# KC-46A
# FLIGHT TRAINING CENTER
## TBD AFB, CONUS
## Design Analysis
## Definitive Design - April 2013

**Prepared for the**
**US Army Corps of Engineers**
**Mobile District**
**By Burns & McDonnell**

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CHAPTER I-1 – GENERAL
Definitive Design Submittal
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1. PROJECT OVERVIEW:

   a. Authorization

      Project is Authorized under Design Instruction (DI)#1, FY14 President's Budget (PB), AMC140002 KC-46A FTC Facility Projects.

   b. Project Scope:

      The scope of this project is to develop a Definitive Design for the new construction of a Flight Training Center facility to support the KC-46A Tanker Program that can be implemented at any Air Force, Air National Guard, or Air Force Reserve Base in the CONUS region.

      When an installation is selected for the program, the Definitive Design will be developed to a final design incorporating and adapting to the actual site conditions.

      The Definitive Design will first be used for siting the facility at Main Operating Base #2 (MOB2) which will be an AETC installation. MOB2 facilities are funded in FY14 and scheduled for beneficial occupancy by fall of 2015 to allow installation of the simulators to be operational prior to the second quarter FY16 delivery of the aircraft.

      The Definitive Design will continue to be used as the basis of design for new construction over the course of several years as the program rolls out and the new aircraft replaces existing aging refueling aircrafts at existing Air Force, Air National Guard and Air Reserve Bases. During this transitional time often both missions will be operating concurrently. The beddown will often require new construction in full, or module additions/alterations to existing facilities to support the KC-46A arrival.

2. PROJECT DESCRIPTION

   a. The Flight Training Center (FTC) facility is a 29,966sf 2-story facility including a high-bay area for two Weapon System Training (WST) simulators and two Boom Operator Training (BOT) simulators; a Part Task Training (PTT) training room, computer room, simulator maintenance & parts storage room, briefing rooms, classrooms, mission planning, instructor offices, learning center, admin offices, engineering &courseware staff offices, and general support areas. Facility is expected to support a personnel load of 40 training staff and classroom space to accommodate 48 students. Facility is designed for future phased expansion to accommodate a total of 6 WST's, 4 BOT Simulators, 8

PTT’s, and all supporting classroom and learning center areas. The phased expansion is currently planned to occur in FY17 and FY21. FY17 is planned to add 2 additional WST’s & BOT’s along with 4 additional PTT’s. FY21 is planned to add two additional WSTs.

b. Project shall be designed to meet a LEED Silver sustainability rating in accordance with v2009 checklist and current Air Force sustainability and energy criteria.

c. The estimated cost of construction based on early programming is between $11.2m and $12.4m, depending on site selection. The cost estimate based on the Interim Definitive Design submittal resulted in a cost range between $10.4m and $11.9m. The estimate was developed based on an ‘average’ Base construction type with the range derived from the comparison of the lowest to highest area cost factors for the candidate Bases.

d. Construction duration is estimated at 18 months, followed by the training device system setup.

e. Category Code: 171-212

3. PROJECT HISTORY:

a. Under Mobile District Corps of Engineers Contract Number W91278-11-D-0057, Delivery Order 0005, Burns & McDonnell was initially authorized to Develop Standard Design-Build Request for Proposal Template Documents (SDRTD) and Dynamic Prototypes (DPs) for the Training Simulators. This effort served to identify the basic project requirements and relationships and produced Dynamic Prototype (DP) modules for each component of the facility. The DP modules were developed into concept floor plans and programming cost estimates for new construction. The DP modules will also be used by AMC and AETC when evaluating existing facilities for alterations or additions to support the KC-46A mission.

b. A modification to the Task Order was issued in January 2013 to Burns & McDonnell to develop of the Definitive Design for the training facilities. The Definitive Design is for new construction projects.

c. A kick-off meeting to start the Definitive Design development was held on 17 January 2013 at the Mobile District headquarters to review concept development with the Corps of Engineers and discuss the design review process with the Mobile District reviewers.

d. A Draft Definitive Design submittal was issued on 19 February and a review conference conducted at AETC Headquarters at Randolph AFB with the User representatives, AETC, AFCEC, Mobile District and the Burns & McDonnell design team on 19 March 2013.

e. An Interim Definitive Design submittal was issued on 5 April and a review conference call conducted with the User representatives, AMC, AFCEC, Mobile District and the Burns & McDonnell design team.

4. PROJECT DESIGN SCHEDULE

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|---|---|
| Draft Definitive Design Submittal | 26 February 2013 |
| Draft Review Meeting at Randolph AFB | 19 March 2013 |
| Interim Definitive Design Submittal | 5 April 2013 |
| Interim Review (Telecon) | 17 April 2013 |
| Definitive Design Submittal | 26 April 2013 |

Refer to Appendix 2 – Needs List.

General
CHAPTER I-2 – NEEDS LIST
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Refer to Appendix 2 – Needs List.

# CHAPTER II-2 – FOUNDATION CONDITIONS
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Geotechnical investigation will be completed upon site selection.

Site Development
CHAPTER III-1 - SITING
Definitive Design Submittal
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1. DESIGN REFERENCES.

a. ASHRAE Standard 189.1-2011, Standard for the Design of High-Performance Green Buildings.

b. Federal Highway Administration (FHWA), Manual on Uniform Traffic Control Devices (MUTCD).

c. U.S. Air Force, AF 32-1010 Land Use Planning.

d. U.S. Air Force, AF 32-1084 Facility Requirements.

e. U.S. Air Force, AF 32-7062 Air Force Comprehensive Planning.

f. U.S. Air Force, ETL 04-2 Standard Airfield Pavement Marking Schemes.

g. U.S. Air Force, ETL 1110-3-394 Aircraft Characteristics for Airfield - Heliport Design and Evaluation.

h. UFC 1-200-02 High Performance and Sustainable Building Requirements.

i. UFC 3-201-02 Landscape Architecture.

j. UFC 3-210-01A Area Planning, Site Planning, and Design.

k. UFC 3-210-02 POV Site Circulation and Parking.

l. UFC 3-210-06A Site Planning and Design.

m. UFC 3-210-10 Low Impact Development.

n. UFC 3-220-04FA Backfill for Subsurface Structures.

o. UFC 3-220-08FA Engineering Use of Geotextiles.

p. UFC 3-250-18FA General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas.

q. UFC 3-260-01 Airfield and Heliport Planning and Design.

r. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.

s. UFC 4-211-02 Aircraft Corrosion Control and Paint Facilities.

t. U.S. Architectural and Transportation Barriers Compliance Board, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

u. U.S. Army Corps of Engineers, Mobile District Design Manual.

v. U.S. Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED).

2. EXISTING SITE CONDITIONS.

(a) The proposed site location is currently unknown at this time. Upon site selection the existing conditions shall be evaluated and reviewed.

3. DEMOLITION.

(a) The proposed site location is currently unknown at this time. Upon site selection any required demolition shall be evaluated and reviewed.

4. PROPOSED SITE LAYOUT.

(a) Included in the project drawings is a conceptual site plan for the facility. Upon site selection the plan will need to be reviewed and adapted to the selected/proposed site.

(b) For planning purposes the conceptual site plan has noted key constraints of the site to be considered in the site selection process. These include, but are not limited to, Anti-Terrorism/Force Protection (ATFP) setbacks, Fire Department setbacks from surrounding buildings, security requirements, airfield imaginary surfaces, etc. All of these constraints shall be further evaluated and reviewed upon site selection. Additional planning will be required upon site selection in coordination with the Base to identify and minimize any impacts or concerns of the planned location.

(c) The conceptual site layout includes a parking lot size that is based upon the facilities determined occupancy and the requirements outlined in Air Force Manual 32-1084. The parking lot requirements will need to be re-evaluated upon site selection.

5. ACCESS DRIVES AND PARKING.

(a) The project drawings show a conceptual parking and access drive layout for the facility. The parking lot and roadways have been setback to meet current Anti-Terrorism/Force Protection (ATFP) standoffs for a primary gathering facility. Any roadways encroaching into the ATFP setback shall be access controlled.

(b) Upon site selection the conceptual layout will need to be reviewed and adapted to the site.

(c) Fire department access will be provided via the facility parking lot and rear access roadway. Upon site selection the selected Base’s fire department will need to review the layout and confirm appropriate access is provided.

6. SIDEWALKS.

(a) The proposed site location is currently unknown at this time. Upon site selection; the proposed facility shall be connected into the existing sidewalk network. Sidewalks will have a minimum width of 6 feet and be per the Base’s design guide.

(b) All sidewalks shall meet the Heat Island Effect requirements in UFC 1-200-02.

7. OTHER SUPPORTING SITE FACILITIES

(a) Upon site selection a bike rack meeting the Base standard shall be provided and located near the entrance to the facility, capacity per LEED as a minimum.

(b) A dumpster pad and screen wall meeting the Base standard and requirements shall be provided. The conceptual site plan provided in the project drawings currently provides space for two standard refuse dumpsters.

8. CONTRACTOR ACCESS AND STAGING.

(a) The preferred location for contractor staging and mobilization will ultimately be at the discretion of the selected Base and Contracting Officer. Temporary fencing and/or foreign object debris (FOD) fencing may be used where necessary to control access to the site and prevent debris from entering airfield pavement areas from the construction site. All construction debris will need to be coordinated with the selected Base to determine if there is a Base landfill or it shall be hauled off base.

(b) Final determination and coordination of the demolition and construction of the project, including scheduling, phasing, limits of project work, and traffic control will need to be coordinated by the associated contractors, the selected Base, and the selected Base Civil Engineering office prior to the start of demolition and construction activities.

9. SPECIFICATIONS.

a. UFGS Section 02 41 00, Demolition.

b. UFGS Section 31 00 00, Earthwork.

c. UFGS Section 31 05 19, Geotextile.

d. UFGS Section 31 11 00, Clearing and Grubbing.

e. UFGS Section 31 23 00.00 20, Excavation and Fill.

f. UFGS Section 31 31 16, Soil Treatment for Subterranean Termite Control.

g. UFGS Section 32 17 23.00 10, Pavement Markings.

CHAPTER III-2 – PAVEMENTS
Definitive Design Submittal
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1. DESIGN REFERENCES.

a. ASHRAE Standard 189.1-2011, Standard for the Design of High-Performance Green Buildings.

b. UFC 1-200-02 High Performance and Sustainable Building Requirements.

c. UFC 3-250-01FA Pavement Design for Roads, Streets, Walks, and Open Storage Areas.

d. UFC 3-250-03 Standard Practice Manual for Flexible Pavements.

e. UFC 3-250-04 Standard Practice for Concrete Pavements.

f. UFC 3-250-08FA Standard Practice for Sealing Joints and Cracks in Rigid and Flexible Pavements.

g. UFC 3-250-11 Soil Stabilization for Pavements.

h. UFC 3-260-02 Pavement Design for Airfields.

2. RIGID PAVEMENT DESIGN.

(a) New Portland cement concrete (PCC) pavement shall be placed for the proposed access drives to overhead doors and all dumpster pads. A rigid pavement design shall be developed using a minimum compressive strength of 4000 psi and a design modulus of subgrade reaction (k) based upon the geotechnical investigation provided after site selection. The rigid pavement section shall be designed using a traffic loading consisting of passenger cars, large trucks, and small trucks for the 20-year design life. The minimum rigid pavement section shall be as required by PCASE design software and the selected Base's Requirements, but shall not be less than 6 inches of PCC on 4 to 6 inches of Base Coarse.

(b) Sidewalks shall consist of a minimum of 4 inches of PCC on compacted subgrade. Sidewalks shall be per the selected Base's requirements.

(c) New PCC pavements shall be designed in accordance with UFC design requirements and PCASE software, and shall be generally designed per the following requirements upon site selection:

(1) Concrete mix will be specified to prevent alkali silica reactivity (ASR).

(2) Cement shall be Type II, low alkali cement (or as required per the geotechnical investigation during site selection).

(3) 25-35 percent of total cementitious material will be specified as a Class "F" fly ash with a loss of ignition of no greater than 3 percent. This complies with the directive in Executive Order 13101, which states that recycled

materials should be used in the construction of new facilities.

(4) Aggregate shall have a measured expansion equal to or less than 0.08 percent at 28 days when tested according to ASTM C1260 for each individual aggregate and for the combined mix.

(5) Air entrainment will be required. Air content by volume shall be 3-5 percent in accordance with ASTM C231.

(6) Water reducing admixture is allowed conforming to ASTM C494, Type A.

(7) Retarding admixtures are not allowed.

(8) Concrete shall have a minimum compressive strength of 4,000 psi or minimum compressive strength of 4000 psi at 28 days.

(9) All concrete that supports utility structures or panels that are irregular in shape will be reinforced.

(10) Any aggregate base course that is required will be specified as a gradation from the UFGS and/or selected Base's State DOT Standard Specifications for Road and Bridge Construction, and/or in accordance with the selected Base requirements.

(d) The curb shall be in accordance with the selected Base's requirements. All concrete gutters will match the existing slope of the adjacent roadway pavement.

(e) Pavement joints will be provided in rigid pavement to allow for contraction and expansion of concrete pavements and for load transfers between pavements.

(1) All new concrete joint shall be sealed with silicone to match the selected Base's standard.

(2) Thickened edge expansion joints will be used between adjoining pavements and around utility structures to provide adequate load transfer.

(3) Isolation joints will be used in areas where pavement abuts a foundation or structure to isolate the foundation or structure from loads in the pavement.

(4) Doweled construction joints will be used to provide load transfer in the pavement where heavy loads or traffic are expected to transfer loads from adjoining slabs.

(5) Contraction joints will be used to limit cracking due to shrinking of the concrete.

(6) Joint depth and width shall be per manufacturer's recommendations but not less than ½ inch regardless of joint type, and joints will be spaced not greater than 12.5 feet for new pavements to match selected Base's requirements.

3. FLEXIBLE PAVEMENT DESIGN.

(a) The existing asphalt roadway pavements around the selected site shall be reviewed and maintained as much as practicable, but may require rehabilitation due to construction activities and pavement removal and replacement required for utilities.

(b) An asphalt pavement design shall be developed based upon a design California Bearing Ration (CBR) as provided in the geotechnical investigation during the site selection phase. The asphalt pavement section shall be designed using a traffic loading consisting of passenger cars, fire trucks, 3-axle trucks, large pickup trucks, and sport-utility vehicles for the 20-year design life. The minimum asphalt pavement section shall be as required by PCASE design software and the selected Base’s Requirements.

(c) The asphalt type shall be as specified in the selected Base’s State Department of Transportation (DOT) Standard Specifications for Road and Bridge Construction, and/or in accordance with the selected Base’s requirements. Any aggregate base course that is required shall be as specified as a gradation from the UFGS and/or the selected Base’s DOT Standard Specifications for Road and Bridge Construction, and/or in accordance with the selected Base’s requirements.

(d) A bituminous prime coat shall be placed on the aggregate base prior to paving the initial asphalt pavement layer, and a bituminous tack coat will be placed between bituminous layers.

4. PAVEMENT REMOVAL AND REPLACEMENT.

(a) To minimize pavement removal and replacement under existing parking and roads, new utility lines shall be installed in common trenches whenever practical and/or be directionally bored.

(b) All proposed sidewalks, courtyards, and POV parking areas shall meet the Heat Island Effect requirements in UFC 1-200-02. All other areas shall implement to the maximum extent possible.

5. SPECIFICATIONS.

a. UFGS Section 32 01 19, Field Molded Sealants for Sealing Joints in Rigid Pavements.

b. UFGS Section 32 11 10, Drainage Layer.

c. UFGS Section 32 11 16.16, Base Course for Rigid and Subbase for Flexible Paving Subbase Course for Pervious Paving.

d. UFGS Section 32 12 10, Bituminous Tack and Prime Coats.

e. UFGS Section 32 12 16, Hot-Mix Asphalt (HMA) for Roads.

f. UFGS Section 32 13 13.06, Portland Cement Concrete for Roads and Site Facilities.

g. UFGS Section 32 15 00, Aggregate Surface Course.

h. UFGS Section 32 16 13, Concrete Sidewalks and Curbs and Gutters.

1. DESIGN REFERENCES.

a. Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES) for Construction Activities.

b. Environmental Protection Agency (EPA), 841-B-09-001 Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (EISA).

c. UFC 3-210-10 Low Impact Development.

d. UFC 3-230-01 Water Storage, Distribution, and Transmission.

e. UFC 3-230-17FA Drainage in Areas Other than Airfields.

f. U.S. Army Corps of Engineers, PWTB 200-1-36 Sustainable Stormwater Storage Alternatives for Army Installations.

g. U.S. Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED).

2. EROSION AND SEDIMENT CONTROL.

(a) Construction activity pollution prevention shall be required for this project for the areas disturbed by construction. Prevention of pollution resulting from construction activities will be accomplished by controlling soil erosion, waterway sedimentation, and airborne dust generation through the use of best management practices (BMPs), including the installation of silt fence, inlet protection, and straw bales.

