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Flying Operations

C-5 OPERATIONS PROCEDURES

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This publication implements Air Force Policy Directive (AFPD) 11-2, *Aircrew Operations*, and supports Air Force Instruction (AFI) 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*, and AFMAN 11-202, Vol 3, *Flight Operations*, by establishing specific guidance for the operation of the C-5 aircraft. This is a specialized publication intended for use by Airmen who have graduated from technical training related to this publication. This instruction applies to all commanders, operations supervisors, and aircrew assigned or attached to all flying activities of commands operating C-5 aircraft. This publication applies to the Regular Air Force and the Air Force Reserve. This publication does not apply to the United States Space Force and the Air National Guard. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction 33-322, *Records Management and Information Governance Progra*m, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the Department of the Air Force (DAF) Form 847, *Recommendation for Change of Publication*; route DAF Form 847 from the field through the appropriate functional chain of command. This publication may be supplemented at any level, but all supplements must be routed to the OPR of this publication for coordination prior to certification and approval. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See DAFMAN 90-161, *Publishing Processes and Procedures*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor's commander for non-tiered compliance items. The use

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SUMMARY OF CHANGES

Substantial content has been removed from this manual that has been incorporated into the AFMAN 11-202V3, *Flight Operations*, Air Mobility Command (AMC) Supplement; incorporates outstanding Flight Crew Information Files throughout; reorders several items; updates references; removes references to NVG operations; removes the requirement for a local supplement; updates guidance regarding Engineering Dispositions; updated the definition of a non-repair capable base; improves descriptions for Column A and B in Minimum Equipment Listing (MEL) tables; adds additional MEL items/systems; clarifies remarks,/limitations/exceptions for several MEL items; clarifies fuel quantity indicator failure and fuel quantity indicator fault code guidance; updated liquid nitrogen guidance for non-threat environments; adds shoulder harness requirement for primary crew members during critical phases of flight; updates aircrew publications requirements; Clarifies guidance for 180-degree turns above 732,500 lbs; clarifies guidance for departure end cables; adds approval for backing training; clarifies Operational Check Flight (OCF) verbiage; added above idle engine run requirements; clarified distinction between crew-entered FMS approach, self-contained approach, and MAJCOM-approved approach; prohibits use of crew-entered FMS approach; updated verbiage from crew-entered flight management system departures to MAJCOM-certified departure procedures to align with the AFMAN 11-202V3; added crew arming requirement; updated navigation accuracy check procedures; updated the Navigation/Communication Capability Table to correct errors, add clarification, and align with Communication, Navigation and Surveillance/Air Traffic Management (CNS/ATM) Operational Flight Program 3.9.0 and 4.1.0; removed C-5 authority to clear a red X verbiage that contradicts AFMAN 11-202V3; removed inoperative EDS procedures; updated TOLD computation guidance; adds requirement for Mission Essential Personnel (MEPs) to be supervised in the cargo compartment; defines the minimum planned landing fuel for destination and alternates; clarifies fuel planning definitions; clarifies purpose of low altitude procedures.

Chapter 1

GENERAL INFORMATION

1.1. Overview.

1.1.1. This manual provides guidance for operating the C-5 aircraft. It is an original source document for many areas, but for efficiency, reaffirms information found in aircraft flight manuals, flight information publications (FLIP), and other Air Force directives. If other non-11 series AFIs or Air Force Manuals (AFMANs) conflict with this manual, this manual will take precedence. For matters where this manual is the source document, waiver authority is in accordance with (IAW) **paragraph 1.4**. For matters where this manual repeats information in another document, follow waiver authority outlined in the basic/source document.

1.1.2. Unit commanders and agency directors involved with or supporting C-5 operations shall make current copies of this manual available to appropriate personnel. **(T-3)** Transportation and Base Operations passenger manifesting agencies are required to reference this manual. **(T-3)**

1.2. Roles and Responsibilities.

1.2.1. Major Command (MAJCOM). MAJCOMs provide guidance and approve waivers (as required), where specified throughout this publication.

1.2.2. Pilot in Command (PIC). The pilot in command is the aircrew member designated by competent authority, regardless of rank, as being responsible for, and is the final authority for the operation of the aircraft. The PIC will ensure the aircraft is not operated in a careless, reckless, or irresponsible manner that could endanger life or property. The PIC will ensure compliance with this publication and the following:

1.2.2.1. Headquarters Air Force, MAJCOM, and Mission Design Series (MDS)-specific guidance;

1.2.2.2. Flight Information Publications (FLIP) and Foreign Clearance Guide (FCG)

1.2.2.3. Air Traffic Control (ATC) clearances;

1.2.2.4. Notices to Airmen (NOTAMs);

1.2.2.5. Aircraft Technical Orders (TOs);

1.2.2.6. Combatant Commander's instructions and other associated directives.

1.2.3. Aircrew. Individuals designated on the flight authorization are responsible to fulfill specific aeronautical tasks regarding operating USAF aircraft as specified in this AFMAN or by other competent, supplemental authority.

1.3. Key Words Explained.

1.3.1. “Will”, “shall” and “must” indicate a mandatory requirement.

1.3.2. “Should” indicates 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., 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 directives in this manual, as indicated by tiering levels located at the end of the statement, except when the situation demands immediate action to ensure safety. The Pilot in Command (PIC) is vested with ultimate mission authority and responsible for each course of action they choose to take.

1.4.1. Waivers. Waiver requests to this manual should originate through appropriate command and control (C2) channels and be submitted using DAF Form 679, *Department of the Air Force Publication Compliance Item Waiver Request/Approval*, or as directed by DAFMAN 90-161. MAJCOM waiver OPRs are as follows: Air Mobility Command Standardization and Evaluations (AMC/A3V): **AMC.A37V@us.af.mil**; Air Force Reserve Command Mobility Division (AFRC/A3M): **HQAFRC.A3M.Workflow.1@us.af.mil**.

1.4.2. Tiering. Tiering levels presented in this manual represent the lowest acceptable level and as such, higher Tiers may also approve the waiver. For example, a Tier 3 statement may be waived by Tier 2, Tier 1, or Tier 0 authorities. Approved, time-critical verbal waivers will be documented on DAF Form 679 and submitted to AMC/A3V (**AMC.A37V@us.af.mil**). **(T-1)**

1.4.3. Permanent waivers without some type of bounding feature, such as an expiration date, are prohibited. **(T-2)**

1.4.4. Long-term waivers that affect theater unique circumstances and need to be enduring in nature do not require an expiration date, so long as some other type of feature bounds the waiver, such as the end of a particular operation. These must be approved by each affected MAJCOM/A3 and a copy sent to AMC Stan/Eval. **(T-2)**

1.5. Supplemental Procedures. This manual is a basic directive. Each using MAJCOM or operational theater may supplement this AFMAN according to DAFMAN 90-161. Stipulate unique MAJCOM procedures (shall not be less restrictive than this basic document) and publish MAJCOM/A3/DO-approved long-term waivers in the MAJCOM supplement.

1.5.1. Combined Command Operations. Plan and conduct all operations that include forces from multiple MAJCOMs using provisions in this manual. Do not assume or expect aircrews to perform MAJCOM theater unique procedures without owning MAJCOM/A3/DO approval and advance training.

1.5.2. Coordination Process. Forward MAJCOM proposed supplements (attach DAF Form 673, *Department of the Air Force Publication/Form Action Request*) to AMC/A3V for mandatory coordination prior to approval.

1.6. Local Supplement Coordination Process. Operations Group Commanders (OG/CCs) may define local operating procedures to this publication in a unit supplement or locally generated operating instruction. OG/CCs shall obtain MAJCOM approval prior to releasing their supplement or operating instruction. **(T-2)** Send an electronic copy of the approved version to AMC/A3V.

1.7. Definitions. Find explanations or definitions of terms and abbreviations commonly used in the aviation community in Code of Federal Regulations (CFR) Title 14, Code of Federal Regulations, **Part 1**, *Definitions and Abbreviations*; Department of Defense (DoD) FLIP General Planning, Chapter 2; and *DoD Dictionary of Military and Associated Terms*. See **Attachment 1** for common terms used herein.

Chapter 2

AIRCREW COMPLEMENT/MANAGEMENT

2.1. Minimum Aircrew Complement. See **Table 2.1** for the number of crewmembers required in each crew position.

2.1.1. The minimum aircrew member complement for a local training flight is the same as for a basic crew. **(T-2) Exception:** Loadmasters are only required on locals carrying passengers or cargo. **Note:** Ballast for space cargo modification (SCM) aircraft is not considered cargo.

2.1.2. See AFMAN 11-202V3, AMC Supplement, for more on crew duty time (CDT) and flight duty period (FDP).

Table 2.1. Aircrew Complement.

Crew Position	Crew Complement	
	Basic	Augmented
Aircraft Commander (see note 1)	1	1
First Pilot (FP) (see note 1)	1	2
Flight Engineer (FE) (see note 2)	2	2
Loadmaster (see notes 3, 4, 5, 6)	2	3

Notes:
1. On air refueling (AR) missions, an aircraft commander will be AR qualified. **(T-3)** Another pilot will be AR trained. **(T-3)**
2. One first and one second engineer (or higher) are the minimum required for a basic crew. Two first engineers or higher are the minimum required for an augmented crew.
3. The designated primary loadmaster should be at least a Mission Qualified C-5 Loadmaster Journeyman.
4. Schedule three loadmasters (when resources are available) on all operational missions. When no cargo or passengers are on board, a loadmaster is not required (ferry flights, maintenance support).
5. **Exception:** Only one loadmaster required for all local training missions with cargo or ≤ 10 passengers on board.
6. Two qualified Loadmasters must be in the Troop Compartment during critical phases of flight when passengers are carried in the Troop Compartment. **(T-2)** During cruise, only one Loadmaster is required to be in the Troop Compartment with passengers.

2.2. Pilots. An instructor pilot (IP) must supervise non-current or unqualified pilots regaining currency or qualification unless otherwise specified in the AFMAN 11-2C-5V1, *C-5 Aircrew Training*, or the C-5M Ready Aircrew Program Tasking Memorandum. **(T-3)** Direct IP supervision is required during critical phases of flight. **(T-3)**

2.2.1. Squadron commanders may designate additional pilots authorized to perform PIC duties, if applicable. The PIC should brief the aircrew on the plan to transfer PIC duties.

2.2.2. Initial qualification pilots enrolled in a MAJCOM-approved training course may accomplish tanker/receiver AR under AR instructor pilot supervision.

2.2.3. Missions with passengers. Only current and qualified pilots (i.e., possessing an AF Form 8, *Certificate of Aircrew Qualification*) will occupy pilot seats with passengers on board. **(T-2)** Prohibitions on passengers are not applicable to mission essential personnel (MEP).

2.2.3.1. A non-current but qualified pilot may fly with passengers on board if under direct IP supervision.

2.2.3.2. Pilots shall not fly touch-and-go landings with passengers on board. **(T-2)** Touch-and-go landings are authorized with MEP on board.

2.3. Flight Engineers and Loadmasters. A non-current or unqualified flight engineer or loadmaster may serve as a primary aircrew member on any mission when supervised by a qualified instructor or flight examiner. Direct supervision is required for critical phases of flight **(T-3)**. A non-current or unqualified crewmember under instructor or flight examiner supervision will be considered one crewmember for the purposes of crew compliment.

2.4. Crew Rest/En route Ground Time.

2.4.1. Off-station/En route Crew Rest. The minimum en route crew rest period is 12 hours before legal for alert or scheduled report time when self–alerting.

2.4.2. Off-station/En route Ground Time. Mobility planners shall provide aircrews at least 17 hours ground time between engine shutdown and subsequent takeoff. **(T-2)**

2.5. Alerting Procedures.

2.5.1. Aircraft commanders will not be asked to accept BRAVO Standby unless the legal-for-BRAVO time is equal to or later than the firm estimated time in commission (ETIC) and consideration is given to factors affecting mission launch (i.e., maintenance personnel and parts on station, slot times, airfield operating hours, diplomatic clearances, etc.). **(T-2)**

2.5.2. Aircrew alert time is normally 4+15 (i.e., 4 hours and 15 minutes) hours before scheduled takeoff time. This allows 1 hour for reporting and 3+15 hours for mission preparation. Individual locations may increase or decrease this time depending on specific capabilities.

Chapter 3

AIRCRAFT OPERATING RESTRICTIONS

3.1. Objective. Redundant systems may allow crews to safely perform some missions when a component/system is degraded. The PIC is the final authority in determining the overall suitability of an aircraft for the mission. Provide a detailed explanation of the discrepancy in the AFTO Form 781A, *Maintenance Discrepancy and Work Document*, and include the following identifiers to ensure the requirement for the item/system is effectively communicated to maintenance. **(T-2)**

3.1.1. Mission Essential (ME). Item, system, or subsystem component is essential for safe aircraft operation.

3.1.2. Mission Contributing (MC). Item, system, or subsystem component, is not currently essential for safe aircraft operation. Maintenance should clear these discrepancies at the earliest opportunity. Re-designate these items as ME if circumstances change or mission safety will be compromised. **(T-2)** Do not delay a mission to clear a MC discrepancy.

3.1.3. Open Item (OI). Discrepancy will not adversely affect the current mission or any subsequent mission. These items may be deferred to home station.

3.1.4. Time Limited Dispatch (TLD). TLD level A faults not otherwise addressed in this manual or Technical Order (TO) 1C-5M-1, *Flight Manual* are ME. TLD level B and level C are initially designated OI but should be re-designated ME at a repair capable facility when time remaining to transition to TLD level A is insufficient for mission completion. Designate level D faults as OI. TLD faults that display a NOT ACTIVE status will be documented IAW TO 1C-5M-1, because the condition that triggered the fault may not always be present.

3.2. Minimum Equipment List (MEL). The MEL is a pre-launch document that lists the minimum equipment/systems to operate the aircraft. It is impractical to prepare a list that would anticipate all possible combinations of equipment malfunctions and contingent circumstances. Mission requirements may dictate that an item not listed in the MEL be repaired prior to flight. Crews should use good judgment to determine the mission impact of systems that are not included in the MEL. A PIC who accepts an aircraft with degraded equipment/systems is not committed to subsequent operations with the same degraded equipment. PICs are not committed to operations with degraded equipment accepted by another PIC.

3.2.1. The PIC should consider the possibility of additional failures during continued operation with inoperative systems or components. The MEL is not intended for continued operation over an indefinite period with systems/subsystems inoperative.

3.2.2. The PIC will ensure all emergency equipment is installed as required in the MEL unless specifically exempted by mission requirements/directives. **(T-2)**

3.3. Waiver Procedure. Waivers to operate with degraded equipment are granted on a case-by-case basis. The PIC determines the need for a waiver after coordinating with the lowest practical level of command. When prepared to operate with a degraded MEL item, the PIC submits waiver requests through C2 channels. The PIC should provide the C2 agent: 1) nature of request, 2) individual aircrew member qualification, 3) mission leg(s) requiring the waiver, 4) weather or other adverse conditions, and 5) the governing directive of waiver request to include volume,

chapter, or paragraph. Initiate waiver requests as soon as possible; plan at least a 1-hour waiver process time.

3.3.1. PICs operating with waiver(s) for degraded equipment are responsible for coordinating mission requirements (i.e., revised departure times, fuel requirements, maintenance requirements, etc.) with the controlling C2 agency and/or flight manager.

3.3.2. If beyond C2 communication capability, or when it is necessary to protect the crew or aircraft from a situation not covered by this chapter and immediate action is required, the PIC may deviate according to **paragraph 1.4**.

3.4. MEL Waiver Authority.

3.4.1. For 618th Air Operations Center (618 AOC) missions, the MEL waiver authority is the 618 AOC/CC, delegable no lower than the 618 AOC Director of Operations (Senior).

3.4.2. For all other missions, the MEL waiver authority is the OG/CC. **(T-2)**

3.5. Engineering Dispositions (ED).

3.5.1. Dispositions are requested when an aircraft is damaged and/or established maintenance technical order procedures cannot be followed or do not exist. The on-site maintenance authority is responsible for requesting an ED. Most EDs allow maintenance to repair the aircraft and return it to unrestricted status; dispositions of this nature do not generally concern aircrews. However, EDs affecting aircrew operations require coordination with AMC/A3V. **(T-2)**

3.5.2. Do not accept dispositions appearing incomplete, in error, or unsafe. **(T-2)** Prior to rejecting a disposition, contact AMC/A3V. **(T-3) Note:** EDs involving deviations from the flight manual require approval IAW AFI 11-215, *Flight Manuals Program*.

3.6. Technical Assistance. The PIC may request technical support and additional assistance from their home unit or MAJCOM C2 agency.

3.7. MEL Tables. The MEL tables that follow serve two purposes: to determine the required aircraft systems/subsystems/components that 1) must be operational for the aircraft to be considered in commission for aircrew alert IAW AFMAN 11-202V3, AMC Supplement, and 2) are required for aircraft dispatch.

3.7.1. MEL tables are arranged by aircraft system to provide the PIC a mechanism to determine minimum system requirements. Components are listed by number installed and minimum required. The *Required* column prescribed for use is based on aircraft location and mission type. An asterisk (*) in the *Required* column indicates the number required is situation dependent; refer to the *Remarks/Limitations/Exceptions* column for clarification.

3.7.2. Aircraft Dispatch. Column *A* lists systems/subsystems/components that must be operational for initial mission departure at the aircraft's home station on operational missions. Column *B* is used for all other departures. **Note:** Maintenance designations of fully mission capable, partially mission capable and non-mission capable are independent of the MEL columns (e.g., an aircraft may be partially mission capable for an inoperative defensive system but may depart on a mission that does not require defensive systems).

3.7.3. Remarks/Limitations/Exceptions. Some technical information and procedures are contained in this column. This is not all-inclusive; refer to the flight manual and other directives

for procedures, techniques, limitations, etc. The following are standard remarks used to designate the extent to which the airplane may be flown before the MEL item becomes ME.

3.7.3.1. Mission Dictates Requirement (MDR): The PIC is the final authority when determining whether equipment is required for mission accomplishment and should consider the entire mission profile, not just the next leg. **Example:** An airplane arrives at repair capable facility with the kneel pad actuator inoperative. Coordination with C2 reveals forward/level kneel operations will not be required for the remainder of the mission; therefore, the PIC elects not to have the item repaired prior to departing.

3.7.3.2. Shall be repaired at main operating base (MOB): Stations assigned C-5 aircraft are MOBs. These items are designated ME at an MOB. Refer to the Remarks/Limitations/Exceptions column for specific exceptions applicable to local training missions.

3.7.3.3. Shall be repaired at repair-capable facility (RCF): Stations with the necessary skilled maintenance personnel, support equipment, technical data, and parts on hand to accomplish repairs are considered repair capable. Items with this designation are ME when the aircraft is at an RCF. In those instances where lack of replacement parts or qualified personnel would necessitate mission capable parts (MICAP) or a maintenance repair team (MRT), the en route location is considered non-repair capable and aircraft may continue operations as described in the MEL. Once maintenance action has been initiated, if it is determined repairs are not possible, the PIC should coordinate possible courses of action with C2 agency to return aircraft to service. **Note:** An MOB is always considered an RCF.

3.7.3.4. One-Time Flight (OTF): Ensure any associated Red X discrepancies have been downgraded IAW TO 00-20-1AMC SUP, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures* prior to flight. An MEL waiver and/or MAJCOM Stan/Eval approval may still be required. This condition does not preclude carrying cargo and passengers unless otherwise stipulated by the waiver. The priority is to move the airplane to an RCF. PICs are responsible for coordinating with appropriate agencies to ensure repair capability exists at the destination. OTFs may include en route stops when necessary to recover the airplane to an RCF. **Note:** Aircraft may not depart an MOB for OTF.

3.7.3.5. OTF to nearest RCF: Flight is limited to the nearest (shortest en route time) repair capable base.

3.7.3.6. OTF to RCF: Flight is not restricted to the nearest repair capable base.

3.8. Supplements. Each MAJCOM may supplement the MEL (see **paragraph 1.5**).

Table 3.1. Engines/Auxiliary Power Units (APUs).

ENGINES/AUXILIARY POWER UNITS (APUs) **(Table 3.1.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
1-1. Engine Fire Detection System	2 per engine	2 per engine	1 per engine	(B) 1 per engine (loop A or B) may be inoperative provided all segments of the parallel loop are operational. If the light in the handle is inoperative, the associated Warning shall be operative.
1-2. Engine Fire Extinguishing System				
a. Engine Fire Handle	4	4	4	All system shutoff and isolation functions of each fire handle will be operational.
b. Fire Extinguisher Bottle	8	8	8	(B) 1 inop OTF to RCF.
c. Fire Extinguisher Discharge Button	4	4	4	Each engine must be capable of discharging agent.
d. Fire Extinguisher Bottle Select Switch	2	2	2	
1-3. Thrust Reverser (TR)	4	4	*	(B) Minimum of 1 symmetrical TR pair (preferably inboards) shall be repaired at RCF. If any TR is deactivated, compute all TOLD without TRs. If either/both inboard TRs are deactivated, see TO 1C-5M-1, Section II, “Rapid Descent without Thrust Reversers”. TLDs associated with TR deactivation should be disregarded.
1-4. Starter Air Valve (SAV)	4	4	2	(B) 1 SAV may be electrically inoperative per wing.

ENGINES/AUXILIARY POWER UNITS (APUs) **(Table 3.1.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
1-5. Nacelle Anti-Ice	4	*	*	Valve failed closed is a LVL-A TLD; maintenance may manually open and lock out valve for LVL-C TLD. Valves that are failed open are considered operational.
1-6. Engine Vibration Monitoring System	1 per engine	1 per engine	1 per engine	(B) 1 or more inop OTF to RCF.
1-7. Auxiliary Power Unit (APU)	2	2	1	(B) See TO 1C-5M-1, Section II for APU requirements.
1-8. APU Bleed Control Valve	2	2	1	(B) Required for APU to be considered operational.
1-9. APU Isolation Valve	2	1	0	(B) Shall be repaired at MOB. 1 or both valves may be failed open provided both Wing Isolation Valves (WIVs) are operational. A single valve may be failed closed provided the associated APU is capable of supplying bleed air to the air turbine motor (ATM).
1-10. APU Isolation Valve Open Light	2	0	0	Valve operation shall be confirmed prior to every departure.
1-11. APU Fire Warning System	2	2	1	(B) 1 (loop A or B) must be operational for the associated APU/ATM to be considered operational. Ground: Do not operate APU/ATM with inoperative fire warning system unless a fire guard is present.
1-12. APU Fire Bottle	2	2	1	(B) Shall be repaired at MOB.

ENGINES/AUXILIARY POWER UNITS (APUs) **(Table 3.1.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
1-13. APU Start Battery	1	1	1	Refer to TO 1C-5M-1 for single battery operation. **Note:** Maintenance faults alone do not constitute a failed battery.
1-14. APU Start Battery Control Electronic Module (BCEM)	1	1	0	(B) Shall be repaired at MOB (**Exception:** Not required for locals). Place the APU Battery Charger switch to BYPASS for APU start and battery charging only, otherwise OFF. Closely monitor volts and load **Note:** Maintenance faults alone do not constitute a failed BCEM.
1-15. APU Battery Isolation Contactor (ABIC)	1	1	0	(B) All APU starts will rely upon APU battery.
1-16. APU Battery Charger Switch	1	1	0	(B) APU start will rely upon APU battery charge.

Table 3.2. Bleed Air and Environmental Systems.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
2-1. Air Cycle Refrigeration System				

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. Air Conditioning Pack	2	2	1	(B) Single pack operation is permitted provided floor heat is operational and aircraft is capable of maintaining pressurization. If both packs are inoperative, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft Mean Sea Level [MSL]) to RCF.
b. Air Conditioning Master Switch	1	1	1	Shall have control of air conditioning packs.
c. Air Conditioning Overheat Light	2	2	1	(B) Required for each operating pack.
d. Air Conditioning Overheat Sensor	2	2	1	(B) Required for each operating pack.
e. Airflow Selector Switch	1	1	1	(B) May be electrically inoperative provided valves can be positioned using tools.
f. Compartment Temperature Indicator	3	0	0	Unmanned compartments shall be monitored for proper temperature. Close troop comp shutoff valve if unoccupied.
g. Flight Station Temp Control Valve	1	1	1	Auto mode may be inoperative provided temp control valve can be controlled in manual mode, or positioned using tools.
h. Relief Compartment Temp Control Valve	1	1	1	Auto mode may be inoperative provided temp control valve can be controlled in manual mode, or positioned using tools.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
i. Cargo Compartment Temp Control Valve	1	1	1	Auto mode may be inoperative provided temp control valve can be controlled in manual mode, or positioned using tools.
j. Troop Compartment Temp Control Valve	1	1	1	Auto mode may be inoperative provided temp control valve can be controlled in manual mode, or positioned using tools. If compartment is unoccupied, valve will be closed.
k. Troop Compartment Shutoff Valve	1	1	1	(B) May be electrically inoperative, provided control valve can be positioned using tools.
l. Cooling Air Exit Door	2	2	1	(B) Door shall be installed. If the door is stuck closed, do not operate the affected A/C below .3 Mach, or with slats extended, or when the aircraft is on the ground. If the door is stuck open, do not plan flight above 28,000 ft MSL.
m. Cooling Fan	2	2	1	(B) Do not operate the affected system on the ground, or with slats extended, or below .3 Mach.
n. Cooling Fan Control Valve	2	2	1	(B) If valve failed closed, do not operate the affected system on the ground, or with slats extended, or below .3 Mach
o. Primary Heat Exchanger High Limit Sensor	2	2	1	(B) Required for each operating pack.
p. Primary Heat Exchanger Temp Control Sensor	2	2	1	(B) Required for each operating pack.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
q. Flow Control Valve (FCV)	2	2	1	(B) Required for each operating pack.
r. Low Limit Temperature Control Sensor	2	2	1	(B) If possible, install operational sensor in the left system.
s. Low Limit Temperature Control Valve	2	2	1	(B) If possible, install operational components in the left system.
t. Diverter Valve	1	1	1	(B) May be electrically inoperative provided it can be positioned using tools.
u. Alternate Air Valve	1	1	1	(B) May be electrically inoperative provided it can be positioned using tools.
v. Aux Vent Valve	1	1	1	(B) May be electrically inoperative provided it can be positioned using tools. Shall be repaired at RCF.
2-2. Bleed Air Overheat and Warning System (BAOWS)	7	7	7	If either channel in the dual sensing loop is operational, the respective overheat system shall be considered operational.
2-3. Engine Bleed Air System (EBAS)				
a. Pylon Shutoff Valve (PSOV)	4	4	4	
b. PSOV CLOSED Lights	4	4	0	(B) May be inoperative provided valve functionality can be verified.
c. Pressure Regulating Shutoff Valve (PRSOV)	4	4	2	(B) 1 may be failed per wing.
d. High Pressure Shutoff Valve (HPSOV)	4	4	2	(B) 1 may be failed closed per wing.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
e. Fan Air Modulating Valve (FAMV)	4	4	2	(B) May be failed open. **Note:** Maintenance faults may provide false indication of FAMV failed closed.
2-4. Air Management System Controller (AMSC)	2	2	2	The airplane cannot be launched with a failed AMSC. **Note:** Maintenance faults alone do not constitute a failed AMSC provided all MEL required items are operational.
2-5. Cabin Pressure Control System (CPCS)				
a. Manual Pressure Controller	1	1	1	(B) If inoperative, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft MSL) to RCF. The Outflow and Thrust Recovery valves shall be open.
b. Automatic Pressure Controller	1	1	0	(B) May be inoperative provided manual mode is fully operational. If the manual controller fails in-flight, use flow control switches, floor heat, PSOVs, and Air Conditioning (AC) Master Switch to control pressurization.
c. Pressurization Mode Selector Switch	1	1	0	(B) Manual mode must be operational. If manual mode is inoperative, comply with 2-5a.
d. Outflow Valve Indicator	1	1	0	(B) Cabin rate of climb and differential pressure indicator shall be operational. Use the Scanner to complete preflight steps.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
e. Outflow Valve and Thrust Recovery Valve	1	1	1	(B) If outflow and/or thrust recovery valve(s) failed open, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft MSL) to RCF.
f. Cabin Altimeter and Differential Pressure Indicator	1	1	1	(B) If inoperative, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft MSL) to RCF. Cabin Press Low Caution shall be operational.
g. Cabin Rate of Climb Indicator	1	1	0	(B) Shall be repaired at MOB (**Exception:** Not required for locals). Automatic pressurization controller, cabin altimeter and differential pressure indicator shall be operational.
h. Emergency Depress System	1	1	1	(B) If inoperative, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft MSL) to RCF.
i. Safety Valve	2	2	2	(B) If either valve is inoperative, MAJCOM Stan/Eval approval required for unpressurized OTF (not to exceed 10,000 ft MSL) to RCF. The Outflow and Thrust Recovery valves shall be fully open.
j. CABIN PRESS LOW Warning Indication	1	1	0	(B) Cabin Altimeter and Differential Pressure Indicator (Item 2-5f.) shall be operational.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
2-6. Floor Heat System	1	1	*	(B) Both air conditioning packs shall be operational. Floor heat shall be operational if cargo requires temperature-controlled environment. **Exception:** Not required for pattern locals.
2-7. Manifold Bleed Air Pressure Indicator	1	1	0	(B) If either manifold pressure transducer or the indicator is inoperative, EDS shall be operational and EBAS manifold pressure test points monitored.
2-8. Wing Isolation Valve (WIV)	2	2	1	(B) 1 WIV may be electrically inoperative provided it can be closed using tools. Valve operation can be verified visually or through manifold pressure indications.
2-9. Pitot Heat System (2 masts and 2 heads per system)	2	2	*	(B) MDR. Both systems (all 4 masts and heads) required for flights in Reduced Vertical Separation Minimum (RVSM) airspace. 1 mast and/or head per system (pilot and co-pilot) may be inoperative for flights conducted in non-icing conditions in non-RVSM airspace.
2-10. Angle of Attack De-ice System	2	1	1	1 system shall be fully operational. Associated stallimiter shall be operational.
2-11. Windshield Heat	5	3	2	(A) The 3 front windshield panels shall be operational. (B) 2 of the 3 front windshield panels shall be operational.

