System Requirements Document (SRD)

for the

KC-X

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836 AESG

Table of Contents

Tables and Figures

1 Introduction

1.1 Scope

This System Requirements Document (SRD), including appendices, presents the technical performance required for the replacement tanker aircraft (KC-X). This SRD supports the recapitalization of approximately the first third of the tanker fleet. Minimum performance requirements are identified as (**MANDATORY**). All other requirements, identified as (**NON-MANDATORY**) are part of the offeror's trade space.

1.2 Concept of Operations Summary

1.2.1 KC-X Missions (Background information only, there are no requirements in this section)

The primary mission of the KC-X is to provide worldwide, day and night, adverse weather aerial refueling (AR) on the same sortie to receiver capable United States (U.S.), allied, and coalition military aircraft (including unoccupied aircraft). AR aircraft (ARA) provide robust, sustained AR capability to support strategic operations, global attack, air-bridge, deployment, sustainment, employment, redeployment, homeland defense, theater operations, and special operations. Secondary missions for KC-X include emergency aerial refueling, airlift, communications gateway, aeromedical evacuation (AE), forward area refueling point (FARP), combat search and rescue (CSAR), and treaty compliance. ARA may allow for mixing secondary missions in a manner not to significantly impact the primary AR mission. KC-X will accomplish these missions primarily through the aerial refueling of other aircraft and airlift capability, exploiting its adaptability and expeditionary capabilities.

1.2.1.1 **Strategic Operations Support**. Strategic operations support is a critical operational requirement, and aerial refueling assets are required to support the bomber leg of the nuclear triad. Aerial refueling provides the nuclear-equipped bomber force with the ability to deliver its payload to any location in the world and recover to a suitable reconstitution base. Bombers may also be refueled while holding in orbit areas well beyond the range of adversary missiles or attack aircraft. The bombers can maintain this orbital status until they are directed to fulfill their mission or are recalled. The enhanced offload versus range performance of the KC-X will increase the range and endurance of bomber and other combat support aircraft (reconnaissance, command and control (C2), etc.), further enhancing their flexibility to strike and reconnoiter distant targets. These same effects are also an indispensable component of the U.S. National Airborne Operations Center by enabling increased on-station times for these aircraft. The KC-X will also be used to support bomber contingency missions enhancing the sustainability of these missions. With aerial refueling, longer-range and longer duration reconnaissance and intelligence gathering missions provide commanders a decisive information edge over the enemy. Operations in this arena dictate the need for protection from electro-magnetic pulse (EMP) and other environmental threats to enable mission completion.

1.2.1.2 **Global Attack Support**. Aerial refueling provides strike and reconnaissance platforms the ability to reach any target globally without relying on intermediate basing locations. The effect of being able to rapidly and directly strike targets in distant locations and recover to safe areas, especially for missions originating in the Continental U.S. (CONUS), would be enhanced by the extensive communication and navigation systems of the KC-X. Global attack support missions highlight the KC-X's key role in Air and Space Expeditionary Force (AEF) employment, demonstrating adaptability to support the full range of operations from

CONUS-based bomber strike support to humanitarian and peacekeeping airlift support, whether conducted in exercise or real-world environments.

1.2.1.3 **Air Bridge Support**. An air bridge creates an airborne line of communication linking CONUS and a theater, or any two theaters. Aerial refueling enables accelerated air bridge operations since en-route refueling stops are reduced or eliminated. It reduces reliance on forward staging bases, minimizes potential en-route maintenance delays, enhances security, and enables airlift assets to maximize their payloads. These effects hinge on the increased communication, navigation, and world wide-compliant capabilities of the KC-X. Enhanced reliability of the KC-X would allow for more efficient air bridge support.

1.2.1.4 **Deployment Support**. In parallel with air bridge support, the KC-X can extend the range of deploying combat and combat support aircraft, allowing them to fly nonstop to an area of responsibility (AOR) or joint operating area. The outcome is an increase in the deterrent effect of CONUS-based forces and rapid response to regional crises. The capability of air assets to fly nonstop to a theater may eliminate the need to obtain landing or overflight rights from foreign countries that may want to remain neutral in a given conflict, obviating political limitations on force deployment and enhancing the security of deploying forces. Significant increases in the efficiency of airlift operations enable the direct delivery of personnel and materiel and enable the successful execution of the AEF concept.

1.2.1.5 **Theater Support to Combat Air Forces**. Intratheater aerial refueling enables fighter aircraft to increase their range, persistence, and flexibility, allowing them to carry a larger payload on initial takeoff by decreasing the amount of initial fuel required, thereby multiplying their combat force and combat efficiency. Aerial refueling also increases the endurance of air combat support assets, negating extensive regeneration periods between sorties. The effects of extending persistence and endurance are a reduction in the number of sorties required, a decrease in ground support requirements at forward locations, and a possible reduction in the number of aircraft deployed to an AOR. The overall effect of continuous engagement is enabled by this mission. Theater-based aerial refueling assets also enhance the security of combat and combat support air assets by allowing them to be based beyond the range of adversary threats. The KC-X's increased offload capability and enhanced self-protection will enable it to operate closer to the battlespace, significantly enhancing this mission critical function, and its increased reliability could decrease the number of tankers required, providing a boost to the force management options of the combatant commanders. The added capability to transition from boom to drogue aerial refueling while airborne is a significant enhancement to the flexibility of the ARA fleet in supporting U.S. joint and allied and coalition forces. Aerial refueling operations are also an essential element of homeland defense, enabling extended persistence for air defense aircraft and permitting larger cargo loads for CONUS-operating airlift aircraft. Homeland support could include activating the deployment support, theater refueling support, Special Operations Force (SOF) support, emergency aerial refueling support, and airlift missions described above within the CONUS, employing all the advanced performance envisioned for the KC-X.

1.2.1.6 **Special Operations Support**. Aerial refueling enables the SOF to maintain a long range operating capability. Successful mission completion requires special equipment, including a night vision imaging system (NVIS) capability and enhanced communication suites, specialized crew training, and modified operational procedures. The increase in the KC-X's capabilities in navigation, communication, situational awareness and formation compatibility with receiver night vision devices will positively affect the successful completion of SOF

support missions. Enhanced reliability may decrease the numbers of KC-X required to support these missions, resulting in a decreased footprint and enhanced security.

1.2.2 **Other Associated Aerial Refueling Missions**

1.2.2.1 **Emergency Aerial Refueling**. Some aerial refueling aircraft will be kept on ground or airborne alert to provide short-notice support for airborne fuel emergencies. Fuel emergencies can result from missed refuelings, en-route winds greater than planned, battle damage, or excessive time engaged with adversary aircraft or targets. Ground spare aircraft are maintained in various stages of readiness depending on mission requirements. Airborne spare aircraft consist of one or more tankers that accompany the aerial refueling formation, but do not participate in any aerial refueling unless required to do so. The effect of shortened response time for alert launches and increased capabilities in communication, navigation and situational awareness of the KC-X enhance the ability to perform this time constrained mission.

1.2.2.2 **Airlift**. Refueling platforms act as augmentation to the airlift fleet. This capability is most important during the deployment phase when airlift requirements are highest and requirements for theater support refuelings are the lowest. In addition, tanker units deploying to a theater or en-route location may typically airlift most of their own support requirements under the integral tanker unit deployment concept. This concept allows tanker units to have key supplies, equipment and personnel on hand as soon as they arrive at their deployed location, affecting an immediate start of aerial refueling operations, and relieves the air transportation system of a portion of their requirements. The KC-X's enhanced capabilities for range, payload, navigation, and communication, are keys to this mission.

1.2.2.3 **Aeromedical Evacuation (AE)**. The flexibility of the KC-X is again highlighted by its capability to conduct the AE mission, enhancing the capability to safeguard the force by reducing the time required to receive advanced medical care. Short response time and enhanced navigation, communication and situational awareness are all mission enablers.

1.2.2.4 **Combat Search and Rescue (CSAR)**. Tanker aircraft provide a limited capability to assist in CSAR operations as a communications and coordination link between airborne and ground-based elements. This capability derives from the KC-X's increased long endurance characteristics and organic communications suite. KC-X can be concurrently tasked with refueling fighter and bomber aircraft remaining on-station for CSAR support, affected by its enhanced aerial refueling performance to refuel receptacle or probe-equipped receivers on the same sortie.

1.2.2.5 **FARP**. KC-X may be used to ferry fuel to FARPs in support of ground and air operations at suitable airfields. This capability may alleviate the load on the airlift fleet during the most stressful phase of deployments. Using FARP procedures, the aircraft will be able to offload fuel on the ground to other aircraft or bladders. To fully exploit FARP capability, the KC-X would require defensive systems and NVIS. Enhanced performance capabilities may enable operations into previously inaccessible airfields. FARP operations will be carried out using the aircraft single point receptacles, the boom, or the probe-and drogue system.

1.2.3 **Threat Environment.** Mission requirements dictate that the KC-X be capable of operating from worldwide locations day and night. The KC-X may operate in chemical and biological (chem/bio) environments, and it will also be threatened by information and electronic warfare to include the possibility of an EMP. The KC-X will operate in a medium threat environment.

The KC-X will not operate in an area of a known high threat envelope without requesting suppression of enemy air defenses and air support.

1.2.3.1 **Threats**. AR is a worldwide mission and therefore a wide range of threats are applicable to it, including chemical and biological environments, and threats such as a strategic or tactical use of EMP. Directed energy weapons represent an emerging threat to the KC-X and include lasers and radio frequency weapons that could pose a threat primarily during ground operations and during takeoff and landings. The most likely threat elements are electro-optical, radar and infrared (IR) surface-to-air-missiles (including man portable air defense), antiaircraft artillery (AAA), and counter air aircraft. The most stressing threats are long range radio frequency (RF) surface to air missiles and long range RF air-to-air missiles. Based upon the worldwide proliferation of threat systems, tankers are no longer able to simply avoid hostile environments.

1.2.3.2 **Asymmetric Threats**. Future adversaries may adopt asymmetric methods across selected domains against areas of perceived U.S. vulnerability and will disregard the law of armed conflict as we understand it to increasingly challenge us in non-traditional areas. There are four distinct security environment challenges that the Department of Defense (DoD) has identified for the future: traditional, irregular, disruptive and catastrophic. The KC-X will have to deal with all four of the challenges of this emerging security environment. The KC-X will be instrumental in achieving and maintaining the capability to respond rapidly and with minimal warning. Terrorism and sabotage represent potential dangers, particularly to aircraft operating overseas and out of civilian airports. Information warfare tactics and systems pose the major threat to electronic systems on the KC-X. Denial of navigation and information systems data by radio frequency jamming, signal spoofing, and emitter detection and monitoring could jeopardize mission safety. Some avionics systems could be vulnerable to information attack such as insertion of false data and malicious software codes. Increased reliance on commercial off-the-shelf components may increase susceptibility to such attacks unless adequate security measures are in place.

1.2.3.3 **Threat Details**. For detailed threat information, see the KC-X Threat Summary Appendix.

1.3 Ground Rules

1.3.1 Unless otherwise specified, aircraft performance requirements in section 3 will be calculated using a dry runway, no wind, no runway slope, sea level (take off), standard day criteria, and all aircraft systems operating normally. No distance credit given for takeoff. Unless otherwise specified, aircraft performance in all regimes is calculated using JP-8 fuel at 6.8 pounds (lbs) per gallon, no fuel conservatism, and normal aircraft configuration to include no wing-mounted drogue refueling system mounted or Large Aircraft Infra-Red Counter Measures (LAIRCM) turrets on the aircraft. Ground clearance during takeoff rotation and landing touchdown will be no less than 12 inches.

1.3.2 Verification definitions in section 4 apply to the verification of section 3. The requirement definitions in section 5 apply to all of section 3 of the SRD. Requirement definitions in classified Appendix B apply only to section 3.5 and classified Appendix B.

2 Applicable Documents. See section 6.

3 System Requirements

3.1 Aerial Refueling

3.1.1 Tanker Refueling

3.1.1.1 The KC-X shall meet, as a minimum, the fuel offload versus unrefueled radius range as depicted in Figure 3-1 for boom refueling at all ranges from 500 nautical miles (nm) to 2,500 nm. The following ground rules for calculating radius-offload apply: maximum fuel weight, not to exceed maximum takeoff gross weight, for 10,000 foot runway (critical field length), takeoff fuel allowance from brake release of 2.5 minutes at maximum continuous thrust. En-route climb at 250 knots indicated airspeed (KIAS) to 10,000 feet (ft), then at recommended climb speed above 10,000 ft to flight level (FL) 250, cruise at FL 250 and at best range speed to planned loiter point (distance to loiter point equal to sum of en-route climbs and cruise). Perform loiter orbit at FL 250 and 275 KIAS, for 1 hour and offload fuel during loiter (offload completed at end of the hour), transferring fuel at 900 gal/minute (refueling boom is in the deployed position for the entire hour). Return to base of origin at FL 250 at best range speed, perform penetration and landing (15 minutes) (no time, fuel, or distance credit for descent to initial approach fix), and land with reserve fuel sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered). **(MANDATORY)**

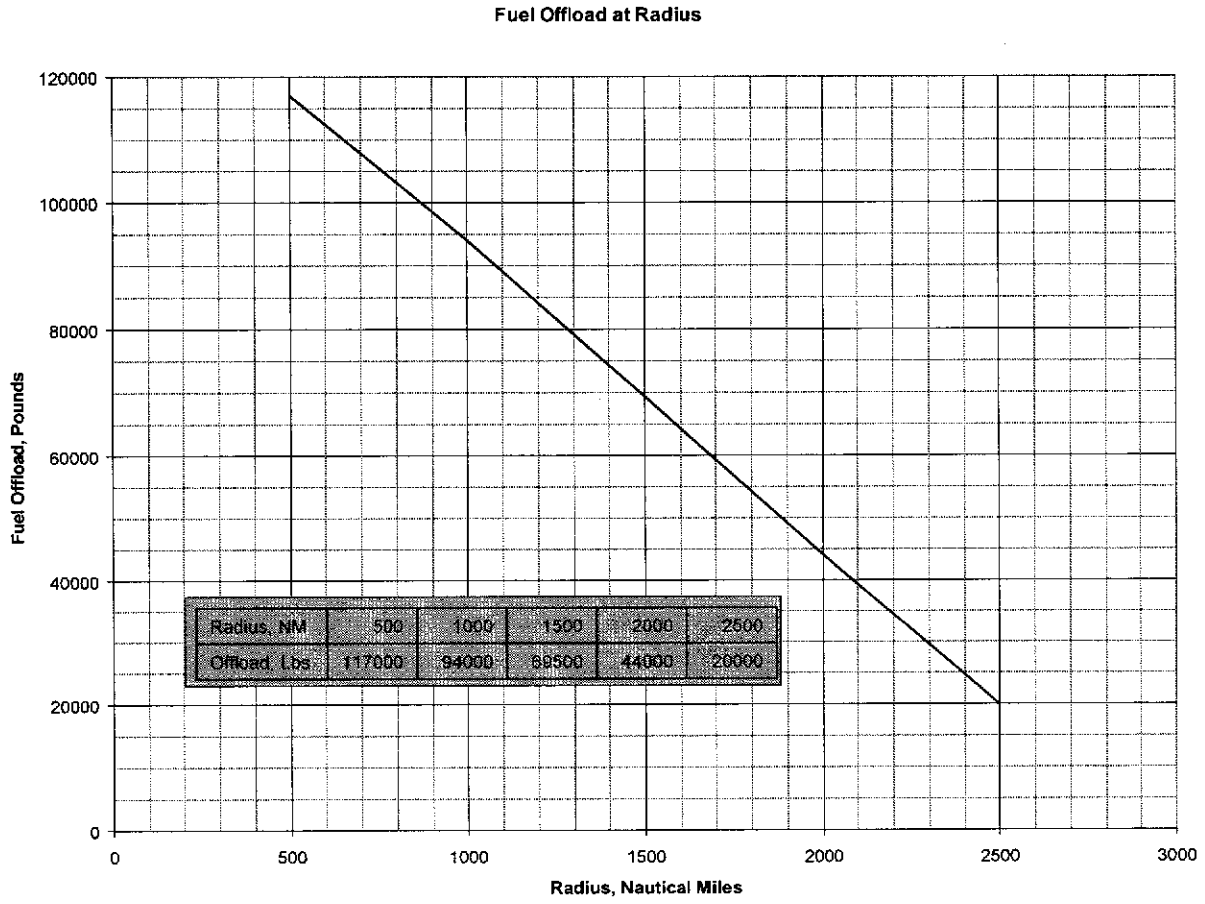

Figure 3-1: Fuel Offload vs Radius Range

3.1.1.1.1 The KC-X should exceed the fuel offload versus unrefueled radius range as depicted in Figure 3-1 using paragraph 3.1.1.1 ground rules. **(NON-MANDATORY)**

3.1.1.2 The KC-X shall have a maximum-fuel offload to available fuel (fuel burned plus fuel offloaded) ratio (aerial refueling efficiency) greater than or equal to the values in Table A-7 for 500 to 2,500 nm using the fuel offload versus radius range mission and ground rules in paragraph 3.1.1.1. **(MANDATORY)**

3.1.1.3 The KC-X boom and drogue aerial refueling systems shall be stable throughout their respective aerial refueling envelopes under all operating conditions identified in Allied Tactical Publication (ATP)-56 Part 1, Part 2, Annex ZA, Annex ZB (centerline drogue procedures), and Annex ZE (KC-135). **(MANDATORY)**

3.1.1.4 The KC-X shall provide for aircrew viewing (direct line of sight view) over both wings, fore and aft of the engines, wing leading edges, and wing trailing edges during ground and flight operations and any ram air turbine associated with wing-mounted drogue refueling systems. **(MANDATORY)**

3.1.1.4.1 The KC-X should provide for aircrew viewing (direct line of sight or remote view) aft of aircraft (including aft of extended and stowed wing-mounted drogue refueling systems) for protection, surveillance and pre-aerial refueling observation. **(NON-MANDATORY)**

3.1.1.5 The KC-X shall automatically record fuel offloaded (boom, centerline and wing-mounted drogue refueling systems) per receiver and electronically capture manual input of associated receiver identification. **(MANDATORY)**

3.1.1.6 The KC-X shall automatically capture distinguishable receiver identification data at contact and tie to associated fuel offloaded (boom, centerline and wing-mounted drogue refueling systems). **(MANDATORY)**

3.1.1.7 The KC-X shall provide access in the cargo compartment to data necessary for receiver aircraft qualification (indicated with an "*" in the Aircraft Information Program (AIP) list, Table A-6), at the following sampling rates: real-time for audio and video, between 400 and 1,000 Hz for loads and fuel pressure measurements, and greater than 10 Hz for all other parameters. **(MANDATORY)**

3.1.1.8 The KC-X shall rendezvous with intended tanker and receiver aircraft in accordance with ATP-56, and be compatible with air-to-air Tactical Air Navigation (TACAN) (with inverse beacon mode), be compatible with Traffic Alert and Collision Avoidance System (TCAS), and Time of Arrival Control as described in Radio Technical Commission for Aeronautics (RTCA) Document Order (DO) 236. **(MANDATORY)**

3.1.1.9 The KC-X shall provide the aircrew with all necessary and appropriate warnings, cautions, and advisories to include: fuel offload approaching or exceeding predetermined minimum onboard fuel quantities, system failures, system degradation, and potentially hazardous changes in system status/position. **(MANDATORY)**

3.1.1.10 The KC-X shall provide sufficient visual cues to any tanker and intended receiver aircraft (including KC-X) to enable all EMCON communications (Options 1-4) aerial refueling operations per ATP-56 Part 2, Chapter 5 and Annexes 5A-5C, under all ambient lighting and background conditions. **(MANDATORY)**

3.1.1.11 The KC-X shall provide receiver aircrew sufficient visual cues to conduct aerial refueling operations in all ambient lighting and background conditions. **(MANDATORY)**

3.1.1.12 The KC-X shall provide for (non-simultaneously) both boom and drogue aerial refueling on the same sortie. **(MANDATORY)**

3.1.1.13 The KC-X shall aerial refuel all fixed-wing receiver aircraft compatible with the KC-135, complying with the following: (1) ATP-56 Part 1, Part 2, Annex ZA, Annex ZE (KC-135) and Annex ZB (centerline drogue) procedures, (2) no modification to existing receiver aerial refueling equipment, (3) no additional restrictions (beyond KC-135 restrictions) to the receiver aircraft aerial refueling airspeed and altitude envelopes, and (4) Standardization Agreement (STANAG) 3447. **(MANDATORY)**

3.1.1.13.1 The KC-X should present a stable centerline drogue aerial refueling system using drogue criteria in paragraph 3.1.1.13 at anticipated M/CV-22 airspeeds as low as 185 KCAS and 10,000 ft altitude at tanker weights for 18,000 lbs of fuel available to offload and 1,500 nm unrefueled radius range (using ground rules in paragraph 3.1.1.1). **(NON-MANDATORY)**

3.1.1.13.2 The KC-X should aerial refuel current fixed-wing receiver aircraft compatible (including F-35 variants) with the KC-135 using criteria in paragraph 3.1.1.13 at the KC-X maximum in-flight gross weight. **(NON-MANDATORY)**

3.1.1.14 While engaged as a tanker, the KC-X shall have maneuverability throughout the entire refueling envelope of any compatible fixed-wing receiver aircraft, in accordance with ATP-56 and STANAG 3447. **(MANDATORY)**

3.1.1.14.1 While engaged as a tanker, the KC-X should have maneuverability throughout the entire refueling envelope of probe equipped receiver aircraft (i.e., level flight, 30 degree bank and toboggan) at anticipated M/CV-22 airspeeds as low as 185 KCAS and 10,000 ft altitude at tanker weights for 18,000 lbs of fuel available to offload and 1,500 nm unrefueled radius range (using ground rules in paragraph 3.1.1.1). **(NON-MANDATORY)**

3.1.1.15 The KC-X Aerial Refueling Operator (ARO) station shall provide the following: permanent seating for an ARO and an ARO instructor; separate duplicate controls, control panels, displays; and ARO instructor override functionality. **(MANDATORY)**

3.1.1.15.1 The KC-X shall provide for a seated ARO observer with visual access to all ARO station controls and displays, and have interphone connectivity during aerial refueling. **(MANDATORY)**

3.1.1.16 The KC-X shall provide for the ARO to receive sufficient cues for conducting boom aerial refueling operations and visually monitoring drogue operations during all ambient lighting and background conditions. **(MANDATORY)**

3.1.1.17 The KC-X shall provide for conducting classified aerial refueling missions (including Information Assurance (IA) implications) as a result of electronic recording classified receivers and locations. **(MANDATORY)**

3.1.1.18 No single failure in the KC-X aerial refueling control system, vision system, fuel line coupling, electrical power, or hydraulic power shall prevent tanker or receiver aerial refueling operations (including boom stowing). **(MANDATORY)**

3.1.1.19 The KC-X aerial refueling systems operation shall not exceed proof pressure in either the tanker or receiver fuel systems, including operation with a single failure. **(MANDATORY)**

3.1.1.20 All usable aircraft fuel shall be available for offload with no degradation to offload rate (other than pumps running dry) throughout the range of tanker fuel loads. **(MANDATORY)**

3.1.1.21 The KC-X shall automatically set the fuel offload rate based on ARO selected receiver type, and provide for the pilots to manually set the fuel offload rate. **(MANDATORY)**

3.1.1.22 The KC-X should isolate, transport, and offload at least 81,600 lbs of a secondary fuel for ground transfer and for in flight receiver transfer, with two actions required to mix isolated fuels to prevent inadvertent mixing. **(NON-MANDATORY)**

3.1.1.23 **Boom Aerial Refueling**

3.1.1.23.1 The KC-X boom shall be lowered, operated, and raised throughout the aerial refueling envelope of the aircraft from the ARO station. **(MANDATORY)**

3.1.1.23.2 The KC-X shall provide for ARO-initiated, receiver-independent, immediate disconnect from any receiver, regardless of receiver aerial refueling system status, during any contact. **(MANDATORY)**

3.1.1.23.3 The KC-X shall automatically control boom loads and alignment to maintain functional and structural integrity while coupled to the receiver, without ARO input. **(MANDATORY)**

3.1.1.23.4 The operationally effective boom envelope shall be at least as large as the envelope identified in ATP-56 (STANAG 3971), Annex ZA Appendix 1 Figures ZA-1-1 and ZA-1-2 for a narrow body KC-X, or twice as large as the envelope identified in ATP-56 for a wide body KC-X. The 10 degrees left and right in Figure ZA-1-2 are in terms of azimuth. **(MANDATORY)**

3.1.1.23.4.1 The operationally effective boom envelope should be at least four (4) times the volume of the envelope identified in ATP-56 (STANAG 3971), Annex ZA Appendix 1 Figures ZA-1-1 and ZA-1-2. The 10 degrees left and right in Figure ZA-1-2 are in terms of azimuth. **(NON-MANDATORY)**

3.1.1.23.5 The KC-X shall automatically set boom envelope limits based on ARO-selected receiver type, and provide for the ARO to manually set boom envelope limits that overrides the automatic limits. **(MANDATORY)**

3.1.1.23.6 The KC-X shall automatically disconnect in both normal and override modes to prevent exceeding boom envelope limits based on ARO selected receiver type or ARO manually set boom envelope limits. **(MANDATORY)**

3.1.1.23.7 The KC-X shall provide for MIL-S-38449 (class 4) Emission Control (EMCON) Option 4 (per ATP-56 Part 2 Annex 5A) compatible communications (thru-the-boom) as a tanker and a receiver. **(MANDATORY)**

3.1.1.23.8 The KC-X shall refuel receiver aircraft after loss of receiver's boom latch functionality, as described in Technical Order (TO) 1C-135(K)R(II)-1 Inoperative Boom/Receptacle Latching (pressure refueling) Checklist. **(MANDATORY)**

3.1.1.23.9 The KC-X shall deliver fuel to all receptacle equipped receivers at a maximum rate of at least 1,200 gallons per minute (GPM), at delivery pressures no greater than 55 pounds force per square inch gauge (psig) measured within three (3) feet upstream of the boom nozzle ball joint. **(MANDATORY)**

3.1.1.24 **Drogue Systems**

3.1.1.24.1 The KC-X shall have a centerline hose and drogue system that performs drogue refueling operations as specified in sub-section 3.1.1 and paragraph 3.5.1.8.4. **(MANDATORY)**

3.1.1.24.1.1 The KC-X should have a redundant centerline hose and drogue system that performs drogue refueling operations as specified in sub-section 3.1.1 and paragraph 3.5.1.8.4. **(NON-MANDATORY)**

3.1.1.24.2 All KC-X drogue refueling systems shall each deliver fuel at maximum flow rates equal to or greater than 400 GPM at delivery pressures no more than 55 psig measured immediately downstream of the probe nozzle. **(MANDATORY)**

3.1.1.24.3 The KC-X shall include all necessary systems and equipment, excluding wing-mounted drogue refueling systems, for simultaneous multi-point drogue aerial refueling and perform drogue aerial refueling operations as specified in section 3.1.1 and paragraph 3.5.1.8.4 when wing-mounted drogue refueling systems are installed. **(MANDATORY)**

3.1.1.24.4 All aerial refueling hoses and drogues shall independently extend, operate, and retract throughout the aerial refueling envelope of the aircraft without striking any part of the KC-X with the exception of the hose/drogue entry/exit tunnel. **(MANDATORY)**

3.1.1.24.5 The KC-X shall jettison centerline aerial refueling hose(s), without striking any part of the KC-X with the exception of the hose/drogue entry/exit tunnel, regardless of extension length. **(MANDATORY)**

3.1.1.24.6 The KC-X shall jettison wing-mounted drogue refueling system hoses without striking any part of the KC-X with the exception of the hose/drogue entry/exit tunnel. **(MANDATORY)**

3.1.1.24.7 All KC-X drogue aerial refueling hoses shall be marked with the limits of refueling transfer position and receiver relative position cues. **(MANDATORY)**

3.1.1.25 **Aerial Refueling Lighting**

3.1.1.25.1 The KC-X shall have a receiver pilot director light (PDL) system that supports boom aerial refueling operations and function as described in ATP-56 Annex ZB. **(MANDATORY)**

3.1.1.25.2 The KC-X shall include the necessary lighting (in addition to PDL) to conduct boom (as both tanker and receiver) and drogue aerial refueling operations, with and without tanker and receiver aircrew using night vision imaging systems, throughout the full range of night ambient lighting and background conditions. **(MANDATORY)**

3.1.1.25.3 The KC-X shall provide receiver aircraft with visual indication(s) of tanker aerial refueling system operational status for both covert and normal lighting modes. **(MANDATORY)**

3.1.1.25.4 KC-X external and internal lighting used during aerial refueling operations (as both tanker and receiver) shall have independently variable intensity controls. **(MANDATORY)**

3.1.1.25.5 The KC-X aerial refueling lighting system shall preclude distracting hotspots or glare during formation, astern, and contact. **(MANDATORY)**

3.1.1.25.6 The KC-X should provide an external lighting system that guides the receiver pilot to maintain the proper closure angle to the contact position. **(NON-MANDATORY)**

3.1.1.25.7 The KC-X should provide an external lighting system that assists the receiver pilot in acquiring and maintaining the proper astern position. **(NON-MANDATORY)**

3.1.2 **Receiver Refueling**

3.1.2.1 The KC-X, for the aerial refueling task (as tanker or receiver), shall exhibit flying qualities no worse than Level 1 (Satisfactory) in Common atmospheric disturbances, no worse than Level 2 (Tolerable) in Uncommon atmospheric disturbances, and no worse than Pilot-in-the-Loop Oscillation Rating (PIOR) 2 in up through Uncommon atmospheric disturbances, all as defined in Military Standard (MIL-STD)-1797. **(MANDATORY)**

3.1.2.2 The KC-X shall aerial refuel as a receiver from KC-135, KC-10, and KC-X tankers in accordance with ATP-56 aerial refueling procedures. **(MANDATORY)**

3.1.2.2.1 The KC-X should aerial refuel as a receiver to its maximum in-flight gross weight with no passengers or cargo on board from KC-135, KC-10, and KC-X tankers in accordance with ATP-56 aerial refueling procedures. **(NON-MANDATORY)**

3.1.2.3 While engaged as a receiver, the KC-X shall maneuver (up to 30 degree bank and toboggan) throughout the aerial refueling envelope required to accommodate aerial refueling with KC-135, KC-10, and KC-X tankers, at all tanker-receiver gross weights up to KC-X maximum in-flight refuelable fuel capacity, and within the tanker boom envelope limitations. **(MANDATORY)**

3.1.2.4 The KC-X shall provide automated and manual methods to disconnect from the tanker boom with a redundant method to isolate the receptacle from the rest of the KC-X fuel system. **(MANDATORY)**

3.1.2.5 The KC-X shall receive fuel at a maximum rate of at least 1,200 GPM at delivery pressures no greater than 55 psig measured within three (3) feet upstream of the boom nozzle ball joint. **(MANDATORY)**

3.1.3 **Fuel Systems**

3.1.3.1 The KC-X shall control fuel transfer sequencing and maintain center of gravity (CG) throughout all aircraft fuel loads without aircrew action, while transferring fuel to the engines and providing the required aerial refueling onload and offload rates. **(MANDATORY)**

3.1.3.2 The KC-X shall provide for manual fuel transfer overriding automatic CG sequencing. **(MANDATORY)**

3.1.3.3 **Forward Area Refueling Point**

3.1.3.3.1 The KC-X shall offload fuel on the ground to other aircraft or bladders without the need for unique ground equipment with and without engine(s) running, in accordance with Air Force Instruction (AFI) 11-235 and STANAG 2946. **(MANDATORY)**

3.1.3.3.2 The KC-X should carry ASTM D975 diesel fuel for FARP operations. **(NON-MANDATORY)**

3.1.3.4 The KC-X shall use the following primary fuels: Jet Propellant (JP)-8, JP-8+100, JP-5 and the respective North Atlantic Treaty Organization (NATO) equivalents F-34, F-37 and F-44. **(MANDATORY)**