(b) Sediment control devices will need to be placed down-slope of disturbed areas and in drainage swales where sheet erosion can possibly occur, and around all existing and newly-installed storm drain inlets. After significant runoff events, all erosion control structures will require inspection for silt build-up that interferes with the performance of the erosion control structure and repair or replace those structures, as necessary. These devices will need to be maintained and the sediment removed behind the device on a regular basis to remain effective. Additionally, careful consideration will need to be given to prevent foreign object debris/damage (FOD) from entering airfield pavement areas from the construction site.

(c) All required erosion and sediment control permits will need to be coordinated with the selected Base’s Civil Engineering and Environmental offices and the State’s Department of Environmental Protection offices as required.

3. SITE GRADING.

(a) Site grading shall be determined based upon site selection, and meet the requirements of UFC 3-210-10.

4. STORM DRAINAGE.

(a) Storm drainage shall be determined based upon site selection.

(b) Upon site selection stormwater control as part of this project may include, but is not limited to a combination of roof drainage piping, storm drain piping, storm drain manholes, underground storm drainage piping, rainwater harvesting, etc.

(c) Site drainage shall meet the requirements of UFC 3-210-10.

5. SPECIFICATIONS.

a. UFGS Section 33 40 00, Storm Drainage Utilities.

b. UFGS Section 33 46 13, Foundation Drainage System.

# CHAPTER III-4 - FENCING
Definitive Design Submittal
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1. DESIGN REFERENCES.

   N/A.

2. FENCING.

   (a) Fencing shall be as required by the selected Base's security forces.

3. SPECIFICATIONS.

   a. UFGS Section 31 31 13, Chain Link Fence and Gates.

CHAPTER III-5 - RAILROADS
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. DESIGN REFERENCES.

N/A.

2. RAILROADS.

(a) There are no railroads on this project.

3. SPECIFICATIONS.

N/A.

# CHAPTER IV-1 – LANDSCAPING, IRRIGATION, PLANTING AND TURFING

Definitive Design Submittal
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TBD AFB, USA

## 1. DESIGN REFERENCES.

a. ASHRAE Standard 189.1-2011, Standard for the Design of High-Performance Green Buildings.

b. UFC 1-200-02 High Performance and Sustainable Building Requirements.

c. UFC 3-201-02 Landscape Architecture.

d. UFC 3-210-10 Low Impact Development.

## 2. LANDSCAPING.

(a) Landscaping shall be as required by the selected Base’s design requirements.

(b) All existing trees and vegetation shall be maintained to the maximum extent possible. For the duration of the project, temporary physical barriers may need to be placed around all plants and trees that are to remain to provide protection against ground disturbance and damage from construction activity.

(c) All areas disturbed by construction that are not to be paved shall be seeded or sodded to match the selected Base’s requirements.

(d) Fertilizer applied to the sodded areas shall be as specified to match the selected Base’s requirements.

(e) Landscaping shall meet the minimum standards of UFC 3-201-10.

## 3. IRRIGATION.

(a) Irrigation shall be determined as part of the site selection.

## 4. SPECIFICATIONS.

a. UFGS Section 32 05 33, Landscape Establishment.

b. UFGS Section 32 84 23, Underground Sprinkler Systems.

c. UFGS Section 32 84 24, Irrigation Sprinkler Systems.

d. UFGS Section 32 92 19, Seeding

e. UFGS Section 32 92 23, Sodding.

f. UFGS Section 32 93 00, Exterior Plants.

g. UFGS Section 32 96 00, Transporting Exterior Plants.

Utilities
CHAPTER V-1 - WATER
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
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1. DESIGN REFERENCES.

   a. ETL 02-15 Fire Protection Engineering Criteria – New Aircraft Facilities.

   b. UFC 3-230-03 Water Treatment.

   c. UFC 3-230-01 Water Storage, Distribution, and Transmission.

   d. UFC 3-600-01 Fire Protection Engineering for Facilities.

2. WATER DISTRIBUTION SYSTEM.

(a) Upon site selection the existing water mains around the perimeter of facility shall be reviewed to determine if adequate flow rates and capacity are provided for the new domestic & fire water service required for the facility.

(b) Refer to CHAPTER XVII – LIFE SAFETY for additional information and requirements regarding Fire Protection design analysis.

(c) Upon site selection existing and new fire hydrants shall be reviewed and provided to ensure adequate hose coverage within 300 feet of any portion of the facility exterior. Fire Hydrants shall be within 3 to 7 feet of paved surfaces. Fire Department Connection (FDC) shall be within 150 feet of fire hydrants.

(d) Valves shall be located on the new water service line branches from utility mains and elsewhere as needed to isolate certain sections and routings of the water piping. Concrete thrust blocks shall be required on new pressurized piping for all bends, tees, and elbows and shall be designed to meet the selected Base’s standards and soil bearing pressure requirements.

3. SPECIFICATIONS.

   a. UFGS Section 33 11 00, Water Distribution.

   b. UFGS Section 32 12 13.00 30, Water Utility Metering.

CHAPTER V-2 - SANITARY/WASTEWATER
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
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1. DESIGN REFERENCES.

a. UFC 3-240-01 Wastewater Collection.

b. UFC 3-240-02 Domestic: Wastewater Treatment.

c. ETL 1110-3-481 Containment and Disposal of AFFF Solution.

2. SANITARY/WASTEWATER COLLECTION SYSTEM.

(a) Upon site selection the existing sanitary sewer mains around the perimeter of facility shall be reviewed to determine if adequate flow capacity is provided for the new facility.

3. INDUSTRIAL WASTE COLLECTION SYSTEM.

(a) There are no industrial waste requirements for this facility.

4. SPECIFICATIONS.

a. UFGS Section 33 30 00, Sanitary Sewers.

CHAPTER V-3 - GAS
Definitive Design Submittal
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TBD AFB, USA

1. DESIGN REFERENCES.

N/A

2. GAS DISTRIBUTION SYSTEM.

(a) Upon site selection the existing gas mains around the perimeter of facility shall be reviewed to determine if adequate flow rates and capacity for the proposed new natural gas service required for the facility.

(b) As required based upon site selection; all gas distribution line designs and layouts shall have to be coordinated with the local utility company by the Contractor. All gas line work is typically completed by the local gas supplier up to and including the building gas meter. The Contractor will be responsible for all associated fees and coordinating with the Contracting Officer and the selected Base’s Civil Engineering office.

3. SPECIFICATIONS.

a. UFGS Section 33 11 23, Natural Gas Piping.

b. UFGS Section 33 15 13.00 30, Natural-Gas Metering.

c. UFGS Section 33 51 15, Natural-Gas/Liquid Petroleum Gas Distribution.

CHAPTER V-4 – STEAM DISTRIBUTION
Definitive Design Submittal
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TBD AFB, USA

1. DESIGN REFERENCES.

N/A.

2. STEAM DISTRIBUTION.

(a) Requirements for steam will be determined based upon site selection for this project.

3. SPECIFICATIONS.

N/A.

CHAPTER V-5 – Environmental
Definitive Design Submittal
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1. DESIGN REFERENCES.

   a. To be provided upon site selection.

2. ENVIRONMENTAL REQUIREMENTS.

Environmental requirements shall be determined upon site selection. The Contractor shall comply with all applicable environmental Federal, State, and local codes, laws, and regulations. Delays resulting from failure to comply with environmental laws and regulations shall be the responsibility of the Contractor.

3. PERMITS.

The Contractor shall be responsible for submitting all applications and paying for all associated fees for environmental permits for the project. All permits required shall be determined upon site selection. Stormwater and/or NPDES permits shall be required and are addressed under the civil portion of the design.

4. DISPOSAL OF WASTE MATERIALS.

The Contractor shall identify the specific disposal site or sites for waste materials generated by the Contractor’s operations. Waste shall be disposed of as required by the selected Base.

5. ENVIRONMENTAL PROTECTION.

Upon site selection the site’s Environmental Assessment shall determine any adverse effects to historic properties, traditional cultural properties, sacred sites, or native villages, etc.

6. EXISTING HAZARDOUS MATERIALS.

Existing hazardous materials shall be determined upon site selection.

7. CONTRACTOR GENERATED HAZARDOUS WASTE.

The Contractor will be responsible for any hazardous waste generated by the Contractor as part of the construction operations. The Contractor shall identify the specific disposal site or sites for waste materials generated by the Contractor’s operations.

8. DISPOSAL OF WASTE MATERIALS.

The Contractor shall identify, as a part of the submittals required by this contract, the specific, disposal site or sites for any waste materials generated by the Contractors operations.

9. ENVIRONMENTAL RESTORATION PROGRAM (ERP) IMPACTS ON SITE ACTIVITIES.

Upon site selection, any ERP sites that are near the construction and renovation sites for this project shall be reviewed and evaluated.

10. SPECIFICATIONS.

Based upon site selection the following specifications may need to be provided:

a. UFGS Section 01 57 20.00 10, Environmental Protection.

b. UFGS Section 02 83 13.00 20, Lead In Construction.

c. UFGS Section 02 81 00, Transportation and Disposal of Contaminated Materials.

11. APPENDICES.

a. To be provided as required upon site selection.

1. DESIGN REFERENCES.

N/A.

2. EXISTING UTILITY REMOVAL AND RELOCATION.

(a) Upon site selection, the site shall be evaluated for any underground utilities located within the proposed building footprint that will require relocation. The removal and/or relocation of the utilities and base utility shutdowns will need to be coordinated with the selected Base's Civil Engineering office to determine which lines are serving the adjacent facilities or are main trunks for the base wide system.

3. CATHODIC PROTECTION.

(a) Upon site selection and based on findings from the geotechnical investigation the requirements of cathodic protection will be determined.

4. SPECIFICATIONS.

a. UFGS Section 26 42 14, Cathodic Protection System (Sacrificial Anode).

# CHAPTER V-7 – FIRE PROTECTION
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Refer to CHAPTER XVII – LIFE SAFETY for Fire Protection design analysis.

# CHAPTER VI-1 – ANTI-TERRORISM/FORCE PROTECTION

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1. DESIGN REFERENCES.

   a. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.

   b. UFC 4-010-02 DoD Minimum Standoff Distances for Buildings.

   c. UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.

   d. UFC 4-022-01 Security Engineering: Entry Control Facilities / Access Control Points.

   e. UFC 4-022-02 Selection and Application of Vehicle Barriers.

2. AT/FP STANDARDS OVERVIEW.

   (a) All new Department of Defense (DoD) facilities are required to meet the minimum antiterrorism standards of UFC 4-010-01. This document lists the AT/FP standards pertaining to the site, structural, architectural, mechanical, and electrical design of the project. Standards are intended to provide baseline antiterrorist protection where no known threat currently exists. Many of these standards are in place to give flexibility to the facility if the threat were ever to escalate.

   (b) The facility shall be located within the controlled perimeter of a CONUS Air Force Base. It is anticipated that the main perimeter fence that secures the Air Force Base is a physical boundary that includes a limited number of access points at which a demonstrated capability for searching vehicles exists. Facility is considered a primary gathering building (including future addition) with the entire perimeter of the building consisting of non-load-bearing metal studs and brick veneer. Consequently, UFC 4-010-01 specifies a conventional construction standoff distance and unobstructed space of 82 feet (25 meters) to parking, roadways, and trash containers. This is the smallest permissible standoff distance allowed for a building to comply with UFC 4-010-01 without any blast analysis results or hardening.

4. AT/FP SITE PLANNING.

   (a) Siting for the facility shall meet Anti-Terrorism/Force Protection (AT/FP) standoff requirements, taking into consideration the trade-off between site constraints and the cost of designing doors for blast effects.

   (b) If existing facilities are renovated, and the cost of such renovations exceeds 50% of the replacement value of the existing facilities in accordance with UFC 3-701-01, then the existing facilities shall be brought into full compliance with all applicable provisions of UFC 4-010-01.

(c) The preferred location of electrical and mechanical equipment is outside of the unobstructed space. This does not preclude placement within the unobstructed space as long as the equipment provides no opportunity for concealment of explosive devices with a height or width of 6 inches or greater, or the equipment is secured to prevent concealment of such devices. Screen walls or fencing, if required, shall be as required by the selected Base's security forces.

3. AT/FP STANDARDS SUMMARY.

(a) The table below presents each of the 21 UFC standards applicable to the project. Standards are marked as follows based on their status as part of the project design.

C – Conforming: the standard applies to the design and is in compliance.

NC – Not Compliant: the standard applies to the design and the design is not in compliance; design modifications are required for the next submittal.

TBD – To Be Designed: the design submittal is not at a detailed enough stage to have been incorporated the standard.

NA – Not Applicable: the standard does not apply to the design.

| UFC 4-010-01 Standards Compliance Matrix | | | | | |
|---|---|---|---|---|---|
| Standard | C | NC | TBD | NA | Comments |
| SITE PLANNING | | | | | |
| 1. Standoff Distances | | | X | | Conventional construction standoff distance of 82' shall be confirmed upon site selection. |
| 2. Unobstructed Space | | | X | | Equipment and landscaping within the unobstructed space will not permit concealment of explosive devices 6 inches or greater in height or width. |
| 3. Drive-Up/Drop-Off Areas | | | | X | No drive-up/drop-off areas will be provided. |
| 4. Access Roads | X | | | | Access roads will have access control measures to limit access. |
| 5. Parking Beneath Buildings or on Rooftops | | | | X | No parking beneath buildings or on rooftops will be provided. |
| STRUCTURAL DESIGN | | | | | |
| 6. Progressive Collapse Avoidance | | | | X | Building will be less than 3 stories. |
| 7. Structural Isolation | | | | X | No structural isolation needed. |
| 8. Building Overhangs | | | | X | No overhangs with occupied space above. |
| 9. Exterior Masonry Walls | | | | X | Masonry walls will meet minimum reinforcement requirements. |
| ARCHITECTURAL DESIGN | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 10. Windows, Skylights and Glazed Doors | X | | | | Exterior windows and glazed doors will be blast resistant. |
| 11. Building Entrance Layout | X | | | | Entrances will not be visible from outside base perimeter. |
| 12. Exterior Doors | X | | | | Exterior doors will be blast resistant. |
| 13. Mailrooms | | | | X | Mail will be screened at a central mail sorting facility. |
| 14. Roof Access | X | | | | No exterior roof access will be provided. |
| 15. Overhead Mounted Architectural Features | X | | | | Overhead features weighing 31 pounds or more will be mounted to resist forces of 0.5 times the component weight in any horizontal direction and 1.5 times the component weight in the downward direction. |
| ELECTRICAL AND MECHANICAL DESIGN | | | | | |
| 16. Air Intakes | X | | | | Intake louvers for ventilation of occupied spaces will be at least 10 feet above ground. |
| 17. Mailroom Ventilation | | | | X | Mail will be screened at a central mail sorting facility. |
| 18. Emergency Air Distribution Shutoff | X | | | | Emergency air distribution shutoff switch will be located in server room. |
| 19. Equipment Bracing | X | | | | Overhead utilities and other fixtures weighing 31 pounds or more will be mounted to resist forces of 0.5 times the component weight in any horizontal direction and 1.5 times the component weight in the downward direction. |
| 20. Under Building Access | | | | X | No under building access will be provided. |
| 21. Mass Notification | X | | | | MNS system will be provided. |

1. DESIGN REFERENCES.

a. UFC 1-200-01 Unified Facilities Criteria, General Building Requirements

b. 2009 IBC International Code Council, International Building Code

c. NFPA 101 National Fire Protection Association, Life Safety Code

d. Mobility Air Forces Distributed Mission Operations Physical Security Guide, 23 March 2009

e. 2010 ADA Standards for Accessible Design

f. UFAS Uniform Federal Accessibility Standards

g. MDDM Mobile District Design Manual

h. UFC 3-600-0 1Design: Fire Protection Engineering for Facilities

i. UFC 4-010-01DoD Minimum Antiterrorism Standards For Buildings

2. GENERAL DESCRIPTION OF THE PROJECT.

(a) This project task is to design a non-site specific Flight Training Center to support the KC-46A Program. This facility is versatile enough to be site adapted (once) at any Air Force installation across the United States and flexible enough to expand with the program over the next 10 fiscal years. This facility’s initial capacity will allow for two KC-46A missions as the program rolls out, but will expand to six missions when fully complete. Similar to the Flight Simulator Facilities, it will house articulated weapon system training devices, boom operator training devices, part task training devices and their associated shop/storage and administration spaces. The facility will be designed to support the training missions for the KC-46A Refueling Aircraft. Pilots and instructors will utilize this facility for mission specific training, general training and flight hours. Besides planning for future expansion, the main difference between the Flight Training Center and the other flight simulator facilities is the ability to train more students in a general training atmosphere. The capacity for specific missions remains the same. Also, executing courseware, configuration, engineering, and the logistics of aircraft parts are all part of the Flight Training Center functions.