BLEED AIR & ENVIRONMENTAL SYSTEMS **(Table 3.2.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
2-12. Windshield Wiper	2	*	*	MDR. 1 system shall be operational for flights with forecast precipitation.
2-13. Total Air Temperature (TAT) Indicator	1	0	0	Static Air Temp (used for temp dev calculations) is displayed in the Personal Computer Interface Unit (PCIU) flight status window; TAT (used for fuel temperature limits) can be obtained from EDS test points.
2-14. Avionics Equipment Cooling System				
a. Avionics Cooling Fan	2	2	1	(B) Shall be repaired at RCF (**Exception:** Not required for locals).
b. Flight Engineer's Panel FAN FAIL Light	1	1	0	(B) Fan must be operational, periodically check fan in-flight.
c. Flight Engineer's Panel Fan	1	1	1	
d. Electrical Power Control Equipment Rack Fan	2	1	1	See TO 1C-5M-1, Section III for ground operating limits.
e. AC Load Center Equipment Fan	1	1	0	(B) Periodically scan courier compartment. Shall be repaired at RCF. See TO 1C-5M-1, Section III for ground operating limits.
f. A-41 Rack Fan	1	1	0	(B) Shall be repaired at RCF. See TO 1C-5M-1, Section III for ground operating limits.
g. Avionics Supplemental Cooling Fan	1	1	0	(B) Shall be repaired at RCF.

Table 3.3. Hydraulics.

HYDRAULICS **(Table 3.3.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
3-1. 1-2 Power Transfer Unit (PTU)	1	1	0	(B) May be inoperative provided #1 ATM and #1 and #2 engine-driven pumps (all) are operational.
3-2. 2-3 PTU	1	1	0	(B) May be inoperative provided the 1-2 and 3-4 PTUs, or #2 and #3 engine-driven pumps (all) are operational.
3-3. 3-4 PTU	1	1	0	(B) May be inoperative provided #4 ATM and #3 & #4 engine-driven pumps (all) are operational.
3-4. ATM ON Light	2	2	1	(B) May be inoperative if ATM is made inoperative. Hydraulics must be isolated.
3-5. ATM	2	2	1	(B) Applicable PTU and engine-driven pumps shall be operational. Complete required preflight items after engine start or with a hydraulic test stand if available. **WARNING:** Do not perform anti-skid check w/engines running.
3-6. Electric Suction Boost Pump	2	2	1	(B) If both electric suction boost pumps are inoperative OTF to RCF. Minimize ATM starts. Associated hydraulic suction boost pump shall be operational. Check applicable hydraulic service center filters for popped button. If button is popped all system filters must be checked for contamination.

HYDRAULICS **(Table 3.3.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
3-7. Hydraulic Suction Boost Pump	4	4	2	(B) Check applicable hydraulic service center filters for popped button. If button is popped all system filters must be checked for contamination. #1 and #4 may be inoperative if the respective electrical suction boost pump is operational. If #2 or #3 boost pump fails, swapping the failed boost pump with either #1 or #4 is permissible provided no contamination is present.
3-8. Engine-Driven Hydraulic Pump	8	8	6	All pumps shall have positive depress capability. (B) Check associated system filters for contamination. Adjacent PTUs shall be operational. Only 1 pump on 2 nonadjacent engines may be inoperative.
3-9. Flight Engineer Hydraulic Pressure Gauge	4	4	3	(B) 2 inoperative gauges requires OTF to RCF. Direct reading gauge shall be operational and periodically monitored. Associated PRESS LOW lights shall be operational.
3-10. Flight Engineer Hydraulic Quantity Indicator	4	4	3	(B) Sight gauge shall be monitored periodically. Associated flight engineer hydraulic pressure gauge and BOOST PRESS LOW light shall be operational.

HYDRAULICS **(Table 3.3.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
3-11. Hydraulic BOOST PRESS LOW Light	4	4	3	(B) Monitor/scan associated system(s). 1 light inoperative requires repair at RCF (**Exception:** Not required for locals). 2 lights inoperative requires OTF to RCF.
3-12. Hydraulic Pressure Gauge (Direct Reading)	4	4	0	(B) Associated flight engineer hydraulic pressure gauge shall be operational.
3-13. Hydraulic Pump PRESS LOW Light	8	8	6	(B) Associated flight engineer hydraulic pressure gauge shall be operational. Depress unaffected hydraulic pump, unless required to pressurize the system. No more than 1 light on each non-adjacent engine may be inoperative.
3-14. Hydraulic Pump Pressure Switch	8	8	6	(B) Associated flight engineer hydraulic pressure gauge shall be operational. Depress unaffected hydraulic pump, unless required to pressurize the system. No more than 1 pressure switch on each non-adjacent engine may be inoperative.
3-15. Hydraulic Reservoir Sight Gauge	4	4	0	(B) May be capped if flight engineer hydraulic quantity indicator is operational. Verify hydraulic quantity prior to launch.
3-16. Ram Air Turbine (RAT)	1	1	1	
3-17. Deploy RAT Light	1	1	0	
3-18. RAT UNLOCKED Caution Indication	1	1	1	

Table 3.4. Landing Gear.

LANDING GEAR **(Table 3.4.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
4-1. Anti-Skid System	1	1	1	Refer to 1C-5M-1 Section III.
a. ANTI-SKID OFF Light	1	1	1	
b. BRAKES Light	1	1	0	(B) Shall be repaired at RCF. Troubleshooting procedures contained in TO 1C-5M-2-10FI-2, *Brakes & Skid Control, Caster Power-Back & Steering/Kneeling Failures*, shall be used to verify malfunction is indication only prior to each departure.
c. NO BRAKES Light	1	1	1	
d. DET FAIL Light	1	1	1	
e. Anti-Skid External Monitoring System	1	1	0	
4-2. Normal Brake System	1	1	1	
a. Normal Brake Pressure Indicator	1	1	0	(B) Shall be repaired at RCF. EMER HYD brake pressure light shall be operational. Alternate brake pressure indicator and flight engineer's #4 hydraulic pressure gauge shall be operational. Select alternate brakes for landing. If normal brakes are required for landing, perform a Brake System Check (In-flight).
4-3. Alternate Brake System	1	1	1	

LANDING GEAR **(Table 3.4.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. Alternate Brake Pressure Indicator	1	1	0	(B) Shall be repaired at MOB (**Exception:** Not required for locals). Normal brake pressure indicator and flight engineer's #1 hydraulic pressure gauge shall be operational. Select normal brakes for landing. If alternate brakes are required for landing, perform a Brake System Check (In-flight).
4-4. Emergency Brake System	1	1	1	
a. EMER HYD Brake Pressure Light	1	1	0	(B) Shall be repaired at MOB. Normal brake pressure indicator shall be operational.
4-5. Anti-rotation/In-Flight Brake System	1	1	*	(B) Aircraft climb performance capability dictates requirement. Refer to TO 1C-5M-1-1, *Performance Manual*, to determine the effect of delayed gear retraction.
4-6. Parking Brake	1	1	1	(B) Inop requires OTF to RCF. Brakes shall be guarded at all times when chocks are removed. Scanner shall install chocks in the event of an emergency. Do not accomplish kneeling/loading/unloading with engines running. With engines shutdown, brakes shall be guarded if operation requires parking brake set.
4-7. Main Landing Gear (MLG) Caster System	1	1	*	(B) MDR.

LANDING GEAR **(Table 3.4.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. MLG FREE Lights	2	2	*	(B) MDR. If inoperative, copilot shall monitor position indicators. If lights are inoperative, do not accomplish kneeling operations.
b. Aft MLG Position and Emergency Control Switch	2	2	0	(B) Shall be repaired at RCF. Limit caster operations. Normal caster shall be operational. Mission segments limited to tow-capable locations.
4-8. Emergency Extend Switch	5	5	5	(B) OTF with affected gear down to nearest RCF. Refer to **paragraph 3.9**.
4-9. Kneeling System	1	1	*	MDR. All main landing gear shall be capable of in-flight kneeling. If not capable of in-flight kneeling, OTF with the affected MLG gear down to the nearest RCF. Refer to **paragraph 3.9**.
4-10. Landing Gear Warning System				
a. Landing Gear Warning Horn	1	1	0	(B) Shall be repaired at RCF.
b. Landing Gear Warning Light	2	2	1	(B) If both lights are inoperative, OTF to RCF. All gear position indicators shall be operational.
c. Landing Gear Warning Test Button	1	1	0	(B) Shall be repaired at MOB.
d. Horn Silence Button	1	1	0	(B) Shall be repaired at MOB.

LANDING GEAR **(Table 3.4.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
e. EMERG SW ON Light	1	1	0	(B) Shall be repaired at MOB. Consider light illuminated and refer to Emergency NLG Extension – EMERG SW ON LIGHT ON prior to each NLG extension.
f. BOGIE PITCH Caution Indication	4	4	4	(B) 1 or more inop requires OTF with affected gear down to nearest RCF. Refer to **paragraph 3.9**.
4-11. NLG Fiber Optics Scope	1	1	1	(B) If inop OTF with NLG down to nearest RCF. Refer to **paragraph 3.9**.
4-12. NLG Inspection Light	3	1	1	Light for the fiber optics target required day or night. (B) If light for the fiber optics target is inoperative, OTF with NLG down to the nearest RCF. Refer to **paragraph 3.9**.
4-13. MLG Inspection Light	2/MLG	*	*	Mission dictates requirement. 1 per MLG should be operational for night operations.
4-14. Nose Gear Steering	1	1	1	Both Normal and Emergency systems shall be operational.
a. Rudder Pedal Steering	1	1	0	(B) Shall be repaired at RCF. Refer to TO 1C-5M-1-1 for effects on Ground Minimum Control Speed (VMCG). Nose Gear Steering system (wheel) shall be operational.
4-15. Position and Indicating Systems	1	1	1	(B) OTF with affected gear down to nearest RCF. Refer to **paragraph 3.9**. Prior to landing, affected gear will be visually verified for proper down and locked indications at sequence control panel and inspection covers/fiber optics.

LANDING GEAR **(Table 3.4.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
4-16. Relay Logic System (Sequence Control Panel)	3	3	3	(B) OTF with affected gear down to nearest RCF. Refer to **paragraph 3.9**. Prior to landing, affected gear will be visually verified for proper down and locked indications.
4-17. Crew Entrance Door Accumulator	1	1	1	(B) If inop, OTF with nose gear down to nearest RCF. Refer to **paragraph 3.9**.
4-18. Emergency MLG Extension Accumulator	2	2	2	(B) If inop OTF with affected gear (2) down to nearest RCF. Refer to **paragraph 3.9**.
4-19. MLG Secondary Strut (deflated)	4	4	4	(B) OTF to RCF. Limit landing sink rate to 6 ft/s (FPS) (360 ft/min) or less.

3.9. Gear Down Flight Operations. Limit gear down flight operations to sorties required to move the aircraft to the nearest RCF. **(T-3)** Consider a gear down flight if the aircraft cannot reasonably be repaired in place.

3.9.1. Before considering a gear down flight, verify the airplane will achieve adequate obstacle identification surface (OIS) / climb gradient and obstacle clearance based on the planned configuration, to include en route stops and alternates.

3.9.2. An MEL waiver is not required for gear down flights. However, consider potential aircraft malfunctions, adverse flight conditions, takeoff and landing data (TOLD) calculations, and proper aircraft documentation prior to a planned gear down flight. If the airplane is on a Red X for a gear malfunction, it must be downgraded IAW TO 00-20-1AMC SUP prior to flight. **(T-3) Note:** If the affected gear is pinned by maintenance, the remaining gear may be retracted.

3.9.3. Local Training Missions. Local missions will not be planned gear down. **(T-3)** When in-flight malfunctions prohibit gear retraction (except MLG rotation malfunctions), the local may continue after the cause of malfunction has been identified and the PIC and maintenance supervisor concur. Do not exceed 200 KCAS/.60 Mach.

3.9.4. Preflight.

3.9.4.1. Refer to Variant Configuration Fuel Planning, **paragraph 11.5.7**, for Gear Down Flight fuel planning.

3.9.4.2. Plan not to exceed 200 KCAS/.60 Mach to reduce stress on landing gear and APU servicing doors. When range is a factor, fly an airspeed that yields the maximum range; do not exceed 250 KCAS/.60 Mach. **Exception:** Tactical departures will not exceed 250 KCAS.

3.9.4.3. Ensure the affected gear is pinned and the APU servicing door panel on the affected side is speed-taped upon completion of the aircrew inspection/prior to flight. Tape the liquid oxygen (LOX) servicing door if the number 1 MLG is pinned. Taping may help prevent loss of the door panel(s).

3.9.5. Post flight. After each gear-down flight, the scanner should pay particular attention to the affected wheel well, doors, actuators, brackets, liquid nitrogen (LN2) servicing panel, and folding bulkhead (if applicable) while accomplishing the before leaving airplane checklist exterior inspection.

Table 3.5. Flight Controls.

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
5-1. Ailerons				
a. Aileron Actuator	2 per aileron	2 per aileron	2 per aileron	
b. Hydraulic SYS X OFF Light/pressure switch	2 per aileron	2 per aileron	1 per aileron	(B) Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.
c. Hydraulic Power Shutoff Valve	2 per aileron	2 per aileron	1 per aileron	(B) Shall be repaired at RCF (**Exception:** Not required for locals). 1 valve may be failed open.
d. Aileron Trim Actuator	2	2	1	(B) Shall be repaired at MOB (**Exception:** Not required for locals/required for simulated engine-out operations). Aileron shall be centered prior to flight.

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
e. Aileron Trim Position Indicator	1	1	0	(B) Ailerons shall be centered prior to flight. Required for simulated engine-out operations.
f. Aileron Artificial Feel	1	1	1	(B) If inop OTF to RCF.
5-2. Elevators				
a. Inboard Elevator Hydraulic SYS X OFF Light/pressure switch	2 per elevator	2 per elevator	1 per elevator	(B) Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.
b. Inboard Elevator Hydraulic Power Shutoff Valve	2 per elevator	2 per elevator	1 per elevator	(B) Shall be repaired at RCF (**Exception:** Not required for locals). 1 valve may be failed open.
c. Outboard Elevator Hydraulic SYS X OFF Light/pressure switch	3 per elevator	3 per elevator	2 per elevator	(B) Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.
d. Outboard Elevator Hydraulic Power Shutoff Valve	3 per elevator	3 per elevator	2 per elevator	(B) Shall be repaired at RCF (**Exception:** Not required for locals). 1 valve may be failed open.
e. Elevator Artificial Feel System (VFUs)	2	2	1	If test equipment is not available, do not drain VFU bottles. (B) If both systems are inoperative: OTF to nearest RCF. Do not engage pitch autopilot.
5-3. Horizontal Stabilizer Pitch Trim				

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. Normal Pitch Trim	1	1	1	(B) If inop OTF to nearest RCF. Alternate and manual trim shall be operational.
b. Alternate Pitch Trim	1	1	1	(B) If inop OTF to nearest RCF. Normal and manual trim shall be operational.
c. Manual Pitch Trim	1	1	1	
d. Trim Disconnect Switch	2	2	2	(B) OTF to nearest RCF with 1 inop. Seat with operational switch shall be occupied at all times.
e. Horizontal Stabilizer Trim Position Indicator	1	1	1	
5-4. Rudders				
a. Rudder Hydraulic SYS X OFF Light/pressure switch	2 per rudder	2 per rudder	1 per rudder	(B) Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.
b. Rudder Hydraulic Power Shutoff Valve	2 per rudder	2 per rudder	1 per rudder	(B) Shall be repaired at RCF (**Exception:** Not required for locals). 1 valve may be failed open only.
c. Rudder Limiter	1	1	0	(B) Shall be repaired at RCF. MIN Q position shall be operational and selected to ensure full rudder travel is available.

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
d. Rudder Trim	1	1	0	(B) Shall be repaired at RCF (**Exception:** not required for locals/required for simulated engine-out operations). Yaw Aug Man Trim shall be operational.
e. Rudder Trim Position Indicator	1	1	0	(B) 1 mechanical inclinometer shall be fully operational; rudder shall be centered prior to flight. Required for simulated engine-out operations.
f. Emergency Rudder (Yaw Aug Man) Trim	1	1	1	(B) If inop OTF to RCF. Refer to TO 1C-5M-1, Section V.
5-5. Flaps and Slats				
a. Flap Slat Asymmetry System	1	1	1	
b. Flap Position Indicator	1	1	1	(B) If PCIU is operational, use associated EDS test points to confirm scanned flap position. Shall be repaired at RCF. If EDS test points cannot be accessed, OTF to RCF; scan flaps to verify approximate position.
c. Ratio Shifters	2	2	0	(B) AUTO position of ratio shifters may be inoperative. Shall be able to manually position ratio shifters to the FLAPS UP and FLAPS DN position. Select matching position.

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
d. Slats	14	14	14	(B) For slats retracted, OTF to RCF. For slats extended, OTF to nearest RCF. See TO 1C-5M-1, Section V.
e. Slat Position Indicator	1	1	0	(B) Shall be repaired at RCF. Flap indicator shall be operational. Scan slats to verify position. If PCIU is operational, use the associated EDS test points to confirm scanned slat position. If the slats are retracted, the slat position indicator circuit breaker for the malfunctioning side may be opened to remove the maximum safe airspeed indicator and normal airspeed may be resumed. The associate air conditioning pack will default to low flow.
f. Slat Drive Disconnect Switch	1	1	1	(B) If inop OTF to RCF. See item 5-5d. Takeoff and Landing will be conducted with slats retracted. See TO 1C-5M-1, Section V.
5-6. Flight Spoilers				
a. Flight Spoiler SYS X OFF Light/pressure switch	2 per spoiler	2 per spoiler	1 per spoiler	(B) An entire 5-light module bank on each wing may be inoperative provided all adjacent (SYS A or B) lights are operational. Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
b. Flight Spoiler Hydraulic Power Shutoff Valve	2 per spoiler	2 per spoiler	1 per spoiler	(B) Shall be repaired at RCF (**Exception:** Not required for locals). 1 valve may be failed open.
5-7. Ground Spoilers				
a. Ground Spoiler SYS X OFF Light/pressure switch	2 per spoiler	2 per spoiler	1 per spoiler	(B) An entire 4-light module bank on each wing may be inoperative provided all adjacent (SYS A or B) lights are operational. Verify malfunction is indication only by checking surface movement with the unaffected hydraulic power switch OFF.
b. Ground Spoiler Hydraulic Power Shutoff Valve	2 per spoiler	2 per spoiler	1 per spoiler	(B) Shall be repaired at RCF. 1 valve may be failed open.
5-8. Active Lift Distribution Control System (ALDCS)	1	1	0	(B) Shall be repaired at RCF. Refer to TO 1C-5M-1, Section V.
5-9. Stability Augmentation System (SAS)				When scheduled for aerial refueling, every effort should be made to launch with operational augmentation. With inoperative systems the applicable autopilot axis will be inoperative. If pitch autopilot is inoperative refer to AFMAN 11-202V3, AMC Supplement for FDP limitations.
a. AUG Power Switch	1	1	1	

FLIGHT CONTROLS **(Table 3.5.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
b. Pitch Augmentation	1	1	0	(B) Shall be repaired at RCF. **Note:** System is considered operational with 1 side disabled IAW TO 1C-5M-1, Section II.
c. Lateral Augmentation	1	1	0	(B) Shall be repaired at RCF. **Note:** System is considered operational with 1 side disabled IAW TO 1C-5M-1, Section II.
d. Yaw Augmentation	1	1	1	OTF to RCF. See TO 1C-5M-1, Sections III and V. **Note:** System is considered operational with 1 side disabled IAW TO 1C-5M-1, Section II.
5-10. Pilot Assist Servo System (PACS)				
a. PACS Roll System	1	1	0	(B) Shall be repaired at RCF. **Note:** System may be considered operational if the OFF advisory can be extinguished by changing the AFCS VIA (PLT/COPLT) control.
b. PACS Pitch System	1	1	0	(B) Shall be repaired at RCF. **Note:** System may be considered operational if the OFF advisory can be extinguished by changing the AFCS VIA (PLT/COPLT) control.
5-11. Automatic Flight Control System (AFCS)				

FLIGHT CONTROLS (Table 3.5.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. AFCS Power Switch	1	1	1	
b. Autopilot	2	2	*	(B) MDR. Pitch autopilot required for flights through RVSM airspace. If any axis of the autopilot is inoperative refer to AFMAN 11-202V3, AMC Supplement for FDP limitations.
5-12. Autothrottle	2	2	0	

Table 3.6. Fuel Systems.

FUEL SYSTEMS (Table 3.6.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
6-1. Aerial Refuel System	1	*	*	MDR. **Note:** Do not delay missions with no A/R requirement to repair fuel leaks in this system if the manifold can be isolated. Do not launch on local A/R training missions without the normal A/R door system in operation. Use of the Aerial Refuel Slipway Door Manual Operation is reserved for operational missions. Refer to TO 1C-5M-1, Section II.
6-2. Aerial Refuel Slipway Light	2	*	*	MDR. At least 1 light required for night air refueling.

FUEL SYSTEMS **(Table 3.6.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
6-3. Main Tank Boost Pump	2 per tank	2 per tank	1 per tank	(B) Open and collar affected pump circuit breaker. Associated crossfeed and isolation valves shall be operational.
6-4. Auxiliary Tank Boost Pump	2 per tank	*	*	MDR. 1 pump per tank may be inoperative if tank contains/will contain fuel. Both pumps may be inoperative if tank does not/will not contain fuel. Open and collar affected pump circuit breaker(s).
6-5. Extended Range Tank Boost Pump	2 per tank	*	*	MDR. 1 pump per tank may be inoperative if tank contains/will contain fuel. Both pumps may be inoperative if tank does not/will not contain fuel. Open and collar affected pump circuit breaker(s).
6-6. Main Tank Boost PRESS LOW Light	4	4	3	(B) Shall be repaired at MOB (**Exception:** Not required for locals). Both boost pumps shall be operational. Place both boost pumps on.
6-7. Fuel Jettison Valve	2	2	1	(B) 1 valve may be failed closed if all separation valves are operational.
6-8. Main Tank Fill Valve	4	4	3	(B) 1 valve failed open – shall be repaired at MOB; control fuel level with associated aux/ext range tank boost pumps. 1 valve failed closed – OTF to RCF provided standard fuel sequencing can be maintained using over-wing ground refueling and engine crossfeed as required.

FUEL SYSTEMS **(Table 3.6.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
6-9. Aux Tank Refuel Valve	4	*	*	MDR. Valves may be failed closed if the tank is not/will not be needed for fuel. If fuel is required in any aux or extended range tank, refer to **paragraph 3.10**.
6-10. Extended Range Tank Refuel Valve	4	*	*	MDR. Valves may be failed closed if the tank is not/will be needed for fuel. If fuel is required in any extended range tank, refer to **paragraph 3.10**.
6-11. Isolation Valve	4	4	3	(B) Shall be repaired at MOB (**Exception:** Not required for locals). 1 valve may be failed closed only. Respective crossfeed valve shall be operational.
6-12. Separation Valve	3	3	2	(B) If center separation valve is failed closed, both aerial refuel isolation valves shall be operational. If outboard separation valve is failed closed, the respective isolation and crossfeed valves shall be operational.
6-13. Crossfeed Valve	2	2	1	(B) Shall be repaired at RCF. 1 valve may be failed closed only; respective isolation valves and outboard separation valve shall be operational.
6-14. Ground Refuel Isolation Valve	2	2	1	
6-15. Manifold PRESS LOW Light	4	4	2	(B) Inboard lights may be inoperative provided the associated manifold pressure gauge is operational.

FUEL SYSTEMS **(Table 3.6.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
6-16. Fuel Manifold Pressure Indicator	2	2	1	Both shall be operational for planned aerial refueling. (B) Separation valves and manifold press low lights shall be operational.
6-17. SUMP LOW Indication	2	2	0	(B) Shall be repaired at MOB (**Exception:** Not required for pattern-only locals). The system shall be made safe prior to flight. Both associated outboard main tank boost pumps shall be operational. Refer to TO 1C-5M-1, Section III. Airspeed limit may affect fuel planning.
6-18. MAIN TANK LOW Indication	2	2	0	(B) Shall be repaired at MOB (**Exception:** Not required for locals). Associated outboard main tank indicator shall be operational.
6-19. VENT FILL Light	2	2	0	(B) Shall be repaired at MOB. Control fuel level with associated aux/ext range tank boost pumps to preclude over filling.
6-20. Total Fuel Quantity Indicator	1	1	0	(B) Serviced tanks must have operational indicators.
6-21. Fuel Quantity Indicators				Do not launch with more than 1 inoperative fuel quantity indicator per wing. Symmetrically opposite indicator shall be operative. Refer to **paragraph 3.10**. Refer to **paragraph 9.11** for ground refueling.
a. Main Tank Fuel Quantity Indicator	4	4	3	Refer to remarks in 6-21.

FUEL SYSTEMS (Table 3.6.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
b. Auxiliary Tank Fuel Quantity Indicator	4	4	2	Refer to remarks in 6-21.
c. Extended Range Tank Fuel Quantity Indicator	4	4	2	Refer to remarks in 6-21.

3.10. Fuel System.

3.10.1. Fuel Quantity Indicator Failure in Flight.

3.10.1.1. Operational Missions. After complying with TO 1C-5M-1, Section III, continue as scheduled and land at the intended destination provided the location has capability to either repair or safe affected tank.

3.10.1.2. Local Missions. After complying with TO 1C-5M-1, Section III, land as soon as practical.

3.10.2. Aerial Refueling with Inoperative Fuel Quantity Indicator.

3.10.2.1. Operational Missions. Comply with TO 1C-5M-1, Section III. Symmetrically opposite indicator shall be operative. **(T-2)** Do not air refuel with more than one inoperative fuel quantity indicator per wing. **(T-2)**

3.10.2.2. Local Missions. Do not conduct aerial refueling for training with an inoperative indicator unless the tank has been safed by maintenance. **(T-2)**

3.10.2.3. Servicing. During aerial refueling, service tanks with operational indicators first. Tanks with inoperative indicators should be serviced internally by transferring a known quantity from another tank.

3.10.2.3.1. Unless TO 1C-5M-1, Section V, Maximum Allowable Fuel Differential limits will be exceeded, do not accomplish internal servicing until termination of refueling. If necessary, internal servicing may be accomplished in the precontact position.

3.10.2.3.2. When a main tank indicator is inoperative and total main tank fuel quantity is less than 30,000 pounds, simultaneously fill all main tanks prior to servicing other tanks using the following procedures:

3.10.2.3.2.1. Position the AUTO REF switch to MAN for transfer.

3.10.2.3.2.2. Monitor symmetrically opposite indicator to judge quantity in tank with inoperative indicator.

3.10.2.3.2.3. After filling the main tanks, disconnect and obtain an offload report

to verify the quantity of fuel in the tank with the inoperative indicator.

3.10.2.3.2.4. Aerial refueling may continue after confirming main tank fuel quantity.

3.10.2.3.2.5. Further servicing of a tank with an inoperative indicator should be made using known quantities from internal sources.

3.10.2.3.2.6. If a fuel imbalance is suspected (i.e., heavy wing or excessive aileron trim requirements), terminate aerial refueling and obtain an offload report.

3.10.2.3.2.7. Prior to internal fuel transfer, verify quantity of fuel in tanks with inoperative indicators.

3.10.2.3.2.8. Refueling may be continued after fuel is balanced.

3.10.3. Fuel Quantity Indicator Error Codes.

3.10.3.1. The presence of error codes does not require that circuit breakers be opened or that fuel tanks be made electrically safe prior to continued operation. Crews should use the procedures in **paragraph 9.11** for ground refueling operations. Crews should contact AMC Stan/Eval via C2 channels prior to requesting that fuel tanks be made electrically safe.

3.10.3.2. En route locations with fuel cell maintenance capabilities should coordinate with MOBs to determine the most logical location, based on the mission profile, to troubleshoot and repair fuel quantity indicating systems when error codes are displayed. **Example:** If the fuel cell is available at ETAR and the airplane is on a depositioning leg, ETAR should perform the repair if the fuel cell at home station is unavailable.

3.10.4. Operations with Nonstandard Fuel Sequencing. Refer to TO 1C-5M-1, Sections II and V if nonstandard fuel sequencing is required for an OTF to the nearest maintenance facility where fuel cell repair capabilities exist.

Table 3.7. Electrics.

ELECTRICS **(Table 3.7.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
7-1. Integrated Drive Generator (IDG)	4	4	2	(B) 1 may be inoperative per wing provided the bus tie system (all functions) and ACXTR is operational. 3 required for SCM aircraft on space cargo transportation system (SCTS) missions.
7-2. Generator Relay (GR)	4	4	2	(B) Required for IDG to be considered operational, see 7-1.

ELECTRICS **(Table 3.7.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
7-3. Bus Tie Relay (BTR)	4	4	2	(B) 1 may be inoperative per wing provided the ACXTR is operational. IDG and GR shall be operational on engine with inoperative BTR. 4 BTRs required for SCM aircraft on SCTS missions.
7-4. APU Power Relay (APR)	1	1	1	
7-5. External Power Relay (EPR)	1	1	0	
7-6. AC Cross Tie Relay (ACXTR)	1	1	0	(B) Shall be repaired at RCF. If failed open, all IDG's shall be operational. If failed closed, 1 IDG per wing may be inoperative.
7-7. AC Load Meter	4	4	2	(B) Required for IDG to be considered operational, see 7-1.
7-8. Generator Out Light	4	4	2	(B) Required for IDG to be considered operational, see 7-1.
7-9. Bus Tie Open Light	4	4	4	
7-10. Aircraft Battery	1	1	1	**Note:** Maintenance faults alone do not constitute a failed battery.
a. Aircraft Battery Switch	1	1	1	(B) OFF and BYPASS positions shall be operational.
b. Battery Charger Electronics Module (BCEM)	1	1	0	(B) Shall be repaired at RCF (**Exception:** Not required for locals). If inoperative place the Acft Batt switch to BYPASS and closely monitor volts and load. **Note:** Maintenance faults alone do not constitute a failed BCEM.

