defense masks/filter assemblies imposes the following limitations:

23.9.3.1. The mask/filter assembly prevents the detection of fumes from fuel, hydraulic fluid and oil.

23.9.3.2. The filter assembly will not protect the user against ammonia fumes and carbon monoxide gas.

23.9.3.3. The filter/mask assembly should not be used without an oxygen source in an oxygen deficient atmosphere.

23.10. ACDE Issue. Aircrews will be issued sized ACDE and GCE at home station. Aircrews will ensure their ACDE and GCE is available at all times while in a CBTA. During deployments, at least one ACDE and one GCE will be issued to each crew member as directed by the unit commander or HQ AMC/TACC. ALS technicians will prepare and issue mobility ACDE "D" bags for aircrew members (Reference AMCI 11-301, *Aircrew Life Support (ALS) Program* (chapters 5 and 7). Mobility processing personnel will issue GCE "C" bags. Aircrew members will confirm the mobility bag contents and correct sizes.

23.11. Operations in a Chemical-Biological Threat Area (CBTA).

23.11.1. Establishing Threat Level. Aircrews should monitor command and control channels to ensure they receive the latest information concerning the destination's alert condition. Diversion of AMC aircraft to alternate "clean" locations may be required, unless operational necessity dictates. The local AMC Command and Control will direct aircrews to undergo medical pre-treatment for chemical exposure.

23.11.2. Protective Equipment Postures. Standardized USAF alert conditions and recommended ACDE requirements are listed below based on a chemical-biological threat. ***NOTE*:** These alarms may be different based on the host country requirements.

23.11.2.1. "ALL CLEAR" Attack is not probable, nor is chemical-biological contamination present. Notification--Verbal; removal of warning signs/flags. ACDE requirements--equipment is issued, prepared for flying, and kept readily available. GCE requirements--equipment is issued, prepared, and readily available.

23.11.2.2. "ALARM YELLOW" Attack is probable. Notification--Verbal; posting of yellow warning flags/placards. ACDE requirements--if en route to fly or during flying operations, all components will be worn except mask and hood, gloves, overcape, and overboots. GCE requirements--appropriate components should be worn with the mask/hood immediately available commensurate with ground duties.

23.11.2.3. "ALARM RED" Attack is imminent or in progress. Notification--Verbal; posting of red warning flags/placards; one minute warbling tone on siren (3 seconds on-1 second off).

ACDE requirements--full ACDE will be worn for flying duties. GCE requirements--full ensemble should be worn commensurate with ground duties. Personnel will take immediate cover.

23.11.2.4. "ALARM BLACK" Contamination is suspected or present. Notification--Verbal; “Gas - Gas - Gas”; posting of black warning flags/placards; warbling tone on siren (1 second on-1 second_off). ACDE requirements--full ensemble will be worn. GCE requirements--full ensemble will be worn commensurate with ground duties. Personnel will remain indoors or under liquid agent cover.

23.12. Donning Equipment. Aircrew will don ACDE based on the alarm condition. Use the "buddy dressing" procedures, and refer to AMCVA 36-2206, *ACDE Donning Checklist* (projected to be AMCVA 11-303), to ensure proper wear. When wearing the ACDE, Atropine and 2 PAM Chloride auto injectors will be kept in the upper left flight suit pocket. This standardized location will allow personnel to locate the medication should an individual be overcome by nerve agent poisoning. M-9 paper on the flight suit will facilitate detection of liquid chemical agents and ACCA processing. M-9 paper should be placed on the flight suit prior to entering a CBTA when an alarm “yellow” or higher has been declared. When inbound to CBTA, prior to descent, the aircraft commander will ensure crew and passengers don appropriate protective equipment IAW arrival destination's mission oriented protective posture (MOPP) level and brief aircrew operations in the CBTA. As a minimum, this briefing will include: flight deck isolation, oxygen requirements, air conditioning system requirements, CW clothing requirements, ground operations and MOPP levels.

23.13. Ground Operations.

23.13.1. Off/On Considerations. Extreme care must be exercised to prevent contamination of aircraft interiors during ground operations, particularly to the flight deck area. Reduce the number of personnel entering the aircraft. Contaminated engine covers, safety pins and chocks will not be placed in the aircraft unless sealed in clean plastic bags. Onload cargo will be protected prior to and while being transported to the aircraft. Protective covers will be removed just prior to placing the cargo on the aircraft. It is the user's responsibility to determine and decontaminate equipment in his/her charge. Aircrew members entering the aircraft will remove plastic overboots and overcape portions of the aircrew ensemble and ensure flight/mobility bags are free of contaminants and placed in clean plastic bags. Aircrew exiting aircraft into a chemically contaminated environment will don plastic overboots and overcape prior to leaving the aircraft.

23.13.2. Physiological Factors. Aircraft commanders must be very sensitive to the problems resulting from physical exertion while wearing ACDE. The aircraft commander should consider factors such as ground time, temperature and remaining mission requirements when determining on/offload requirements. Individuals involved should be closely monitored for adverse physiological effects.

23.13.3. Communications. Conducting on/offloading operations while wearing the complete ACDE complicates communications capability. Use the mini-amplifier/speaker or the aircraft public address system and augment with flashlight and hand signals as required.

23.13.4. Passenger/Patients. A path should be decontaminated between the aircraft and the ground transportation vehicle to reduce interior decontamination when loading/unloading passengers/patients.

23.14. Chemical Attack During Ground Operations. If an attack (Alarm Red) occurs during on/off-loading operations or transport to and from aircraft, take immediate cover away from the aircraft/vehicle. Follow "buddy dressing" procedures to ensure proper donning of ACDE prior to flight.

NOTE: Aircrews should don the ground crew protective chemical mask and protective helmet, consistent with circumstances and duties. Aircrews could be expected to forward information concerning medical aid, damage estimates, unexploded ordinance. Appropriate information may be forwarded via the aircraft radios to the controlling agencies.

23.15. Crew Rest Procedures. Operational necessity may require the aircrew to rest/fly in a contaminated CBTA. If the mission is not being staged by another aircrew or preflight crews are not available, the aircrew will normally preflight, load, and secure the aircraft prior to entering crew rest. The departing aircrew will perform necessary crew preparations and preflight briefings, then report to the ACCA for processing with assistance from ALS personnel who will assist aircrews donning ACDE prior to reassuming flying duties. If possible, aircrew transport should be provided in a covered vehicle. Aircrews should avoid preflighting aircraft prior to departure to prevent contamination to themselves and the aircraft. As aircrews proceed to fly they will require assistance from ground support personnel in removing their aircrew protective overcape and overboots prior to entering the aircraft.

23.16. Outbound with Actual/Suspected Chemical Contamination. Venting Aircraft/Removing ACDE Components: With actual/suspected vapor contamination, the aircraft must be purged for 2 hours using Smoke and Fume Elimination procedures. To ensure no liquid contamination exists, a close inspection of aircrew, passenger ensembles, and cargo will be conducted using M-8 and M-9 detection paper. M-8 and M-9 detection paper only detects certain liquid agents and will not detect vapor hazards. Above the shoulder ACDE may be removed only if the presence of vapor/liquid agents are not detected or suspected. The aircrew must take every precaution to prevent spreading of liquid contaminants, especially on the flight deck area. The best course is to identify actual/suspected contamination and physically avoid those areas for the remainder of the flight and keep cargo compartments cool. If an aircrew member or passenger has been in contact with liquid contaminants, all personnel aboard the aircraft will stay in full ACDE/GCE until processed through their respective contamination control area (CCA).

23.17. Communicating Down-line Support. Pass chemical contamination information through command and control channels when inbound. This information will be used to determine if a diversion flight is required. Report the physical condition of any crew/passengers who are showing chemical agent symptoms and whether they are wearing chemical defense ensembles.

23.18. Contamination Control Areas (CCA) Procedures. Aircrews will proceed to the ACCA for processing. Ground personnel will report to the ground crew contamination control area (GCCA) for processing. All personnel will remove protective clothing IAW established procedures located in respective CCA's.

NOTE: Because of the technical characteristics of life support/flying equipment and mission essential aircrew resources, an ACCA is required to ensure minimum exposure to contaminates. GCCA's are generally used to process ground crew personnel and typically are subject to potentially higher concentration levels. The ACCA is equipped and manned by trained ALS personnel to process aircrews and decontaminate their equipment.

23.19. Work Degradation Factors. Work timetables need to be adjusted to minimize thermal stress caused by wearing the ACDE. Aircrews must weigh all factors when performing in-flight and ground duties. The following are degradation factors for wearing full GCE, and may also be used to represent the Task Time Multipliers for the ACDE. To estimate how much time it takes to perform a task or operation, (1) take the Task Time Multiplier for the appropriate Work Rate and ambient air temperature and (2) multiply it by the time it normally takes to perform the task. For example, given a heavy work rate and an air temperature of 70F, the crew member should expect a normal one hour task to take 2.1 hours while wearing ACDE. A more extensive discussion of this subject is found in AFMAN 32-4005, *Personnel Protection and Attack Actions.*

Table 23.1. Task Time Multipliers.

TASK TIME MULTIPLIERS			
Work Rate	Temperature		
	20-49F	50-84F	85-100F
Light	1.2	1.4	1.5
Moderate	1.3	1.4	3.0
Heavy	1.7	2.1	5.0

Chapter 24

NIGHT VISION GOGGLE OPERATIONS (NVG)

24.1. General. This chapter provides guidance for C-17 NVG operations. It is applicable to all C-17s required to perform missions employing NVGs. Where not specifically stated in this chapter, all operational restrictions for operations are identical to those contained in the other chapters of AFI 11-2C-17.

24.2. Mission. After proper training and certification, NVG aircrews are capable of aerial delivery of personnel, equipment and supplies into marked (overt and covert) and unmarked drop zones (DZs), assault landing zones (ALZs), and airfields. MAJCOMs will determine the number and phase level of NVG certified aircrews.

WARNING: NVGs are one tool for enhancing situational awareness in the low-light environment. Crewmembers should use all means available (autopilot, flight instruments, navigational systems) to maintain situational awareness. Because NVGs do not turn "night into day," crewmembers must be aware of the limitations of NVGs.

24.3. Training/Operations. Accomplish aircrew training according to AFI 11-2C-17V1 and MAJCOM approved training guide before NVG use. NVG use for MAF pilots will occur in a phased program for enroute and airland operations. These phases of certification and capability provide a stepping stone approach to full NVG integration. Loadmasters have only one phase of certification which includes ERO, combat offload, and airdrop (if airdrop qualified). SOLL II crews will complete basic NVG training (including airdrop) in addition to SOLL II training.

NOTE: The pilot with the lowest certification will determine the level of NVG use for the mission (i.e., pilots may use NVGs even if the loadmaster on the crew is not NVG certified).

24.3.1. NVG Enroute/airdrop.

24.3.1.1. Phase 1: Enroute phase 1 pilots are authorized to fly single ship or formation on NVGs at standard night VMC altitude within 5 NM of centerline. NVGs may be used during air refueling rendezvous. Remove NVGs no later than 1 NM from tanker (coordinate tanker lighting during mission planning). Airdrop qualified pilots may drop on DZs marked with standard overt/covert lighting patterns IAW AFI 13-217. Operations Group Commander is the approval authority for airdrop using special use DZ lighting.

24.3.1.2. Phase 2: Enroute phase 2 pilots are authorized to fly single ship or formation at standard night VMC altitudes within a corridor 3 NM either side of centerline. Implementation of phase 2 requires MAJCOM/DO approval.

24.3.1.3. Phase 3: Enroute phase 3 pilots are authorized to fly single ship or formation on NVGs at night VMC altitudes no lower than 500 feet above the highest terrain feature / spot elevation, or 400 feet plus one contour interval above the highest depicted basic terrain contour, whichever is higher, within 3 NM either side of centerline. Segmenting legs is strongly encouraged. The crew must visually acquire and circumnavigate all man-made obstacles (towers, antennas, etc.) by a safe distance during flight. If obstacles are not visually acquired, climb to arrive at an altitude of 500 feet above the obstruction height 2 NMs prior to the obstruction. Implementation of phase 3 requires MAJCOM/DO approval.

24.3.2. NVG Airland.

NOTE: NVG enroute-qualified pilots that are not NVG airland qualified may use NVGs for ALZ/airfield acquisition. The pilot flying the approach and landing will remove NVGs no later than 10 minutes prior to landing. The PNF will remove NVGs as soon as the ALZ is acquired but no later than glideslope intercept.