(b) This project is anticipated to be new construction with 6,950 square feet of simulator and boom operator high bay space housing two weapons system trainers (WST) and two boom operator trainers (BOT). A surrounding two story lean-to encompassing 16,750 square feet of general training space, administration space, shops and the necessary building support spaces (support space sizes subject to change upon site selection).

3. BASIS OF DESIGN SUMMARY.

(a) This design was derived using programmed spaces from other successful aerial refueling support facilities. In particular, end users from the KC-135 and KC-10 offered insight on how to produce an efficient facility in order to accomplish specific missions and general training functions. After establishing program requirements, dynamic prototypes were created along with data sheets to capture the individual spaces needed to support the mission. The prototypes convey information utilized by the site the survey teams, especially in ADD/Alter opportunities. Multiple configurations were developed and approved for a variety of site shapes and orientations. After which, one satisfactory layout was chosen and is now being developed to the furthest level possible without a site. Once a site is selected; the construction documents will be revisited and completed for a 100% design submittal.

(b) The facility will provide space required to support the mission of various squadrons.

These spaces will include:

1) Unclassified Non-Secure space.

2) Simulator and Boom operator High Bay space

3) Simulator and Boom computer support space

4) Toilets and Break Rooms

5) Support Spaces

(c) The non-secure area encompasses the majority of this facility including all Administration spaces, both configuration and courseware staff with their associated management, Logistics/Maintenance with their associated parts storage, Engineering Hardware and Software, both Simulator Bay and BOT Bays with their associated Computer Room, WST Part Task Training (PTT), BOT Part Task Trainer (PTT), Instructor’s Offices, all Classrooms, all Brief/Debrief rooms, Mission Planning, all Break Rooms and restrooms. In general, all rooms are simple in shape to provide flexibility for future expansion. Some rooms, including the Part Task Training are separated by a soft (operable) partition to provide the opportunity to repurpose the space in the future.

(d) The support spaces include Mechanical Room and Yard, UPS, Electrical Room, Fire Pump Room, Communication Room and Shipping/Receiving.

(e) All building occupants will enter through the main building entrance into unclassified space where they are greeted by the Lobby, Break

Room, and restrooms. From there, permanent building occupants will utilize the administration space along corridors #119, #132 and #143. All pilots, instructors and approved maintenance crew will report to the second level to prepare for training. Pilots will utilize the second level classrooms for general KC-46A training purposes. One classroom (#206) will be open storage classification and will require key card access.

4. LIFE SAFETY

Refer to CHAPTER XVII – LIFE SAFETY for Life Safety design analysis.

5. INTERIOR FINISHES.

The interior of the facility shall be attractive, safe and meet the end user’s needs and functions. The interior will promote an appropriate professional image that is responsive to the work environment and maximizes the work environment’s effectiveness. Interior finishes will be selected based on room function and required aesthetic for that particular space. All finishes will be durable, easily maintained and cost efficient over the life of the building. Although finishes will comply with base standards, levels of finish will remain consistent for all simulator facilities across the program.

| Building Spaces | Floors | Walls |
|---|---|---|
| Unclassified non-secure: | | |
| Logistics Manager | Carpet Tile | Paint |
| Site Manager | Carpet Tile | Paint |
| COR Office | Carpet Tile | Paint |
| Training Manager | Carpet Tile | Paint |
| Admin. Open Office | Carpet Tile | Paint |
| AFMSS | Carpet Tile | Paint |
| Test Admin. | Carpet Tile | Paint |
| Engineer Staff Hardware | Carpet Tile | Paint |
| Conference | Carpet Tile | Paint |
| IT Manager | Carpet Tile | Paint |
| Config Manager | Carpet Tile | Paint |
| Eng. Staff Software | Carpet Tile | Pain |
| Courseware Manager | Carpet Tile | Paint |
| Courseware Staff | Carpet Tile | Paint |
| Configuration Staff | Carpet Tile | Paint |
| Part Task Trainers | Carpet Tile | Paint |
| Sim/MX Parts | Sealed Concrete | Paint |
| Brief/Debrief Rooms | Carpet | Paint |
| Instructors Office | Carpet | Paint |
| Learning Center | Carpet | Paint |
| Classrooms – Non VTRAT | Carpet | Paint |
| Mission Planning | Carpet | Paint |
| Break | Porcelain Tile | Paint |
| Toilets | Porcelain Tile | Ceramic/Porcelain Tile |

| | | |
|---|---|---|
| JC/Storage | Vinyl Composition Tile | Ceramic Tile/ Epoxy Paint |
| Simulator Bay | Epoxy Floor Coating | Paint |
| Boom Operator Bays | Epoxy Floor Coating | Paint |
| Computer Room | Raised Access Flooring | Paint |

Open Storage Classified:

| | | |
|---|---|---|
| VTRAT Classroom | Carpet | Paint |

Support Areas:

| | | |
|---|---|---|
| Mechanical Room | Sealed Concrete | Paint |
| Electrical Room | Sealed Concrete | Paint |
| Communication Room | Sealed Concrete | Paint |
| UPS Room | Sealed Concrete | Paint |
| Fire Pump Room | Sealed Concrete | Paint |
| Shipping/Receiving | Sealed Concrete | Paint |

Corner guards shall be provided at all outside corners of gypsum board. Casework shall be plastic laminate construction with solid surface countertops. Window blinds shall be provided on all exterior windows in offices and open office areas. The use of fabric wrapped acoustical wall panel is encouraged in conference rooms and briefing rooms, and should be furnished with tackable cores. Vestibules shall have recessed walk-off mat as required by LEED and the UFC 1-200-02. Stairs shall be provided with integral stair tread and riser and coordinating landing material.

Understandable and clear signage, directories and way finding will be developed for easy circulation throughout the facility. Signage design and finishes meet the Air Force and base standards.

6. FURNITURE, FIXTURES AND EQUIPMENT (FF&E)

(a) The FF&E package for the KC-46A Flight Training Center shall be attractive, durable, easily maintained and responsive to the end user's needs.

(b) Furniture included in the FF&E Package is moveable items that are not permanently fixed or require additional blocking for stability. The following items shall be included within the FF&E Package:

(1) Accessories

Accessory requirements shall be verified as design continues. All desk and workstations shall be provided with individually controlled overhead task lights.

(2) Desks

Freestanding desks shall be used in the private office of the facility.

(3) Workstations

Panel based workstation shall be used in the open office areas of the facility.

(4) Chairs

Ergonomic desk and task chairs shall be procured for all desks, and workstation, including the Learning Center. Briefing rooms and conference room shall be provided with ergonomic and adjustable chairs with coordinating side seating as necessary. Guest seating shall follow the same hierarchy as the desks. Lounge seating and soft seating shall be selected for waiting areas. The break room shall have stacking chairs with durable cleanable finishes.

(5) Tables

Break Areas shall have laminate top tables with steel bases. Training room tables and conference/briefing room tables shall be furnished with power and data supply. Tables in Learning Center shall be provided with a (3) monitor arm support and a minimum 4 power receptacles per table.

(6) Files and Storage

Storage and filing requirements shall be verified as design is confirmed.

(7) Equipment

One 55”-60” flat panel monitors shall be provided for each briefing room, mission planning, learning center, and classrooms. Any additional equipment requirement shall be verified as design continues. Equipment shall be presented at later date for approval.

7. GENERAL DESIGN STATEMENT

Upon selection, the facility’s architecture shall comply with the base specific Architectural Compatibility standards that will be provided by authority having jurisdiction. It will be the objective of the Base to define an overall architectural language as compared to other facilities on base. The facility shall not sacrifice the consistency of building function and flow when compared to other KC-46A Trainer Facilities. As standards are being developed, the following design considerations are being incorporated:

(a) Roof Assembly and Slope: All roofs will be 3/12 standing seam metal roof unless noted otherwise. The use of hip roofs mixed with a gable lean-to offers flexibility in the future.
(b) Massing: The building’s massing uses simple forms to create a prominent presence on base for training depiction. A hierarchy technique is being used by offsetting the larger masses from aligning with the remaining facility.
(c) The simple geometry of the building allows for efficient

function and circulation while offering the flexibility of different punched window shapes and sizes.

(d) The brick veneer exterior finish allows flexibility for other veneer or masonry finishes.

(e) 4’x6’ aluminum framed with insulated glass panel window system is used at non secure area including break room and administration areas.

(f) Translucent/insulated wall panel (Kal-wall) is used at the top of high bay area to provide natural light at high bay and lighten the heavy massing of SIM bay. Also removable translucent panel (instead of roll up door) is used at exterior of high bay wall for large equipment delivery.

## 8. BUILDING SYSTEMS ANALYSIS

The building systems include; cast-in-place concrete floor slabs and foundations(subject to change per site selection and geotechnical reports), steel framed structure with insulated exterior walls and roofs, fire rated or non-rated interior metal stud partitions with various finishes, and electrical, mechanical heating and ventilation systems with air-conditioning in selected areas.

Exterior wall assembly shall be 5/8” gypsum wall board at interior wall, 6” metal stud with batt-insulation infill, 1/2” exterior sheathing, air/water barrier, 2” of rigid insulation, 2-1/4” air space, and 3-5/8” brick veneer. All interior walls shall be gypsum wall board finish unless specified otherwise. Abuse resistant board shall be used in all furred exterior walls in shop and similar spaces.

Roof assembly shall be structural metal decking, rigid insulation and standing seam metal roof.

R-value and thickness of insulation will be determined upon base selection.

Typical doors shall be hollow metal or solid wood with hollow metal frames. Sidelights will be used on interior doors in administration and training areas.

Ceilings shall be 2x2 suspended lay-in acoustic ceiling tiles in offices, corridors and break rooms. Gypsum Board ceilings will be used in the restrooms, and other SID will be included at points of interest. The structure shall be left exposed in shop/storage spaces.

Floors shall be sealed concrete in shop/storage areas. Carpet tile shall be used in most admin areas. The restroom/shower/locker rooms shall be porcelain floor tile.

## 9. DEFINITIVE DESIGN ASSUMPTIONS AND REFERENCES

The definitive design standard is a non-site specific prototypical KC-46A Two Bay Flight Simulator Facility. The following generalized notes provide information not yet gathered in order to complete a site specific design.

1. This definitive design standard is based on the available UFC design criteria as of March 2013.
2. All building systems and components shall be reviewed against the local climate, local building codes and any other special requirements upon site selection. Some examples of building systems

include R-Value of insulation, vapor barrier location, necessity of perimeter insulation below grade, gutter and downspout design, storm water discharge, snow guard on roof, and exterior glazing lay-up. Reference the drawings, specification and design narrative for further direction.

3. The exterior wall system shall be reviewed to meet “DOD minimum antiterrorism standards for buildings” upon site selection.
4. The necessity of a fire pump room and the size of the room shall be reviewed and revised upon site selection.
5. The mechanical yard screen wall design and location shall be confirmed upon site section.
6. The architectural design and exterior wall material shall be reviewed against the selected site “design standard” and neighboring facilities.
7. The building security system, including door hardware shall be reviewed with the selected site security requirements.
8. The final specification of interior building finishes will be reviewed and aligned with the selected site design theme. Furniture layouts have been provided for information and shall be verified. Final selection of FF&E and detailed specifications shall be reviewed upon site selection.

The following issues and reference criteria have conflicting design approaches.

1. Heat island effect on wall.

The resolution of this issue will vary per site location and selected site design standard. 20 feet tall and 15% of building perimeter length will be a screen wall for Definitive Design Standard cost estimate purpose. Screen wall material will match to building exterior wall.

UFC 1-200-02: 2-3.2 Mitigation of Heat Island Effect.

For Walls – Meet the requirements in ASHRAE 189.1 Section 5.3.2.2 (Walls).

*ASHRAE 189.1*

*5.3.2.2 Walls. Above-grade building walls and retaining walls shall be shaded in accordance with this section. The building is allowed to be rotated up to 45 degrees to the nearest cardinal orientation for purposes of calculations and showing compliance. Compliance with this section shall be achieved through the use of shade-providing plants, manmade structures, existing buildings, hillsides, permanent building projections, on-site renewable energy systems or a combination of these, using the following criteria:*

*a. shade shall be provided on at least 30% of the east and west above-grade walls and retaining walls from grade level to a height of 20 ft. (6 m) above grade or the top of the exterior wall, whichever is less, within five years of issuance of the final certificate of occupancy. Shade coverage shall be calculated at 10 a.m. for the east walls and 3 p.m. for the west walls on the summer solstice.*

*b. where shading is provided by vegetation, such vegetation (including trees) shall be existing trees and vegetation or new bio-diverse plantings of native plants and adapted plants and appropriately sized, selected, planted, and maintained so that they do not interfere with overhead or underground utilities. Such trees shall be placed a minimum of 5 ft. (1.5 m) from and within 50 ft. (15 m) of the building or retaining wall.*

*Exceptions:*

*1. The requirements of this section are satisfied if 75% or more of the opaque wall surfaces on the east and west have a minimum SRI of 29. Each wall is allowed to be considered separately for this exception.*

*2. East wall shading is not required for buildings located in climate zones 5, 6, 7, and 8. West wall shading is not required for buildings located in climate zones 7 and 8.*

2. Day lighting

The end user prefers not to have windows at open storage area and current building configuration does not allow windows in some class room and offices. UFC requirements conflict with user requirement. Building geometry and window location will be reviewed with site condition and user requirement again upon site selection.

UFC 1-200-02: 2-6.3 Daylighting.

Meet the requirements of ASHRAE 189.1 Section 8.4.1 (Daylighting by Sidelighting) or Section 8.5.1 (Daylighting Simulation). Provide automated lighting controls in accordance with UFC 3-530-01.

*ASHRAE 189.1*

*8.4.1 Daylighting by Sidelighting*

*8.4.1.1 Minimum Sidelighting Effective Aperture.*

*Office spaces and classrooms shall comply with the following criteria:*

*a. All north-, south-, and east-facing facades for those spaces shall have a minimum sidelighting effective aperture as prescribed in Table 8.4.1.1.*

*b. The combined width of the primary sidelighted areas shall be at least 75% of the length of the façade wall.*

*c. Opaque interior surfaces in daylight areas shall have visible light reflectances greater than or equal to 80% for ceilings and 70% for partitions higher than 60 in. (1.8 m) in daylight areas.*

*Exceptions:*

*1. Spaces with programming that requires dark conditions (e.g., photographic processing).*

*2. Spaces with toplighting in compliance with Section 8.3.4.*

*3. Daylight areas where the height of existing adjacent* *structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.*

The following chart shows the standard definitive design information that will be shown on the drawings in the phase one submittal. After base selection, more site dependent information will be conveyed in the drawings set for phase 2.

| **Phase 1 - Standard Definitive Design** | **Phase 2 - Selected Site Specific Design** |
|---|---|
| ARCHITECTURAL LEGEND/ABBREVIATION AND GENERAL NOTES | REVIEW OF UPDATED UFC |
| LIFE SAFETY PLANS | LOCAL BUILDING CODE |
| FLOOR PLANS | SECURITY SYSTEM<br>CIVIL AND LANDSCAPE ELEMENTS, INCLUDING MECHANICAL YARD SCREEN WALL.<br>OIRENTATION OF BUILDING |
| REFLECTED CEILING PLANS | SECURITY ELEMENTS |
| ROOF PLAN | GUTTER, DOWN SPOUT, STORM WATER DISCHARGE |
| EXTERIOR BUILDING ELEVATIONS | CIVIL GRADING ELEVATION<br>FOUNDATION AND GEO TECH DATA<br>UPDATED STRUCTURE DESIGN<br>SITE SPECIFIC EXTERIOR WALL/ROOF MATERIAL AND DESIGN REQUIREMENT<br>CONTEXT OF NEIGHBORING FACILITIES<br>SPECIFICATION OF GLAZING AND GLAZING LAY-UP. |
| BUILDING SECTIONS | ATITERRORISM STANDARD<br>EXTERIOR WALL SYSTEM PER LOCAL CLIMATE |
| WALL SECTIONS - Critical wall sections only | ALL REQUIRED WALL SECTIONS FOR CONSTRUCTION DOCUMENTATION |
| ENLARGED BREAK ROOM & TOILET PLAN | FINISH MATERIAL AND WALL DESIGN |
| ENLARGED STAIR PLANS & SECTIONS | |
| ROOM FINISH SCHEDULE | ALL REQUIRED INTERIOR ELEVATIONS FOR CONSTRUCTION DOCUMENTATION<br>ALL REQUIRED INTERIOR DETAILS FOR CONSTRUCTION DOCUMENTATION<br>ROOM FINISH PLAN<br>FINISH MATERIAL SAMPLE AND COLOR<br>CID |
| DOOR SCHEDULE | DOOR HARDWARE<br>REQUIRED DOOR DETAILS FOR CONSTRUCTION DOCUMENTATION |
| WINDOW SCHEDULE | GLASS TYPE<br>REQUIRED WINDOW DETAILS FOR CONSTRUCTION DOCUMENTATION |

| | |
|---|---|
| LOUVER SCHEDULE | LOUVER SIZE/LOCATION PER MECHANICAL DESIGN. REQUIRED LOUVER DETAILS FOR CONSTRUCTION DOCUMENTATION |
| FURNITURE PLAN - layout only | FURNITURE LABLE AND SPECIFICATION |
| SIGNAGE SCHEDULE - with standard details | SITE SPECIFIC SIGNAGE DESIGN |
| STANDARD MOUNTING HEIGHTS & CLEARANCES | |
| PARTITION TYPES | |
| TYPICAL PENETRATION DETAILS | |
| DETAILS - critical detail only | ALL REQUIRED DETAILS FOR CONSTRUCTION DOCUMENTATION |

10. DESIGN CALCULATIONS

Gross building areas:

(a) 21,700 SF First floor Gross Area

(b) 8,266 SF Second Floor Gross Area

(c) 158 SF 50% of exterior covered area

Toilet fixture count shall be determined based on a total of 558 building occupants. The occupants shall be assumed to be 60% male and 40% female. Based on 2009 IBC Table 2902.1, the minimum number of required fixtures is as follows:

There are locations throughout the shops in this facility that shall have conveniently located lavatories. There will be emergency eye-wash/drench showers located in areas where personnel handle chemicals.