3.1.3.5 The KC-X shall use the following alternate fuels: JP-4, Jet B; Jet A and Jet A-1 with corrosion inhibitor/lubricity improver (CI/LI), fuel system icing inhibitor (FSII), and static dissipater additive (SDA); TS-1 with CI/LI, FSII, and SDA; Jet A and Jet A-1 neat (no additives); TS-1 neat (no additives) and a 50/50 blend of JP-8/Synthetic Paraffinic Kerosene (SPK) derived from a Fischer-Tropsch (FT) process per Military Detailed Specification (MIL-DTL)-83133. **(MANDATORY)**

3.1.3.6 The KC-X shall provide for dumping fuel in flight at a rate of at least 300 GPM. **(MANDATORY)**

3.1.3.7 The KC-X shall provide for dumping fuel on the ground at the same or higher rate than the in-flight dump rate. **(MANDATORY)**

3.1.3.7.1 The KC-X should dump fuel in flight and on the ground at the same maximum rate it can deliver fuel to a receptacle equipped receiver. **(NON-MANDATORY)**

3.1.3.8 The KC-X shall provide for dumping fuel to a default limit, set to the maximum landing weight, which can be overridden to a minimum fuel limit individually selectable by the Aircraft Commander and the Pilot. **(MANDATORY)**

3.1.3.9 The KC-X should utilize the following emergency fuels: aviation gasoline (grades 115/145, 100/130, 80/87, and 100LL), TS-1 with Gosudarstvennyy Standart (GOST) additives, and RP-1. **(NON-MANDATORY)**

3.1.3.10 The KC-X should carry all primary, alternate and emergency fuels as well as the following in the isolated fuel part of the fuel system:
China: Jet Fuel#3 (GB 6537-94)
Sweden: Flygfotogen 75 Kerosene (FSD 8607E)
Romania: TH (STAS 5639-88)
South Africa: 50% Synthetic Blend (Def Stan 91-91). **(NON-MANDATORY)**

3.2 **Airlift**

3.2.1 **Seamless and Efficient Cargo Operation Within Defense Transportation System**

3.2.1.1 The KC-X shall transport cargo and personnel by using only material handling equipment and transportation support processes and procedures employed by other Air Mobility Command (AMC) assets. **(MANDATORY)**

3.2.1.2 **Cargo Handling**

3.2.1.2.1 The entire KC-X main cargo compartment shall accommodate an all cargo configuration using 463L pallets. **(MANDATORY)**

3.2.1.2.2 The KC-X main cargo compartment shall provide for loading of 463L pallets on the wide dimension, and loading of pallets coupled on the short-side to be loadable with room to rotate 90 degrees (to line up inside). **(MANDATORY)**

3.2.1.2.3 The KC-X cargo handling systems (including any guide systems) shall be compatible with and accommodate 463L pallets utilizing DoD certified tie-down equipment. **(MANDATORY)**

3.2.1.2.3.1 The KC-X cargo handling systems should provide for loading, handling, and restraining non-palletized items utilizing DoD certified tie-down equipment. **(NON-MANDATORY)**

3.2.1.2.4 The KC-X shall have an integral cargo handling system that provides for moving fully loaded 463L pallets (including coupled pallets) to and from the loader, moving and rotating pallets into the main cargo compartment, and positioning pallets to final locations, without the use of additional equipment. **(MANDATORY)**

3.2.1.2.5 The KC-X shall provide for moving of cargo pallets (up to maximum pallet position ground handling design weight) fore and aft to assigned locations throughout the cargo compartment. **(MANDATORY)**

3.2.1.2.5.1 The KC-X should have a powered system with portable and remote-from-the-pallet hand controls to move cargo fore and aft throughout the cargo compartment. **(NON-MANDATORY)**

3.2.1.2.6 The KC-X cargo compartment(s) shall as a minimum transport the cargo and passenger self-deployment package (without pallet teardown and rebuild) as defined in Table A-1 on any six (6) KC-X aircraft using permanent seating and non-developmental 463L palletized seating (10 (AAR Mobility System P/N 50141-023), 12 (AAR Mobility System P/N 50141-

015 or 50019-024) or 15 (AAR Mobility System P/N 50019-022) seat configurations permitted). **(MANDATORY)**

3.2.1.3 **Equipment Storage**

3.2.1.3.1 The KC-X shall have built-in storage compartment(s) for all cargo tie-down devices, chains and straps necessary for maximum cargo configuration. **(MANDATORY)**

3.2.1.3.2 The KC-X shall have sufficient in-flight accessible built-in storage for all mission specific aircraft items and "miscellaneous requirements" of the type consistent with AFI 11-2KC-10V3, addenda A Table 1.1 ("Contingency" column). **(MANDATORY)**

3.2.1.3.3 The KC-X shall have an integral lockable container for storing five loaded sidearms plus one spare magazine per weapon located forward of the main cargo compartment. **(MANDATORY)**

3.2.1.4 The KC-X shall carry hazardous cargo throughout the main cargo compartment, in accordance with Air Force (AF) Interservice Manual 24-204(I), including separate overboard vents for cryogenic and non-cryogenic (fumes, vapors, and exhausts). **(MANDATORY)**

3.2.1.5 **Cargo Door(s)**

3.2.1.5.1 The KC-X shall have a main cargo door that can be operated manually (unpowered) and that is powered by any and all of the following primary power sources: aircraft external, engine, and auxiliary power unit (APU). **(MANDATORY)**

3.2.1.5.2 The KC-X main cargo door opening height shall accommodate loading of a 463L pallet that includes 96 inches of cargo height in accordance with AMCI 24-101 Volume 11. **(MANDATORY)**

3.2.1.5.3 The KC-X main cargo door shall provide for powered fully opening and closing without primary power sources: aircraft external, engine, and APU. **(MANDATORY)**

3.2.1.5.4 The KC-X main deck cargo door opening shall have integral protection from damage during cargo loading and unloading. **(MANDATORY)**

3.2.1.5.5 The KC-X main deck cargo door opening controls shall be located internally where the operator can have a clear view of the entire interior and exterior cargo door area. **(MANDATORY)**

3.2.1.5.6 All KC-X cargo door(s) shall withstand winds up to 50 knots (sustained or gusts) from any direction in the fully open position(s), and at least 40 knots for all cargo door in-transit positions. **(MANDATORY)**

3.2.2 **Passengers and Aeromedical Evacuation**

3.2.2.1 The KC-X shall control interior temperature to Federal Aviation Administration (FAA) passenger and cargo aircraft levels on the ground and in the air, for all mission configurations (including AE). **(MANDATORY)**

3.2.2.2 The KC-X environmental system shall control interior temperature consistent with FAA passenger and cargo aircraft levels under single failure conditions. **(MANDATORY)**

3.2.2.3 KC-X shall automatically control and provide for manual control of cabin temperature to prevent extreme hot or cold temperatures in accordance with MIL-STD-1472 section 5.8.1 to avoid threats to patient safety and negative impacts to patient therapy, under normal and single failure conditions. **(MANDATORY)**

3.2.2.4 **Aeromedical Evacuation**

3.2.2.4.1 The entire KC-X main cargo compartment shall accommodate an all AE configuration, using patient support pallets (PSPs National Stock Number (NSN) 1670-01-505-1041). **(MANDATORY)**

3.2.2.4.2 The KC-X shall provide for air transport, using existing patient support pallets (PSP) (supporting at least 250 lbs in the top litter position and 275 lbs in all lower litter positions), for 50 patients total, 24 litter and 26 ambulatory patients, for a 16 hour mission. **(MANDATORY)**

3.2.2.4.3 The KC-X shall accommodate the use of assembled Litter Station Augmentation Set (LSAS) for aeromedical care. **(MANDATORY)**

3.2.2.4.4 The KC-X shall have integral equipment for five (5) aeromedical aircrew members, to include: two (2) work surfaces for laptops and paperwork with access to aircraft external unclassified voice and data communication and 115 volt Alternating Current (AC) power; five (5) total seats with aircrew and private AE interphone, lighting, chem/bio blower power (28 volt) interface, panel mounted oxygen regulators; and storage for five (5) walk around oxygen bottles. **(MANDATORY)**

3.2.2.4.5 The KC-X shall provide integral stations, stanchions, utility panels and litters for six patients positioned off the floor (two three-tier or three two-tier litter stations) that are secured to structural hard points and recessed fittings, with integral storage for all components when not in use. **(MANDATORY)**

3.2.2.4.6 The KC-X integral litter stations shall support the same litter and patient weights as the PSPs (at least 250 lbs in the top litter position and 275 lbs in all lower litter positions). **(MANDATORY)**

3.2.2.4.7 The KC-X should provide at least 100 liters per minute of US Pharmacopeia grade 93-99.7% oxygen at receptacles positioned throughout the KC-X main cargo compartment (at least 4 receptacles with one within reach of the integral litter location) regulated at 50 pounds per square inch (psi) for a 16 hour patient therapeutic mission. **(NON-MANDATORY)**

3.2.2.5 **Seating**

3.2.2.5.1 The KC-X shall provide permanent seating for fifteen (15) total aircrew members. **(MANDATORY)**

3.2.2.5.2 Centerline pallet positions along the entire length of the KC-X main cargo compartment shall accommodate fully loaded non-developmental 463L palletized seating (10 (AAR Mobility System P/N 50141-023), 12 (AAR Mobility System P/N 50141-015 or 50019-024) or 15 (AAR Mobility System P/N 50019-022) seat configurations permitted) with 250-pound passengers. **(MANDATORY)**

3.2.2.6 **Water**

3.2.2.6.1 The KC-X shall provide a potable water system that supports maximum passenger load, patient, and aircrew requirements with running water available at each sink for 12 hours (473 milliliters per person per hour). **(MANDATORY)**

3.2.2.6.1.1 The KC-X should provide hot and cold water, and a water purification system, that supports maximum passenger load, patient, and aircrew requirements with running water available at each sink for 12 hours (473 milliliters per person per hour). **(NON-MANDATORY)**

3.2.2.7 The KC-X shall provide permanent lavatories for maximum aircrew load for 12 hours, and accommodate lavatories that support a maximum passenger load for 12 hours (151 milliliters per person per hour). **(MANDATORY)**

3.2.2.7.1 The KC-X should provide permanent lavatories for maximum aircrew load for 24 hours, and accommodate lavatories that support a maximum passenger load for 24 hours (151 milliliters per person per hour). **(NON-MANDATORY)**

3.2.2.8 **Galley**

3.2.2.8.1 The KC-X shall store and maintain cold beverages and cold meals, provide for preparation of hot beverages and reheating meals, for a maximum AE patient load and aircrew load for 16 hours (two beverages and two meals per person). **(MANDATORY)**

3.2.2.8.1.1 The KC-X should be compatible with servicing and utilization of the Air Transportable Galley/Lavatory (ATGL), NSN 7360-01-328-5127. **(NON-MANDATORY)**

3.2.2.9 **Cargo Compartment Lighting**

3.2.2.9.1 All KC-X cargo compartments shall have lighting for loading and unloading of passengers and cargo, in all ambient light conditions, with and without use of NVIS in accordance with MIL-STD-3009. **(MANDATORY)**

3.2.2.9.2 The KC-X cargo compartment lighting shall be in accordance with MIL-STD-1472 Table XV ordinary seeing task for patient care. **(MANDATORY)**

3.2.3 **Payload Combination and Reconfiguration**

3.2.3.1 **Turn Time**

3.2.3.1.1 The KC-X shall have a maximum en-route turn time of two (2) hours, 45 minutes for all cargo missions. The following ground rules apply: time starts with the cargo door(s) open on an empty aircraft with reserve fuel only and necessary equipment standing by; time ends when the aircraft is fully loaded (maximum aircraft cargo weight and maximum number of pallets), the cargo is secured, the aircraft has been refueled to maximum ramp gross weight, and thru-flight maintenance (no repair) is complete; maximum of eight flight line personnel, not including ground vehicle drivers, are available to accomplish the en-route turn. **(MANDATORY)**

3.2.3.2 The KC-X shall provide a movable smoke and fume barrier that: prevents smoke and fumes from passing into passenger designated areas from cargo designated areas; can be installed at any pallet position in the main cargo compartment; allows aircrew passage; allows combinations of palletized cargo, passengers (centerline pallets), and AE patients (on PSPs); and can be stored in built-in storage. **(MANDATORY)**

3.2.3.3 **Cargo Compartment Reconfiguration**

3.2.3.3.1 Conversion between configurations (unloaded) shall require no longer than two (2) man-hours with no more than two (2) support personnel. The following ground rules apply: conversion between all combinations of cargo (empty), full passenger (unloaded), and aeromedical (unloaded) configurations start from an open cargo door with loaders standing by and end when all equipment is installed and properly connected. **(MANDATORY)**

3.2.3.3.1.1 Conversion between configurations (unloaded) should require no longer than one (1) man-hour with no more than two (2) support personnel using the ground rules in paragraph 3.2.3.3.1. **(NON-MANDATORY)**

3.2.3.3.2 No major reconfigurations, such as removing aircrew seats, barrier net, aircrew rest facilities, or other peripherals, should be required to load or unload the KC-X main deck cargo compartment. **(NON-MANDATORY)**

3.2.3.4 **Aircraft Servicing**

3.2.3.4.1 The KC-X permanent lavatories shall be serviced through an external port. **(MANDATORY)**

3.2.3.4.2 The KC-X refueling and defueling operations shall be powered by any and all of the following sources; engine power, external power, and APU power. **(MANDATORY)**

3.2.3.4.3 The KC-X shall provide for ground concurrent servicing operations (i.e., simultaneous refueling, cargo loading, passenger loading, minor maintenance, and APU operation). **(MANDATORY)**

3.2.3.4.4 The KC-X shall provide for servicing water, fuel, hydraulics, and lavatories while loading cargo. **(MANDATORY)**

3.2.3.4.5 The KC-X shall provide for ground fuel servicing on both sides of the aircraft simultaneously. **(MANDATORY)**

3.2.3.4.6 The KC-X shall provide for servicing fuel to full capacity without external electrical power applied to the aircraft. **(MANDATORY)**

3.3 **Information Management**

3.3.1 **Worldwide Operations**

3.3.1.1 The KC-X shall operate, per Table 3-1, in all civil and military airspaces at all times including in-flight transitions between classified and unclassified mission segments. **(MANDATORY)**

Table 3-1: Worldwide Operations

Title	Required Attributes
Communication Functions	
3.3.1.1-1 Ultra High Frequency (UHF) voice transceiver	The KC-X shall provide for dual (2) simultaneous-operation secure (up to SECRET) and clear voice, jam-resistant transmit and receive UHF communications (225 to 400 Megahertz (MHz)), interoperable with military UHF voice systems including full time UHF guard receive (243 MHz). **(MANDATORY)**
3.3.1.1-2 Very High Frequency (VHF) voice transceiver	The KC-X shall provide for dual (2) simultaneous-operation voice transmit and receive VHF communications, interoperable with military VHF voice systems (30 to 80 MHz Frequency Modulation (FM) Single-Channel Ground-Air Radio System (SINCGARS) and 108 to 144 MHz Amplitude Modulation (AM)) and civil air traffic control systems (to include RTCA DO 186 class E receiver (8.33 kilohertz (kHz) and 25 kHz channel spacing) and class 5 transmitter (200 nm with 8.33

	kHz channel spacing) with FM immunity including full time VHF guard receive (121.5 MHz)). **(MANDATORY)**
3.3.1.1-3 High Frequency (HF) transceiver	The KC-X shall provide for dual (2) HF voice and data communications with HF Selective Calling System (SELCAL) and automatic link establishment (ALE). **(MANDATORY)**
3.3.1.1-4 Ultra High Frequency Satellite Communications (UHF SATCOM) transceiver	The KC-X shall provide for unclassified and classified (up to SECRET) voice and data communications compatible with half-duplex Demand Assigned Multiple Access (DAMA) and Integrated Waveform (IW) (per Mil-STD-188-182, -183). **(MANDATORY)**
3.3.1.1-5 Satellite telephone	The KC-X shall provide for satellite telephone communications. **(MANDATORY)**
3.3.1.1-6 Crew Interphone System, Intercommunications Control System (ICS)	The KC-X shall provide an ICS that is accessible at all aircrew positions and includes the following: - Boom interphone system for the ARO and ARO instructor which is available at primary aircrew positions when allowed by ARO or ARO instructor (KC-X is a tanker), - Aerial refueling receptacle interphone system at primary aircrew positions (KC-X is a receiver), -Interphone located at all aircrew positions, aircrew rest area, main cargo compartment, and external (fore and aft) for ground servicing, - Private interphone system (minimum 3 full duplex channels) located at all ICS locations with an emergency override function at all primary aircrew positions, and - Aircraft Commander and Pilot control of communications (all frequencies and modes, presets set manually and by mission planning media, and selection of participants on each private interphone channel). **(MANDATORY)**
Civil Data Link Systems & Functions	
3.3.1.1-7 Future Air Navigation System (FANS-1/A) application aeronautical facilities notification (AFN)	The KC-X shall provide for line of sight (LOS) and beyond line of sight (BLOS) data communications in accordance with civil data link standards for FANS-1/A. **(MANDATORY)**
3.3.1.1-8 Aeronautical Telecommunications Network (ATN) application	The KC-X shall provide for LOS and BLOS data communications in accordance with civil data link

	standards for ATN. **(MANDATORY)**
3.3.1.1-9 Automatic Dependent Surveillance - Contract (ADS-C) application	The KC-X shall provide LOS and BLOS data link communications in accordance with civil data link standards for ADS-C. **(MANDATORY)**
3.3.1.1-10 Controller-Pilot Data Link Communications (CPDLC) application	The KC-X shall have the CPDLC application function and provide for transmitting and receipt of CPDLC information via LOS and BLOS data links in accordance with civil data link standards for CPDLC. **(MANDATORY)**
3.3.1.1-11 Aeronautical Operational Control (AOC) application data link communications	The KC-X shall provide for LOS and BLOS data link communications in accordance with civil data link standards for AOC messages identified in Tables A-8 and A-9. **(MANDATORY)**
3.3.1.1-12 Printer	The KC-X shall provide for printing of primary aircrew selected mission planning data. **(MANDATORY)**
3.3.1.1-13 Emergency Locator Transmitter (ELT)	The KC-X shall provide ELT with pilot selectable disable function, for 406 MHz with Global Positioning System (GPS), 243 MHz, and 121.5 MHz frequencies. **(MANDATORY)**
3.3.1.1-14 Automatic Dependent Surveillance - Broadcast (ADS-B) transceivers	The KC-X shall provide two-way (transmit and receive) integrated 1030 and 1090 MHz ADS-B with display of situational awareness data. **(MANDATORY)**
3.3.1.1-15 Mode S Enhanced Surveillance	The KC-X shall transmit and receive Mode S enhanced surveillance data. **(MANDATORY)**
3.3.1.1-16 Identification Friend or Foe, Selective Identification Feature (IFF/SIF) transponders	The KC-X shall provide IFF/SIF Modes 1 through 5, A, C, and S with selectable ground test mode, and provide for simultaneous operation of TCAS and Mode S systems without degrading operations. **(MANDATORY)**
3.3.1.1-17 Airborne doppler weather radar with forward looking windshear detection	The KC-X shall provide forward looking (predictive) wind shear detection and warning system. **(MANDATORY)**
Navigation Systems & Functions	
3.3.1.1-18 Required Navigation Performance (RNP) and Area Navigation (RNAV)	The KC-X shall provide an integrated Flight Management System (FMS) and autopilot with departure, en-route, terminal, and landing navigation, using RNP, RNAV, reduced vertical separation minimums (RVSM), and time of arrival control to include:

	- Over-water unaided navigation solutions with a drift rate of no more than 1.0 nm per hour circular error probable (CEP) - Space-aided and ground-aided navigation solutions (GPS with Receiver Autonomous Integrity Monitoring (RAIM) and Fault Detection and Exclusion (FDE), inertial navigation system (INS), dual distance measuring equipment (DME/DME), VHF omni-directional range distance measuring equipment (VOR/DME), and TACAN) - U.S. terminal and RNAV routes (standard instrument departures (SIDS), and standard terminal arrival routes (STARS)). **(MANDATORY)**
3.3.1.1-19 RNP 12.6	The KC-X shall conduct navigation using Minimum Navigation Performance Specification (MNPS) and RNP 12.6 in the North Atlantic Track (NAT). **(MANDATORY)**
3.3.1.1-20 RNP 10, RNAV 10	The KC-X shall conduct navigation using RNAV 10 and RNP 10 on oceanic and remote routes. **(MANDATORY)**
3.3.1.1-21 RNP 5, RNAV 5, Basic RNAV (BRNAV)	The KC-X shall conduct navigation using RNP 5, RNAV 5, and BRNAV on continental routes. **(MANDATORY)**
3.3.1.1-22 RNP 4	The KC-X shall conduct navigation using RNP 4 on oceanic and remote routes. **(MANDATORY)**
3.3.1.1-23 RNP 2, RNAV 2, United States RNAV (USRNAV) Types A and Q	The KC-X shall conduct navigation using RNAV 2, RNP 2, USRNAV Type A and Q on continental and terminal routes. **(MANDATORY)**
3.3.1.1-24 RNP 1, RNAV 1, Precision RNAV (P-RNAV), USRNAV Type B	The KC-X shall conduct navigation using RNAV 1, P-RNAV, RNP 1, and USRNAV Type B on terminal routes. **(MANDATORY)**
3.3.1.1-25 RNP 0.3, Lateral Navigation (LNAV)	The KC-X shall conduct navigation using RNP 0.3 and LNAV on terminal approach routes. **(MANDATORY)**
3.3.1.1-26 RNP < 0.3 and Special Aircraft and Aircrew Authorization Required (SAAAR) approaches	The KC-X shall conduct RNP < 0.3 and SAAAR landing approaches. **(MANDATORY)**
3.3.1.1-27 LNAV/Vertical Navigation (VNAV), Barometric VNAV (B-VNAV)	The KC-X shall conduct lateral and vertical navigation using LNAV, VNAV, B-VNAV and LNAV/VNAV during landing approaches.

	(MANDATORY)
3.3.1.1-28 Global Navigation Satellite System (GNSS)Landing System (GLS)	The KC-X shall conduct GLS landing approaches. **(MANDATORY)**
3.3.1.1-29 Autonomous landing approaches	The KC-X shall conduct autonomous landing approaches, independent of ground-based navigation aids. **(MANDATORY)**
3.3.1.1-30 TACAN	The KC-X shall conduct TACAN departure, en-route navigation, air-to-air rendezvous, and landing approaches. **(MANDATORY)**
3.3.1.1-31 GPS	The KC-X shall provide Standard Positioning Service (SPS) and Precise Positioning Service (PPS) GPS navigation, integrated with the FMS and autopilot, including the following civil and military GPS functions: - Switching between SPS and PPS modes in flight with no loss of navigation solution. - PPS GPS Selective Availability Anti-Spoofing Module (SAASM) compliant. - PPS free of influence from civil augmentation (i.e., Ground Based Augmentation System (GBAS), Space Based Augmentation System (SBAS), and SPS). **(MANDATORY)**
3.3.1.1-32 Differential Global Positioning System (DGPS)	The KC-X shall conduct DGPS (including SBAS) landing approaches. **(MANDATORY)**
3.3.1.1-33 VOR	The KC-X shall conduct VOR departure, en-route navigation, and landing approaches, with frequency modulation (FM) immunity. **(MANDATORY)**
3.3.1.1-34 Non-Directional Beacon (NDB)	The KC-X shall conduct NDB en-route navigation and non-precision landing approaches. **(MANDATORY)**
3.3.1.1-35 Distance Measuring Equipment (DME)	The KC-X shall perform the DME function for VOR/DME, localizer DME (LOC/DME), localizer back course DME (LOC BC/DME) and in parallel operation with NDB, localizer type directional aid (LDA), and Simplified Directional Facility (SDF) non-precision approaches. **(MANDATORY)**
3.3.1.1-36 Microwave Landing System (MLS)	The KC-X shall conduct MLS precision and non-precision landing approaches. **(MANDATORY)**
3.3.1.1-37 Instrument Landing System (ILS)	The KC-X shall conduct ILS (CAT I, CAT II, and CAT IIIa), Localizer (LOC), LOC Back Course

Category IIIa (ILS Cat IIIa)	(LOC BC), LDA, SDF approaches and landings, with FM immunity. **(MANDATORY)**

3.3.1.1.1 The KC-X should provide cordless interphone system for at least two ground maintenance personnel that interfaces with aircraft ICS and provides coverage within the parking space (normal operations). **(NON-MANDATORY)**

3.3.1.1.2 The KC-X should provide for secure satellite telephone communications (up to SECRET). **(NON-MANDATORY)**

3.3.1.1.3 The KC-X should provide for protected (ARINC 823 standard civil encryption) commercial data link for CPDLC transmit and receive communications. **(NON-MANDATORY)**

3.3.1.1.4 The KC-X should provide for civil Satellite Communications (SATCOM) with at least 432 kilobits per second (kbps) data rate which supports civil Air Traffic Control (ATC) messaging. **(NON-MANDATORY)**

3.3.1.2 **Emission Control**

3.3.1.2.1 The KC-X shall provide for inhibiting of all Communications, Navigation, and Surveillance, Air Traffic Management (CNS/ATM) transmissions and preclude transmission of CNS/ATM-related data accumulated during the inhibited portion of the mission. **(MANDATORY)**

3.3.1.2.2 Operation of all KC-X transmissions shall be selectable on the flight deck, including on and off selection from Aircraft Commander and Pilot positions. **(MANDATORY)**

3.3.1.2.3 All KC-X communications, navigation, and surveillance systems should operate in a non-emitting receive-only mode upon basic aircrew selection. **(NON-MANDATORY)**

3.3.1.3 **National Geospatial Intelligence Agency (NGA) Geospatial Information and Services (GI&S)**

3.3.1.3.1 The KC-X shall be compatible with and use current GI&S data products with foundation feature data attributes which support utilizing all applicable map scales and resolutions. **(MANDATORY)**

3.3.1.3.2 The KC-X shall provide for navigation with respect to all NGA-recognized datum points. **(MANDATORY)**

3.3.1.3.3 The KC-X system shall maintain GI&S data accuracy and granularity to support mission requirements. **(MANDATORY)**

3.3.1.3.4 The KC-X navigation system shall translate all imported datum to *DoD World Geodetic System 1984*. **(MANDATORY)**

3.3.1.3.5 The KC-X shall have a digitized moving map which uses Standard GI&S products from NGA. **(MANDATORY)**

3.3.1.4 **Flight Management System Functionality**

3.3.1.4.1 The KC-X FMS shall include KC-135 military mission unique functionality (e.g.: aerial refueling track; multiple climb, cruise, and descent profiles; and rendezvous) described in Air Force Tactics, Techniques, and Procedures (AFTTP) 3-3.KC-135 and ATP-56 Part 1, Part 2, Annex ZA, Annex ZB (centerline drogue procedures), and Annex ZE (KC-135). **(MANDATORY)**

3.3.1.4.2 The KC-X shall automatically compute KC-X Take Off and Landing Data (TOLD) and range performance data, weight and balance data, and flight planning data throughout the mission environment in normal and abnormal configurations. **(MANDATORY)**

3.3.1.4.3 The KC-X FMS shall be compatible with the NGA/Digital Aeronautical Flight Information File (DAFIF) navigation data. **(MANDATORY)**

3.3.1.4.4 The KC-X FMS shall be compatible with the Air Mobility Command Mission Planning System. **(MANDATORY)**

3.3.1.4.5 The KC-X FMS mission planning interface shall provide for the Aircraft Commander and Pilot to accept missions from a data transfer device, data-linked missions and segments, and alter missions as required. **(MANDATORY)**

3.3.1.4.6 The KC-X FMS shall accept partial mission segments transmitted by data link upon confirmation by the Aircraft Commander and Pilot. **(MANDATORY)**

3.3.1.4.7 Altered KC-X mission flight plans shall be verified by the FMS or other on board system to assure integrity of data and total mission completion. **(MANDATORY)**

3.3.1.4.8 The KC-X FMS shall provide for Aircraft Commander or Pilot in-flight modifications to mission plans. **(MANDATORY)**

3.3.1.4.9 The KC-X FMS shall comply with applicable National Security Agency (NSA) standards for protecting sensitive and classified data, and for maintaining separation between classified and unclassified data. **(MANDATORY)**

3.3.1.5 **Formation Flight**

3.3.1.5.1 The KC-X shall perform day and night formation flight, as defined in AFTTP 3-3.KC-135 Section 5, in both Instrument Meteorological Conditions (IMC) and Visual Meteorological Conditions (VMC) in all phases of flight. **(MANDATORY)**

3.3.1.5.1.1 The KC-X should provide a secondary IMC formation flight system that performs day and night formation flight, as defined in AFTTP 3-3.KC-135 Section 5, in both IMC and VMC in all phases of flight. **(NON-MANDATORY)**

3.3.1.5.2 The KC-X formation flight system shall provide situational awareness information (relative position, altitude, and vertical airspeed of other aircraft) on the Aircraft Commander and Pilot flight displays, to include the predicted flight track of selected aircraft. **(MANDATORY)**

3.3.1.5.2.1 The KC-X formation flight system should provide automated active formation station keeping. **(NON-MANDATORY)**

3.3.1.5.3 The KC-X formation flight system shall annunciate system degradation when safe aircraft separation cannot be maintained. **(MANDATORY)**

3.3.1.5.4 The KC-X shall track and monitor at least 40 aircraft simultaneously (including other tankers and receivers) in accordance with the formation procedures in ATP-56 Part 2 Annex 2A. **(MANDATORY)**

3.3.1.5.5 KC-X exterior formation lighting shall have independently variable intensity controls at the Aircraft Commander and Pilot positions. **(MANDATORY)**

3.3.1.6 The KC-X shall receive and display (multi-function display (MFD) selectable) dynamic weather (e.g., location, temperature, precipitation, cloud cover, turbulence, visibility, water vapor, icing, altitude, time and winds) of any world-wide location, and transmit current local

meteorological conditions by data link both manually and automatically (at least every 10 minutes). **(MANDATORY)**

3.3.1.7 The KC-X shall provide intercom access at the alternate mission equipment (e.g., treaty compliance) locations in the main cargo compartment. **(MANDATORY)**

3.3.1.8 **Command Communication System Access**

3.3.1.8.1 The KC-X shall accommodate and provide for immediate access to all modes of voice communications systems at all flight deck positions, including the flight observer position, and ARO station. **(MANDATORY)**

3.3.1.8.2 The KC-X shall provide for an additional aircrew member on the flight deck with access to command radios, controls and displays that, as a minimum, enables monitoring of flight management activities, viewing of situational awareness information and data link messages, and sending of non-ATC data link messages. **(MANDATORY)**

3.3.1.9 The KC-X shall provide a third (3) simultaneous voice transmit and receive VHF radio interoperable with military VHF voice systems (30 to 80 MHz FM SINCGARS and 108 to 144 MHz AM) and civil air traffic control systems (to include RTCA DO 186 class E receiver (8.33 kilohertz (kHz) and 25 kHz channel spacing) and class 5 transmitter (200 nm with 8.33 kHz channel spacing) with FM immunity including full time VHF guard receive (121.5 MHz)). **(MANDATORY)**

3.3.2 **Net Ready**

3.3.2.1 **Net-Centric**

3.3.2.1.1 The KC-X shall transmit, receive, process, and display encrypted net-centric data (i.e., C2 messages (Extensible Markup Language (XML) simple object access protocol (SOAP) format), email with attachments, text chat, and web browsing on both Non-Secure Internet Protocol Router Network (NIPRNet) and Secure Internet Protocol Router Network (SIPRNet)) at all primary aircrew positions except the flight observer. **(MANDATORY)**

3.3.2.1.2 The KC-X shall transmit and receive encrypted-unclassified e-mail, with attachments, from the cargo compartment, compatible with AE laptop computers. **(MANDATORY)**

3.3.2.1.3 The KC-X system shall operate within the Global Information Grid (GIG) via Key Interface Profiles: UHF SATCOM, Joint Tactical Information Distribution System (JTIDS), Integrated Broadcast Service (IBS), and GPS Space Segment. **(MANDATORY)**

3.3.2.1.4 The KC-X shall comply with DoD Information Technology Standards Registry (DISR) mandated GIG information technology (IT) standards. **(MANDATORY)**