NOTE: ALZ lighting patterns are IAW AFI 13-217.

24.3.2.1. Phase 1. Airland phase 1 pilots may perform takeoffs, approaches, landings, and taxi operations on NVGs at airfields or ALZs marked with standard overt/covert lighting patterns. Implementation of phase 1 requires MAJCOM/DO approval.

24.3.2.2. Phase 2. Airland phase 2 pilots may perform takeoffs, approaches, landings, and taxi operations on NVGs at unmarked ALZs. Implementation of phase 2 requires MAJCOM/DO approval.

24.4. Mission Planning. Pilots require one full day of planning is required for any missions employing NVGs in the low-level environment. Route selection and mission planning techniques and procedures should incorporate strategies for enroute climbs and descents to optimize night terrain usage for threat avoidance. A leg segment should not be less than 10 NMs in length to minimize unnecessary altitude changes.

24.4.1. Weather minimums are IAW this instruction and AFI 11-202V3. NVGs have inherent limitations which can further be reduced by poor weather conditions. Crews must seriously consider IMC conditions, moon illumination and position, sky glow at dawn and dusk, cultural lighting, and weapon/expendable effects when planning NVG operations.

24.4.2. The aircraft commander will ensure all aircrew members receive a pre-mission briefing specifically emphasizing NVG-related items.

24.5. Minimum Operational Equipment. The following equipment is required for NVG operations:

24.5.1. ANVIS-9 (F4949) NVGs that are HUD compatible (F4949G or L) mounted on a standard aircrew helmet. One spare set of NVGs per crew. Each crewmember must carry spare batteries for their own NVGs.

NOTE: All crewmembers will preflight their own NVGs prior to flight IAW **Figure 24.2.** The spare will also be pre-flighted.

24.5.2. All landing and taxi lights with infrared (IR) filters (airland only). ***EXCEPTION***: A maximum of one light between the four lights (landing and taxi) may be inoperative.

24.6. Aircraft/Aircrew Preparation. Aircraft will be configured for NVG operations prior to departure. In addition to the normal aircraft preflight, crewmembers may have specific tasks to prepare the aircraft for NVG missions. Refer to **Figure 24.1.** for specific NVG preparation steps. Additional equipment may be necessary to prepare the aircraft and crewmembers for missions that utilize NVG operations.

24.6.1. Aircraft Kit.

24.6.1.1. IR filters for landing lights (mandatory on all NVG missions).

24.6.1.2. Porthole covers.

24.6.1.3. Tape.

24.6.2. Aircrew Kit.

24.6.2.1. NVG-compatible flashlights.

24.6.2.2. Personal lip/finger lights (as desired).

24.6.2.3. Chem lights (as required).

24.7. NVG Donning/Doffing Procedures.

24.7.1. Donning and doffing of NVGs will be initiated by the aircraft commander through the use of the Combat Entry/Exit Checklist or as briefed. If in formation, donning and doffing times will be determined in the formation briefing. For non-NVG landings, cease NVG usage 5 minutes prior to landing to regain adequate night visual acuity. Generally, NVGs will be doffed during the Combat Exit Checklist.

NOTE: Crewmembers will take careful note of diopter settings during eyelane focusing. Rough handling may disrupt these settings during preflight. Ensure the correct diopter settings are checked during donning.

24.8. NVG Enroute Procedures.

24.8.1. Segmenting legs based on terrain and man-made obstacles is strongly encouraged. Route legs may be divided into segments (for next lower terrain-based altitude), depending on terrain differential or threats, in order to fly lower. NVG enroute phase 1 and 2 crews may descend to next lower altitude once the controlling obstacle for that segment is visually confirmed and the aircraft is at or past the obstacle. NVG enroute phase 3 crews may operate IAW paragraph **24.3.1.3.** when authorized by MAJCOM/DO.

24.9. NVG Airland Procedures. NVG airland operations include NVG takeoffs, approaches, landings, and ground operations on infrared-lighted ALZs and airfields.

24.9.1. Aircrew Requirements. Operations into IR-lit ALZs or airfields are authorized for NVG airland certified aircrews. Normal takeoff and landing emergency procedures will be thoroughly briefed, as well as actions to be taken in the event of NVG failure. See paragraph **24.14.** below for expanded guidance.

24.9.2. Takeoff and Landing Requirements. Use the airfield marking patterns IAW AFI 13-217 appropriate to runway conditions and the tactical situation.

24.9.2.1. The minimum runway required for takeoff is critical field length as computed by the mission computer or 3,500 feet, whichever is greater.

24.9.2.2. The minimum runway required for a 3/4 flap landing utilizing NVGs is landing distance as computed by the mission computer plus 500 ft or 3,500 feet, whichever is greater. The minimum runway required for full flap landings is ground roll as computed by the mission computer plus 1000 ft or 3,500 feet, whichever is greater.

24.9.3. Takeoff Procedures.

24.9.3.1. Both pilots will wear NVGs for takeoff.

24.9.3.2. Formation Operations. Minimum spacing for formation takeoff is 30 seconds.

24.9.4. Approach and Landing Procedures.

24.9.4.1. General. Both pilots will wear NVGs during approaches and landings. All crewmembers must place special emphasis on obstacle clearance, airspeed control, rate of descent, AGL altitude, and distance from the runway. IR-filtered landing lights must be used for landings.

24.9.4.2. Instrument Approaches. Use of NVGs is permitted during instrument approaches. However, use of NVGs in IMC is prohibited.

24.9.4.3. Visual Approaches. The primary method for accomplishing NVG landings is via a mission computer approach. Visual straight in approaches are a secondary method used only when a mission computer approach would not be feasible. Preflight route study and inflight chart reading is key for successful NVG visual approaches.

24.9.4.4. Formation Operations. Obtain spacing for landing prior to descending from enroute altitude.

24.9.5. Go-Around and Departure Procedures. Whether maneuvering for another approach or proceeding with the route, plan to fly no lower than operational requirements dictate, but no lower than enroute or pattern altitude.

CAUTION: Pilots are especially susceptible to spatial disorientation during NVG go-arounds and departures.

24.9.6. Ground Operations. Loadmasters will use NVGs during engine running offloads (EROs) and combat offloads if the mission dictates.

NOTE: Do not operate landing/taxi lights with IR filters for more than 5 minutes on the ground.

24.9.7. Setting Radar Altimeters. Radar altimeters should remain set at enroute altitude setting IAW the Combat Entry Checklist until the slowdown for airland maneuver. Once the Approach Checklist is initiated, the radar altimeter may be reset to assist in landing.

24.9.8. Weather requirements for NVG airland operations are IAW AFI 11-202V3, VFR minimums.

24.9.9. Touch-and-Go landings on NVGs are not authorized.

24.10. NVG Airdrop Procedures. NVG airdrop operations can include operations into unmarked drop zones. Mission requirements will dictate the release method used. Follow checklists and procedures in **Chapter 19** of this AFI.

24.10.1. Loadmasters will use NVGs during airdrops if the mission dictates. After the Combat Entry Checklist, all cargo compartment lighting will be switched to red lights. Loadmasters will carefully consider cargo compartment lighting intensity prior to opening ramp and door to minimize interference with formation wingmen's NVG vision.

24.10.2. Emergency Procedures. Aircrews will follow standard airdrop emergency procedures and checklists as described in **Chapter 19** of this AFI. Crews will review and coordinate NVG failure procedures for all phases of the mission. Refer to paragraph. **24.14.** for expanded guidance.

24.11. NVG Formation External Lighting Procedures. Light-out operations during peacetime must be conducted in warning or restricted areas IAW AFI 11-202V3. Use the following guidance for aircraft

exterior lighting configurations when operating outside of these areas. During combat/contingency operations, the tactical situation may dictate the use of all, some, or none of the aircraft exterior lights as determined by the mission commander.

WARNING: Immediately discontinue use of NVGs, and/or increase spacing from preceding aircraft (if possible), when exterior lights in a preceding aircraft create excessive distractions or degrade performance of NVGs to the point where safe flying operations cannot be maintained.

24.11.1. Exterior Lighting.

24.11.1.1. Navigation Lights: Steady, bright.

24.11.1.2. Formation Lights: On, medium (formation operations only).

24.11.1.3. Anti-Collision: On, lower (upper and lower for single ship operations or for the last aircraft in the formation unless it causes distractions).

24.12. NVG Inadvertent Weather Penetration Procedures. Undetected meteorological conditions represent one of the most dangerous conditions facing a crew using NVGs. The onset of 'scintillation', a loss of scene detail, or a change in the appearance of halos represent three of the best clues to the possibility of inadvertent weather penetration.

24.12.1. If IMC conditions are encountered, crews will cease NVG use until VMC conditions can be attained. If appropriate, execute Inadvertent Weather Penetration Procedures IAW **Chapter 18** of this instruction.

NOTE: NVGs may be used in SKE formations. However, use of NVGs in IMC is prohibited.

24.13. NVG Rejoin Procedures. NVG formation rejoins will be IAW **Chapter 18** of this instruction. Formation rejoin altitude will be no lower than MSA. Coordinate for exterior lighting and/or SKE procedures as required.

24.14. NVG Emergency Procedures. The PNF must be ready to immediately assume aircraft control if the PF experiences spatial disorientation or an NVG malfunction.

24.14.1. Enroute Flight through Completion of Slowdown.

24.14.1.1. Single-ship or formation lead. For enroute phase 2 operations, if either pilot's NVGs become inoperative, maintain or initiate an immediate climb to at least MSA, transfer aircraft control to the other pilot if appropriate, and transition to a spare set. Phase 1operations may continue the mission without climbing to MSA.

24.14.1.2. Formation wingmen. Maintain formation position if able. Transfer aircraft control if appropriate and transition to a spare set of NVGs. Maintain enroute spacing from other aircraft in the formation and MSA (as a minimum) until the problem is resolved and continued safe low-level operations can be ensured. If the difficulty cannot be corrected, exit the formation, notify lead, and climb to the MSA.

24.14.2. Slowdown through Escape (airdrop crews only).

24.14.2.1. Single-ship and formation lead. If either pilot's NVGs become inoperative, continuing the airdrop will be at the aircraft commander's discretion. As a guide, if the DZ is in sight and CARP alignment has been confirmed between the PF and the PNF, the airdrop may be continued.

24.14.2.2. Formation wingmen. Maintain formation position if able.. Notify lead when appropriate. Transfer aircraft control if appropriate and transition to a spare set. Maintain drop spacing from other aircraft in the formation and MSA (as a minimum) until the problem is resolved and continued safe low-level operations can be ensured. If the difficulty cannot be corrected, exit the formation, execute a no-drop, and initiate a climb to at least MSA.

24.14.3. NVG Takeoff, Approach and Landing. During an NVG takeoff, if the PF experiences NVG failure takeoff may be continued at the discretion of the aircraft commander; otherwise an abort will be initiated. If NVG malfunctions occur after refusal speed, takeoff will be continued with the other pilot assuming control of the aircraft if necessary. If either pilot's NVGs fail after takeoff, continue the climbout and follow the appropriate procedures for loss of NVGs. Strong consideration should be given to continuing flight on autopilot. If the pilot or copilot experience NVG failure or other malfunctions occur prior to touchdown, perform a go-around. If the PF's NVGs fail during or after touchdown, transfer control to the PNF for the landing rollout.

24.14.4. The PNF should be ready to assume aircraft control at any time during takeoff or landing as necessary.

24.15. Aircraft Preparation Checklist . Use **Figure 24.1.** The cockpit of the C-17A is specifically designed for NVG operations and little preparation is required for flights requiring NVGs. During exterior walk around inspection, a pilot will ensure all wheel well inspection lights are turned off. Spare pieces of tape will be available at each crew station for sealing light leaks and providing additional masking on incompatible lights. Loadmasters will follow applicable items in **Figure 24.1.** to prepare the aircraft for NVG flight.

Figure 24.1. Aircraft Preparation Checklist.

Loadmaster Aircraft Preparation Checklist. The following checklist identifies items which should be accomplished prior to NVG flight. Complete the required items on the checklist before departing home or TDY station or as mission requirements dictate.

NOTE: Taping over items may require two to three layers of tape. The use of mini-chemical lights or tape to mark/identify switches and/or equipment may be used as required.