See next page for Design Calculations.

Counting method: IBC 2009 occupant load

| | sf | 100sf/person | |
|---|---|---|---|
| | Total Area | occupant load factor | Total occupants |
| | | Business | |
| FTC | 30,125 | 100 | 300 |

1 per 50 occupant +1

| | WC Male/Female Ratio | | WC Required | | WC Provided | |
|---|---|---|---|---|---|---|
| | Male 60% | Female 40% | Male | Female | Male (urinal) | Female |
| FTC | 180 | 120 | 5 | 4 | 4 + (4) = 8 | 4 |
| | | | | | | |

1 per 80 occupant +1

| | Lavatories Required | | Lavatories Provided | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| FTC | 4 | 3 | 4 | 4 |

| | 1 per 500 occupant | | 1 service sink | |
|---|---|---|---|---|
| | Drinking fountain | | Service Sink | |
| | Required | Provided | Required | Provided |
| FTC | 1 | 2 | 1 | 1 |

CHAPTER VIII - STRUCTURAL
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. DESIGN REFERENCES.

(a) Project Planning Documents

(b) Facilities Requirements Plan

(c) See following Basis of Structural Design for other design references and design criteria.

2. SCOPE OF WORK.

(a) The project will consist of a single story high double simulator bay and adjacent two story office/briefing/classroom/support area.

(b) Structural design of the facility will be governed by the referenced codes and standards. The structure will be designed for the actual weight of the structure, covering and permanent contents, allowances for mechanical and electrical items, as well as roof live loads, wind and seismic loadings.

(c) The roof framing system will be metal roof deck over wide flange beams and bar steel joists on framing to steel wide flange columns. The floor framing will be concrete deck on composite steel decking framing to steel beams and girders. The girders will frame to the steel wide flange columns

(d) Lateral loads at the roof level will be transferred to steel braced frames by the roof diaphragm system. Lateral loads at the floor level will be transferred to steel braced frames by the floor diaphragm system. The concentric steel braced frames will transfer lateral loads to the building foundations. The roof diaphragm system will be a shallow sloping roof with Type B roof steel roof deck over wide flange beams and steel bar joists. The floor diaphragm system will be a concrete slab on composite 3” floor deck over wide flange beams and girders.

(e) All interior building columns are supported on individual reinforced concrete spread footings. Exterior building columns and walls are supported on reinforced concrete spread footings connected with continuous reinforced concrete strip. Allowable bearing pressures will be increased one-third for transient loads. The slab at grade is a “floating” reinforced concrete slab designed for different floor loading conditions with a minimum thickness of 100 mm (4”). Control and isolation joints will be placed to control cracking. Concrete foundations will be provided for interior and exterior electrical and mechanical equipment as required. The computer room will be depressed for access flooring and the Simulator units will have a specialized isolated footing and trenches to the footings for utilities.

(f) A site specific Geotechnical Report will need to be prepared for the final site.

3. BASIS OF STRUCTURAL DESIGN.

(a) Codes

1) 2009 International Building Code

2) American Concrete Institute 318-08

3) American Institute of Steel Construction, Thirteenth Edition

4) ASCE 7-05 Minimum Design Loads For Buildings and Other Structures

5) UFC 1-200-01 General Building Requirements

6) UFC 3-301-01 Structural Engineering

7) UFC 3-310-04 Seismic Design for Buildings

8) UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

9) UFC 4-010-02 DoD Minimum Antiterrorism Standoff Distances for Buildings

10) Building Code Requirements for Masonry Structures, ACI 530-08

11) American Welding Society, AWS D1.1 Structural Welding Code Steel

12) Diaphragm Design Manual, DDM03.

4. LOADS.

*The site for the facility has not been established. The loading criteria specific to the facility site will need to be determined. The following are values assumed for the definitive design.*

(a) Building Classification per ASCE-7: Category II

(b) Dead Loads: (Assumed):

- Roof: 9 psf
- Floor: 65 psf

(c) Collateral Loads:

- Ceilings: 3 psf
- Ductwork: 4 psf
- Fire Protection Piping: 3 psf
- Lighting and Electrical: 2 psf

(d) Connection Weight Allowance: 5 percent

(e) Live Loads

- Roof: 20 psf Uniform

- 
- Roof:  300 # concentrated load (concurrent with live load)
- Floor:  100 psf Uniform
- Roof and Floor live load reductions are permitted in accordance with IBC and ASCE7.

(f) Wind Loads per ASCE 7

- Basic wind speed: 90 MPH
- Exposure category: C
- Importance factor:  I=1.00
- Building Condition:  Enclosed
- Topographic Factor:  1.0

(g) Snow Loads per ASCE 7

- Ground snow load: 25 psf
- Sloped Snow Load:  20 psf
- Exposure Factor:  0.9
- Importance Factor:  1.0
- Thermal Factor:  1.0

(h) Seismic Loads per ASCE 7:

- Seismic Loads per ASCE 7
- Maximum considered earthquake spectral response accelerations Ss=.140 g, Sl=.050
- Design earthquake spectral response accelerations Sds=.112 g, Sdl=.057
- Site Class: C
- Seismic Design Category: A
- Importance Factor: 1.00
- Response Modification Factor R: 3.00
- Basic Seismic Force Resisting System:  Steel systems not specifically detailed for seismic resistance.
- Analysis Procedure: Equivalent Lateral Force

(i) Crane Loads

- Two-Ton Top Running Bridge Crane at Simulator Bays
- One-Ton Top Running Bridge Crane at Boom Trainer Bays

(j) Thermal Loads

- Design Temperature Change: 61°F ambient, 34°F for heated and air-conditioned building

5. SERVICEABILITY CRITERIA.

(a) Foundation Settlement:

1) Vertical Settlement Limit: 1” total settlement; ½” differential settlement maximum.

(b) Beam/Girder/Frame/Wall Deflection Limit:

1) Roof and Floor Beam/Girder/Truss Deflection Limit: L/360 for live load, L/240 for total load

2) Masonry Veneer/Stud Wall: H/600 (0.00167H)

3) Overall Structure Drift Limit: H/200 (0.005H) for wind load, H/100 (0.01H) for earthquake

4) Other: L/600 for Metal Studs Supporting CMU Walls

6. FOUNDATIONS.

*It is anticipated the structure could be supported on reinforced concrete spread footings and reinforced concrete strip footings. A geotechnical report will be prepared for foundation design specific to the facility site. The following system and assumed soil parameter values assumed for the definitive design.*

All interior building columns are supported on individual reinforced concrete spread footings. Exterior building columns and walls are supported on reinforced concrete spread footings connected with continuous reinforced concrete strip. Allowable bearing pressures will be increased one-third for transient loads. The slab at grade is a “floating” reinforced concrete slab designed for different floor loading conditions with a minimum thickness of 100 mm (4”). Control and isolation joints will be placed to control cracking. Concrete foundations will be provided for interior and exterior electrical and mechanical equipment as required. The computer room will be depressed for access flooring and the Simulator units will have a specialized isolated footing and trenches to the footings for utilities.

(a) Assumed Soil Information
1) Subgrade Modulus: 100 pci
2) Allowable Bearing Pressure for Undercutting and Backfill = 2,000 psf (at 3 feet below existing grade)
3) Undercutting Requirements
None
4) Soil Density: 110 pcf
5) Lateral Earth Pressure:
Ka (active) = 0.3
Kr (at rest) = 0.5
Kp (passive) = 2.0
6) Water Table Depth: 20 feet below grade
7) Frost Depth: 18 inches
8) Coefficient of Friction: 0.35
9) Seismic Site Classification: C
10) Types of Foundations: Concrete spread footings

7. SUPERSTRUCTURE.

*Alternate construction methods should be investigated for cost efficiency for each specific site along with site conditions such as seismic, hurricane, flooding, etc. Structural considerations include steel beams, columns, trusses and the roof system. A viable economical solution for the superstructure at most sites is assumed as follows.*

(a) The roof framing system will be metal roof deck over wide flange beams and bar steel joists on framing to steel wide flange columns. The floor framing will be concrete deck on composite steel decking framing to steel beams and girders. The girders will frame to the steel wide flange columns

(b) Lateral loads at the roof level will be transferred to steel braced frames by the roof diaphragm system. Lateral loads at the floor level will be transferred to steel braced frames by the floor diaphragm system. The concentric steel braced frames will transfer lateral loads to the building foundations. The roof diaphragm system will be a shallow sloping roof with Type B roof steel roof deck over wide flange beams and steel bar joists. The floor diaphragm system will be a concrete slab on composite 3” floor deck over wide flange beams and girders.

8. MATERIALS.

(a) Reinforced Concrete: Designed per ACI 318-08

1) Concrete f'c: 4000 psi UNO;

2) Reinforcing Steel Fy: 60,000 psi

3) Maximum Slab-on-grade Joint Spacing: 20 feet

(c) Concrete Masonry: Designed per ACI 530-08

1) f'm: 1500 psi

2) Reinforcing Steel Fy: 60,000 psi

(d) Structural Steel: Designed per AISC 360-05 and AISC 341-05

1) Rolled shapes and plates: ASTM A36, Fy=36 ksi, UNO

2) Wide flange shapes and tees: ASTM A992, Fy = 50 ksi

3) Structural tubes: ASTM A500, Fy = 46 ksi

4) Steel Connections

a) Anchor Rods: ASTM F1554, Fy =36 ksi

b) Connection Bolts

1. Types, usage, and typical sizes: 3/4 inch diameter, ASTM A325
2. Bracing connection types and hole sizes: Bearing type, standard holes.
3. Shear Connection Types: AISC Standard Framed Beam Connection

c) Welding Electrode: E70XX per AWS D1.1-04

9. MISCELLANEOUS.

(a) Force Protection

1) Minimum force protection levels will be provided per UFC 4-010-01 by providing required standoff distances and providing adequate lateral support for windows and doors.

2) Blast Loads per UFC 4-010-01 and UFC 4-010-02 (FOUO)

a) Explosive Weight: II

b) Standoff Distance: To parking, roadways, and trash containers

10. GUIDE SPECIFICATIONS.

| | | |
|---|---|---|
| (a) | UFGS Section 03 11 13.00 10 | STRUCTURAL CAST-IN-PLACE CONCRETE FORMING |
| (b) | UFGS Section 03 15 00.00 10 | CONCRETE ACCESSORIES |
| (c) | UFGS Section 03 20 00.00 10 | CONCRETE REINFORCING |
| (d) | UFGS Section 03 30 00.00 10 | CAST-IN-PLACE CONCRETE |
| (e) | UFGS Section 03 39 00.00 10 | CONCRETE CURING |
| (f) | UFGS Section 04 21 13.13 | NONBEARING MASONRY VENEER/STEEL STUD WALLS |
| (g) | UFGS Section 05 05 23 | WELDING, STRUCTURAL |
| (h) | UFGS Section 05 12 00 | STRUCTURAL STEEL |
| (i) | UFGS Section 05 21 19 | OPEN WEB STEEL JOIST FRAMING |
| (j) | UFGS Section 05 30 00 | STEEL DECKS |
| (k) | UFGS Section 05 40 00 | COLD-FORMED METAL FRAMING |
| (l) | UFGS Section 05 50 13 | MISCELLANEOUS METAL FABRICATIONS |
| (m) | UFGS Section 05 51 00 | METAL STAIRS |
| (n) | UFGS Section 05 52 00 | METAL RAILINGS |
| (o) | UFGS Section 41 22 13.14 | BRIDGE CRANES, OVERHEAD ELECTRIC, TOP RUNNING |

1. APPLICABLE PUBLICATIONS.

(a) ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) – Fundamentals Handbook (2009)

(b) ASHRAE – HVAC Applications Handbook (2011)

(c) ASHRAE – HVAC Systems and Equipment Handbook (2012)

(d) ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality (2010)

(e) ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (2007)

(f) ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (2010)

(g) ASHRAE 189.1 – Standard for the Design of High-Performance Green Buildings (2011)

(h) Air Mobility Command (AMC) – Mobility Air Forces Distributed Mission Operations Physical Security Guide.

(i) Energy Policy Act of 2005 (EPACT 05) (Public Law 109-58)

(j) Energy Independence and Security Act of 2007 (EISA 2007)

(k) Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management

(l) International Mechanical Code (IMC 2012)

(m) LEED® (Leadership in Energy and Environmental Design) NC – LEED Reference Guide for Green Building Design and Construction, 2009 Edition

(n) NFPA (National Fire Protection Association) 33 – Standard for Spray Application Using Flammable or Combustible Materials

(o) NFPA 90A – Installation of Air Conditioning and Ventilating Systems (2009)

(p) SMACNA (Sheet Metal and Air Conditioning Contractors’ National Association, Inc) – HVAC Duct Construction Standards: Metal and Flexible

(q) SMACNA – HVAC Systems Duct Design

(r) SMACNA – Seismic Restraint Manual for Mechanical Systems

(s) UFC 1-200-02 – High Performance and Sustainable Building Requirements

(t) UFC 3-400-02 – Design: Engineering Weather Data

(u) UFC 3-410-01FA – Design: Heating, Ventilating, and Air Conditioning (HVAC)

(v) UFC 3-430-01FA – Heating and Cooling Distribution Systems

(w) UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings

2. SCOPE OF WORK.

(a) The mechanical design will provide a prototype design that can be modified by the designer of record based on the selection of site and equipment to be utilized inside the building.

(b) A life cycle cost analysis (LCCA) and an energy analysis shall be performed during the design phase for final system selection and to demonstrate compliance with EISA 2007 energy reduction requirements. Perform the LCCA as specified in UFC 1-200-02. The project also has a goal to achieve LEED Silver as a minimum and shall comply with requirements of UFC 1-200-02.

(c) This prototype design has been developed with variable air volume (VAV) air handling units, and hydronic heating and cooling. These systems have been chosen because they are versatile for multiple climates, and require a Mechanical Room size that will accommodate other system choices.

(d) The use of VAV systems for the definitive design is not meant to drive the final design choice. Possible HVAC systems and components to be considered during the LCCA analysis for actual system selection include the systems discussed above as well as fan coil units, electric heat, DX systems, condensing boilers, dedicated outside air systems (DOAS), ground source heat pumps, air and water side economizers, and energy recovery. Other system types and components not mentioned may also be used if found to be life cycle cost effective and comply with project requirements. Final system selections shall comply with the requirements specified in 2(b).

(e) Hydronic, refrigerant, and natural gas piping will not be shown on the definitive design drawings and shall be developed by the designer of record.

3. DESIGN REQUIREMENTS:

(a) Outdoor Design Conditions: To be determined after site selection. Obtain weather data as described in UFC 3-400-02 – Design: Engineering Weather Data. Base calculations on the 1% occurrence dry bulb and wet bulb temperatures for cooling and dehumidification. Use the 99% occurrence dry bulb temperature for heating.

(b) Indoor Design Conditions:

| | |
|---|---|
| Offices, Admin Area | 75°F ± 2°F dry bulb – cooling condition<br>60% maximum relative humidity<br><br>68°F ± 2°F dry bulb – heating condition |
| Shop and Support Areas | 75°F dry bulb – cooling condition<br>60% maximum relative humidity<br><br>65°F dry bulb – heating condition |
| Communication Rooms<br>Simulator Bays and<br>Computer Rooms | 65°F - 72°F ± 2°F dry bulb<br>40-60% relative humidity<br>Humidification required |
| Mechanical, and Electrical Rooms | Ambient + 10°F – cooling condition<br><br>60°F dry bulb – heating condition |

(c) Exhaust Air Rates:

| | |
|---|---|
| Toilet Rooms | 50 cfm per water closet or 1.5 cfm per ft2 – whichever is greater |
| Janitor's Closet | 50 cfm or 1 cfm per ft2 – whichever is greater |
| Locker Rooms | 0.5 cfm per ft2 |

(d) Conditioned Outside Air Rates: Comply with ASHRAE 62.1-2010

4. BUILDING ENVELOPE:

Wall and roof R-Values shall be in accordance with or exceed requirements in ASHRAE 90.1-2010.