ELECTRICS **(Table 3.7.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
c. Aircraft Battery Light	1	1	1	(B) OTF to RCF.
7-11. 600 Amp Current Limiter	1	1	0	(B) All APU starts will rely upon APU battery.
7-12. 750 Amp Current Limiter	1	1	0	(B) Shall be repaired at MOB. Both transformer rectifiers shall be operational. APU battery must be serviceable and the APU battery charger switch OFF for APU starts. **Note:** Split loadmeter indication alone does not constitute a failed current limiter.
7-13. 325 Amp Current Limiter	1	1	1	
7-14. Regulated Transformer Rectifier Unit (RTRU)	2	2	2	(B) 1 inop requires OTF to RCF. 750 Amp current limiter shall be operational.
7-15. RTRU Fan	2	2	1	(B) Shall be repaired at RCF.
7-16. Isolated Bus Switch	1	1	1	
7-17. DC Load Meter	2	2	1	(B) Shall be operational for each operational RTRU.
7-18. DC Volt Meter	1	1	1	(B) OTF to RCF. Prior to applying electrical power, check battery voltage using external meter.
a. DC Volt Meter Selector Switch	1	1	1	(B) OTF to RCF.
7-19. Emergency Generator System	1	1	1	
7-20. Emergency Generator Test AC Voltmeter	1	1	0	

ELECTRICS **(Table 3.7.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
7-21. Emergency Bus Power Relay (EBPR)	1	1	1	

Table 3.8. Instruments.

INSTRUMENTS **(Table 3.8.)**				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
8-1. Standard Central Air Data Computer (SCADC)	2	2	2	If a single SCADC has been replaced and test equipment is not available or, mission dictates, the required leak and accuracy check may be deferred provided the unaffected pitot-static system has not been disturbed. Cross-check pilot and copilot airspeed indicators at 80 knots on takeoff roll. Abort the takeoff if airspeed differs by five knots or more. **Exception:** Leak and accuracy check is required before flight in RVSM airspace.
a. SCADC/VFU Drain Bottles	12	12	12	If bottle(s) for a single system are drained and test equipment is not available or, mission dictates, the required leak and accuracy check may be deferred provided the unaffected pitot-static system has not been disturbed. Cross-check pilot and copilot airspeed indicators at 80 knots on takeoff roll. Abort the takeoff if airspeed differs by five knots or more. **Exception:** Leak and accuracy check is required before flight in RVSM airspace.
8-2. Magnetic Compass	1	1	1	Magnetic Compass Correction Cards shall be installed.
8-3. Accelerometer	1	1	0	(B) EDS shall be capable of monitoring in-flight loads.

INSTRUMENTS (Table 3.8.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
8-4. Multifunction Display Units (MFDU)				
a. Pilots Station	6	6	4	(B) Operational units shall be installed in pilot‘s left, pilot‘s center, copilot‘s left and copilot‘s center positions.
b. Flight Engineer Station	1	1	1	Operational unit may be taken from pilot’s or copilot’s right position.
8-5. MFDU Controls				
a. Cursor Control Device (CCD)	2	2	2	(B) 1 inop requires OTF to RCF. Cross-side function shall be operational. Operational CCD shall be installed on pilot‘s side.
b. Cursor Control Panel (CCP)	1	1	1	
8-6. Multifunction Control Display Unit (MCDU)				
a. Pilot	1	1	0	(B) Copilot’s and observer’s MCDU shall be operational. Circuit breaker for inoperative MCDU shall be pulled.
b. Copilot	1	1	1	
c. Observer	1	1	0	(B) Pilot’s and copilot’s MCDU shall be operational. Circuit breaker for inoperative MCDU shall be pulled.

Table 3.9. Avionics.

AVIONICS (Table 3.9.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
9-1. Versatile Integrated Avionics (VIA)	2	2	2	(B) 1 inop requires OTF to RCF. BIP shall be operational. See TO 1C-5M-1, Unable RNP Procedures and reference **Table 8.1**, "Navigation/Communication Capability of C-5M" for airspace requirements. Accomplish TO 1C-5M-1, Section III VIA/AIU Failure In Flight checklist during preflight. **Note:** CMF selection should correct VIA 2 Nonvolatile Memory (NVM) START FAIL Caution.
9-2. Nonvolatile Memory (NVM)	1 per VIA	1 per VIA	1 per VIA	(B) If maintenance is not available, MAJCOM Stan/Eval approval required for OTF to RCF. Record data from each operating VIA NVM Configuration MCDU page before requesting approval. Rudder Lim switch shall be placed to MIN-Q. Time remaining on any TLDs must be manually calculated/tracked.
9-3. Avionics Interface Unit (AIU)	2	2	2	(B) 1 inop requires OTF to RCF. BIP shall be operational. Accomplish TO 1C-5M-1, Section III VIA/AIU Failure In Flight during preflight.
9-4. VIA/AIU Alternate Power Switch	1	1	1	
9-5. Backup Integrating Processor (BIP)	1	1	1	(B) If inop requires OTF to RCF. Both VIAs/AIUs shall be operational.
9-6. Bus Subsystem Interface Unit (BSIU)	2	2	2	(B) 1 inop requires OTF to RCF. See TO 1C-5M-1, Section III, BSIU Failures.
9-7. Data Loader	1	1	*	(B) MDR.
9-8. Communication Navigation Panel (CNP)	2	2	1	(B) If possible place the operational CNP in the pilot's position. Pilot and Copilot MCDUs shall be operational.

AVIONICS (Table 3.9.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
9-9. Multi-Mode Receiver (MMR)	2	2	1	2 required for CAT II ILS approaches
9-10. Tactical Air Navigation (TACAN)	2	2	0	(B) If both TACANs are inoperative, 1 shall be repaired at RCF.
9-11. V/UHF Radio	2	2	1	(B) Operational radio shall be placed in the #1 position.
9-12. HF Radio	2	*	*	MDR. 1 required for oceanic missions, Not applicable (N/A) for locals.
a. Datalink Printer	1	*	*	MDR.
9-13. AERO-I	1	*	*	MDR. Refer to **Table 8.1**.
9-14. UHF #3	1	1	1	
9-15. Automatic Direction Finder (ADF)	2/1	0	0	**Note:** The ADF is slated for removal.
9-16. Embedded Global Positioning System/Inertial Navigation System (EGI)	2	2	1	(B) Shall be repaired at RCF. Three sources of attitude required (1 EGI, MIRS and SAI). See TO 1C-5M-1, Unable RNP Procedures and reference **Table 8.1** "Navigation/Communication Capability of C-5M" for airspace requirements. **Note:** A single EGI does not qualify as dual Long Range Navigation Systems for airspace requirements.
9-17. Micro Inertial Reference System (MIRS)	1	1	0	(B) Shall be repaired at RCF. Three sources of attitude required (2 EGIs and SAI).
9-18. Identification Friend of Foe (IFF)	1	1	1	Mode 3A and C shall be operational.
a. Mode 5 Computer	1	1	*	(B) MDR. Do not delay takeoff except when the aircraft will transit an area where safe passage procedures are implemented. In-flight failures: Continue to intended destination. Where safe passage is implemented, follow procedures for inoperative Mode 5.

AVIONICS (Table 3.9.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
9-19. Traffic Collision Avoidance System (TCAS)	1	1	0	(B) Shall be repaired at RCF. May adversely affect operations in certain CNS/ATM airspace. Check FLIP for restrictions.
a. Mode S	1	*	*	MDR.
9-20. Flight Management System (FMS)	2	2	1	(B) Shall be repaired at RCF. See TO 1C-5M-1, Unable RNP Procedures. **Note:** Reference **Table 8.1** "Navigation/Communication Capability of C-5M" for airspace requirements.
9-21. Standby Attitude Indicator (SAI)	1	1	0	(B) Shall be repaired at RCF. Both EGIs and the MIRS shall be operational.
a. SAI Air Data Unit	1	1	0	(B) Shall be repaired at RCF.
9-22. Navigation Database	1	1	1	The aircraft must always have a database loaded. See **paragraph 3.11** for expired database procedures.
9-23. Interphone System				Shall be able to communicate with all occupied positions.
a. Flight Deck Loudspeaker	3	3	1	(B) Enhanced Ground Proximity Warning System (EGPWS)/TCAS loudspeaker shall be operational.
b. Microphone Switch (Yoke)	2	2	1	(B) Shall be repaired at RCF.
c. Microphone Switch (Floor)	2	1	0	(B) Should be operational at flight engineer position.
d. Interphone Cords	16	*	*	1 required for each occupied primary crew position. (B) Scanner and Loadmasters may substitute wireless headsets if available. Cargo compartment cords are mission dependent.
9-24. Public Address (PA) System	1	1	0	(B) If inoperative in troop compartment, interphone communications shall be maintained when compartment is occupied.

AVIONICS (Table 3.9.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
a. Troop Compartment PA	1	1	*	(B) Shall be operational when carrying passengers unless other means of communication is available (i.e., bullhorn).
9-25. Radar Altimeter	2	2	1	The operational radar altimeter must be selected to the Primary Flight Display of the pilot controlling the AFCS.
9-26. Weather Radar (WXR)	1	1	*	(B) Shall be operational for all flights into areas of known or forecast thunderstorms. Auto mode must be functional for WXR 2100 to be considered operational.
a. Video Distribution Units (VDU)	2	2	1	(B) All pilot MFDUs shall be functional on the side with the operational VDU.
9-27. Remote Interface Unit (RIU)	6	6	3	(B) Operational RIUs shall be placed in odd numbered positions (1, 3, & 5). Install operational even-numbered RIUs in the following priority: 6, 2, 4. See TO 1C-5M-1, Section III RIU Failures.
9-28. Bus Adapter Unit (BAU)	2	2	2	A BAU failure will result in a communication failure of the associated AMSC. See **Table 3.2**, item 2.4.

3.11. Navigation Database Loading. The aircraft must have a correct model number database loaded for all departures. **(T-2)** Aircrews shall compare their scheduled return times with the expiration of the loaded navigation database(s) prior to departure from home station. **(T-2)** If the scheduled return time exceeds the expiration of the database, create an AFTO 781A info note prior to departure from home station to ensure maintenance personnel are aware of the need to load a new database. **(T-3)** The PIC may not depart any location with database loading capabilities with an expired database. **(T-2)**

3.11.1. Aircrews should depart home station with a copy of current and next cycle database if available. Aircrew may accomplish navigation database loading procedures contained in TO 1C-5M-1 at locations without maintenance loading capability.

3.11.2. If the database expires while the airplane is off station, the crew:

3.11.2.1. May continue a mission with an expired database if the database information required for the flight can be verified with current FLIP (paper or electronic).

3.11.2.2. Shall ensure the database is updated at the first opportunity. **(T-2)**

3.11.2.3. Shall not use the database to fly procedures that require terminal or better accuracy. **(T-2)**

Table 3.10. Recording and Emergency Location.

RECORDING & EMERGENCY LOCATION (Table 3.10.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
10-1. Emergency Locator Transmitter (ELT)	1	1	1	(B) May be inoperative for local airland flights at or in the vicinity of home station. DFDR shall be operational.
10-2. Digital Flight Data Recorder (DFDR)	1	1	0	(B) Shall be repaired at RCF. CVR shall be operational.
10-3. Cockpit Voice Recorder (CVR)	1	1	0	(B) Shall be repaired a RCF. DFDR (including all DFDR inputs) shall be operational.

Table 3.11. Embedded Diagnostic System.

EMBEDDED DIAGNOSTIC SYSTEM (EDS) (Table 3.11.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
11-1. Auxiliary Maintenance Computer (AMC)	1	1	0	(B) Shall be repaired at RCF. Refer to **paragraph 9.5.6**.
11-2. Personal Computer Interface Unit (PCIU)	1	1	0	(B) Shall be repaired at RCF. Refer to **paragraph 9.5.5**.
11-3. Remote Memory Module (RMM)	1	1	0	(B) Shall be replaced at RCF.
11-4. Printout Unit (POU)	1	1	0	

Table 3.12. Cargo Door System.

CARGO DOOR SYSTEM (Table 3.12.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
12-1. Visor/Forward Ramp	1	*	*	MDR. May depart if manual override is required to open, close, or lock the visor or forward ramp. Door locks may be inoperative if all locks are confirmed locked and are not required for the mission.

CARGO DOOR SYSTEM (Table 3.12.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
12-2. Forward Ramp Manual Locking Pin	8	8	8	(B) If locking ball is missing, secure pin with safety wire and annotate in AFTO 781A.
a. Yellow Streamer	8	8	0	
b. Mechanical Lock Indicator	10	10	0	(B) Verify all locks are locked; lock indicator lights shall be operational.
12-3. Visor Door Mechanical Lock Indicator	23	23	0	(B) Verify all locks are locked; lock indicator lights shall be operational.
12-4. Ramp Extension Support Jack	4	*	*	MDR. See TO 1C-5M-9, *Loading Instructions Manual*, for loading limitations when less than 4 jacks are serviceable.
12-5. Aft Cargo Doors/Ramp	1	*	*	MDR. May depart if manual override is required to open, close, or lock the doors or aft ramp. Door locks may be inoperative if all locks are confirmed locked and are not required for the mission.
12-6. Aft Ramp Manual Locking Pin	14	14	14	(B) If locking ball is missing, secure pin with safety wire and annotate in AFTO Form 781A.
a. Yellow Streamer	14	14	0	
b. Mechanical Lock Indicator	14	14	0	(B) Verify all locks are locked. Lock indicator lights shall be operative.

Table 3.13. Oxygen System.

OXYGEN SYSTEM (Table 3.13.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
13-1. 25 Liter Converter	1	1	*	(B) MDR. May be inoperative provided the 75 liter converter contains enough LOX per **paragraph 5.14** and the associated quantity indicator is operational. Operations with leaks are prohibited unless, through maintenance troubleshooting, it is determined that the leak is within documented limitations and downstream of the check valve in the respective manifold and the converter is drained prior to flight.
13-2. 75 Liter Converter	1	1	*	(B) MDR. May be inoperative provided the 25 liter converter contains enough LOX per **paragraph 5.14** and the associated indicator is operational. Operations with leaks are prohibited unless, through maintenance troubleshooting, it is determined that the leak is within documented limitations and downstream of the check valve in the respective manifold and the converter is drained prior to flight.
13-3. Oxygen Shutoff Valve	1	1	1	
13-4. Recharger Outlets	10	10	7	(B) No more than 1 inoperative per compartment.
13-5. Flight Crew Oxygen Regulator	5	5	3	(B) P, CP, and FE positions shall be operational. Navigator and Observer position shall be operational if occupied.
13-6. Relief Bunk Oxygen System	6	6	0	(B) Do not occupy bunk with inoperative regulator above 10,000 ft MSL.
13-7. Continuous Flow Oxygen Regulator	2	2	2	

OXYGEN SYSTEM (Table 3.13.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
13-8. Drop-Down Masks	101	*	*	1 per occupied seat in each compartment. May result in passenger limitations.
13-9. Oxygen Quantity Indicator (25 liter)	1	1	0	(B) 75 liter indicator shall be operative. If required for mission and servicing capability exists, service 25 liter converter prior to launch.
13-10. Oxygen Quantity Indicator (75 liter)	1	1	0	(B) 25 liter indicator shall be operative. If required for mission and servicing capability exists, service 75 liter converter prior to launch.
13-11. Quantity Low Light	2	2	0	(B) If the associated LOX converter is serviced, corresponding quantity indicator shall be operative.
13-12. Oxygen Quantity Indicator (25 liter) Test Switch	1	1	0	(B) 75 liter indicator and test switch shall be operational. If required for mission and servicing capability exists, service 25 liter converter prior to launch.
13-13. Oxygen Quantity Indicator (75 liter) Test Switch	1	1	0	(B) 25 liter indicator and test switch shall be operational. If required for mission and servicing capability exists, service 75 liter converter prior to launch.
13-14. Oxygen Warning System	1	1	0	(B) Shall be repaired at RCF. Not required for flights below 10,000 ft MSL. If passengers are on board, and the oxygen warning system is inoperative, the flight is limited to 10,000 ft MSL. If flight above 10,000 ft MSL is required, the crew shall be on oxygen.
13-15. Emergency Passenger Oxygen System (EPOS)	88	*	*	1 per occupied seat in each compartment. May result in passenger limitations.

OXYGEN SYSTEM (Table 3.13.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
13-16. Portable Oxygen Bottles	16	16	*	Crewmembers entering/transitioning a compartment without quick access to oxygen bottles in flight must carry a portable oxygen bottle. Crewmembers occupying a primary crew position without a flight crew oxygen regulator require a portable oxygen bottle. See **paragraph 3.12**.

3.12. Modified MA-1 Portable Oxygen Bottles. The A-21 regulator refill valves on some MA-1 bottles were modified to restrict flow of oxygen during servicing. Unfortunately, restricted flow increased on-aircraft fill time from 30-45 seconds (unmodified refill valve) to as much as 3.5 minutes (modified refill valve). Under certain conditions, bottles can be depleted faster than they can be refilled.

3.12.1. Refill Valve Identification. A fast-fill refill valve (modified 2) is replacing the old style refill valves through attrition. Until all bottles are modified, three different refill valves could be installed on the aircraft. Except for fill times, operation of bottles is identical. Refill valve type is determined by viewing the inside of the fill nozzle and/or identaplate as specified below:

3.12.1.1. Unmodified. Refill valves have a push valve inside the nozzle resembling a standard tire valve stem.

3.12.1.2. Modified. Refill valves have a brass plate/filter covering inside of nozzle and no valve stem is visible.

3.12.1.3. Modified 2 (Fast-Fill). Refill valves have a brass plate/filter covering inside of nozzle and no valve stem is visible. The valve also has a groove cut into the flat before the wrench flat.

3.12.2. MEL Impact.

3.12.2.1. A minimum of four unmodified/modified 2 bottles are required for all A-column and MOB departures. They shall be installed in the following locations: 1) on the emergency equipment access area, across the aisle from the flight station ladder, 2) in the recessed cubicle across from the flight deck service door, 3) on the aft right side of the troop compartment and 4) on the aft right side of the troop compartment on the floor next to the loadmaster outboard seat. If additional unmodified/modified 2 bottles are available, install them at each recharger outlet in the cargo compartment.

3.12.2.2. A minimum of four unmodified/modified 2 bottles should be installed for all en route B-column departures. The mission may continue if less than four bottles are available; however, they shall be replaced upon reaching a RCF.

Table 3.14. Warning Systems.

WARNING SYSTEMS (Table 3.14.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
14-1. Stallimiter System	2	1	1	1 fully functioning system required for all departures.
14-2. Ground Proximity Warning System (GPWS)	1	1	0	(B) Shall be repaired at RCF.
14-3. Master Caution Light	2	2	0	(B) At least 1 must be repaired at MOB. Cautions, warnings and advisories (CWA) aural alerts and a minimum of 1 reset function must be operational.
14-4. Door Warning System (Lock Status Lights)				
a. Visor	25	25	24	(B) If all criteria in TO 1C-5M-1, Section III are met, 1 door NOT LKD light may be depressed to BYPASS.
b. Forward Ramp	2	2	0	(B) Lights may be inoperative provided mechanical pins are installed and the locks are verified locked.
c. Crew Entrance Door	1	1	1	
d. Aft Ramp	2	2	0	(B) Lights may be inoperative provided mechanical pins are installed and the locks are verified locked.
e. Fwd Underfloor Access Door	1	1	0	(B) Light may be inoperative provided the door is verified closed and locked.
f. Aft Winch Access Hatch	1	1	0	(B) Light may be inoperative provided the door is verified closed and locked.
g. Aft Bilge Access Hatch	1	1	0	(B) Light may be inoperative provided the door is verified closed and locked.
h. Forward Bilge Access Hatch	1	1	0	(B) Light may be inoperative provided the door is verified closed and locked.
i. Left and Right Side Cargo Doors	4	4	0	(B) Lights may be inoperative provided the door(s) are verified closed and locked.

WARNING SYSTEMS (Table 3.14.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
j. Center Cargo Door	2	2	2	
k. Ramp to Pressure Door	4	4	2	(B) Outboard lights may be inoperative provided the door is verified closed and locked.
l. Horizontal Stabilizer Access Door	1	1	0	(B) Light may be inoperative provided the door is verified closed and locked.
14-5. Smoke Detector System	1	1	0	(B) If any detector is inoperative, the associated compartment shall be scanned at least once every hour. The associated Fire Suppression System (FSS) optical detection system (if applicable) shall be operational. Troop compartment shall be occupied if troop or center wing detector is inoperative and additional crewmembers are available.
14-6. Bailout Alarm	1	1	0	(B) PA should be operational. If PA system is inoperative, interphone communication shall be maintained.
14-7. Ice Detection System	1	1	1	(B) OTF to RCF with no forecast icing. All 4 Engine Anti-Ice systems shall be operated from engine start until just prior to engine shutdown to prevent engine ice ingestion. **Exception:** May be inoperative on local training and ferry flights when icing is not forecasted.

Table 3.15. Fire Suppression System.

FIRE SUPPRESSION SYSTEM (FSS) (Table 3.15.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
15-1. Dewars	2	2	*	If both dewars are inoperative, 1 shall be repaired at RCF. See **paragraph 3.13**.

FIRE SUPPRESSION SYSTEM (FSS) (Table 3.15.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
15-2. Nitrogen Fire Suppression Control Panel	1	1	1	Shall be capable of fire warning and discharge. **Exception:** Discharge capability is N/A when LN2 is depleted and no servicing capability exists.
15-3. Nose Wheel Well Control Panel	1	1	0	(B) Shall be repaired at RCF.
15-4. Optical Detection	1	1	0	(B) Shall be repaired at MOB (**Exception:** Not required for locals). If any component is inoperative, associated compartment shall be scanned every hour. The associated smoke detector(s) shall be operational.
15-5. Isolation Valve	2	2	*	(B) Shall be operational for each serviced dewar.
15-6. Outboard Main Tank ΔP Switch	2	2	0	(B) Shall be repaired at RCF. Do not pressurize wings (vent wings).
15-7. Overboard Relief Valves	2	2	*	(B) Shall be operational for each serviced dewar.
15-8. Pressure Limiters	2	2	*	(B) Shall be operational for each serviced dewar.
15-9. Primary Climb/Dive Valve	2	2	0	(B) Secondary climb/dive valve must be operational.
15-10. Primary Pressure Regulator	2	2	*	(B) Shall be operational for each serviced dewar.
15-11. Secondary Climb/Dive Valve	2	2	0	(B) Primary climb/dive valve must be operational. Manual override shall be operational.
15-12. Secondary Pressure Regulator	2	2	*	(B) Shall be operational for each serviced dewar.
15-13. Vent Box Float Switch	2	2	2	
15-14. Wing Pressure Warning System	2	2	2	
15-15. Liquid Nitrogen Service Panel	1	1	*	(B) Shall be repaired at RCF. Some functions may be inoperative provided all MEL requirements can be satisfied.

FIRE SUPPRESSION SYSTEM (FSS) (Table 3.15.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
15-16. Central Processing Unit (CPU)	1	1	1	Shall be capable of fire warning and discharge. **Exception:** Discharge capability is N/A when LN2 is depleted and no servicing capability exists.
15-17. FSS Fire Detection	1	1	1	
15-18. FE 1301	20	0	0	Bottles may be inoperative as long as detection system is operative. If cargo bottles are inoperative, 1 fire extinguisher of not less than 1 gallon shall be placed in the cargo compartment. If an additional fire extinguisher is not available, OTF to RCF.

3.13. Liquid Nitrogen (LN2) Servicing. Because of the increased safety margin provided by the FSS, obtain full LN2 servicing at stations with servicing capability. **Note:** Fully serviced is defined as 650 pounds per operational dewar to allow for gauge inaccuracies, automatic shutoff settings, and LN2 boil-off.

3.13.1. Home Station Departures. The airplane will be fully serviced. **(T-3)**

3.13.2. En route Stations WITH Servicing Capability. The airplane will be fully serviced unless directed otherwise by the PIC. **Exception:** Station supply depleted or equipment malfunctions (i.e., all servicing trucks inoperative). PIC should pass less than full LN2 requirements for next mission leg during maintenance debrief.

3.13.3. En route Stations WITHOUT Servicing Capability. The mission may be continued regardless of the amount of LN2 on board.

3.13.4. Local Missions. Do not depart with less than that required for the planned mission duration (plus an adequate firefighting reserve). **(T-3)** For engine running crew changes, airplanes will be fully serviced for the first half to ensure the second half will have adequate LN2. **(T-3)**

3.13.5. General Requirements.

3.13.5.1. LN2 leaks do not require the dewars to be drained prior to flight unless maintenance technical data states otherwise. Maintenance shall attempt to repair or isolate leaks prior to departure. **(T-2)** LN2 leaks in the manned area of the airplane from the left or right tank pressurization lines shall be isolated by pulling the left and right pressure limiter handles down. **(T-2)** This action will eliminate fuel tank inerting in both wings while allowing firefighting capability.

3.13.5.2. Use the following values to calculate the minimum amount of LN2 required by paragraphs **3.13.1** and **3.13.4** These values are guides; amounts used may vary. Document

significant variations in AFTO 781A. Two hundred fifty (250) pounds are required for firefighting (adequate for one application to the largest zone) plus:

3.13.5.2.1. Twelve pounds for every 1,000-feet of descent planned during a line or AAR mission. **Example:** An AAR mission that requires an 8,000-foot descent from initial level off altitude to rendezvous altitude, followed by a final cruise altitude of FL370 will need 540 pounds of LN2. (8,000 + 37,000 = 45,000 feet of total descent x 12 = 540 pounds).

3.13.5.2.2. One hundred twenty (120) pounds will be used for each hour of local transition flying.

3.13.6. Missions expecting to transit a threat environment. If LN2 servicing is not available at the last stop prior to entering the threat environment, manage LN2 use as follows.

3.13.6.1. Threat Environment Legs. Regardless of the LN2 quantity, do not vent wings on legs into and within threat locations.

3.13.6.2. LN2 is not required to fly in a threat environment. If LN2 is not available, do not delay the mission.

Table 3.16. Emergency Equipment.

EMERGENCY EQUIPMENT (Table 3.16.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
16-1. Life Raft/Survival Kit	4	4	*	(B) MDR. Troop compartment rafts may be inoperative or removed; however, total troop passengers will be reduced by 25 per inoperative raft. A raft shall be installed at #6 service door when the troop compartment is occupied. A raft shall be installed at the #2 escape hatch. **Exception:** Locals and depot ferry flights may be conducted without a life raft provided the flight will not take place over water and a survival kit is carried.
16-2. Descent Reel	24	24	*	(B) 1 required per occupant on the flight deck.

EMERGENCY EQUIPMENT (Table 3.16.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
16-3. Escape Slide/Exit	7	7	*	(B) MDR. The #5 service door slide/exit shall be operational. Pilot and copilot clear vision sliding windows must be easily operable. If troop compartment is occupied, #4 hatch and #6 service door slide/exits shall be operational. Limit troop compartment to 40 passenger/crew when 3L and/or 3R troop compartment slide/exit is not operational.
16-4. Escape Rope	8	8	*	(B) MDR. 3 escape ropes shall be installed in the cargo compartment and 1 above the troop compartment ladder. Troop compartment exits, slides, and life rafts are not considered operative unless an escape rope is installed.
16-5. First Aid Kit	22	22	*	(B) MDR. 1 kit required for every 5 occupants in compartment.
16-6. Fire Extinguishers				
a. Aircraft with Operational FE 1301 System	15	15	9	(B) Shall be replaced/repaired at RCF. Minimum of 3 operational extinguishers per compartment (flight deck, cargo, troop).
b. Aircraft without Operational FE 1301 System	17	17	10	(B) Shall be replaced/repaired at RCF. Minimum of 3 operative extinguishers per compartment (flight deck, cargo, troop), plus 1 additional extinguisher of not less than 1 gallon in the cargo compartment.
16-7. Life Preserver Unit	100	*	*	(B) 1 per occupant during over-water flights. May result in passenger limitations.
16-8. Crash Axe	3	3	2	(B) A minimum of 1 crash axe shall be available on the flight deck and 1 in the troop compartment.

EMERGENCY EQUIPMENT (Table 3.16.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
16-9. Emergency Exit Light	12	12	*	(B) Required for all operational exits. Troop compartment lights not required when compartment is unoccupied. May result in passenger limitations.
16-10. Rope Ladder	1	1	0	Both release handles required to consider ladder operational. (B) Shall be repaired at MOB. Not required if emergency escape slide and emergency descent reels (1 per occupant) are operational.

Table 3.17. Defensive Systems.

DEFENSIVE SYSTEMS (Table 3.17.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
17-1. Defensive Systems (DS)	2	*	*	MDR. The airplane may be considered to have an operational DS with either a fully functional MWS, IRCM or, both. See theater Special Instructions (SPINS).
a. Missile Warning Set (MWS)	1	*	*	MDR. All system components must be operational for the MWS to be considered operational.
b. Infrared Countermeasures (IRCM)	1	*	*	MDR. All system components must be operational for the IRCM to be considered operational. A fully functional Countermeasures Dispensing Set (CMDS) is required for IRCM to be considered operational.

Table 3.18. Lighting.

LIGHTING (Table 3.18.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
18-1. Interior Lights Master Switch	1	1	0	

LIGHTING (Table 3.18.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
18-2. Exterior Lighting		*	*	See AFMAN 11-202V3 requirements. Navigation lights (at least 1 bulb in each position) required for night operations. Anti-collision lights (1 upper and 1 lower) and landing lights (at least 1 wing tip light) required for day or night operations.
18-3. Pilot/Copilot AMP Panel Lighting	1	1	*	(B) MDR.
18-4. Flight Engineer/ Navigator AMP Panel Lighting	1	1	*	(B) MDR.
18-5. Troop Compartment Overhead Aisle Lights (Dome Lights)	6	5	3	(B) Minimum requirements for carrying passengers.

Table 3.19. Miscellaneous Equipment.

MISCELLANEOUS EQUIPMENT (Table 3.19.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
19-1. Lock Blocks, Pressure Door Hinge	2	2	*	(B) MDR.
19-2. F-valve Safety Guard	1	1	0	
19-3. Night Curtain	2	0	0	
19-4. Service Door Safety Gate	2	2	0	
19-5. Window Shade	12	6	6	6 required in cargo compartment.
19-6. Winch	2	*	*	MDR. 1 required for all cargo missions.
19-7. Latrines				
a. Crew	1	1	0	(B) Shall be repaired at RCF. **Note:** Crew latrine may be considered operational with an inoperative flushing mechanism provided the tank has no external leaks (N/A airplanes with vacuum flush system). Troop compartment latrines shall be operational.