1. External Power Panel Light Switches – OFF
2. SATCOM Pre-Amp Indicator Light – Taped (a maintenance stand will be required to tape light)
3. Fuselage station 880 left side blackbox indicator light – Taped
4. Cargo Compartment Underfloor Light – OFF
NOTE: Ensure all other maintenance inspection lights (under flight deck) are off.
5. Cargo Floor Anti Skid – Checked
Check condition of cargo floor anti skid and replace as required.
6. Cargo Compartment Landing Gear Inspection Windows – Taped
Accomplish the following when it is necessary to perform blacked-out operations in the cargo compartment. These items must be completed prior to the Combat Entry Checklist.
7. Lavatory Light – Off

8. Forward Loadmaster Station – Set
    1. CARGO COMPARTMENT LIGHTS
       Ensure FWD AISLE, PANEL, DIGIT/LCD, FLOOD (PANEL) lights are off.
    2. ANNUNCIATORS
       Set ANN BRT/DIM switch to DIM, and tape over JUMP and DOOR/STATUS annunciator panels.
    3. P.A. Panel – Tape over
    4. AGILE PMA/PRINTER – Shut down and turn off AGILE PMA, and turn off printer.
9. Galley - Set
    1. Turn light switch off and pull open circuit breaker for light.
    2. Tape over all indicator lights or unscrew light bulbs and store in galley.
10. Aft Loadmaster Station Left Side – Set
    1. LIGHTS – Ensure STAGING, PANEL, and PANEL FLOOD lights are off.
    2. ANNUNCIATORS – Set ANN BRT/DIM switch to DIM and tape over ELEC PWR, HYD PWR, CARGO DOOR and RAMP, TROOP DOOR, and TROOP ARM/DISARM annunciators.
    3. P.A. Panel – Tape over.
11. Aft Loadmaster Station Right Side – Set
    1. ANNUNCIATORS – Tape over TROOP DOOR annunciators.
12. Cargo Compartment Porthole covers – Installed
13. Chem Lights – Positioned and taped
    1. Emergency Exit Handles – Tape one mini-chem light next to each Emergency Exit operating handle leaving a small amount of light showing.
    2. Winch compartment – Insert mini chem light(s) in winch compartment if it is to be used
    3. Lavatory – Place large chem light(s) in lavatory
    4. RAMP BLOWDOWN Switches – (If desired for emergency exit) tape one mini chem light to each switch.
    5. LM FEDS ARM Switch – Tape one mini chem light to switch (overwater flights only)
    6. LM FEDS Initiator Handle – Tape one mini chem light to handle (overwater flights only)
    7. Ditching Ladder Release Handle – Tape one mini chem light to each handle (overwater flights only)

Figure 24.2. AN/AVS-9 NVG Adjustment Procedures.

The verbiage below is intended for review purposes only. Personnel should consult an NVG instructor or Life Support personnel for detailed instructions on focusing and adjusting of AN/AVS-9 NVGs.

NOTE: Proper focusing is critical to ensure safe and effective use of NVGs. Improper focusing may lead to headaches, dizziness, and loss of visual acuity.

1. Inspect Helmet
2. Inspect Mount
   a. Inspect for cracks, wear and tear, and integrity of wiring
3. Inspect Binocular Assembly 3.
4. Inspect and Clean Lenses
   a. Clean lens only with appropriate lens paper
5. Set Diopter to Zero
6. Adjust Eye Relief
   a. Initially set the binocular assembly as far forward as possible. Further adjustment will take place during focusing.
7. Center Tilt
8. Set Inter Pupillary Distance (IPD)
9. Adjust Vertical
10. Don Helmet
11. Attach Binocular Assembly and tilt assembly in front of eyes
    a. There should not be any need to exert excessive force. Check with life support personnel if excessive force is required.
12. Adjust Vertical of Binocular Assembly
    a. The binocular assembly should be located directly in front of eyes.
13. Adjust Tilt
    a. The optical axis of the assembly should be directly aligned with your visual axis.
14. Adjust Eye to Binocular Assembly
    a. Assembly should be positioned to maximize the field of view without reducing the ability to see underneath NVGs.
    b. Ensure the assembly is not so close to the face that the lens contacts spectacles or eyelashes.
15. IPD Adjustment
    a. Close one eye and center the image in front of opposite eye. Repeat for opposite eye. With both eyes open the two images should overlap to form a single image.
16. Evaluate Image
    a. There should be no shading of any of image. Eliminate any shading by making adjustments in the direction of shading.
17. Initial Objective Focus
    a. With one eye closed, turn the objective focus (outer ring) of the opposite tube while viewing a coarse grid of the NVG eye lane chart or testing device.
    b. Bring the lines into the sharpest focus possible.

18. Diopter Focus
    a. Turn diopter focus ring (inner ring) to the left (counter-clockwise) until the image is blurred. Allow your eye to relax, then turn diopter adjustment ring clockwise until the image just becomes sharp again. Note this diopter setting and use this setting (for that specific set of NVGs) while in the aircraft. Perform same step for other eye.

NOTE: The importance of performing step #18 correctly cannot be overemphasized. Proper focusing of the NVGs is the single most important step in using NVGs correctly. Performed incorrectly, diopter focus can result in eyestrain, eye fatigue and headaches resulting in a loss of NVG efficiency.

19. Re-adjustment of Objective Focus (outer ring)19.
    a. Focus the objective for each eye to view as many lines on eye lane chart as possible. It may be necessary to repeat steps 17, 18 and 19 in an iterative process to achieve the sharpest possible image.
20. Evaluate Visual Acuity
    a. Ensure that the image obtained with both eyes is at least as good as it is with any single eye.
21. Evaluate Image Quality
    a. Be alert for any of the following degradations to image quality. Obtain another set of NVGs if any serious degradation to image quality exists.
        1. Shading
        2. Edge Glow
        3. Bright Spots
        4. Dark Spots
        5. Honeycomb
        6. Distortion
        7. Flicker
        8. Veiling Glare
        9. Scintillation
22. Note final adjustment settings (especially diopter settings)
23. At Aircraft
    a. Confirm Diopter settings
    b. Focus NVGs at Optical Infinity- In the eyelane, the NVG was adjusted to a 20 ft viewing distance. Once at the aircraft, the NVG should be re-focused to infinity.
    c. Choose an object in the distance (at least 150 ft away) and re-adjust the objective (outer) ring to obtain the sharpest possible image. When possible, choose an object with clearly delineated horizontal and vertical lines.

NOTE: DO NOT readjustment the diopter settings.

Chapter 25

NAVAL EMERGENCY AIR CARGO DELIVERY SYSTEM (NEACDS)

25.1. General. NEACDS is designed for C-17 aircraft to airdrop emergency supplies to ships at sea.

25.2. NEACDS Operational Requirements.

25.2.1. C-17 crews will, as a minimum:

25.2.1.1. Carry Navy Numerical Code (AMCS 608 NUCO) encode and decode tables and Navy voice call sign listing (AKAI 16 VSCL). Additional terms/codes are found in Joint Command Manual 55-200, AFR 3-16, and JCS Pub 1.

25.2.1.2. Carry binoculars to aid in ship recognition.

25.2.1.3. Carry operational brevity codes contained in Attachment 2 of this chapter.

25.2.2. Drop Zone (DZ). DZ selection, criteria, and markings for airdrop to land targets are not applicable for NEACDS. The target ship determines the DZ axis and point of impact (PI). Drop axis allows for downwind drop based on surface winds. The PI is determined on ship recovery capabilities but in no case will be closer than 500 yards abeam and 1,000 yards beyond target ship.

25.2.3. Restrictions include: radar altimeter must be operational prior to departure. If the objective area altimeter setting is unreliable or unavailable and the radar altimeter fails, the mission will be aborted. Radar must be operational prior to departure. Minimum drop altitudes are in accordance with AFI 11-231. Do not perform airdrops more than 1500 feet above ground level.

25.2.4. Prohibited operations: Multiple platform drops. (Airdrops of more than one platform or bundle per pass.), Overflight of ships with doors open, and formation drops.

25.3. Mission Planning.

25.3.1. Obtain the following information: Load configuration (number of loads, type load, load weight, and type parachutes); Drop altitude and airspeed; Forecast weather en route and in the objective area (includes cloud coverage and surface winds); Estimated drop axis; Rendezvous time; Minimum loiter time (loiter does not include search time); Maximum loiter time; Estimated ship's position at rendezvous time; Ship's state at rendezvous time (stationary or underway); Ship's description (call sign, type of ship, hull number, and photograph); Radio frequencies available (primary and secondary).

25.3.2. Use the fuel planning section, blocks 1 through 13, on AF Form 4081, **Flight Plan and Record**.

25.3.3. Fuel requirements. Complete AF Form 4081 except as follows:

25.3.3.1. Item 1. Time and fuel from takeoff to overhead the target ship.

25.3.3.2. Item 4. Use 20 minutes and 2,000 pounds of fuel.

25.3.3.3. Item 5 (loiter). Provide time between airdrops for ship retrieval efforts. Unless more time is specified, plan 30 minutes for the initial drop and for subsequent drops. For planning purposes, initial loiter begins 20 NM at 4,000 feet and includes the remaining descent and low-level

flight, orbit, and drop. Consider the rendezvous point the departure point for the climb after red light and return to destination segment. Use 18,000 pounds per hour for all low-level operations.

25.3.3.4. Item 8. Plan the return flight at 250 knots calibrated air speed (KCAS) in the event the aircraft must return in a nonstandard configuration. Plan the return at the highest cruise altitude for unpressurized light not to exceed flight level (FL) 250. Plan using the INTEGRATED TIME chart. Increase fuel using a drag index of 80 and use the correction factor and use the correction factor in Section 5 of T.O. 1C-17A-1-1.

25.3.3.5. Item 9. Compute the reserve using the method described for item 8.

25.3.3.6. Item 21. Plan the search using 18,000 pounds per hour.

25.4. Search Procedures.

25.4.1. General. Preplan search procedures because the ship's position may be unreliable. Available fuel determines the size and type of search pattern. These procedures and patterns are recommended based upon the following:

25.4.1.1. Limited fuel is available for search.

25.4.1.2. Navigation error has caused the ship or aircraft position to be unreliable.

25.4.1.3. The ship's position is close to the preplanned or best known position and the search area is not extensive.

25.4.1.4. The probability of ship position error is equidistant around the best known position.

25.4.1.5. Airborne radar is available to augment visual sighting efforts.

25.4.2. Planning. Use common sense to determine the fuel carried for search, i.e., distance to ship, navigation aids, available radar, and navigational aids aboard the ship to assist in acquisition, side of ship, etc. The maximum fuel allowable should be carried on long-range missions where ship acquisition may be difficult. Use the pattern best suited to the mission situation.

25.4.2.1. Determine search endurance (t) by subtracting total fuel requirements from ramp fuel. Convert this fuel to time by using 18,000 pounds per hour fuel flow (item 21 on AF Form 4081).

25.4.2.2. Determine search distance (d) by using the formula "d=(t)(TAS)." Plan search at 230 KCAS. Use this distance in planning the search pattern.

25.4.2.3. Turns. Navigation is simplified and complete coverage of the search area is enhanced by making the turns as accurately and uniformly as possible. To ensure accurate turns to rollout on the next course on centerline, initiate the turn at given distance prior to the end of the leg. The following information shows a simple procedure to plan these turns. All turns will be 90 degrees at 20 degrees of bank.

25.4.2.3.1. TAS:

25.4.2.3.1.1. 210 KTAS - 1.9 NM/leg distance/turn.

25.4.2.3.1.2. 230 KTAS - 2.3 NM/leg distance/turn.

25.4.2.3.1.3. 250 KTAS - 2.6 NM/leg distance/turn.

25.4.2.3.2. Example: 230 KTAS.

25.4.2.3.2.1. First leg is 10 NM, start turn 10 NM - 2.3 NM = 7.7 NM on the leg.

25.4.2.3.2.2. Second leg is 10 NM, start turn 10 NM - 4.6 NM = 5.4 NM wings level on course.

25.4.2.3.2.3. Third leg is 20 NM, start turn 20 NM - 4.6 NM = 15.4 NM wings level on course.

25.4.2.4. Expanding square pattern (ss) (see **Figure 25.1.**, Expanding Square). This is the recommended pattern for a stationary target. It is a series of search legs which expand outward forming a square pattern. The first and second legs are equal in length to track spacing. Fly the legs using right angle ground tracks. Fly the initial leg on the ship's reported or best known axis. When it is known the ship is stationary, plan for upwind, downwind, and crosswind legs to minimize navigational error. Normally, all turns are to the left and standard rate.