5. SYSTEM DESCRIPTION:

(a) The definitive mechanical design is based upon a variable air volume air side system for the building with cooling provided by an air cooled chiller and heating from hot water boilers. Mechanical designer of record shall base final system determination on a life cycle cost analysis.

(b) Estimated loads have been used for the simulator equipment located in the simulator bays, the computer rooms and the part task training rooms. Actual loads from the equipment provider are to be validated with the provider and utilized in design calculations. Preliminary internal loads are itemized in the Mechanical Calculations.

(c) Geographic location, schedule of building operations, utility rates and final occupancy are unknown. The systems depicted are based on an assumed population and use preliminary heating and cooling equipment loads from a nonspecific location in ASHRAE Climate Zone 7.

(d) Definitive Design - Hydronic Cooling Systems:

Chilled water provided by an air cooled chiller located on grade adjacent to the main Mechanical Room. Chilled water shall contain propylene glycol if necessary for freeze protection at a concentration determined by the site climate. Distribute to air handling units serving the Administrative areas and the Simulator Bays. Chilled water shall also be piped to computer room cooling units located in the Simulator Computer room. Two 100% capacity, variable speed, end-suction pumps (one active, one standby) will be located in the Mechanical Room. Chilled water may also be required by simulator cooling equipment, coordinate with final requirements of simulator manufacturer.

Piping Systems
Chilled water piping shall be schedule 40 black steel pipe or Type L copper pipe.

(e) Definitive Design - Hydronic Heating Systems:

Heating water is provided by two 65% capacity, high efficiency, natural gas-fired, hot water boilers, located in the Mechanical Room. Boilers shall be sized for complete facility heat load. Hot water is distributed as necessary to the building unit heaters, air handling units, VAV hot water reheat terminal boxes, and computer room units via two 100% capacity, variable speed, inline heating water pumps and accessories. The heating water system shall contain propylene glycol if necessary for freeze protection at a concentration determined by the site climate.

Piping Systems
Heating water piping shall be schedule 40 black steel pipe or Type L copper pipe.

(f) The Comm Room and UPS Room each require dedicated HVAC systems for continuous operation, independent of the building wide HVAC system. DX split systems with outdoor condensing units and indoor fan coil units shall be provided. Units shall be provided with electric heat and humidifier where required.

(g) Definitive Design - Air Side Systems:

1) Variable Volume Air Handling Units
Variable volume air handling units are located in the Mechanical Room. VAV Units are provided with mixing box, MERV 8 and MERV 13 filter section, chilled water cooling coil, hot water heating coil, and fan section. Return air is ducted from each of the spaces and either returned to the VAV unit or exhausted to maintain space pressurization.

Outside air shall be introduced to the unit at the mixing box to meet ASHRAE 62 ventilation standards for each space. Outside air via energy recovery unit may be required by ASHRAE 90.1-2010, depending on airflow rates and climate zone. Transfer air is used for the otherwise unventilated corridors and toilet rooms. Airflow measuring station shall be installed to measure the outside airflow rates. Restrooms, locker rooms, and janitor’s closets shall be continuously exhausted during occupied times to maintain the spaces at a negative pressure relative to the adjacent areas.

Supply air is ducted to variable volume terminal units provided with a reheat coil for perimeter heating and individual zone temperature control.

Manbars shall be provided in all wall openings for ductwork penetrating secured areas as required for openings over 96 square inches. Provide inspection hatch on the secure side. Duct silencers shall be installed for sound attenuation at these penetrations. Refer to the Mobility Air Forces Distributed Mission Operations Physical Security Guide for requirements.

Fire dampers shall be provided for all rated walls and corridors as required.

2) Computer Room Units
Dedicated, 100% recirculated air computer room units shall be provided in the Simulator Computer Room. Two units will be provided in rooms requiring more than 5 tons of cooling, each sized for 50% of the load. Units are floor mounted, discharging air into the floor plenum and distributed in the room using floor nozzles or perforated raised floor tiles. Return air is ducted from the ceiling return plenum. Units shall have chilled water cooling and hot water or electric reheat coils. Humidification provided based on climate and the requirements of the computer equipment manufacturer.

(h) Control Systems:
The selected AFB standard for building DDC and EMCS systems shall be utilized. The EMCS shall communicate to third party systems such as chillers, boilers, air handling systems, etc. All mechanical equipment described herein shall be controlled via the DDC control system. The DDC system shall be integrated with the existing base wide system if applicable.

6. ROOM DESCRIPTIONS.

(a) Administration Area:
All office, administration, break room, briefing and conference rooms shall be air conditioned and heated via the VAV systems.

(b) Simulator Bays:
The simulator bays shall be served by a dedicated VAV system. Provide humdification where necessary.

(c) Comm and UPS Rooms:
Dedicated constant volume, direct expansion (DX) ductless split systems with outdoor condensing units and indoor fan coil units shall be provided for each room. These independent units allow the larger systems to be turned off at night and weekends and still protect the equipment located within these rooms. Units shall be complete with

integral controls for individual supply air temperature heating and cooling.

(d) Toilet Rooms, Lockers, and Janitor’s Closet
Rooms will be exhausted by a central inline centrifugal exhaust fan or via energy recovery unit based on results of the life cycle cost analysis or where required by ASHRAE 90.1-2010.

(e) Storage and Tool Rooms
These rooms shall be air conditioned and heated via the VAV systems.

(f) Electrical, Fire Pump & Mechanical Rooms
Heat service rooms using unit heaters. Ventilation of 10 air changes per hour or maximum 10°F delta T shall be provided by fans and wall louvers with motorized dampers.

7. SEISMIC RESTRAINTS AND FORCE PROTECTION:

(a) Requirements for seismic restraints for mechanical systems to be determined after site selection.
(b) Mount all overhead utilities and other fixtures weighing 31 pounds (14 kilograms) or more (excluding distributed systems such as piping networks that collectively exceed that weight) using either rigid or flexible systems to minimize the likelihood that they will fall and injure building occupants. Design all equipment mountings to resist forces of 0.5 times the equipment weight in any horizontal direction and 1.5 times the equipment weight in the downward direction.
(c) Air intakes for heating, ventilating, and air-conditioning shall be located at least ten feet above the ground per ATFP standards. Provide all outside air intakes, relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency air distribution shutoff switch is activated. The low leakage dampers will have maximum leakage rates of 3 cfm/square foot with a differential pressure of one inch of water gage across the damper.
(d) The building will have an HVAC Emergency Shutdown Switch that will immediately shut down the building air distribution systems and close outdoor air intake, relief and exhaust dampers in the event of a chemical or biological attack on the building. Locate the shutoff switch (or switches) to be easily accessible by building occupants. Locate them similarly to manual fire alarm boxes in accordance with NFPA 72 and with at least one shutoff switch per floor and so that the travel distance to the nearest shutoff switch will not be in excess of 200 feet. Ensure that the shutoff switches are well labeled and of a different color than fire alarm pull stations.

8. UFGS (UNIFIED FACILITIES GUIDE SPECIFICATIONS) LIST:

Refer to Appendix 1 for a list of specifications.

(a) Only a limited amount of specification sections will be edited during the definitive design as the life cycle cost analysis and final system selections will not be done until after site selection.

CHAPTER IX-2 – Plumbing
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. APPLICABLE PUBLICATIONS.

a. ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) – HVAC Applications Handbook (2011)

b. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (2010)

c. ASHRAE 189.1 – Standard for the Design of High-Performance Green Buildings (2011)

d. ASPE (American Society of Plumbing Engineers) Data Books – Volumes 1, 2, 3, and 4

**e.** International Plumbing Code (2012)

f. LEED® (Leadership in Energy and Environmental Design) NC –LEED Reference Guide for Green Building Design and Construction, 2009 Edition

g. UFC 1-200-02 – High Performance and Sustainable Building Requirements

h. UFC 3-420-01 – Plumbing Systems

i. UFC 4-010-01- DoD Minimum Antiterrorism Standards for Buildings

2. SCOPE OF WORK.

(a) Domestic hot and cold water, as well as sanitary waste and vent, shall be provided for the restrooms, janitor’s closet, break rooms, and other areas requiring plumbing.

(b) A life cycle cost analysis (LCCA) shall be performed during the design phase for hot water system selection and to demonstrate compliance with EISA 2007 energy reduction requirements. Perform the LCCA as specified in UFC 1-200-02. If life cycle cost effective, a minimum 30 percent of the hot water demand shall be met through the installation and use of solar water heaters. Also consider systems such as heat pump water heaters or utilizing waste heat.

(c) Underground piping will not be shown on definitive design plans. The layout of the underground piping is dependent on the site selection and orientation of the building.

(d) Compressed air is not required for this facility.

3. SYSTEM DESCRIPTIONS.

(a) Domestic water to serve the facility shall be provided by a connection to the site underground domestic water system and routing the new main domestic water supply line into the Fire Pump Room or

Mechanical Room. Provide a reduced pressure backflow preventer and water meter either inside or outside the building depending on Base standards. Domestic cold water will be distributed throughout the facility to serve the various plumbing fixtures.

(b) A storage domestic water heater will be provided to serve the facility. Due to the occupancy of the building, it is expected that solar water heating system with solar panels located on the roof supplementing the gas-fired domestic water heater will not be life cycle cost effective. The life cycle cost analysis will be conducted by the designer of record. Domestic hot water will be distributed throughout the building to serve various plumbing fixtures defined herein. A hot water inline circulation pump shall be provided for the hot water system in order to maintain the temperature of the domestic hot water system as required for temperature maintenance.

(c) A conventional sanitary waste and venting system shall be provided for plumbing fixtures and floor drains.

(d) Storm drainage for the sloped roofs shall be accomplished through exterior gutters and downspouts.

4. PIPING SYSTEMS.

(a) Domestic hot and cold water piping shall be standard weight copper with soldered fittings, and will be insulated per UFGS standards. Piping will be exposed in mechanical rooms, simulator bays, and shop areas and concealed in all other areas.

(b) Sanitary waste and vent piping above ground shall be service weight cast iron with no-hub couplings, while the underground waste and vent piping shall be PVC or hub and spigot cast iron.

5. BUILDING PLUMBING FIXTURES.

(a) Mechanical Rooms shall be provided with floor drains with trap primers.

(b) Provide wall hydrants on the exterior of the facility at intervals of approximately 100 feet.

(c) Janitor’s Closets will be provided with a floor mounted janitor’s sink (2.5 gpm) and a floor drain with trap primer.

(d) Restrooms shall be provided with wall-mounted, low-flow, flush valve water closets (1.28 gpf); wall-mounted, low-flow, flush valve urinals (0.125 gpf); and lavatories (0.5 gpm) with insulation on the drain piping. Also, restrooms will be provided with floor drains with trap primers.

(e) Break areas will be provided with a stainless steel single compartment kitchen sink (1.5gpm) with 1/2 hp garbage disposal.

6. CATHODIC PROTECTION.

(a) Cathodic protection requirements will be determined after site selection.

7. SEISMIC RESTRAINTS AND FORCE PROTECTION:

(a) Requirements for seismic restraints for plumbing systems to be determined after site selection.
(b) Mount all overhead utilities and other fixtures weighing 31 pounds (14 kilograms) or more (excluding distributed systems such as piping networks that collectively exceed that weight) using either rigid or flexible systems to minimize the likelihood that they will fall and injure building occupants. Design all equipment mountings to resist forces of 0.5 times the equipment weight in any horizontal direction and 1.5 times the equipment weight in the downward direction.

8. UFGS (UNIFIED FACILITIES GUIDE SPECIFICATIONS) LIST:

a. Refer to Appendix 1 for a list of specifications.

b. Only a limited amount of specification sections will be edited during the definitive design as the life cycle cost analysis and final system selections will not be done until after site selection.

# CHAPTER IX-3 – FIRE PROTECTION
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

Refer to CHAPTER XVII – LIFE SAFETY for Fire Protection design analysis.

Electrical
CHAPTER X-1 – ELECTRICAL
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. REFERENCES (LATEST EDITIONS)

   a. Air Force

      i. AFI 32-1065 Grounding Systems

      ii. AFI 32-1063 Electrical Power Systems

      iii. AFI 32-1064 Electrical Safe Practices

      iv. AFI 32-1067 Grounding Systems

   b. American National Standard Institute (ANSI)

      i. ANSI C2 National Electrical Safety Code (NESC)

   c. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

      i. 189.1 Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

   d. Engineering Technical Letters

      i. ETL 11-10 Electrical Manhole Design Considerations

      ii. ETL 99-4 (Change 1): Fire Protection Engineering Criteria and Technical Guidance – Emergency Lighting and Marking of Exits

   e. Institute of Electrical and Electronic Engineers (IEEE)

      i. IEEE C2 National Electrical Safety Code (NESC)

      ii. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems

   f. Illuminating Engineering Society of North America (IESNA)

      i. Illuminating Engineering Society of North America, Lighting Handbook

   g. Military Handbooks

      i. MIL-HDBK-419A Grounding, Bonding and Shielding for Electronic Equipment and Facilities

ii. MIL-HDBK-1190 Facility Planning and Design Guide, Chapter 9

h. National Fire Protection Association (NFPA)

i. NFPA 70 National Electrical Code (NEC)

ii. NFPA 70E Standard for Electrical Safety in the Workplace

iii. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

iv. NFPA 101 Life Safety Code

v. NFPA 780 Installation of Lightning Protection Systems

i. Unified Facilities Criteria (UFC)

i. UFC 1-200-01 General Building Requirements

ii. UFC 1-200-02 High Performance and Sustainable Building Requirements

iii. UFC 3-310-04 Seismic Design of Buildings

iv. UFC 3-400-01 Energy Conservation

v. UFC 3-501-01 Electrical Engineering

vi. UFC 3-520-01 Interior Electrical Systems

vii. UFC 3-530-01 Design: Interior and Exterior Lighting and Controls

viii. UFC 3-550-01 Exterior Electrical Power Distribution

ix. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

2. POWER

a. Site power requirements will be included when a site is selected for the facility.
b. A pad-mounted service transformer and underground secondary service (480Y/277 volts) will be provided for the facility.
c. The main distribution panelboard and panelboards feeding HVAC and lighting loads shall be 480Y/277 volts. Panelboards feeding receptacles and small power loads shall be 208Y/120 volts. Distribution equipment will be sized for 25% spare capacity.
d. Transformers feeding a large number of non-linear loads will be K13 rated. The secondary neutral will be sized at 200%. Panelboards feeding a large number of non-linear loads will be provided with a 200% rated neutral bus.
e. A digital multi-function meter shall be provided at the main distribution panelboard.
f. A surge protection device shall be provided at each panelboard.

g. A 20 ampere, 120 volt, quadruplex receptacle outlet shall be provided at each workstation in the facility. Duplex receptacle outlets will be provided throughout the facility and around the exterior as required for general purpose and maintenance.
h. Provisions will be included for an uninterruptible power supply to backup power to each simulator and associated computer room load. Trenches will be provided in floor slabs to the simulators.

3. GROUNDING AND LIGHTNING PROTECTION

a. A grounding counterpoise will be provided around the facility perimeter and connected to the main distribution panelboard ground bus, along with connections to building steel, cold water pipe and concrete reinforcement (UFER).
b. A telecommunications grounding system shall be provided consisting of a main telecommunications ground bus (MTGB) in the entrance room connected to a ground bus in each communication room in the building and a connection between the TMGB and main ground bus (MGB) in the main electrical room.
c. Lightning protection requirements will be included when a site is selected for the facility.

4. LIGHTING

a. Lighting systems will be designed to provide illumination levels and environments as required by UFC 3-530-01 and recommended by the IES Handbook. Lighting power densities will be 30% less than those required by ASHRAE 90.1.
b. Interior light fixtures will include fluorescent lamps and electronic energy-saving ballasts. Lamps will be predominantly T5 in low mounting applications and T5HO in high bay applications. Lamps will be low-mercury.
c. Recessed, indirect, volumetric light fixtures will provide a glare-free environment in workstation and training areas.
d. Pendant-mounted industrials will be provided in unfinished spaces such as electrical and mechanical rooms.
e. High-bay areas with daylight will be provided with high-bay fluorescent light fixtures with multiple ballasts to allow two-step dimming coordinated with daylight controls. Fixtures in high-bay areas will be wall-mounted low around the perimeter of the room to allow easy replacement of lamps and emergency ballasts.
f. Exterior light fixtures will be building-mounted LED with type II distribution and will light the building perimeter and door areas.
g. A lighting relay control panel will be provided and will allow interior lighting in common spaces to be controlled on a time schedule and exterior lighting to be controlled on a time schedule or based on photocell.
h. All rooms (with the exception of high bay areas and restrooms) will be provided with occupancy sensors to ensure lights are turned off when not in use.
i. Emergency battery ballasts will be provided in select light fixtures along egress paths throughout the facility. Emergency fixtures in corridors will be always on night lights. Emergency

fixtures in other areas will be switchable with other normal fixtures in the room.

j. Exit signs will be battery backup, LED type.
k. The need for building-mounted obstruction lights will be evaluated upon site selection.