MISCELLANEOUS EQUIPMENT (Table 3.19.)				
Item/System	Installed	Required		Remarks/Limitations/Exceptions
		A	B	
b. Troop Compartment	2	2	*	(B) MDR. 2 inoperative: Mission may continue with C2 concurrence and no pax in troop compartment. 1 inoperative: Mission may continue with C2 concurrence and troop compartment occupancy IAW AFMAN 11-2C-5v3, Addenda A. **Note:** 1 inop personnel limit does not apply to airplanes vacuum flush system due to single airplane waste tank.
19-8. Passenger Seats	73	*	*	MDR. See **paragraph 3.14**.

3.14. Passenger Seat Limitations. A passenger seat shall not be occupied for takeoff or landing if it cannot be locked in the full upright position or, has missing armrest cover(s) that result in exposed screws/sharp metal edges. **(T-3)** If a seatback tray table will not stow and lock, passengers will not be seated directly behind the affected seat for takeoff or landing. **(T-3)** If the associated stowage pocket is unserviceable, passengers will not be seated in the affected seat for takeoff and landing. **(T-3)** Make every reasonable effort to repair the broken seats before turning away passengers. Coordinate seat release changes with C2 to avoid over-booking seats.

Chapter 4

OPERATIONAL PROCEDURES

4.1. Duty Station. One pilot or the flight engineer may be out of their seat for brief periods to meet physiological needs. Notify the pilot prior to departing assigned duty station whether in performance of normal duties or in connection with physiological needs.

4.1.1. The flight engineer is responsible for accountability of all personnel transiting the cargo compartment in flight. A brief interphone announcement shall be made when personnel enter/exit the cargo compartment. **(T-3)** A headset shall be worn by crewmembers while transiting the cargo compartment in flight to allow immediate access to the airplane interphone system. **(T-3)**

4.1.2. Seat belt policy will be IAW AFMAN 11-202V3, AMC Supplement and the following:

4.1.2.1. Crew members will have seat belts fastened during all phases of flight, unless crew duties dictate otherwise. **(T-2)**

4.1.2.2. Shoulder harnesses are required to be worn when occupying a primary crew position during critical phases of flight, unless crew duties dictate otherwise. **(T-2)**

4.2. Aircraft and Flight Station Entry. The PIC is responsible for all personnel aboard the aircraft and is authorized to restrict entry or limit access as necessary in the interest of safety and mission accomplishment. Unless specifically cleared by the aircrew, all support personnel (maintenance, fleet service, passenger service, and aerial port) should wait at least twenty minutes after final engine shutdown before boarding the aircraft.

4.3. Takeoff and Landing Policy. An aircraft commander, or above, will occupy either the left or right seat during all takeoffs and landings. **(T-3)** The designated PIC (A code) is not required to occupy a primary position but retains overall authority for conduct of the mission.

4.3.1. An aircraft commander (AC) or IP will make all takeoffs and landings during: **(T-3)**

4.3.1.1. Aircraft emergencies, unless conditions prevent compliance.

4.3.1.2. Airlift of nuclear weapons.

4.3.1.3. Category II Instrument Landing System (ILS) approaches and landings when the weather is below Category I minimums.

4.3.1.4. Substandard airfield operations.

4.3.2. If the PIC has less than 100 primary aircraft inventory (PAI) hours since AC certification, First Pilots (FPs) shall not accomplish takeoffs and landings under any of the following conditions: **(T-3)**

4.3.2.1. Ceiling/visibility less than 300 feet and/or runway visual range (RVR) 40 (3/4 SM visibility).

4.3.2.2. Runway Condition Reading (RCR) less than 12.

4.3.2.3. Crosswind component greater than 15 knots.

4.4. Landing Gear and Flap Operating Policy. The pilot flying (PF) commands configuration changes. The pilot monitoring (PM) verifies appropriate airspeed and configuration prior to

echoing the gear or flap actuation command. The copilot conducts all gear operations. The PM conducts all flap operations. **Exception:** During touch-and-go landings, the IP/evaluator pilot (EP) may activate the flaps as PF. **Note:** Consideration should be given to the PM's experience level prior to the IP/EP delegating movement of the flaps during touch-and-go landings.

4.5. Aircraft Lighting. IAW AFMAN 11-202V3, AFMAN 11-218, *Aircraft Operations and Movement on the Ground* theater SPINS and the following:

4.5.1. During combat/contingency operations, the tactical situation may dictate the use of all, some, or none of the aircraft exterior lights. Lights-out operations during peacetime will be conducted in warning or restricted areas IAW AFMAN 11-202V3 unless a letter of agreement exists with the Federal Aviation Administration (FAA). **(T-1)**

4.5.2. Use the following guidelines for aircraft exterior lighting when operating outside of these areas:

4.5.2.1. Navigation, Fuselage and Leading Edge Lights: Steady, ON, ON

4.5.2.2. Landing lights should be turned on no later than 500 feet above ground level (AGL) prior to landing.

4.6. Portable Electronic Devices. The Common Use Carry-On Equipment Safe-to-Fly Listing issued by the C-5 System Program Office specifies equipment that is Electromagnetic Interference certified and authorized for use on board the airplane. AMC/A3V posts the list on AMC ePubs upon release/update.

4.7. Communications Policy. Crewmembers are expected to maintain a high degree of flight deck professionalism and crew coordination at all times.

4.7.1. Aircraft Interphone. The PIC may allow the troop compartment and aft flight deck loadmasters to go off interphone at cruise provided the public address (PA) system is operative.

4.7.2. Wireless Headsets. With the exception of the pilot, copilot, and flight engineer, an authorized portable transceiver may be used during any phase of ground or flight operations by any crewmember in lieu of the standard interphone connection.

4.8. Crew Resource Management (CRM)/Threat and Error Management (TEM). PICs will conduct a CRM Enhancement exercise on the first suitable segment of each mission. **(T-3)** This should be done at cruise on a non-interference basis with other mission requirements. Take the exercise to a logical conclusion and ensure crew communications and duties are IAW the flight manual and other appropriate directives.

4.9. Use of Automation. It is imperative that crews safely use automation. These procedures provide an outline to maximize use of automation while ensuring safety is not compromised.

4.9.1. MCDU Programming. Normally, the PM makes all MCDU inputs. Any change which affects the lateral or vertical path should be coordinated with the PF before execution to ensure that the PF is aware of these changes. The PF acknowledges and approves these changes by saying "EXECUTE". The PF may elect to make MCDU inputs above 10,000 feet MSL.

4.9.1.1. With the autopilot engaged, the PF should make all changes to AFCS modes and settings, unless specifically directed otherwise by the PF. This includes setting assigned headings and altitudes. In all cases the new settings are verbally confirmed with the other pilot.

4.9.1.2. With the autopilot disengaged, the PM should make all AFCS inputs at the direction of the PF. When receiving Air traffic Control (ATC) vectors or altitude change clearances, the PM should automatically set assigned headings and engage HDG SEL mode, or set the new altitude and await the PF's instructions to engage a vertical mode.

4.9.1.3. Vertical Navigation (VNAV). The Altitude Select Window is set by the PF and verbally confirmed by the PM. The commanded altitude depends on the vertical mode to be used for the climb/descent. If using VNAV, the PF may elect to set the highest level cleared in a climb or the lowest level cleared in a descent. This allows VNAV management of the climb profile for intervening altitude restrictions. If not using VNAV, set current altitude clearance. Do not preselect a subsequent altitude until an altitude hold or altitude capture flight mode annunciation (FMA) is displayed and clearance to that altitude has been issued. At no time should an expected ATC clearance be set in the Altitude Select Window.

4.9.1.4. Standard Terminology. When directing the PM to make AFCS inputs, clarity is of the utmost importance. Standard terminology aids clarity and brevity and ensures that crews effectively operate in concert with each other, while maintaining situational awareness. However, in-flight context may allow simplified direction and execution. For example "PRESELECT 10,000" is obviously an altitude command and does not require the noun "ALTITUDE" to clearly communicate the PF's desires. Vertical speeds appended with "UP" or "DOWN" are sufficiently clear. The PM should ask for clarification when unsure of a command. If an uncommanded FMA is displayed, the PF clearly restates the command and ensures the correct change is made. Pilots will use the following standard terminology: **(T-2)**

4.9.1.4.1. "SELECT", "SET", or "ENGAGE" directs the selection of a value and/or a mode on the AFCS panel which results in the value being placed in the engaged (top, green) portion of the FMA. "SELECT" or "SET" is normally used with rotary knobs; however, "ENGAGE" is acceptable.

4.9.1.4.2. "ARM" directs the selection of a mode on the AFCS panel which results in the value being in the armed (bottom, cyan) portion of an FMA.

4.9.1.4.3. "ENGAGE" should be used to request autopilot or autothrottle engagement.

4.9.1.4.4. "UP" or "DOWN" should be used to indicate a change in vertical speed.

4.9.1.4.5. "EXECUTE" should be used by the PF to indicate agreement with a programmed change to the flight path.

4.9.1.4.6. "PRESET" or "PRESELECT" should be used to change an AFCS value without changing the engaged or armed mode (e.g., when setting a missed approach heading before the missed approach point).

4.9.1.4.7. Examples of Use. Exact, scripted communication is not as important as clarity. The examples in Air Force Tactics, Techniques, and Procedures (AFTTP) 3-3.C-5, *Combat Aircraft Fundamentals C-5* under Approved Terminology, demonstrate how this terminology may be used to ensure clear, efficient communication between pilots. The general framework is action, axis, and setting (e.g., "SET SPEED 250").

4.9.2. Manual Aircraft Control. Manual flight means controlling the aircraft without the use of the aircraft's automated flight systems but does not include disabling automatic augmentation systems that are required for normal flying (e.g., ALDCS, PACS, Flight Augmentation). Manual aircraft control proficiency is critical to the safety and effectiveness of aircraft operation. **Note:** Sound pilot judgment as to the use of manual flying is paramount. Manual flying for the primary purpose of maintaining proficiency is only to be exercised in suitable environmental and airspace conditions.

4.10. Caution Warning Advisory (CWA) Processing Philosophy.

4.10.1. CWAs are normally acknowledged verbally by the crew and processed by the flight engineer in coordination with the pilot monitoring (PM). The flight engineer reads the CWA, condition, and response over interphone. The PM follows along with the flight engineer in the CWA table and accomplishes any pilot steps with the coordination of the pilot flying (PF).

4.10.2. Many CWAs look alike; therefore, the crew should always verify the CWA table procedure corresponds to the actual CWA message on the Multifunction Display Unit (MFDU). **Example:** A crew could mistakenly reference the ENG 1 (2, 3, or 4) OIL HOT caution when experiencing an ENG 1 (2, 3, or 4) OIL TEMP HI advisory.

4.10.3. CWAs that recover before being processed by the crew should not be ignored. Certain intermittent CWAs have serious implications, e.g., BOGIE PITCH. All CWAs are captured by the Embedded Diagnostic System. The flight engineer can use this system to aid in correctly identifying and processing recovered CWAs.

4.10.4. Previously processed CWAs that recover and reassert shall be verbally reprocessed in their entirety. **(T-3)** The flight engineer should review condition and response and advise the pilots of any changes to the previous disposition.

4.10.5. During critical phases of flight, the PF may direct the flight engineer to process individual cautions or advisories independently. The decision to exercise this option should be based on the severity of the malfunction and pilot workload. The flight engineer should advise the pilots of the outcome and any pertinent system configuration changes or limitations at the earliest practical opportunity. **Example:** On approach, an AMC COMM FAIL advisory would be a good candidate for the flight engineer to process independently; a RATIO SHIFT caution would not.

4.11. Runway, Taxiway, and Airfield Requirements.

4.11.1. Minimum Runway and Taxiway Requirements. Aircrews will observe the following length and width limits for normal operations. **(T-2)** Aircrews will ensure obstacle clearance requirements are met. **(T-2)**

4.11.1.1. Runway Length. Minimum runway length is 6,000 feet (1,830 meters).

4.11.1.2. Runway Width. Minimum runway width is 147 feet (45 meters).

4.11.1.3. Taxiway Width. Minimum taxiway width is 75 feet (23 meters). Standing waivers may be found in the Giant Report and may approve operations on specific taxiways less than 75 feet (23 meters) wide but not less than 50 feet.

4.11.1.4. 180 Degree Turns. 150 feet (46 meters) of stressed pavement (e.g., runway/taxiway intersection) is required for weights up to 732,500 lb. Weights above

732,500 lb require additional width. Until refined measurements are available, pilots should use 218 feet as the minimum paved width when planning for a 180 degree turn at weights above 732,500 pounds.

4.11.2. Runway Length for Takeoff and Landing. Takeoff is prohibited if computed critical field length exceeds usable runway. **(T-2)** Landing is prohibited if computed landing distance exceeds usable runway. **(T-2)**

4.11.2.1. Intersection Takeoffs. Normally, the PF should initiate takeoffs from the beginning of the approved usable portion of the runway. The decision to make intersection takeoffs rests solely with the PIC. Pilots may accomplish intersection takeoffs provided the operating environment (i.e., gross weight, obstructions, climb criteria, weather, etc.) allows a safe takeoff and departure. Calculate takeoff performance based on the runway remaining from the point at which the takeoff is initiated.

4.11.2.2. During operations on runways partially covered with snow or ice, base takeoff computations on the reported runway surface condition (RSC) or RCR for the cleared portion of the runway. A minimum of 50 feet either side of centerline should be cleared. If 50 feet either side of centerline is not cleared, compute takeoff data based on the uncleared portion up to 50 feet either side of centerline.

4.11.2.3. Use of Overruns. 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 and rejected takeoff.

4.11.3. Arresting Cables.

4.11.3.1. Aircrews must take special care when operating on runways where arresting cables are present and rigged. BAK12 with affixed eight-point tiedowns is the only rigged non-recessed cable system authorized for higher-than-taxi speed operations. **(T-3)**

4.11.3.2. Regardless of the arresting system type, do not land (touchdown) on or before non-recessed approach-end arresting cables. **(T-3)**

4.11.3.3. For non-recessed cables other than BAK12 systems with eight-point tiedowns, do not commence takeoff roll on or prior to approach-end arresting cables. **(T-3)** For takeoffs over non-recessed cables, crews should first attempt to have the cable derigged. If that is not possible, for takeoff calculations, crews may use the full length of runway provided the CFL is less than the distance to the raised departure cable (see example below).

Full Runway Length = 10,000 feet
Runway Length for Refusal = 10,000 feet
Distance from Approach End of Runway to Departure End Cable = 8,000 feet
Acceptable Computed CFL ≤ 8,000 feet

4.11.3.4. There are no restrictions for operating over a properly rigged recessed arresting cable.

4.11.3.5. If uncertain of arresting cable type or status, then crews will plan operations to avoid arresting cables for takeoff and landing. **(T-3)**

4.11.3.6. Notify tower anytime a non-recessed arresting system other than BAK12 with eight-point tiedown is rolled over at any speed above normal taxi speed. The PIC will also ensure a damage check of the aircraft is conducted at the next engine shutdown. (**T-3)**

4.11.4. RCR Limitations. When no RCR is available refer to the Flight Information Handbook for standard conversions based on reported runway condition; use the most conservative value when an RCR range is provided. Minimum RCR for takeoff or landing is the lowest RCR depicted in the flight manual (never less than 3). Normally, RCR values are not reported for taxiways and ramps. During periods of reported low RCR, the taxiways and ramps may have an even lower RCR than reported for the runway. Consider the runway surface as wet when there is sufficient water on the surface to cause a reflective glare or when rain is falling.

4.11.5. Wind Limitations. Airfields are considered below minimums for takeoff and landing when winds, including gusts, are greater than: **(T-2)**

4.11.5.1. 50 knots from any direction

4.11.5.2. 10 knots tailwind component

4.11.5.3. The maximum crosswind component, corrected for RCR, as specified in the flight manual.

4.12. Aircraft Taxi and Taxi Obstruction Clearance Criteria and Foreign Object Damage Avoidance.

4.12.1. Do not taxi an aircraft within 25 feet of obstructions without wing walkers monitoring the clearance between aircraft and obstruction. **(T-3)** With wing walkers, avoid taxi obstructions by at least 10 feet. AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, contains additional guidance/exceptions for locally based aircraft.

4.12.2. When taxi clearance is doubtful, use one or more wing walkers. If wing walkers are unavailable, deplane one or more crewmembers to maintain obstruction clearance and provide marshaling using AFMAN 11-218 signals. Use wing walkers, deplaned crewmembers, or a crewmember on interphone positioned at a door to act as an observer while maneuvering on narrow taxiways. AFMAN 11-218 requires marshallers to have an illuminated wand in each hand during night taxi operations. Wing walkers are only required to have one illuminated wand. Wing tip landing lights should be used to the maximum extent whenever the airplane is in motion. Observers should be in a position to see wing walkers at all times (through door, windows or #1 escape hatch) and communicate with the pilot.

4.12.3. Foreign Object Damage (FOD) Avoidance. Make every effort to minimize the potential for engine FOD. Crews should:

4.12.3.1. Carefully review airfield layout paying particular attention to taxi routes, turn requirements, and areas for potential FOD.

4.12.3.2. Minimize power settings during all taxi operations and consider two-engine taxi whenever practical.

4.12.4. Taxi Criteria. Refer to **Table 4.1** for minimum taxi clearance criteria. Use extreme caution when scanning from inside the airplane. Wing tip and tail growth in turns and the distance from the fuselage to the wing tip make determination of actual clearance very difficult.

Table 4.1. Minimum Taxi Clearance Criteria.

Lateral Clearance Of Component	To An Obstacle	Without Wing Walker	With Wing Walker
Main Gear Pod	Less than 3 feet high	25 feet	10 feet
Outboard Nacelle	3 feet high, but less than 6 feet high	25 feet	10 feet
Wing Tip	6 feet or higher	25 feet	10 feet

4.12.4.1. Where possible, avoid 180° turns. If it becomes necessary to accomplish a 180° turn on a narrow runway, the turn should be accomplished at an intersection of a link taxiway or at a designated turn around pad. Normally, the airplane is positioned on the opposite side of the runway and the turn is made toward an intersecting taxiway.

4.12.4.2. Where possible, avoid taxi operations that position an operating engine over an unprepared or un-swept surface. If unavoidable, leave the engine at idle (to the maximum extent possible) until the engine is over an improved surface. Two-engine taxi should be used when practical to reduce FOD and minimize braking.

4.12.4.3. After landing and clearing the runway, the loadmaster may open the aft cargo doors and lower the ramp with approval of the PIC to prepare for cargo off/onload. Placing the cargo doors aft arming switch to "ARM" implies permission to open the aft doors.

4.12.5. Backing.

4.12.5.1. Approval for backing.

4.12.5.1.1. C-5 operational missions are not normally planned to employ backing procedures and require MAJCOM approval IAW TO 1C-5M-1.

4.12.5.1.2. Backing training is authorized for units with an OG/CC-approved training plan.

4.12.5.2. Engine FOD is a critical concern when backing. If practicable, conduct a FOD-walk and/or request a sweeper truck prior to backing to minimize FOD. Backing is not recommended over snow or ice covered surfaces.

4.12.5.3. Backing is not a common procedure in the C-5; therefore, the highest qualified pilot on the crew should occupy the pilot seat if backing is required. **Exception:** During training sorties, the instructor pilot may occupy either seat. The pilot should coordinate intentions and signals with the scanners and marshallers (if used) prior to backing. During backing, the No. 7 left and right troop door scanners direct reverse taxi, report hazards, and provide the pilot with continuous interphone instructions on turns, distance remaining, conditions of the maneuvering area, and stopping point. Do not back the airplane to within 25 feet of an obstruction with or without a marshaller.

4.13. Check Flights. See AFMAN 11-202V3, AMC Supplement and TO 1-1-300, *Maintenance Operational Checks and Check Flights*, for check flight guidance.

4.13.1. Operational Check Flight (OCF), In-Flight Operational Check (IFOC) and Functional Check Flight (FCF). An OCF is a Check Flight conducted after maintenance to ensure aircraft

mission specific equipment is operational and aircraft is mission ready. An IFOC/FCF is conducted to validate maintenance action that cannot be validated on the ground.

4.13.2. The only C-5 crews qualified to perform Check Flights (to include OCF, IFOC and FCF) are assigned to Air Force Materiel Command (AFMC) functions (339th Flight Test Squadron). **(T-2)** If a need arises for additional units to qualify Flight Check crews, the OG/CC shall coordinate with AMC/A3 to obtain current training, qualification, and program management guidance from HQ AFMC. **(T-2) Exceptions:** The Ram Air Turbine (manual) check contained in TO 1C-5M-6CF-1, *Acceptance and/or Functional Check Procedures Manual*, is authorized to be conducted by all C-5 units. The check may be accomplished at the end of a local training sortie or, if on a departure, the PIC should ensure a full stop taxi back is accomplished for a maintenance inspection, as required. All units are also authorized to conduct the ground magnetic compass calibration and in-flight magnetic compass check IAW TO procedures.

Chapter 5

AIRCREW PROCEDURES

Section 5A—Pre-Mission

5.1. Personal Requirements.

5.1.1. Required Flight Equipment.

5.1.1.1. In case of inadvertent escape slide or life raft deployment inside the airplane, crewmembers will have a knife in their possession when monitoring passengers. **(T-3)**

5.1.1.2. Two Piece Flight Duty Uniform tops will be worn from engine start to engine shutdown. **(T-3) Exception:** Tops are not required to be worn during in-flight rest not in a crew duty station but must be readily available.

5.1.2. Crewmembers will wear a reflective belt on flight lines during hours of darkness or periods of reduced visibility. **(T-3)**

5.2. Aircrew Publications Requirements.

5.2.1. Publications in the format and quantities specified in **Table 5.1** will be carried on every sortie. **(T-2)** "P" designates the publication is required to be carried in paper format. "D" designates the publication may be carried in either paper or digital format. If publications are carried in a digital format, the unit will provide the media to view the digital publications. **(T-2)** Units may develop publications kits in order to satisfy the requirements of this paragraph. The unit may specify additional publications in their unit supplement to this instruction. Reference AFI 11-215, *Flight Manuals Program*, for guidance on electronic publications.

5.2.2. Primary Publications Source. Electronic publications are the primary source.

5.2.3. Minimum Electronic Flight Bag (EFB) Requirement. All crewmembers should have an EFB capable of accessing the publications specified in **Table 5.1** prior to departing home station. If a failure occurs prior to departure, attempt to resolve the malfunction prior to launch. Do not delay departure for failure(s) if sufficient EFBs are available to safely accomplish the mission. PICs will not launch unless all primary crew positions possess EFBs capable of accessing the publications specified in **Table 5.1**. **(T-2)** PICs may commandeer and redistribute their crew's EFBs as required for mission accomplishment.

Table 5.1. Aircrew Publications.

Publication	Paper Requirements
TO 1C-5M-1	D
TO 1C-5M-1-1	D
TO 1C-5M-1CL-1	P (2)
TO 1C-5M-1CL-2	P (1)
TO 1C-5M-1CL-3	P (1)
TO 1C-5M-1CL-4	P (1 per loadmaster based on required crew complement)
TO 1C-5M-9	D
TO 1C-5M-9CL-1	P (1 per loadmaster based on required crew complement)

TO 1C-5M-9-2	D
AFMAN 11-2C-5V3	D
AFMAN 11-202V3	D
AFMAN 11-202V3, AMC Supplement	D
AMC C-5 Briefing Guide	D

Section 5B—Pre-departure

5.3. Global Decision Support System (GDSS) Account. Pilots will obtain a GDSS account prior to operating on integrated flight management (IFM)-planned sorties. **(T-3)** For operational missions, ensure GDSS account is active and will remain active throughout the duration of the mission. Download aircrew departure papers using the GDSS account, Mattermost, or other approved method at locations without an AMC C2 presence.

5.4. Mission Kits. The following are suggested mission kit contents. Units may develop kits with reduced-contents for local training missions; however, items marked with an asterisk (*) are required on operational missions. **(T-3)** Forms may be maintained and carried electronically provided in-flight printing capability exists.

5.4.1. Forms:

5.4.1.1. *CBP Form 6059B, *US Customs and Border Protection Declaration Form*.

5.4.1.2. *DD Form 2131, *Cargo/Passenger Manifest*.

5.4.1.3. *CBP Form 7507, *General Declaration (Outward/Inward)*.

5.4.1.4. *SF 44, *Purchase Order-Invoice-Voucher*.

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

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

5.4.1.7. *AFTO Form 781, *ARMS Aircrew/Mission Flight Data Document*.

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

5.4.1.9. AF Form 2282, *Statement of Adverse Effect-Use of Government Facilities*.

5.4.1.10. AF Form 664, *Aircraft Fuels Documentation Log*.

5.4.1.11. AF Form 4052, *C-141/C-130/C-5 Refueling*.

5.4.1.12. AF Form 4054, *Performance and Fuel Management Log*.

5.4.1.13. *AF Form 4101, *Relay Logic Landing Gear Malfunctions*.

5.4.1.14. *AFTO Form 200, *C-5M Performance Data Worksheet*.

5.4.1.15. *AFTO Form 201, C-5M *TOLD Card*.

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

5.4.1.17. AF Form 711B, *USAF Mishap Report*.

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

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

5.4.1.20. Japanese Customs Service Form.

5.4.1.21. *AMC Form 97, *AMC In-Flight Emergency and Unusual Occurrence Worksheet*.

5.4.1.22. *DD Form 365-4, *Weight And Balance Clearance Form F – Transport/Tactical*.

5.4.2. Orders:

5.4.2.1. AF Form 1631, *NATO Travel Order* (when required).

5.4.2.2. *AF Form 4327A, *Crew Flight (FA) Authorization.*

5.4.3. Miscellaneous:

5.4.3.1. *Box car seals.

5.4.3.2. *Masking tape.

5.4.3.3. General Services Agency approved padlock (when weapons are carried).

5.4.3.4. Approximately 20 70% Isopropyl Alcohol pre-moistened towelettes.

5.5. Route Navigation Data Requirements. Carry paper products when MAJCOM-approved FLIP app does not provide sufficient chart coverage.

5.6. Briefing Requirements. The AMC C-5 Briefing Guide addresses all mission phases and should be used for each brief.

5.7. Flight Plan/Data Verification.

5.7.1. Equipment and Capabilities Codes. Inform your flight manager when equipment failures prior to flight will affect the Equipment and Capabilities Codes in Block 10 of the DD Form 1801, *DoD International Flight Plan.* **(T-3)** Ensure the Equipment and Capabilities Codes meet the airspace requirements for the planed route of flight. **(T-3)**

5.7.2. Flight Plan Weather Inaccuracies. Inform your flight manager when temperature deviation error exceeds 5 degrees for the flight planned altitude or as specified in the AFMAN 11-202V3, AMC Supplement. **Note:** An Air Operations Center (AOC) pilot in-flight report (PIREP) does not fulfill this requirement. If unable to report in flight, report actual winds or temperatures at the first opportunity.

5.8. Departure Planning. Use AFMAN 11-202V3, *Flight Operations* and a MAJCOM-approved departure planning checklist. Regardless of the type of departure flown, instrument flight rules (IFR) or visual flight rules (VFR), review the following as appropriate: IFR Departure Procedure, instrument approach plate, NOTAMS, GDSS Giant Report, and appropriate terrain charts.

5.8.1. IFR Departures.

5.8.1.1. Use an approved IFR departure method as outlined in AFMAN 11-202V3.

5.8.1.2. IFR departures require detailed planning to ensure obstacles and high terrain are avoided. The PIC shall comply with climb gradient, obstacle, and screen height clearance requirements contained in AFMAN 11-202V3, and the MAJCOM-approved departure planning checklist. **(T-2)**

5.8.2. VFR Departures. Refer to FLIP for host nation VFR requirements and the AFMAN 11-202V3 before flying VFR OCONUS.

5.9. Departure Alternates. PICs must designate a departure alternate if crosswinds (corrected for RCR) are out of limits for landing or if the computed landing distance for emergency return exceeds the runway available due to RCR or gust. **(T-2)**

5.10. Adverse Weather.

5.10.1. Turbulence.

5.10.1.1. The C-5 is a category II aircraft for turbulence. Crews should confirm the type of aircraft the forecast turbulence applies to, or what type of aircraft reported the encounter, to gain a more accurate picture for their route of flight. Turbulence category charts are found in AFH 11-203V2, *Weather for Aircrews-Products and Services*.

5.10.1.2. The PIC will direct all passengers to be seated, with seat belts fastened, when areas of moderate or greater turbulence are encountered or anticipated. **(T-2)**

5.10.2. Icing. When an aircraft requires de-icing refer to TO 1C-5M-1, TO 42C-1-2, *Aircraft Anti-icing Procedures*, and TO 1C-5M-2-1, *Ground Handling And Servicing*.

5.10.3. Cold Weather. When performing departures, approaches, and landings at locations where temperatures are 0 °C or below, refer to AFMAN 11-202V3 and the Flight Information Handbook Section D, Temperature Correction Chart, to correct minimum descent altitude (MDA), decision altitude (DA), and other barometric altitudes inside the final approach fix (FAF). When temperature is below -30 °C or if in mountainous terrain, apply correction to all altitudes on the approach plate.

5.10.4. Hazard avoidance will be conducted IAW AFMAN 11-202V3, AMC Supplement and the following:

5.10.4.1. Avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo. **(T-3)** This is especially true under the anvil of a large cumulonimbus. Crews will consider red radar returns (Airplanes Not Modified by TCTO 1C-5M-545, *Color Weather Radar Modification*) or solid red radar returns (Airplanes Modified by TCTO 1C-5M-545) as intense radar echo. **(T-3)**

5.10.4.2. Avoid WXR-2100 predicted hazards (Airplanes Modified by TCTO 1C-5M-545). **(T-3)**

Section 5C—Preflight

5.11. Hazard Identification and Mitigation. If not previously briefed, the PIC should brief primary mission hazards facing the crew during takeoff and climb-out, after the entire crew is assembled at the aircraft.