25.4.2.5. Creeping Line Pattern (see **Figure 25.2.**, Creeping Line). This pattern is good for use if the target ship is underway. **S** is determined in the same manner as in the **ss** pattern. Determines distance on either side of the objectives intended track (OIT) based on the simulation of the reliability of the aircraft's and ship's estimated position.

Figure 25.1. Expanding Square.

NOTE: To be used when last known position/most probable position (MPP) is fairly well known.

S = Track Spacing = 2d

d = Visual Detection Range

NOTE: Visual dection range is a function of sea condition, weather, terrain characterisrics, time of day, signal aids of distressed aircraft, type of object searching for , etc.

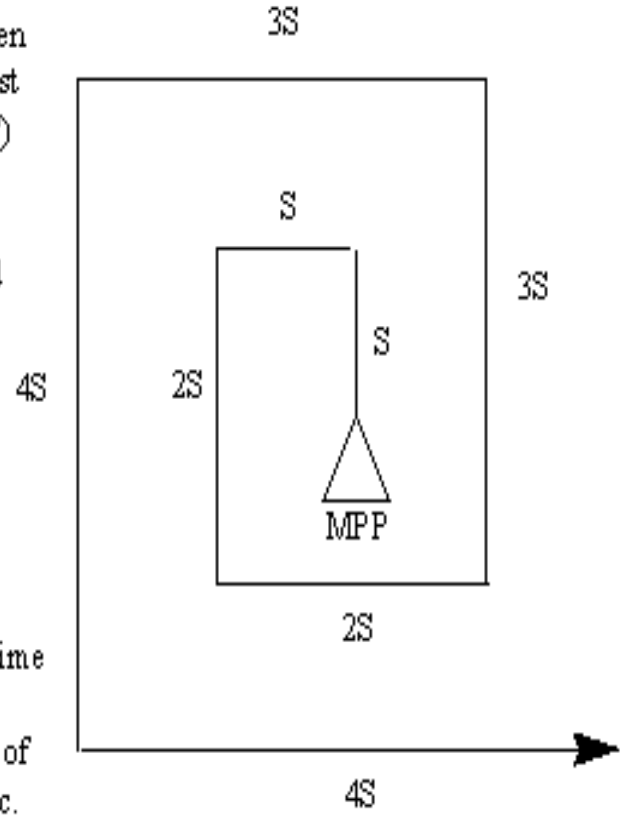
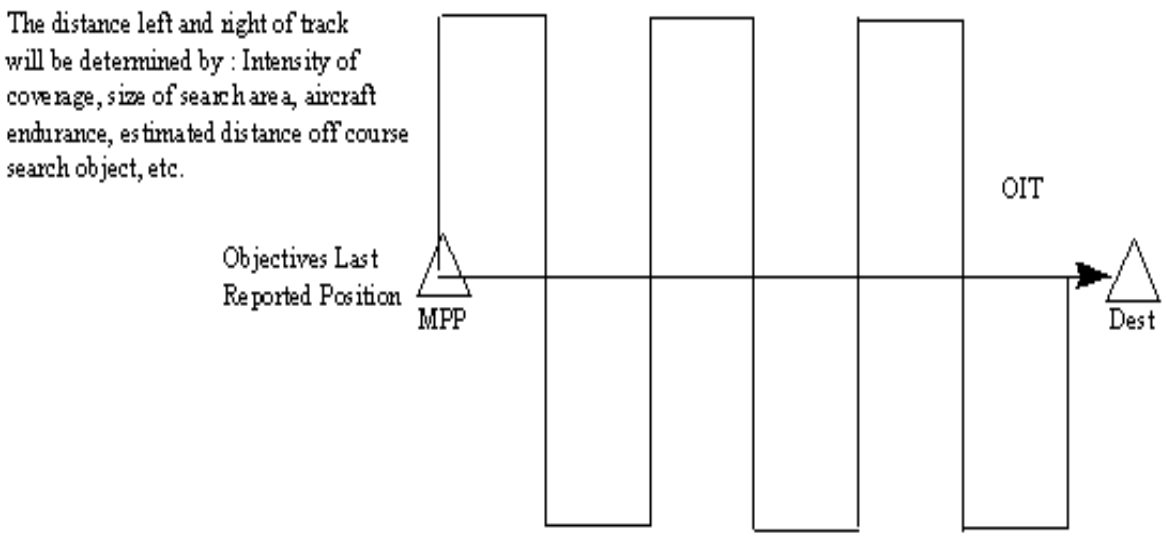


Figure 25.2. Creeping Line Pattern.



25.5. Procedures.

25.5.1. En Route. (See **Figure 25.3.**, NEACDS En Route Profile).

25.5.1.1. Fly to the objective area as planned. The planned time over target (TOT) is the actual rendezvous time plus approximately 6 minutes.

25.5.1.2. Entering the objective area, obtain an air traffic control (ATC) descent clearance, attempt radio contact with the ship, and navigate to the target ship's position using all available aids (**Figure 25.3.**).

25.5.1.3. Initiate an en route descent to be level at 4000 feet, 20 NM from the ship (**Figure 25.3.**). Establish radio contact with the ship as soon as possible and exchange airdrop data using the NEACDS Radio Worksheet (**Attachment 1**). En route descent may be made without radio contact with the ship.

25.5.1.4. Level off at 4,000 feet and proceed inbound to the ship's position at 230 KCAS, or as briefed. If radio contact has been made, request radar vectors if available. Base descent below 4,000 feet on availability of NAVAIDs, an accurate altimeter setting, radar altimeter, visibility, and positive contact with the ship. Descent to 3,000 feet is recommended for search. Do not descend below 1500 feet without positive contact (e.g., visual, radar, or TACAN).

25.5.1.5. Plan further descent and slowdown (approximately 10 NM out) to be level at drop altitude and airspeed (150 KCAS) abeam the ship (**Figure 25.3.**). Maneuver to pass 500 yards (or briefed lateral offset distance) right (starboard) of the ship on the downwind heading (drop axis). On the initial run-in, verify the heading required to parallel the ship's course. Complete all checklists through the 10-minute checklist prior to rendezvous; delay completion of the slowdown checklist until after rendezvous.

25.5.2. Objective Area. Use drop procedures in **Chapter 16**, **Chapter 17**, **Chapter 18**, and **Chapter 19**, with the following procedures. (See **Figure 25.3.** and **Figure 25.4.**)

25.5.2.1. Visual meteorological conditions (VMC) procedures. Passing abeam the ship at drop altitude and airspeed, enter a 6-minute left racetrack using 20 degrees of bank and maintain visual contact with the ship (See **Figure 25.4.** and**Figure 25.5.**). If, in VMC, radio contact cannot be established, the ship signals clearance to drop with a green light from the bridge. A red light signal implies a no-drop condition and the aircraft should continue to orbit.

25.5.2.2. Instrument meteorological condition (IMC) procedures. If unable to obtain VMC, proceed to the ship's position using all available aids. The ship may provide radar vectors upon request. Cross-check all available information to positively identify the ship. If IMC, abeam the ship on the initial pass, enter an extended racetrack, and prepare for an IMC delivery. Fly the upwind leg on the reciprocal of the ship's reported track.

25.5.2.3. Station keeping equipment/zone marker (SKE/ZM). SKE aircraft use standard SKE procedures. If a zone marker is available, confirm ZM location during initial contact.

25.5.2.4. Non-SKE/ZM. Aircraft not equipped with SKE (SKE inoperative) proceed to the ship using TACAN, airborne radar with fan beam, or shipboard radar, and enter an extended racetrack that allows a 10-15 NM final approach leg. Request ship radar assistance in turning to and aligning on DZ centerline, at least 500 yards right of the ship's reported track. Use airborne radar for final DZ alignment and start timing when radar shows abeam the bow of the ship.

25.5.3. Airdrop. (See figure 25.6., NEACDS Airdrop).

25.5.3.1. Determine the computer air release point (CARP} in accordance with AMCR 55-40. The PI will be determined by the target ship, but no closer than 500 yards (approximately 1/4 NM abeam, and 1,000 yards forward of the ship's bow. However, on the final run-in, the aircraft will fly no closer than 500 yards abeam the ship; adjust the PI if necessary.

25.5.3.2. The aircrew receives final drop clearance and wind update 1 minute prior to drop. Navy ships cannot provide mean effective wind information. There are no altitude wind restrictions. Maximum surface winds are at the discretion of the target ship. The target ship determines acceptability of sea conditions and surface wind for load recovery. Should any factor in the surface environment present a hazard to the operation, the ship will call or signal a no-drop.

25.5.3.3. Timing to the CARP begins abeam the bow of the ship; in no case will the release be made prior to passing the bow of the ship. Adjust the PI if necessary. Usable DZ length is 10 seconds or as briefed.

25.5.3.4. Multiple passes. The planned minimum time between heavy equipment drops is 30 minutes. Make every attempt to plan racetracks to maintain visual contact with the target ship.

25.5.3.5. Post-drop procedures are standard.

WARNING: Pay close attention to fuel requirements. Depart the objective area with sufficient fuel remaining to arrive at destination with required reserves.

Figure 25.3. NEACDS En Route Profile

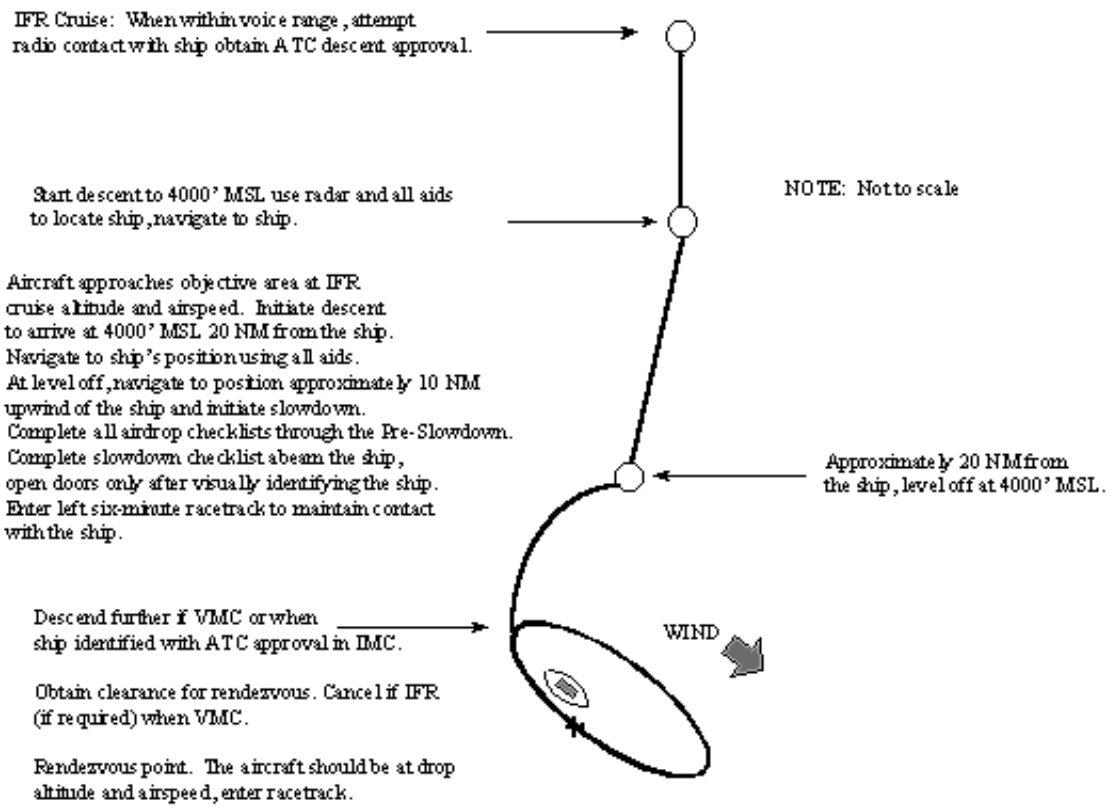


Figure 25.4. Time from Rendezvous to First Turn.