# CHAPTER XI-1 – ELECTRONICS
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. REFERENCES (LATEST EDITIONS)

   a. Unified Facilities Criteria (UFC)

      i. UFC 4-020-01 DoD Security Engineering Facilities Planning Manual

      ii. UFC 4-020-02FA Security Engineering: Concept Design (FOUO)

      iii. UFC 4-020-03FA Security Engineering: Final Design (FOUO)

      iv. UFC 4-020-04A Electronic Security Systems: Security Engineering

   b. National Fire Protection Association (NFPA)

      i. NFPA 70 National Electrical Code (NEC)

2. Intrusion Detection, Access Control, Notification and Sound Attenuation Systems

   a. No electronic security systems are required for the Fuselage Trainer Facility unless required by the Base. Upon site selection, security-in-depth measures will be reviewed with Base Security and transmitting and reporting requirements will be included.

3. Fire Alarm

   Refer to Chapter XVII – LIFE SAFETY for Fire Protection design analysis.

CHAPTER XII-1 – Communications
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. REFERENCES (LATEST EDITIONS)

   a. American National Standard Institute (ANSI)

      i. ANSI C2 National Electrical Safety Code (NESC)

   b. Engineering Technical Letters

      i. ETL 2-12 Communications and Information System Criteria for Air Force Facilities (Change 1) 2002

   c. Military Handbooks

      i. MIL HDBK 1012/3  Telecommunications Premises Distribution Planning, Design, and Estimating

   d. National Fire Protection Association (NFPA)

      i. NFPA 70 National Electrical Code (NEC)

   e. Unified Facilities Criteria (UFC)

      i. UFC 3-580-01 Design: Telecommunications Building Cabling

         Systems Planning and Design (2007)

   f. Telecommunications Industry Association

      i. TIA-568 Commercial Building Telecommunication Cabling Standard

      ii. TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces

      iii. TIA-606 Administration Standard for Telecommunications Infrastructure

      iv. TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications

      v. TIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard

2. Voice/Data

   a. Site specific requirements and Base Communication Squadron preferences will be added upon site selection.  Voice system (VoIP, telephone switch, etc.) requirements will be determined upon site selection.  Outside plant fiber optic and copper service will be provided to the building as indicated on the design drawings.

b. Interior fiber optic and copper backbones will be provided between the entrance communication room and each communication room in the building. Fiber optic cable will be terminated in rack-mounted fiber patch panels and copper will be terminated on 110 type punch down blocks on the wall.

c. Horizontal cabling, jacks and patch panels will be TIA Category 6. Two data ports and one voice port will be provided at each workstation and on each of two walls in individual offices. One wall-mount telephone will be provided in each support space (electrical room, mechanical room, etc.).

d. Classified networks are not required for this facility.

e. Communication rooms will be located and sized according to UFC 3-580-01 and TIA-569. Fire-resistant, plywood backboard will be provided on all walls in each communication room. Open communication racks will be provided with patch panels and cable management. Ladder rack or runway will be provided above racks and along a minimum of two walls. A dedicated power panelboard will be provided in each communication room to serve rack and wall mounted equipment in the room. A dedicated computer room unit will be provided to meet environmental requirements for each communication room.

f. All horizontal cabling will be routed in 1-inch minimum conduit and wire basket cable tray from outlet to communication room.

3. Cable TV

a. F-type connector outlets will be provided at TV locations where designated. Coaxial cabling will be routed in 1-inch minimum conduit back to the demarcation point. Cable service provider requirements will be determined upon base selection.

1. APPLICABLE PUBLICATIONS

| | |
|---|---|
| a. Air Force SDD Policy | Air Force Sustainable Design and Development Policy |
| b. ASHRAE Standard 90.1-2007 | Energy Standard for Buildings Except Low Rise Residential |
| c. ASHRAE Standard 189.1-2011 | Standard for the Design of High-Performance Green Buildings |
| d. EISA 2007 | Energy Independence and Security Act |
| e. EPAct 2005 | Federal Energy Policy Act 2005 |
| f. Executive Order 13423 | Strengthening Federal Environmental, Energy and Transportation Management |
| g. Executive Order 13514 | Federal Leadership in Environmental, Energy and Economic Performance |
| h. FLHPSB MOU | Guiding Principles for Federal Leadership in High Performance and Sustainable Building |
| i. LEED-NC 2009 | US Green Building Council’s (USGBC) LEED 2009 for New Construction and Major Renovations Rating System |
| j. LEED Reference Guide | LEED Reference Guide for Green Building Design and Construction, 2009 Edition |
| k. UFC 1-200-02 | High Performance and Sustainable Building Requirements |

2. GENERAL SUSTAINABILITY GOALS

a. Pursuant to the Air Force SDD Policy and federal mandates, new facilities and major renovations shall be designed and constructed to achieve LEED Silver certification, achieving a minimum of 50 points through the US Green Building Council’s (USGBC) LEED-NC 2009 Rating System. These policies and mandates emphasize the importance of sustainable development in the built environment to reduce environmental impact, optimize performance, lower energy and operating costs, conserve resources and increase occupant satisfaction and productivity through improved health and well-being.

3. LEED CERTIFICATION

a. In order to pursue third-party LEED certification, all LEED 2009 Minimum Program Requirements (MPRs) must be met. The Definitive Design for the FTC currently meets all MPRs and there are no indications the selected site will have problems meeting the MPRs.
b. Individual projects will be registered with GBCI using LEED-NC 2009 by Burns & McDonnell upon selection of the installation. At that time, LEED Online project access will be provided to the design and construction team, and additional team members upon request. Upon LEED Online project registration, the USACE Mobile District's Sustainable Design and Development point of contact shall be assigned to the project with a role of "Corps of Engineers Representative" with an authorization level of Project Team Manager.

4. SUSTAINABLE DESIGN DOCUMENTATION

a. The following documents are attached in Appendix 3 and shall serve as living documents to be updated throughout design and construction. Prior to selection of a project site, the LEED checklist is based on preliminary site and energy goals. Upon final design, site and energy credits will be better defined.

i. LEED-NC 2009 Checklist

ii. Air Force MILCON Sustainability Requirements Scoresheet

iii. Owner's Project Requirements (OPR) – to be provided at future submittal.

iv. Lifecycle Cost Analysis and Energy Analysis – to be provided at future submittal.

5. SUSTAINABLE DESIGN APPROACH

a. Sustainable design approaches and technologies are often unique to a project's climate, location and site characteristics. See Appendix E for a preliminary LEED checklist, which was developed as part of the Definitive Design for the KC-46 training program but requires further development and analysis during final design. General sustainable design principles, per the LEED rating system, focus on site development, water savings, energy efficiency, materials/resources and indoor environmental quality.

i. Sustainable Sites: Site impact is minimized by selecting a previously developed site, preferably with pedestrian access to Base services and access to alternative transportation options. The preferred site incorporates vegetated areas and/or pervious pavement to reduce stormwater runoff through on-site infiltration. Light-colored pavement and roofing materials with high reflectivity reduce the heat island effect. Light pollution of adjacent sites and the night sky is minimized through an efficient, but secure, exterior lighting design.

ii. Water Efficiency: Native and drought-tolerant landscape design eliminates the need for permanent irrigation and reduces on-going maintenance. The selection of low-flow plumbing fixtures reduces water consumption by 30-40%. Based on the selected site, the central plant may contribute LEED points if wastewater is treated to tertiary standards for reuse or infiltration on Base.

iii. Energy & Atmosphere: The building envelope, mechanical systems and lighting systems will be designed to maximize energy savings. Based on selected installation, the proposed systems and baseline capital, energy, maintenance and replacement costs will be compared using a 40-year life-cycle cost analysis. The selected system will then be modeled through whole building energy simulation software with the goal of achieving a 30% energy use reduction when compared to the ASHRAE 90.1-2007 baseline. Life-cycle cost analysis will also evaluate solar domestic hot water systems and other renewable energy systems to reduce the consumption of fossil fuels. Commissioning of the building energy systems is required to verify installation and operation of systems as designed and according to the owner's requirements, while measurement and verification systems monitor operational performance. During equipment selection, refrigerant impact is minimized by specifying refrigerants with reduced ozone depletion and global warming potential.

iv. Materials and Resources: Upon site selection, resource impact can be greatly reduced by evaluating existing resources and infrastructure to accommodate the new program. Based on local recycling and salvage opportunities and programs, the minimum goal will be diverting a minimum of 75% of demolition and construction waste from landfill. After construction and throughout facility operation, readily-accessible recycling bins will further reduce the quantity of waste introduced to landfill. Building materials with high recycled content and durability also redirect materials from the waste stream. Selecting locally-available materials benefit the local economy and minimize the need for long distance transportation. Rapidly renewable and bio-based materials, as well as certified wood products, further reduce negative impact to natural resources.

v. Indoor Environmental Quality: Good indoor air quality reduces health risks and promotes occupant productivity. Strategies include a no smoking policy, outside air ventilation rates above ASHRAE 62.1-2007 minimums with automatic controls and reduction of indoor pollutants. IAQ management during construction and before occupancy reduces air quality problems resulting from the construction process. Pollutant source control, increased filtration at outside air supplies and the use of low-emitting adhesives, sealants, paints, coatings, flooring, carpeting, furniture and composite wood products contribute to a healthier indoor environment. Occupant comfort is increased through efficient system design and verification, as well as individual controls for lighting and thermal comfort, natural daylighting, connection to the environment and operable windows where appropriate. Task lighting will be provided with workstations.

vi. Innovation in Design: Based on selected site, additional opportunities to reduce environmental impact will be evaluated. Elimination of asphalt or dark paving materials and sourcing 95% of wood from sustainably managed forests provide two examples of "exemplary performance" by exceeding LEED requirements. Long-life lamps with low mercury content reduce hazardous waste disposal.

vii. Regional Priority: To address regional environmental priorities, six additional credits are identified per geographic location. These credits will be identified based on the project's zip code.

Construction Coordination
CHAPTER XIV-1 – NOTES TO THE RESIDENT ENGINEER
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

There are no notes for the Resident Engineer at the time of this submittal.

Cost Estimate
CHAPTER XV-1 – COST ESTIMATE
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

## 1. CURRENT COST

The estimated cost of construction based on early programming is between $11.2m and $12.4m, depending on site selection. The cost estimate based on the Interim Definitive Design submittal resulted in a cost range between $10.4m and $11.9m. The estimate was developed based on an ‘average’ Base construction type with the range derived from the comparison of the lowest to highest area cost factors for the four candidate Bases. The Interim Definitive Design cost estimate is provided under separate cover.

## 2. BID OPTIONS

Bid Options shall be developed as design progresses and may include the following:

- Landscaping
- Sidewalks
- Parking

Cost Reduction Strategies
CHAPTER XVI-1 – COST REDUCTION STRATEGIES
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

1. EXECUTIVE SUMMARY:

This section summarizes the Cost Reduction Strategies evaluated by the design working group in the development of the Definitive Design documents.

The evaluations consider economic and life cycle cost decisions that were made as part of the design development or consideration of materials.

This supports AFCEC guidance for Cost Reduction Initiatives and demonstrates cost restraint by the AF during project planning and programming.

2. APPROACH:

As design decisions are made which may significantly affect the upfront cost and/or life cycle cost of the facility a cost reduction initiative (CRI) is developed. The CRI's will track why a particular design or material was chosen.

3. COST REDUCTION INITIATIVE CRI-1 – SIMPLIFIED STRUCTURE:

1. Reviewed floor plan layouts from programming charrette. Simplified building structure while essentially maintaining approved floor plans and adjacencies.
2. Several layouts haven evaluated. The current plans provide a simpler structure by
3. Change creates a simpler design.
4. Change slightly enlarges building footprint while reducing construction costs.

4. COST REDUCTION INITIATIVE CRI-2 – ATFP SETBACK:

1. ATFP guidance allows varying setbacks based upon wall construction and window blast requirements. If a larger standoff is used the exterior wall type and window construction be conventional construction standards.
   a. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
2. Several design approaches may be considered and will be dependent upon the site selection. Current conceptual plans provide for conventional construction standoff distances.
3. Feasibility of design initiative will be determined based upon site selection.
4. The conventional construction reduces building costs, but uses more land area.

5. COST REDUCTION INITIATIVE CRI-3 – ALUMINUM ALLOY (AA-8000) CONDUCTORS IN LIEU OF COPPER CONDUCTORS FOR POWER DISTRIBUTION:

   a. Copper conductors are generally always excepted, but misperceptions about aluminum alloy conductors sometimes prevent them from being excepted.
   b. In the 1950’s and 1960’s, aluminum alloy conductors were installed in buildings which were the same grade used for transmission lines and did not have properties desirable for building applications. These conductors were, in some cases, terminated with steel screws which expand and contract at a different rate than aluminum alloy. The connections were loosened over time and high resistance led to fires.
   c. Since 1968, an improved aluminum alloy AA-8000 conductor can be terminated with dual-rated Al-Cu lugs and is safe and reliable.
   d. Aluminum alloy conductors cost less than copper conductors of the similar ampacity and are slightly larger, but typically fit in the same size conduit.

6. COST REDUCTION INITIATIVE CRI-4 - MC CABLE IN LIEU OF CONDUCTORS IN CONDUIT FOR 120V CIRCUITS IN WALLS:

   a. MC cable is a factory assembly of one or more insulated circuit conductors enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath.
   b. MC cable is a cost advantage over conductors in conduit for new installations. However, when future renovations are necessary, MC cable can be difficult to access in particular types of walls (CMU block, for example). Also, MC cable must be supported every 6 feet, which may not be possible in walls exceeding 8 feet in height. The MC cable would have to be replaced (if possible). In some cases, wall demolition or surface mounted raceway would be necessary for future circuit installation.
   c. When conduit is installed, conductors may be replaced without having to access the conduit inside the wall, so conduit can be a cost advantage over MC cable with respect to future renovations.

Additional Cost Reduction Initiatives to be provided as design progresses upon site selection. The following additional items will be reviewed:

- Major building components
- Interior/exterior finishes/materials
- Energy features/systems
- Utility features/systems
- ATFP Windows
- ATFP Window Reinforcing
- Copper vs Aluminum Conductors
- MC Cable vs Conduit
- LEED

# CHAPTER XVII-1 – LIFE SAFETY
Definitive Design Submittal
KC-46A FLIGHT TRAINING CENTER
TBD AFB, USA

*Sections with an * are site dependent and will be modified with a final site selection.*

## 1. FIRE PROTECTION

### a. Applicable Criteria

This report is prepared using primarily the International Building Code (IBC), NFPA 101 Life Safety Code, and UFC 3-600-01 Fire Protection Engineering for Facilities.  The IBC's focus was on allowable floor area, building height limitations, and building separation distances requirements.  NFPA 101 was used for building construction related to egress and safety to life. Excerpts from the following codes were also used as applicable to the project.

| | |
|---|---|
| IBC | International Building Code, 2009 Edition |
| NFPA 10 | Standard for Portable Fire Extinguishers, 2013 Edition |
| NFPA 13 | Standard for the Installation of Sprinkler Systems, 2013 Edition |
| NFPA 20 | Standard for the Installation of Stationary Pumps for Fire Protection, 2013 Edition |
| NFPA 24 | Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2013 Edition |
| NFPA 70 | National Electric Code, 2011 Edition |
| NFPA 72 | National Fire Alarm and Signaling Code, 2013 Edition |
| NFPA 80 | Standard for Fire Doors and Other Opening Protectives, 2013 Edition |
| NFPA 90A | Standard for the Installation of Air-Conditioning and Ventilating Systems, 2012 Edition |
| NFPA 101 | Life Safety Code, 2012 Edition |
| UFC 1-200-01 | General Building Requirements, 2011 Edition |
| UFC 3-600-01 | Design:  Fire Protection Engineering for Facilities, March 2013 Edition |
| UFC 4-010-01 | DOD Minimum Antiterrorism Standards for Buildings, 2012 |
| UFC 4-021-01 | Design and O&M: Mass Notification Systems, 2010 |

AFI 91-203 Air Force Consolidated Occupational Safety Instruction, 2012

b. Purpose:

The purpose of the fire protection narrative is to establish a comprehensive approach to fire protection on this project. An overall fire protection assessment of the design is done to ensure coordination between fire alarm, fire suppression, life safety, smoke management, passive fire protection, and hazards within the facility. Goals for fire safety on this project are as follows:

- Provide life safety for the public, building occupants, and emergency responders. Minimize fire-related injuries and prevent undue loss of life.

- Protect property. Protect the building and contents from fire and exposure to and from adjacent buildings.

- Provide for continuity of operations. Minimize undue loss of operations due to fire-related damage.