3.3.2.1.4.1 The KC-X precise time of day and date information shall conform to the DISR. **(MANDATORY)**

3.3.2.1.5 The KC-X shall recover from communication delays and disconnections to ensure full information exchanges. **(MANDATORY)**

3.3.2.1.6 The KC-X shall use ground entry points and GIG entry points requiring no new infrastructure for support of net-centric data flows. **(MANDATORY)**

3.3.2.1.7 All KC-X Internet Protocol (IP) based information technology systems shall use Net-Centric Enterprise Services and be compatible with IP Version 4 (IPv4) and IP Version 6 (IPv6). **(MANDATORY)**

3.3.2.2 **Net-Centric Messaging**

3.3.2.2.1 The KC-X shall exchange IP based military C2 messages, in XML-format, identified in Tables A-3 and A-4. **(MANDATORY)**

3.3.2.2.2 The KC-X data transmission systems shall have connectivity and bandwidth to transmit and receive information, to include: broadcast data (e.g., threat updates, KC-X positional information, and friendly force tracks) (within 5 seconds of the event), aerial refueling rendezvous information (within 30 seconds of the event), command and control direction (e.g., mission information and changes) (within 2 minutes of the event), and aircraft status reporting information (within 5 minutes of the event). **(MANDATORY)**

3.3.2.2.3 The KC-X should transmit encrypted near real-time (within 10 minutes) discrepancies and status of systems directly to home station and en-route stations. **(NON-MANDATORY)**

3.3.2.3 **Tactical Data Links**

3.3.2.3.1 The KC-X shall securely transmit, receive, process, and display (MFD selectable) selected J-Series message information (per Mil-STD-6016 and Mil-STD-3011) in accordance with Table A-5 to and from tactical data networks (LOS and BLOS) as a participating network combatant. **(MANDATORY)**

3.3.2.3.2 The KC-X shall receive, filter, process, and display IBS theater intelligence data (per Mil-STD-6018) at each primary aircrew position, excluding the flight observer position. **(MANDATORY)**

3.3.2.4 **Communication Gateways**

3.3.2.4.1 The KC-X shall provide a main cargo compartment interface panel compatible with operating palletized communication relay equipment, provisioned as a minimum in accordance with Table A-2, with a growth path to accommodate at least one (1) additional future communication relay system, with integration requirements typical of the Roll On Beyond Line of Sight Enhancement (ROBE) system. **(MANDATORY)**

3.3.2.4.1.1 The KC-X should receive situational awareness data (e.g., air tracks, ground tracks and threat data) from the palletized communication equipment and selectively display the data (up to SECRET) on the flight deck (MFD selectable). **(NON-MANDATORY)**

3.3.3 **Architecture and Software**

3.3.3.1 **Future Growth**

3.3.3.1.1 The KC-X shall accommodate future systems growth and upgrades by utilizing a Modular Open Systems Approach (MOSA) via widely used, well documented and publicly available, non-proprietary standards for hardware and software interfaces. **(MANDATORY)**

3.3.3.1.2 The KC-X shall provide a growth path for implementing extremely high frequency (EHF) SATCOM capabilities. **(MANDATORY)**

3.3.3.1.3 The KC-X shall provide a growth path for future incorporation of GBAS. **(MANDATORY)**

3.3.3.1.4 The KC-X shall provide growth path to accommodate at least three (3) future C4I systems, with integration requirements typical of Airborne and Maritime/Fixed Station Joint Tactical Radio System (AMF/JTRS). **(MANDATORY)**

3.3.3.2 **Information Assurance (IA)**

3.3.3.2.1 The KC-X shall provide security measures that prevent compromising classified information and equipment, and that comply with all mission assurance category (MAC) 1 Classified DoD Instruction (DODI) 8500.2 IA requirements to ensure IA Certification and Accreditation (C&A). **(MANDATORY)**

3.3.3.2.2 Interconnection of KC-X systems operating at different classification levels shall protect secure voice and data transmissions. **(MANDATORY)**

3.3.3.2.3 All cryptologic devices, including algorithms, shall be NSA Type 1 accredited. **(MANDATORY)**

3.3.3.2.4 All KC-X communication security (COMSEC) equipment shall comply with DoD cryptographic modernization requirements in accordance with Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6510.02. **(MANDATORY)**

3.3.3.2.5 The KC-X shall provide for securing all on-board classified electronic data (for a subsequent power-off condition) in a manner that provides for aircrew to restore mission data prior to next flight, by any one or combination of the following methods: protect the data consistent with data classification level for unguarded data; locking the media in a NSA approved integral container consistent with data classification level; and selectively sanitize per paragraph 3.3.3.7.5. **(MANDATORY)**

3.3.3.2.6 The KC-X and all onboard classified KC-X specific support equipment shall protect, or provide for destruction of electronically stored classified material and crypto keys, within 30 seconds after landing touchdown. **(MANDATORY)**

3.3.3.3 **Security**

3.3.3.3.1 The KC-X shall utilize anti-tamper techniques to prevent: unauthorized access to, modification to, and reproduction of critical technologies and software. **(MANDATORY)**

3.3.3.3.2 The KC-X shall provide preventive measures against unauthorized entry to the aircraft when unattended. **(MANDATORY)**

3.3.3.3.2.1 The KC-X should detect, indicate, and record unauthorized entry into the aircraft. **(NON-MANDATORY)**

3.3.3.4 **Computer Resources**

3.3.3.4.1 The KC-X shall provide storage memory to load the worldwide navigation and terrain databases with 100 percent growth (configured at completion of critical design review (CDR)) installed non-volatile memory. **(MANDATORY)**

3.3.3.4.2 The KC-X shall have at least 100 percent installed reserve (configured at completion of CDR) for the flight management system, defensive system situational awareness system and all newly developed or modified systems, over worst case conditions, in computer resources (memory size, processor and databus utilization) unless otherwise specified herein. **(MANDATORY)**

3.3.3.5 **Operational Flight Program (OFP)**

3.3.3.5.1 All KC-X OFP software and updates shall be loaded and verified through standard interface(s), consolidated at a single location, with each OFP loaded within 30 minutes by organic flightline maintenance personnel. **(MANDATORY)**

3.3.3.5.1.1 All KC-X OFP software and updates should be loaded and verified through standard interface(s), consolidated at a single location, with each OFP loaded within 15 minutes by organic flightline maintenance personnel. **(NON-MANDATORY)**

3.3.3.5.2 The cumulative load time for all loadable OFPs and databases, should not exceed 3 hours. This time includes verification and confirmation that all data is accurate and safe for flight. **(NON-MANDATORY)**

3.3.3.6 The KC-X shall electronically display each of the OFP version(s) and any associated databases, using appropriate groupings of OFP and data installed on the aircraft, by line replaceable unit (LRU) or other discriminator, (including technical manuals and checklists) for both maintenance and aircrew personnel available by user request as well as at system power-up. **(MANDATORY)**

3.3.3.7 **Mission Data**

3.3.3.7.1 The KC-X mission and navigation data (e.g., databases, mission plans, and tables) shall be loaded and verified on the flight deck, via a data transfer system compatible with the Air Force Mission Planning System used by Air Mobility Command. **(MANDATORY)**

3.3.3.7.2 All KC-X IFF and SIF modes and crypto keys shall be loaded on the flight deck. **(MANDATORY)**

3.3.3.7.3 The KC-X shall electronically store, process, transmit, receive, and display classified data (up to SECRET). **(MANDATORY)**

3.3.3.7.3.1 The KC-X should electronically store, process, transmit, receive, and display classified data (up to TOP SECRET). **(NON-MANDATORY)**

3.3.3.7.4 Upon a single operator action the KC-X shall sanitize all classified data (with the exception of flight deck voice and flight data recorders) in accordance with AF System Security Instruction (SSI) 8580 and zeroize all COMSEC keying material, and protect both from inadvertent activation. **(MANDATORY)**

3.3.3.7.5 The KC-X shall provide for selective sanitization of any system that contains sensitive information (i.e., electronic order of battle, digital map, navigation and mission specific data) (with the exception of flight deck voice and flight data recorders) within 15 seconds when power is on. **(MANDATORY)**

3.3.3.7.5.1 The KC-X should provide for selective sanitization of any system that contains sensitive information (i.e., electronic order of battle, digital map, navigation and mission specific data) (with the exception of flight deck voice and flight data recorders) within 15 seconds when power is off. **(NON-MANDATORY)**

3.3.3.7.6 All KC-X loadable databases shall be loaded and verified within 30 minutes per database. **(MANDATORY)**

3.3.3.7.6.1 All KC-X loadable databases should be loaded and verified within 15 minutes per database. **(NON-MANDATORY)**

3.3.3.7.7 The KC-X shall provide for flight deck loading of weight and balance data and verifying against aircraft limits, within 2 minutes. **(MANDATORY)**

3.3.3.7.7.1 The KC-X should provide for flight deck loading of weight and balance data and verifying against aircraft limits, within 30 seconds. **(NON-MANDATORY)**

3.3.3.7.8 The KC-X shall record voice and flight data information to support the Military Flight Operational Quality Assurance program requirements including data listed in Table A-6, Aircraft Information Program Data Collection Items. **(MANDATORY)**

3.3.3.7.9 The KC-X flight deck voice recording system (including ICS) shall accommodate holding classified discussions on the flight deck (including ARO station), and meet NSA requirements for encrypting sensitive and classified (up to SECRET) information. **(MANDATORY)**

3.3.3.8 The KC-X should provide for dual (2) secure (up to SECRET) digital HF voice and data communications. **(NON-MANDATORY)**

3.3.3.9 **Aircrew Interphone System**

3.3.3.9.1 The KC-X ICS should provide for use of United States Air Force (USAF) active noise reduction headsets. **(NON-MANDATORY)**

3.3.3.9.2 The KC-X should provide automated (pre-recorded) passenger briefing (audio only) audible in the main cargo compartment. **(NON-MANDATORY)**

3.3.3.10 The KC-X should provide redundant IFF/SIF (All modes). **(NON-MANDATORY)**

3.4 **Operational Utility**

3.4.1 **Bare Base Operations**

3.4.1.1 The KC-X shall support aerial refueling operations from bare base airfields with confined ramp space, as defined by a parking space (normal operations) of less than 100,000 square feet and a ground flotation Aircraft Classification Number (ACN) of less than Rigid Type C 110. **(MANDATORY)**

3.4.2 **Aircraft Performance**

3.4.2.1 After a maximum gross weight takeoff, the KC-X shall climb to 31,000 ft altitude within 30 minutes. **(MANDATORY)**

3.4.2.2 **Takeoff and Landing Performance**

3.4.2.2.1 The KC-X shall operate (balanced field performance using FAA ground rules) from a 7,000 ft dry, hard-surface runway. **(MANDATORY)**

3.4.2.2.1.1 The KC-X should perform the fuel offload versus unrefueled radius range described in paragraph 3.1.1.1 (from 500 nm to 2,500 nm) from a 7,000 ft dry, hard-surface runway (balanced field performance using FAA ground rules). **(NON-MANDATORY)**

3.4.2.3 **Aircraft Maneuverability**

3.4.2.3.1 For the tanker tactical profiles described in AFTTP 3-3.KC-135 and all Class III flight phases and tasks currently performed by the KC-135, the KC-X shall exhibit flying qualities no worse than Level 1 (Satisfactory) in Common atmospheric disturbances, no worse than Level 2 (Tolerable) in Uncommon atmospheric disturbances, no worse than Level 2 (Tolerable) with any single failure, and no worse than PIOR 2 in up through Uncommon atmospheric disturbances, all as defined in MIL-STD-1797.**(MANDATORY)**

3.4.2.4 The KC-X shall maintain CG within limits without requiring unusable ballast fuel. **(MANDATORY)**

3.4.2.5 **Aircraft Engines**

3.4.2.5.1 The KC-X engines shall operate for ten continuous minutes at maximum takeoff power during climb-out, without requiring post flight inspection for continued normal operation. **(MANDATORY)**

3.4.2.5.2 The KC-X engines shall have sufficient power to operate the aircraft at 90% or less of the engine's maximum thrust capacity during all phases of flight at associated conditions and maximum operating weights. **(MANDATORY)**

3.4.2.5.3 The KC-X shall provide a single exterior receptacle for ground air start (non-simultaneous) of any and all engines. **(MANDATORY)**

3.4.2.5.4 The KC-X should back up on a zero (0) percent grade hard-ground surface using its own engine power at maximum ramp weight. **(NON-MANDATORY)**

3.4.2.6 **Quick Start**

3.4.2.6.1 The KC-X shall start engines, taxi 3,000 feet, and take-off within 10 minutes from a power off "on alert" (fully fueled, ullage inerting not required, checklists complete up to engine start) configuration throughout the KC-X operating temperature range (-40°Fahrenheit (F) to +130°F) with the aircraft temperature soaked for the previous 24 hour period. **(MANDATORY)**

3.4.2.7 The KC-X shall have a weighted average fuel usage rate of no greater than five (5) percent above ___ (gallons per hour) when performing the mission profiles and using ground rules in Table A-10. Blank to be filled in by offeror. **(MANDATORY)**

3.4.2.8 The KC-X should have a minimum unrefueled ferry range of 9,500 nm starting at maximum takeoff gross weight at brake release, and utilizing a maximum range flight profile. No runway length restriction is imposed for this requirement. Landing reserve fuel is five (5) percent of initial fuel load. Takeoff fuel allowance is the same as for the fuel offload versus radius calculations. Descent, approach and landing fuel allowances reflect an en-route descent to approach and landing at the destination. **(NON-MANDATORY)**

3.4.3 **Utility Attributes**

3.4.3.1 **FAA Certification and USAF Airworthiness**

3.4.3.1.1 The KC-X shall be FAA certified (i.e., Type Certificate and Supplemental Type Certificates, including FAA certifications for ditching and ice protection) including aircraft configurations necessary to meet the requirements herein (e.g., with and without the following: wing-mounted drogue refueling systems, 463L pallets, non-developmental 463L palletized seating, PSPs, LSAS, and LAIRCM turrets). **(MANDATORY)**

3.4.3.1.2 The KC-X shall meet the equipment requirements of 14 CFR Part 121, to include 180-minute extended operations (ETOPS) and for extended overwater operations. **(MANDATORY)**

3.4.3.1.3 The KC-X shall meet 14 CFR Part 36 Stage 4 noise requirements. **(MANDATORY)**

3.4.3.1.4 The KC-X shall comply with USAF airworthiness requirements documented in the approved KC-X Airworthiness Specification. **(MANDATORY)**

3.4.3.2 **Natural Environmental Factors**

3.4.3.2.1 The KC-X shall operate worldwide and remain fully mission capable in all temperature, altitude, vibration, shock, cabin altitudes, humidity, sand, dust, precipitation and saltwater-laden breezes that the KC-X may be exposed to in flight or on the ground. **(MANDATORY)**

3.4.3.3 To enhance interoperability, all newly developed and modified (beyond baseline non-military aircraft) KC-X systems shall be compatible with Joint DoD and NATO standards for ground servicing and OFP loading. **(MANDATORY)**

3.4.3.4 **Environmental, Safety and Occupational Health**

3.4.3.4.1 The KC-X shall comply with federal, state, local, and international pollution control laws and regulations. **(MANDATORY)**

3.4.3.4.2 The KC-X system shall comply with AF Occupational, Safety and Health (AFOSH) standards 91-25, 91-38, 91-50, 91-67, 91-68, and 91-100. **(MANDATORY)**

3.4.3.4.3 The KC-X system environment, safety and health risks shall be eliminated, minimized or controlled to acceptable levels using improbable risk levels, as defined in MIL-STD-882, of less than 10E-9 during aircraft system life. **(MANDATORY)**

3.4.3.4.4 The KC-X system shall have acceptable safety risk levels of all potentials for mishaps, in accordance with MIL-STD-882 Tables A-II, A-III, and A-IV. **(MANDATORY)**

3.4.3.5 **Hazardous Materials (HAZMAT) and Ozone Depleting Substances (ODSs)**

3.4.3.5.1 There shall be no additional KC-X ODSs beyond the non-military baseline aircraft. **(MANDATORY)**

3.4.3.5.2 There shall be no additional KC-X HAZMAT use and hazardous waste disposal beyond the non-military baseline aircraft (additional fuel types and LAIRCM excluded). **(MANDATORY)**

3.4.3.5.3 The KC-X shall utilize a FAA certified non-ODS fire suppression system. **(MANDATORY)**

3.4.3.6 **Electromagnetic Environmental Effects (E3)**

3.4.3.6.1 The KC-X shall operate in its intended operational E3 environment in accordance with MIL-STD-464 without suffering or causing performance degradation. **(MANDATORY)**

3.4.3.7 **Fuel Management**

3.4.3.7.1 The KC-X shall display aircraft CG (longitudinal and lateral) while in flight and on the ground. **(MANDATORY)**

3.4.3.7.2 The KC-X shall automatically adjust CG calculations depending on the type and density of on-board approved fuels. **(MANDATORY)**

3.4.3.8 **Aircraft Environmental System**

3.4.3.8.1 The KC-X environmental system shall enable self-sustained worldwide ground operations within an outside ambient temperature range of -40°F to +130°F, including worst case corresponding internal temperatures. **(MANDATORY)**

3.4.3.8.2 The KC-X integrated avionics suite shall not use liquid cooling. **(MANDATORY)**

3.4.3.9 **Electrical System**

3.4.3.9.1 The KC-X electrical system shall supply system power requirements (without use of the APU) with margin to support specified growth in section 3.3.3.1. **(MANDATORY)**

3.4.3.9.1.1 The KC-X electrical system should supply twice the proposed system power requirements (without use of the APU). **(NON-MANDATORY)**

3.4.3.9.2 The KC-X electrical power system shall provide a smooth transition from external to internal aircraft power and for internal transfers, precluding power interruptions that may cause or require any operating system or peripheral device to reinitialize during transition. **(MANDATORY)**

3.4.3.9.3 The KC-X shall provide 115 Volts, Alternating Current (VAC) 60 Hertz (Hz) nominal (minimum 20 amp service) outlets on the right and left sides, at every other pallet row per side, readily accessible throughout the main cargo compartment, on the flight deck and in the galley. **(MANDATORY)**

3.4.3.9.4 The KC-X shall provide 28 volt Direct Current (DC) connections at each aircrew seat to support current aircrew chemical and biological equipment blower assembly to enable

aircrew to perform in-flight duties in chemical and biological environments. **(MANDATORY)**

3.4.3.10 **Auxiliary Power Unit**

3.4.3.10.1 The KC-X APU shall supply the maximum continuous electrical load required for all aircraft ground operations (including engine start) simultaneously, with margin to support specified growth in section 3.3.3.1. **(MANDATORY)**

3.4.3.10.1.1 The KC-X APU should supply twice the maximum continuous electrical load required for all aircraft ground operations (including engine start) simultaneously. **(NON-MANDATORY)**

3.4.3.10.2 The KC-X shall provide for APU start from both externally near the main aircrew entry door (accessible on the ground) and the Aircraft Commander and Pilot positions. **(MANDATORY)**

3.4.3.10.3 The KC-X APU shall start and operate throughout the ground and in-flight envelopes and environments necessary for operational needs. **(MANDATORY)**

3.4.3.11 **Paint**

3.4.3.11.1 The KC-X shall be painted in accordance with an AMC approved paint scheme including meeting current military aerospace applications for advanced performance requirements (Military Performance Specification (MIL-PRF)-32239, Type 2, Class 1). **(MANDATORY)**

3.4.3.12 **Service Life**

3.4.3.12.1 The KC-X shall meet a design service life of at least forty (40) years with 750 flight hours per year to the usage and profiles in Figure A-1, and meet no less than the structural integrity criteria of the baseline non-military aircraft. **(MANDATORY)**

3.4.3.12.1.1 The KC-X should meet a design service life of at least forty (40) years with 1,000 flight hours per year to the usage and profiles in Figure A-1, and meet no less than the structural integrity criteria of the baseline non-military aircraft. **(NON-MANDATORY)**

3.4.3.13 The KC-X shall detect and indicate to aircrew an over-G event. **(MANDATORY)**

3.4.3.14 **Treaty Compliance Support**

3.4.3.14.1 The KC-X shall have dedicated Ethernet (Cat 5E or equivalent) and RS 422 compliant cabling running from each wing multi-point refuel mounting hard point to a location in the main cargo compartment for interfacing with alternate mission equipment. **(MANDATORY)**

3.4.3.14.2 The KC-X shall provide 28 volts DC available at each wing multi-point refuel mounting hard point (at least 15 amps continuous and 30 amps startup) and in the main cargo compartment (at least 5 amps continuous and 10 amps startup) for the treaty compliance equipment. **(MANDATORY)**

3.4.3.14.3 The KC-X shall provide 115 VAC 400 Hz three phase (16 KVA continuous and 24 KVA at startup) for the treaty compliance equipment in the main cargo compartment. **(MANDATORY)**

3.4.3.14.4 The KC-X shall provide the following navigation data (via ARINC 429 interface or equivalent) for the treaty compliance equipment in the main cargo compartment: latitude, longitude, altitude (barometer adjusted), GPS altitude, GPS time, true air speed, true heading, ground track direction, ground track velocity, wind direction, and wind velocity. **(MANDATORY)**

3.4.3.15 **Human-System Interface**

3.4.3.15.1 The KC-X system shall be compatible with human physical and cognitive characteristics and limitations, including all controls, displays, auditory indicators, and other cognitive decision aids. **(MANDATORY)**

3.4.3.15.2 The KC-X minimum aircrew complement for operation shall be no more than an Aircraft Commander, Pilot, and one ARO (basic aircrew). **(MANDATORY)**

3.4.3.15.3 The KC-X flight deck (excluding ARO station) shall accommodate Case 2 through Case 6 and Case 9 of the anthropometric characteristics specified in Table 5 of ENFC-CSB-08-01, and accommodate flying class III anthropometric criteria as described in AFI48-123, at the ARO station. **(MANDATORY)**

3.4.3.15.3.1 The KC-X flight deck and ARO station should additionally accommodate Cases 1 and 7 of Table 5 of ENFC-CSB-08-01. **(NON-MANDATORY)**

3.4.3.16 **Oxygen System**

3.4.3.16.1 The KC-X shall provide a primary oxygen system with panel mounted regulators to support aircrew standard oxygen masks and chem/bio breathing devices (per TO 14-1-1 Table 6-1 for KC-10 and KC-135) at aircrew permanent seats. **(MANDATORY)**

3.4.3.16.2 The KC-X shall have a secondary oxygen source (equivalent capacity as a MA-1 bottle, and rechargeable from the flight deck primary oxygen system and two other main cargo compartment locations) accessible in-flight at each of the following locations: flight deck for primary aircrew members, emergency equipment stations, lavatories, galley(s), aircrew rest accommodations, and at a minimum of five stations throughout the main cargo compartment. **(MANDATORY)**

3.4.3.16.3 The KC-X should generate onboard oxygen on the ground and in-flight with sufficient capacity for maximum aircrew, passenger and patient loads (including patient movements). **(NON-MANDATORY)**

3.4.3.17 **Aircraft Access**

3.4.3.17.1 The KC-X shall provide entry into the aircraft and access to the flight deck within 2 minutes (starting from outside a closed aircraft) without the use of ground equipment. **(MANDATORY)**

3.4.3.17.1.1 The KC-X should provide entry into the aircraft and access to the flight deck within 30 seconds (starting from outside a closed aircraft) without the use of ground equipment. **(NON-MANDATORY)**

3.4.3.17.2 The KC-X entry means shall be integral to the aircraft and stowed within 2 minutes without exceeding the physical effort constraints of an aircrew member in accordance with FAA Human Factors Design Standard (HFDS) 2003, section 14.5. **(MANDATORY)**

3.4.3.17.2.1 The KC-X entry means should be integral to the aircraft and stowed within 30 seconds without exceeding the physical effort constraints of an aircrew member, in accordance with FAA HFDS 2003, section 14.5. **(NON-MANDATORY)**

3.4.3.17.3 The KC-X shall provide aircrew members in-flight access to all main deck compartments. **(MANDATORY)**

3.4.3.18 **Aircrew Equipment Storage**

3.4.3.18.1 The KC-X shall provide at least 16 cubic feet of storage space for flight bags, a lockable gun box (in addition to the one forward of the main cargo compartment) and personal gear for

six of the aircrew members (at least one full helmet bag and standard publications bag each). **(MANDATORY)**

3.4.3.18.2 The KC-X shall provide sufficient secure storage (at least 16 inches x 10 inches x 18 inches) for sensitive and classified aircrew items. **(MANDATORY)**

3.4.3.19 **Controls and Displays**

3.4.3.19.1 KC-X task loading shall be within the aircrew human limitations such that both normal and emergency tasks can be accomplished within mission constraints. **(MANDATORY)**

3.4.3.19.2 Newly developed and modified KC-X flight deck displays (hardware, software and information) shall use display symbology in accordance with MIL-STD-1787. **(MANDATORY)**

3.4.3.19.2.1 All KC-X flight deck displays (hardware, software and information) should use display symbology in accordance with MIL-STD-1787. **(NON-MANDATORY)**

3.4.3.19.3 All KC-X flight deck displays should be placed in accordance with MIL-STD-1787, Section 4.1.6. **(NON-MANDATORY)**

3.4.3.20 **Crew Rest**

3.4.3.20.1 The KC-X shall provide three (3) aircrew horizontal resting accommodations, each equipped with emergency oxygen access and individual lighting suitable for reading (70 foot-candles). **(MANDATORY)**

3.4.3.20.2 The KC-X should provide six (6) aircrew horizontal resting accommodations, each equipped with emergency oxygen access and individual lighting suitable for reading (70 foot-candles). **(NON-MANDATORY)**

3.4.3.21 The KC-X shall provide lighting for work surfaces in accordance with applicable sections of MIL-STD-1472 sufficient for occupants to conduct assigned tasks. **(MANDATORY)**

3.5 **Survivability**

3.5.1 **Self Protection**

3.5.1.1 The KC-X shall operate in hostile environments as defined in the classified Appendix B, Table B-1. **(MANDATORY)**

3.5.1.2 **Defensive Systems (DS)**

3.5.1.2.1 The KC-X DS shall provide for reprogramming using existing fielded USAF support equipment. **(MANDATORY)**

3.5.1.2.2 The KC-X DS shall display status information viewable by Aircraft Commander, Pilot, and flight observer. **(MANDATORY)**

3.5.1.2.3 The KC-X IR and RF DS should neither be blinded by other on-board sensors and emitters nor the IR DS incur blindness greater than Y time in accordance with classified Appendix B, Table B-2 due to flash from nuclear detonation and from flares. **(NON-MANDATORY)**

3.5.1.3 **Fuel Tank Protection**

3.5.1.3.1 Fire and explosion protection of all KC-X fuel tanks shall be equivalent to an ullage oxygen content of 9.8 percent or less, for AFTTP 3-3.KC-135 profiles from prior to takeoff through landing. **(MANDATORY)**

3.5.1.3.2 The KC-X shall inert the fuel tank ullage and vent lines to the levels specified in paragraph 3.5.1.3.1 within 90 minutes while on the ground. The following ground rules shall be used: starting from ambient in-tank oxygen concentration, sea level standard day conditions, and

aircraft fuel load for no more than a 2,000 nm ferry mission (no cargo) using a normal aircraft climb schedule to optimum cruise altitude, a cruise climb profile at optimum altitudes, an en-route descent, and landing with reserve fuel sufficient for no more than 2 hours at best range speed at optimum altitude(s) (No fuel conservatism). **(MANDATORY)**

3.5.1.4 **Ballistics Protection**

3.5.1.4.1 The KC-X shall provide integral flight deck floor and sidewall (at least 1 foot up from the floor) protection from small arms or AAA fire (7.62 millimeter (mm) armor piercing incendiary (API) round at velocities up to muzzle velocity), not adding more than 8 pounds per square foot of coverage, such that no single shot incapacitates a primary aircrew member. **(MANDATORY)**

3.5.1.4.1.1 The KC-X should provide integral flight deck floor and sidewall (at least 2 feet up from the floor) protection from small arms or AAA fire (12.7 mm API round and armor piercing incendiary - tracer (APIT) round at velocities up to muzzle velocity), not adding more than 10 pounds per square foot of coverage, such that no single shot incapacitates a primary aircrew member. **(NON-MANDATORY)**

3.5.1.4.2 The KC-X shall have integral protection for flight-critical aircraft systems against small arms or AAA fire (7.62 mm API round at velocities up to muzzle velocity), not adding more than 8 pounds per square foot of coverage, such that no single shot causes catastrophic loss of the aircraft. **(MANDATORY)**

3.5.1.4.2.1 The KC-X should have integral protection for flight-critical aircraft systems against small arms or AAA fire not to exceed 12.7 mm API round and APIT round at velocities up to muzzle velocity), not adding more than 10 pounds per square foot of coverage, such that no single shot causes catastrophic loss of the aircraft. **(NON-MANDATORY)**

3.5.1.4.3 The KC-X should provide integral floor and sidewall (at least 2 feet up from the floor) protection for all aircrew positions from small arms or AAA fire (12.7 mm API round and APIT round at velocities up to muzzle velocity), not adding more than 10 pounds per square foot of coverage, such that no single shot incapacitates any aircrew member located at their seat. **(NON-MANDATORY)**

3.5.1.5 **Electromagnetic Pulse Protection**

3.5.1.5.1 The KC-X flight critical systems and aerial refueling mission critical systems (as a tanker and a receiver, excluding wing-mounted drogue refueling systems) shall remain fully operational and without degradation of performance when exposed to the E3 requirements of MIL-STD-464, including EMP requirements. **(MANDATORY)**

3.5.1.5.2 All KC-X wing-mounted drogue refueling systems should remain fully operational and without degradation of performance when exposed to the E3 requirements of MIL-STD-464, including EMP requirements. **(NON-MANDATORY)**

3.5.1.5.3 All KC-X mission critical systems should remain fully operational and without degradation of performance when exposed to the E3 requirements of MIL-STD-464, including EMP requirements. **(NON-MANDATORY)**

3.5.1.6 **Force Protection (Chem/Bio)**

3.5.1.6.1 The KC-X shall provide for controls and systems operation by aircrew, and aircraft servicing, launch and recovery tasks by organizational level (O-level) maintenance personnel, all wearing chem/bio protective clothing and associated equipment as identified in Table 6-1 of TO 14-1-1 for KC-10 and KC-135. **(MANDATORY)**

3.5.1.6.2 The KC-X shall perform all mission critical operations, including aerial refueling, for at least 30 days (without decontamination) after exposure to the chem/bio threat environments as defined in the classified Appendix B, Table B-3 and Table B-4. **(MANDATORY)**

3.5.1.6.3 The KC-X should provide for suitably clothed (up to Mission Oriented Protection Posture IV ensembles), trained, and acclimated personnel to perform mission-essential operations, communications, maintenance, re-supply and decontamination tasks in chem/bio threat environments, in accordance with classified Appendix B, Table B-3 and Table B-4. **(NON-MANDATORY)**

3.5.1.6.4 Decontamination (i.e., internal +180°F hot air decontamination and externally applied +140°F hot soapy water at 100 psi) should not degrade the KC-X either structurally or functionally. **(NON-MANDATORY)**

3.5.1.7 **Eye Protection Systems**

3.5.1.7.1 The KC-X shall provide for the primary aircrew performing duties while wearing laser eye protection devices as identified in AFI 11-301 Volume 4, Aircrew Laser Eye Protection (ALEP). **(MANDATORY)**

3.5.1.7.2 The KC-X shall be compatible with flash blindness protection devices identified in TO 14-1-1 including the Lead Lanthium Zirconium Titanate (PLZT) system, or provide at least the equivalent protection. **(MANDATORY)**

3.5.1.8 **NVIS and Covert Compatibility**

3.5.1.8.1 The KC-X shall provide for switching in flight between covert and normal lighting modes. **(MANDATORY)**

3.5.1.8.2 The KC-X flight deck displays shall annunciate which lighting mode (covert or normal) is in use. **(MANDATORY)**

3.5.1.8.3 The KC-X shall be compatible with use of existing Class B/C night vision imaging systems as defined in MIL-STD-3009. **(MANDATORY)**