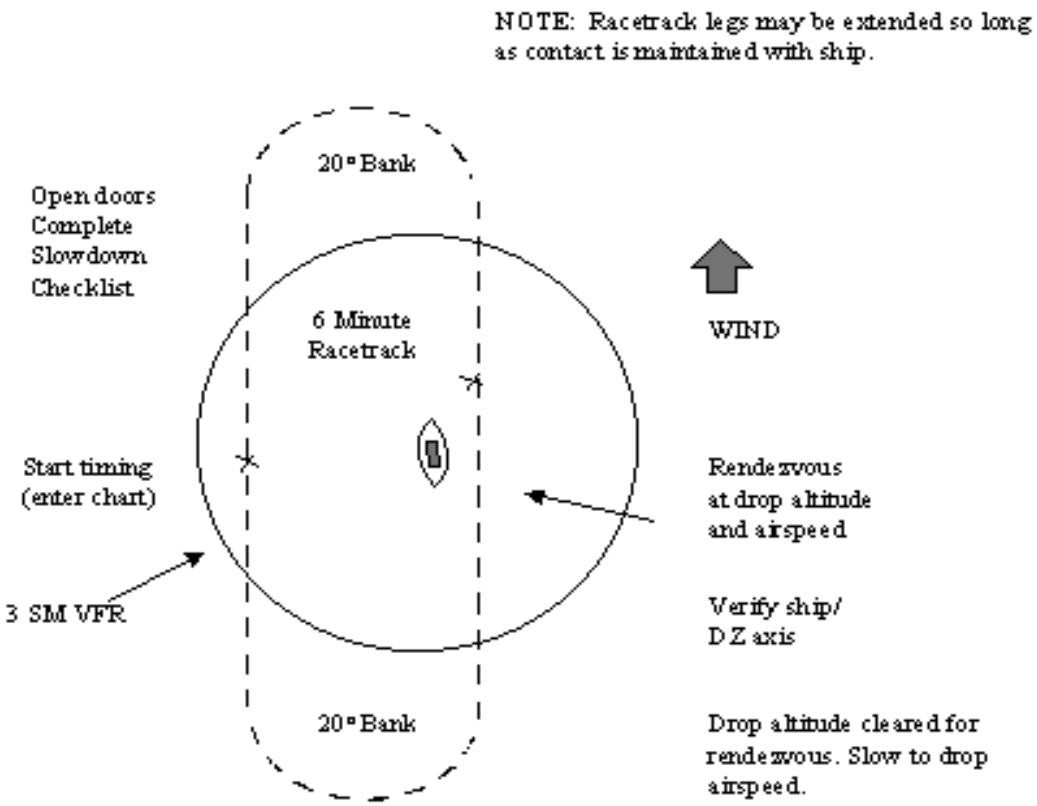


Table 25.1. Average Groupspeed - Rendezvous to First Turn.

135	140	145	150	155	160	165	170	175	180	185	190
57	55	53	51	49	48	46	45	44	43	41	40

Table 25.2. Time Abeam Ship to Turn Inbound/Outbound Groundspeed.

	115	120	125	130	135	140	145	150	155	160	165	170
2:00	30	29	28	28	27	26	25	24	24	23	22	21
2:10	36	35	34	33	32	31	31	30	29	28	27	26
2:20	42	41	40	39	38	37	36	35	34	32	31	30
2:30	49	47	46	45	44	42	41	40	38	37	36	35
2:40	55	53	52	51	49	48	46	45	43	42	41	39
2:50	1:01	1:00	58	56	55	53	52	50	48	47	45	44
3:00	1:07	1:06	1:04	1:02	1:00	59	57	55	53	52	50	48

3:10	1:14	1:12	1:10	1:08	1:06	1:04	1:02	1:00	58	56	54	52
3:20	1:20	1:18	1:16	1:14	1:12	1:09	1:07	1:05	1:03	1:01	59	57
3:30	1:26	1:24	1:22	1:19	1:17	1:15	1:13	1:10	1:08	1:06	1:04	1:01
3:40	1:32	1:30	1:28	1:25	1:23	1:20	1:18	1:15	1:13	1:11	1:08	1:06
3:50	1:39	1:36	1:33	1:31	1:28	1:26	1:23	1:21	1:18	1:15	1:13	1:10
4:00	1:45	1:42	1:39	1:37	1:34	1:31	1:28	1:26	1:23	1:20	1:17	1:15
4:10	1:51	1:48	1:45	1:42	1:39	1:37	1:34	1:31	1:28	1:25	1:22	1:19
4:20	1:57	1:54	1:51	1:48	1:45	1:42	1:39	1:36	1:33	1:30	1:27	1:24
4:30	2:04	2:00	1:57	1:54	1:51	1:47	1:44	1:41	1:38	1:34	1:31	1:28
4:50	2:16	2:13	2:09	2:05	2:02	1:58	1:55	1:51	1:48	1:44	1:40	1:37
5:00	2:22	2:19	2:15	2:11	2:07	2:04	2:00	1:56	1:53	1:49	1:45	1:41

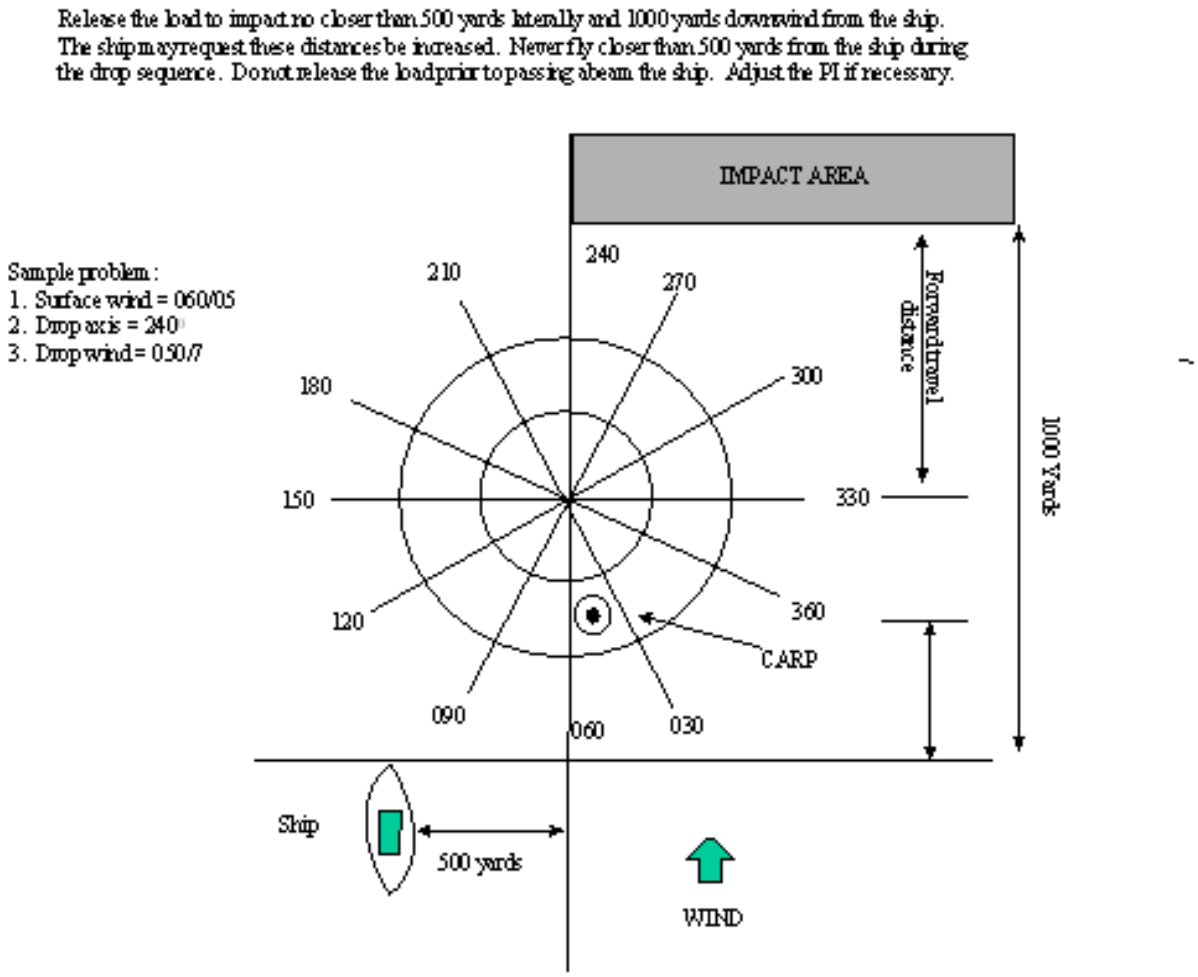
NOTES:

Charts assume ship is stationary.

Abeam ship on initial pass (rendezvous), start stop watch and enter top chart with average groundspeed from rendezvous to first turn.

Abeam ship on reciprocal heading, start watch and note time remaining to CARP. Enter groundspeed and time-to-CARP to determine timing to initiation of turn inbound to ship.

Figure 25.5. NEACDS CARP



25.6. NEACDS Radio Worksheet.

25.6.1. Contact the target ship on the briefed frequency and relay Section II data; ship replies with Section III data. Information that is classified will be controlled according to DOD 5200.1R and AFR 205-1 Users should insure appropriate classification markings and annotate proper downgrading instructions when using classified information in conjunction with the NEACDS radio worksheet.

25.6.2. Prebriefed Items (Sample data).

1.Airdrop data: **7350** pounds on **4** platforms, **4** passes.

Drop altitude **600** feet absolute;

Drop airspeed **150** knots (KCAS);

Estimated drop axis **230** degrees true;

Point of impact: **600** yards starboard, **1200** yards past ship's bow.

Estimated barometric pressure: **30.23** inches.

Zone marker location: **1200** yards short **600** yards left.

1.Rendezvous time **1620Z** ; minimum loiter time **3.2** .

2.Rendezvous **3657.4N** ; **9120.5W** .

Ship speed **6** Knots, direction **225** degrees true at rendezvous.

1.Ship's description: Call Sign **TUB 2** . Hull number **PT-109** .

Type ship **battleship** (superstructure description).

1.Aircraft description: Call sign **LIFTR 61** . Type aircraft **C-17** .

2.Radio frequencies: UHF **343.1** (primary) **234.2** (secondary);

VHF **133.75** (primary) **128.25** (secondary);

HF **8990** (primary) **12345** (secondary);

1.Navaid frequencies:

TACAN Channel **29** , ADF Frequency **341** .

Status of shipboard radars, UHF/DF, IFF, etc.

25.6.3. Section II Aircraft Transmission (Sample Data)

1.(Target ship) **TUB 2** , this is (aircraft) **LIFTR 61** on frequency **133.75** .

(After ship acknowledges, transmit the following message).

1.(Target ship) **TUB 2** , this (aircraft) **LIFTR 61** .

Estimate rendezvous at **1619Z** .

Squawking IFF Mode **3/A** , Code **3470** .

Current **100NM** (true direction) from the rendezvous point at **180 degrees** (true direction) from the rendezvous point at **FL 140** (altitude).

1.(Revision of prebriefing data; special instructions).

2.Request clearance for rendezvous.

25.6.4. Ship Transmission (Sample data).

(Aircraft) **LIFTR 61** , this is (target ship) **TUB 2** , we copy all.

1.Revision of prebriefed data. NOTE: Confirm ZM/location for IMC drop.

2.Target area data: Barometric pressure **30.22** inches; surface wind **220** degrees true at **11** knots; drop axis **225** degrees true. Temperature **23 degrees C** .

3.(Other information to include encoded position, course, and speed).

After positive contact and confirmation of position information,

1.Steer **050** degrees true to our position.

2.Cleared for rendezvous at drop altitude.

25.7. Operational Brevity Codes are Table 25.1. -(Extracted from ACP 65).

Table 25.3. Operational Brevity Codes.