5.12. Aircraft Servicing and Ground Operations.

5.12.1. Fire Protection and Crash Rescue. For detailed requirements see AMCI 11-208, *Mobility Air Forces Management*. The aircraft engine fire extinguisher system fulfills the minimum requirements for fire protection during engine start.

5.12.2. Fall Protection. Aircrew members are prohibited from climbing onto the upper fuselage or wing surfaces. **(T-2)** Aircraft commanders will ensure no other personnel (excluding qualified maintenance personnel), have access to, or be allowed to climb onto the fuselage or wings. **(T-2)**

5.12.3. Aircrew and Maintenance Engine Runs. Aircrew are authorized to perform engine runs when qualified maintenance personnel are not available. Do not mix maintenance and aircrew personnel. When aircrew perform engine runs for maintenance purposes, the following procedures apply:

5.12.3.1. Maintenance personnel will accomplish any necessary inspections and preparations for the engine run. **(T-3)** These actions include but are not limited to: intake/exhaust inspections, access panel security, servicing, and AFTO 781 documentation.

5.12.3.2. Aircrew are required to use only aircrew checklists. **(T-3)** Perform the required flight engineer and scanner aircrew inspections. Complete the Before Starting Engines and Starting Engines checklist. Deviations are authorized if less than four engines are required. Engine runs above idle require prior coordination with AMC/A3V. Prior to initiating engine runs above idle, ensure sufficient area behind the aircraft is clear. Operate symmetrical engines when power settings above ground idle are required. Ensure the parking brake is set, guard the brakes, and install chalks if available. Upon completion, accomplish the After Landing, Engine Shutdown and Before Leaving Airplane checklists.

5.13. Aircrew Flight Equipment Requirements (AFE).

5.13.1. AFE requirements will be IAW the AFMAN 11-202V3, AMC Supplement.

5.13.2. Life Preserver Units (LPUs). Loadmasters distribute LPUs within easy reach of each passenger and aircrew member before takeoff on overwater flights. Overwater flights are considered flights outside gliding distance to land. The loadmaster will ensure the appropriate number and type of life preservers are aboard for overwater missions carrying children and infants. **(T-2)**

5.14. Oxygen Requirements.

5.14.1. The PIC will ensure the quantity of oxygen aboard the aircraft before takeoff is sufficient to accomplish the planned flight from the equal time point (ETP) to recovery should oxygen be required. **(T-2)** Calculate up to 5 crewmembers using the CREW REGULATORS ON 100 PERCENT and the remaining crew and passengers using the PASSENGERS ON CONTINUOUS FLOW portions of the Oxygen Duration Chart in TO 1C-5M-1.

5.14.2. Crewmembers occupying a crew station will have an oxygen mask connected and readily available for use from before engine start until engine shutdown. **(T-2)**

5.14.3. Crewmembers transiting the cargo compartment will ensure they have an oxygen bottle available IAW AFMAN 11-202V3, AMC Supplement. **(T-2)**

5.15. Automatic Dependent Surveillance (ADS). ADS automatically reports aircraft position. Turn off ADS functions when not required for any segment of that flight. When ADS is required for any portion of the sortie, leave it on for the duration of the leg. Ensure the Equipment and Capabilities Codes in Block 10 of the DD Form 1801 match the intended ADS usage.

Section 5D—Departure (not used)

Section 5E—*En route*

5.16. FMS Special Military Patterns. Use of FMS Special Military Patterns is prohibited. **(T-2)**

Section 5F—Arrival

5.17. Descent.

5.17.1. Night and Marginal Weather Operations. With the exception of instrument straight-in approaches, a visual glide slope indicator to the runway of intended landing is required for night approaches. **(T-2) Note:** On operational missions, consider flying the most precise approach available at night and in marginal weather.

5.17.2. VNAV. VNAV may be used for all descents, including those below 10,000 feet. Verify all altitudes prior to and during VNAV use. VNAV use during approach phase is prohibited, regardless of the type of approach. **(T-2)**

5.18. Crew-Entered FMS Approach. Use of Crew-Entered FMS Approach functionality is prohibited. **(T-2)**

5.19. Instrument Approach Procedures.

5.19.1. Aircraft Category. The C-5 is a Category D aircraft in both FAA and International Civil Aviation Organization (ICAO) airspace. Crews are not authorized to fly an instrument approach using a lower category. If approach speeds exceed 165 knots, use the Category E minimums. **(T-2)**

5.19.2. Weather Minimums. Before starting an instrument approach or beginning a descent, confirm the existing weather is reported to be:

5.19.2.1. At or above the required visibility for a straight-in or sidestep approach.

5.19.2.2. Minimum RVR for Category II ILS approaches is 1200 (350 meters).

5.19.2.3. Minimum RVR for precision approach radar (PAR) is 2400 (750 meters) or ½ mile visibility (800 meters) with no RVR readout available.

5.19.2.4. At or above required ceiling and visibility for a circling approach.

5.19.2.5. When the runway approach lighting system is inoperative, increase the published visibility minimums of an instrument approach by ½ SM or as noted in NOTAMs, automated terminal information service (ATIS), or on the approach plate. This applies only to the approach lighting system itself, not to visual approach slope indicator, precision approach path indicator, and other lights that are not a component of the approach lighting system.

5.19.2.6. If the ceiling is below the required value for a precision approach, but the visibility is at or above the authorized minimums, verify compliance with fuel requirements before initiating en route descent, penetration, or approach.

5.19.3. Category I ILS Procedures. DA is as published but no lower than 200 feet height above touchdown (HAT).

5.19.3.1. Aircrew are permitted to execute Category I ILS approaches with less than 2400 RVR (750 meters) at locations without touchdown zone and centerline lighting (or when such system is inoperative) as restricted below: **(T-2)**

5.19.3.1.1. The minimum RVR is 1800 (550 meters).

5.19.3.1.2. The approach must be flown using flight director (FD) or autopilot (AP) to DA.

5.19.3.1.3. The approach plate itself must have the note authorizing FD, heads-up display, or AP to DA.

5.19.3.1.4. Special Authorization Category I (SA CAT I) approaches are not authorized.

5.19.3.2. ILS Precision Runway Monitor (PRM) Approaches. Both pilots must be certified to conduct an ILS PRM approach. **(T-2)** Pilots will comply with restrictions published on the approach procedure and the Attention All Users Page. **(T-0)**

5.19.4. Category II ILS Procedures. Decision Height (DH) is based on radar altitude. HAT may be no lower than 100 feet, however, published radar altimeter setting may be lower than 100 feet to correspond to a 100 foot HAT.

5.19.4.1. The maximum crosswind component is 10 knots or as specified in the flight manual, whichever is lower.

5.19.4.2. Aircrews will not execute an actual Category II ILS to minimums unless both pilots are qualified and current in Category II ILS. **(T-2)**

5.19.4.3. Special Authorization Category II (SA CAT II) approaches are not authorized. **(T-2)**

5.19.5. PAR Approaches. Decision altitude is as published but no lower than 200 foot HAT.

5.19.6. Microwave Landing System (MLS) Approaches. C-5 aircrew are authorized to conduct MLS approaches.

5.19.7. Non-Directional Radio Beacon (NDB) Procedures. Conduct NDB approaches IAW AFMAN 11-202V3.

5.19.8. Area Navigation (RNAV) Procedures. RNAV, RNAV (GPS), RNAV (GNSS), and Required Navigation Performance (RNP) approaches will be flown to Lateral Navigation (LNAV) minimums IAW TO 1C-5M-1. RNAV (RNP), RNP (AR), or RNAV procedures with "Special Aircraft & Aircrew Authorization Required (SAAAR)" statements in the profile view are not authorized.

5.19.9. Constant Descent Final Approach (CDFA) Procedures. IAW AFMAN 11-202V3, pilots should use the CDFA technique when practical. When applying the CDFA technique on non-precision approaches, compute the derived decision altitude (DDA) by adding 50 feet to the published MDA. The following avionics setup is recommended:

5.19.9.1. MDA or missed approach altitude set in the altitude select window.

5.19.9.2. DDA set in the barometric altitude minimums.

5.19.9.3. Visual descent angle set in the flight path angle (FPA).

5.19.9.4. Approach Advisory Calls will be made IAW AFMAN 11-202V3, AMC Supplement except “100 Above” and “Minimums” calls should be made in reference to DDA instead of MDA.

5.19.10. Changes to Weather after Beginning Descent or Approach. IAW AFMAN 11-202V3.

5.19.10.1. If the approach is continued, the PIC must ensure sufficient fuel is available to complete the approach and missed approach, and proceed to a suitable alternate with normal fuel reserve. **(T-2) Exception:** Do not continue a Category II ILS if the weather is reported to be below Category II minimums.

5.19.10.2. The PIC has final responsibility for determining when the destination is below designated minimums, and for initiating proper clearance request.

5.19.11. Holding. An aircraft may hold at a destination that is below landing minimums, but forecast to improve to at or above minimums provided:

5.19.11.1. The aircraft has more fuel remaining than that required to fly to the alternate and hold for the appropriate holding time, and the weather at the alternate is forecast to remain at or above alternate filing minimums for the period, including the holding time.

5.19.11.2. The destination weather is forecast to be at or above minimums before excess fuel will be consumed.

5.20. Insect and Pest Control. Use **Table 5.2** to determine the duration of spray 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.

Table 5.2. Spray Chart.

Location	Seconds
Crew Compartment	42
Troop Compartment	50
Cargo Compartment	374
Underfloor Compartment	51

Section 5G—Miscellaneous

5.21. Flight Deck Congestion and Loose Objects. Do not place items (e.g., checklists, EFBs, headsets, etc.) on the throttle quadrant, control column/yoke or bogie emergency position switches.

5.22. AFTO Form 781 Special Use Block. Enter landing gear cycles/go arounds in the SPECIAL USE (16) block when completing the AFTO Form 781. **Example:** Twelve landing gear cycles and three go arounds would be entered as "12 / 3".

Chapter 6

AIRCRAFT SECURITY

6.1. General. This chapter provides guidance on aircraft security and preventing and resisting aircraft piracy (hijacking) of the C-5 aircraft. AFI 13-207-O, *Preventing and Resisting Aircraft Piracy (Hijacking)* (FOUO), DAFI 31-101, *Integrated Defense* (ID), 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. **(T-2)**

6.2. Security. The C-5 is normally a Protection Level 3 resource, but the mission may dictate a higher level protection level in some cases. Aircraft security must be appropriately coordinated though the controlling agency, particularly at locations other than US military installations. **(T-2)**

6.3. Integrated Defense. The following security procedures implement AFI 31-101 requirements for C-5 aircraft:

6.3.1. The aircraft will be parked in an established restricted area and afforded protection IAW AFI 31-101. **(T-2)**

6.3.2. 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. Portable security lighting is provided during the hours of darkness if sufficient permanent lighting is not available. Post security forces IAW AFI 31-101.

6.3.3. At non-United States military installations, the PIC determines the adequacy of local security capabilities to provide aircraft security commensurate with this chapter. If the PIC determines security to be inadequate the aircraft should be moved to a station where adequate security is available.

6.3.4. Security support is a continual requirement and is not negated by the presence of aircrew or ground crewmembers. Security force support terminates only after the aircraft doors are closed and the aircraft taxis.

6.4. Arming. When arming is directed, ensure there is an armed crewmember in compartments occupied by passengers and in the flight deck as a minimum. **(T-2) Note:** Armed crewmembers should transfer their weapon to a crewmember occupying a primary crew position during periods of rest.

Chapter 7

TRAINING AND OPERATING LIMITATIONS

7.1. Passengers on Training Missions.

7.1.1. Initial qualification or re-qualification for pilots will not be conducted with passengers onboard (not applicable [N/A] MEP). **(T-2)**

7.1.2. Mission certification training, evaluations, off station trainers, and JA/ATTs may carry passengers only if the aircrew in training is qualified. Receiver AR is authorized if the pilot flying is qualified (i.e., AF 8 on file documenting successful completion of an aircraft flight evaluation including air refueling).

7.1.3. Touch-and-go landings and multiple practice approaches are prohibited with passengers onboard (N/A MEP). **(T-2)**

7.2. Touch-and-Go Landing Limitations.

7.2.1. Direct supervision of an IP/EP is required for touch-and-go landings. **(T-3)**

7.2.2. Limitations. **(T-2)**

7.2.2.1. Comply with all flight manual restrictions and procedures to include performance degradation with fuel, cargo limits, etc. Do not exceed a gross weight of 635,850 pounds.

7.2.2.2. Minimum runway length: 7,000 feet.

7.2.2.3. Minimum runway width: 150 feet.

7.2.2.4. Minimum ceiling/visibility: 300 feet and RVR 40 (¾ SM) (1200 meters).

7.2.2.5. Minimum RCR: 12.

7.2.2.6. Do not accomplish touch-and-go landings on slush-covered runways.

7.2.2.7. Do not conduct touch-and-go landings with a crosswind component exceeding the maximum takeoff and landing crosswind component for the normal zone regardless of RCR. Do not apply an approach or rotation speed increase to allow crosswind operations in the normal zone.

7.2.2.8. Touch-and-go landings may be performed with cargo onboard provided the PIC and loadmaster determine suitability of cargo and normal landing weight is not exceeded. Touch-and-go landings with hazardous cargo on board are prohibited. **(T-2) Exception:** Home station touch-and-go training may be accomplished with diesel powered vehicles on board. Cargo security is checked prior to the first touch-and-go and thereafter at an interval determined by the PIC (should not exceed 1 hour). PICs should allow additional time for this inspection during flight. **Note:** Touch-and-go landings that exceed the normal landing fuel weight are authorized provided TO 1C-5M-1, Section V limitations are adhered to.

7.3. Training on Operational Missions. Aircrews may accomplish AR training on operational missions provided compliance with applicable items of Chapter 25 of the AFMAN 11-202V3, AMC Supplement.

7.4. Flight Maneuvers.

7.4.1. Practice of the following maneuvers are prohibited in the airplane: **(T-1)**

7.4.1.1. Stall and approach to stalls.

7.4.1.2. Dutch roll.

7.4.1.3. Emergency descent.

7.4.1.4. Unusual attitudes.

7.4.1.5. Compound emergencies.

7.4.1.6. Simulated engine-out takeoffs.

7.4.1.7. Bank angles greater than 45 ° (except MAJCOM-approved tactics maneuvers).

7.4.1.8. Jammed stabilizer.

7.4.1.9. Landing with inoperative hydraulic systems.

7.4.1.10. Simulated runaway pitch trim malfunctions.

7.4.1.11. RAT deployment.

7.4.1.12. In-flight gear kneeling.

7.4.1.13. No-slat landing.

7.4.1.14. Minimum run landings.

7.4.1.15. Rejected takeoffs.

7.4.1.16. PACS off landing.

7.4.1.17. Simultaneous simulated engine failures and no flap approach training.

7.4.1.18. Simulated two engines out landings and missed approaches.

7.4.2. See **Table 7.1** for additional details on training flight restrictions.

7.5. Senior Officer Course (SOC)/Unqualified Pilot Training.

7.5.1. SOC graduates may practice aerial refueling from the left seat (to include the contact position) with the following restrictions:

7.5.1.1. Accomplished under direct AR instructor pilot supervision. **(T-2)**

7.5.1.2. No passengers are authorized. **(T-2)**

7.5.1.3. Contacts by non-AR qualified SOC pilots will only be made after receiving acknowledgment from the tanker pilot and boom operator. **(T-2)** The boom operator must be fully qualified. **(T-2)** (N/A during flight training unit [FTU] training provided the boom operator is under direct instructor supervision.)

7.5.2. An FP may perform any tactical maneuver under the direct supervision of an IP.

7.6. Category II ILS Training. Flight training and evaluation may be conducted using any ILS approach where signal output is accurate and stable enough to achieve the desired training. Comply with the following restrictions: **(T-2)**

7.6.1. Weather is no lower than Category I ILS minimums.

7.6.2. Maximum crosswind component is 15 knots.

7.6.3. When CAT II ILS DH is not published, DH for training is based on 100 foot HAT.

7.6.4. Do not combine with a no-flap approach.

7.7. No Flap Landings. No flap landings may be conducted for flight training and evaluations. No flap landings are only flown to a full-stop. Comply with the following restrictions: **(T-2)**

7.7.1. Maximum crosswind component is 15 knots.

7.7.2. Maximum gross landing weight is 525,000 lb.

Table 7.1. Training Flight Restrictions. (T-3)

Maneuver	**Altitude**	**Remarks**
Instrument Missed / Low approaches	MDA/DA/DH	Initiate practice instrument missed approaches no lower than the minimum altitude for the type of approach executed.
Visual Low Approach / Planned Go Around	Initiate no lower than 100 feet AGL	
Personnel or equipment on runway	Initiate above 500 feet AGL	
Simulated Engine Failure	(One throttle at idle) Initiate above 500 feet AGL	Simulated engine failures are not authorized at less than 2-engine V_{MCA} (V_{APP} or 125 knots, whichever is higher). Simulated engine failure will not be practiced when any actual emergency exists, during no-flap landings, or during practice Category II ILS approaches. Simulate use of "MIN Q."
Go-Around		
All Engines	Initiate above 100 feet AGL	Instructor/evaluator shall not plan to initiate a go-around below 100 feet AGL.
3 engines	Initiate no lower than 200 feet AGL	Use all engines if below 200 feet AGL.
Note: These restrictions do not apply to operational missions.		

7.8. Multiple VFR Patterns. When performing multiple VFR patterns, crews should consider leaving the gear down to reduce gear cycles. Before exercising this option, instructor pilots should consider crew proficiency and experience levels. In order to maintain positive habit patterns, crews will adhere to the following: **(T-3)**

7.8.1. Verbally acknowledge the gear position after takeoff.

7.8.2. Call for the Before Landing Checklist at the normal configuration point.

7.9. Manual Gear Extension. The Emergency Nose/Main Landing Gear Extension – Normal Hydraulic Pressure Available procedures contained in TO 1C-5M-1, Section III may be accomplished for training by simulating emergency generator power only and/or loss of normal DC power. Open the affected landing gear control circuit breaker(s) prior to checklist initiation. Aircrew shall not use the emergency extend switches for training in the airplane. **(T-2)**

Chapter 8

NAVIGATION PROCEDURES

8.1. General. This chapter establishes procedures and requirements for worldwide en route C-5 navigation. It is to be used in conjunction with procedures and requirements set forth in AFMAN 11-202V3 and FLIP. Since airspace and associated navigational aid equipment capability are rapidly evolving, pilots need to maintain an in-depth knowledge of current requirements/policies.

8.2. Mission Planning.

8.2.1. The PIC or designated representative shall verify that proposed routes and flight altitudes and levels provide proper terrain clearance and meet FLIP and Foreign Clearance Guide requirements. **(T-2)**

8.2.2. The PIC or designated representative shall crosscheck the computer flight plan (CFP) route of flight against the ATC Acknowledgement Message or the electronically filed route of flight and the route of flight entered on the DD Form 1801, *DoD International Flight Plan.* **(T-2) Note:** When operating in Eurocontrol's airspace, the ATC Acknowledgement Message is normally indicated by TITLE ACK in the crew papers.

8.2.3. If a CFP is out of date or not available and routing or meteorological information is desired, the PIC should obtain direct assistance from the 618 AOC (TACC) flight planner or IFM. CFPs and CFP tracks to assist in manual flight planning are available with a current GDSS account.

8.3. Oceanic/Class II Navigation. Utilize the AMC C-5 Oceanic Checklist and adhere to the procedures in the AFMAN 11-202V3, AMC Supplement.

8.4. Navigation and Communication Capability.

8.4.1. Communication, Navigation, and Surveillance capabilities are listed in **Table 8.1**.

8.4.2. Performance-based navigation (PBN) requirements (RNAV and RNP), performance-based communication and surveillance (PBCS) requirements (i.e., required surveillance performance [RSP] and required communications performance [RCP]), and RVSM are mandatory when specified.

8.4.3. The C-5M is not certified for PBCS tracks.

8.4.4. Immediately report malfunctions or loss of navigation capability which degrades centerline accuracy to the controlling agency. Refer to flight manual, FLIP, North Atlantic Track (NAT) Doc 007 and appropriate publications for procedures and system malfunctions regarding navigation performance and vertical separation.

8.4.5. The C-5M is considered a non SBAS-equipped aircraft with fault detection and exclusion (FDE).

8.4.6. The C-5M EGI is a TSO-C129a equivalent global positioning (GPS) sensor.

8.4.7. BIP is not considered an FMS for the purpose of RNP airspace requirements.

8.4.8. Operating the GPS in precise positioning service (PPS) mode is authorized as primary navigation for civil navigation unless directed otherwise by SPINS, command authority, or host nation guidance for all phases of flight.

Table 8.1. Navigation/Communication Capability of C-5M.

Function	Requirement	Compliant	Remarks
Comm	8.33 KHz Radio Spacing	Yes	At least one ARC-210 radio must be operative.
	Datalink - CPDLC	Yes	HFDL only meets RCP 400 requirements. Verify airspace requirements before using HFDL for CPDLC.
	Datalink - ATS/AOC	Yes	
Nav	FM Immunity	Yes	At least one MMR must be operative.
	RNAV (GPS) Approach RNAV (GNSS) Approach	Yes	Flown in RNP mode or dedicated GPS mode. DME/DME RNP 0.3 not authorized.
	RNAV (RNP) Approach	No	
	RNP RWY XX Approach	Yes	IAW ICAO Circular 336. No lower than RNP 0.3.
	RNP (AR) Approach	No	
	NGA Navigation Database	Yes	Approved for all operations excluding RNAV (RNP) and RNP (AR) approaches.
	RVSM	Yes	Refer to FLIP GP. 2 SCADC, one transponder and one AP with altitude alerting operative are required.
Nav	NAT HLA	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNAV 10 RNP 10	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNAV-5	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNP 4 Oceanic Routes	Yes	UNABLE RNP CWA not displayed. With UNABLE RNP CWA displayed, may continue on RNP 4 Oceanic Routes in dedicated INU/GPS or GPS mode with ATC approval if route PRAIM check was completed.

	PRNAV	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNAV-2 (Q- & T-routes)	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNAV-1	Yes	UNABLE RNP CWA not displayed or IAW Section III procedures for UNABLE RNP.
	RNP-2	Yes	UNABLE RNP CWA not displayed.
	RNP-1	Yes	UNABLE RNP CWA not displayed.
	RNP 0.3	Yes	UNABLE RNP CWA not displayed.
Surv	ADS-C	Yes	HFDL only meets RCP 400 requirements. Verify airspace requirements before using HFDL for ADS-C.
	ADS-B out	Yes	Reference current command guidance for ADS-B operation.
	Elementary Mode S	Yes	Transponder operative.
Surv	Enhanced Mode S	Yes	Reverts to Elementary Mode S in BIP.
	TCAS version 7.1	Yes	Transponder operative and TCAS ON.
Misc	TAWS	Yes	EGPWS operative.
	406 MHz ELT	Yes	
	Stage 3 Noise	Yes	
	Stage 4 Noise	**	Compliant at gross weights ≤769K.

8.5. Grid Operations. Operations above 70 degrees north and below 60 degrees south require thorough study and understanding of instrument approach procedures (IAP) and of inertial navigation system (INS) procedures and heading displays. The PIC decides whether headings are magnetic, grid, or true oriented and ensure the other pilots understand what type heading is being displayed on the HSIs, bearing distance heading indicators (BDHIs), and MCDUs. **Note:** Grivation (GV) shown on the IAP applies to other aircraft and is not used for C-5 operations. IAPs above approximately 65 degrees north contain the following notice: Grid courses are true polar courses and convergence angle factor is not applied. Convergence angle factors apply to sub-polar navigation charts used by aircraft other than C-5 and are not used. C-5s use a convergence factor of 1.00000.

8.6. Self-Contained Approaches and MAJCOM-Certified Approach Procedures.

8.6.1. Self-contained approaches (SCAs) and MAJCOM-certified approach procedures are approved for use IAW AFMAN 11-202V3.

8.6.2. The MAJCOM will provide the crew with an approved approach procedure leading to a final approach fix. All course data and altitude restrictions required to program the approach in the FMS 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.

8.6.3. SCAs are developed using terminal instrument procedures (TERPS) criteria. MAJCOM-certified approach procedures do not use TERPS criteria and may not provide the same obstacle clearance guarantees as published approaches.

8.6.4. Restrictions on self-contained approaches and MAJCOM-certified approaches.

8.6.4.1. SCA and MAJCOM-certified approach procedures in IMC will only be used when no other published approach procedure is available and requires specific authorization from MAJCOM/A3. All crews are authorized to use these procedures for training in VFR conditions IAW AFMAN 11-202V3.

8.6.4.2. RNP of 0.3 NM is required from the FAF to the runway unless non-standard RNP values are specified by the procedure.

8.6.4.3. It is highly recommended that the approach is flown with the autopilot coupled.

8.6.4.4. Weather minimums will be no lower than 600-2. **(T-2)**

8.6.4.5. Ensure LDI does not exceed ½ full scale deflection.

8.6.4.6. Navigation System Malfunctions. Unless the runway is in sight, execute the missed approach procedure if UNABLE RNP or NO APPR CWA is displayed.

8.6.4.7. Self-contained approach waypoints required to fly the approach and missed approach must exist in the current navigation database. **(T-2)** If the waypoints are not in the current navigation database, aircrews will be provided the required waypoints to be loaded electronically into the FMS (via PC card or other means). Aircrews will not manually enter or alter coordinates for any portion of the approach or missed approach. **(T-2)**

8.6.4.8. MAJCOM-certified approach procedure waypoints required to fly the approach and missed approach may be loaded by the aircrew.

8.6.4.9. Ensure all of the waypoints for the approach up to the FAF are loaded in the primary flight plan.

8.6.4.10. Both pilots will review the entire procedure in the FMS, verifying both the coordinates and the MFDU map display for accuracy prior to commencing the approach. **(T-2)** If any portion does not agree with the approved procedure, the approach will not be flown. **(T-2)**

8.7. MAJCOM-Certified Departure Procedures.

8.7.1. MAJCOM-certified departure procedures are approved IAW AFMAN 11-202V3.

8.7.2. The MAJCOM will provide the crew with an approved departure procedure leading to an en route altitude and transition fix. All course data and altitude restrictions required to program the departure in the FMS will be included on the departure procedure. This will

include any high-precision waypoints, weather minimums, and instructions required to safely execute the departure.

8.7.3. MAJCOM-certified departure procedures do not use TERPS criteria and may not provide the same obstacle clearance guarantees as published departures.

8.7.4. Restrictions on MAJCOM-certified departure procedures.

8.7.4.1. MAJCOM-certified departure procedures in IMC will only be used when no other published departure procedure is available and requires specific authorization from MAJCOM/A3. All crews are authorized to use these procedures for training in VFR conditions IAW AFMAN 11-202V3.

8.7.4.2. RNP of 0.3 NM is required from the runway to the first en route transition point unless non-standard RNP values are specified by the procedure.

8.7.4.3. It is highly recommended that the departure is flown with the autopilot coupled.

8.7.4.4. Weather minima for approved departures will be no lower than 600-2. **(T-2)**

8.7.4.5. Lateral Deviation. Ensure cross track error does not exceed 0.2 NM from flight plan centerline.

8.7.4.6. MAJCOM-certified departure waypoints may be loaded by aircrew.

8.7.4.7. Ensure all of the waypoints for the procedure up to the first en route fix are loaded in the primary flight plan.

8.7.4.8. Both pilots will review the entire procedure in the FMS, verifying both the coordinates and the MFDU map display for accuracy prior to commencing the approach. **(T-3)** If any portion does not agree with the approved procedure, the departure will not be flown. **(T-2)**

Chapter 9

FLIGHT ENGINEER PROCEDURES

9.1. General. This chapter contains flight engineer procedures not contained in the flight manual, other portions of this manual, or other publications.

9.2. Responsibilities. The flight engineer (FE) is responsible to the pilot in command for all inspections and procedures required by the applicable technical orders and regulations. A qualified second engineer can perform scanner duties without direct supervision and is responsible to the primary engineer for the completion of all duties for which they are qualified. When performing primary FE duties, the second engineer must be under the supervision of an instructor or flight examiner. **(T-2)**

9.3. Aircraft Servicing and Ground Operations. The flight engineer is qualified and authorized to accomplish these duties when maintenance personnel are not available. This guidance is designed for support of the aircraft and its mission while away from home station. The flight engineer will use the applicable refueling and de-fueling checklists on the EFB during all refueling and de-fueling operations. **(T-2)** If ground support personnel are not available, the aircraft commander should designate other crewmembers to assist the flight engineer. A flight engineer may assist the normal maintenance function when critical taskings dictate their use, provided this action does not impact crew duty and crew rest limits specified in AFMAN 11-202V3, AMC Supplement. **Exception:** Flight Engineers are not qualified to service Nitrogen or Oxygen. **WARNING:** Do not load/offload cargo containing explosives, oxygen, flammable gases or liquids during fuel servicing operations.

9.3.1. When an all aircrew member team is required to refuel, the flight engineer should act as the refueling team supervisor. Comply with TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*, and TO 1C-5M-2-1 when acting as refueling supervisor or panel operator.

9.3.1.1. Concurrent Ground Operations. The PIC and chief servicing supervisor (CSS) shall ensure aircrew members and servicing personnel accomplish concurrent servicing (CS) in accordance with TO 00-25-172 and TO 1C-5M-2-1. **(T-2)** Aircrews performing Dash-1 preflight inspections or cargo loading concurrent with servicing must have cooperation and close coordination with the CSS. **(T-2)** The CSS will remain in continuous intercom contact with fuel servicing team members during the entire servicing operation. **(T-2)** Team members include CSS, a monitor for each SPR in use, refueling panel monitor, fuel specialists. When the aircrew is at the aircraft, the PIC is responsible for all aspects of aircraft operations and can inform the CSS how aircrew members will participate in passenger evacuation/safety. In keeping with the guidelines in TO 00-25-172 and TO 1C-5M-2-1, CSS has authority over all phases of CS operations to include personnel participating in the refuel.