3.5.1.8.4 The KC-X shall takeoff, land, and aerial refuel, as a tanker (boom and drogue) and receiver while in an NVIS environment. **(MANDATORY)**

3.5.1.8.5 The KC-X shall operate in all flight and ground regimes in an NVIS environment. **(MANDATORY)**

3.5.1.8.6 The KC-X external lighting system (including formation lighting) shall be compatible with night vision imaging systems in accordance with MIL-STD-3009. **(MANDATORY)**

3.5.2 **IR Protection**

3.5.2.1 The KC-X shall include a three (3) turret Large Aircraft Infra-Red Counter Measures (LAIRCM) (AN/AAQ-24B (V)12) system (without the turrets installed) that meets the mandatory performance requirements described in the IR protection section herein when installed with turrets. **(MANDATORY)**

3.5.2.2 The KC-X LAIRCM defensive system (DS) shall successfully counter an aggregate average of X percent of available and exploited Tier 1 Group 1 missile engagements at all threat aspects and to an adequate miss distance with no individual missile type's average less than XX in accordance with classified Appendix B, Table B-2. **(MANDATORY)**

3.5.2.3 The KC-X LAIRCM DS shall operate within aircraft flight envelope in accordance with classified Appendix B, Table B-2. **(MANDATORY)**

3.5.2.4 The KC-X LAIRCM DS shall successfully operate within the aircraft environments in accordance with classified Appendix B, Table B-2. **(MANDATORY)**

3.5.2.5 The KC-X LAIRCM DS shall provide X azimuth and elevation spatial coverage protection in accordance with classified Appendix B, Table B-2, in any aircraft configuration or permissible orientation. **(MANDATORY)**

3.5.2.6 The KC-X LAIRCM DS shall successfully counter simultaneous engagements in accordance with classified Appendix B, Table B-2. **(MANDATORY)**

3.5.2.7 The KC-X LAIRCM DS (as integrated) false alarm rate shall be less than or equal to X in accordance with classified Appendix B, Table B-2. **(MANDATORY)**

3.5.2.7.1 The KC-X LAIRCM DS (as integrated) false alarm rate should be less than or equal to Y in accordance with classified Appendix B, Table B-2. **(NON-MANDATORY)**

3.5.2.8 The KC-X LAIRCM DS countermeasures shall not degrade the electromagnetic compatibility of other systems, and not interfere with any aircraft operations. **(MANDATORY)**

3.5.2.9 The KC-X LAIRCM DS (as integrated) Mean Repair Time (MRT) shall not exceed 60 minutes. **(MANDATORY)**

3.5.2.9.1 The KC-X LAIRCM DS (as integrated) MRT should not exceed 30 minutes. **(NON-MANDATORY)**

3.5.2.10 Reloading of KC-X LAIRCM DS classified countermeasures software shall be possible without maintenance support. **(MANDATORY)**

3.5.2.11 The KC-X LAIRCM DS shall identify to personnel whether the system contains classified information without maintenance support. **(MANDATORY)**

3.5.3 **RF Protection**

3.5.3.1 **RF Detection**

3.5.3.1.1 The KC-X shall warn the Aircraft Commander and Pilot of the presence of RF directed weapon systems in accordance with classified Appendix B Table B-5, with the exception identified by note 1 in the aforementioned table. **(MANDATORY)**

3.5.3.1.2 The KC-X shall warn the Aircraft Commander and Pilot of the presence of RF directed weapons systems identified in classified Appendix B Table B-5 within X response times in accordance with classified Appendix B Table B-6. **(MANDATORY)**

3.5.3.1.2.1 The KC-X should warn the Aircraft Commander and Pilot of the presence of RF directed weapons systems identified in classified Appendix B Table B-5 within Y response times in accordance with classified Appendix B Table B-6. **(NON-MANDATORY)**

3.5.3.1.3 The KC-X RF detection system shall calculate the location (geolocation) of the origin of the RF signal associated with each detected ground-based RF emitter identified, within X seconds in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.3.1 The KC-X RF detection system should calculate the location (geolocation) of the origin of the RF signal associated with each detected ground-based RF emitter identified, within Y seconds in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.4 The KC-X RF detection system shall detect, identify, and locate signals associated with RF emitters identified in classified Appendix B, Table B-5. **(MANDATORY)**

3.5.3.1.5 The KC-X RF detection system shall successfully detect an aggregate average of at least X percent of emitters in accordance with classified Appendix B, Table B-7 greater than the

emitter detection ranges (R_D) identified in classified Appendix B, Table B-5. **(MANDATORY)**

3.5.3.1.5.1 The KC-X RF detection system should successfully detect an aggregate average of at least Y percent of emitters in accordance with classified Appendix B, Table B-7 greater than R_D identified in classified Appendix B, Table B-5. **(NON-MANDATORY)**

3.5.3.1.6 The KC-X RF detection system shall detect emitters transmitting in the XX frequency bands in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.6.1 The KC-X RF detection system should detect emitters transmitting in the YY frequency bands in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.7 The KC-X RF detection system shall correctly identify an aggregate average of at least X percent of emitters in accordance with classified Appendix B, Table B-7 greater than R_D identified in classified Appendix B, Table B-5, and display the correct symbol associated with the emitter. **(MANDATORY)**

3.5.3.1.7.1 The KC-X RF detection system should correctly identify an aggregate average of at least Y percent of emitters in accordance with classified Appendix B, Table B-7 greater than R_D identified in classified Appendix B, Table B-5, and display the correct symbol associated with the emitter. **(NON-MANDATORY)**

3.5.3.1.8 The KC-X RF detection system shall correctly and unambiguously identify at least X percent of the emitters in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.8.1 The KC-X RF detection system should correctly and unambiguously identify at least Y percent of the emitters in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.9 The KC-X RF detection system shall have an azimuth accuracy of X degrees or less for ground based, high band emitters in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.9.1 The KC-X RF detection system should have an azimuth accuracy of Y degrees or less for ground based, high band emitters in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.10 The KC-X RF detection system shall have an azimuth accuracy of X degrees or less for ground based, low band emitters in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.10.1 The KC-X RF detection system should have an azimuth accuracy of Y degrees or less for ground based, low band emitters in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.11 The KC-X RF detection system azimuth accuracy shall be achieved at least X percent of the time in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.11.1 The KC-X RF detection system azimuth accuracy should be achieved at least Y percent of the time in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.12 The KC-X RF detection system shall determine slant range to X accuracy XX percent of the time in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.12.1 The KC-X RF detection system should determine slant range to Y accuracy YY percent of the time in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.13 The KC-X RF detection system shall detect and identify threat systems in a dense signal environment as detailed in classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.14 The KC-X RF detection system shall provide at least X degrees RF detection coverage in elevation, in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.14.1 The KC-X RF detection system should provide at least Y degrees RF detection coverage in elevation, in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.1.15 The KC-X RF detection system shall provide at least X degrees RF detection coverage in azimuth, in accordance with classified Appendix B, Table B-7. **(MANDATORY)**

3.5.3.1.15.1 The KC-X RF detection system should provide at least Y degrees RF detection coverage in azimuth, in accordance with classified Appendix B, Table B-7. **(NON-MANDATORY)**

3.5.3.2 **RF Defensive Systems Situational Awareness (SA)**

3.5.3.2.1 The KC-X shall receive off-board SA data, correlate this data with on-board sensor data, and display to the Aircraft Commander and Pilot battle-space information to provide for SA and assist in using defensive systems and avoiding potential threats. **(MANDATORY)**

3.5.3.2.2 The KC-X shall provide threat avoidance information, consisting of an audible warning as well as a graphical depiction of the relationship of the aircraft to the threat avoidance range boundary on the threat display, to the Aircraft Commander and Pilot at least X seconds prior to entering the threat avoidance range, in accordance with classified Appendix B, Table B-8. **(MANDATORY)**

3.5.3.2.2.1 The KC-X should provide threat avoidance information, consisting of an audible warning as well as a graphical depiction of the relationship of the aircraft to the threat avoidance range boundary on the threat display, to the Aircraft Commander and Pilot at least Y seconds prior to entering the threat avoidance range, in accordance with classified Appendix B, Table B-8. **(NON-MANDATORY)**

3.5.3.2.3 The KC-X shall continuously correlate data from on-board sensors, off-board sensors, and the pre-loaded electronic order of battle (EOB) provided by the mission-planning system and update the EOB within X seconds, in accordance with classified Appendix B, Table B-8. **(MANDATORY)**

3.5.3.2.3.1 The KC-X should continuously correlate data from on-board sensors, off-board sensors, and the pre-loaded EOB provided by the mission-planning system and update the EOB within Y seconds, in accordance with classified Appendix B, Table B-8. **(NON-MANDATORY)**

3.5.3.2.4 The KC-X defensive SA system shall provide on-board embedded operator training (with simulated threats). **(MANDATORY)**

3.5.3.2.5 The KC-X defensive SA system shall automatically plan optimized-threat-avoidance route(s) (for quickest time back to previous course) and provide associated maneuvering cues to the Aircraft Commander and Pilot within X seconds after a threat has been identified, in accordance with classified Appendix B, Table B-8, to safely avoid new threats as they are identified and located. **(MANDATORY)**

3.5.3.2.5.1 The KC-X defensive SA system should automatically plan optimized-threat-avoidance route(s) (for quickest time back to previous course) and provide associated maneuvering cues to the Aircraft Commander and Pilot within Y seconds after a threat has been identified, in accordance with classified Appendix B, Table B-8, to safely avoid new threats as they are identified and located. **(NON-MANDATORY)**

3.5.3.2.6 The KC-X defensive SA system shall use terrain data to automatically plan a selectable terrain-masking, optimized-threat-avoidance route(s) (for quickest time back to previous course) and provide associated maneuvering cues to the Aircraft Commander and Pilot within X seconds after a threat has been identified, in accordance with classified Appendix B, Table B-8, to safely avoid new threats as they are identified and located. **(MANDATORY)**

3.5.3.2.7 The KC-X shall record and provide for download of at least 4 hours of EOB data processed during threat portion of mission(s). **(MANDATORY)**

3.5.3.2.7.1 The KC-X should record and provide for download of at least 18 hours of EOB data processed during threat portion of mission(s). **(NON-MANDATORY)**

3.5.3.2.8 The KC-X shall provide threat avoidance information for the types of threat systems selected by the Aircraft Commander and Pilot within X seconds after determining the flight path will enter threat avoidance range (R_T) of a detected threat in accordance with classified Appendix B, Table B-8. **(MANDATORY)**

3.5.3.2.8.1 The KC-X should provide threat avoidance information for the types of threat systems selected by the Aircraft Commander and Pilot within Y seconds after determining the flight path will enter R_T of a detected threat in accordance with classified Appendix B, Table B-8. **(NON-MANDATORY)**

3.5.3.2.9 The KC-X shall display the R_T for any displayed threat (active or inactive) selected, where R_T is defined in classified Appendix B. **(MANDATORY)**

3.5.3.2.10 The KC-X shall provide for the Aircraft Commander and Pilot to selectively display families of emitter types (e.g., acquisition, track, AAA). **(MANDATORY)**

3.5.3.2.11 The KC-X shall accept data in standard intelligence file formats (e.g., *.RCV, *.THR per MIL-STD-6016) for creating the EOB. **(MANDATORY)**

3.5.3.2.12 The KC-X defensive SA system(s) shall have the following operating modes: fully automatic, consensual, and manual. **(MANDATORY)**

3.5.3.2.13 The KC-X shall completely overwrite all stored EOB data by a single action available to the Aircraft Commander, Pilot, and aircraft maintainers at any time. **(MANDATORY)**

3.5.3.2.14 The KC-X generated defensive SA and threat data shall be viewable and usable by the Aircraft Commander and Pilot. **(MANDATORY)**

3.5.3.2.14.1 The KC-X generated defensive SA and threat data should be displayed on heads up displays (HUD) for Aircraft Commander and Pilot. **(NON-MANDATORY)**

3.5.3.2.15 The KC-X shall provide audio and visual warnings when: a new threat is detected, the aircraft enters the R_T boundary for threats identified in the EOB, and a missile launch is detected. **(MANDATORY)**

3.5.3.2.16 The KC-X shall provide for Aircraft Commander and Pilot selection of displayed emitters by the following categories: off-board sources (Air Force approved mission planning system, IBS, and Tactical Data Link (TDL)) only, on-board source(s) (RF detection) only, and correlated information from all sources. **(MANDATORY)**

3.5.3.2.17 The KC-X shall provide for selectable display of detailed information for any selected emitter to include: the location error ellipse, the frequency band, emitter type, modes of operation, and any desired EOB provided threat characteristics. **(MANDATORY)**

3.5.3.2.18 The KC-X shall provide for defensive SA system and display control by Aircraft Commander and Pilot. **(MANDATORY)**

3.5.3.2.19 The KC-X defensive SA system shall provide moving map presentations. **(MANDATORY)**

3.5.3.2.20 The KC-X defensive SA system shall use stored map image data, terrain elevation data, and mission planning system data to generate map displays with at least nine (9) stepped levels of detail with at least as fine as 100 meter resolution source data. **(MANDATORY)**

3.5.3.2.20.1 The KC-X defensive SA system should use stored map image data, terrain elevation data, and mission planning system data to generate map displays with at least nine (9) stepped levels of resolution (with the finest level at 30 meter resolution or better). **(NON-MANDATORY)**

3.5.3.2.21 The KC-X defensive SA system shall provide for the basic aircrew and additional aircrew member to electronically move the display map area in any direction from the aircraft's present position to any position within the preplanned mission area, and provide look-ahead, pan and at least nine (9) stepped-zoom levels functionality. **(MANDATORY)**

3.5.3.2.22 The KC-X defensive SA system shall provide a symbol menu that can be placed by the aircrew at any location they choose on the display. **(MANDATORY)**

3.5.3.2.23 The KC-X defensive SA system shall provide display data for a geo-referenced symbology overlay on displayed map of preplanned EOB and pop-up threat emitter locations, in accordance with MIL-STD-1787. **(MANDATORY)**

3.5.3.2.24 The KC-X shall display defensive SA system maintenance health and fault data. **(MANDATORY)**

3.5.3.2.25 The KC-X defensive SA system shall automatically manage SA and any RF countermeasures subsystems to respond to at least X engagements in accordance with classified Appendix B, Table B-8. **(MANDATORY)**

3.5.3.2.25.1 The KC-X defensive SA system should automatically manage SA and any RF countermeasures subsystems to respond to at least Y engagements in accordance with classified Appendix B, Table B-8. **(NON-MANDATORY)**

3.5.3.2.26 The KC-X defensive SA system shall exchange data among its subsystems at least as fast as a MIL-STD-1553 databus. **(MANDATORY)**

3.5.3.2.27 The KC- X defensive SA system OFP and Mission Data File (MDF) software, and subsystem OFP and MDF software shall be loaded at a single common loading port, using Common Aircraft Portable Reprogramming Equipment (CAPRE). **(MANDATORY)**

3.5.3.2.28 The KC- X defensive SA system EOB data loading medium shall be compatible with Air Force mission planning system. **(MANDATORY)**

3.5.3.2.29 The KC-X defensive SA system shall not use mobile code. **(MANDATORY)**

3.5.3.2.30 The KC-X defensive SA system OFP and MDF software shall be separately loadable. **(MANDATORY)**

3.5.3.2.31 The KC-X defensive SA system shall have a single configuration of OFP software which will not be aircraft dependent. **(MANDATORY)**

3.5.3.2.32 The KC- X defensive SA system shall have a continuous built-in-test (BIT) function that: identifies at least 99.5 percent of the critical faults within 45 seconds, identifies at least 85 percent of the non-critical faults within 45 seconds, and isolates faults to the LRU level within three (3) minutes at least 90 percent of the time. **(MANDATORY)**

3.5.3.2.32.1 The KC- X defensive SA system should have a continuous built-in-test (BIT) function that isolates faults to the LRU level within three (3) minutes at least 95 percent of the time. **(NON-MANDATORY)**

3.5.3.2.33 The KC- X defensive SA system shall transform RF detection threat data messages into J-series format messages, provide these J-series messages to the communication system for transmission over the TDL, and provide proof of information origin and receipt as appropriate. **(MANDATORY)**

3.5.3.2.34 The KC- X defensive SA system shall process received Command and Control data for storage and display, and process automated and aircrew responses for transmission over the secure BLOS communication system. **(MANDATORY)**

3.5.3.2.35 The KC- X defensive SA system(s) performance shall not be degraded by the operation of other on-board equipment and not adversely affect the operation of other on-board equipment. **(MANDATORY)**

3.6 **Product Support**

3.6.1 **Availability**

3.6.1.1 **Operational Availability (A_O)**

3.6.1.1.1 The KC-X A_O shall be at least 89 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.1.2 **Mission Capable (MC) Rate**

3.6.1.2.1 The KC-X MC rate shall be at least 92 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.1.2.2 The KC-X tanker-partial MC rates associated with aerial refueling missions (i.e., boom, centerline drogue, multi-point, and boom and drogue on the same mission) shall each be at least 90 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.1.3 **Mission Completion Success Probability (MCSP)**

3.6.1.3.1 The KC-X MCSP shall be at least 99 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.1.3.1.1 The KC-X MCSP should be at least 99.5 percent at 50,000 accumulated fleet hours. **(NON-MANDATORY)**

3.6.2 **Reliability and Maintainability (R&M)**

3.6.2.1 **Readiness and Performance**

3.6.2.1.1 The KC-X R&M shall be sufficient to generate, deploy, operate, sustain and recover the tanker in the conduct of operations to levels and degrees of readiness and performance as follows: Break Rate (BR) equal to or less than 1.3 breaks per 100 sorties and the twelve (12)-hour fix rate (FR) for code-3 aircraft equal to or greater than 71 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.2.1.2 The KC-X cannot-duplicate (CND) and retest okay (RTOK) rates shall each not exceed 10 percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.2.1.2.1 The KC-X CND and RTOK rates should not exceed two (2) percent at 50,000 accumulated fleet hours. **(NON-MANDATORY)**

3.6.2.2 The KC-X shall display and download all onboard diagnostics and bit-checks, to include BIT anomalies and other appropriate data. **(MANDATORY)**

3.6.2.3 The KC-X false alarms rate shall not exceed two (2) percent at 50,000 accumulated fleet hours. **(MANDATORY)**

3.6.2.3.1 The KC-X false alarms rate should not exceed one (1) percent at 50,000 accumulated fleet hours. **(NON-MANDATORY)**

3.6.3 **Supportability**

3.6.3.1 The KC-X shall provide provisions on or adjacent to the flight deck (not interfering with a pallet position) to secure to the KC-X a removable container (36 inches long x 18 inches height x 30 inches wide) that is accessible in flight. **(MANDATORY)**

3.6.3.2 All KC-X systems and equipment added to the baseline non-military aircraft shall be compatible with the USAF 2-level maintenance concept. **(MANDATORY)**

3.6.3.3 **Packaging, Handling, Storage and Transportation**

3.6.3.3.1 To ensure minimum mobility footprint the entire KC-X engine change package shall be transportable on one (1) USAF C-17 aircraft. **(MANDATORY)**

3.6.3.3.2 KC-X components shall comply with item unique identification requirements defined in MIL-STD-130. **(MANDATORY)**

3.6.3.4 KC-X shall conduct ground operations without external aircraft structural support (e.g., tail stand). **(MANDATORY)**

3.6.3.5 The KC-X APU shall be accessible for inspections and servicing without having to lower the boom. **(MANDATORY)**

3.6.3.6 **Maintenance Display**

3.6.3.6.1 The KC-X shall display digital interactive electronic technical manuals at a station on the flight deck. **(MANDATORY)**

3.6.3.7 **Integrated Diagnostics and Health Management**

3.6.3.7.1 The KC-X integrated diagnostics shall immediately alert and provide all information necessary for status awareness and required actions to both the operators and maintainers for subsystems of the aircraft including propulsion, structures, avionics and flight systems. **(MANDATORY)**

3.6.3.7.2 The KC-X health management system shall provide systems data to enable normal and emergency procedures, and to enable automated actions. **(MANDATORY)**

3.6.3.7.3 The KC-X system shall provide for organization-level technicians to accurately detect, isolate and verify 99 percent of faults to the LRU level, without trial and error. **(MANDATORY)**

3.6.3.7.4 The KC-X BIT modes shall have start-up, continuous and initiated BIT functions. **(MANDATORY)**

3.6.3.7.5 The KC-X health management system shall accurately detect and display 99 percent of flight critical faults to the LRU level. **(MANDATORY)**

3.6.3.7.6 The KC-X shall provide for transmitting flight critical faults to the Tanker Airlift Control Center and arrival station by encrypted messaging. **(MANDATORY)**

3.6.3.7.7 The KC-X health management system shall detect, isolate and display at least 95 percent of all faults to the subsystem level using BIT alone. **(MANDATORY)**

3.6.3.7.8 The KC-X BIT and fault history (at least 48 hours) shall be stored in nonvolatile memory for recall and download from a single location on demand in flight and on the ground. **(MANDATORY)**

3.6.3.7.9 The KC-X shall report and display faults in plain English to preclude the need for cross-referencing codes. **(MANDATORY)**

3.6.3.7.10 The KC-X engine health monitoring system shall support integrity and health monitoring programs by providing 100 percent on-board automated collection of all required data and provide any on-board analysis with 95 percent detection and prediction accuracy. **(MANDATORY)**

3.6.3.7.10.1 The KC-X engine health monitoring system should provide 98 percent detection and prediction accuracy for any on-board analysis. **(NON-MANDATORY)**

3.6.3.8 **Aircraft Data Collection**

3.6.3.8.1 The KC-X health management system flight and mission critical fault detection information shall include a time stamp for use with the AIP. **(MANDATORY)**

3.6.3.8.2 The KC-X shall record and provide for download from a single point on the aircraft using a standard interface: engine discrepancies and status, over-G event data, BIT information, in flight fuel onload and offload, and receiver information. **(MANDATORY)**

3.6.3.8.3 The KC-X data collection system download media and content shall be compatible with the Core Automated Maintenance System for Mobility (CAMS-FM)/GO81 data collection systems (XML format). **(MANDATORY)**

3.6.3.8.4 The KC-X shall provide for download of collected data (both unclassified and classified) using commercially-based, non-proprietary software and media. **(MANDATORY)**

3.6.3.9 **Aircrew Flight Equipment**

3.6.3.9.1 The KC-X shall provide provisions for integration, stowage and use of standard fielded and qualified aircrew flight equipment and survival equipment for a full aircrew as identified in TO 14-1-1 Table 6-1 for KC-10 and KC-135 and Appendix B (i.e., meeting military specifications or FAA equivalent). **(MANDATORY)**

3.6.3.9.2 The KC-X shall provide a sufficient number of protective breathing equipment (PBE)s, at least three (3), stowed in built-in, readily accessible locations for the aircrew to operate the aircraft and combat fires. **(MANDATORY)**

3.6.3.9.2.1 The KC-X should provide built-in storage for sufficient smoke and fume protection in readily accessible locations for full passenger and patient loads. **(NON-MANDATORY)**

3.6.3.9.3 The KC-X shall provide life rafts, personal floatation, and signaling equipment, stowed in built-in, readily accessible locations, in sufficient quantity and types to support a full aircrew and passenger configuration, as identified in TO 14-1-1 Table 6-1 for KC-10 and KC-135, and Appendix B (i.e., meeting military specifications or FAA equivalent). **(MANDATORY)**

3.6.3.9.4 The KC-X onboard life preservers and rafts should be compatible with the integration and interoperability of survival and signaling equipment as identified in TO 14-1-1 Table 6-1 for KC-10 and KC-135, and Appendix B. **(NON-MANDATORY)**

3.6.3.10 **Maintenance Work Environment**

3.6.3.10.1 The KC-X shall provide for USAF O-level maintenance personnel to perform all required KC-X O-level maintenance tasks in adverse weather conditions (in accordance with current

USAF maintenance and Occupational Safety and Health Administration directives) within an outside ambient temperature range of -40°F to +130°F, including worst case corresponding internal temperatures. **(MANDATORY)**

3.6.3.10.2 The KC-X shall provide for USAF O-level maintenance personnel to perform all required aircraft servicing, launch and recovery tasks wearing field gear (to include body armor) or cold weather gear (including parkas, parka pants, gloves, boots). **(MANDATORY)**

3.6.3.11 O-level KC-X support equipment and test measurement and diagnostic equipment (SE/TMDE) shall support maintaining the aircraft under all operational conditions within the O-level maintenance concept and be deployable. **(MANDATORY)**

3.6.3.12 KC-X support equipment shall perform its intended purpose during maintenance and operations without damaging the aircraft while preserving aircraft functionality. **(MANDATORY)**

3.6.3.13 A single common configuration trailer shall support storage, flight and ground transport, and installation and removal of a built-up KC-X engine. **(MANDATORY)**

3.6.3.14 The KC-X shall provide for both wing-mounted drogue refueling systems to be installed by four (4) O-level personnel within six (6) hours and removed by four (4) O-level personnel within six (6) hours. **(MANDATORY)**

4 Qualification Provisions.

4.1 General. Section 4 (Qualification Provisions) contains the methodology for verifying the system's design, operation, and performance to meet all mandatory requirements and proposed non-mandatory requirements established in Section 3 (System Requirements) herein.

4.1.1 Philosophy of Verifications. The basis of any verification method is the root source that establishes the data used to support requirement compliance (e.g., if analysis of another program's flight test data is used, then the verification method is flight test). The intent of the development verification approach is to maximize the integration of development, airworthiness certification, and operational evaluations, in order to optimize costs, schedule, and performance.

4.1.2 Location of Verifications. Prime contractor, sub-contractor, commercial, and Government owned facilities, that are acceptable to the Government, may be utilized for the application(s) intended.

4.1.3 Responsibility for Verifications. The prime contractor is responsible for planning, resourcing, performing, successful completion, and reporting for all requirement compliance verifications. The Government formal approval of verification documentation constitutes completion. The Government reserves the right to require additional verification effort within the confines of the required verification methods. The Government reserves the right to participate in or witness any of the requirement verifications.

4.1.4 Verification Cross Reference Matrix (VCRM). The VCRM (Table 4-1) provides the cross reference between each Section 3 requirement, the associated minimum required verification methods (defined below), and the associated verification paragraph numbers.

4.2 Verification Methods. The verification methods are defined below. The methods are independent, but are sometimes used as formal complements to other verification methods, to support substantiation or for completeness. The methods can also be used in combination with other verification methods to convert already available data to verification compatible data.

4.2.1 Not Applicable (N). This verification method is usually reserved for Section 3 requirement headers or title paragraphs which do not contain requirements.

4.2.2 Inspection (I). This verification method consists of actual component, system, function, installation non-destructive examination (without special or complex equipment) by sensory means, simple physical manipulation, and simple measurement; including review of authenticated documentation.

4.2.3 Analysis (A). This verification method consists of an evaluation of components or systems interacting with their intended environment, using technical calculations or mathematical modeling based on physical laws and empirical data. Analysis can include design margins. Sensitivity, similarity, and failure effects analyses are forms of this method. Analysis associated with refining test data is not a part of this method.

4.2.4 Demonstration (Demo). This verification method consists of a non-instrumented operation of the actual component or system under specified controlled conditions on the air vehicle or in an equivalent environment, where functional success is determined on a qualitative or pass-fail basis. This can be on the ground or in-flight.

4.2.4.1 Ground Demonstration (g). This verification sub-method consists of a demonstration on ground.

4.2.4.2 Flight Demonstration (f). This verification sub-method consists of a demonstration in-flight.

4.2.5 Test. This general group of sub-methods consists of quantitative measuring of the characteristics or performance of actual components or systems in controlled intended conditions (real or representative). These sub-methods include analysis of the resulting data. Sub-methods are as follows:

4.2.5.1 Laboratory Test (L). This verification sub-method consists of testing in an off-air vehicle ground-based facility with a physical simulation of the operating environment.

4.2.5.2 Ground Test (G). This verification sub-method consists of on-air vehicle testing under ground static conditions.

4.2.5.3 Flight Test (F). This verification sub-method consists of on-air vehicle testing under dynamic ground, transition-to-flight, and flight envelope conditions.

4.3 Completion Instructions. Sub-section 4.3 is to be filled-out by the offeror in the proposed system specification and contain the proposed detailed (next level down) approach to verification of each mandatory requirement and proposed non-mandatory requirement in Section 3 (System Requirements) herein. The offeror's approach must be consistent with the method entries for each requirement, provided in the VCRM. These approach paragraphs must include specific verification or support types of method (e.g., software integration laboratory type of laboratory test method), detailed description for the specific type, and specific success criteria, for each of the specific requirement verification methods. The paragraph numbering system must align with the Section 3 paragraph numbering (e.g., paragraph 4.3.1 b. would be the second verification method paragraph for requirement paragraph 3.1).