WORD	MEANING
ANGELS _____	Height of friendly aircraft in thousands of feet or fly (am flying at) height indicated in thousands of feet, e.g., ANGELS TEN (10,000 feet). If other than whole thousands of feet are required, hundreds will be expressed as tenths of one thousand feet separated by the word POINT, e.g., ANGELS TWO POINT FIVE (2,500 feet). ANGELS POINT NINE (900 feet).
BINGO	Proceed or proceeding to alternate or specified field or carrier. (Not home field or carrier).
BINGO FIELD	Alternate airfield.
BINGO STATE	Amount of fuel plus designated reserve necessary to proceed to alternate airfield.
BOWWAVE	Long form weather report giving:
(see also VAT "B")	B – Below or Base of cloud in thousands of feet. If below one thousand feet use hundreds of feet but add the word "hundred." O – Over or Top of cloud level in thousands of feet. If unknown use the word "unknown." NOTE: If there is more than one cloud layer, report the base and top of the lower formation, followed by the base and top of progressively higher layers (e.g., "two, twelve, seventeen, twenty-five.") W – Wind (8 points, N, NE, E, SE, S, SW, W, NW) plus the velocity in knots. When wind is missing, omit or use the word "unknown." W – Weather. General description of weather in plain language; such as clear, partly cloudy, cloudy, overcast, light, moderate or heavy rain, mist, haze, thunderstorm, and distant lightning. Amplification of the weather should be made at the end of the report under "E." A – Amount of clouds in tenths. V – Visibility in miles. Use a fraction if less than one mile. E – Extra phenomena of significance such as turbulence, icing, heavy sea or swell, and description of front. This is an elaboration of the report which includes anything of interest I plain and concise language.
BUSTER	Fly at maximum continuous speed (power).
CANDLES	Night illumination devices.
CHECK PORT/LEFT ____	Alter heading ____ degrees to left momentarily for airborne radar search and then resume heading.

CHECK STBD/RIGHT ____	Alter heading ____ degrees to right momentarily for airborne radar search and then resume heading.
COWBOY(S)	Ship(s) of Surface Attack Unit (Normally destroyer class).
EVERGREEN	Dye marker showing in water.
FAMISHED	Have you any instructions or information for me?
FREAK	Frequency in MHz.
FREDDIE	Controlling unit for aircraft.
FREELANCE	Self control of aircraft is being employed or operate under self control.
GATE	Fly at maximum speed (or power). (To be maintained for a limited time only, depending on type of aircraft. Use of afterburner, rockets, etc., in accordance with local doctrine).
GOODYEAR	Liferaft. (Followed by number of survivors.)
HOMEPLATE	Home airfield or home carrier.
HOOKER	Fishing or other small craft.
IN THE DARK	Not visible on my scope and any position information is estimated.
LINER	Fly at speed giving maximum cruising range.
ORANGES SOUR	Weather is unsuitable for aircraft mission.
ORANGES SWEET	Weather is suitable for aircraft mission.
OUTHOUSE	My position in true bearing or miles from my reference point (assigned station).
PARROT	A military identication, friend or foe (IFF) transponder.
PIGEONS_____	The magnetic bearing and distance of HOMEPLATE (or unit indicated) from you is ___ degrees ___ miles.
POPEYE	In clouds or area of reduced visibility.
REDHEAD	Pulsating red light.
SAUNTER	Fly at best endurance.
SUNLAMP	Submarine Provide UHF homing signal by transmitting a steady 10-second hum on UHF once each minute. Aircraft--home on signal using UHF homing equipment.
VAT "B"	Short form weather report giving:
(see also BOWWAVE)	V - Visibility in miles. A - Amount of clouds in tenths. T - Height of cloud top, in thousands of feet. B - Height of cloud base, in thousands of feet.

25.8. Forms Prescribed. AF Form 4114, **C-17 Nuclear Load Planning Worksheet.**

MARVIN R. ESMOND, Lt General, USAF
DCS, Air and Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFI 10-1101, *Operations Security*

AFI 10-403, *Deployment Planning*

AFI 10-801, *Assistance To Civilian Law Enforcement Agencies*

AFI 11-202V3, *General Flight Rules*

AFI 11-209, *Air Force Participation in Aerial Events*

AFI 11-214, *Aircrew and Weapons Director Procedures for Air Operations*

AFI 11-215, *Flight Manuals Program*

AFI 11-218, *Aircraft Operation and Movement on The Ground*

AFI 11-221, *Air Refueling Management*

AFI 11-231,*Computed Air Release Point Procedures*

AFI 11-299, *Nuclear Airlift Operations*

AFI 11-2C-17V1, *C-17 Aircrew Training*

AFI 11-301, *Aircrew Life Support (AlS) Program*

AFI 11-401, *Flight Management*

AFI 11-403, *Aerospace Physiological Training Program*

AFI 13-207, *Preventing and Resisting Piracy*

AFI 13-212V1, *Weapons Ranges*

AFI 13-217, *Assault Zone Procedures*

AFI 21-101, *Maintenance Operations and Management Policy*

AFI 23-202, *Buying Petroleum Products and Other Supplies and Services Off-Station*

AFI 31-101V1, *Air Force Physical Security Program*

AFI 31-207, *Arming and Use of Force by Air Force Personnel*

AFI 31-401, *Information Security Management Program Management*

AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*

AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel*

AFI 37-124, *The Information Collections and Reports Management Program: Controlling Internal, Public, and Interagency Air Force Information Collections*

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AFM 3-4, *Tactical Air Operations-Tactical Airlift*

AFP 102-2V1, *Joint Users Handbook - US Message Text Formats*

AFPD 11-2, *Aircraft Rules and Procedures*

AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*

AFPD 10-9, *Lead Operating Command Weapon Systems Management*

AFPD 10-21, *Air Mobility Lead Command Roles and Responsibilities*

AFTTP 3-1V1 (S): *General Planning and Employment Considerations*

AFTTP 3-1V2 (S): *Threat Reference Guide and Countertactics*

AMCI 11-208, *Tanker/Airlift Operations*

AMCI 11-301, *Aircrew Life Support (ALS) Program*

AMCMAN 11-211 (S): *Tactical Employment*: C-5, C-17, and C-141 (to be replaced by AFTTP 3-1V35 (S), *Tactical Employment – C-5, C-17, C-141*)

AMCR 28-2, *Contingency Planning Policies and Procedures*

AMCR 3-2V2 (S): *Threat Environment Concepts*

FLIP *DoD Flight Information Publication*

FM 101-5-1: *Operational Terms and Symbols*

JCS Pub 1-02: *DoD Dictionary of Military and Associated Terms*

T.O. 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*

T.O. 00-25-172 Volume 2, *Weapons Range Management*

T.O. 00-25-172 Volume 3, *Hazardous Methodology and Weapon Safety Footprint*

Abbreviations and Acronyms

A/C—Aircraft

ACM—Additional Crew Member

AD—Airdrop

ADS—Aerial Delivery System

AE—Aeromedical Evacuation

AECM—Aeromedical Evacuation Crew Member

AFCS—Automatic Flight Control System

AFRC—Air Force Reserve Component

AGL—Above Ground Level

ALC—Aircrew Laptop Compter

AMC—Air Mobility Command

AMCC—Air Mobility Control Center

AOA—Angle of Attack

AP—Auto Pilot

APU—Auxiliary Power Unit

A/R—Air Refueling

ARCP—Air Refueling Control Point

ARCT—Air Refueling Control Time

ARIP—Air Refueling Initial Point

AT—Auto Throttle

ATA—Actual Time of Arrival

ATC—Air Traffic Control

ATS—Auto Throttle System

AUX—Auxiliary

BARO—Barometric

BASH—Bird Aircraft Strike Hazard

BCN—Beacon

BDHI—Bearing Distance Heading Indicator

BIT—Built in Test

BTMS—Brake Temperature Monitor System

BRNAV—Basic Area Navigation Airspace

CAT I—Category I Approach

CAT II—Category II Approach

CARP—Computed Air Release Point

CAWS—Central Aural Warning System

CB—Circuit Breaker

CCU—Communications Control Unit

CDS—Container Delivery System

CFL—Critical Field Length

CIP—Core Integrated Processor

CNC—Comm/Nav Control

COMSEC—Communications Security

CVR—Cockpit Voice Recorder

C2IPS—Command and Control Information Processing System

DH—Decision Height

DLC—Direct Lift Control

DME—Distance Measuring Equipment

DNAV—Degraded Navigation Mode

DTD—Data Transfer Device

DZ—Drop Zone

EDP—Earliest Descent Point

EEC—Electronic Engine Control

EFCS—Electronic Flight Control System

EM—CONEmitter Control

EPR—Engine Pressure Ratio

ERO—Engine Running On/Offload

ESC—Environmental System Controller

ETA—Estimated Time of Arrival

ETE—Estimated Time En route

ETP—Equal Time Point

FAF—Final Approach Fix

FCC—Flight Control Computer

FD—Flight Director

FEDS—Flotation Equipment Deployment System

FMC—Full Mission Capable

FOD—Foreign Object Damage

FOM—Figure of Merit

FPA—Flight Path Angle

FPV—Flight Path Vector

G/S—Glide Slope

GMT—Greenwich Mean Time

GPS—Global Positioning System

GPWS—Ground Proximity Warning System

GRM—Gate Release Mechanism

GS—Ground Speed

HAHO—High Altitude High Opening

HALO—High Altitude Low Opening

HARP—High Altitude Release Point

HDG—Heading

HE—Heavy Equipment

HF—High Frequency

HQ—Have Quick

HUD—Head Up Display

IAS—Indicated Airspeed

ICAO—International Civil Aviation Organization

IFF—Identification Friend or Foe

IFR—Instrument Flight Rules

ILS—Instrument Landing System

INOP—Inoperative

INT—Intermediate Thrust

IP—Initial Point

IRU—Inertial Reference Unit

KCAS—Knots Calibrated Airspeed

KIAS—Knots Indicated Airspeed

KTS—Knots

LAPES—Low Altitude Parchute Extraction System

LNAV—Lateral Navigation

LOC—Localizer

LRU—Line Replaceable Unit

LS—Line Select

LSK—Line Select Key

LVAD—Low Velocity Airdrop

MACH—Mach Number

MAX—Maximum Thrust

MC—Mission Computer

MCD—Mission Computer/Communication Display

MCK—Mission Computer/Communication Keyboard

MCT—Maximum Continuous Thrust

MDA—Minimum Descent Altitude

MFC—Multifunction Control

MFD—Multifunction Display

MNPS—Minimum Navigation Performance Specification

MSD—Mission Design Series (e.g., C17)

MWS—Missile Warning System

NM—Nautical Mile

OAT—Outside Air Temperature

OBIGGS—On Board Inert Gas Generating System

PBIT—Preflight Bit

PDM—Parachute Deployment Mechanism

PFD—Primary Flight Display

PPI—Plan Position Indicator

RA/BA—Radar Altitude/Barometric Altitude

RAT—Ram Air Turbine

RCR—Runway Condition Reading

REC—Receive

RNP—Required Navigation Performance

RSC—Runway Surface Condition

RZ—Rendevous

SAAF—Small Austere Airfield

SAAM—Special Assignment Airlift Mission

SATCOM—Satellite Communications

SC—Secure Communications

SC/EFC—Spoiler Control/Electronic Flap Computer

SED—Standby Engine Display

SKE—Station Keeping Equipment

SPR—Single Point Refueling

TOGA—Takeoff/GoAround

TOLD—Take off and Landing Data

TOT—Time Over Target

UARRSI—Universal Aerial Refueling Receptacle Slipway Installation

V PROF—Vertical Profile

VNAV—Vertical Navigation

WACS—Warning and Caution System

WAP—Warning and Caution Annunciation Panel

WCCS—Wireless Comm Control System

XFEED—Crossfeed

XFER—Transfer

XMIT—Transmit

ZFW—Zero Fuel Weight

ZM—Zone Marker

Terms

Aeromedical Evacuation (AE)—Movement of patients under medical supervision between medical treatment facilities (MTFs) by air transportation.

Aeromedical Evacuation Coordination Center (AECC)—(DOD) A coordination center, within the joint air operations center's airlift coordination cell, which monitors all activities related to aeromedical evacuation (AE) operations execution. It manages the medical aspects of the AE mission and serves as the net control station for AE communications. It coordinates medical requirements with airlift capability, assigns medical missions to the appropriate AE elements, and monitors patient movement activities. Also called AECC.

Aeromedical Evacuation Crew member (AECM)—Qualified Flight Nurse (FN) and Aeromedical Evacuation Technician performing AE crew duties.

Aeromedical Evacuation Operations Officer (AEOO)—Medical Service Corps (MSC) officer or medical administrative specialist or technician (AFSC 4A0X1) assigned to the AE system to perform duties outlined in applicable Air Force policy directives, instructions, 41-series handbooks, and this AFI.