9.3.1.2. During fuel servicing (refuel) operations, electric and electronic equipment may be on and operated to include operations performed by aircrew members during required inspections with the following exceptions:

9.3.1.2.1. TACANs and radar altimeters are turned off.

9.3.1.2.2. Radar is in STBY, TEST, or OFF. (N/A WXR-2100)

9.3.1.2.3. IFF should be off but may be in standby if mission requirements dictate.

9.3.1.2.4. Radio operations are authorized. **Exception:** Use of HF radios is prohibited.

9.3.1.2.5. Simultaneous fuel and oxygen servicing is not authorized.

9.3.1.2.6. APUs and ATMs may be used. APUs, if required should be started prior to fuel servicing. If the APU requires starting during servicing, the pantograph or refueling hose will be depressurized prior to initiating the APU start. **(T-2)**

9.3.2. Hot Refueling. Hot refueling (i.e., refueling with aircraft engines running) will only be conducted by crews that have been authorized and certified according to AFI 11-235, *Specialized Refueling Operations*. **(T-2)**

9.3.3. Aircrew Dash One Preflight Inspection Requirements IAW TO 1C-5M-1. No further inspection is required if a face-to-face turnover is conducted provided the departing crew finishes the inspection.

9.4. Aircraft Recovery Away from Main Operating Base (MOB). The PIC is responsible for ensuring the aircraft is turned to meet subsequent mission tasking. If qualified maintenance specialists are unavailable, the aircrew is responsible for turning the aircraft to meet subsequent mission taskings.

9.4.1. The PIC is responsible for the recovery items including:

9.4.1.1. Parking and receiving.

9.4.1.2. Aircraft servicing, including aircraft ground equipment (AGE) usage.

9.4.1.3. Supervision of minor maintenance within local capability.

9.4.1.4. Minor configuration changes to meet mission tasking.

9.4.1.5. Securing the aircraft before entering crew rest.

9.4.1.6. Coordinating aircraft security requirements.

9.4.1.7. Documenting AFTO Form 781-series.

9.4.2. Comply with the appropriate maintenance technical order whenever aircrews must service the aircraft without qualified maintenance specialist assistance.

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

9.5. Aircraft Structural Integrity Program (ASIP). The purpose of this program is to provide a reliable system for predicting potential or impending failures based on historical records of the aircraft's exposure to those actions contributing to fatigue failures. The ASIP is automated in the EDS.

9.5.1. Flight Engineer ASIP Procedures.

9.5.1.1. Ensure all applicable tabs are completed within the EDS program according to procedures in **paragraph 9.5.2**.

9.5.1.2. Use the procedures in paragraph **9.5.5** and **9.6.6** during operations with a failed PCIU or AMC.

9.5.1.3. At home station, remove the RMM and turn into maintenance debrief. **Note:** If the crew and maintenance do not conduct a formal debrief (e.g., first period local, mission thru-flights, debrief not available), the RMM will be left on the aircraft. **(T-3)** Units may establish local procedures.

9.5.1.4. When flying another wing's aircraft, turn in the RMM to maintenance debrief at the aircraft home station.

9.5.1.5. When delivering an aircraft to depot or another wing, return the RMM to home station documentation section.

9.5.2. Flight Engineer EDS Instructions. Do not complete input for any ground operation or sortie that does not involve an attempted takeoff. This includes ground aborts for maintenance operations, weather, and onload or offload exercises. When a sortie is terminated before an attempted takeoff, complete the applicable sections to document crew actions. Any abnormal cruise conditions (e.g., gear down flight, slats extended and speed restricted aircraft) will be annotated in the remarks section. **(T-3)**

9.5.2.1. Start-up and initialization. This data is entered and used to pre-populate additional fields. The intent of these entries is to format the AFTO Form 781A and reflect minimum signature requirements in TO 00-20-1AMC SUP. Enter the initial takeoff and final landing airfield ICAO designations. **Example:** Flight Engineer Name: R *SERRICCHIO, SMSGT FE* (use all capitals) Military Employee No. is entered as a five digit squadron, i.e., *00337*, *00009*, Squadron, *22AS*, *68AS*, Mission Number for that leg, ICAO, enter departure and intended landing airport, make remarks entry for diverts.

9.5.2.2. Log start. Select the log start event and document the basic operating weight and cargo weight obtained from DD Form 365-4 or the automated Form F. Also enter the cumulative airframe hours as depicted in the AFTO Form 781-series. **Note:** Load environmental spectra survey (LESS) equipped aircraft fuel weights are prefilled for automatically detected events when the LESS circuit breakers are closed.

9.5.2.3. Takeoff. Select the takeoff event and document the gross weight (zero fuel weight plus fuel weight), center of gravity, and fuel weight as of brake release. Annotate with a check mark if the takeoff is accomplished on a substandard runway.

9.5.2.4. Liftoff. Select the liftoff event and document the fuel weight as of liftoff.

9.5.2.5. Cruise. Enter fuel remaining at the start of the cruise event. Use the remarks section to identify abnormal cruise conditions. If not automatically detected after 15 minutes when above 6,000 feet mean sea level (MSL) or 5 minutes when at or below 6,000 feet MSL, manually enter a cruise event and document the start time, stop time, Mach, altitude, and fuel remaining.

9.5.2.6. Aerial refueling. Record the start of an air refueling event as the time the aircraft enters the tanker wake turbulence. Enter the beginning fuel weight and the incremental weight as the total amount of fuel offloaded by the tanker (KIPS is a unit of measurement equal to 1,000 pounds), the Mach, altitude at which the air refueling occurred, and the tanker type. The stop time is recorded when the aircraft departs the tanker wake turbulence

at the completion of the event. **Note:** Use KC-10 as the tanker type when accomplishing AR events with a KC-46. Enter "Tanker Type – KC-46" in the event remark section.

9.5.2.7. Air drop and terrain following. Not currently used.

9.5.2.8. Low level (LL). Use LL when flying a clean configuration event at or below 2,000-feet AGL for longer than 5 minutes. Record the fuel weight, route (2-digit low level route number), altitude AGL in feet, Mach number, mode (use manual), and any pertinent remarks. **Note:** Usually applies during tactical VFR training (TVT) sorties.

9.5.2.9. Cargo jettison. Record the fuel weight, the incremental weight offloaded, Mach and altitude.

9.5.2.10. Fuel jettison, Record the incremental weight offloaded, Mach and altitude.

9.5.2.11. Touchdown. Record the fuel weight upon landing for full stop landings. This event also provides the capability to record a landing on a substandard runway or flights using non-standard fuel sequencing. For touch-and-go operations, the fuel load entry is optional for each touchdown event logged. Use the remarks section to enter appropriate comments that could influence aircraft fatigue factors. Examples are unpressurized flight, severe turbulence encountered, hard landing, and high load maneuvers.

9.5.2.12. Engine start, ALDCS, taxi, gear cycle, new flight, engine shutdown and log stop. These are additional automatic events that do not require attention unless abnormal conditions occur. Use the remarks section to identify abnormal conditions.

9.5.2.13. Runway abort. Select the runway abort event and then enter the reason for the rejected takeoff.

9.5.2.14. Over-G. Select the over-g event and enter relevant information about the exceedance condition.

9.5.3. After documenting the required information within each event details viewer, use the save button to record the data onto the RMM.

9.5.4. PCIU Security. The PCIU does not contain virus protection. All software loaded on the EDS PCIU require Computer Program Identification Numbers (CPINs). Authorized uses of the PCIU are described in the flight manual. The PCIU should be locked (Windows) when unattended during ground operations. The flight engineer will turn off sensitive recording when directed by the mission execution authority. **(T-2)**

9.5.5. PCIU Failure. To allow data recovery after a PCIU failure, attempt to replace the PCIU prior to AMC power down. Refer to TO 1C-5M-1, EDS Operation with PCIU Inoperative. The EDS Aircraft Structural Integrity Program is fully functional with a failed PCIU.

9.5.6. AMC Failure. Refer to TO 1C-5M-1, EDS Operation with AMC Inoperative. During operations with a failed AMC, annotate in the aircraft forms, all Thrust Reverser deployments including airspeed/groundspeed at time of deployment. **Example:** Engine 2 and 3 TRs deployed on descent airspeed 230 knots. If deployment is during ground operations, indicate engine operation at or above idle. **Example:** #1 and #4 eng TR deployed for op ck, ground speed 0, engine throttles idle. The EDS Aircraft Structural Integrity Program is not fully functional with a failed AMC. However, aircraft structural data can be extracted at the engineering level.

9.5.7. RMM Failure. Refer to TO 1C-5M-1, EDS Operation with RMM Not Installed. If the RMM card fails prior to data download, attempt to replace the card prior to power down of the EDS and PCIU. If a replacement RMM is not available, copy the data on to another approved media (e.g., DVD).

9.6. Performance Data, Including TOLD Card.

9.6.1. All performance data will be computed by a first flight engineer or higher. **(T-2)** A second engineer may compute performance data if supervised by an instructor.

9.6.2. TOLD should be computed and verified using a single device.

9.6.3. When performance data is completed using the TO 1C-5M-1-1 only, Flight Engineers must place all TOLD conditions and computations on the TOLD Card Worksheet. **(T-2)** The AFTO Form 200 as displayed on an approved eTOLD program satisfies this requirement. The AFTO Form 200 must be open and displayed during taxi, takeoff, approach, landing and during all crew briefings. **(T-2)**

9.6.4. Runway slope calculations. Non-DoD/NOAA airfield diagrams and approach plates do not provide runway slope information. To calculate runway slope, extract the departure end elevation and approach end elevation from the airfield diagram and use the following formula:

Slope in Percent = (Departure End Elevation – Approach End Elevation) X 100

Runway Length

9.7. Fuel Management/Monitoring (AF Form 4054).

9.7.1. The purpose of this form is to provide a snapshot view of aircraft performance and fuel consumption and should only be used when a discrepancy exists between the actual fuel state and the CFP. Use this form for computing actual Air Refueling onload during operational Air Refueling missions. When applicable, use TO 1C-5M-1-1 or MAJCOM-approved computer based fuel log program and appropriate information from the CFP, AF Form 4052 if used, or AF Form 4053, *INS Flight Plan and Log Computation*, if used, to complete AF Form 4054.

9.7.2. Section I:

9.7.2.1. Zero Fuel Weight (ZFW). Obtain zero fuel weight from the DD 365-4 (Form F).

9.7.2.2. Takeoff (T/O) FUEL. Obtain takeoff fuel by adding fuel tank quantities.

9.7.2.3. TO GW. Calculate takeoff gross weight by adding ZFW to T/O FUEL.

9.7.2.4. TEMPERATURE DEVIATION. Use the forecast level off temperature deviation.

9.7.2.5. INITIAL ALTITUDE. Confirm initial four-engine cruise ceiling using level-off gross weight and level-off temperature deviation.

9.7.2.6. ENGINE OIL READINGS. Record oil pressure and temperature during first stabilized cruise segment (Mach and altitude stabilized).

9.7.2.7. AERIAL REFUELING.

9.7.2.7.1. Before takeoff obtain the following information from the CFP or AF 4052 if used: BURNOFF BEHIND TANKER, FUEL REQUIRED AT EXIT, PLANNED TRANSFER. Calculate SUBTOTAL by adding FUEL REQUIRED AT EXIT to

BURNOFF BEHIND TANKER. Subtract the PLANNED TRANSFER from the subtotal to obtain FUEL REQUIRED AT ARCP.

9.7.2.7.2. Forty-five minutes before the air refueling control point (ARCP) compute ESTIMATED FUEL AT ARCP based on your estimated time of arrival (ETA) to the ARCP. Subtract from the SUBTOTAL to obtain REQUIRED TRANSFER. Advise the aircraft commander of the required fuel transfer. AERIAL REFUELING periods 2 and 3 are completed in the same method if required.

9.7.3. Section II:

9.7.3.1. "A. BEGIN DESCENT TIME." Obtain begin descent time from the pilot.

9.7.3.2. "B. TIME." Record Zulu time of observation.

9.7.3.3. "C. ZFW." Obtain zero fuel weight from DD 365-4 or ZFW block above.

9.7.3.4. "D. FUEL REMAINING." Obtain fuel remaining from fuel gauge readings.

9.7.3.5. "E. GW." Calculate actual gross weight by adding FUEL REMAINING to ZFW.

9.7.3.6. "F. ALT/MACH." Record current flight level and Mach number. **Example:** 350/77.

9.7.3.7. "G. TEMP DEV." Use the average temperature deviation obtained from the CFP. If a significant discrepancy (i.e., > 5°C) exist between the actual temperature deviation and the CFP forecast for that leg and planned altitude, actual temperature deviation may be used.

9.7.3.8. "H. PAGE #." Page number in TO 1C-5M-1-1 that is used to compute time in block I. Enter “Comp” if electronic program is used.

9.7.3.9. "I. FUEL ETE." Compute fuel ETE using computation blocks at bottom of form (section III), and record in hours and minutes.

9.7.3.10. “J. ETE BDP/OH or ARCP.” Subtract Zulu time from BDT to obtain ETE BDP/OH or ARCP.

9.7.3.11. "K. EXTRA TIME." Subtract ETE BDP/OH or ARCP from FUEL ETE to obtain EXTRA TIME.

9.7.3.12. "L. 4 ENG CEIL." Use optimum step climb altitude.

9.7.3.13. "M. 3 ENG CEIL." Compute 3-engine cruise ceiling using current gross weight and actual temperature deviation.

9.7.3.14. "N. PILOT'S INITIALS." Pilot reviews and initials at least every hour and 20 minutes and may discontinue the form at his or her discretion.

9.7.4. Section III:

9.7.4.1. FUEL REQUIRED OH or ARCP. Enter FUEL REQUIRED OH from CFP, AF 4053 (block 13) or AF 4052 (block 56) for airland/final destination or FUEL REQUIRED ARCP from AF 4054 section I for aerial refueling missions.

9.7.4.2. ZFW. Enter zero fuel weight.

9.7.4.3. OH GW/TIME. Obtain OH GW by adding FUEL REQ OH or ARCP and ZFW. Obtain TIME using the applicable TEMP DEV and TO 1C-5M-1-1 performance charts or electronic program.

9.7.4.4. AGW/TIME. Record actual gross weight. Compute TIME using the applicable TEMP DEV and 1C-5M-1-1 performance charts or electronic program.

9.7.4.5. FUEL ETE. Subtract AGW/TIME from OH GW/TIME to compute FUEL ETE. Fuel ETE is recorded in hours and minutes.

9.8. Fault Code Reporting Procedures.

9.8.1. The fault reporting method (FRM) is used to isolate system malfunctions with a minimum amount of troubleshooting and provide a description of the malfunction for maintenance.

9.8.2. Troubleshoot system malfunctions monitored by EDS, or observed by a crewmember, using the FRM or Fault Isolation Manual (FIM) procedures contained in EDS to maximum extent possible.

9.8.3. Base AFTO Form 781A discrepancies on the fault isolation (FI) and include reference to the fault detection (FD) along with the description of the malfunction. If the FD does not have a FI, base the AFTO Form 781A on the FD. Include any additional information required for clarification of the discrepancy.

9.9. Weight and Balance. The flight engineer is responsible for obtaining a DD Form 365-4 (Form F) in the absence of a qualified loadmaster when no cargo or passengers are on board. This can be obtained from an OG managed CANNED Form F Program or a Duty Loadmaster as appropriate.

9.10. Monitoring Primary Radios. The FE monitors the primary radio for flight clearances, altitudes, heading changes, and radio frequencies. The FE is not required to copy departure clearances.

9.11. Ground Refueling Procedures with Inoperative Fuel Quantity Indicators or Error Codes Displayed:

9.11.1. Primary method. A known quantity of fuel is transferred from an adjacent tank to a tank with inoperative quantity indicator or error code displayed. The aircrew transfers fuel internally to the configuration or sequence required prior to flight when servicing is complete.

9.11.2. Alternate method.

9.11.2.1. The aircrew empties the tank with the inoperative indicator and the corresponding tank on the opposite wing. It is not serviced by maintenance.

9.11.2.2. When a single refueling unit is used, the crew fills the tank with the inoperative fuel quantity indicator individually and prior to remaining tanks, when possible, within wing loading limitations.

9.11.2.3. When a dual refueling unit is used, the tank with the inoperative fuel quantity indicator and the corresponding tank on the opposite wing may be filled simultaneously.

9.11.2.4. The refueling unit is used to determine the amount of fuel in the tank with inoperative indicator.

9.11.3. Maintenance may service aircraft to the following fuel values without the aircrew monitoring. **Note:** This does not alleviate the crew from determining a known quantity is in a tank with an inoperative fuel quantity indicator:

9.11.3.1. Outboard main tank inoperative—284,000 pounds.

9.11.3.2. Inboard main tank inoperative—281,000 pounds.

9.11.3.3. Outboard or inboard auxiliary tank inoperative—269,000 pounds.

9.11.3.4. Outboard or inboard extended range tank inoperative—278,000 pounds. **CAUTION:** Observe wing differential loading limits.

9.12. Wheel and Brake Procedures.

9.12.1. If dragging wheels or brakes are suspected during taxi, deplane the scanner and comply with **paragraph 9.12.2** Comply with paragraphs **9.12.2** and **9.12.3** if any portion of the fire suppression system (FSS) wheel well fire detecting system is inoperative.

9.12.2. Pre-departure End-of-Runway Inspection for Overheated Brakes. Unless the aircraft is parked on or immediately adjacent to the takeoff portion of the active runway the pre-departure end-of-runway inspection is completed as follows:

9.12.2.1. Use the scanner and another crewmember other than pilot, copilot, or FE. The additional crewmember deplanes with scanner and performs scanner duties while scanner accomplishes brake check.

9.12.2.2. Maintain interphone contact throughout the inspection.

9.12.2.3. To inspect, approach directly from the front or rear of the tire, touch main landing gear tire and cautiously move the hand toward the wheel. Then place the hand near the brake to determine excessive heat without touching the brake surface. Repeat for each MLG wheel and brake assembly.

9.12.2.4. If any brake is significantly hotter than the majority, advise maintenance as corrective action is necessary. If an obviously dangerous overheated condition is observed, do not taxi the airplane.

9.12.2.5. If no brake is found significantly hotter than the majority of brakes, the brake check is satisfactory.

9.12.3. In-flight Procedures:

9.12.3.1. Inspect the MLG wheel wells after takeoff for evidence of heat, smoke, or fire. If abnormalities are detected, extend the landing gear immediately at or below 250 KCAS/.60 Mach.

9.12.3.2. Inspect the cargo compartment sidewall and floor areas adjacent to the MLG wheel wells for evidence of heat (i.e., discoloration or variation in surface temperature) at 15-minute intervals for the first hour of flight. Inspect hourly for the remainder of flight.

Chapter 10

CARGO AND PASSENGER PROCEDURES

10.1. General.

10.1.1. 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.

10.1.2. The primary loadmaster is annotated on the flight authorization. The primary loadmaster is a key communication link between other crew positions and support agencies for loading issues. The primary loadmaster is also directly responsible for the supervision and conduct of other loadmasters on the crew. The primary loadmaster has the following responsibilities:

10.1.2.1. Pre-mission planning. As part of mission planning, contact Current Operations or the mission development function prior to entering pre-departure crew rest to obtain load and mission information for all Special Assignment Airlift Mission (SAAMs), Joint Airborne/Air Transportability Training (JA/ATTs), and Close Watch missions. Additionally, the primary loadmaster should attempt to obtain load and mission information for all channel and contingency missions. Perform all necessary coordination and make all needed contacts and arrangements.

10.1.2.2. Mission show time. Obtain pertinent mission and aircraft information and contact Air Terminal Operations Center (ATOC) for the load data and cargo brief. Assign and brief other loadmasters on their duties and responsibilities. **Note:** If an early departure is planned, notify all support agencies to ensure adjustments are made to the sequence of events (SOE).

10.1.2.3. Arrival at aircraft. Complete a walkthrough of all compartments to check for obvious discrepancies. Ensure that a full shoring kit is onboard the airplane. Monitor the SOE and keep the PIC and other crew positions informed of any problems or potential delays. Ensure all required forms are reviewed and signed, and account for all manifests.

10.1.2.4. Inflight. Assign loadmaster duties for the arrival station and brief the PIC on requirements upon arrival. Conduct periodic checks of all compartments to ensure cleanliness and ascertain proper relief/rest periods of other loadmasters.

10.1.2.5. Arrival at destination. Coordinate onload and offload requirements with local personnel. Ensure completion of Customs and Agriculture documentation and other forms as required. Ensure all areas are clean (e.g., garbage pickup, blankets folded and stowed), overhead cargo compartment lights are off if not needed, and checklists are completed.

10.2. Responsibilities for Aircraft Loading.

10.2.1. AMC Designated Stations:

10.2.1.1. Aerial port personnel are responsible for selecting cargo and mail for airlift, promptly completing documentation, palletizing cargo, load planning (as required), computing load distribution, and moving cargo to and from the aircraft to meet scheduled departure. Before starting loading operations, they advise the loadmaster of destination,

size, weight, and types of cargo (e.g., classified, hazardous, etc.) to permit proper positioning. They also coordinate traffic activities affecting loading and offloading, and assign sufficient aerial port loading personnel for cargo loading. Aerial port personnel are responsible for safe positioning of material handling equipment (MHE) and cargo to and/or from the aircraft cargo door, ramp or auxiliary ground loading ramps. Under the supervision of the loadmaster, aerial port personnel may assist in preparing the aircraft for loading, stow loading equipment if the aircraft is not to be reloaded, physically load the aircraft, tie down cargo and equipment, release tie down and physically offload cargo.

10.2.1.2. Loadmaster Responsibilities. The following is list of common loadmaster responsibilities:

10.2.1.2.1. Aircraft preflight.

10.2.1.2.2. Load planning (as required).

10.2.1.2.3. Certifying load plans.

10.2.1.2.4. Preparing weight and balance documentation.

10.2.1.2.5. Operating aircraft equipment.

10.2.1.2.6. Supervising cargo tie down.

10.2.1.2.7. Coordinating with the load team chief to validate the cargo against manifests.

10.2.1.2.8. Supervising and directing on/offloading.

10.2.1.2.9. Ensures safe movement of cargo into and out of the aircraft.

10.2.1.2.10. Notifies the PIC, C2, or terminal operations officer if loading personnel are injured or cargo, aircraft equipment, or aircraft structure is damaged during on/offloading.

10.2.1.2.11. Briefs the PIC on hazardous cargo prior to engine start.

10.2.1.3. Loadmasters should accept loads planned by qualified load planners and load cargo as planned unless the load compromises flight safety or does not comply with applicable directives. If cargo is refused or rearranged for these reasons, forward all applicable information, including a copy of the load plan, to MAJCOM Stan/Eval through Stan/Eval channels. AMC personnel attach an AMC Form 54. **Exception:** The loadmaster may deviate from load plans to facilitate ease of on/offloading of cargo and to alleviate unnecessary aircraft reconfiguration without submitting documentation. The loadmaster should take into consideration the next station's cargo configuration requirements and will ensure the aircraft is in proper weight and balance limits. **(T-2)** A new load plan is not required.

10.2.1.4. The loadmaster is the on-scene expert and final authority for load planning and final authority for accepting cargo for airlift. Some non-standard cargo not specifically detailed in applicable directives may require the loadmaster to use his/her best judgment based on training, experience, and knowledge to determine the best and safest method of loading the cargo. When difficulties arise, they should seek the advice of other personnel (i.e., squadron, group, wing, or MAJCOM Stan/Eval personnel). Non-standard cargo that

exceeds limitations and is not contained in the aircraft loading manuals requires certification for air shipment. The shipper will provide a copy of the certification to the loadmaster prior to loading. **(T-2)** If the certification letter with loading instructions/requirements is not provided to the loadmaster, the cargo will not be loaded. **(T-2)** Contact Air Transportability Test Loading Agency (ATTLA) **attla@us.af.mil** or ASC/ENFC at Wright Patterson AFB, OH, voicemail (937) 255-2330/2547 or MAJCOM Stan/Eval for questions concerning cargo certification.

10.2.2. At locations without AMC air terminal or traffic personnel, the shipper assumes responsibilities in **paragraph 10.2.1.1** and provides sufficient qualified personnel and MHE for on/offloading. Loadmaster responsibilities and authority are the same as described in paragraphs **10.2.1.2** and **10.2.1.3**.

10.2.3. During JA/ATT, SAAM, and USAF mobility, and contingency 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 (user and transporting force), may be used in lieu of applicable portions of the vehicle inspection portion of the applicable loading checklist. However, this does not relieve the loadmaster from ensuring accompanying loads are secured prior to takeoff. The DD Form 2133 is not to be used to document preparation of hazardous materials. The shipper will certify and document hazardous material using the Shippers Declaration for Dangerous goods. **(T-2)**

10.3. Emergency Exits and Safety Aisles.

10.3.1. Ensure cargo compartment troop doors and the crew entrance door are unobstructed and operative when passengers and troops are transported in cargo compartment.

10.3.2. Ensure that at least one unobstructed safety aisle is available in the cargo compartment to allow movement between the flight deck and the troop compartment. Do not stow cargo or loose equipment on the cargo compartment walkways. **(T-2) Note:** All passenger hand carried items must be of a size to fit under the seat and must not obstruct the safety aisle(s). **(T-2)** Stow any items that do not fit under a seat, or obstruct an aisle way with checked baggage. **(T-2)**

10.3.3. Troop compartment occupancy is limited to 40 total personnel, including crewmembers, when either #3L or #3R escape hatches are not fully operational. Personnel will not be transported in the troop compartment when either the #4 escape hatch and/or the #6 service door is not fully operational IAW **Table 3.16**. **(T-2)** Aircrews will ensure the slide and associated exit meet the following requirements to be considered fully operational: **(T-2)**

10.3.3.1. The slide is capable of pneumatic inflation.

10.3.3.2. Exits are capable of being opened with reasonable effort.

10.3.3.3. The #6 service door guides stay in the tracks and the door stays latched in the open position.

10.3.3.4. Emergency Exit Light installed and charging.

10.3.4. Simultaneous Cargo and Passenger On/Offloading. Loadmasters shall ensure high stairs (“Galaxy stairs”) are in place prior to stowing the troop ladder or conducting operations in the vicinity of the ladder. **(T-2)**

10.4. Pre-Mission Duties.

10.4.1. Cargo Missions:

10.4.1.1. The loadmaster will coordinate with aerial port personnel to establish loading times. **(T-3)** Loading times that differ from the normal pre-departure sequence of events will be established with PIC coordination, before the loadmaster enters crew rest. **(T-3)** Loading time is governed by the type of load and complexity of loading procedures (e.g., bulk, palletized, etc.) not by port saturation or management of aerial port workload levels. When reporting for duty, the loadmaster checks in with the ATOC or other designated location to obtain load brief and assist in load planning as required. **(T-3)**

10.4.1.2. Aerial Port Expediter (APEX) Loading Operations. APEX is an aerial port loading program directly managed and supervised by air transportation personnel. It provides port units the flexibility to determine the best time to load or offload aircraft when aircrew support is not available. The intent of the program is to allow aerial port management the ability to evenly distribute port workloads. It does not serve as an aircrew enhancement or alleviate the loadmasters' responsibility to on/offload aircraft.

10.4.1.3. APEX provides the capability for aerial ports to on/offload cargo without loadmasters. APEX Load Directors are qualified to on/offload all types of cargo.

10.4.1.3.1. Load Directors have overall control until formally relieved by the outbound primary loadmaster. The load director will present a full cargo briefing to outbound primary loadmaster. **(T-2)**

10.4.1.3.2. Loadmasters who need on/offloads for training or evaluations should notify ATOC upon arrival. ATOC should make every effort to accommodate the request.

10.4.1.3.3. Loadmasters shall treat APEX loaded aircraft like any duty-loaded or staged aircraft. **(T-3)** Any cargo discrepancies that cannot be corrected by the loadmasters in a timely manner will be reported to ATOC. **(T-3)**

10.4.1.3.4. Forward negative APEX trend data to AMC/A3V through Stan/Eval channels.

10.4.1.4. Proper cargo documentation accompanies each load. Aerial port personnel deliver consolidated statement (i.e., manifest) to the aircraft prior to departure unless one is not available due to a lack or failure of the manifest processing equipment. In this case, a cargo listing or load plan with transportation control numbers (TCN) will accompany the load.

10.4.1.5. Fleet Service.

10.4.1.5.1. Pillow and Blanket Distribution. Hand out pillows and blankets only when requested by passengers. For quick turn missions at en route locations, leave used pillows and blankets on seats for thru-load passengers. At RON locations, used pillows and blankets are placed in plastic bags for pick up by fleet service personnel. Inventory will be on a one-for-one replacement basis by fleet service. **(T-3)** Do not mix used and unused pillows and blankets.

10.4.1.5.2. When it is not possible for aircrew personnel or passengers to contain potential bio-hazard spills during flight, aircrew will request Bio Environmental

personnel, through Command Post/ATOC, to meet the aircraft and provide a determination of cleaning responsibilities. **(T-3)**

10.4.2. Passenger Missions:

10.4.2.1. When 20 or more passengers/troops are planned, a pallet position shall be left open to accommodate a baggage pallet. **(T-3)** If a pallet is not available, the loadmaster has the option to floor load passenger baggage in the open pallet position.

10.4.2.2. When a pallet position is not available for baggage, additional seats (more than 20) may be released for passengers that have "Hand-Carried-Only baggage" that does not exceed the following dimensions: Length 21", Height: 12.5", Width 13" and the ACL is not exceeded and cargo configuration is maintained.