Table 4-1: Verification Cross Reference Matrix

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.1.1.1			X					X
3.1.1.1.1			X					X
3.1.1.2			X					X
3.1.1.3			X		X	X		
3.1.1.4				X	X			
3.1.1.4.1				X	X			
3.1.1.5				X		X		X
3.1.1.6			X			X		X
3.1.1.7			X			X	X	X
3.1.1.8			X			X		X
3.1.1.9			X			X	X	X
3.1.1.10						X		X
3.1.1.11						X		X
3.1.1.12					X			
3.1.1.13		X	X	X	X	X	X	X
3.1.1.13.1		X	X	X	X	X	X	X
3.1.1.13.2			X					X
3.1.1.14			X					X
3.1.1.14.1			X					X
3.1.1.15					X	X		
3.1.1.15.1			X		X			
3.1.1.16						X		X
3.1.1.17			X	X		X		
3.1.1.18			X			X	X	X
3.1.1.19			X			X	X	
3.1.1.20			X				X	X
3.1.1.21						X	X	X
3.1.1.22			X	X	X			
3.1.1.23.1						X		X
3.1.1.23.2			X			X	X	X
3.1.1.23.3			X			X		X
3.1.1.23.4			X			X		X
3.1.1.23.4.1			X			X		X
3.1.1.23.5			X			X		X
3.1.1.23.6			X			X		X
3.1.1.23.7			X	X	X	X		
3.1.1.23.8			X					X
3.1.1.23.9			X			X	X	X

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.1.1.24.1		X	X	X	X	X	X	X
3.1.1.24.1.1		X	X	X	X	X	X	X
3.1.1.24.2			X				X	X
3.1.1.24.3		X	X	X	X	X	X	X
3.1.1.24.4			X			X	X	X
3.1.1.24.5			X			X		X
3.1.1.24.6			X			X		X
3.1.1.24.7		X						X
3.1.1.25.1							X	X
3.1.1.25.2				X		X		X
3.1.1.25.3				X		X		X
3.1.1.25.4				X				
3.1.1.25.5				X		X		X
3.1.1.25.6			X			X		X
3.1.1.25.7			X			X		X
3.1.2.1			X			X		X
3.1.2.2		X	X	X	X	X	X	X
3.1.2.2.1			X					X
3.1.2.3			X					X
3.1.2.4						X	X	X
3.1.2.5			X			X	X	X
3.1.3.1			X			X	X	X
3.1.3.2			X			X	X	X
3.1.3.3.1			X				X	
3.1.3.3.2			X	X		X		
3.1.3.4			X			X		X
3.1.3.5			X			X		X
3.1.3.6			X			X		X
3.1.3.7			X			X	X	
3.1.3.7.1			X			X	X	X
3.1.3.8					X	X		
3.1.3.9			X			X		
3.1.3.10			X	X		X		
3.2.1.1			X	X				X
3.2.1.2.1		X	X				X	
3.2.1.2.2			X	X				
3.2.1.2.3			X	X		X		
3.2.1.2.3.1			X	X				
3.2.1.2.4			X	X				

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.2.1.2.5			X	X				
3.2.1.2.5.1			X	X		X		
3.2.1.2.6		X	X				X	
3.2.1.3.1		X	X	X		X		
3.2.1.3.2		X	X	X		X		
3.2.1.3.3				X				
3.2.1.4		X	X				X	
3.2.1.5.1		X		X				
3.2.1.5.2		X	X					
3.2.1.5.3		X		X				
3.2.1.5.4		X	X	X				
3.2.1.5.5				X				
3.2.1.5.6			X				X	
3.2.2.1							X	X
3.2.2.2							X	X
3.2.2.3							X	X
3.2.2.4.1		X	X	X				X
3.2.2.4.2		X	X	X				X
3.2.2.4.3			X	X				
3.2.2.4.4		X		X		X		
3.2.2.4.5			X	X				
3.2.2.4.6			X			X		
3.2.2.4.7			X			X	X	X
3.2.2.5.1		X						
3.2.2.5.2		X	X				X	
3.2.2.6.1			X	X				
3.2.2.6.1.1		X		X				
3.2.2.7		X	X					
3.2.2.7.1		X	X					
3.2.2.8.1			X	X	X			
3.2.2.8.1.1			X	X	X			
3.2.2.9.1				X				
3.2.2.9.2			X				X	
3.2.3.1.1				X				
3.2.3.2			X	X				
3.2.3.3.1				X				
3.2.3.3.1.1				X				
3.2.3.3.2				X				
3.2.3.4.1				X				

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.2.3.4.2			X	X				
3.2.3.4.3			X	X				
3.2.3.4.4			X	X				
3.2.3.4.5			X	X				
3.2.3.4.6							X	
3.3.1.1			X		X	X	X	X
3.3.1.1-1						X	X	X
3.3.1.1-2						X	X	X
3.3.1.1-3						X	X	X
3.3.1.1-4			X			X	X	X
3.3.1.1-5						X	X	X
3.3.1.1-6						X	X	X
3.3.1.1-7			X			X		X
3.3.1.1-8			X			X		X
3.3.1.1-9			X			X		X
3.3.1.1-10			X			X		X
3.3.1.1-11			X			X		X
3.3.1.1-12					X			
3.3.1.1-13							X	
3.3.1.1-14			X			X		X
3.3.1.1-15						X		X
3.3.1.1-16						X	X	X
3.3.1.1-17			X			X		X
3.3.1.1-18			X			X		X
3.3.1.1-19			X			X		X
3.3.1.1-20			X			X		X
3.3.1.1-21			X			X		X
3.3.1.1-22			X			X		X
3.3.1.1-23			X			X		X
3.3.1.1-24			X			X		X
3.3.1.1-25			X			X		X
3.3.1.1-26			X			X		X
3.3.1.1-27			X			X		X
3.3.1.1-28			X			X		X
3.3.1.1-29			X			X		X
3.3.1.1-30			X			X		X
3.3.1.1-31			X			X		X
3.3.1.1-32			X			X		X
3.3.1.1-33			X			X		X

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.3.1.1-34			X			X		X
3.3.1.1-35			X			X		X
3.3.1.1-36			X			X		X
3.3.1.1-37			X			X		X
3.3.1.1.1				X		X		
3.3.1.1.2			X			X	X	X
3.3.1.1.3			X			X	X	X
3.3.1.1.4			X			X	X	X
3.3.1.2.1			X			X	X	X
3.3.1.2.2				X		X		X
3.3.1.2.3			X			X	X	X
3.3.1.3.1			X			X	X	
3.3.1.3.2			X			X	X	
3.3.1.3.3			X			X		X
3.3.1.3.4			X			X		X
3.3.1.3.5			X			X	X	X
3.3.1.4.1						X	X	X
3.3.1.4.2			X			X	X	X
3.3.1.4.3		X		X		X		
3.3.1.4.4		X				X	X	
3.3.1.4.5						X	X	X
3.3.1.4.6						X	X	X
3.3.1.4.7			X		X	X		
3.3.1.4.8						X		X
3.3.1.4.9		X		X	X	X		
3.3.1.5.1			X			X	X	X
3.3.1.5.1.1			X			X	X	X
3.3.1.5.2			X			X	X	X
3.3.1.5.2.1			X			X	X	X
3.3.1.5.3			X			X	X	X
3.3.1.5.4			X			X	X	X
3.3.1.5.5				X				
3.3.1.6						X		X
3.3.1.7				X				
3.3.1.8.1			X		X			
3.3.1.8.2			X	X	X			
3.3.1.9			X			X		X
3.3.2.1.1			X			X	X	X
3.3.2.1.2						X	X	X

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.3.2.1.3		X	X					
3.3.2.1.4		X	X					
3.3.2.1.4.1		X						
3.3.2.1.5			X			X		X
3.3.2.1.6		X						
3.3.2.1.7		X	X					
3.3.2.2.1			X			X	X	X
3.3.2.2.2			X				X	
3.3.2.2.3			X			X		X
3.3.2.3.1			X			X	X	X
3.3.2.3.2			X			X	X	X
3.3.2.4.1		X					X	X
3.3.2.4.1.1			X			X	X	
3.3.3.1.1		X	X	X		X		
3.3.3.1.2			X					
3.3.3.1.3		X	X					
3.3.3.1.4		X	X					
3.3.3.2.1		X	X			X	X	X
3.3.3.2.2			X			X	X	
3.3.3.2.3		X						
3.3.3.2.4		X						
3.3.3.2.5		X	X	X		X		
3.3.3.2.6			X			X	X	
3.3.3.3.1			X	X		X		
3.3.3.3.2				X				
3.3.3.3.2.1				X		X		
3.3.3.4.1			X	X		X		
3.3.3.4.2		X	X			X		
3.3.3.5.1		X	X	X		X		
3.3.3.5.1.1		X	X	X		X		
3.3.3.5.2		X	X	X		X		
3.3.3.6			X	X		X		
3.3.3.7.1		X		X		X		
3.3.3.7.2				X		X	X	
3.3.3.7.3			X			X	X	X
3.3.3.7.3.1			X			X	X	X
3.3.3.7.4		X	X			X	X	
3.3.3.7.5			X			X	X	
3.3.3.7.5.1			X			X	X	

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.3.3.7.6				X		X		
3.3.3.7.6.1				X		X		
3.3.3.7.7				X		X		
3.3.3.7.7.1				X		X		
3.3.3.7.8			X			X		X
3.3.3.7.9			X			X	X	
3.3.3.8			X			X	X	X
3.3.3.9.1				X	X	X		
3.3.3.9.2				X				
3.3.3.10						X	X	X
3.4.1.1			X	X				
3.4.2.1			X					X
3.4.2.2.1			X					X
3.4.2.2.1.1			X					X
3.4.2.3.1			X		X			X
3.4.2.4			X					
3.4.2.5.1						X		X
3.4.2.5.2			X					X
3.4.2.5.3				X				
3.4.2.5.4		X	X					
3.4.2.6.1				X	X			
3.4.2.7			X					X
3.4.2.8			X					X
3.4.3.1.1		X					X	X
3.4.3.1.2		X						
3.4.3.1.3			X				X	X
3.4.3.1.4		X	X	X	X	X	X	X
3.4.3.2.1			X			X	X	X
3.4.3.3		X	X					
3.4.3.4.1		X	X				X	
3.4.3.4.2		X	X				X	
3.4.3.4.3			X					
3.4.3.4.4			X			X		
3.4.3.5.1		X	X					
3.4.3.5.2		X	X					
3.4.3.5.3		X	X					
3.4.3.6.1			X			X	X	X
3.4.3.7.1			X	X	X			
3.4.3.7.2			X	X				

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.4.3.8.1			X			X	X	
3.4.3.8.2		X						
3.4.3.9.1			X			X	X	X
3.4.3.9.1.1			X			X	X	X
3.4.3.9.2			X			X	X	X
3.4.3.9.3		X	X					
3.4.3.9.4		X	X	X				
3.4.3.10.1			X			X	X	
3.4.3.10.1.1			X			X	X	
3.4.3.10.2				X				
3.4.3.10.3			X			X	X	X
3.4.3.11.1		X						
3.4.3.12.1			X			X		X
3.4.3.12.1.1			X			X		X
3.4.3.13		X	X			X		
3.4.3.14.1		X		X				
3.4.3.14.2			X				X	
3.4.3.14.3			X				X	
3.4.3.14.4			X		X	X		
3.4.3.15.1		X	X	X		X		X
3.4.3.15.2			X	X	X			
3.4.3.15.3		X	X	X				
3.4.3.15.3.1		X	X	X				
3.4.3.16.1		X		X				
3.4.3.16.2		X	X	X				
3.4.3.16.3			X			X	X	X
3.4.3.17.1				X				
3.4.3.17.1.1				X				
3.4.3.17.2			X	X				
3.4.3.17.2.1			X	X				
3.4.3.17.3				X				
3.4.3.18.1		X	X	X				
3.4.3.18.2		X	X	X				
3.4.3.19.1			X	X	X	X		
3.4.3.19.2		X	X	X		X		
3.4.3.19.2.1		X	X	X		X		
3.4.3.19.3		X	X					
3.4.3.20.1		X					X	
3.4.3.20.2		X					X	

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.4.3.21		X					X	
3.5.1.1		X	X	X	X	X	X	X
3.5.1.2.1						X	X	
3.5.1.2.2				X		X		
3.5.1.2.3			X			X		X
3.5.1.3.1			X			X	X	X
3.5.1.3.2			X	X				X
3.5.1.4.1			X			X		
3.5.1.4.1.1			X			X		
3.5.1.4.2			X			X		
3.5.1.4.2.1			X			X		
3.5.1.4.3			X			X		
3.5.1.5.1			X			X	X	
3.5.1.5.2			X			X	X	
3.5.1.5.3			X			X	X	
3.5.1.6.1			X				X	X
3.5.1.6.2			X			X		
3.5.1.6.3			X				X	X
3.5.1.6.4			X	X		X		
3.5.1.7.1				X		X		X
3.5.1.7.2				X		X		X
3.5.1.8.1					X	X		
3.5.1.8.2				X		X		
3.5.1.8.3			X			X	X	
3.5.1.8.4			X			X	X	X
3.5.1.8.5			X			X	X	X
3.5.1.8.6			X			X	X	X
3.5.2.1		X	X	X	X	X	X	X
3.5.2.2			X			X		X
3.5.2.3			X			X		X
3.5.2.4			X			X		X
3.5.2.5			X				X	X
3.5.2.6			X			X		X
3.5.2.7			X			X		X
3.5.2.7.1			X			X		X
3.5.2.8			X			X	X	X
3.5.2.9			X	X				
3.5.2.9.1			X	X				
3.5.2.10				X	X	X		

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.5.2.11				X		X		
3.5.3.1.1			X			X		X
3.5.3.1.2			X			X		X
3.5.3.1.2.1			X			X		X
3.5.3.1.3			X			X		X
3.5.3.1.3.1			X			X		X
3.5.3.1.4			X			X		X
3.5.3.1.5			X			X		X
3.5.3.1.5.1			X			X		X
3.5.3.1.6			X			X		X
3.5.3.1.6.1			X			X		X
3.5.3.1.7			X			X		X
3.5.3.1.7.1			X			X		X
3.5.3.1.8			X			X		X
3.5.3.1.8.1			X			X		X
3.5.3.1.9			X			X		X
3.5.3.1.9.1			X			X		X
3.5.3.1.10			X			X		X
3.5.3.1.10.1			X			X		X
3.5.3.1.11			X			X		X
3.5.3.1.11.1			X			X		X
3.5.3.1.12			X			X		X
3.5.3.1.12.1			X			X		X
3.5.3.1.13			X			X	X	
3.5.3.1.14			X			X		X
3.5.3.1.14.1			X			X		X
3.5.3.1.15			X			X		X
3.5.3.1.15.1			X			X		X
3.5.3.2.1		X	X	X	X	X	X	X
3.5.3.2.2			X			X		X
3.5.3.2.2.1			X			X		X
3.5.3.2.3			X			X		X
3.5.3.2.3.1			X			X		X
3.5.3.2.4			X			X		X
3.5.3.2.5			X			X		X
3.5.3.2.5.1			X			X		X
3.5.3.2.6			X			X		X
3.5.3.2.7			X		X	X		
3.5.3.2.7.1			X		X	X		

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.5.3.2.8			X			X		X
3.5.3.2.8.1			X			X		X
3.5.3.2.9			X			X		X
3.5.3.2.10				X	X	X		
3.5.3.2.11						X		X
3.5.3.2.12					X	X		
3.5.3.2.13						X	X	
3.5.3.2.14						X		X
3.5.3.2.14.1						X		X
3.5.3.2.15			X			X		X
3.5.3.2.16			X			X		X
3.5.3.2.17			X			X		X
3.5.3.2.18					X	X		X
3.5.3.2.19					X	X		X
3.5.3.2.20			X			X		X
3.5.3.2.20.1			X			X		X
3.5.3.2.21			X			X	X	
3.5.3.2.22				X	X	X		
3.5.3.2.23			X			X		X
3.5.3.2.24				X		X		
3.5.3.2.25			X			X		X
3.5.3.2.25.1			X			X		X
3.5.3.2.26						X	X	
3.5.3.2.27						X	X	
3.5.3.2.28				X		X		
3.5.3.2.29			X			X		
3.5.3.2.30				X		X		
3.5.3.2.31		X						
3.5.3.2.32			X			X		
3.5.3.2.32.1			X			X		
3.5.3.2.33			X			X		X
3.5.3.2.34			X			X		X
3.5.3.2.35			X			X		X
3.6.1.1.1			X					
3.6.1.2.1			X					
3.6.1.2.2			X					
3.6.1.3.1			X					
3.6.1.3.1.1			X					
3.6.2.1.1			X	X				

				Demo		Test		
SRD Para	N	I	A	g	f	L	G	F
3.6.2.1.2			X					
3.6.2.1.2.1			X					
3.6.2.2				X		X		
3.6.2.3			X		X	X		
3.6.2.3.1			X		X	X		
3.6.3.1			X	X				
3.6.3.2			X					
3.6.3.3.1				X				
3.6.3.3.2		X						
3.6.3.4			X	X				
3.6.3.5		X		X				
3.6.3.6.1				X		X		
3.6.3.7.1			X			X	X	X
3.6.3.7.2			X		X	X		
3.6.3.7.3			X	X		X		
3.6.3.7.4				X	X	X		
3.6.3.7.5			X	X		X		
3.6.3.7.6						X		X
3.6.3.7.7			X	X		X		
3.6.3.7.8			X	X	X	X		
3.6.3.7.9		X		X				
3.6.3.7.10			X			X		
3.6.3.7.10.1			X			X		
3.6.3.8.1			X		X	X		
3.6.3.8.2			X	X		X		
3.6.3.8.3		X		X				
3.6.3.8.4			X	X		X		
3.6.3.9.1		X		X				
3.6.3.9.2		X						
3.6.3.9.2.1		X						
3.6.3.9.3		X		X				
3.6.3.9.4		X		X				
3.6.3.10.1			X				X	
3.6.3.10.2			X				X	
3.6.3.11		X		X		X		
3.6.3.12			X	X				
3.6.3.13		X		X				
3.6.3.14				X				

5 Acronyms and Definitions

A/C	Aircraft
AAA	Antiaircraft Artillery
AAR	Air-to-Air Refueling
AC	Alternating Current
ACARS	Aircraft Communication Addressing and Reporting System
ACN	Aircraft Classification Number
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AE	Aeromedical Evacuation
AEF	Air and Space Expeditionary Force
AESG	Aeronautical Systems Group
AF	Air Force
AFCS	Automatic Flight Control System
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFN	Aeronautical Facilities Notification
AFOSH	Air Force Occupational, Safety and Health
AFTO	Air Force Technical Order
AFTTP	Air Force Tactics, Techniques, and Procedures
AGE	Aerospace Ground Equipment
AIP	Aircraft Information Program
ALAS	Air Refueling Load Alleviation System
ALE	Automatic Link Establishment
ALEP	Aircrew Laser Eye Protection
AM	Amplitude Modulation
AMC	Air Mobility Command
AMCI	AMC Instruction
AMF/JTRS	Airborne and Maritime/Fixed Station Joint Tactical Radio System
amp	ampere
AMXS	Aircraft Maintenance Squadron

A_O	Operational Availability
AOC	Aeronautical Operational Control
AOP	Area of Probability
AOR	Area of Responsibility
API	Armor Piercing Incendiary
APIT	Armor Piercing Incendiary - Tracer
APU	Auxiliary Power Unit
AR	Aerial Refueling
ARA	Aerial Refueling Aircraft
ARCT	Air Refueling Control Time
ARO	Air Refueling Operator
ATC	Air Traffic Control
ATGL	Air Transportable Galley/Lavatory
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATP	Allied Tactical Publication
ATSO	Ability to Survive and Operate
BDA	Battle Damage Assessment
BDA	Boom Drogue Adapter
Bio	Biological
BIT	Built-In Test
BLOS	Beyond Line of Sight
BR	Break Rate
BRNAV	Basic Area Navigation
B-VNAV	Baro Vertical Navigation
C&A	Certification and Accreditation
C2	Command and Control
C4I	Command, Control, Communications, Computers, and Intelligence
CAMS-FM	Core Automated Maintenance System For Mobility
CAPRE	Common Aircraft Portable Reprogramming Equipment
Cat	Category

C-E	Communications-Electronic
CDR	Critical Design Review
CEP	Circular Error Probable
CFR	Code of Federal Regulations
CG	Center of Gravity
chem	Chemical
CI/LI	Corrosion Inhibitor/Lubricity Improver
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CND	Could Not Duplicate
CNS	Communications, Navigation, and Surveillance
COMSEC	Communications Security
CONUS	Continental United States
CPDLC	Controller-Pilot Data Link Communications
CSAR	Combat Search and Rescue
CSB	Crew Systems Bulletin
CVR	Cockpit Voice Recorder
DAFIF	Digital Aeronautical Flight Information File
DAMA	Demand Assigned, Multiple Access
DC	Direct Current
DECON	Decontamination
Def Stan	Defense Standard (British Ministry of Defense)
DFDR	Digital Flight Data Recorder
DGPS	Differential Global Positioning System
DISR	DoD Information Technology Standards Registry
DME	Distance Measuring Equipment
DME/DME	Dual Distance Measuring Equipment
DO	Document Order
DoD	Department Of Defense
DODI	Department of Defense Instruction
DS	Defensive Systems
DSTRK	Desired Track
E3	Electromagnetic Environmental Effects

EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
EHF	Extremely High Frequency
ELT	Emergency Locator Transmitter
EMCON	Emission Control
EMP	Electro-Magnetic Pulse
ENFC	Crew Systems Branch in the Engineering Directorate at Aeronautical Systems Center (ASC) at Wright-Patterson AFB, OH
EOB	Electronic Order of Battle
EPR	Engine Pressure Ratio
EPU	Emergency Power Unit
ETA	Estimated Time of Arrival
ETOPS	Extended Operations
EW	Electronic Warfare
F	Fahrenheit
F.D.	Flaps Down
FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FARP	Forward Air Refueling Point
FDE	Fault Detection and Exclusion
FL	Flight Level
FM	Frequency Modulation
FM	Flight Manager
FMC	Full Mission Capable
FMS	Flight Management System
FR	Fix Rate
FSII	Fuel System Icing Inhibitor
FT	Fisher-Tropsch
ft	feet
gal	Gallon(s)
GBAS	Ground Based Augmentation System
GI&S	Geospatial Information and Services

GIG	Global Information Grid
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GOST	Gosudarstvennyy Standart
GOX	Gaseous Oxygen
GPM	Gallons per Minute
GPS	Global Positioning System
HAZMAT	Hazardous Materials
HF	High Frequency
HFDS	Human Factors Design Standard
hrs	hours
HUD	Heads Up Display
Hz	Hertz
IA	Information Assurance
IBS	Integrated Broadcast Service
ICS	Internal Communications System
IFF	Identification Friend or Foe
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
INMARSAT	International Maritime Satellite
INS	Inertial Navigation System
IP	Internet Protocols
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
IR	Infrared
IT	Information Technology
IW	Integrated Waveform
JP	Jet Propellant
JTIDS	Joint Tactical Information Distribuition System
JTRS	Joint Tactical Radio System
kbps	kilo bits per second
kHz	kilo hertz

KCAS	Knots Calibrated Airspeed
KIAS	Knots Indicated Airspeed
KVA	Kilo volt-amps
KW	Kilo watts
LAIRCM	Large Aircraft Infra-Red Counter Measures
LASS	Large Aircraft Start System
lbs	pounds
LDA	Localizer Type Directional Aid
LDG	Landing
LNAV	Lateral Navigation
LOB	Line of Bearing
LOC	Localizer
LOC BC	Localizer Back Course
LOC BC/DME	Localizer Back Course Distance Measuring Equipment
LOC/DME	Localizer Distance Measuring Equipment
LOS	Line of Sight
LRU	Line Replaceable Unit
LSAS	Litter Station Augmentation Set
MAC	Mission Assurance Category
MAF	Mobility Air Forces
MC	Mission Capable
MCSP	Mission Completion Success Probability
MDF	Mission Data File
MEIS	Mobility Enterprise Information Services
MFD	Multi-Function Display
MHz	Mega-Hertz
MIL-DTL	Military Detailed Specification
MIL-PRF	Military Performance Specification
MIL-S	Military Specification
MIL-STD	Military Standard
MLS	Microwave Landing System
mm	Millimeter

MNPS	Minimum Navigation Performance Specification
MOSA	Modular Open Systems Approach
MRT	Mean Repair Time
MXS	Maintenance Squadron
N/A or NA	Not Applicable
NAT	North Atlantic Track
NATO	North Atlantic Treaty Organization
NDB	Non-Directional Beacon
NGA	National Geospatial Intelligence Agency
NGH	New Generation Heater
NIMA	National Imagery and Mapping Agency
NIPRNet	Non-Secure Internet Protocol Router Network
nm	Nautical Mile
NMC	Not Mission Capable
NSA	National Security Agency
NSN	National Stock Number
NVIS	Night Vision Imaging System
ODS	Ozone Depleting Substance
OFP	Operational Flight Program
O-level	Organizational Level
OOOI	Out/Off/On/In
PATT	Pattern
PBE	Protective Breathing Equipment
PDL	Pilot Director Light
PIOR	Pilot-in-the-Loop Oscillation Rating
PIREP	Pilot Report
PLZT	Lead Lanthium Zirconium Titanate
PMC	Partial Mission Capable
Pos	Position
PPLI	Precise Position Location Information
PPS	Precise Positioning Service
P-RNAV	Precision Area Navigation

psi	Pounds per Square Inch
psig	Pound-Force per Square Inch Gauge
PSP	Patient Support Pallet
R&M	Reliability and Maintainability
RAIM	Receiver Autonomous Integrity Monitoring
R_D	Emitter Detection Range
REQ	Required
RF	Radio Frequency
R_L	Lethal Range
RNAV	Area Navigation
RNP	Required Navigation Performance
ROBE	Roll On Beyond Line of Sight Enhancement
RP	Refined Petroleum
R_T	Threat Avoidance Range, Threat Boundary
RTB	Return to Base
RTCA	Radio Technical Commission for Aeronautics
RTOK	Retest Okay
RVSM	Reduced Vertical Separation Minima
SA	Situational Awareness
SAAAR	Special Aircraft and Aircrew Authorization Required
SAASM	Selective Availability Anti Spoofing Module
SAR	Search and Rescue
SAS	Stability Augmentation System
SATCOM	Satellite Communications
SBAS	Space Based Augmentation System
SCAS	Stability Control Augmentation System
SDA	Static Dissipater Additive
SDF	Simplified Directional Facility
SE	Support Equipment
SELCAL	Selective Calling System
SID	Standard Instrument Departure
SIF	Selective Identification Feature

SINGARS	Single-Channel Ground-Air Radio System
SIPRNet	Secure Internet Protocol Router Network
SOAP	Simple Object Access Protocol
SOF	Special Operations Force
SPK	Synthetic Paraffinic Kerosene
SPS	Standard Positioning Service
SRD	System Requirements Document
SSI	System Security Instruction
STANAG	Standard Agreement
STAR	Standard Terminal Arrival Route
STD	Standard
T&GO	Touch and Go
TACAN	Tactical Air Navigation
TACC	Tanker Airlift Control Center
TAI	Total Aircraft Inventory
TBM	Theater Ballistic Missile
TCAS	Traffic Alert And Collision Avoidance System
TDL	Tactical Data Link
TMDE	Test, Measurement and Diagnostic Equipment
TO	Technical Order
TOLD	Take Off and Landing Data
U.S.	United States
UHF	Ultra High Frequency
USA	United States of America
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
USRNAV	United States Area Navigation
UTC	Coordinated Universal Time
VAC	Volts, Alternating Current
VCRM	Verification Cross Reference Matrix
VHF	Very High Frequency

VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOR	VHF Omni-Directional Range
WOW	Weight On Wheels
WSR	Weapon System Reliability
XML	Extensible Markup Language

The following definitions are applicable to section 3 of this document.

Term	Definition
Additional Aircrew Member	A position on the flight deck in addition to Aircraft Commander, Pilot, ARO and the flight observer.
Aerial Refueling Lighting	All interior and exterior lighting used during aerial refueling
Aerial Refueling Operations	Operations during rendezvous, pre-contact, contact, refueling, observation and departure
Aeromedical Evacuation (AE) Crew	Aircrew consisting of two (2) flight nurses and three (3) medical technicians who are responsible for patient medical care during flight.
Aircrew	Total complement of personnel responsible for the safe ground and flight operation of the aircraft and onboard systems, or for airborne duties essential to accomplishment of the aircraft's mission (15 persons).
Alternate Fuel	Fuel authorized for continuous use where thrust is not adversely affected. An alternate fuel is one on which the air vehicle can be flown without operational restrictions but which can have long term durability or maintainability impact if used for continuous operation (multiple flights). Alternate fuels are used only on an occasional or intermittent basis.
Area Navigation (RNAV)	A method of navigation that permits aircraft operation on any desired flight path within the coverage of station-reference navigation aids or within the limits of the capability of self contained aids, or a combination of these.
ARO Duties	ARO duties include in-flight refueling systems operation, cargo handling
Baseline Non-Military Aircraft	Basic aircraft, including major components, prior to any military modification
Basic Aircrew	Aircraft Commander, Pilot, ARO
Biological and Chemical Contamination Survivability	The instantaneous, cumulative, and residual effects of weapons upon the aircraft, including its personnel
Boom Normal Mode	Contact status is determined by input from the receiver aircraft through the boom signal coil.
Boom Override Mode	A mode where the receiver signal from normal mode is overridden by ARO. This occurs when the ARO has advanced the tanker system after the automated system has not recognized contact.
Break Rate (BR)	The percentage of aircraft that land in code-3 status, as defined in Air Force Instruction (AFI) 21-101. BR (%) equals the number of sorties that land code-3 divided by total sorties flown times 100. BR(%) = (Number of Sorties that land "Code-3"/Total Sorties Flown) X 100
Cannot Duplicate	The result of any maintenance action to troubleshoot a discrepancy in which

(CND)	the conditions causing the discrepancy could not be reenacted to confirm the discrepancy.
Command Radios	Communication equipment necessary for safe flight of the aircraft, e.g., ATC radios.
Computer Resources	Memory size, processor and databus throughput loading
Correlate	The processing of parametric Radio Frequency (RF) emitter data provided by multiple sensors to determine if there is a common source of the sensed data and if so to characterize that source as a single entry in the Electronic Order of Battle (EOB).
Covert Lighting	Lighting undetectable to the unaided eye beyond 500 feet and compatible with night-vision imaging systems.
Critical Technology and Software	Information or components critical to a military system or network mission effectiveness, technology that would reduce the US technological advantage if it came under foreign control. Can include software, processes, techniques, capabilities and materials.
Design Service Life	The period of time (e.g., years, flight cycles, hours, landings, etc.) established at design, during which the structure is expected to maintain its structural integrity when flown to the design loads and environment spectrum.
Detection Range (R_D)	See classified Appendix B for definition.
Embedded Operator Training	This Situational Awareness system feature enables pilot training by incorporating a training EOB that includes pop-up threats hidden from the aircrew until activated. Pre-loaded training missions are modifiable on the aircraft prior to flight. The system responds to this data as it would to actual threat data. The level of training is selectable to provide scenarios from entry-level training to advanced tactical scenarios. In the training mode, the system stores and loads data on aircrew reactions to support de-briefings and training.
Emergency Fuel	Fuel which can be used in the air vehicle on a limited basis but which may cause degradation of the propulsion system or air vehicle subsystems under extended use. Emergency fuel use may cause significant damage, be limited to one flight, or used only for emergency or countering emergency action. Examples of conditions that might warrant use of emergency fuels are accomplishing an important military mission, countering enemy actions, emergency evacuation flights, or emergency aerial refueling.
Engine Change Package	A package that includes a built-up ready-to-install spare engine (including the quick engine change kit) and all technical data, piece parts, consumables, tools (hand and special) and support equipment required to remove, replace and operate an aircraft engine.
False Alarm (for section 3.5 only)	An event that occurs when the system detects, declares, and classifies a situation requiring countermeasures when no threat actually exists.