Air Force Satellite Communication—.Satellite communications system capable of 75 bits per second (BPS) record message traffic.

Air Force Component Commander—.In a unified, sub-unified, or joint task force command, the Air Force commander charged with the overall conduct of Air Force air operations.

Air Force Mission Support System (AFMSS)—.A computer system capable of mission planning and generating flight plans used by C-17 mission computers.

Aircraft/Weapon System/Equipment—.Software that makes AFMSS flight plans/products specific to the C-17 or other aircraft.

Airlift—.Aircraft is considered to be performing airlift when manifested passengers or cargo are carried.

Air Mobility Control Center (AMCC)—.Provides global coordination of tanker and airlift for AMC and operationally reports to the AMC TACC. Functions as the AMC agency that manages and directs ground support activities and controls aircraft and aircrews operating AMC strategic missions through overseas locations.

Air Mobility Element (AME)—.The air mobility element is an extension of the Air Mobility Command Tanker Airlift Control Center deployed to a theater when requested by the geographic combatant commander. It coordinates strategic airlift operations with the theater airlift management system and collocates with the air operations center whenever possible. Also called AME.

Air Force Reserve Component (AFRC)—.Refers to Air National Guard and Air Force Reserve Command forces, both Associate and Unit Equipped.

Allowable Cabin Load—.The maximum payload which can be carried on an individual sortie. Also called ACL.

Air Route Traffic Control Center—.The principal facility exercising en route control of aircraft operating under instrument flight rules within its area of jurisdiction. Approximately 26 such centers cover the United States and its possessions. each has a communication capability to adjacent centers.

Air Traffic Control—A service provided by an appropriate authority to promote the safe, orderly and expeditious use of the air transportation system and to maximize airspace utility.

AMC History System—.Database that compiles and stores tanker activity input by line units.

AMC TACC—.Operations center that controls all tanker and airlift forces worldwide through a network of computer systems. The TACC is organized into geographic cells consisting of East, West, Mission Support, and Emergency Action Cells. The TACC contains the following functions: Command and Control, Current Operations, Mission Support, Logistics Operations Center, Aerial Port Control Center, Flight Planning, Diplomatic Clearance, Weather, and Mission Support Planning Office.

Augmented Crew—.Basic aircrew supplemented by additional qualified aircrew members to permit in-flight rest periods.

Automated "G" File (AGILES)—.Computer system designed to store/access aircraft technical order information and maintenance fault data;

Base Station—A functional AFMSS station with one or more work stations normally located in a tactics office or base operations facility. The base station is air transportable to forward operating environments. The most common configuration is a dual station unit.

Bird Aircraft Strike Hazard (BASH)—.An Air Force program designed to reduce the risk of bird strikes.

Bird Watch Condition Low—Normal bird activity [as a guide, fewer than 5 large birds (waterfowl, raptors, gulls, etc.) or fewer than 15 small birds (terns, swallows, etc)] on and above the airfield with a low probability of hazard. Keep in mind a single bird in a critical location may elevate the Bird Watch

Condition (BWC) to moderate or severe.”.

Bird Watch Condition Moderate—Increased bird population (approximately 5 to 15 large birds or 15 to 30 small birds) in locations that represent an increased potential for strike. Keep in mind a single bird in a critical location may elevate the BWC to moderate or severe.”.

Bird Watch Condition Severe—High bird population (as a guide, more than 15 large birds or 30 small birds) in locations that represent an increased potential for strike. Keep in mind a single bird in a critical location may cause a severe BWC.

Block Time—.Time determined by the scheduling agency responsible for mission accomplishment for the aircraft to arrive at (block in) or depart from (block out) the parking spot.

BLUE BARK.—US military personnel, US citizen civilian employees of the Department of Defense, and the dependents of both categories who travel in connection with the death of an immediate family member. It also applies to designated escorts for dependents of deceased military members. Furthermore, the term is used to designate the personal property shipment of a deceased member.

Border Clearance—.Those clearances and inspections required to comply with federal, state, and local agricultural, customs, immigration, and immunizations requirements.

Category I Route—.Any route that does not meet the requirements of a category II route, including tactical navigation and over water routes.

Category II Route—.Any route on which the position of the aircraft can be accurately determined by the overhead crossing of a radio aid (NDB, VOR, TACAN) at least once each hour with positive course guidance between such radio aids.

Chalk Number—.Number given to a complete load and to the transporting carrier.

Charge Medical Technician—AET responsible for ensuring completion of enlisted aeromedical crew duties.

Chart Update Manual—Chart Update Manual (CHUM). Manual issued each March and September (with monthly supplements) to update maps/charts with new information. It may reflect temporary or permanent information pending the next chart/map release. Manual issued each March and September (with monthly supplements) to update maps/charts with new information. It may reflect temporary or permanent information pending the next chart/map release.

Circular Error Average—.Indicator of the accuracy of an airdrop operation. It is the radius of a circle within which half of the air-dropped personnel and items or materiel have fallen.

COIN ASSIST—.Nickname used to designate dependent spouses accompanying dependent children and dependent parents of military personnel reported missing or captured who may travel space available on military aircraft for humanitarian purposes on approval of the Chief of Staff, United States Army; Chief of Staff, United States Air Force; Chief of Naval Operations; or the Commandant of the Marine Corps.

Combat Mission Folder—Folder containing information pertinent to a combat mission. It is used for mission preparation and execution and includes logs, strip charts, predictions, photos, images, etc. See Mission Planning Folder (MPF).

Command and Control (C^2)—.The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications,

facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called C2.

Command and Control Center—.Each C^2 Agency provides supervision, guidance, and control within its assigned area of responsibility. For the purpose of this AFI, C^2 Agencies include operations centers, command posts, air mobility elements, tanker airlift control elements (TALCE), air mobility control centers, and tanker task forces.

Command and Control Information Processing System (C^2IPS)—Computer-based information transmission and information handling for command and control functions associated with the Director of Mobility Forces (DIRMOBFOR), AME fixed units, and TALCE. Interfaces to and automatically updates the Global Decision Support System (GDSS).

CONFERENCE SKYHOOK—.Communication conference available to help aircrews solve in-flight problems that require additional expertise.

Contingency Mission—.Mission operated in direct support of an OPORD, OPLAN, disaster, or emergency.

Critical Phase Of Flight—. Takeoff, air refueling (Precontact and closer), visual or non-SKE formation, low level (below MSA), airdrop (from Pre-slowdown Checklist through DZ escape), approach, and landing.

Deadhead Time—.Duty time for crew members positioning or de-positioning for a mission or mission support function.

Designated Courier—.Officer or enlisted member in the grade of E-5 or above of the US Armed Forces, or a Department of State diplomatic courier, selected by the Defense Courier Service (DCS) to accept, safeguard, and deliver DCS material as directed. A primary aircrew member should be used as a courier only as a last resort.

Desolate Terrain Missions—.Any mission in excess of one hour over desert, tropical, or jungle terrain (not to include flights conducted over the CONUS.

Deviation—.A deviation occurs when takeoff time is not within -20/+14 minutes of scheduled takeoff time. Scheduled takeoff time may be adjusted to make good an ARCT. Notify controlling agency before takeoff to adjust the scheduled takeoff time.

Direct Instructor Supervision—Supervision by an instructor of like specialty with immediate access to controls (for pilots, the instructor must occupy either the pilot or copilot seat).

Digital Aeronautical Flight Information File (DAFIF)—Digitized FLIP data containing airport, runway, navigation aid, and enroute data. Contains both low and high altitude structures.

Digital Features Analysis Data (DFAD)—Selected natural and man-made features collected from photographic and cartographic sources.

Digital Terrain Elevation Data (DTED)—A matrix of terrain elevation values that provides landform, slope, elevation, and/or terrain roughness information.

Director, Mobility Forces (DIRMOBFOR)—.Individual in command of all mobility forces within a designated area or for a designated operation. In overseas theaters, the DIRMOBFOR is normally responsible for theater mobility force management. The Air Force component commander exercises

operational control of assigned or attached mobility forces through the DIRMOBFOR. The DIRMOBFOR monitors and manages assigned mobility forces operating in theater.

Distinguished Visitor (DV)—.Passengers, including those of friendly nations, of star or flag rank or equivalent status, to include diplomats, cabinet members, members of Congress, and other individuals designated by the DoD due to their mission or position (includes BLUE BARK and COIN ASSIST).

Diverse Departure—.The airfield has been assessed for departure by TERPS personnel and no penetration of the obstacle surfaces exist. An aircraft may depart the field, climb to 400 feet above the departure end of the runway elevation, turn in any direction, and if a minimum climb gradient of 200'/NM is maintained be assured of obstacle clearance. This is normally indicated on DoD/NOAA publications by the absence of any published departure procedures.

Double Blocking—.When an aircraft is required to block-in at one parking spot, then move to normal parking for final block-in. The extra time required for double blocking will be taken into account during mission planning/scheduling. To compensate for double blocking on departure, the aircrew "legal for alert time" may be adjusted to provide additional time from aircrew "show time" to departure. When double blocking is required on arrival, the aircrews entry into crew rest will be delayed until postflight duties are complete.

Due Regard—.Operational situations that do not lend themselves to International Civil Aviation Organization (ICAO) flight procedures, such as military contingencies, classified missions, politically sensitive missions, or training activities. Flight under "Due Regard" obligates the military aircraft commander to be his or her own air traffic control (ATC) agency and to separate his or her aircraft from all other air traffic. (See FLIP General Planning, section 7.)

DZ Entry Point—A fixed point on DZ run-in course where an aircraft or formation of aircraft may safely begin descent from IFR en route altitude to IFR drop altitude. The DZ entry point is a maximum of 40 NM before the DZ exit point according to Federal Aviation Administration FAR exemption 4371C. Formation descent will not begin until the last aircraft in formation is at or past the DZ entry point.

DZ Exit Point—A fixed point on the DZ escape flight path centerline, established during pre-mission planning, at which the formation will be at the minimum IFR en route altitude. Calculate the exit point based upon three-engine performance at airdrop gross weight. This point will be planned no less than four NMs track distance beyond the DZ trailing edge.

Earliest Descent Point—Earliest point in the DZ run-in course where the lead aircraft may begin IFR descent to IFR drop altitude and be assured of terrain clearance for the entire formation. Compute EDP by subtracting formation length (i.e. a 4-ship is 2 NMs long) from the computed DZ entry point.

Egress—The route portion from the last objective to the planned recovery base.

Equal Time Point—.Point along a route at which an aircraft may either proceed to destination or first suitable airport or return to departure base or last suitable airport in the same amount of time based on all engines operating.

Estimated Time In Commission—(ETIC).Estimated time required to complete required maintenance.

Execution—.Command-level approval for initiation of a mission or portion thereof after due consideration of all pertinent factors. Execution authority is restricted to designated command authority.

Familiar Field—.An airport in the local flying area at which unit assigned aircraft routinely perform transition training. Each operations group commander will designate familiar fields within their local

flying area.

Firm Scheduled Return Time (FSRT)—.Scheduling tool used by air mobility units to predict when crews will return to home station. FSRT for active duty and AFRC is defined as SRT plus 24 hours.

First Pilots—First pilots are highly experienced copilots who are qualified IAW volumes 1 and 2 of this instruction to taxi, take-off, and land the aircraft from the left seat under the supervision of a qualified aircraft commander.

Force Rendezvous Point (FRP)—.Navigational checkpoint over which formations of aircraft join and become part of the main force.

Geographic and Geodetic Coordinates—These numbers indicate locations on the surface of the earth. Technically, these two types of coordinates are the same. However, for mission planners, Geographic has come to mean map-derived coordinates while Geodetic refers to mensurated or photo/survey-derived coordinates. Geodetic and geographic data must not be mixed during calculations.

Global Decision Support System (GDSS)—.AMC's primary execution command and control system. GDSS is used to manage the execution of AMC airlift and tanker missions.

Global Patient Movement Requirements Center (GPMRC—). A joint activity reporting directly to the Commander in Chief, US Transportation Command, the Department of Defense single manager for the regulation of movement of uniformed services patients. The Global Patient Movement Requirements Center authorizes transfers to medical treatment facilities of the Military Departments or the Department of Veterans Affairs and coordinates intertheater and inside continental United States patient movement requirements with the appropriate transportation component commands of US Transportation Command.