10.4.2.3. Ensure both ATMs and the APU on the side used to enplane passengers are shutdown. **Exception:** If passenger buses are parked directly behind the airplane and passengers will be on/offloaded over the aft ramp, both APUs may be operated. A passenger service representative or crewmember will assist passengers at the bottom of the steps/stairs. **(T-3)** The loadmaster will assist in seating passengers. **(T-3)** DVs, passengers requiring assistance, and families should be boarded first to minimize separation. Make every effort to seat families together. Ensure that only adult, English-speaking, physically capable, and willing passengers are seated in emergency exit rows. **(T-2)**

10.4.2.4. Transportation of Pets, Service Animals or Emotional Support Service Animals. Pets are defined in DoDI 4515.13, *Air Transportation Eligibility*, as dogs and cats. Pet movement aboard DoD organic aircraft is authorized for PCS moves only when such aircraft provide the only service to/from a location. Other animals, such as horses, fish, birds, and rodents are excluded as pets and no waivers are authorized. Service animals may be transported in main cabin or cargo hold of aircraft. Emotional Support or Psychiatric service animals will remain with passenger as accommodation during air travel. **(T-3)**

10.4.2.5. Passenger Restrictions.

10.4.2.5.1. Ensure no-show passenger baggage or baggage of passengers removed from flight is downloaded prior to departure. **(T-3)**

10.4.2.5.2. Passengers are not permitted to be transported in the cargo compartment without the specific approval of AMC/A3. **(T-2)**

10.5. Passenger Handling.

10.5.1. The loadmaster is a key figure in good passenger relations. The following rules should be observed:

10.5.1.1. Address passengers by proper titles.

10.5.1.2. Avoid arguments and controversial subjects, national or international politics, criticism of other personnel or organizations.

10.5.1.3. Offer services or perform duties in a manner indicating a personal interest and willingness to help.

10.5.1.4. Comments by the loadmaster and the manner in which they are made often determine passenger attitudes about the flight. Always remember that passengers are individuals; address them collectively only when making announcements.

10.5.1.5. Ensure crewmember's entertainment media (e.g., magazines, electronic media, etc.) are of an appropriate nature.

10.5.2. In-flight Procedures:

10.5.2.1. Passengers may move about the cabin after reaching cruise altitude and the seat belt sign is off; however, crewmember judgment should be exercised on the number of passengers allowed out of their seats at any one time. Encourage passengers to remain seated with their seat belts fastened. Due to concern for their safety, passengers are not allowed to lounge or sleep on emergency equipment. Discourage passengers from congregating around galley, lavatory and crew bunk areas.

10.5.2.2. Make frequent checks on cabin temperature, passengers with small children, and cleanliness of the cabin and lavatories.

10.5.2.3. Do not allow passengers to tamper with emergency equipment.

10.5.2.4. On long flights, particularly during hours of darkness, use all possible means to make passengers comfortable. Dim and extinguish unnecessary compartment lights.

10.5.2.5. Passengers may visit the flight deck only when approved by the PIC. Use good judgment when requesting this authority. Refer to **paragraph 4.2** for further guidance.

10.5.2.6. Passengers will not be permitted access to checked baggage. **(T-2)**

10.5.2.7. MEPs must be escorted by a qualified C-5 crewmember when transiting the cargo compartment. **(T-2) Exception:** N/A for MEPs who are qualified C-5 crewmembers.

10.5.2.8. When crew compliment does not include loadmasters, MEPs must be monitored by an additional crew member (i.e., a crew member that is not in a primary crew position). **(T-2) Exception:** N/A for MEPs who are qualified C-5 crewmembers.

10.5.3. Meal Service:

10.5.3.1. MREs. Flameless Ration Heaters (FRH), included in MREs, shall not be used inside the aircraft. **(T-2)** If activated, the FRH will become extremely hot and may cause personal injury.

10.5.3.2. Ensure each passenger receives the meal ordered by verifying the passenger's AMC Form 148-2, *Boarding Pass/Ticket/Receipt*.

10.5.3.3. Box Meals. After takeoff, distribute box meals to passengers who boarded at the previous station. This lessens confusion when flight segments are short and more passengers board at subsequent stations. Aircrews will not accept Frozen/Cooked meals for passengers. **(T-3)** Box meals should be served in the following sequence:

10.5.3.3.1. Small children requiring assistance.

10.5.3.3.2. Distinguished Visitors (DVs).

10.5.3.3.3. All other passengers

10.5.3.4. When purchased meals are not furnished to passengers, the loadmaster should annotate the individual's AMC Form 148-2 to reflect reimbursement is authorized. Inform the passengers they may receive refunds at the passenger service counter at the next station, originating location, or destination terminal.

10.5.3.5. 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 JA/ATT, Joint Chief of Staff (JCS) exercises, or SAAM missions. The squadron or port operations officer should ensure snacks and beverages are placed on board when departing AMC stations. When departing from other stations and no snacks or beverages are placed onboard, the loadmaster may obtain required snacks and beverages from the local in-flight kitchen.

10.5.3.6. Meals ordered by aircrew within 45 minutes prior to block time or after established local SOEs must be picked up by the aircrew. In extenuating circumstances, when directed by ATOC to deliver meals after the 45-minute cutoff, potential aircraft delays are not attributed to Fleet Service.

10.6. En route and Post-Flight Duties.

10.6.1. At stations where a crew change is made and loading or offloading is conducted, the inbound loadmaster is responsible for offloading the aircraft. The outbound loadmaster is responsible for planning and loading the outbound load.

10.6.2. At crew stage points, brief relief personnel about passenger and aircraft equipment, any missing items, the location of through cargo, mail and baggage, and any information pertinent to through passengers. Point out cargo requiring special consideration (hazardous material, perishables, etc.). If unable to conduct a face-to-face briefing, leave written instructions with the cargo manifest or local C2.

10.7. Loaded Weapons. Troops or deadhead crewmembers will not retain custody of ammunition on an aircraft; they will turn it in to the troop commander or PIC. **(T-2)** Troops may carry unloaded weapons and ammunition aboard the aircraft during combat operations. Weapons are considered loaded if a magazine or clip is installed in the weapon. This applies even though the clip or magazine is empty.

10.7.1. Personnel who will engage an enemy force immediately on arrival in actual combat may carry basic combat loads on their person. Personnel must ensure weapons are clear with magazines or clips removed until immediately prior to exiting the aircraft. **(T-2)** The troop commander will coordinate with the loadmaster prior to directing personnel to load any weapons. **(T-2)**

10.7.2. Personnel who do not immediately engage an enemy force will store basic ammunition loads in a centralized location for redistribution on arrival at the objective. **(T-2)** Magazines or clips will not be inserted into weapons. **(T-2)**

10.7.3. Dummy clips that can be easily identified may be loaded for training at the order of the troop commander in coordination with the aircrew.

10.8. Weight and Balance.

10.8.1. Accomplish weight and balance for this aircraft according to TO 1-1B-50, *Weight and Balance,* and AFMAN 11-2C-5v3, Addenda A, *C-5 Operations Configuration and Mission*

Planning. The unit possessing the aircraft maintains the primary weight and balance handbook containing the current aircraft status and provides a supplemental weight and balance handbook for each aircraft. The supplemental handbook should be enclosed in a wear-resistant binder (preferably metal), stenciled "Weight and Balance" with the airplane model and complete serial number on the cover or a spine.

10.8.2. The unit will ensure supplemental handbooks include a certified copy of the current DD Form 365-3, Chart C, *Basic Weight and Balance Record*. **(T-2)** The Chart C includes the aircraft's current basic weight, basic moment, and center of gravity.

10.8.3. The loadmaster will file the original DD Form 365-4, *Weight and Balance Clearance Form F—Transport/Tactical*, at the departure airfield and maintain a physical or electronic copy for the duration of the flight. **(T-3)**

10.8.4. The weight and balance section of the unit possessing the aircraft will maintain the required documents. **(T-2)**

10.9. Cargo Validation On/Offloading Procedures and Format. Use the following format when tasked to validate a new loading procedure or when encountering any cargo you feel requires special or specific on/offloading or tiedown procedures not currently listed in applicable loading manuals. After completion, send through standardization channels to AMC/A3V. General Loading Data:

10.9.1. 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.

10.9.2. Dimensions (in inches). Length, width, and height. Rough drawing or picture of the unit pointing out critical dimensions, projections, overhangs, etc.

10.9.3. Weight (in pounds). Gross weight, individual axle weight, or data plate weight if possible.

10.9.4. Number of loading crew personnel and loadmasters required to on/offload cargo and their position to observe clearances, if required.

10.9.5. Equipment and Material Requirements. Special equipment and material required to on/offload cargo; i.e., cargo winch, prime mover, shoring requirements.

10.9.6. Aircraft Configuration Required.

10.9.7. Preparation of Cargo for Loading. Components removed or reconfigured to on/offload cargo (i.e., helicopter struts, exhaust stacks, cabs, etc.).

10.9.8. On/offloading Procedures.

10.9.9. Location of Tiedown Points.

10.9.10. Comments.

10.10. Emergency Airlift of Personnel.

10.10.1. Apply the following procedures to ensure a safe, efficient loading method for the emergency airlift of personnel and aeromedical evacuation (AE) of litter patients from areas faced with enemy siege, hostile fire, for humanitarian evacuations, or when directed by the 618 AOC (TACC), controlling component commander, or DIRMOBFOR.

10.10.2. Emergency airlift normally is accomplished without the use of individual seats or safety belts. Evacuees are seated on the cargo compartment floor and restrained with tiedown straps. Approximately 600 evacuees can be transported in this configuration, but can vary depending on individual sizes. Loading procedures and actual placement of evacuees is at the discretion of the loadmaster and PIC.

10.10.3. The maximum altitude for emergency airlift is 25,000 ft MSL. **(T-2)**

10.11. Rucksacks.

10.11.1. The following procedures apply to loading of rucksacks. During administrative (i.e., training) deployments, rucksacks may be loaded on deploying vehicles or palletized.

10.11.2. During tactical deployments into a FOB/OB, rucksacks not loaded on vehicles will be carried by the individuals onto the aircraft. Allocate pallet space on the load plan for loading rucksacks.

10.12. Flight Station and Troop Compartment Access. During loading operations, do not place cargo in a position that will restrict the use of the flight station or troop compartment stair ladders during flight.

10.13. Cargo and Material Handling Equipment (MHE) Issues.

10.13.1. ATOC will coordinate with the shipper or maintenance to connect/disconnect cargo venting systems. **(T-2)** Loadmasters are not authorized to connect/disconnect cargo venting systems.

10.13.2. Tiedown Equipment. Even though most faulty devices and cargo straps have been removed from inventory, loadmasters should remain vigilant and not use faulty tiedown equipment.

10.13.2.1. Davis 08/08 25K tiedown device. Prior to use, ensure all CGU-3/E 25K lb devices with manufacture date 08-08 have a repair kit installed. Repair Kits consist of a keeper plate on the top side or release handle attached with 3 phillips head screws.

10.13.2.2. Peck & Hale CGU-4/E 10K lb device defect. The chain can become unlocked after pulling excess chain (free end). After applying tension, inspect to ensure the chain is properly locked into the chain pocket and quick release lever is not oriented in a downward position. Then pull on the free end; if the chain comes out of pocket, remove device from service.

10.13.2.3. Davis CGU-4/E 10K lb device defect. The chain can be pulled out of the pocket when significant slack is present and loaded end of the chain is pulled away from the device while locked in the chain pocket. This defect is amplified when the chain pocket/ release lever is positioned down. Ensure the chain is properly locked into the chain pocket and quick release lever is not oriented in a downward position; pull on the loaded end of the chain. If the chain comes out of pocket, remove the device from service.

10.13.2.4. Weissenfel MB-1 Chain and 1998 Davis MB-1 Devices. The Weissenfel MB-1 chain will not be used. **(T-2)** The Weissenfel MB-1 chain can be identified by the word W-ITALY stamped on the chain hook. The 1998 Davis MB-1 tiedown device will not be used. **(T-2)** These devices can be identified by a stamp reading contract number SPO470-98- C-5103. Remove any Weissenfel MB-1 chain or 1998 Davis MB-1 device from the

aircraft. Examine chained palletized cargo for these chains and devices. If they are found, replace them with other chains and devices. Return the chains and devices to maintenance or the aerial port activity.

10.13.2.5. Commercial Cargo Straps. Do not use commercial cargo straps. **(T-2)** The only authorized cargo straps are the CGU/1b, 5k air cargo strap, PN 1670-00-725-1437, strap, webbing universal tiedown, PN 5340-00-980-9277 (Army version of the AF CGU/1b, 5k strap) and the 10,000-pound restraint assembly cargo, NSN 1670-00-406-2657.

10.13.2.6. Ratchet device stamped: PECK & HALE, LLC, CGU-1/B 5000 LBS CAP. 94658 6MRW/1465B with white unmarked strap will not be used. **(T-2)** Remove any deficient devices found on the aircraft and turn them in to aerial port personnel for final disposition.

10.13.3. U.S. Customs Pre-Cleared Containers. Pre-cleared containers regardless of size will not be sealed with bolt-type seals and offered for air shipment. **(T-2)** Only easily broken (without specialized tools) seals are authorized for use. The intent of the seal is to detect pilferage or tampering, not prevent it. Additionally, containers will not be locked with key-type or combination padlocks unless the aircrew has access to keys/combination. **(T-2)** The loadmaster is the final on-scene authority to determine if seals/locks will be removed for inspection. Exemptions are typically used for classified/sight sensitive cargo, however, the exemption does not waive "safety of flight".

10.14. Procedures for Loading Hazardous Cargo.

10.14.1. Hazardous materials/cargo not properly packaged and documented in accordance with AFMAN 24-604, *Preparing Hazardous Materials for Military Air Shipments,* will be rejected for air shipment.

10.14.2. Hazardous materials/cargo falls into many categories and the utmost precautions must be observed when handling or transporting these items. **(T-2)** Load all hazardous material to permit easy access in-flight without moving other cargo. **(T-2)**

10.14.3. Hazardous materials shipped in a freight container (i.e., ISU-90, conex, etc.). Load plans must allow in-flight access in event of an emergency, or hazardous materials will be removed from the container. **(T-2)** Some containers have built-in "HAZMAT" access panels; however, when these containers are utilized, any hazardous materials must be positioned to permit access through the panel. **(T-2)** Hazardous materials in the upper compartment of the container are inaccessible unless the adjacent pallet position is left empty to facilitate opening the doors. If the person responsible for the container is not on board, the key or combination for locks on containers must be on the container adjacent to the lock or in the cargo manifest. **(T-2) Exception:** See AFMAN 24-604 for hazardous cargo not required to be accessible in-flight.

10.14.4. Lithium Batteries and Pyrotechnic Material (Class/Division 1.3G). Aircraft halon fire extinguishers will only help reduce the intensity of the fire until the lithium and pyrotechnic material expends itself. The prohibited transportation of damaged lithium batteries and strict adherence to packaging requirements has greatly reduced the inherent risks associated with shipment.

10.14.4.1. Load planners shall position primary lithium battery and pyrotechnic material shipments on aircraft load plans in a manner that will permit easy access and jettisoning in-flight without moving other cargo. **(T-2)** Any agency providing hazardous cargo briefings will ensure aircrew personnel are aware of lithium battery and pyrotechnic material quantity and location aboard the aircraft. **(T-2)**

10.14.4.2. On/Offloading Procedures. Load teams must use extreme caution when handling or transporting these items and ensure hazard markings and warning labels are visible to aircrew and load team personnel. **(T-2)** To mitigate any hazard posed by an in-flight incident, this cargo shall be positioned on the aircraft in a manner that facilitates immediate access by aircrew personnel. **(T-2)**

10.14.4.3. In-flight/Emergency Procedures. Loadmasters shall conduct frequent in-flight cargo checks to monitor primary lithium battery and pyrotechnic material shipments. **(T-2)** If a fire is suspected or indicated, loadmasters will notify the PIC and complete the applicable aircraft emergency procedures. **(T-2)** Use aircraft Halon fire extinguishers to slow down the thermal runaway and prevent the spread of fire to other cargo. **WARNING:** Do not use water as a fire suppression system for lithium batteries or pyrotechnic material. Water presents a hazard to electronic equipment and, in less than a large quantity, is ineffective.

Chapter 11

FUEL PLANNING

11.1. General. This chapter is designed to assist aircrews in fuel planning for airland and air refueling missions. The planning procedures in this chapter apply to AMC-tasked and 618 AOC (TACC)-flight managed missions in addition to local missions. Missions should be planned at altitudes, routes, and airspeeds to minimize fuel usage.

11.2. Fuel Conservation. It is Air Force policy to conserve aviation fuel when it does not adversely affect training, flight safety, or operational readiness. Aircrew and mission planners should manage aviation fuel as a limited commodity and precious resource. Fuel optimization should be considered throughout all phases of mission planning and execution. Comply with the following whenever consistent with tech order guidance and safety:

11.2.1. Fuel Loads. Excessive ramp and recovery fuel adds to aircraft gross weight and increases fuel consumption. Do not carry extra fuel beyond optimum requirements for safe mission accomplishment and training objectives. **(T-3)**

11.2.2. Flight Planning. Aircrew and mission planners should optimize flight plans and flight routing for fuel efficiency.

11.2.3. APU Usage. Minimize the APU usage to the maximum extent possible. Early coordination may be required to ensure external power carts are available.

11.2.4. Center-of-Gravity (CG). Whenever possible, load and maintain aircraft at an aft CG consistent with mission requirements and TO 1C-5M-1 restrictions. Optimal zero fuel CG is 38% or 36% when passengers and baggage are not accounted for.

11.2.5. Engine Start. Delay engine start on all departures whenever practical to minimize fuel consumption.

11.2.6. Taxi. Consider two-engine taxi when practical.

11.2.7. Departure Planning. If winds allow, consider use of opposite direction runway to reduce taxi and/or expedite departure routing.

11.2.8. Climb/Descent. In-flight procedures such as climb/descent profiles and power settings should also be considered for efficient fuel usage. Constant descent arrivals should be performed when able.

11.2.9. Weather Deviations. Attempt to coordinate for off-course deviation early so gross maneuvering is not required.

11.2.10. Cruise techniques. Fly fuel efficient speeds and altitudes to the maximum extent possible.

11.2.11. Approach. Fly the most direct routing to arrival approach consistent with mission requirements.

11.2.12. Holding. If holding is necessary, hold in the clean configuration at the most fuel efficient altitude and request a large holding pattern. Hold at endurance or performance manual recommended holding speeds, conditions permitting.

11.2.13. Parking. Consider using shortest taxi route and avoid double blocking when able.

11.3. Fuel Planning Procedures. Refer to the current command Flight Planning Fuel Policy Letter for additional guidance, located in the *All Global* folder on the EFB. Aircrew should employ the following aviation fuel optimization measures without compromising flight safety or jeopardizing mission/training accomplishment:

11.3.1. Alternate.

11.3.1.1. Plan fuel to an alternate only when AFMAN 11-202V3 or this manual requires the filing of an alternate.

11.3.1.2. When only one alternate is necessary, use the closest suitable airfield meeting mission requirements (e.g., special requirements for hazmat or patients) and AFMAN 11-202V3 weather criteria.

11.3.1.3. If two alternates are necessary, use the two closest suitable airfields meeting AFMAN 11-202V3 weather criteria and fuel plan to the more distant of the two.

11.3.1.4. When selecting an alternate, suitable military airfields are preferred if within 75 NM of destination.

11.3.1.5. The practice of selecting an alternate solely based on maintenance capability is not used.

11.3.1.6. For remote destinations, holding is authorized in lieu of an alternate airport. In such situations, use 2+00 hr reserve fuel (1+15 holding in lieu of an alternate and 0+45 reserve).

11.3.2. Using all available planning tools and guidance in this chapter, PICs determine the required ramp fuel load (RRFL). When actual fuel load exceeds the RRFL by more than 5,000 lb, consider defueling the aircraft to the RRFL whenever practical. When there is a conflict between an on-time departure and defueling, the 618 AOC (TACC) Deputy Director of Operations (DDO) or MAJCOM C2 equivalent will determine which takes precedence. The OG/CC makes this determination when serving as execution authority for the mission.

11.3.3. Fuel Tankering. Refer to the current command Flight Planning Fuel Policy Letter for additional guidance, located in the *All Global* folder on the EFB. Tankering fuel for aircrew convenience is prohibited. **(T-2)** MAJCOM C2 or 618 AOC (TACC)-sanctioned tankered fuel is deemed operationally necessary, and are included in the RRFL. The MAF Cost Avoidance Tankering (MAFCAT) Program specifically determines when tankering fuel is cost effective between fuel onload locations. Aircrews will notice remarks in the FM notes section of their aircrew papers if additional planned fuel was based on the decision matrix. If operational circumstances change (e.g., more cargo than planned), aircrews should work with the flight manager to determine new required ramp fuel. Safe mission execution is the priority over tankered fuel. Tankered fuel will be annotated under Planned Landing Fuel in the CFP. It is incumbent upon aircrew to report actual fuel tankered for either cost advantage or operational requirements.

11.3.4. Force Extension/AR. Attempt to cancel scheduled AR requirements prior to execution through C2 channels when not needed for operational or training requirements.

11.3.5. Due to allowable tolerances in fuel totalizer indication, the most accurate fuel total representation is obtained through the summation of individual fuel tanks instead of simply using the totalizer quantity.

11.4. Computer Flight Plan (CFP).

11.4.1. The flight manager uses the AMC-approved flight planning software system to create and calculate the CFP included in the departure papers. CFPs are optimized for en route weather, winds and temperature. Therefore, changing altitudes and accepting direct routing may actually degrade fuel efficiency.

11.4.2. AMC has determined MAFPS calculates fuel burn to an acceptable level. Any anomalies should be communicated to the Command Flight Manager for remediation and updated policy will be disseminated via the Flight Planning Fuel Policy.

11.4.3. Validate the CFP by confirming the correct aircraft mission design series, routing, cargo and passenger weight, and valid winds for expected departure time. Weights are considered valid if they are within 10,000 lb for flights up to 1,000 NM or within 5,000 lb for flights over 1,000 NM. If the computer flight plan does not meet these criteria the FM will provide a new CFP or RRFL. **(T-2)**

11.4.4. Mission Index Flying (MIF) is incorporated in CFP products.

11.5. Fuel Requirements. This section augments AFMAN 11-202V3 fuel requirements.

11.5.1. The minimum planned landing fuel at the primary or alternate destination is the higher of 18,000 lb or the sum of Alternate Fuel (as applicable), AFMAN 11-202V3 Fuel Reserve and the total fuel quantity error (3,500 lbs for analog fuel gauges, 1,200 lbs for digital fuel gauges). **(T-2)**

11.5.2. PICs are responsible for verifying fuel requirements prior to flight.

11.5.2.1. The PIC will ensure that the CFP is valid IAW **paragraph 11.4.3** and may use additional means of verification. **(T-2)**

11.5.2.2. With a valid CFP, manual fuel cards are not required. If a CFP is unobtainable, complete a manual fuel plan (AF Form 4052 or Form 4053) using guidance in **Table 11.1** and TO 1C-5M-1-1.

11.5.3. In flight, PICs will periodically verify that the fuel remaining is sufficient. **(T-3)**

11.5.3.1. If it becomes apparent the actual fuel remaining is less than the calculated fuel remaining on the CFP or manual fuel card, consider diverting.

11.5.3.2. Fuel divert when the PIC determines any AFMAN 11-202V3 Fuel Reserve fuel will likely be burned. Do not divert using hydraulic heat exchanger operation as justification.

11.5.3.3. Declare “MINIMUM FUEL” to the controlling agency when the aircraft may land with less than 18,000 lb of fuel. Declare “EMERGENCY FUEL” to the controlling agency when the aircraft may land with less than the AFMAN 11-202V3 Fuel Reserve plus the total fuel quantity indicator error (3,500 lbs for analog fuel gauges, 1,200 lbs for digital fuel gauges). **(T-2)**

Table 11.1. Manual Fuel Planning.

Fuel Planning Category	Quantity	Notes

Location-Specific Fuel Additions		Reference the current AMC Flight Planning Fuel Policy Letter
EN ROUTE (Block 1)		Time and Fuel from departure to destination.
EN ROUTE RESERVE (Not used) (Block 2)		Not used.
EN ROUTE + RESERVE (Block 3)		Total of 1 and 2.
ALTERNATE / MISSED APPROACH (Block 4)		Include when AFMAN 11-202V3 or this AFMAN requires the filing of an alternate. Calculate fuel to alternate from OH destination to closest suitable alternate (suitable military airfields are preferred if within 75 NM) or to most distant alternate when two are required. Compute using OH destination GW (takeoff GW minus blocks 3 and 7a).
	8,000	**Missed Approach Fuel.** Required for vis-only approaches. Add 8,000 lb if destination is below required ceiling but at or above visibility minimums.
OFF COURSE MANEUVERING	600/min	**Departure**. Include for terrain clearance and air traffic control (ATC) requirements.
	400/min	**Cruise**. Include for ATC requirements **Note:** In both cases, compute fuel based on anticipated increase in flying time, not time spent maneuvering off course.
THUNDERSTORM FUEL	6,000	Include 15 min fuel at en route fuel burn rate if forecast thunderstorms are scattered or numerous along the route of flight.
	3,000	Include 8 min fuel at en route fuel burn rate if forecast thunderstorms are few along the route of flight.
	1,500	Include 4 min fuel at en route fuel burn rate if forecast thunderstorms are isolated along the route of flight. **Note:** Thunderstorm corrections are not cumulative. Use the highest applicable correction for the forecast conditions. Thunderstorm fuel is incorporated in the identified extra fuel block.

HOLDING (Block 5)		**For non-remote destinations**: Total holding fuel will be 1+00. This includes 45 min fuel reserve and 15 min contingency fuel. Calculate using the Holding Fuel chart by doubling the value obtained from the 30-MIN AT 10,000 FEET line. **For remote destination**: Total holding fuel will be 2+15. This includes 1+15 holding in lieu of an alternate, 45 min fuel reserve and 15 min contingency fuel. Calculate using the Holding Fuel chart by doubling the value obtained from the 1-HR+00-MIN AT 20,000-ft line and add the value obtained from the 15-MIN AT 10,000-ft line. **Note**: Contingency is fuel added to compensate for unforeseen circumstances during any phase of flight (i.e., unforecasted weather, launch delay, etc.). Contingency fuel should not be considered reserve fuel or part of the minimum landing fuel. Local training missions are not required to have contingency fuel.
Early Descent		Reference the current AMC Flight Planning Fuel Policy Letter
DESCENT, APPROACH/LANDING (Block 6)	5,000	When manually flight planning, add 15 min and 5,000 lb to fuel overhead destination for approach and landing. For CFP verification use 7,000 lb.
Insufficient and Unreliable Navaids	5,000	At destination airfield.
Engine Running Onload And Offload	100/min	
STORED FUEL (Block 7B)		Tankered fuel is additional fuel carried through a primary destination for use on a subsequent leg.
TAXI AND ACCELERATION (Block 9)	3,000	When more than 15 min taxi time is anticipated, add 120 lb/min, not to exceed 5,000 lb.
MINIMUM PLANNED LANDING FUEL		The minimum planned landing fuel at the primary destination is the greater of: 18,000 lb or the sum of Alternate Fuel, computed fuel reserve and the total fuel quantity indicator error (3,500 lbs for analog fuel gauges, 1,200 lbs for digital fuel gauges).

11.5.4. Alternate Planning. Refer to AFMAN 11-202V3, AMC Supplement, and **paragraph 11.3.1** For those missions flight managed by 618 AOC (TACC), flight managers provide a route of flight to the primary alternate if greater than 75 miles from the destination. When two alternates are necessary the FM uses the furthest as the primary. **(T-2)** This route of flight is only for providing an accurate fuel plan and is not part of the route of flight filed with ATC. If no routing to alternate is included, CFP calculates a direct route to the alternate.

11.5.5. Aircraft commanders will ensure that canned fuel loads are not used and final servicing is delayed until accurate fuel requirements are known. **(T-3)** Aircraft commanders should not

add any additional fuel without first discussing the reason with their FM. **(T-3)** Ensure ramp fuel is correct upon arrival at aircraft. When the aircraft commander believes the fuel load is insufficient to execute the mission, contact the FM to identify and resolve the differences. When the aircraft commander and FM do not reach an agreement, the aircraft commander is the final authority for adding additional fuel. The FM will add a comment to the crew papers indicating the final fuel load, as determined by the AC. **(T-2)** Refer to the current AMC Flight Planning Fuel Policy.

11.5.6. AR Fuel Planning.

11.5.6.1. Formating altitude. If the end refuel tanker weight is unknown, use 400,000 lb for a KC-10 and 150,000 lb for a KC-135.

11.5.6.2. In-flight Fuel Planning. For single and multiple AR, PICs will ensure recovery fuel requirements and required onload are computed. **(T-2)**

11.5.6.3. Recovery fuel requirement computation. After reaching the cruise altitude and before AR, estimate the fuel on board at the ARCP and compare this with the ARCP required fuel on the CFP, AF 4052 Block 14 or Block 35 (for multiple ARs) to ensure recovery capability from the ARCP.

11.5.6.4. Fuel onload confirmation. Approximately 45 minutes before each ARCP, complete the fuel onload requirements to ensure sufficient fuel is obtained from the tanker.

11.5.7. Variant Configuration Fuel Planning. The following procedures are provided to standardize fuel planning for variant configurations.

11.5.7.1. Estimate the flying time for the configuration you have.

11.5.7.2. Use the calibrated airspeed/Mach limit from TO 1C-5M-1-1, Section 5, for the configuration you have and convert it to a true airspeed (TAS) using TO 1C-5M-1-1 (enter the chart at 25,000-feet).

11.5.7.3. Use the average forecast wind factor (FWF) from the CFP to convert the TAS to ground speed (GS).

11.5.7.4. Apply the ground speed to the total distance remaining to arrive at the total time en route.

11.5.7.5. Estimate a takeoff gross weight using the following:

11.5.7.5.1. Flights with a drag index less than 150 or a takeoff gross weight less than 550,000 lb.

11.5.7.5.1.1. 30,000 lb per hour for the first hour.

11.5.7.5.1.2. 25,000 lb per hour for remaining flight time.

11.5.7.5.1.3. Alternate fuel: 25,000 lb per hour.

11.5.7.5.1.4. Holding fuel: 15,000 lb.

11.5.7.5.1.5. Approach and landing: 7,000 lb.

11.5.7.5.1.6. Start, taxi, and takeoff: 3,000 lb.

11.5.7.5.2. Flights with a drag index greater than 150 or a takeoff gross ≥550,000 lb.

11.5.7.5.2.1. 35,000 lb for the first hour.

11.5.7.5.2.2. 30,000 lb per hour for remaining flight time.