False Alarm (for section 3.6 only)	Faults or failed BITs that do not repeat on the next automatically initiated BIT
False Alarm Rate (for section 3.6 only)	The resultant percentage of False Fault Alarms divided by the number automatically initiated BITs over a given period of time. Example: 100 initiated BITs in 1 hour with 1 False Alarms = 1% rate
Flight Critical Faults	Gradations or failures, indicated or actual, that jeopardizes airworthiness or aircrew safety.
Flight Critical Systems	Those systems necessary for the safe flight of the aircraft or safety to aircrew
Flight Deck	The flight deck includes all primary aircrew positions. The ARO station is considered part of the flight deck regardless of actual location.
Full Situational Awareness (for formation flight only)	Definition only applies to formation flight. Information providing safe guidance and separation during all weather, day and night multi-ship flights using at a minimum relative position, altitude and vertical airspeed
Geolocation	See Classified Appendix B for definition.
Glare	Reflection of light off of a surface that distorts the image
Growth Path	Margins for space, power, weight, computer resources, cooling, information connectivity, primary structure, wiring and future antenna installations.
Hotspots	Direct view of a light source that creates an overexposed portion of the image
Internal Communications System (ICS)	An internal communication system that allows connection to external communication sources.
Interphone	Part of the ICS used for internal aircraft communications only.
KC-X	The aircraft portion of the KC-X system including all hardware and software. The following items are not considered a part of the KC-X: wing mounted refueling systems, 463L pallets, palletized seating, PSPs, LSAS, and LAIRCM turrets.
KC-X System	The KC-X aircraft and all support equipment, training, technical data, and aircraft configuration equipment necessary to meet the requirements herein (e.g., wing mounted refueling systems, 463L pallets, palletized seating, PSPs, LSAS, and LAIRCM turrets).
Lethal Range (R_L)	See classified Appendix B for definition.
Litter Station Augmentation Set (LSAS)	The LSAS is a kit containing nine (9) C-17 litter stations providing twenty-seven (27) litter positions with stanchion interface hard points as shown in 17P9B3570-1 aeromedical litter stanchion and 17B9B3054-2 catch clamp drawings.
Maximum Passenger	The largest number of passengers (including palletized baggage) the aircraft

Load	can support using non-developmental 463L palletized seating for 12 hours.
Mean Repair Time (MRT)	MRT is the average on-equipment or off-equipment corrective maintenance time in an operational environment. Corrective maintenance includes all actions to correct any inherent, induced, or no-defect malfunction. MRT begins when the technician arrives at the aircraft site and all maintenance actions including removal and replacement of component, repairing, adjusting, functional checks, and necessary cure times. MRT does not include logistics delays (e.g., maintenance or supply delays).
Missile Launch Envelope	See Classified Appendix B for definition.
Mission Capable (MC) Rate	MC is an assessment of an aircraft's ability to perform its assigned peacetime or wartime mission(s). MC rate is the measure of how long, in percent of possessed time, a system can perform at least one of its assigned missions. MC rate is calculated as: percentage of possessed hours for aircraft that are full mission capable (FMC) or partial mission capable (PMC) for specific measurement periods (e.g., monthly or annual). MC(%)=[(FMC hours + PMC hours) / Possessed Hours] * 100.
Mission Completion Success Probability (MCSP)	The probability, once airborne, of completing the primary AR mission and safely landing.
Mission Critical Systems	Those systems necessary for the successful completion of the mission
Mobile Code	Mobile code is defined as software obtained from remote systems outside the enclave boundary, transferred across a network, and then downloaded and executed on a local system without explicit installation or execution by the recipient.
Modified System	Existing commercial or military system modified for use on the KC-X
Modular Open Systems Approach (MOSA)	MOSA is an integrated business and technical strategy that: • Establishes an enabling environment conducive to open system implementation • Employs modular design tenets • Defines key interfaces where appropriate • Applies widely supported, consensus-based (i.e., open) standards that are published and maintained by a recognized industry standards organization • Uses certified conformant products For a more complete description of MOSA, see the MOSA Program Managers' Guide and the Air Force Open Technology Development Strategy Briefing (both in the bidders' reference library) and the Open Systems Joint Task Force website (<<http://www.acq.osd.mil/osjtf/>>).
Narrow Body Aircraft	Baseline non-military aircraft with a single aisle in an all passenger configuration

New System	System developed for the KC-X
Night Vision Imaging System (NVIS) Environment	An environment in which primary vision is provided using NVIS. If visual spectrum lighting is provided, it does not degrade the visual acuity of Type II Class B/C NVIS goggles as compared to a dark ambient environment.
On Alert Configuration	An aircraft that is fully fueled, serviced, and loaded as necessary, with checklists complete up to but not including engine start
Operating Modes	Situational Awareness (SA) System Operating Modes: a. Fully automatic: The system monitors the environment, notifies the aircrew of detected threats, manages countermeasures as required, and provides aircraft maneuver cueing information to the crew. b. Consensual: The system monitors the environment, notifies the aircrew of detected threats, manages countermeasures as required with consent from the crew, and provides aircraft maneuver cueing information to the crew. c. Manual: The system monitors the environment, notifies the aircrew of detected threats, operates countermeasures as directed by the aircrew, and provides aircraft maneuvering cueing information to the primary aircrew.
Operational Availability (A_O)	The probability an aircraft will be ready for operational use when required (i.e., the availability of a weapon system in an operational environment). A_O is calculated as: total aircraft hours in the inventory (TAI hours) less the number of depot possessed aircraft hours (all depot purpose coded hours) less total not mission capable (NMC) hours all divided by TAI hours.
Parking Space (Normal Operations)	The parking space required for an aircraft in square feet. parking space = (25 + Wing Span + 25) * ((Wing Span / 2) + 50 + aircraft length + 25)
Partial Mission Capable	The aircraft is operating in an impaired condition. It can perform at least one, but not all of its assigned missions. PMC rate is calculated as: percentage of possessed hours for aircraft that are partial mission capable (PMC) for specific measurement periods (e.g., monthly or annual). PMC(%)=[PMC hours / Possessed Hours] * 100.
Passengers	All personnel transported on the aircraft excluding the aircrew. The weight for each passenger, primary aircrew and maintenance personnel is 250 pounds for design purposes, unless specified otherwise.
Patient Support Pallet (PSP)	An aeromedical transport system consisting of litter stanchions and airline seats mounted on a 463L style pallet. Each pallet can carry six seated personnel or two 3-tiered litter stanchions for six (6) patients on litters or three seats and one 3-tiered litter stanchion for three (3) patients on litters.
Primary Aircrew	The aircrew with permanent seats on the flight deck. The number of occupied seats at any one time depends on mission needs. Note: This does not include the ARO observer.
Primary Fuel	Fuel used to demonstrate contract compliance for complete steady-state and transient operating ranges. A primary fuel is one which can be used for

	continuous operation indefinitely without operational restrictions or adverse impacts to durability or maintenance.
Protective Breathing Equipment	Equipment that protects the aircrew from the effects of smoke, carbon dioxide or other harmful gases or an oxygen deficient environment caused by other than an aircraft depressurization while on flight deck duty, and protects aircrew from the above effects while combating fires on board the aircraft.
Provide(s) for	Includes all necessary attributes to enable personnel to accomplish a specified requirement.
Required Navigation Performance (RNP)	Aircraft performance required to access RNP airspace at specified RNP level with containment.
Response Time	The time from emission of electromagnetic energy associated with the weapon system until a warning becomes visible on the aircraft display provided the range of the emitter is not greater than the specified detection range (R_D) listed in classified Appendix B, Table B-5.
Retest Okay (RTOK)	The result of a maintenance action to confirm and troubleshoot a LRU fault code or discrepancy in which the confirmation test results in a serviceable condition of the supposed failed component.
Sanitizing	Process to remove information from media such that data recovery is not possible
Stable	Oscillations and perturbations are not severe enough to cause a rating higher than three (3) on the Cooper-Harper scale for the task at hand. Disturbances damp-out to one-third amplitude within three cycles.
Symbol Menu	A SA System symbol menu including symbols indicating no-fly zones, way points, landing zones, air refueling tracks, drop zones, commercial airways, and geographical features such as railroads, roads, air fields (military and civilian), towns, country borders, and water.
Teardown and Rebuild	The breaking down of a specific item into additional pieces (beyond standard riggings) in order to: place it on different pallets, spread out a pallet load, or combine separate pieces onto an already specified pallet. Rearranging an item on a pallet or selecting a different standard rigging does not constitute teardown and rebuild.
Threat Avoidance Range (R_T)	See Classified Appendix B for definition.
Twelve (12)-hour Fix Rate (FR)	The percentage of aircraft with landing status of code-3 returned to a flyable status in a certain amount of time (clock hours). 12-hour Fix Rate equals code-3 breaks fixed within 12 hours of landing divided by total code-3 breaks times 100. FR(%) = ("Code-3" Breaks fixed within 12 hours of landing/total "code-3" Breaks) * 100
Weapon System	The probability that the KC-X system, in mission capable status, will successfully complete its designated mission. This is specified as a

Reliability (WSR)	percentage of successful versus total missions.
Wide Body Aircraft	Baseline non-military aircraft with more than a single aisle in an all passenger configuration
Zeroize	To remove or eliminate the key from a crypto equipment or fill device

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Appendix A Tables and Figures

Table A-1 - Six-ship Self Deployment Package

Item	Length* (Inches)	Width* (Inches)	Height* (Inches)	Axle #1 Weight	Axle #2 Weight	Weight (Lbs)	Coupled Pallet Y/N
AMXS Initial Support Pallet	108	88	75	NA	NA	4095	N
AMXS Initial Support Pallet	108	88	67	NA	NA	2570	N
AMXS Initial Support Pallet	108	88	65	NA	NA	4325	N
MXS Initial Support Pallet	108	88	61	NA	NA	4110	N
MXS (AGE) Support Pallet	108	88	66	NA	NA	2855	N
MXS (AGE) A/C Jack Pallet	108	88	95	NA	NA	3345	N
MXS (AGE) A/C Jack Pallet	108	88	95	NA	NA	3345	N
Fire Extinguisher Pallet	108	88	63	NA	NA	1745	N
Tire Change Dolly	76	46	53	250	250	500	N
B-4 Stand	93	53	36	295	295	590	N
B-4 Stand	93	53	36	295	295	590	N
FL-1D Floodlight	80	48	66	1000	600	1600	N
FL-1D Floodlight	80	48	66	1000	600	1600	N
MC-2A Air Compressor	89	54	39	1095	NA	1125	N
NGH Portable Heater	65	57	60	740	NA	960	N
NGH Portable Heater	65	57	60	740	NA	960	N
NGH Portable Heater	65	57	60	740	NA	960	N
NGH Portable Heater	65	57	60	740	NA	960	N
Self Generating Nitrogen Trailer	72	67	60	1440	1730	3170	N
Self Generating Nitrogen Trailer	72	67	60	1440	1730	3170	N
AMXS ATSO Pallet	88	108	60	NA	NA	2350	N
Jacking Mainfold (Trailer)	85	57	53	1450	1150	2600	N
B-4 Stand	93	53	36	295	295	590	N
Self Generating Nitrogen Trailer	80	66	61	1175	855	2030	N
H-1 Heater	76	54	46	720	NA	850	N
H-1 Heater	76	54	46	720	NA	850	N
FL-1D Floodlight	96	67	61	875	1075	1950	N
FL-1D Floodlight	96	67	61	875	1075	1950	N
Fire Bottle	88	108	62	NA	NA	600	N
B-1 Stand	186	59	72	510	610	1120	Y
B-5 Stand	110	97	84	350	450	800	Y
B-5 Stand	110	97	84	350	450	800	Y
72 KW Generator	100	78	71	2900	2830	5730	Y

Item	Length* (Inches)	Width* (Inches)	Height* (Inches)	Axle #1 Weight	Axle #2 Weight	Weight (Lbs)	Coupled Pallet Y/N
72 KW Generator	100	78	71	2900	2830	5730	Y
Fuel Cell Trailer	127	58	66	1710	1710	3420	Y
Fuel Bowser	137	77	49	560	560	1120	Y
GOX Cart	150	64	41	1885	NA	2000	Y
GOX Cart	150	64	41	1885	NA	2000	Y
Dash 95 LASS Cart	116	63	75	1600	1080	2680	Y
MC-7 Air Compressor	130	72	51	2800	NA	2900	Y
MJ-2A-1, Hydraulic Mule	114	74	74	2340	2700	5040	Y
Portable Welder	152	80	80	1675	1675	3350	Y
B-1 Stand	186	59	36	510	610	1120	Y
DECON Washer	150	73	77	750	1500	2250	Y
B-1 Stand	186	59	36	510	610	1120	Y
M-32A-95 Turb	116	63	76	1250	1650	2900	Y
A/M32A-86D Generator	100	78	65	2900	2600	5500	Y
Wing Pod Support Pallet	108	88	30	NA	NA	650	N
Wing Pod Support (Fuel Disp Trailer)	102	48	57	577	566	1143	N
Wing Pod Support Pallet	108	88	40	NA	NA	1926	N
Wing Pod Support (Fuel Disp Trailer)	102	48	57	577	566	1143	N
Total Cargo Weight						**110787**	
Total Pallet Positions							**69**

*Dimensions shown are maximums and may be smaller at other parts of the item.

Personnel Requirements	**148** (includes 3 basic aircrew members (Aircraft Commander, pilot and ARO) per aircraft and passengers. Passengers will sit in permanent aircrew seats and in non-developmental 463L palletized seating (10 (AAR Mobility System P/N 50141-023), 12 (AAR Mobility System P/N 50141-015 or 50019-024) or 15 (AAR Mobility System P/N 50019-022) seat configurations permitted)).

Estimated Baggage Weight	**41,440** (4 bags per person, 70 lbs per bag)

Table A-2 - Communication Gateway Panel

Communication Gateway Panel	
Link-16	A connection for Link-16
JREAP-A	A connection for UHF SATCOM Joint Range Extension Application Protocol- Appendix A (JREAP-A)
SADL	A connection for the Situational Awareness Data Link (SADL)
IBS	A connection for Integrated Broadcast Service (IBS)
INMARSAT	A connection for International Maritime Satellite (INMARSAT)
Aircraft Power	A connection for aircraft power outlet (240 VAC, 400 Hz)

Table A-3 - C2 Downlink Messages

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
1	Air Refueling Event Status (Tanker Air Refueling aircraft only)		X	X	Mobility Enterprise Information Services (MEIS) Network	Tanker aircrews use the Air Refueling Event Status message to report status of their tasked aerial refueling event to C2 operators. The aircrew uses a C2 application to check/correct pre-filled air refueling information, which in-turn automatically generates and sends a message to report actual air refueling event information including actual fuel offload, fuel remaining on board, and fuel available for offload. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system. Both the tanker and receiver aircrews may use a free text message to report the status of an unsuccessful aerial refueling event.
2	Advisory		X		MEIS	Aircrews use the Advisory message to advise C2 operators on mission, aircraft, aircrew, equipment, etc., issues that could result in a delay in scheduled takeoff time. The aircrews use a C2 application to report a change in estimated time of departure and reason for the change. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
3	Aircraft Arrival	X	X#	X	MEIS	KC-X generates the Aircraft Arrival (On) message to automatically report to C2 systems that the aircraft has landed on the runway surface. This message is fully automatic and the date and time sent to ground-based C2 systems. If the automatic message generation and send is inoperative, the aircrews use the C2 application to manually enter and report the time. If KC-X automatically generates and sends the Aircraft Arrival (On) message, it also updates the aircrew's C2 application displays with the generated date and time information.

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
4	Aircraft Departure	X	X#	X	MEIS	KC-X generates the Aircraft Departure (Off) message to automatically report to C2 systems that the aircraft has left the runway surface and is airborne. This message is fully automatic and the date and time sent to ground-based C2 systems. If the automatic message generation and send is inoperative, the aircrews use the C2 application to manually enter and report the time. If KC-X automatically generates and sends the Aircraft Departure (Off) message, it also updates the aircrew's C2 application displays with the generated date and time information.
5	Estimated Time of Arrival (ETA)		X		MEIS	Aircrews use the Estimated Time of Arrival (ETA) message to advise C2 operators of a new ETA. The aircrews use the C2 application to report the ETA change and reason for the change. This message is initiated by the aircrew via a C2 application (may be auto populated with revised ETA date and time), transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
6	Free Text Report		X		MEIS or Email Server	Aircrews use the Free Text Report message to send a plain text formatted message (or an e-mail type message) to C2 operators. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system (or email server mail box).
7	Flight Plan Request		X	X	MEIS	Aircrews use the Flight Plan Request message to request C2 systems (or operators) send the active flight plan information for their sortie. This message is initiated by the aircrew, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
8	Position Information	X	X#	X	MEIS	KC-X generates the Position Information message to report actual aircraft position at a specific point in space and time to ground-based C2 systems. Information includes the date and time, present position (Latitude/Longitude), altitude, current direction (ground track), ground speed, outside air temperature, total remaining fuel on board, etc. This message is auto generated (or manually initiated by the aircrew as an option), transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system. KC-X sends a Position Information message upon reaching each way point on the active flight plan, and/or every 30 minutes (on legs exceeding 30 minutes, direct flights, or when no flight plan is active), when manually initiated by the aircrew via a C2 application, or requested by a ground to air C2 message.
9	Request for Weather Information		X		MEIS	Aircrews use the Request for Weather Information message to request en-route and/or terminal area weather from weather or C2 operators. The aircrews use their C2 application to request weather for a point in space, air refueling track, planned route, drop zone, landing zone, and/or airfield. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
10	Automatic Initialization Request		X		MEIS	Aircrews use the Automatic Initialization Request message to initialize and synchronize KC-X C2 data and links with their controlling ground based C2 systems. The aircrew uses KC-X to send basic aircraft and position information to the ground C2 system to request and load planned mission information. The C2 system collects aircraft and position information to automatically send core mission information (such as mission number, priority, tasking, departure station, arrival station, planned aircraft configuration, planned fuel load, crew information, planned payload, etc.) to auto populate the KC-X C2 application. This allows aircrew to quickly resume operations when beginning a mission, after tail swapping from a

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
						broken aircraft, or reloading mission information after a KC-X system failure or shutdown without losing and/or manually re-entering data. This message is initiated by the aircrew, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
11	Aircraft Alpha Status		X		MEIS	Aircrews use the Aircraft Alpha Status message to report aircraft operational status and systems problems to C2 and Logistics operators. The aircrew reports a change in operational mission status (i.e., A1, A2, or A3) and a reason for change in status (i.e.: #2 air conditioning pack inoperative). The aircrew use their C2 application to enter in a status or change an existing reported status, identify the aircraft system causing a status change, and additional information that explains the problem so ground maintenance personnel can order parts and/or be ready to trouble shoot/repair the system shortly after the aircraft blocks in. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
12	Aircraft Block In	X	X#	X	MEIS	KC-X generates the Aircraft Block-In (In) message to report to C2 systems that the aircraft has blocked in and brakes set. This message is fully automatic and the date and time sent to ground-based C2 systems. If the automatic message generation and send is inoperative, the aircrew uses the C2 application to manually enter a time which then generates the message. If KC-X automatically generates and sends the Aircraft Block-In (In) message, it also updates the aircrew's C2 application displays with the generated date and time information.

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
13	Aircraft Block Out	X	X#	X	MEIS	KC-X generates the Aircraft Block-Out (Out) message to report to C2 systems that the aircraft has blocked out and brakes released. This message is fully automatic and the date and time sent to ground-based C2 systems. If the automatic message generation and send is inoperative, the aircrew uses the C2 application to manually enter a time which then generate the message. If KC-X automatically generates and sends the Aircraft Block-Out (Out) message, it also updates the aircrew's C2 application displays with the generated date and time information.
14	Payload		X		MEIS	Aircrews use the Payload message to send actual payload (Cargo/Passenger) information for the sortie to C2 operators. Cargo report type information includes (planned and actual onload and offload) cargo weight, number of passengers, number of pallets, pieces of rolling stock, hazardous material, number of human remains, Signature Service / Registered Mail, any special handling instructions, etc., and remaining number of Souls on Board. The aircrews use their C2 application to view, correct, enter, and transmit payload information. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
15	Message Acknowledge		X		MEIS	Aircrews use the Message Acknowledgement message to acknowledge any message that is sent to the aircrew for review and/or acceptance back to the C2 operator. The aircrews use their C2 application to view the information, and when appropriate, acknowledge receipt and understand of the information. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
16	Air Refueling Track Request		X	X	MEIS	Aircrews use the Air Refueling Track Request message to request information on a documented air refueling track from the ground-based C2 system. The aircrews use their C2 application to enter in the requested Air Refueling Track name. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system. The C2 system automatically responds by sending KC-X the Air Refueling Track Detail information.
17	Divert		X		MEIS	Aircrews use the Divert message to inform C2 operators they are diverting from their planned destination. The aircrew use the KC-X C2 application to enter new destination, ETA, and reason for the divert. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
18	Mission Clearance Request		X		MEIS	Aircrews use the Mission Clearance Request message to request approval (Go/No Go) to execute the tasked mission/sortie/event. This message is used for missions that require positive control and/or a waiver to aircraft or aircrew operations. The aircrews use their KC-X C2 application to request "Positive Launch" approval or waiver. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system. The C2 system prompts the C2 operator to send the aircrew a launch or waiver approval, launch, or waiver disapproval, or directions to hold at the current air or ground operating location.
19	Delay		X		MEIS	Aircrews use the Delay message to advise C2 operators that the aircraft failed to depart within the allotted departure timeframe. The aircrews use the C2 application to report the reason for the delay. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.

No.	C2 Message *(Air to Ground)*	Auto Gen	Manual (#Backup)	OFP Feed	Receiving Name	Message Description
20	Response to Divert		X		MEIS	Aircrews use the Response to Divert to response to a C2 operator request to divert. The aircrew use their KC-X C2 application to acknowledge they understand and either accept or reject the divert request. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.
21	Weather Report		X	X	MEIS	Aircrews use the Weather Report message to report un-forecasted and/or significant en-route weather to C2 operators. The aircrews use their KC-X C2 application to fill in the relevant weather information and send to C2 operators. This message is initiated by the aircrew via a C2 application, transmitted machine-to-machine by KC-X, and auto populated in a ground-base C2 system.

Table A-4 - MEIS C2 Uplink Messages to KC-X

No.	C2 Message *(Ground to Air)*	Manual	Receiving Name	Message Description
1	Air Refueling Tasking	X	KC-X	C2 operators use the Air Refueling Tasking message to send aerial refueling task, tanker, and receiver information to the tanker and receiver aircrews. This message contains information on air refueling track, air refueling control time (ARCT), altitude, other tankers in the formation, and tanker and receiver information such as aircraft design series/tail number/home station, and planned fuel on load/off load. The aircrews use their C2 application to view air refueling, tanker, and receiver information. This message is received machine-to-machine and auto populated in the KC-X C2 application.
2	Air Refueling Track Detail	X	KC-X	C2 operators use the Air Refueling Track Detail message to send air refueling track information to tanker and receiver aircrews. This contains such information as air refueling track long and short name, key coordinates that define entry, rendezvous, and exit points, communications frequencies, etc. The aircrews use their C2 application to view air refueling track information. This message is received machine-to-machine and auto populated in the KC-X C2 application.
3	Free Text Report	X	KC-X	C2 operators use the Free Text Report message to send a plain text formatted message (or an e-mail type message) to aircrews. This message is received machine-to-machine and auto populated in the KC-X C2 application (or email client mail box).
4	Flight Plan		KC-X	C2 operators use the Flight Plan message to send new flight plan and route of flight information to the aircrews. This provides the aircrew the ability to collaborate on flight plan information with the C2 operator. The aircrews use their C2 application to view the new flight plan and route of flight information and accept or reject it. This message is received machine-to-machine and auto populated in the KC-X C2 application.
5	Flight Plan Request	X	KC-X	C2 operators use the Flight Plan Request message to request KC-X send the active flight plan information for their sortie. This message is received machine-to-machine and auto populated in the KC-X C2 application.

No.	C2 Message *(Ground to Air)*	Manual	Receiving Name	Message Description
6	Mission Information	X	KC-X	C2 operators use the Mission Information message to send all mission information needed for sortie execution to aircrews. The aircrews use their C2 application to view mission itinerary, mission taskings, diplomatic clearance, aircrew, aircraft, and payload information. This message is received machine-to-machine and auto populated in the KC-X C2 application.
7	Position Information Request	X	KC-X	C2 operators use the Position Information Request message to request current position information from KC-X without any aircrew intervention. This message is received machine-to-machine and triggers an auto response by the KC-X.
8	Weather Information	X	KC-X	C2 operators use the Weather Information message to send requested forecast and actual en-route and/or terminal weather information to aircrews. The aircrews use their C2 application to view weather information and, when appropriate, graphically display weather information on a geospatial map background. This message is received machine-to-machine and auto populated in the KC-X C2 application.
9	Divert	X	KC-X	C2 operators use the Divert message to send divert information (new airfield, landing zone, drop zone, and/or air refueling track) to aircrews. The aircrews use the C2 application to view divert information and reason. This message is received machine-to-machine and auto populated in the KC-X C2 application.
10	Advisory			C2 operators use the Advisory message to notify aircrews of mission, aircraft, aircrew, equipment, etc., issues that could result in a revised aircraft departure (such as pending diplomatic clearance approval). The aircrews use the KC-X C2 application to review the change in estimated time of departure and the reason for the change. This message is received machine-to-machine and auto populated in the KC-X C2 application.
11	Payload	X	KC-X	C2 operators use the Payload message to send planned payload (Cargo/Passenger) information for the sortie to aircrews. Cargo report type information includes (planned onload and offload) cargo weight, number of passengers, number of pallets, pieces of rolling stock, hazardous material, number of human remains, Signature Service / Registered Mail, any special handling instructions, etc. The aircrews use their C2 application to view, correct, and retransmit payload information. This message is received machine-to-machine and auto populated in the KC-X C2

No.	C2 Message *(Ground to Air)*	Manual	Receiving Name	Message Description
				application.
12	Undelivered Message Advisory		KC-X	Ground-based C2 systems use the Undelivered Message Advisory to notify aircrews whether a message was delivered or not delivered to the appropriate C2 system. The aircrews use their C2 application to view the delivery status of any information sent off the aircraft. This message is received machine-to-machine and auto populated in the KC-X C2 application.
13	Mission Clearance Request	X	KC-X	C2 operators use the Mission Clearance Request to send approval (Go/No Go) to execute the tasked mission/sortie/event. This message is used for missions that require positive control and/or a waiver to aircraft or aircrew operations. The aircrews use their KC-X C2 application to view the "Positive Launch" approval or waiver. This message is received machine-to-machine and auto populated in the KC-X C2 application.
14	Message Acknowled gement	X	KC-X	C2 operators use the Message Acknowledgement message to acknowledge any message that is sent by the aircrew for C2 review and/or acceptance. The aircrews use their KC-X C2 application to view the acknowledgement message and any additional information. This message is received machine-to-machine and auto populated in the KC-X C2 application.
15	Response to Divert	X	KC-X	C2 operators use the Response to Divert message to respond to an aircrew's request to divert. The aircrews use their KC-X C2 application to view the C2 message response and approve or disapprove of the request. This message is received machine-to-machine and auto populated in the KC-X C2 application.

Table A-5 - J-series messages

Message	Title	Use Case	Subtitle	Transmit / Receive (T/R)
J2.0	Indirect Interface Unit Precise Participant Location Identification (PPLI) Message	1	Track Database Processing	T/R
J2.2	Air PPLI Message	2	Track Database Processing	T/R
J2.3	Surface PPLI Message	2	Track Database Processing	R
J2.4	Subsurface PPLI Message	2	Track Database Processing	R
J2.5	Land Point PPLI Message	2	Track Database Processing (Unit Located with Joint Tactical Information Distribution System (JTIDS) Antenna)	R
		3	Track Database Processing (Unit Displaced from JTIDS Antenna)	R
J2.6	Land Track PPLI Message	2	Track Database Processing	R
J3.0	Reference Point Message	1	Single Unslaved Point	R
		5	Unslaved Single Point Area (General)	R
		6	Unslaved Single Point Area (Ballistic Missile Launch or Impact Point)	R
		11	Segmented Line of 2 or 3 Points	R
		12	Course & Speed Supplement for Uses 11 and 13 (3-Word Limit)	R
		13	Points 1, 2, and 3 of a Segmented Line of 4 to 17 Points or of Multipoint Area	R
		14	Additional Points for a Segmented Line of 4 to 17 Points or of Multipoint Area	R
		15	Width Supplement for Uses 11, 13 and 14 (3-Word Limit)	R
J3.1	Emergency Point Message	1	Receive Emergency Point	R
		2	Receive Emergency Point Deactivation	R

Message	Title	Use Case	Subtitle	Transmit / Receive (T/R)
J3.2	Air Track Message	1	Real Time Air Track Processing	R
J3.3	Surface Track Message	1	Real Time Surface Track Processing	R
		2	Non-real Time Surface Track Processing	R
J3.4	Subsurface Track Message	1	Track Processing	R
J3.5	Land Point/Track Message	1	Land Point Processing	R
		2	Real Time Land Track Processing	R
		3	Non Real Time Land Track Processing	R
J3.7	Electronic Warfare (EW) Product Information Message	1	Receive EW Line-of-Bearing (LOB) Product (Known Bearing)	R
		2	Receive EW LOB Product (Unknown Bearing)	R
		3	Receive EW Fix Product	R
		4	Receive EW Area of Probability (AOP) Product	R
J6.0	Amplification Message	1	Receive Amplifying Data	R
J7.0	Track Management Message	1	Receive Drop Track/Point	R
		2	Amend FORCE TELL Status for Transmission in Platforms PPLI	R
		3	Receive Exercise Status Order	R
J7.7	Association Message	1	Data Association	R
		2	Terminate Data Association	R
J10.2	Engagement Status Message	1	Engagement Status against other than Theater Ballistic Missiles (TBMs)	R
		2	Engagement Status against other than TBMs	R
		3	Engagement Status against other than TBMs	R
		5	Engagement Termination	R
		6	Engagement Termination	R
		7	Engagement Termination	R
		8	Battle Damage Assessment	R
		9	Battle Damage Assessment	R

Message	Title	Use Case	Subtitle	Transmit / Receive (T/R)
		10	Battle Damage Assessment	R
J10.6	Pairing Message	1	Pairing	R
		2	Pairing Termination	R
J12.0	Mission Assignment Message	13	Mission Assignment: Return to Base (RTB)	T/R
		14	Mission Assignment: Divert or Recall	T/R
		15	Mission Assignment: Orbit	T/R
		16	Mission Assignment: Refuel	T/R
		17	Mission Assignment: Search and Rescue (SAR)	T/R
		21	Mission Assignment: Clear To Drop	T/R
		22	Supplemental Information Pertaining to Mission Assignment	T/R
		23	Mission Assignment Response	T/R
		24	Mission Assignment Cancellation: Break Engage, Do Not Drop, Cease Attack, or Cease Mission	T/R
		25	Mission Assignment Cancellation Response	T/R
		26	Go To Voice Order	T/R
		27	Go To Voice Response	T/R
		28	Salvo/Clear Aircraft Order	R
		29	Salvo/Clear Aircraft Order Response	T/R
		30	High Interest Track Designation	R
		31	Cancel High Interest Track Designation	R
J12.1	Vector Message	1	Vector, Operator Initiated	R
		2	Vector, Automated Update	R
		3	Response to Vector	R
		4	Vector Termination	R
		5	Response to Vector Termination	R
J12.3	Flight Path Message	1	Flight path- Original	R
		2	Flight Path- Update	R

Message	Title	Use Case	Subtitle	Transmit / Receive (T/R)
		4	Operator Response to Flight Path	T/R
J12.4	Controlling Unit Change Message	1	Control Change Order	R
		2	Response to Control Change Order	R
		3	Terminate Control	R
		4	Response to Terminate Control	R
		5	Check-in Request	T
		6	Response to Check-in Request	R
		7	Added information to Check-in Response	R
J12.5	Target/Track Correlation Message	0	Target/Track Decorrelation	R
J12.6	Target Sorting Message	1	Local Target Report	R
		5	Termination of Local Target, Local Target Bearing or Local Markpoint	R
		6	Targeting Status Report on Local Target	R
		7	Targeting Status Report on Remote Target	R
		8	Targeting Status Report on Surveillance Track	R
		9	Engagement Status Report on Local Target	R
		10	Engagement Status Report on Remote Target	R
		11	Engagement Status Report on SurveillanceTrack	R
		12	Termination of Engagement Status Report on Local Target	R
		13	Termination of Engagement Status Report on Remote Target	R
		14	Termination of Engagement Status Report on Surveillance Track	R
		15	Bomb Damage Assessment (BDA) Report on Local Target	R
		16	BDA Report on Remote Target	R
		17	BDA Report on Surveillance Track	R

Message	Title	Use Case	Subtitle	Transmit / Receive (T/R)
		21	Local Mark Point/Point of Interest	T/R
		22	Pointer to Geographic Location	T/R
		23	Pointer to Local Target	T/R
		24	Pointer to Remote Target	T/R
		25	Pointer to Surveillance Track	T/R
J13.0	Airfield Status Message	1	Update Status of Nominated Airfield	R
J13.2	Air Platform and System Status Message	1	Update to Status of Air Unit	T/R
J14.0	Parametric Information Message	1	EW Parametric Bearing (Known Bearing)	T/R
		2	EW Parametric Bearing (Unknown Bearing)	T/R
		3	EW Parametric Fix	T/R
		4	EW Parametric AOP	T/R
J15.0	Threat Warning Message	1	Receipt of Threat Warning	R
		2	Receipt of Cancel Threat Warning	R
J16.0	Imagery Message	0	Summary	R
J16.1	Route Change Message	0	Summary	T/R
J17.0	Weather Over Target Message	1	Weather Over Target Data	T/R
J28.2	Text Message	1	J28.2(0) Text message	T/R

Table A-6 - AIP Data Collection Items

Parameter ID	Parameter Name
1	Time*
2	Pressure altitude*
3	Indicated airspeed*
4	Heading—primary flight crew reference (if selectable, record Discrete, true or magnetic)*
5	Normal acceleration (Vertical)
6	Pitch attitude*
7	Roll attitude*
8	Manual radio transmitter keying, or CVR/DFDR synchronization reference
9	Thrust/power of each engine - primary flight crew reference
10	Autopilot engagement status
11	Longitudinal acceleration
12	Pitch control input
13	Lateral control input
14	Rudder pedal input
15	Primary pitch control surface position
16	Primary lateral control surface position
17	Primary yaw control surface position
18	Lateral acceleration
19	Pitch trim surface position or parameters of paragraph (a) (82) of this section if currently recorded
20	Trailing edge flap or [cockpit flap control selection (except when parameters of paragraph (a)(85) of this section apply]
21	Leading edge flap or [cockpit flap control selection (except when parameters of paragraph (a)(86) of this section apply]
22	Each Thrust reverser position (or equivalent for propeller airplane)
23	Ground spoiler position or [speed brake selection (except when parameters of paragraph (a) (87) of this section apply]
24	Outside or [total air temperature]*
25	Automatic Flight Control System (AFCS modes and engagement status, including auto-throttle)
26	Radio altitude (when an information source is installed)
27	Localizer deviation, MLS Azimuth
28	Glide-slope deviation, MLS Elevation
29	Marker beacon passage
30	Master warning
31	Air/ground sensor (primary airplane system reference nose or main gear)
32	Angle of attack (when information source is installed)*
33	Hydraulic pressure low (each system)
34	Ground speed (when an information source is installed)