- Limit the environmental impact of a fire.

c. Building Description:

The facility is a training center to support the new KC-46A program with simulators and training props.

| | |
|---|---|
| Total Building Area: | Approx. 19,507 square feet. |
| Structure: | Steel frame structure consisting of open web joists, wide flange beams and girders, and steel columns. |
| Interior Walls: | Gypsum board over metal studs. |
| Exterior Walls: | A combination of exterior brick, metal panel and/or precast with metal stud backup. |
| Roof: | The roof construction is pitched with a standing seam metal roof. |
| Doors: | All exterior doors will be insulated hollow metal or aluminum store front system with insulated glass panel. |

d. Classification of Occupancy:

| Occupancy | IBC | NFPA 101 |
| --- | --- | --- |
| Offices, Classrooms/Briefing Rooms and Break Rooms <50 occupants | Business Group B Section 304.1 | Business Section 6.1.11 |
| Storage | Storage Group S-1 Section 311.2 | Storage Section 6.1.13 Ordinary Hazard Section 6.2.2.3 |

The main occupancy is a Business Occupancy per IBC and NFPA 101. Accessory spaces such as utility spaces and incidental storage are considered part of the main occupancy without separation per IBC 508.2 and NFPA 6.1.14.1.3.

Assembly spaces and such as the conference rooms and break rooms in the building that are less than 750 square feet and 50 persons and the classroom that are less than 1,000 sq.ft. and 50 persons are classified as part of the business occupancy per NFPA 6.1.2.1 and IBC section 303.1.

The storage rooms are identified in the table above as individual spaces but are treated as part of the Business occupancy per IBC 508.2 as accessory use and NFPA 101 6.1.14.1.3 as part of the predominate use.

No area will exceed allowable quantities of 240 gallons for flammable Class IB, IC or combustible Class II liquids or 660 gallons of combustible Class IIIA liquids or 26,400 gallons of combustible Class IIIB liquids where stored in an approved storage cabinet per IBC Table 307.1(1).

e. Building Code Analysis:

Type of Construction

UFC 3-600-01 section 2-1.3 requires the use of the IBC for determining the permitted types of construction. The building construction is Type II B per IBC. The structural fire rating is in accordance with the following table. Construction materials are limited to non-combustible or limited combustible materials as defined in IBC 2009 section 602.2.

| Building Element | IBC 2009 Type II B | Rating Provided |
| --- | --- | --- |
| Structural Frame | 0 hour | 0 hour |
| Bearing Exterior Wall | 0 hour | Bearing Walls are not Provided |
| Bearing Interior Wall | 0 hour | Bearing Walls are not Provided |
| Non-Bearing Walls Exterior | Refer to Building Separation | Refer to Building Separation |
| Non-Bearing Walls Interior | 0 hour | 0 hour |

| | | |
|---|---|---|
| Floor Construction Including Supporting Beams and Joists | 0 hour | 0 hour |
| Roof Construction Including Supporting Beams and Joists | 0 hour | 0 hour |

*f. Building Separation*:*

Per UFC 3-600-01 Section 2-1.4, separation between buildings will conform to IBC Table 602. This building has a fire separation distance greater than 30 feet and does not require exterior walls to be fire resistance rated for buildings with Type IIB construction in accordance with IBC Table 602. This section will be re-evaluated after final site selection with respect to final building separations.

*g. Height and Area Limitations*:*

Per the UFC 3-600-01 Section 2-3, building height and area limitations will conform to IBC. For type IIB construction the area, height and stories are limited by IBC Table 503.

The storage areas are less than 10% of the building area and are included in the business occupancy per IBC 508.2

| Occupancy (IBC) | Allowable Height | Allowable Number of Stories | Allowable Area per Floor |
|---|---|---|---|
| Business Group B | 55 feet | 4 | 23,000 sq ft |

IBC Section 507.3 allows two story sprinklered buildings with 60’ clear space around them to be unlimited in area. This will be re-evaluated once a specific site is selected. The area of each floor is less than the unmodified allowable area per floor and no complications are expected even if the 60’ clear space is not provided.

IBC Section 504.1 allows the height to be increased 20’ and one story in fully sprinklered buildings such as this.

The modified allowable height, stories, and area per floor are shown in the following table.

| Occupancy (IBC) | Modified Allowable Height | Modified Allowable Number of Stories | Modified Allowable Area per Floor |
|---|---|---|---|
| Business Group B | 75 feet | 5 | Unlimited |

The following table is the actual heights and area per floor of this building.

| Occupancy (IBC) | Actual Height | Actual Number of Stories | Actual Area per Floor |
|---|---|---|---|
| All – First Story | NA | 1 | ~21,700 sq ft |
| All – Second Story | ~60’ | 2 | ~8,266 sq ft |

IBC Section 508 covers the provisions for mixed use buildings as is the case for this building.

Per IBC Section 508.2.4 the Business and Storage mixed occupancies are allowed to be nonseperated.

h. Occupancy Separation and Passive Fire Protection:

Per UFC 3-600-01 section 2-1.2, fire resistance ratings of non-bearing partitions will comply with NFPA 101. No additional occupancy separations are required.

Per NFPA 101 Section 6.1.14.1.3 the predominate Business use will be followed.

i. Additional Separations Requirement:

| Construction | NFPA 101 2009 | Provided |
|---|---|---|
| Corridors | 0 hour per 38.3.6.1 (3) | 0 hour |
| Storage | 1 hour or smoke partition per 8.7.1.2, 38.3.2.1 | Smoke partition |
| Furnace or Boiler Room | 1 hour or smoke partition per 8.7.1.1(2), 38.3.2.1 | Smoke partition |
| Floors | Smoke Partition per 8.6.1 | Smoke partition |
| Vertical Openings | 1 hour Fire Barrier per 8.6.2, 8.6.5, 7.1.3.2.1 | 1 hour Fire Barrier |

Refer to life safety plans for further information on rated assembly locations.

j. Passive Fire Protection:

Fire/Smoke dampers will be provided at all shaft enclosure penetrations by duct or air transfer openings in accordance with NFPA 90A figure A.5.3.

k. Egress Analysis:

See Life Safety Plans for additional details. The following is an overview and does not specifically address every room.

Within the nonseperated occupancies the predominate Business elements will apply per NFPA 101 Section 6.1.14.1.3.

l. Occupant Load:

Per UFC 3-600-01 the means of egress will comply with NFPA 101. Occupant load factor is calculated in accordance table NFPA 101 paragraph 7.3.1.2. For the purposes of occupant loading the use of a space can be different than the occupancy classification. For example classrooms with less than 50 occupants in a Business Occupancy are not classified as an Educational or Assembly Occupancy but the use from table 7.3.1.2 most closely resembles an Education classroom. The briefing rooms on the second floor are part of the classroom program and are treated as such in lieu of a conference room type use.

| **Area Type (NFPA)** | **Occupant Load Factor** |
|---|---|
| Business (B) | 100 sq ft per person |
| Classroom/Briefing Rooms (A) | 20 sq ft per person |
| Assembly (without fixed seating) (A) | 15 sq ft per person |
| Storage (S) | 500 sq ft per person |

The building occupant load is shown in the following table.

| **Floor** | **Area Type (NFPA)** | **Area (sq ft)** | **Occupant Load Factor** | **People** | **Total** |
|---|---|---|---|---|---|
| First | Business | 19,718 | 100 sq ft | 198 | 269 |
| | Storage | 964 | 500 sq ft | 2 | |
| | Assembly | 1,018 | 15 sq ft | 69 | |
| Second | Business | 3,294 | 100 sq ft | 33 | 289 |
| | Classrooms/ Briefing Rooms | 4,734 | 20 sq ft | 240 | |
| | Assembly | 238 | 15 sq ft | 16 | |

m. Arrangement of Exits:

The arrangement of exits within the building is in accordance with NFPA 101 section 7.5.1.3.3. Since this building is protected throughout by an approved, supervised automatic sprinkler system, the minimum separation distance between two exits or exit access doors will be not less than one-third the length of the maximum overall diagonal dimension of the building or area to be served.

In accordance with NFPA 101 section 7.7.2, where the level of discharge is fully sprinklered 50 percent of the required number of exits and not more than 50 percent of the required egress capacity is allowed to discharge through the level of exit discharge.

Per NFPA 101 section 7.5.2.1 access to an exit cannot be through kitchens, storerooms, restrooms, workrooms or similar.

Additionally, access to an exit cannot be through a room subject to locking. Per NFPA 101 section 7.5.1.6 exit access cannot be through a room of higher hazard.

n. Number of Exits:

In accordance with NFPA 101 section 7.4.1, the number of means of egress from any story or portion thereof will not be less than 2 for less than 500 occupants.

o. Common Path, Dead-End and Travel Distance Limit:

The common path of travel, dead end corridors and maximum travel distance are shown in the following table for a sprinklered facility in accordance with Table A.7.6 of NFPA 101. Refer to life safety plans for further information on building egress.

Within the nonseperated occupancies the predominate Business elements will apply per NFPA 101 Section 6.1.14.1.3.

| **Type of Occupancy (NFPA)** | **Common Path Limit** | **Dead-End Limit** | **Travel Distance Limit** |
|---|---|---|---|
| Business | 100′ | 50′ | 300′ |

p. Minimum Exit Widths:

| **Component** | **Requirement** | **NFPA 101 2009** |
|---|---|---|
| Doors in Exit Path | Minimum 32″ clear | Section 7.2.1.2.3.2 |
| Corridor | Minimum 44″ clear | Section 38.2.3.2 |
| Level Components and Ramps | 0.2″ per person | Table 7.3.3.1 |
| Stairs | 0.3″ per person | Table 7.3.3.1 |

Per the occupant load calculated previously the required egress width is determined. The provided egress width exceeds the required egress width in accordance with NFPA 101.

| **Floor** | **Area** | **Requirement** | **Occupant Load** | **Required Width** | **Width Provided** |
|---|---|---|---|---|---|
| First | All | 0.2″ per person | 269 | 53.8″ | 196″ |
| Second | All | 0.2″ per person | 289 | 57.8″ | 67″ |
| Second | Stairs | 0.3″ per person | 289 | 86.7″ | 96″ |

q. Roof Access:

The building is less than three stories in height. As such, roof access is not required in accordance with UFC 3-600-01 section 2-9.

## 2. FIRE PROTECTION

### a. Fire Water Supply

*Water Supply**
Fire water supply to the site is through *.

A hydrant flow test will be performed to determine if adequate volume and pressure are available. The expectation is the volume will be adequate but given the height of the building the pressure will not.

| | |
|---|---|
| Static Pressure: | xx psi |
| Residual Pressure: | xx psi |
| Residual Flow: | x,xxx gpm |

*Water Distribution**
General description of the water supply in the area of the building will be provided with a final site selection.

A double check backflow preventer is used to isolate the fire suppression system in accordance with the IPC Table 608.1. The sprinkler risers and backflow preventer is located in the fire pump/fire riser room. The water velocity in the underground fire main is not expected to exceed 8 ft/sec entering the facility. A strainer is not required in accordance with UFC 3-600-01.

*Fire Hydrant Location**
Fire hydrants are located around the facility in accordance with UFC 3-600-01 section 3-7.3.3. All parts of the building are located within 350 ft of a hydrant.

### b. Suppression Systems

The facility is completely protected by hydraulically designed automatic sprinkler systems in accordance with UFC 3-600-01 and NFPA 13. A wet pipe sprinkler system protects all areas of the facility except the simulator bay and computer room. The wet systems are zoned by floor. The simulator bay and computer room are protected by a double interlock, electric/pneumatic, pre-action sprinkler system. The municipal water supply is undetermined. A fire pump is assumed until final site selection and flow testing is complete.

The system piping is Schedule 40 black steel for the threaded piping and Schedule 40 or 10 for the grooved piping. Piping with welded or flanged connections are used upstream of the zone valves.

White semi-recessed heads are provided in areas with lay-in ceilings, and upright heads will be provided in areas without ceilings. Sprinkler mains are routed in the ceiling space with branch piping routed to serve the individual room sprinkler systems.

Occupancies and hazardous areas were determined in accordance with UFC 3-600-01 paragraph B-1. A summary of these classifications are shown below.

| **Hazard Classification** | **Design Density[1]** | **Design Area[1]** | **Hose Stream Allowance[1]** | **Duration of Supply[1]** |
|---|---|---|---|---|
| Light Hazard Wet-Pipe System (HC-1) | 0.10 $gpm/ft^2$ | 1,500 sq ft | 250 gpm | 60 minute |
| Ordinary Hazard Group II Wet-Pipe System (HC-2) | 0.2 $gpm/ft^2$ | 2,500 sq ft | 250 gpm | 60 minute |
| Extra Hazard Double Interlock Preaction System (HC-3) | 0.50 $gpm/ft^2$ | 4,000 sq ft | 500 gpm | 90 minute |

1 – Design density, area, hose stream allowance and duration per UFC 3-600-01 Section 4-2.3.1 in accordance with Factory Mutual Data Sheet 3-26.

Typical occupancies and hazardous areas in both facilities are indicated below in accordance with NFPA 13 and UFC 3-600-01 criteria.

- Light Hazard: Offices and conference rooms.

- Ordinary Hazard Group II: Incidental storage, janitor closets, air handler rooms, electrical rooms, general storage of ordinary combustibles less than 12 feet, mechanical rooms where gas appliances are used.

- Extra Hazard Double Interlock Preaction System: Simulator Bay and Computer room

c. Project will be designed to meet a LEED Silver sustainability rating in accordance with v2009 checklist and current Air Force sustainability and energy criteria.

*d. Hydraulic Analysis**

The sprinkler and hose stream demand were totaled to determine the building demand. The estimated sprinkler system demand is 3,000 gpm at 70 psi. This includes 2,000 gpm sprinkler plus 20% balancing overage, 500 gpm of outside hose demand plus 100 gpm for industrial/domestic demands. Calculations to be included in the Appendix. The base water supply is assumed to be capable of supplying the required flow without storage tanks but with insufficient pressure requiring a fire pump. Once a site is selected these demands will be re-evaluated based on the specific local conditions. Sprinkler coverage is in accordance with UFC 3-600-01 generally restricting the use of extended coverage heads. The system will utilize quick response sprinklers throughout except in the simulator bay where quick response is prohibited by the Extra Hazard occupancy. Where applicable the design area will be increased by 30% for a ceiling slope in excess of a 1:10 pitch. The fire sprinkler contractor will perform final hydraulic calculations.

e. Manual Fire Suppression

Standpipe System
In accordance with UFC 3-600-1 Section 4-5.1 and the IBC a standpipe system is not required for this building being it is less than four stories in height (30 feet).

Fire Extinguishers
Fire extinguishers are provided in accordance with UFC 3-600-01 Section 4-9. Semi-recessed and surface mounted portable fire extinguishers will be installed as required by NFPA 10 and NFPA 101 and classified in accordance with NFPA 10 2010 Table 6.2.1.1. Refer to Life Safety Plans for fire extinguisher locations.

| **Criteria** | **Light Hazard** | **Ordinary Hazard** | **Extra Hazard** |
|---|---|---|---|
| Minimum Rated Single Extinguisher | 2-A | 2-A | 4-A |
| Maximum Floor Area per Unit of A | 3,000 sq ft | 1,500 sq ft | 1,000 sq ft |
| Maximum Floor area For Extinguisher | 11,250 ft | 11,250 ft | 11,250 ft |
| Maximum Travel Distance to Extinguisher | 75 ft | 75 ft | 75 ft |

f. Smoke Management

Smoke management in this facility is passive. Smoke/heat vents or smoke control systems are not required for this facility. As indicated in the table above, smoke partitions may be substituted for 1 hour fire resistance rated construction in some areas in a fully sprinklered facility. In these cases a smoke partition will be provided to limit the transfer of smoke, not prevent it. Smoke dampers are not required in a ducted system where penetrating a smoke partition. Air transfer openings in a smoke partition require smoke dampers in accordance with NFPA 101 paragraph 8.4.6.2. Plenum return is not allowed from a room enclosed with a smoke partition.

Air handling equipment with a CFM rating of 2,000 CFM will shut down on alarm of the local duct detector. The detection for these systems is on the supply and return side of the fan in accordance with NFPA 90A and IMC.

Additional smoke dampers and fan shut down are required for HVAC systems that are common to the simulator bay and other areas of the building.

Fire/Smoke dampers will be provided at all shaft enclosure penetrations by duct or air transfer openings in accordance with NFPA 90A figure A.5.3.

Ceiling spaces are all un-sprinklered noncombustible areas and therefore do not require draft stops. Some office partitions will extend up to the structure above, which divide the ceiling spaces into smaller areas, thereby providing some inherent smoke compartmentalization.

3. FIRE ALARM AND MASS NOTIFICATION:

a. Fire Alarm and Mass Notification System

The fire alarm / mass notification system will be fully addressable and electrically supervised with battery back-up in accordance with NFPA 72, as required by UFC 3-600-01 section 5-3.1.