Ground Time—.Interval between engine shut down (or arrival in the blocks if engine shutdown is not scheduled) and next takeoff time.

Hazardous Cargo or Materials—.Articles or substances that are capable of posing significant risk to health, safety, or property when transported by air and classified as explosive (class 1), compressed gas (class 2), flammable liquid (class 3), flammable solid (class 4), oxidizer and organic peroxide (class 5), poison and infectious substances (class 6), radioactive material (class 7), corrosive material (class 8), or miscellaneous dangerous goods (class 9). Classes may be subdivided into divisions to further identify hazard, i.e., 1.1, 2.3, 6.1, etc.

Home Station Departure—For the purposes of **Chapter 4** of this instruction, home station departure refers to any flight duty period which begins at the units home base and is planned to terminate at another location.

Ingress—The route portion from takeoff to the last objective.

Instructor Supervision—Supervision by an instructor of like specialty. For critical phases of flight, the instructor must occupy one of the seats or stations, with immediate access to the controls.

Interfly—The exchange and/or substitution of aircrews and aircraft between Mobility Air Forces (MAF) including crew members and/or c-17 aircraft from AETC and AMC-gained AFRC forces.

In-Place Time (IPT)—Time when an aircraft and crew are at an operating base and prepared to load for the mission.

Joint Airborne/Air Transportability Training (JA/ATT)—.Continuation and proficiency combat airlift training conducted in support of DoD agencies. Includes aircraft load training and service school

support. AMC headquarters publishes JA/ATT tasking in AMC OPORD 17-76, annex C, appendix 1.

Jumpmaster—.The assigned airborne-qualified individual who controls parachutists from the time they enter the aircraft until they exit. See also stick commander (air transport).

Latest Descent Point—.Latest planned point on the DZ run-in course where the formation plans to initiate descent to drop altitude. This is planned to ensure all aircraft in the formation are stabilized (on altitude and airspeed) before the drop.

L-Band SATCOM—.600 BPS satellite communications (SATCOM) system contracted through the International Maritime Satellite Organization (INMARSAT), used primarily for command and control. The system consists of a satellite transceiver, a laptop computer, and a printer.

Loading Time—.Specific time established jointly by the commanders concerned when aircraft loading will begin. For paratroopers, 20 minutes before Air Force stations time.

Local Training Mission—.A mission scheduled to originate and terminate at home station (or an off-station training mission), generated for training or evaluation, and executed at the local level.

Maintenance Status:—

A-1;—No maintenance required.

A-2 (Plus Noun);—Minor maintenance required, but not serious enough to cause delay. Add nouns that identify the affected units or systems, i.e. hydraulic, ultra high frequency (UHF) radio, radar, engine, fuel control, generator, boom or drogue, etc. Attempt to describe the nature of the system malfunction to the extent that appropriate maintenance personnel will be available to meet the aircraft. When possible, identify system as mission essential (ME) or mission contributing (MC).

A-3 (Plus Noun);—Major maintenance. Delay is anticipated. Affected units or systems are to be identified as in A-2 status above.

A-4;—Aircraft or system has suspected or known biological, chemical, or radiological contamination.

Medical Crew Director (MCD).—FN responsible for supervising patient care and AEMCs assigned to AE missions. On missions where an FN is not onboard, the senior AET will function as MCD.

Military Training Route (MTR)—MTRs are developed for use by the military for low-altitude, high-speed training. FLIP contains descriptions of these routes. Nonparticipating aircraft are not prohibited from flying within the boundaries of a MTR; however, they are encouraged to exercise extreme vigilance and to contact FSS for route status when flying in the vicinity of a MTR.

Mission—.1The task, together with the purpose, that clearly indicates the action to be taken and the reason therefor. 2. In common usage, especially when applied to lower military units, a duty assigned to an individual or unit; a task. 3. The dispatching of one or more aircraft to accomplish one particular task.

Mission Advisory—.Message dispatched by command and control agencies, liaison officers, or aircraft commanders advising all interested agencies of any changes in status affecting the mission.

Mobility Air Force (MAF)—Forces assigned to mobility aircraft or MAJCOMs with operational or tactical control of mobility aircraft.

Modified Contour—.Flight in reference to base altitude above the terrain with momentary deviations above and below the base altitude for terrain depressions and obstructions to permit a smooth flight

profile.

Off Station Training Flight—.A training flight that originates or terminates at other than home station that is specifically generated to provide the aircrew experience in operating away from home station. Off station trainers will not be generated solely to transport passengers or cargo.

Operational Control (OPCON)—Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called OPCON.

Operational Missions—.Missions executed at or above TACC level. Operational missions termed "CLOSE WATCH" include CORONET missions and AFI 11-221, *Air Refueling Management (KC-10 and KC-135)*, priority 1, 2, and 3 missions tasked by the TACC. Other operational missions such as deployment, re-deployment, reconnaissance operations, operational readiness inspections (ORI), AMC channel or SAAM, and JA/ATT missions may be designated "CLOSE WATCH" as necessary.

Operational Risk Management (ORM)—ORM is a logic-based, common sense approach to making calculated decisions on human, materiel, and environmental factors before, during, and after Air Force operations. It enables commanders, functional managers and supervisors to maximize operational capabilities while minimizing risks by applying a simple, systematic process appropriate for all personnel and Air Force functions.

Opportune Airlift—.Transportation of personnel, cargo, or both aboard aircraft with no expenditure of additional flying hours to support the airlift.

Originating Station—.Base from which an aircraft starts on an assigned mission. May or may not be the home station of the aircraft.

Over water Flight—.Any flight that exceeds power off gliding distance from land.

Pathfinder Aircraft—.Aircraft that precedes the main force to the objective area. Its primary functions are to airdrop the CCT and provide current weather information to the main force.

Patient Movement Categories—

Urgent—Patients who must be moved immediately to save life, limb, or eyesight, or to prevent complication of a serious illness.

Priority—Patients requiring prompt medical care that must be moved within 24 hours.

Routine—Patients who should be picked up within 72 hours and moved on routine/scheduled flights.

Permit to Proceed—.Aircraft not cleared at the first US port of entry may move to another US airport on a permit to proceed issued by customs officials at the first port of entry. This permit lists the requirements to be met at the next point of landing, i.e. number of crew and passengers, cargo not yet cleared. Aircraft commanders are responsible to deliver the permit to proceed to the customs inspector at the base where final clearance is performed. (Heavy monetary fines can be imposed on the aircraft commander for not complying with permit to proceed procedures.)

Point Of No Return—.A point along an aircraft track beyond which its endurance will not permit return to its own or some other associated base on its own fuel supply.

Point of Safe Return—.Most distant point along the planned route from which an aircraft may safely return to its point of departure or alternate airport with required fuel reserve.

Portable Mission Planning System (PMPS)—Man-portable AFMSS computer system capable of loading flight plan information into the C-17 mission computer.

Positioning and De-positioning Missions—.Positioning missions are performed to relocate aircraft for the purpose of conducting a mission. De-positioning missions are made to return aircraft from bases at which missions have terminated.

Quick Stop—.Set of procedures designed to expedite the movement of selected missions by reducing ground times at en route or turnaround stations.

Ramp Coordinator—.Designated representative of the C^2 agency whose primary duty is the coordination of ground handling activities on the ramp during large scale operations.

Scheduled Return Time (SRT)—Scheduling tool used by air mobility units to predict when crews will return to home station. It allows force managers to plan aircrew availability and provide crews visibility over monthly flying activities. AMC and AMC-gained aircrews (except those on standby at home station) will have an SRT established on their flight orders.

Scheduled Takeoff Time—.Takeoff time is established in the schedule or OPORD. For air aborts and diversions, this will be engine shut down time (or arrival in the blocks if engine shutdown is not scheduled) plus authorized ground time. Early deviation does not apply to aborts or diversions unless the mission is formally rescheduled by current operations.

Section—.1As applied to ships or naval aircraft, a tactical subdivision of a division. It is normally one-half of a division in the case of ships, and two aircraft in the case of aircraft.

Serial—.Normally consists of 12 aircraft (2 sections or 4 elements).

Significant Meteorological Information (SIGMET)—.Area weather advisory issued by an ICAO meteorological office relayed to and broadcast by the applicable ATC agency. SIGMET advisories are issued for tornadoes, lines of thunderstorms, embedded thunderstorms, large hail, severe and extreme turbulence, severe icing, and widespread dust or sand storms. SIGMETs frequently cover a large geographical area and vertical thickness. They are prepared for general aviation and may not consider aircraft type or capability.

Special Assignment Airlift Mission (SAAM)—.Funded airlift that cannot be supported by channel missions because of the unusual nature, sensitivity, or urgency of the cargo or that requires operations to points other than the established channel structure.

Special Tactics Team (STT)—.Team of Air Force personnel organized, trained, and equipped to

establish and operate navigational or terminal guidance aids, communications, and aircraft control facilities in support of combat aerial delivery operations.

Stabilization Point—.Point on the DZ run-in course at which the lead aircraft should plan to be stabilized at drop altitude and airspeed. This point will be planned to be at least 6 NMs before the point of impact.

Stations Time (Airborne)—Specified time when paratroopers will be seated in the aircraft with seat belts fastened. Normally, this time is 5 minutes before Air Force Stations time.

Stations Time (Air Force)—Normally, 45 minutes before takeoff time for the C-17. Aircrews will have completed their pre-flight duties and be at their crew positions. Passengers will be seated and cargo will be secured.

Tactical Event—Non-SKE formations, SKE formations larger than two-ships, SAAF landings, airdrop operations, low level routes and threat avoidance approaches/departures, EROs, combat offloads.

Tanker Airlift Control Center (TACC)—The Air Mobility Command direct reporting unit responsible for tasking and controlling operational missions for all activities involving forces supporting US Transportation Command's global air mobility mission. The Tanker Airlift Control Center is comprised of the following functions: current operations, command and control, logistics operations, aerial port operations, aeromedical evacuation, flight planning, diplomatic clearances, weather, and intelligence. Also called TACC.

Tanker Airlift Control Element (TALCE)—Team of qualified Air Force personnel established to control, coordinate, and function as an Air Force tanker and airlift C2 facility at a base where normal AMC C2 facilities are not established or require augmentation. TALCEs support and control contingency operations on both a planned and no-notice basis.

Tanker Task Force (TTF)—Force of tanker aircraft assembled and tasked to perform a specific function.

Theater Patient Movement Requirements Center (TPMRC)—The TPMRC is responsible for theater wide patient movement (e.g., medical regulating and AE scheduling), and coordinates with theater MTFs to allocate the proper treatment assets required to support its role. The primary role of the TPMRC is to devise theater plans and schedules and then monitor their execution in concert with the GPMRC. The TPMRC is responsible to the Combatant Commander through the Combatant Command Surgeon. The TPMRC is also responsible for all aspect of intratheater patient movement management. A TPMRC provides command and control for patient movement management operations in its theater of operations, as directed by its Combatant Commander's operational policy, and in coordination with USTRANSCOM, acting as a supporting combatant command, responsible for intertheater and CONUS patient movement.

Time Out—.Common assertive statement used to voice crew member concern when safety may be jeopardized.

Topographical Line Map (TLM)—A map scaled at 1 inch = 50,000 feet.

Training Mission—.Mission executed at the unit level for the sole purpose of aircrew training for upgrade or proficiency. Does not include operational missions as defined in this AFI.

Transportation Working Capital Fund (TWCF)—Formerly known as Defense Business Operations Fund-Transportation (DBOF-T). Part of the Air Force Working Capital Fund (AFWCF). Normally used to cover costs that can be recovered from an air mobility customer. Examples include TDY costs, site surveys of TALCE or airlift unit deployment bed down locations, airlift unit level mission planning expenses, and support or contract costs for deployed TWCF units/personnel.

Unilateral—.Operations confined to a single service.

Unit Move—Unit relocation in support of a contingency or exercise deployment/redeployment. These moves are made to desired areas of operation or to designated locations, and are made IAW a troop movement schedule.

World Vector Shoreline (WVS)—A chart that displays shorelines, political boundaries, and country names only.

Zero Fuel Weight—.Weight, expressed in pounds, of a loaded aircraft not including wing and body tank fuel. All weight in excess of the maximum zero fuel weight will consist of usable fuel.