Parameter ID	Parameter Name
35	Ground proximity warning system
36	Landing gear position and landing gear cockpit control selection
37	Drift angle (when an information source is installed)
38	Wind speed and direction (when an information source is installed)
39	Latitude and longitude (when an information source is installed)*
40	Stick shaker/pusher (when an information source is installed)
41	Wind-shear (when an information source is installed
42	Throttle/power lever position
43	Additional engine parameters (as designated in 14 CFR Part 121 Appendix M and listed below)
44	Traffic alert and collision avoidance system
45	DME 1 and 2 distances
46	Nav 1 and 2 selected frequency
47	Selected barometric setting (when an information source is installed)
48	Selected altitude (when an information source is installed)
49	Selected speed (when an information source is installed)
50	Selected Mach (when an information source is installed)
51	Selected vertical speed (when an information source is installed)
52	Selected heading (when an information source is installed)
53	Selected flight path (when an information source is installed)
54	Selected decision height (when an information source is installed)
55	EFIS display format (Pilot & [First Officer])
56	Multi-function/engine/alerts display format
57	Thrust command (when an information source is installed)
58	Thrust target (when an information source is installed)
59	Fuel quantity in CG trim tank (when an information source is installed)
60	Primary Navigation System Reference
61	Icing (when an information source is installed)
62	Engine warning each engine vibration (when an information source is installed)
63	Engine warning each engine over temp (when an information source is installed)
64	Engine warning each engine oil pressure low (when an information source is installed)
65	Engine warning each engine over speed (when an information source is installed)
66	Yaw trim surface position
67	Roll trim surface position
68	Brake pressure (selected system)
69	Brake pedal application (left and right)
70	Yaw or sideslip angle (when an information source is installed)*
71	Engine bleed valve position (when an information source is installed)
72	De-icing or anti-icing system selection (when an information source is installed)

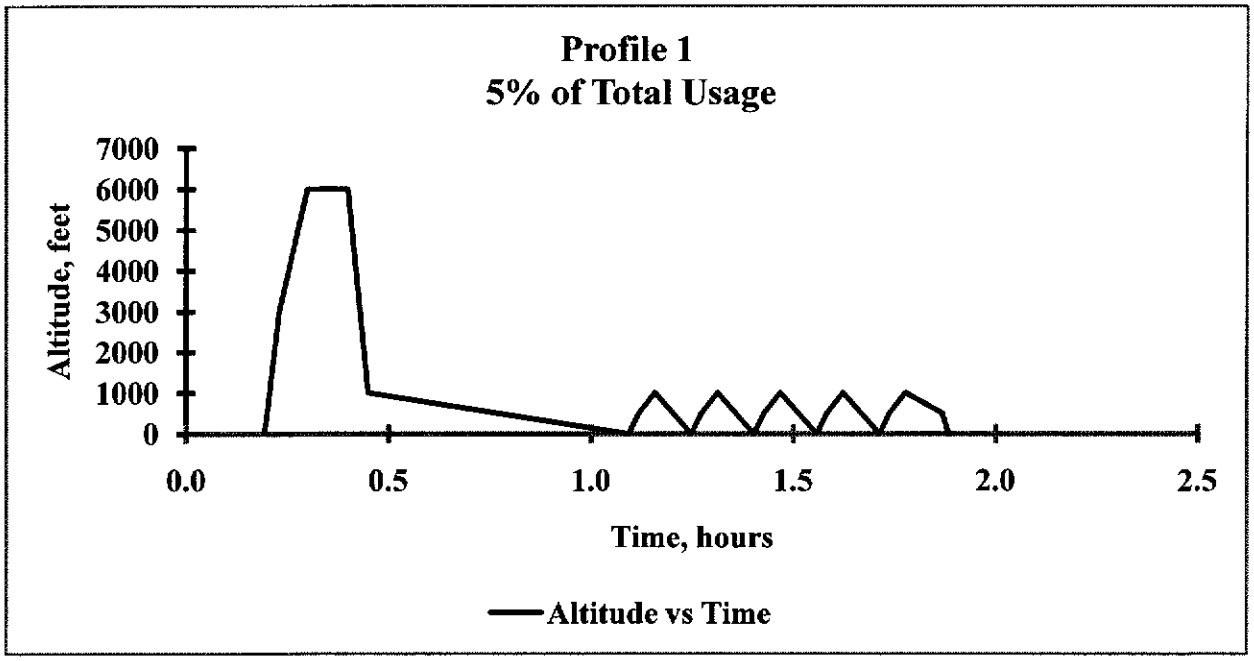
Parameter ID	Parameter Name
73	Computed center of gravity (when an information source is installed)*
74	AC electrical bus status
75	DC electrical bus status
76	APU bleed valve position (when an information source is installed)
77	Hydraulic pressure (each system)
78	Loss of cabin pressure
79	Computer failure
80	Heads-up display (when an information source is installed)
81	Para-visual display (when an information source is installed)
82	Cockpit trim control input position--pitch
83	Cockpit trim control input position--roll
84	Cockpit trim control input position--yaw
85	Trailing edge flap and [cockpit flap control position]
86	Leading edge flap and [cockpit flap control position]
87	Ground spoiler position and [speed brake selection]
88	All cockpit flight control input forces (control wheel, control column, rudder pedal)
92	Data Time Tag Reference
93	Recorder Elapsed Time
94	Relative Time count
95	UTC/GPS Time
96	Date
97	Aircraft Number
98	Departure Base
99	Aircraft Weight
100	Taxi Speed
101	MACH #*
102	GPS Altitude
104	Speed brake Position
108	Hydraulic System Selected
109	Stability Augmentation System Engagement
110	Ground Spoiler Cockpit Selection
112	Bleed Air Select
113	Co-pilot Selected Barometric Setting
114	Course/DSTRK
115	Path Angle
116	Communication Frequencies
117	Secondary Power System (APU/EPU) Select
118	AFCS Malfunction
119	SAS/SCAS Failure

Parameter ID	Parameter Name
120	Engine Controller Failure
121	Converter(s) Fail/Malfunction
122	Generator(s) Fail
123	Inverter
124	Battery Temp/Failures
125	Secondary Power (APU/EPU) System Fail
126	Pneumatic Low Pressure Warning
127	Oxygen Concentration Low
128	Oxygen Back Up
130	Fire Warning
132	Co-pilot EFIS Display Format
133	Chip Lights
134	Engine Stall
135	Fuel Pressure
136	ILS/GPS Glidepath
137	ILS/GPS Localizer
138	Total Fuel Quantity
139	Fuel Transfer
140	Fuel Boost
141	Fuel Filter/Bypass
142	In-flight Refueling Engage
143	Fuel Dump Switch Position
144	Fuel Dump Valve Position
145	HUD Display Parameters
146	Head Up Display in use
147	Cabin Pressure
148	Air/Ground Status & each landing gear WOW As installed
149	Nose Gear Up and Locked
150	Nose Gear Down and Locked
151	Lt Main Gear Up and Locked
152	Lt Main Gear Down and Locked
153	Rt Main Gear Up and Locked
154	Rt Main Gear Down and Locked
155	Parking Brake On
156	Wheel Speed
157	Nose Gear Steering Fail
158	Anti Skid/Brakes Fail/Inop
159	Controllable Stabilator Input
160	Pitch Rate
161	Roll Rate

Parameter ID	Parameter Name
162	Yaw Rate
163	Boom Azimuth/Roll*
164	Boom Elevation*
165	Boom Extension*
166	Boom Torsion Load*
167	Boom Axial Load*
168	Boom Radial Load*
169	Boom - Commanded Ruddervator position
170	Boom - Commanded extension position
171	Boom-Receiver contact
172	Boom Brute Force Disconnect
173	Boom Status (ready/contact/disconnect)*
174	Boom disconnect trigger source & value*
175	Fuel transfer rate*
176	Amount of fuel off-loaded from KC-X*
177	Amount of fuel on-loaded to KC-X*
178	Fuel Quantity in Each Tank*
179	Fuel Temperature in Each Tank*
180	Fuel Pressure at Boom inlet & downstream of Boom Pressure Regulator*
181	Fuel Pressure at Drogue AR System(s) and downstream from Pressure Regulator*
182	Boom envelope limit settings *
183	Air Refueling Load Alleviation System (ALAS) - inputs & responses
184	Boom/air-refueling exterior lighting settings
185	Boom trim
186	ARO video - Boom*
187	ARO audio - Boom*
188	Hose/Drogue length*
189	Hose/Drogue Status*
190	ARO video - Drogue*
191	ARO audio - Drogue*
192	Hose/Drogue Cycles*
193	Receiver Receptacle Status (door open/closed, ready/contact/disconnect*
194	KC-X As Receiver disconnect trigger source & value*
195	RAM Air Turbine Speed*
196	AR Warning Cautions and Advisories*
197	Data Link Acknowledged messages (input)
198	Data Link Acknowledged messages (output)
199	Yaw Damper Command
200	Yaw Damper Status

Parameter ID	Parameter Name
201	Standby Rudder Status
202	Engine Status/Parameters
203	Thrust of Each Engine
204	Engine Pressure Ratio (EPR)
205	Fan speed (N1)
206	Indicated vibration level
207	Core Speed (N2)
208	Exhaust Gas Temperature (EGT)
209	Fuel Flow
210	Fuel Cutoff Lever Position
211	Oil Pressure
212	Oil Temperature
213	Torque
214	Turbine Inlet Temperature
215	Microphone/transmitter keying
216	CVR Recording Status
217	Calibrated Airspeed
218	Receiver Identification
219	Fault Code Event (Verified Fault Code + Work Unit Code + How Malfunction Code)

Figure A-1 - Referenced Flight Profiles



Profile 1 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
FLAPS DOWN (F.D.) CLIMB	500	0.03	0.2	DOWN	DOWN
CLIMB	3,000	0.07	0.23	UP	UP
CRUISE	6,000	0.1	0.3	UP	UP
DESCENT	2,900	0.05	0.4	UP	UP
PATTERN	1,000	0.643	0.45	DOWN	DOWN
TOUCH&GO	0	0.025	1.093	DOWN	DOWN
CLIMB	500	0.04	1.118	DOWN	DOWN
PATTERN	1,000	0.09	1.158	DOWN	DOWN
TOUCH&GO	0	0.025	1.248	DOWN	DOWN
CLIMB	500	0.04	1.273	DOWN	DOWN
PATTERN	1,000	0.09	1.313	DOWN	DOWN
TOUCH&GO	0	0.025	1.403	DOWN	DOWN
CLIMB	500	0.04	1.428	DOWN	DOWN

Profile 1 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
PATTERN	1,000	0.09	1.468	DOWN	DOWN
TOUCH&GO	0	0.025	1.558	DOWN	DOWN
CLIMB	500	0.04	1.583	DOWN	DOWN
PATTERN	1,000	0.09	1.623	DOWN	DOWN
TOUCH&GO	0	0.025	1.713	DOWN	DOWN
CLIMB	500	0.04	1.738	DOWN	DOWN
PATTERN	1,000	0.09	1.778	DOWN	DOWN
F.D. DESCENT	500	0.016	1.868	DOWN	DOWN
LANDING ROLL	0	0.007	1.884	DOWN	AS REQ
TAXI IN	0	0.119	1.891	DOWN	UP
MISSION TIME			2.01		

NOTES FOR PROFILE 1:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

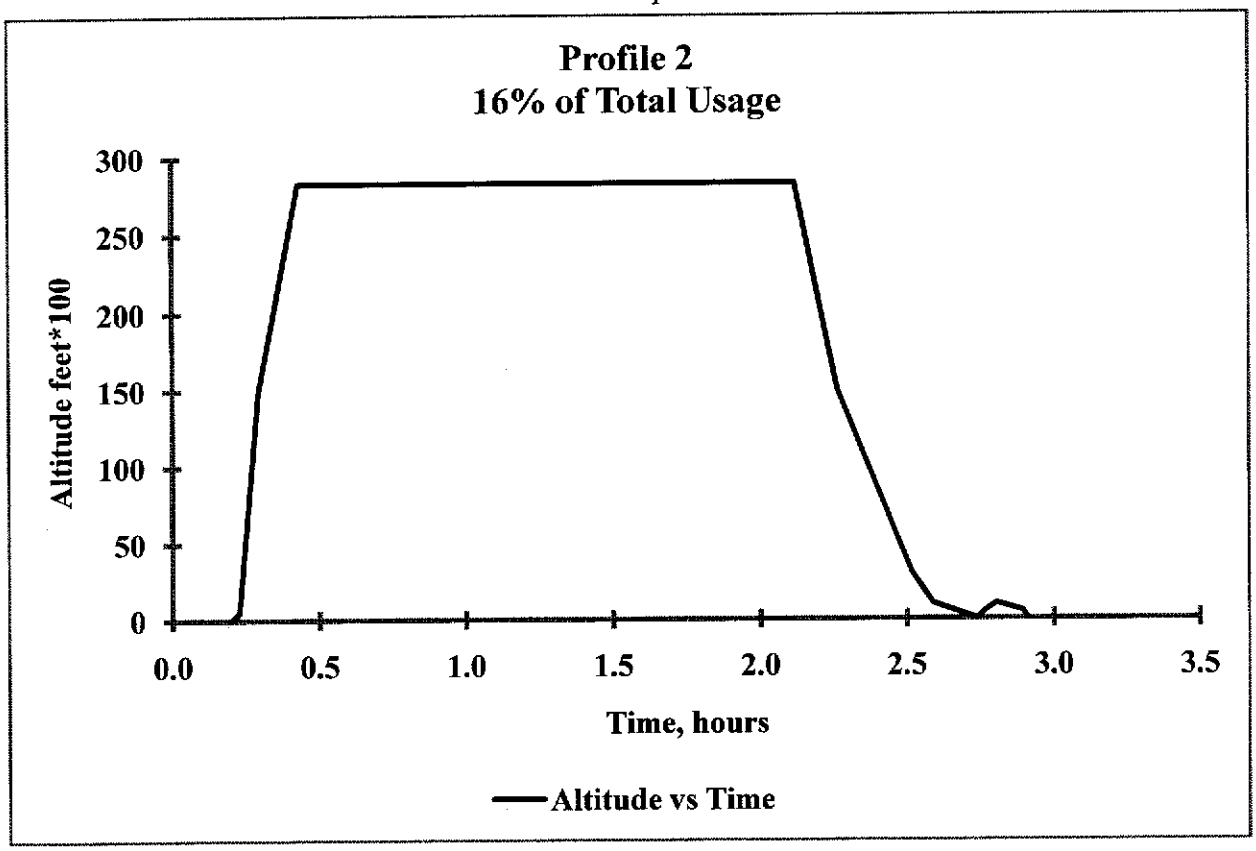
3. Cruise to be accomplished for specified times and at specified altitude(s).

4. En-route descent. Altitude shown is final altitude after maneuver.

5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

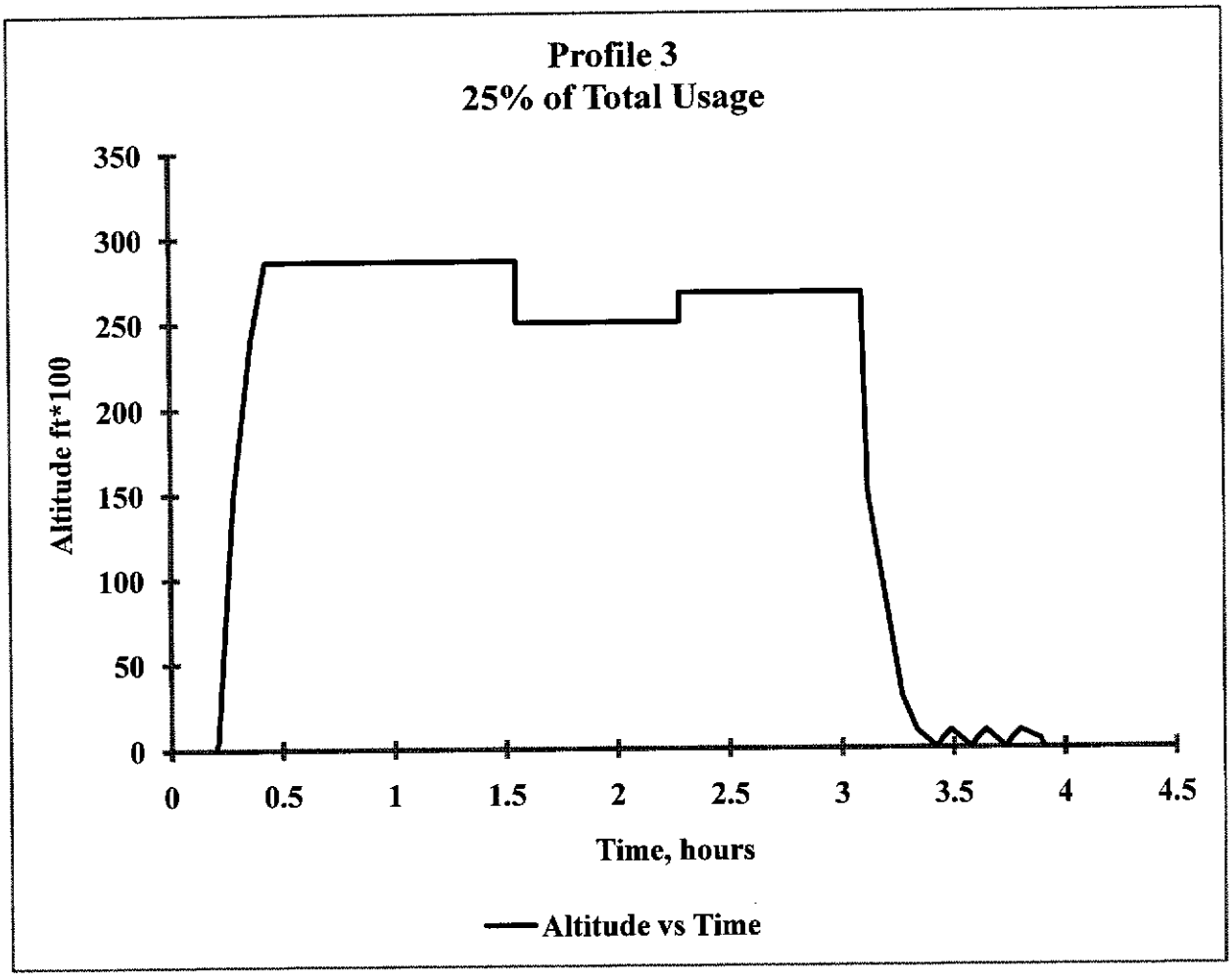


Profile 2 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.027	0.2	DOWN	DOWN
CLIMB	24,150	0.203	0.227	UP	UP
CRUISE	28,300	1.69	0.43	UP	UP
DESCENT	3,000	0.469	2.12	UP	UP
PATTERN	1,000	0.15	2.589	DOWN	DOWN
TOUCH&GO	0	0.025	2.739	DOWN	DOWN
CLIMB	500	0.04	2.764	DOWN	DOWN
PATTERN	1,000	0.09	2.804	DOWN	DOWN
F.D. DESCENT	500	0.016	2.894	DOWN	DOWN
LANDING ROLL	0	0.007	2.91	DOWN	AS REQ
TAXI IN	0	0.119	2.917	DOWN	UP

Profile 2 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
MISSION TIME			3.036		

NOTES FOR PROFILE 2:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.
2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.
3. Cruise to be accomplished for specified times and at specified altitude(s).
4. En-route descent. Altitude shown is final altitude after maneuver.
5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).
6. Time specified is the elapsed time for the specific event.
7. Total Time is the total elapsed time to the start of the specific event.



Profile 3 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN
CLIMB	24,050	0.22	0.211	UP	UP
CRUISE	28,600	1.12	0.431	UP	UP
OFFLOAD 8,500 LBS	25,000	0.73	1.551	UP	UP
CRUISE	26,700	0.81	2.281	UP	UP
DESCENT	3,000	0.243	3.091	UP	UP

Profile 3 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
PATTERN	1,000	0.09	3.334	DOWN	DOWN
TOUCH&GO	0	0.025	3.424	DOWN	DOWN
CLIMB	500	0.04	3.449	DOWN	DOWN
PATTERN	1,000	0.09	3.489	DOWN	DOWN
TOUCH&GO	0	0.025	3.579	DOWN	DOWN
CLIMB	500	0.04	3.604	DOWN	DOWN
PATTERN	1,000	0.09	3.644	DOWN	DOWN
TOUCH&GO	0	0.025	3.734	DOWN	DOWN
CLIMB	500	0.04	3.759	DOWN	DOWN
PATTERN	1,000	0.09	3.799	DOWN	DOWN
F.D. DESCENT	500	0.016	3.889	DOWN	DOWN
LANDING ROLL	0	0.007	3.905	DOWN	AS REQ
TAXI IN	0	0.119	3.912	DOWN	UP
MISSION TIME			4.031		

NOTES FOR PROFILE 3:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

3. Cruise to be accomplished for specified times and at specified altitude(s).

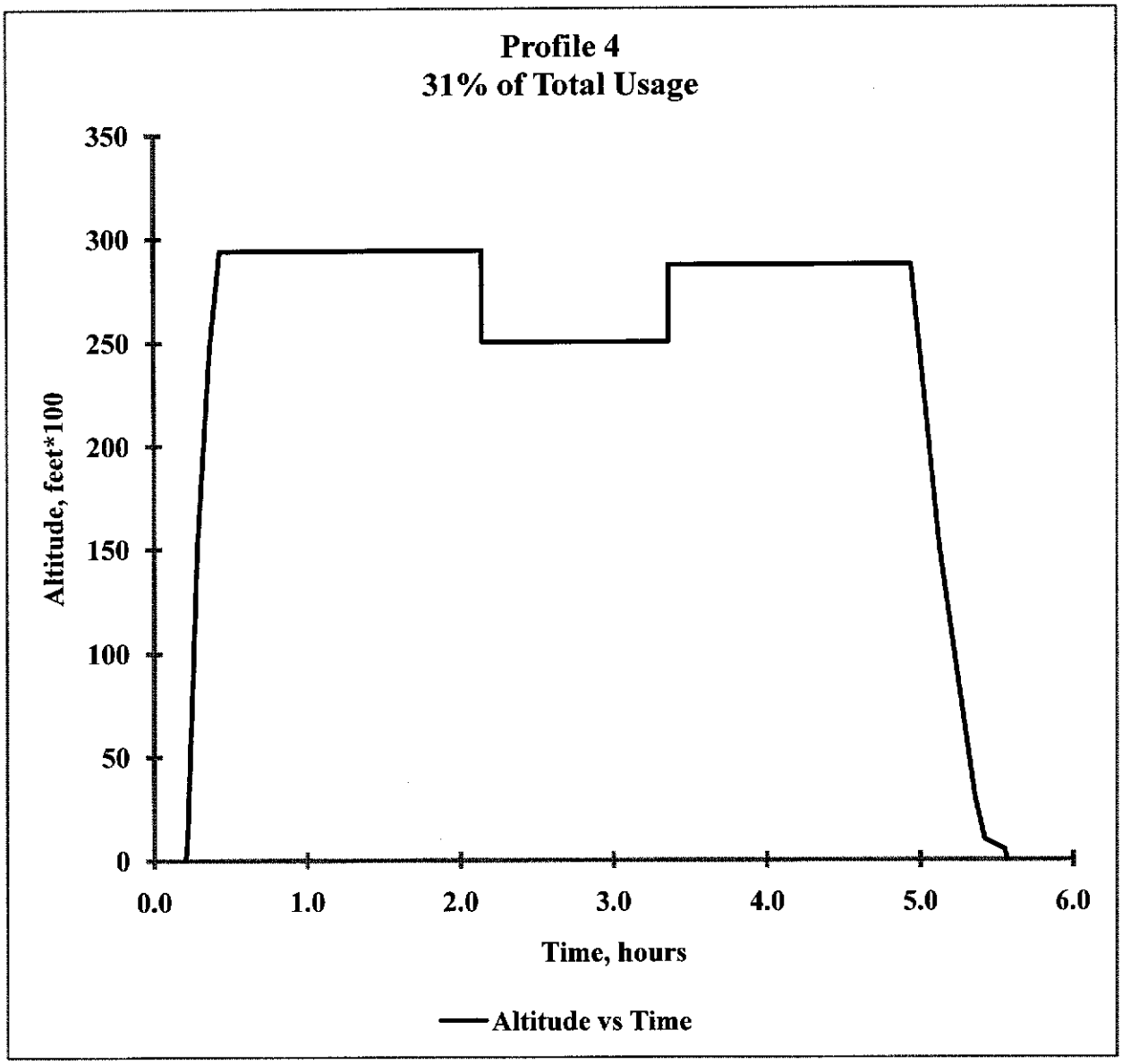
4. En-route descent. Altitude shown is final altitude after maneuver.

5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

8. The amount to be offloaded is specified under "OFFLOAD". Fuel for Time for descents/climbs to/from refueling orbits or tracks will not be included.



Profile 4 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN
CLIMB	24,700	0.22	0.211	UP	UP
CRUISE	29,400	1.71	0.431	UP	UP

Profile 4 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
OFFLOAD 24,000 LBS	25,000	1.22	2.141	UP	UP
CRUISE	28,700	1.58	3.361	UP	UP
DESCENT	3,000	0.481	4.941	UP	UP
PATTERN	1,000	0.13	5.422	DOWN	DOWN
F.D. DESCENT	500	0.016	5.552	DOWN	DOWN
LANDING ROLL	0	0.007	5.568	DOWN	AS REQ
TAXI IN	0	0.119	5.575	DOWN	UP
MISSION TIME			5.694		

NOTES FOR PROFILE 4:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

3. Cruise to be accomplished for specified times and at specified altitude(s).

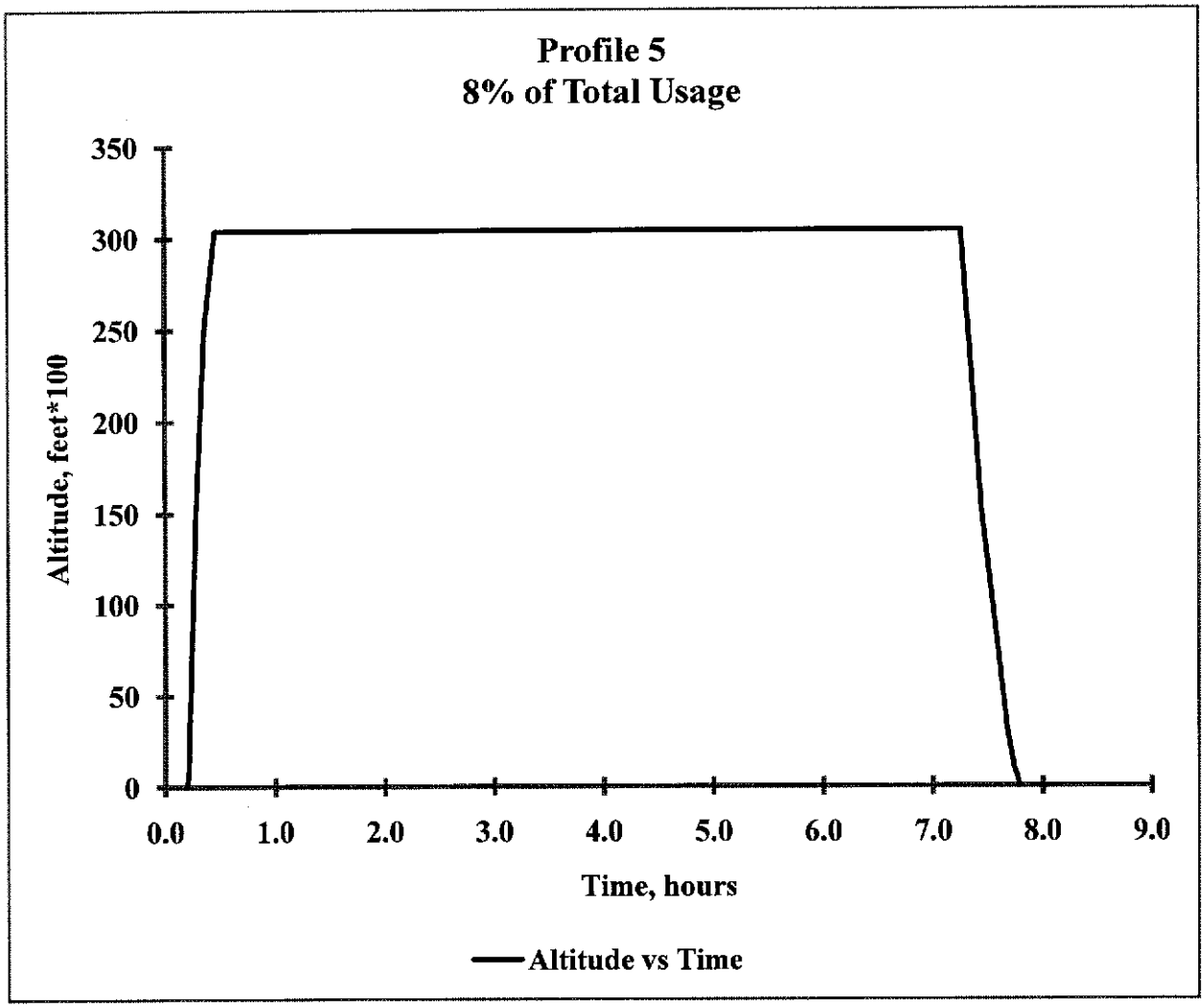
4. En-route descent. Altitude shown is final altitude after maneuver.

5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

8. The amount to be offloaded is specified under "OFFLOAD". Fuel for Time for descents/climbs to/from refueling orbits or tracks will not be included.

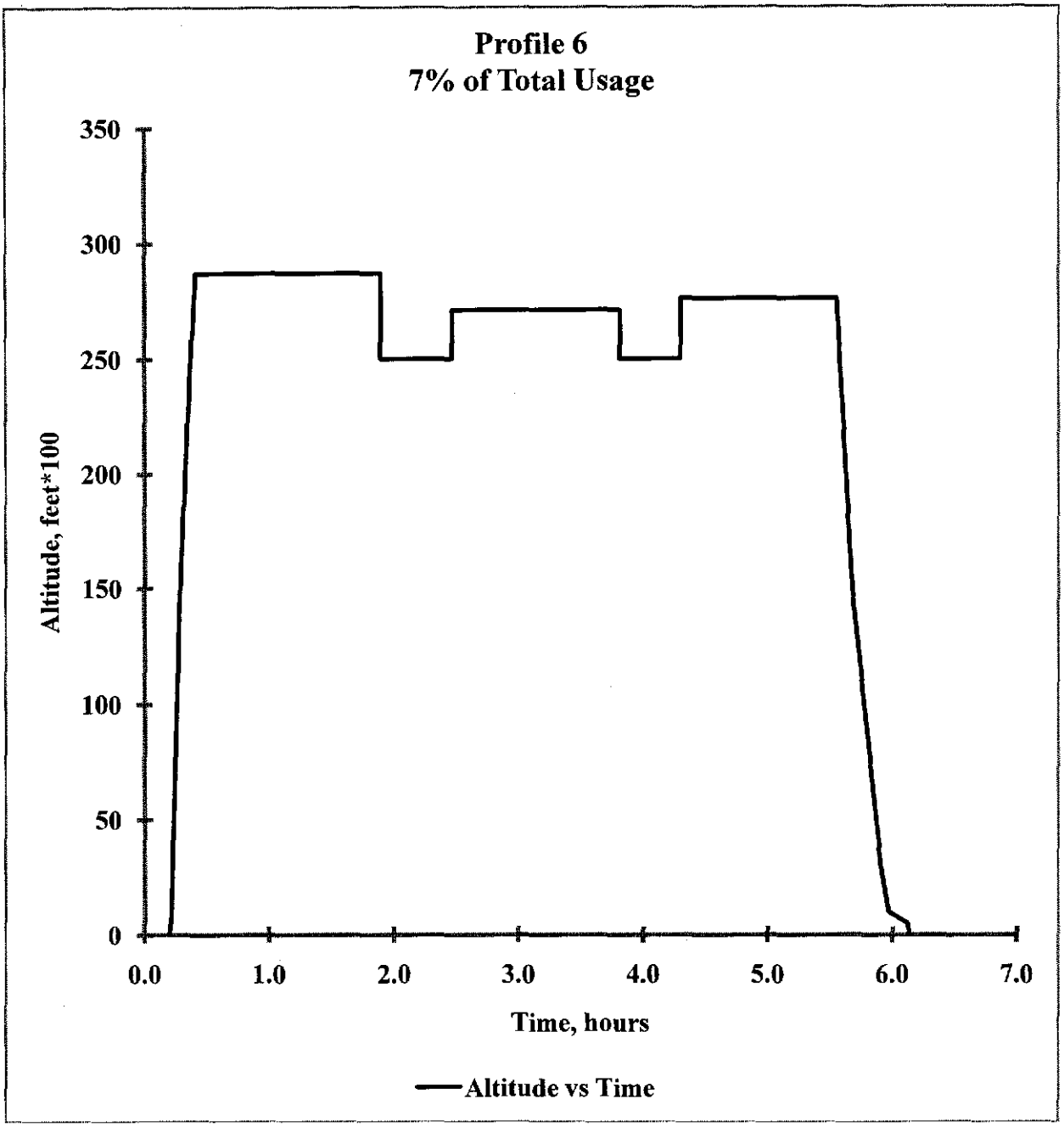


Profile 5 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN
CLIMB	25,200	0.25	0.211	UP	UP
CRUISE	30,400	6.797	0.461	UP	UP
DESCENT	3,000	0.481	7.258	UP	UP
PATTERN	1,000	0.03	7.739	DOWN	DOWN
F.D. DESCENT	500	0.016	7.769	DOWN	DOWN

Profile 5 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
LANDING ROLL	0	0.007	7.785	DOWN	AS REQ
TAXI IN	0	0.119	7.792	DOWN	UP
MISSION TIME			7.911		

NOTES FOR PROFILE 5:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.
2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.
3. Cruise to be accomplished for specified times and at specified altitude(s).
4. En-route descent. Altitude shown is final altitude after maneuver.
5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).
6. Time specified is the elapsed time for the specific event.
7. Total Time is the total elapsed time to the start of the specific event.