11.5.7.5.2.3. Alternate fuel: 30,000 lb per hour.

11.5.7.5.2.4. Holding fuel: 20,000 lb.

11.5.7.5.2.5. Approach and landing: 7,000 lb.

11.5.7.5.2.6. Start, taxi, takeoff: 3,000 lb.

11.5.7.6. Using estimated gross weight, obtain a performance ceiling from TO 1C-5M-1-1.

11.5.7.7. Determine the optimum range airspeed and compare it to TO 1C- 5M-1-1, Section 5 limits. Use the lower of the two.

11.5.7.8. Convert the calibrated airspeed/Mach to a true airspeed using TO 1C-5M-1-1.

11.5.7.9. Use the forecast wind factor to determine an average ground speed.

11.5.7.10. Determine the air distance for the entire route. Air Distance = (ground distance)(true airspeed) divided by (ground speed).

11.5.7.11. Obtain a climb range and climb fuel from TO 1C-5M-1-1, and correct for variant configuration.

11.5.7.12. Subtract the climb range from the total air distance.

11.5.7.13. Determine the en route fuel requirement using TO 1C-5M-1-1 and correct for variant configuration. Fuel Required = (1,000) (air distance) divided by (air nautical miles per 1,000 pounds of fuel).

11.5.7.14. Compute alternate fuel.

11.5.7.15. Obtain a holding fuel from TO 1C-5M-1-1 and correct for variant configuration.

11.5.7.16. Approach and landing fuel: 7,000 pounds.

11.5.7.17. Start, taxi and takeoff: 3,000 lb. **Note:** This procedure requires the use of estimates to get started. The estimates are general and were developed to cover a wide range of situations. Consequently, aircrew may need to run the procedure twice to refine the fuel load.

Chapter 12

AIR REFUELING

12.1. General. This chapter establishes procedures for aircrews to air refuel the C-5 and is in addition to procedures in TO 1C-5M-1 and ATP-3.3.4.2.

12.2. AR Limitations. The following limitations apply:

12.2.1. An AR qualified AC, not necessarily the PIC, must onload all mission-required fuel. **(T-2) Exception:** An AR qualified aircraft commander candidate on an Operational Mission Evaluation satisfies this requirement. An AC candidate on Line Training Mission satisfies this requirement provided he/she has completed the prerequisite AR requirements detailed in AFMAN 11-2C-5V1 and an AR instructor pilot occupies the right seat.

12.2.2. Tanker Autopilot. Tanker pilots will notify receiver pilots when any axis of the autopilot is not used. **(T-2)** If the tanker copilot is required to fly autopilot-off for training, unqualified receiver pilots will not fly the aircraft (N/A FTU). **(T-2)** Tanker pilots will notify the receiver when copilot autopilot-off training is conducted and receive confirmation that the receiver pilot flying the aircraft is qualified. **(T-2)**

12.2.3. AR Without Tanker Disconnect Capability. Without tanker disconnect capability means the boom operator cannot trigger an immediate disconnect. PICs will not conduct AR after a loss of tanker disconnect capability. **(T-2) Exceptions:** 1. Fuel emergency situation. 2. Contingency missions, JCS alert, 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. **(T-2)**

12.2.4. Emergency boom latching (EBL) is also referred to as manual boom latching, override boom latching or amplifier override and is an emergency procedure. Normal tanker disconnect capability and automatic disconnect limits are inoperative. PICs must have authorization for use of this procedure in the mission directive. **(T-2) Note:** The boom operator and receiver pilot will coordinate all actions as required by applicable directives and checklists when making AR contacts using EBL procedures. **(T-2)**

12.2.5. Reverse AR procedures are accomplished for operational necessity only. See TO 1C-5M-1.

12.2.6. Emergency Separations/Breakaways. Follow procedures IAW TO 1C-5M-1. When separation between receiver and tanker has been affected, the receiver pilot advises the tanker "WELL CLEAR" and states altitude passing. When the situation has stabilized, coordinate clearance back to precontact. Restrict all emergency separations/breakaways to 1,000’ below individual tanker’s altitude.

12.2.7. Practice Emergency Separations/Breakaways:

12.2.7.1. Prior to the actual accomplishment of a practice emergency separation, coordination between the tanker pilot, boom operator, and receiver pilot is mandatory.

Coordination includes when the separation occurs and who gives the command of execution.

12.2.7.2. Practice emergency separations may be accomplished with passengers on board. Ensure all passengers are seated with seat belts fastened. **Note:** Practice emergency separations terminate no lower than 1,000 feet below tanker altitude.

12.2.8. Receiver AR Training for Unqualified Receiver Pilots. This includes pilots, aircraft commander upgrade candidates and aircraft commanders refueling from the right seat. In-flight training will be accomplished under direct AR instructor pilot supervision. **(T-2)** The following procedures apply:

12.2.8.1. The receiver pilot will inform and receive acknowledgment from the tanker. (**T-2)** The boom operator at the controls will be qualified for the applicable category receiver. **(T-2)** This restriction does not apply during FTU training provided the student boom operator is under direct instructor supervision.

12.2.8.2. 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. **(T-2)**

12.2.9. 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. **(T-2)**

12.2.10. 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 complete. **(T-2)**

12.2.11. When conducting AR behind a KC-135, tanker disconnect capability will be demonstrated by a boom operator initiated disconnect before conducting a limit demonstration or a practice emergency separation from the contact position. **(T-2)**

12.2.12. Weather Limitations.

12.2.12.1. Terminate air refueling if moderate turbulence is encountered. **(T-2)**

12.2.12.2. Do not close from 1 NM range (2 NM for receiver or tanker formations) unless you have visual contact with the tanker(s). **(T-2)**

12.2.12.3. Discontinue AR if in-flight visibility is insufficient to continue safe operations. **(T-2)**

12.2.12.4. PICs must ensure AR divert airfields meet AFMAN 11-202V3 alternate airport criteria. **(T-2)**

Chapter 13

COMBAT MISSION PLANNING

13.1. General. This chapter provides combat mission planning guidance for planners and aircrews, standardizing procedures for planning, briefing, and reviewing all missions. Planners and aircrews will reference AFMAN 11-202V3 and AFTTP 3-3.C-5 for additional mission planning guidance.

13.2. Low Altitude Restrictions. En route operations below 1,000 ft AGL is not authorized. **(T-2)** The following minimum altitudes are established for C-5 operations. FLIP/ICAO procedures, training considerations, terrain, or operational directives may dictate higher altitudes. Planners will ensure accurate terrain analysis by evaluating both spot elevations and the highest contour level. **(T-2)** Refer to AFTTP 3-3.C-5, Chapter 2 for inherent chart errors.

13.2.1. Day VMC en route. Plan a minimum of 1,000 feet above the highest obstacle or 900 feet plus one chart contour interval whichever is higher, within 1 NM of planned centerline of the route segment. **Note:** EGPWS will be operable during these phases of flight. **(T-2)**

13.2.1.1. If the altitude for the next leg is higher than the current leg altitude, climbs are completed before the turn point. If the altitude for the next leg is lower, do not initiate descent until after the turn point.

13.2.1.2. 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.

13.2.2. Night VMC en route. Plan en route legs at an indicated altitude of 1,000 feet above the highest obstruction to flight (e.g., man-made obstacle, terrain feature, or spot elevation), or 900 feet plus one chart contour interval above the highest depicted terrain contour, whichever is highest, within 5 NM of route centerline to include the aircraft turn radius over each turn point.

13.2.2.1. If the altitude for the next leg is higher than the current leg altitude, climbs are completed before the turn point. If the altitude for the next leg is lower, do not initiate descent until after the turn point.

13.2.2.2. 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. **Note:** Planning a route on a JOG chart, if available, may reduce night en route 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.

13.2.3. 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 (e.g., man-made obstacle, terrain feature, or spot elevation) within 5 NMs of route centerline.

13.2.3.1. This altitude should be rounded off to the next higher 100-foot increment.

13.2.3.2. If the altitude for the next leg is higher than the current leg altitude, climbs are completed before the turn point. If the altitude for the next leg is lower, do not initiate descent until after the turn point.

13.2.3.3. 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. **(T-2)** The min IFR altitude may be above the top of the MTR leg altitude. In this case, slow the aircraft 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, Operations Group Stan/Eval will issue local approval and restrictions in their unit supplement to this publication. **(T-2)**

13.2.4. 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 (e.g., route orientation and aircraft malfunctions or when either pilot leaves the seat during low-level operations, etc.). An MSA will be computed for each leg or route segment or entire low level route. **(T-2)** The MSA is 1000 feet above the highest obstruction within 5 NMs of route centerline. **(T-2)**

13.2.5. Emergency Safe Altitude (ESA). ESA is designed to provide positive IMC terrain clearance during emergency situations that require leaving the low level structure.

13.2.5.1. 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.

13.2.5.2. 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:** 1. Climbing to ESA may put the aircraft in a controlled (i.e., IFR) altitude structure requiring coordination with Air Traffic Control agencies. 2. Pressure altimeters are calibrated to indicate true altitudes under International Standard Atmospheric (ISA) conditions. Any deviation from these standard conditions results 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.

13.3. Peacetime Route Restrictions. In addition to restrictions in AFMAN 11-202V3, specific country or theater of operations publications, and FLIP area planning, routes should not be planned or flown 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.).

13.3.1. With less than 3 NM separation from prohibited airspace.

13.3.2. With less than 3 NM separation from nuclear power plants.

13.3.3. Through restricted airspace without clearance.

13.3.4. 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 in addition to the restrictions in AFMAN 11-202V3.

13.3.5. Over or through active live fire or impact areas that may not be specifically designated as prohibited or restricted areas.

13.4. Navigation Chart Preparation. Mission planners will construct a master chart for mission briefings and aircrew reference. **(T-2)** 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 vector vertical obstruction data (VVOD) (or equivalent) or supplement. **(T-2)** In no case will VVOD coverage be less than 22 NMs either side of the entire planned route of flight. **(T-2)** 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. **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 VVOD. Individual chart annotations have, as a minimum, turn points, IP, objective area, course line, navigation information, VVOD data and date, ESA and chart series/date. Reference AFTTP 3-3.C-5 for standard chart preparations.

13.5. Route Study. Crew route study is mandatory before accomplishing flight in the low level environment. **(T-2)** The route study will include at a minimum: **(T-2)**

13.5.1. Route overview.

13.5.2. Obstacles/obstructions along the planned route.

13.5.3. Leg information (e.g., course, altitudes, and controlling obstacles).

13.5.4. Low Level hazards and mitigation.

13.5.5. Terrain features.

13.5.6. Individual aircrew member responsibilities/duties.

13.5.7. Discussion of any airspace restrictions.

13.5.8. ESA controlling obstacle and location.

13.5.9. Critical obstacles that do not meet three-engine climb performance.

13.6. Briefings. The PIC will ensure all applicable briefings and de-briefings are completed for each mission. **(T-2)** Brief applicable items in sufficient detail to ensure a clear understanding of mission objectives and procedures. The PIC is responsible for ensuring all crewmembers are briefed on applicable mission items. Reference AMC C-5 Briefing Guide and AFTTP 3-3.C-5 for inclusive items.

13.7. Mission Debriefings. Hold immediately after the mission if practical. Reference AMC C-5 Aircrew Briefing Guide and AFTTP 3-3.C-5 for suggested items to include in the debrief.

Chapter 14

EMPLOYMENT

14.1. General. Note: Certain technical information was intentionally omitted or generalized to keep this chapter unclassified. Users should be aware that written additions to any portion of this document could cause it to become classified.

14.1.1. Refer to AFTTP 3-3.C-5 guidance when performing tactical arrivals and departures, or when operating into locations with a hostile threat environment, except as noted in this chapter.

14.1.2. Cargo Compartment Observers. Use of cargo compartment observers based on PIC discretion. If cargo compartment observers are used, the PIC should coordinate positioning and repositioning prior to initiating the combat entry/exit checklist. Cargo compartment observers are prohibited from remaining in the cargo compartment for takeoff or landing and must wear protective headgear at all times while in a threat environment. **(T-2)**

14.2. Tactical Arrivals. Refer to AFTTP 3-3.C-5.

14.2.1. Maintain situational awareness using all available aids (e.g., EFB moving map, map reading, GPS, NAVAIDs, mission laptop GPS overlay, etc.) while considering emission control (EMCON) requirements.

14.2.2. The pilots and other crewmembers as designated by the PIC share responsibility for en route navigation, terrain avoidance, and time control. During low altitude operations, a composite crosscheck is paramount for the pilots to ensure threat avoidance and navigation are not done at the expense of basic aircraft control. Refer to AFTTP 3-3.C-5 Chapter 16.

14.2.3. Plan approaches IAW AFTTP 3-3.C-5 Chapter 7 and the airfield identification procedures published in the OPORD or SPINS. For tactical approaches, limit bank angles to 30 degrees below 1,000-feet AGL at night and 400-feet AGL during day. **Exception:** Level flight turns during night tactical approaches may use bank angles up to 45 degrees no lower than 500 ft AGL. 1,000 ft AGL night restriction still applies to final turn.

14.3. Ground Operations. This section outlines procedures to follow when conducting engines running on/offloads (EROs). Crews should spend minimum time on the ground when accomplishing EROs. Preparation and a thorough briefing enhance your ability to operate quickly and safely. Brief appropriate ground personnel and subsequent aircrews on unexpected hazards encountered during takeoff or landing (e.g., dust, winds, hostile activity). Conduct EROs according to TO 1C-5M-1. Conduct emergency airlift of personnel according to AFTTP 3-3.C-5 Chapter 10.

14.4. Tactical Departures.

14.4.1. Low Escape. When specific threats dictate, speeds up to the maximum operating limits may be used. Retract flaps when clear of all obstacles and at or above V_{MFR}/H_{MFR}. Climb to en route altitude when able as determined by the threat.

14.4.2. High Escape. Use this departure when a high or medium altitude escape is necessary (e.g., small arms environment). Accelerate to the best climb speed for the conditions and spiral up to en route altitude remaining within the confines of the desired maneuver area / protected airspace.

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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AF Form 1631, *NATO Travel Order*

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AF Form 457, *USAF Hazard Report*

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

AF Form 664, *Aircraft Fuels Documentation Log*

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DD Form 2131, *Passenger Manifest*

DD Form 2133, *Joint Airlift Inspection Record*

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SF 44, *Purchase Order-Invoice-Voucher*

Abbreviations and Acronyms

ABIC—APU Battery Isolation Contactor

AC—Air Conditioning

AC—Aircraft Commander

ACXTR—AC Cross Tie Relay

ADF—Automatic Direction Finder

ADS—Automatic Dependent Surveillance

AE—Aeromedical Evacuation

AF/A3T—Air Force Training

AFCS—Automatic Flight Control System

AFE—Aircrew Flight Equipment

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFRC/A3M—Air Force Reserve Command Mobility Division

AFTTP—Air Force Tactics Techniques and Procedures

AGE—Aircraft Ground Equipment

AGL—Above Ground Level

AIU—Avionics Interface Unit

ALDCS—Active Lift Distribution Control Subsystem

AMC—Air Mobility Command

AMC—Auxiliary Maintenance Computer

AMC/A3V—Air Mobility Command Standardization and Evaluations

AMSC—Air Management System Control

AOC—Air Operations Center

AP—Autopilot

APEX—Aerial Port Expediter

APR—APU Power Relay

APU—Auxiliary Power Unit

AR—Air Refueling

ASIP—Aircraft Structural Integrity Program

ATC—Air Traffic Control

ATIS—Automated Terminal Information Service

ATM—Air Turbine Motor

ATOC—Air Terminal Operations Center

ATTLA—Air Transportability Test Loading Agency

BAOWS—Bleed Air Overheat and Warning System

BAU—Bus Adapter Unit

BCEM—Battery Control Electronic Module

BDHI—Bearing Distance Heading Indicator

BDP—Begin Descent Point

BIP—Backup Integrating Processor

BSIU—Bus-Subsystem Interface Unit

BTR—Bus Tie Relay

C2—Command and Control

CAT II—Category II ILS Approach

CCD—Cursor Control Device

CCP—Cursor Control Panel

CDT—Crew Duty Time

CDFA—Constant Descent Final Approach

CFP—Computer Flight Plan

CFR—Code of Federal Regulations

CG—Center of Gravity

CNP—Communication Navigation Panel

CNS/ATM—Communication Navigation and Surveillance/Air Traffic Management

COMSEC—Communications Security

CP—Co-Pilot

CPCS—Cabin Pressure Control System

CPIN—Computer Program Identification Number

CPU—Central Processing Unit

CRM—Crew Resource Management

CS—Concurrent Servicing

CSS—Chief Servicing Supervisor

CVR—Cockpit Voice Recorder

CWA—Cautions, Warnings and Advisories

DA—Decision Altitude

DC—Direct Current

DDA—Derived Decision Altitude

DDO—Deputy Director of Operations

DFDR—Digital Flight Data Recorder

DH—Decision Height

DIRMOBFOR—Director of Air Mobility Forces

DME—Distance Measuring Equipment

DoD—Department of Defense

DS—Defensive Systems

DV—Distinguished Visitor

EBAS—Engine Bleed Air System

EBL—Emergency Boom Latching

EBPR—Emergency Bus Power Relay

ED—Engineering Disposition

EDS—Embedded Diagnostic System

EFB—Electronic Flight Bag

EGI—Embedded Global Positioning System/Inertial Navigation System

EGPWS—Enhanced Ground Proximity Warning System

ELT—Emergency Locator Transmitter

EMCON—Emission Control

EP—Evaluator Pilot

EPOS—Emergency Passenger Oxygen System

EPR—External Power Relay

ERO—Engine Running On/Offload

ESA—Emergency Safe Altitude

ETA—Estimated Time of Arrival

ETIC—Estimated Time in Commission

ETP—Equal Time Point

FAA—Federal Aviation Administration

FAF—Final Approach Fix

FAMV—Fan Air Modulating Valve

FARP—Forward Area Refueling Point

FCF—Functional Check Flight

FCG—Foreign Clearance Guide

FCV—Flow Control Valve

FD—Fault Detection

FD—Flight Director

FDE—Fault Detection and Exclusion

FDP—Flight Duty Period

FE—Flight Engineer

FI—Fault Isolation

FIM—Fault Isolation Manual

FLIP—Flight Information Publications

FMA—Flight Mode Annunciation

FMS—Flight Management System

FOD—Foreign Object Damage

FP—First Pilot

FPA—Flight Path Angle

FPS—Feet per Second

FRAG—Fragmentary Order

FRM—Fault Reporting Method

FSAF—First Suitable Airfield

FSS—Fire Suppression System

FTU—Flight Training Unit

FWF—Forecast Wind Factor

GDSS—Global Decision Support System

GP—General Planning

GPS—Global Positioning System

GPWS—Ground Proximity Warning System

GR—Generator Relay

GS—Ground Speed

GV—Grivation

GW—Gross Weight

HATR—Hazardous Air Traffic Report

HAZMAT—Hazardous Material

HDG—Heading

HF—High Frequency

HPSOV—High Pressure Regulator Shutoff Valve

HSI—Horizontal Situation Indicator

HQ—Headquarters

IAP—Instrument Approach Procedure

IAW—In Accordance With

ICAO—International Civil Aviation Organization

IDG—Integrated Drive Generator

IFF—Identification Friend or Foe

IFM—Integrated Flight Management

IFR—Instrument Flight Rules

IFOC—In-Flight Operational Check

ILS—Instrument Landing System

IMC—Instrument Meteorological Conditions

INOP—Inoperative

INS—Inertial Navigation System

INU—Inertial Navigation Unit

IP—Instructor Pilot

IRCM—Infrared Countermeasures

ISA—International Standard Atmospheric

JA/ATT—Joint Airborne/Air Transportability Training

JCS—Joint Chief of Staff

KCAS—Knots Calibrated Airspeed

LESS—Load Environmental Spectra Survey

LN2—Liquid Nitrogen

LNAV—Lateral Navigation

LOX—Liquid Oxygen

LPU—Life Preserver Unit

LSAF—Last Suitable Airfield

MACH—Mach Number

MAF—Mobility Air Forces

MAJCOM—Major Command

MC—Mission Contributing

MCDU—Multifunction Control Display Unit

MDA—Minimum Descent Altitude

MDR—Mission Dictates Requirement

MDS—Mission Design Series

MEL—Minimum Equipment List

ME—Mission Essential

MEP—Mission Essential Personnel

MFDU—Multifunction Display Unit

MHE—Material Handling Equipment

MICAP—Mission Capable Parts

MIRS—Micro Inertial Reference System

MLG—Main Landing Gear

MLS—Microwave Landing System

MMR—Multi-Mode Receiver

MOB—Main Operating Base

MRT—Maintenance Repair Team

MSA—Minimum Safe Altitude

MSL—Mean Sea Level

MWS—Missile Warning System

N/A—Not Applicable

NAT—North Atlantic Track

NDB—Non-Directional Radio Beacon

NGA—National Geospatial-Intelligence Agency

NLG—Nose Landing Gear

NM—Nautical Mile

NOTAM—Notice to Airmen

NSN—National Stock Number

NVM—Nonvolatile Memory

OCF—Operational Check Flight

OCONUS—Outside the Contiguous United States

OG—Operations Group

OH—Overhead

OI—Open Item

OIS—Obstacle Identification Surface

OPLAN—Operational Plan

OPORD—Operations Order

OPR—Office of Primary Responsibility

OTF—One-Time Flight

P—Pilot

PA—Public Address

PACS—Pilot Assist Servo System

PAI—Primary Aircraft Inventory

PAR—Precision Approach Radar

PBCS—Performance-Based Communication and Surveillance

PCIU—Personal Computer Interface Unit

PF—Pilot Flying

PIC—Pilot in Command

PIREP—Pilot In-Flight Report

PM—Pilot Monitoring

PNAF—Prime Nuclear Airlift Force

POU—Printout Unit

PRM—Precision Runway Monitor

PRNAV—Precision Area Navigation

PRSOV—Pressure Regulator Shutoff Valve

PSOV—Pylon Shutoff Valve

PTU—Power Transfer Unit

RAT—Ram Air Turbine

RCF—Repair-Capable Facility

RCP—Required Communication Performance

RCR—Runway Condition Reading

RIU—Remote Interface Unit

RMM—Remote Memory Module

RNAV—Area Navigation

RNP—Required Navigation Performance

RRFL—Required Ramp Fuel Load

RSC—Runway Surface Condition

RSP—Required Surveillance Performance

RTRU—Regulated Transformer Rectifier Unit

RVR—Runway Visual Range

RVSM—Reduced Vertical Separation Minimum

SAAM—Special Assignment Airlift Mission

SAI—Standby Attitude Indicator

SAS—Stability Augmentation System

SAV—Starter Air Valve

SCADC—Standard Central Air Data Computer

SCM—Space Cargo Modified

SCTS—Space Cargo Transportation System

SOC—Senior Officer Course

SOE—Sequence of Events

SPINS—Special Instructions

SPR—Single Point Refueling

TACAN—Tactical Air Navigation

TACC—Tanker Airlift Control Center

TAS—True Airspeed

TAT—Total Air Temperature

TCAS—Traffic Collision Avoidance System

TCN—Transportation Control Numbers

TEM—Threat and Error Management

TERPS—Terminal Instrument Procedures

TLD—Time Limited Dispatch

TO—Technical Order

TOLD—Takeoff and Landing Data

TR—Thrust Reverser

TWCF—Transportation Working Capital Fund

UHF—Ultra High Frequency

USAF—United States Air Force

VDU—Video Distribution Units

VFR—Visual Flight Rules

VFU—Variable Feel Unit

VHF—Very High Frequency

VIA—Versatile Integrated Avionics

VMCG—Ground Minimum Control Speed

VNAV—Vertical Navigation

VRA—Virtual Risk Assessment

VVOD—Vector Vertical Obstruction Data

WIV—Wing Isolation Valves

WXR—Weather Radar

ZFW—Zero Fuel Weight

Terms

List—The following is a list of common mobility terms and associated abbreviation. Additional terms common to the aviation community may also be found in FAR, Part 1 and DoD FLIP General Flight Planning, Chapter 2.

Aeromedical Evacuation (AE)—Movement of patients under medical supervision between medical treatment facilities (MTFs) by fixed-wing aircraft.

Airlift—Aircraft is considered to be performing airlift when manifested passengers or cargo is carried.

Air Refueling Control Point (ARCP)—The planned geographic point over which the receiver(s) arrive in the observation/pre-contact/astern position with respect to the assigned tanker.

Air Route Traffic Control Center (ARTCC)—A facility that provides air traffic control (ATC) services to aircraft operating on IFR flight plans within controlled airspace, principally during the en route phase of flight.

Air Traffic Control (ATC)—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.

Augmented Crew—Basic aircrew supplemented by additional qualified aircrew members to permit in-flight rest periods.

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.

Border Clearance—Those clearances and inspections required to comply with federal, state, and local agricultural, customs, immigration, and immunizations requirements.

Command and Control (C2)—Exercise of direction and authority over assigned forces by a properly designated command echelon in the accomplishment of the mission.

Command and Control (C2) Center—Each C2 center provides supervision, guidance, and control within its assigned area of responsibility. For the purpose of this AFMAN, C2 centers include operations centers, local AMC C2s, air mobility elements, tanker airlift control elements (TALCE), air mobility control centers, unit command posts, and tanker task forces.

Computer Flight Plan (CFP)—An Air Force level system which is the follow on replacement for the Optimized AMC Flight Plan (formerly Jeppesen). The system brings an improved user interface to the customer, runs in Microsoft Windows, and communicates with a mainframe located at Scott AFB IL. Once the optimized flight plans are produced on the mainframe, they are transmitted back to the Window's PC.

Contingency Fuel—Identified extra to compensate for unforeseen circumstances during any phase of flight (i.e., unforecasted weather, launch delay, etc).

Contingency Mission—Mission operated in direct support of an OPORD, OPLAN, disaster, or emergency.

Crew Resource Management (CRM)—The effective use of all available resources--people, weapon systems, facilities, and equipment, and environment -- by individuals or crews to safely and efficiently accomplish an assigned mission or task.

Critical Phase Of Flight—Terminal area operations including taxi, takeoff and landing, low-level flight, air refueling, and all portions of any test or functional check flight or any aerial demonstration.

Depressurization Fuel—The additional fuel required in the event of a cabin depressurization followed by an extended diversion to an alternate at low altitude where fuel consumption is increased.

Deviation—A deviation occurs when takeoff time is not within -20/+14 minutes of 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).

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.

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 aircrew’s entry into crew rest will be delayed until post-flight duties are complete.

Equal Time Point (ETP)—A point along a route at which an aircraft may either proceed to the first suitable airfield (FSAF) or return to the last suitable airfield (LSAF) in the same amount of time based on all engines operating. FSAF and LSAF are airports closest to the coast out and coast in waypoints that meet recovery airfield requirements.

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.

Fuel Reserve—Amount of usable fuel that must be carried beyond that required to complete the flight as planned.

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.

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 (HAZMAT)—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.

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.

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.

Loading Time—Specific time established jointly by the commanders concerned when aircraft loading will begin.

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.

Marginal Weather—Weather conditions with ceiling between 1,000 and 3,000 feet and/or visibility between 3 and 5 statute miles.

Mission—Movement of aircraft from a designated point of origin to a designated destination as defined by assigned mission identifier, mission nickname, or both in the schedule, mission directive, OPORD, OPLAN, or FRAG order.

Mobility Air Force (MAF)—Forces assigned to mobility aircraft or MAJCOMs with operational or tactical control of mobility aircraft.

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 Necessity—A mission associated with war or peacetime operations in which the consequences of an action justify the risk of loss of aircraft and crews.

Operational Missions—Missions executed at or above 618 AOC (TACC) level.

Operations Order (OPORD)—Directive from a commander to subordinate commanders to announce the plan, state intentions, provide necessary information and instructions for a situation and assign specific tasks to subordinate commands.

Operations Plan (OPLAN)—A plan for a single or a series of connected operations to be carried out simultaneously or in succession, based on stated assumptions; a directive to permit subordinate commanders to prepare supporting plans and orders.

Originating Station—Base from which an aircraft starts on an assigned mission. It may or may not be the home station of the aircraft.

Over water Flight—Any flight that exceeds power off gliding distance from land.

Pilot Flying (PF)—The pilot at the flight controls who is in direct maneuvering control of the aircraft. The PF is primarily responsible to control and monitor the aircraft's current/projected flight path and energy state (including autoflight systems, if engaged).

Pilot Monitoring (PM)—The pilot at the flight controls who is not in direct maneuvering control of the aircraft, yet is primarily responsible to support the PF by actively monitoring the aircraft's current/projected flight path and energy state, intervening if necessary.

Required Ramp Fuel Load (RRFL)—Minimum fuel required at engine start to complete the mission.

Scheduled Return Date (SRD)—Scheduling tool used by 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 SRD 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. Scheduled takeoff time may be adjusted to make good an ARCT. Notify controlling agency prior to takeoff to adjust the scheduled takeoff time.

Section—Subdivision of a formation. A section normally consists of 6 aircraft (2 elements).

Secure Communication—Voice and/or data communications, encrypted for exchange of up to SECRET information between the aircraft and external entities, via both line of sight and beyond line of sight radio frequencies. Secure communications is distinct from communications security (COMSEC) in that COMSEC is associated with the process of protecting voice and data links, to include obtaining and handling crypto devices and keying materials.

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.

618 Tanker Airlift Control Center (618 AOC [TACC])—Operations center that controls tanker and airlift forces worldwide through a network of computer systems. The 618 AOC (TACC) contains the following functions: Airlift Allocation Directorate, Airlift Planning Directorate, Air Refueling Planning Directorate, Global Air Mobility Support System Directorate, Mobility Operations Directorate, Intelligence, Surveillance, and Reconnaissance Directorate, Strategy Directorate, Weather Directorate, and an Air Communications Squadron.

Tactical Event—Tactical Approach/Departure.

Tankered Fuel—Additional fuel carried through a primary destination for use on a subsequent leg.

Threat and Error Management (TEM)—A systems approach that builds multiple layers of defense logically designed to identify, prevent and trap threats and/or mitigate inevitable threats, errors, and undesired aircraft states.

Training Mission—Mission executed at the unit level for the sole purpose of aircrew training for upgrade or proficiency. It does not include operational missions as defined in this AFMAN.

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 customers. 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.

Zero Fuel Weight—Weight, expressed in pounds, of a loaded aircraft not including fuel. All weight in excess of the maximum zero fuel weight will consist of usable fuel.