Profile 6 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN

Profile 6 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
CLIMB	24,350	0.202	0.211	UP	UP
CRUISE	28,700	1.48	0.413	UP	UP
OFFLOAD 11,000 LBS	25,000	0.57	1.893	UP	UP
CRUISE	27,100	1.35	2.463	UP	UP
OFFLOAD 0 LBS	25,000	0.49	3.813	UP	UP
CRUISE	27,600	1.25	4.303	UP	UP
DESCENT	3,000	0.419	5.553	UP	UP
PATTERN	1,000	0.15	5.972	DOWN	DOWN
F.D. DESCENT	500	0.016	6.122	DOWN	DOWN
LANDING ROLL	0	0.007	6.138	DOWN	AS REQ
TAXI IN	0	0.119	6.145	DOWN	UP
MISSION TIME			6.264		

NOTES FOR PROFILE 6:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

3. Cruise to be accomplished for specified times and at specified altitude(s).

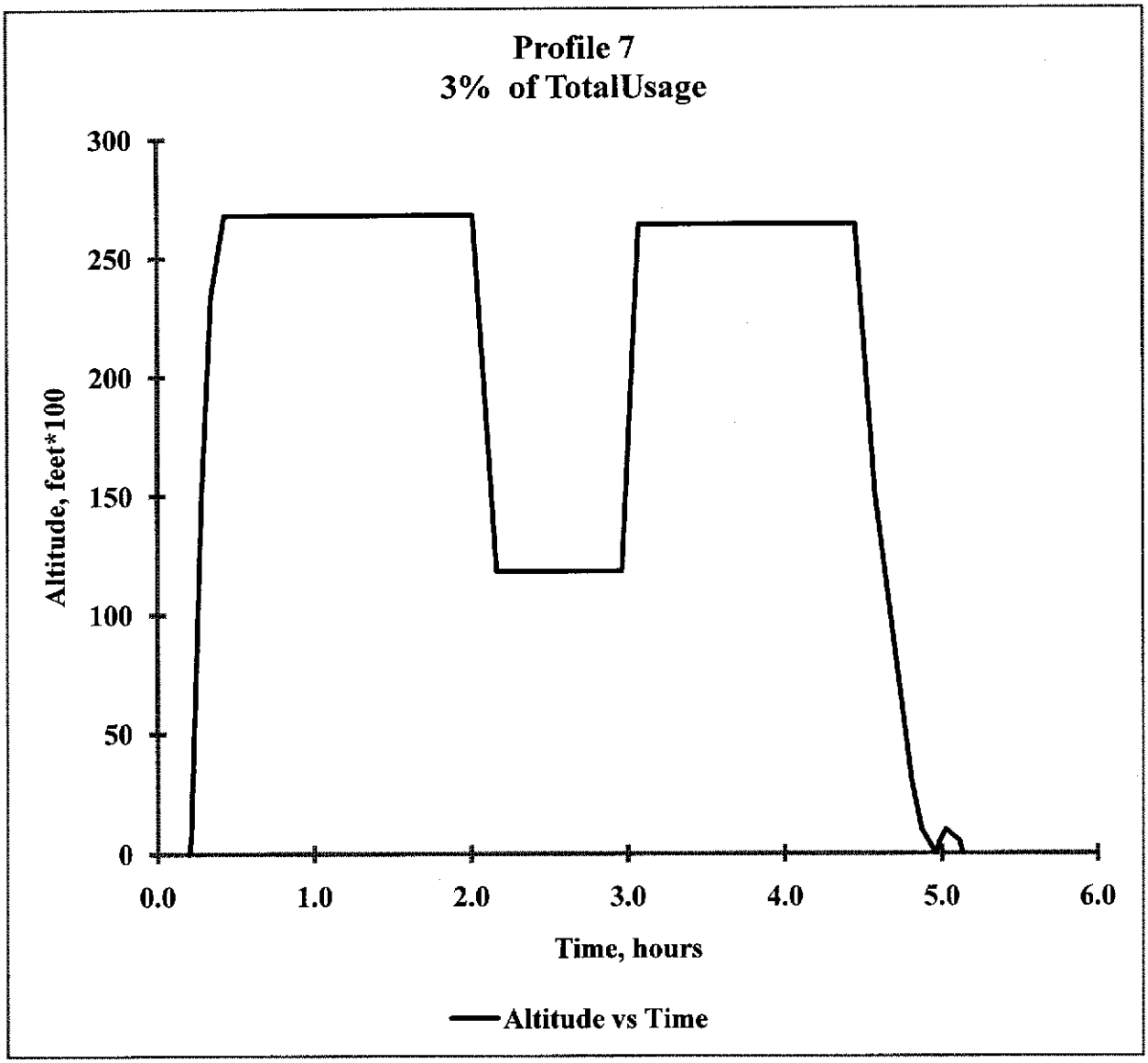
4. En-route descent. Altitude shown is final altitude after maneuver.

5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

8. The amount to be offloaded is specified under "OFFLOAD". Fuel for Time for descents/climbs to/from refueling orbits or tracks will not be included.



Profile 7 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN
CLIMB	23,400	0.22	0.211	UP	UP
CRUISE	26,800	1.58	0.431	UP	UP
DESCENT	19,300	0.15	2.011	UP	UP

Profile 7 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
OFFLOAD 4,000 LBS	11,800	0.8	2.161	UP	UP
CLIMB	19,100	0.11	2.961	UP	UP
CRUISE	26,400	1.38	3.071	UP	UP
DESCENT	3,000	0.419	4.451	UP	UP
PATTERN	1,000	0.09	4.87	DOWN	DOWN
TOUCH&GO	0	0.025	4.96	DOWN	DOWN
CLIMB	500	0.04	4.985	DOWN	DOWN
PATTERN	1,000	0.09	5.025	DOWN	DOWN
F.D. DESCENT	500	0.016	5.115	DOWN	DOWN
LANDING ROLL	0	0.007	5.131	DOWN	AS REQ
TAXI IN	0	0.119	5.138	DOWN	0
MISSION TIME			5.257		

NOTES FOR PROFILE 7:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

3. Cruise to be accomplished for specified times and at specified altitude(s).

4. En-route descent. Altitude shown is final altitude after maneuver.

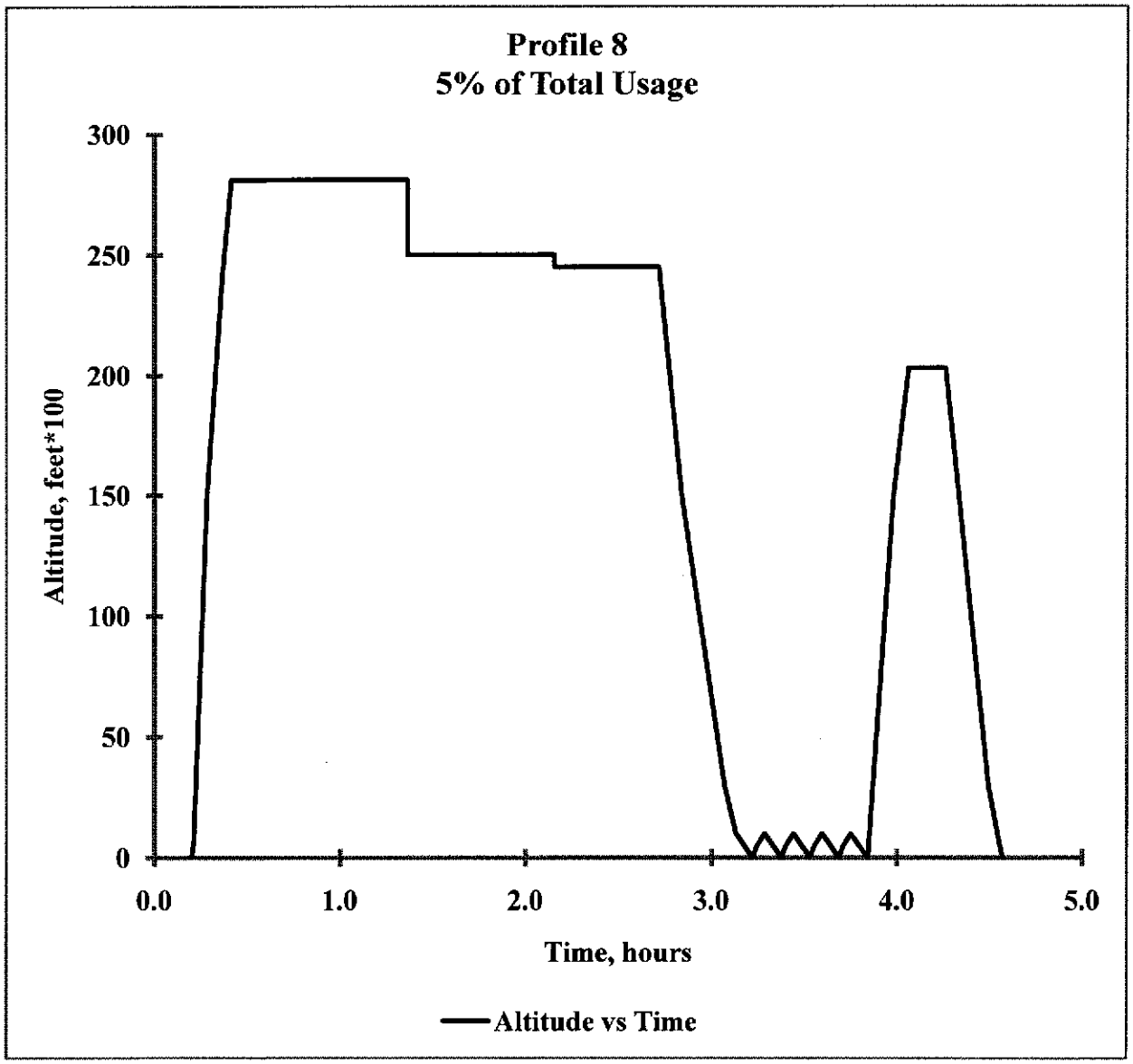
5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

8. The amount to be offloaded is specified under "OFFLOAD". Fuel or Time for descents/climbs to/from refueling orbits or tracks will not be included unless specified.

9. For this profile, fuel burned and time required for the descent to refueling altitude and climb back to cruise altitude is to be calculated.



Profile 8 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
TAXI OUT	0	0.193	0	DOWN	UP
TAKEOFF ROLL	0	0.007	0.193	DOWN	AS REQ
F.D. CLIMB	500	0.011	0.2	DOWN	DOWN
CLIMB	24,050	0.202	0.211	UP	UP
CRUISE	28,100	0.95	0.413	UP	UP

Profile 8 Mission Data					
Event Description	**Altitude (ft)**	**Time (hrs)**	**Event Start Time (hrs)**	**Landing Gear Position**	**Flaps (Pos)**
OFFLOAD 2,000 LBS	25,000	0.79	1.363	UP	UP
CRUISE	24,500	0.56	2.153	UP	UP
DESCENT	3,000	0.419	2.713	UP	UP
PATTERN	1,000	0.09	3.132	DOWN	DOWN
TOUCH&GO	0	0.025	3.222	DOWN	DOWN
CLIMB	500	0.04	3.247	DOWN	DOWN
PATTERN	1,000	0.09	3.287	DOWN	DOWN
TOUCH&GO	0	0.025	3.377	DOWN	DOWN
CLIMB	500	0.04	3.402	DOWN	DOWN
PATTERN	1,000	0.09	3.442	DOWN	DOWN
TOUCH&GO	0	0.025	3.532	DOWN	DOWN
CLIMB	500	0.04	3.557	DOWN	DOWN
PATTERN	1,000	0.09	3.597	DOWN	DOWN
TOUCH&GO	0	0.025	3.687	DOWN	DOWN
CLIMB	500	0.04	3.712	DOWN	DOWN
PATTERN	1,000	0.09	3.752	DOWN	DOWN
TOUCH&GO	0	0.025	3.842	DOWN	DOWN
CLIMB	500	0.04	3.867	DOWN	DOWN
CLIMB	15,000	0.153	3.907	UP	UP
CRUISE	20,300	0.2	4.06	UP	UP
DESCENT	3,000	0.295	4.26	UP	UP
F.D. DESCENT	500	0.016	4.555	DOWN	DOWN
LANDING ROLL	0	0.007	4.571	DOWN	AS REQ
TAXI IN	0	0.119	4.578	DOWN	UP
MISSION TIME			4.697		

NOTES FOR PROFILE 8:

1. Standard day, no wind, no slope, no obstacle, standard atmospheric conditions used for all profile events.

2. Perform en-route climb at 250 KIAS to 10,000 ft, then at recommended climb speed above 10,000 ft to cruise altitude.

3. Cruise to be accomplished for specified times and at specified altitude(s).

4. En-route descent. Altitude shown is final altitude after maneuver.

5. Aircraft is to land with the fuel reserves sufficient for 2 hours at best range speed at optimum altitude(s) (fuel burn to climb to this condition need not be considered).

6. Time specified is the elapsed time for the specific event.

7. Total Time is the total elapsed time to the start of the specific event.

8. The amount to be offloaded is specified under "OFFLOAD". Fuel for Time for descents/climbs to/from refueling orbits or tracks will not be included.

Table A-7 - Aerial Refueling Efficiency. SRD Para 3.1.1.2

Aerial Refueling Efficiency			
Range (NM)	**Offload (lbs)**	**Fuel Burned (lbs)**	**AR Efficiency**
500	117,000	42,900	0.7317
1,000	94,000	65,600	0.5890
1,500	69,500	90,500	0.4344
2,000	44,000	115,500	0.2759
2,500	20,000	140,300	0.1248

Aerial Refueling Efficiency = Offload / (Fuel Burned + Offload)

Table A-8 - MAF Standard ACARS AOC Uplinks

No.	Message Title	Message Description & Purpose	Transmitted By	Used By	Generated by Specific Downlink?	Generate a Specific Downlink?
1	Initialization Message (Uplink)	Response to aircrew downlink request to establish data link connection with C2 System, normally occurs before "block-out"	Tanker Airlift Control Center (TACC) Flight Manager (FM), and C2 node controllers	Primary crew	Yes; Initialization Request Message (Downlink)	No
2	Free Text Message (Uplink)	Unformatted text messaging capability to pass information that is not serviced by a pre-formatted message between the C2 system and the aircraft.	TACC FMs; C2 node controllers	Primary crew	No	No
3	Weather (PIREP) Request (Uplink)	Request from C2 system for pilot report (PIREP) with detailed weather data from the aircrew	TACC FMs; C2 node controllers	N/A	No	Yes; Pilot Report (PIREP) (Downlink)
4	Maintenance Status Request (Uplink)	Request from C2 system for downlink of aircraft maintenance status in order to facilitate required actions for this mission and / or future missions for this aircraft	TACC FMs; C2 node controllers	N/A	No	Yes; In-Range/Ramp Services Report (Downlink)
5	Air Evac Load Message (Uplink)	Uplink of air evacuation mission data for next station as aircraft transits to facilitate in-bound crews planning of next leg.	TACC FMs; C2 node controllers	Primary crew and AE Crew	No	No

No.	Message Title	Message Description & Purpose	Transmitted By	Used By	Generated by Specific Downlink?	Generate a Specific Downlink?
6	Flight Plan Route (Uplink)	Transmission of flight plan route from C2 system to the aircraft for automatic loading into the aircraft's flight management system (FMS) and to reduce Primary crew workload / time to act on new route	TACC FMs; C2 node controllers	Primary crew	Yes; Flight Plan Request (Downlink)	Yes; Uplinked Flight Plan Accepted (Downlink) or Uplinked Flight Plan Rejected (Downlink)
7	Position Report Request (Uplink)	Request from C2 system to the aircraft for a position report to determine current position of aircraft and / or weather conditions at aircraft location	TACC FMs; C2 node controllers	N/A	No	Yes; Position Message (Downlink)
8	Weather Report (Uplink)	Uplink of weather information to the aircraft following a Weather Request (Downlink) or in response to changed conditions along route of flight	TACC FMs, weather personnel and C2 node controllers	Primary crew	Yes; Weather Request (Downlink)	No
9	Wind Data Response (Uplink)	Response to Wind Data Request (Downlink); contains wind data for specific locations / altitudes / times to facilitate crew decision making regarding route / altitude changes	TACC FMs, weather personnel and C2 node controllers	Primary crew	Yes; Wind Data Request (Downlink)	No

No.	Message Title	Message Description & Purpose	Transmitted By	Used By	Generated by Specific Downlink?	Generate a Specific Downlink?
10	Reporting Request Message (Uplink)	Uplink which enables C2 node controller (currently TACC FM) to change settings within aircraft for automatic reporting of mission data (Position Reports and Engine Reports). Does not require crew response/action.	TACC FMs; C2 node controllers	N/A	No	Yes; Position Message (Downlink) or Engine Report (Downlink)
11	Structural Report Request (Uplink)	Request from C2 system to the aircraft for weight & balance/structural data provides sortie-specific data on structural wear of aircraft for long-term analysis and health of the fleet (almost identical to AFTO 76 or "Blue-dot" form used in KC-135 fleet)	TACC FMs; C2 node controllers	N/A	No	Yes; Structural Data Report (Downlink)
12	Load Report Request (Uplink)	Request from C2 system for downlink of actual aircraft weight & balance information to support C2, flight planning/load planning, analysis processes.	TACC FMs; C2 node controllers	N/A	No	Yes; Load Report (Downlink)
13	Fault History Report Request (Uplink)	Request from C2 system for downlink of fault history on key systems to expedite or assist with troubleshooting and maintenance actions	TACC FMs; C2 node controllers, maintenance personnel	N/A	Yes; In-Range/Ramp Services Report (Downlink)	Yes; Fault Report (Downlink)

No.	Message Title	Message Description & Purpose	Transmitted By	Used By	Generated by Specific Downlink?	Generate a Specific Downlink?
14	Summary Message Request (Uplink)	Request from C2 system for downlink of aircraft "Out" "Off" "On" and "In" time & fuel on-board information that has been captured to that point.	TACC FM; C2 node controllers	N/A	No	Yes; Flight Summary Message (Downlink)
15	Flight Plan Report Request (Uplink)	Request from C2 system to generate downlink of aircraft's active route of flight. Clarifies intent/answers questions regarding what route the aircraft is following	TACC FM; C2 node controllers	N/A		Yes; Flight Plan Report (Downlink)
16	Waypoint List Request (Uplink)	Request from C2 system for downlink of all waypoints in aircraft's active route of flight. Enables capture of "actual" data or answers questions regarding what route the aircraft is following	TACC FM; C2 node controllers	N/A	No	Yes; Waypoint List Report (Downlink)
17	Maintenance Response (Uplink)	Response from C2 system following a downlink of maintenance status. Usually includes parking instructions and any other info the crew may need before arrival	TACC FM; C2 node controllers	Primary crew	Yes; In-Range/Ramp Services Report (Downlink)	No

Table A-9 – MAF Standard ACARS AOC Downlinks

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
1	Initialization Request Message (Downlink)	Aircrew initiated request to establish data link connection with C2 System, normally occurs before "block-out"	N/A	No	Yes; Initialization Message (Uplink)
2	Block Out Event (Downlink)	Automatically generated report that aircraft has left the blocks. Provides event time and fuel on board. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations	C2 system. Flight Managers, planners, analysts	No	No
3	Takeoff Event (Downlink)	Automatically generated report that aircraft has taken off. Provides event time and fuel on board. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations	C2 system. Flight Managers, planners, analysts	No	No
4	Landing Event (Downlink)	Automatically generated report that aircraft has landed. Provides event time and fuel on board. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	No	No
5	Block In Event (Downlink)	Automatically generated report that aircraft has blocked-in. Provides event time and fuel on board. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	No	No

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
6	Position Message (Downlink)	Normally an automatically generated report based on waypoint sequencing or time period, but can also be manually generated. Provides time / altitude, speed, winds & temp for a waypoint sequenced, as well as the next waypoint and estimated time to that point. When manually generated provides conditions at current position. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	Yes; for an automatic report it's generated by Position Report Request (Uplink) or aircraft sensors; and for a manual report, it's in response to specific request from C2 system	No
7	Flight Summary Message (Downlink)	Manually generated report following block-in of aircraft, or automatically generated in response to an Uplink of "Summary Message Request." Provides summary of (Out/Off/On/In) OOOI events, with associated times and fuels. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	Yes; for an automatic report it is a response to Flight Summary Message Request (Uplink), and for a manual report it is part of the aircrew post-flight checklist.	No
8	Free Text Message (Downlink)	Unformatted text messaging capability to pass information that is not serviced by a pre-formatted message between the aircraft and the C2 system.	C2 system. Flight Managers, planners, analysts	No	No

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
9	Pilot Report (PIREP) (Downlink)	Response to request from C2 system to pass flight conditions / weather info from aircraft to C2 system. Provides aircraft current position, altitude, speed, outside air temp, winds, cloud cover, icing and turbulence information.	C2 system. Flight Managers, weather personnel, planners, analysts	Yes; Weather (PIREP) Request (Uplink)	No
10	Receiver Air Refueling Report (Downlink)	Manually generated report following completion of an air refueling on-load. Provides fuel transfer amount and total fuel on-board, tanker information, as well as other data associated with a position report. Enables tracking of aircraft/mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	No	No
11	Tanker Air Refueling Report (Downlink)	Manually generated reports following completion of an air refueling off-load. Provides fuel transfer amount and total fuel on-board, receiver information, as well as other data associated with a position report. Enables tracking of aircraft / mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	No	No
12	Load Report (Downlink)	Report from aircraft after departure which provides detailed info on cargo and passengers aboard. Enables tracking of mission progress and facilitates analysis of planning & operations.	C2 system. Flight Managers, planners, analysts	Yes; Load Report Request (Uplink)	No

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
13	Airdrop Report (Downlink)	NA for KC-X - Reserved	NA - Reserved	NA - Reserved	NA - Reserved
14	In-Range/Ramp Services Report (Downlink)	Manual Downlink of mission/aircraft information (cargo / passenger / AE info, arrival time, maintenance status, etc) to prepare next station for arrival and to facilitate/expedite processes at next station	C2 system. Flight Managers, planners, analysts	Yes; Maintenance Status Request (Uplink), but also manually generated as part of aircrew procedures	Yes; Maintenance Response (Uplink)
15	Flight Plan Request (Downlink)	Request from crew for uplink of a flight plan that can be loaded into the aircraft FMS	C2 system. Flight Managers, planners	No	Yes; Flight Plan Route (Uplink)
16	Engine Report (Downlink)	Downlink of specific engine parameters used to facilitate engine condition and performance tracking/trending. Can be automatically generated or manually generated. Supports fuel efficiency and maintenance improvements.	Maintenance personnel / analysts	Yes (if not by default settings); Reporting Request Message (Uplink)	No
17	Uplinked Flight Plan Accepted (Downlink)	Response to uplink of flight plan indicating that it has been accepted without changes. Generated automatically by aircrew handling of uplinked flight plan.	C2 system. Flight Managers	Yes; Flight Plan Route (Uplink)	No

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
18	Uplinked Flight Plan Rejected (Downlink)	Response to uplink of flight plan indicating that it has been rejected. Generated automatically by aircrew handling of uplinked flight plan.	C2 system. Flight Managers	Yes; Flight Plan Route (Uplink)	No
19	Weather Request (Downlink)	Request from crew for weather at specific locations.	C2 system. Flight Managers, weather personnel	No	Yes; Weather Report (Uplink)
20	Emergency Message (Downlink)	Downlink to indicate to C2 nodes that aircraft has an emergency situation and provide basic info about the nature of the emergency. Triggered by transponder Mode III code selection of 7500, 7600 or 7700, or manually for other situations. Provides position report, cargo / passenger / AE info, critical system fault info and squawk info.	C2 system. Flight Managers	No	No
21	Flight Plan Report (Downlink)	Response to request for flight plan report. Provides route of flight in aircraft's active flight plan so C2 controllers or FMs can verify what is happening with the mission.	C2 system. Flight Managers, planners, analysts	Yes; Flight Plan Report Request (Uplink)	No
22	Fault Report (Downlink)	Downlink of key system fault history before arrival in order to facilitate appropriate, timely maintenance actions. Can be automatically triggered by Fault History Report Request (Uplink), or generated manually.	Maintenance personnel / analysts	Yes; Fault History Report Request (Uplink)	No

No.	Message Title	Message Description & Purpose	Used By	Generated by Specific Uplink?	Generate a Specific Uplink?
23	Wind Data Request (Downlink)	Request from aircrew for flight level winds at different levels	C2 system. Flight Managers, weather personnel	No	Yes; Wind Data Response (Uplink)
24	Structural Data Report (Downlink)	Response to Structural Report Request (Uplink). Provides sortie-specific data on weight & balance / structural wear of aircraft for long-term analysis and health of the fleet (almost identical to (Air Force Tech Order (AFTO) 76 or "Blue-dot" form used in KC-135 fleet)	Maintenance personnel / analysts	Yes; Structural Report Request (Uplink)	No
25	Waypoint List Report (Downlink)	Automatically generated downlink of active flight plan Cruise Waypoints in response to Waypoint List Request (Uplink).	C2 system. Flight Managers, planners, analysts	Yes; Waypoint List Request (Uplink)	No

Table A-10 – Fuel Usage Rate Profiles

Profile A: Operational Aerial Refueling Mission Profile* (Weighted: 54.0%)	
Phase	**Description**
1	Chocks removal and taxi-out
2	Takeoff
3.a	En-route climb from sea level to 10,000 ft AGL at 250 KIAS
3.b	En-route climb continues from 10,000 ft to FL 250 at recommended climb speed
4	Cruise at FL 250 and at best range speed, with en-route climbs and cruise total distance of 1,000 nm
5	Loiter for 1 hour (hr) with boom in the deployed position at FL 250 and 310 KCAS
6	Offload 61,800 lbs of fuel at end of loiter
7	Cruise-back 1,000 nm to overhead departure base at FL 250 and at best range speed
8	Descent, with no time or fuel penalty, and no distance credit
9	Transition training for 2 hrs, with six (6) touch-and-go traffic patterns
10	Final landing approach
11	Full stop landing with fuel reserves at 16% of takeoff fuel load
12	Taxi-in and chocks placement

Profile B: Training Aerial Refueling Mission Profile* (Weighted: 45.0%)	
Phase	**Description**
1	Chocks removal and taxi-out
2	Takeoff
3.a	En-route climb from sea level to 10,000 ft AGL at 250 KIAS
3.b	En-route climb continues to FL 250 at recommended climb speed
4	Cruise at FL 250 and at best range speed, with en-route climbs and cruise total distance of 500 nm
5	Loiter for 1 hour (hr) with boom in the deployed position at FL 250 and 310 KCAS
6	Offload 14,250 lbs of fuel at end of loiter
7	Cruise-back 500 nm to overhead departure base at FL 250 and at best range speed
8	Descent, with no time or fuel penalty, and no distance credit
9	Transition training for 3 hrs, with nine (9) touch-and-go traffic patterns

Profile B: Training Aerial Refueling Mission Profile* (Weighted: 45.0%)	
Phase	**Description**
10	Final landing approach
11	Full stop landing with fuel reserves at 17% of takeoff fuel load
12	Taxi-in and chocks placement

Profile C: Operational Airlift Mission Profile* (Weighted: 1.0%)	
Phase	**Description**
1	Chocks removal and taxi-out with 35,000 lbs cargo payload on board
2	Takeoff
3.a	En-route climb from sea level to 10,000 ft AGL at 250 KIAS
3.b	En-route climb continues to FL 250 at recommended climb speed
4	Cruise at FL 250 and at best range speed to initial descent
5	En-route descent to pattern altitude, with en-route climbs, cruise, and en-route descent total distance of 1,000 nm
6	Transition training for 2 hrs, with six (6) touch-and-go traffic patterns
7	Final landing approach
8	Full stop landing with fuel reserves at 21% of takeoff fuel load
9	Taxi-in and chocks placement

The following overall ground rules apply to all three (3) mission profiles. Total mission time is defined as starting at chocks removal with immediate taxi-out, and ending at mission completion chocks placement immediately following taxi-in. Engine(s) are already started and running at chocks removal. Sea level (for departure and arrival base) will be used. No runway length restrictions are to be used. Aircraft performance will be calculated using JP-8 fuel at 6.8 pounds (lbs) per gallon, no fuel conservatism, and normal aircraft configuration without wing-mounted aerial refueling systems and without Large Aircraft Infrared Countermeasures turrets. All missions are without in-flight receptacle refueling. Cruise calculations will use the average specific range value for each half of a cruise phase. Loiter calculations will use the average specific range value with the boom extended for the entire loiter phase. Fuel offload phases are instantaneous, have no time or fuel burn penalties, and receive no distance credit. Transition training is conducted as touch-and-go traffic pattern work with 20 minutes per pattern. Transition training traffic patterns will include time for positioning maneuvers for approach, approach and landing, and takeoff and climb to 2,000 feet (ft) above ground level (AGL). All maneuvering between the end of climb and approach for landing will be accomplished at 250 knots indicated airspeed (KIAS) and 2,000 ft AGL with landing gear, flaps, aerial refueling boom stowed,

and in an otherwise clean configuration. Standard fuel, time, and distance amounts will be used for all touch-and-go patterns from approach through climb to 2,000 ft. Fuel usage for maneuvering between completion of climb to 2,000 ft and the next approach for landing will be included in traffic pattern calculations. Fuel and time for the final 20 minutes traffic pattern to full stop landing is separate from transition training. Total mission time will include departure and arrival taxi (5 minutes each), takeoff, en-route climb, cruise phase(s), loiter (if applicable), descent, transition training, and final approach and full-stop landing.

Average mission profile fuel burn rate is computed by dividing the total fuel consumed for each mission by the total mission time for each mission. The fuel usage rate (paragraph 3.4.2.7) is a weighted average of the three (3) resulting average mission profile fuel burn rates.

Appendix B KC-X Classified Appendix

Classified SECRET, available to personnel with the appropriate security clearance from the Contracting Officers Ms Barbara G. Gehrs and Mr. Joe Leising, (937) 255-4813 and (937) 255-8964 respectively, e-mail: KC-X.IndustryRequests@wpafb.af.mil. Proof of facility and personnel clearances to handle classified documentation must accompany the request.