The main fire alarm control panel (FACP) will be located in the Fire Equipment Room. An additional remote annunciating panel is located at the main fire department entry point. The system utilizes Class B SLC and NAC circuits. All fire alarm circuits are installed in red conduits with red labeled junction boxes. Wire nuts are not permitted and splices will be limited. Where splicing is required it will be via screw terminals. Extender boxes are not permitted.

For mass notification, an autonomous control unit (ACU) is provided to monitor and control the notification appliance network. The ACU allows personnel in the facility to initiate the delivery of a pre-recorded voice message, provide live voice messages and instructions, and initiate visual strobes. The ACU is integrated with the building fire alarm control panel to form one combined system which performs fire alarm and mass notification as required by UFC 4-021-01 section 4-3.2.2.

Strobes are sized and spaced in accordance with NFPA 72 requirements. Audible notification provides a minimum of 15 dBA above ambient in all locations in the facility, measured with all openings closed (e.g. doors and fire shutters). Allowances in accordance with UFC 4-021-01 for hard surface rooms and normally unoccupied rooms are allowed.

These systems communicate with the fire department through the base Monaco radio transmitting system.

Initiation:

- Manual pull stations for general alarm will be located at each exit and where the distance to the exit exceeds 200 feet. Fire detection is via smoke detectors (photoelectric) only where required by UFC 3-600-01 section 5-4.3 per NFPA 72 and NFPA 101.

- Water flow alarms are provided at each riser.

Notification:

- White Strobes marked “Fire” for fire alarms throughout the building.

- Amber Strobes marked “Alert” for the MNS throughout the building.

- Speakers - Voice evacuation with a voice intelligibility in all areas except as noted and at each exit.  A CIS score of 0.8 is provided.

MNS local operating consoles (LOC) are provided at the FACP, remote annunciator and such that travel distance does not exceed 200’ and on each floor.  The LOC’s are capable of overriding the FACP and provide the following prerecorded messages:

1. Bomb threat or actual bomb within/around the building
2. Intruder/hostile person sighted within/around the building
3. Directions to occupants to take cover within the building
4. Evacuation of the building using exits other than the normal main entrance/exit
5. Emergency weather conditions appropriate for the local area
6. “All Clear” message
7. A test message intended for verifying functionality of the system
8. Additional as required

b. Emergency Lighting and Exiting

Emergency lighting and signage will be provided as required by NFPA 101.

| Required/Provided | Emergency Lighting | Exit Signage |
|---|---|---|
| Business | Required Per NFPA 101 Section 38.2.9.1 | Required Per NFPA 101 Section 38.2.10 |
| Provided | Provided in accordance with NFPA 101 Section 7.9 | Provided in accordance with NFPA 101 Section 7.10 |

c. Interior Finish Ratings

In accordance with UFC 3-600-01 paragraph 2-6.1 interior wall and ceiling finishes including movable partitions will conform to the requirements of NFPA 101.  The following table is a compilation of the business occupancy requirements for interior finishes in accordance with NFPA 101 table A.10.2.2.  In accordance this section where a complete standard system of automatic sprinklers is installed, interior wall and ceiling finish with a flame spread rating not exceeding Class C is permitted to be used in any location where Class B is required and with a rating of Class B in any location where Class A is required. The following table includes the reduction in finish ratings allowed for sprinklered buildings.

| Occupancy (NFPA 101) | Exits | Exit Access Corridors | Other Spaces |
|---|---|---|---|
| Business | Class C | Class C | Class C |
| Exit Enclosures | Class B | Class C | Class C |

d. Security and Antiterrorism Requirements

Security and Antiterrorism/Force Protection guidelines applicable to the project are used as design criteria. Refer to specific sections such as civil, architectural, structural and mechanical for more details as force protection applies to those disciplines. Mass notification is provided as described above.

e. Fire Department Access*

In accordance with UFC 3-600-01 section 2-10.1 fire department access to a facility greater than 5,000 sq ft must be via a paved road terminating no farther than 33 ft from the building.

Access will be determined once a site is selected.

# *Appendix 1*
# *Index of Specifications*

| **UFGS TABLE OF CONTENTS - (Definitive Update - April 2013)** | | Definitive Design Complete Edit | Definitive Design Partial Edit | Definitive Design Not Edited | Discipline | Comments |
|---|---|---|---|---|---|---|
| **DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS** | | | | | | |
| 00 41 00 | BID SCHEDULES | | | X | PM | |
| | | | | | | |
| **DIVISION 01 - GENERAL REQUIREMENTS** | | | | | | |
| 01 32 01.00 10 | PROJECT SCHEDULE | | | X | PM | |
| 01 33 00 | SUBMITTAL PROCEDURES | | | X | PM | |
| 01 33 29 | LEED(TM) DOCUMENTATION | | X | | Sustainability Spec. | |
| 01 35 26 | GOVERNMENTAL SAFETY REQUIREMENTS | | | X | PM | |
| 01 42 00 | SOURCES FOR REFERENCE PUBLICATIONS | | | X | PM | |
| 01 45 00.00 10 | QUALITY CONTROL | | | X | PM | |
| 01 45 00.10 10 | QUALITY CONTROL SYSTEM (QCS) | | | X | PM | |
| 01 45 35 | SPECIAL INSPECTIONS | | | x | Struct | |
| 01 50 00 | TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS | | | X | PM | |
| 01 57 20.00 10 | ENVIRONMENTAL PROTECTION | | | X | PM | |
| 01 57 23 | TEMPORARY STORM WATER POLLUTION CONTROL | | | X | PM | |
| 01 58 00 | PROJECT IDENTIFICATION | | | X | PM | |
| 01 62 35 | RECYCLED / RECOVERED MATERIALS | | | X | PM | |
| 01 74 19 | CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT | | | X | PM | |
| 01 78 23 | OPERATION AND MAINTENANCE DATA | | | X | PM | |
| 01 91 00.00 40 | COMMISSIONING | | x | | CxA / Mech | |
| | | | | | | |
| **DIVISION 02 - EXISTING CONDITIONS** | | | | | | |
| 02 41 00 | DEMOLITION | | | X | Civil | |
| 02 83 13.00 20 | LEAD IN CONSTRUCTION | | | X | PM | |
| 02 81 00 | TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIALS | | | X | PM | |
| | | | | | | |
| **DIVISION 03 - CONCRETE** | | | | | | |
| 03 11 13.00 10 | STRUCTURAL CAST-IN-PLACE CONCRETE FORMING | | x | | struct | |
| 03 15 00.00 10 | CONCRETE ACCESSORIES | | x | | struct | |
| 03 20 00.00 10 | CONCRETE REINFORCING | | x | | struct | |
| 03 30 00.00 10 | CAST-IN-PLACE CONCRETE | | x | | struct | |
| 03 45 00 | PRECAST ARCHITECTURAL CONCRETE | | x | | arch/struct | |
| | | | | | | |
| **DIVISION 04 - MASONRY** | | | | | | |
| 04 20 00 | Masonry | | | x | arch/stuct | exterior screen wall - mech yard |
| 04 21 13.13 | NONBEARING MASONRY VENEER/STEEL STUD WALLS | | x | | arch/struct | |
| | | | | | | |
| **DIVISION 05 - METALS** | | | | | | |
| 05 05 23 | WELDING, STRUCTURAL | | x | | struct | |
| 05 12 00 | STRUCTURAL STEEL | | x | | struct | |
| 05 21 10 | OPEN WEB STEEL JOIST FRAMING | | x | | struct | |
| 05 30 00 | STEEL DECKS | | x | | struct | |
| 05 40 00 | COLD-FORMED METAL FRAMING | | x | | struct | |
| 05 50 13 | MISCELLANEOUS METAL FABRICATIONS | | x | | struct | |
| 05 51 00 | METAL STAIRS | | x | | arch/struct | |
| 05 51 33 | METAL LADDERS | | x | | arch/int/struct | |
| 05 52 00 | METAL RAILINGS | | x | | arch/int/struct | |
| | | | | | | |
| **DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES** | | | | | | |
| 06 10 00 | ROUGH CARPENTRY | | x | | arch | |
| 06 20 00 | FINISH CARPENTRY | | x | | arch | |
| 06 41 16.00 10 | LAMINATE CLAD ARCHITECTURAL CASEWORK | | x | | arch/int | |
| 06 61 16 | SOLID POLYMER (SOLID SURFACING) FABRICATIONS | | x | | arch/int | |
| | | | | | | |
| **DIVISION 07 - THERMAL AND MOISTURE PROTECTION** | | | | | | |
| 07 08 27. 00 10 | BUILDING AIR BARRIER SYSTEM FOR COMMISSIONING | | | x | arch/mech | |
| 07 11 13 | BITUMINOUS DAMPPROOFING | | x | | arch | |
| 07 21 13 | BOARD AND BLOCK INSULATION | | x | | arch | |
| 07 21 16 | MINERAL FIBER BLANKET INSULATION | | x | | arch | |
| 07 22 00 | ROOF AND DECK INSULATION | | x | | arch | |
| 07 42 13 | METAL WALL PANELS | | x | | arch | |
| 07 60 00 | FLASHING AND SHEET METAL | | x | | arch | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 07 61 14.00 20 | STEEL STANDING SEAM ROOFING | | x | | arch | |
| 07 84 00 | FIRESTOPPING | | x | | arch | |
| 07 92 00 | JOINT SEALANTS | | x | | arch | |
| | | | | | | |
| **DIVISION 08 - OPENINGS** | | | | | | |
| 08 11 13 | STEEL DOORS AND FRAMES | | x | | arch/int | |
| 08 11 16 | ALUMINUM DOOR AND FRAMES | | X | | arch/int | |
| 08 14 00 | WOOD DOORS | | x | | arch/int | |
| 08 34 19.10 20 | ROLLING SERVICE [AND FIRE] DOORS | | x | | arch/int | |
| 08 34 73 | SOUND CONTROL DOOR ASSEMBLY | | x | | arch | |
| 08 41 13 | ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS | | x | | arch | |
| 08 51 13 | ALUMINUM WINDOWS | | x | | arch/int | |
| 08 60 45 | TRANSLUCENT PANELS | | x | | arch/int | |
| 08 71 00 | DOOR HARDWARE | | x | | arch/int | |
| 08 81 00 | GLAZING | | x | | arch | |
| 08 91 00 | METAL WALL LOUVERS | | x | | arch/int | |
| | | | | | | |
| **DIVISION 09 - FINISHES** | | | | | | |
| 09 06 90 | COLOR SCHEDULE | | | x | int | |
| 09 22 00 | SUPPORTS FOR PLASTER AND GYPSUM BOARD | | x | | arch | |
| 09 29 00 | GYPSUM BOARD | | x | | arch | |
| 09 30 00 | CERAMIC TILE, QUARRY TILE, AND PAVER TILE | | x | | int | |
| 09 51 00 | ACOUSTICAL CEILINGS | | x | | arch | |
| 09 65 00 | RESILIENT FLOORING | | x | | int | |
| 09 68 00 | CARPET | | x | | int | |
| 09 69 13 | RIGID GRID ACCESS FLOORING | | x | | arch/int | |
| 09 83 13 | ACOUSTICAL WALL TREATMENT | | x | | int | |
| 09 90 00 | PAINTS AND COATINGS | | | x | arch/int | |
| 09 96 00 | HIGH-PERFORMANCE COATINGS | | x | | arch/int | |
| | | | | | | |
| **DIVISION 10 - SPECIALTIES** | | | | | | |
| 10 10 00 | VISUAL COMMUNICATIONS SPECIALTIES | | x | | int | |
| 10 14 00.20 | INTERIOR SIGNAGE | | x | | int | |
| 10 14 01 | EXTERIOR SIGNAGE | | | x | arch/int | |
| 10 21 13 | TOILET COMPARTMENTS | | x | | arch/int | |
| 10 22 39 | FOLDING PANEL PARTITION | | x | | arch/int | |
| 10 26 13 | WALL AND CORNER GUARDS | | x | | int | |
| 10 28 13 | TOILET ACCESSORIES | | x | | arch | |
| 10 44 16 | FIRE EXTINGUISHERS | | x | | arch | |
| 10 51 13 | METAL LOCKERS | | x | | int | |
| | | | | | | |
| **DIVISION 11 - EQUIPMENT** | | | | | | |
| | | | | | | |
| **DIVISION 12 - FURNISHINGS** | | | | | | |
| 12 21 00 | WINDOW BLINDS | | x | | int | |
| 12 24 13 | ROLLER WINDOW SHADES | | x | | int | |
| 12 48 13.13 | ENTRANCE FLOOR MATS | | x | | int | |
| 12 50 00 | FURNITURE SYSTEMS | | | x | int | |
| | | | | | | |
| **DIVISION 13 - SPECIAL CONSTRUCTION** | | | | | | |
| 13 48 00.00 10 | SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT | | | x | struct/MPE | |
| 13 48 00 | SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT | | | x | struct/MPE | |
| | | | | | | |
| **DIVISION 14 - CONVEYING EQUIPMENT** | | | | | | |
| 14 21 23 | ELECTRIC TRACTION PASSENGER ELEVATORS | | x | | arch/int/struct | |
| | | | | | | |
| **DIVISION 21 - FIRE SUPPRESSION** | | | | | | |
| 21 13 13.00 10 | WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION | | x | | Fire | |
| 21 13 18.00.10 | PREACTION AND DELUGE SPRINKLER SYSTEMS, FIRE PROTECTION | | x | | Fire | |
| 21 30 00 | FIRE PUMPS | | | x | Fire | Depends on available pressure at site. |
| | | | | | | |
| **DIVISION 22 - PLUMBING** | | | | | | |
| 22 00 00 | PLUMBING, GENERAL PURPOSE | | x | | Mechanical | Water heater to be finalized after site selection. |
| 22 33 30.00 10 | SOLAR WATER HEATING EQUIPMENT | | | x | Mechanical | Likely not used. |
| | | | | | | |
| **DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING** | | | | | | |
| 23 00 00 | AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS | | x | | Mechanical | Partial editing to focus on common equipment such as ductwork, and deleting items that are covered better in a dedicated spec section such as air handling units. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 23 03 00.00 20 | BASIC MECHANICAL MATERIALS AND METHODS | | | | Mechanical | |
| 23 05 15 | COMMON PIPING FOR HVAC | | | x | Mechanical | |
| 23 05 48.00 40 | VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT | | | x | Mechanical | |
| 23 05 93 | TESTING, ADJUSTING, AND BALANCING FOR HVAC | | | x | Mechanical | |
| 23 07 00 | THERMAL INSULATION FOR MECHANICAL SYSTEMS | | | x | Mechanical | |
| 23 08 00.00 10 | COMMISSIONING OF HVAC SYSTEMS | | | x | Mechanical | |
| 23 09 23.13 20 | BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC | | | x | Mechanical | Includes utility monitoring if required. |
| 23 11 25 | FACILITY GAS PIPING | x | | | Mechanical | |
| 23 21 13.00 20 | LOW TEMPERATURE WATER (LTW) HEATING SYSTEM | | x | | Mechanical | The boiler section will only be partially edited. Final selection by designer of record. |
| 23 23 00 | REFRIGERANT PIPING | x | | | Mechanical | |
| 23 25 00 | CHEMICAL TREATMENT OF WATER FOR MECHANICAL SYSTEMS | | | x | Mechanical | |
| 23 34 23.00 40 | HVAC POWER VENTILATORS | | | x | Mechanical | |
| 23 52 00 | HEATING BOILERS | | | x | Mechanical | |
| 23 54 16.00 10 | HEATING SYSTEM; GAS-FIRED HEATERS | | | x | Mechanical | |
| 23 57 10.00 10 | FORCED HOT WATER HEATING SYSTEMS USING WATER AND STEAM HEAT EXCHANGERS | | | x | Mechanical | |
| 23 64 10 | WATER CHILLERS, VAPOR COMPRESSION TYPE | | | x | Mechanical | |
| 23 64 26 | CHILLED, CHILLED-HOT, AND CONDENSER WATER PIPING SYSTEMS | x | | | Mechanical | |
| 23 65 00 | COOLING TOWERS | | | x | Mechanical | |
| 23 73 13.00 40 | MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS | | | x | Mechanical | |
| 23 81 23.00 20 | COMPUTER ROOM AIR CONDITIONING UNITS | | | x | Mechanical | |
| 23 81 47 | WATER-LOOP AND GROUND-LOOP HEAT PUMP SYSTEMS | | | x | Mechanical | |
| 23 82 00.00 20 | TERMINAL HEATING AND COOLING UNITS | | | x | Mechanical | |
| 23 82 02.00 10 | UNITARY HEATING AND COOLING EQUIPMENT | | | x | Mechanical | |
| 23 82 16.00 40 | AIR COILS | | | x | Mechanical | |
| 23 82 46.00 40 | ELECTRIC UNIT HEATERS | | | x | Mechanical | |
| | | | | | | |
| **DIVISION 25 - INTEGRATED AUTOMATION** | | | | | | |
| | | | | | | |
| **DIVISION 26 - ELECTRICAL** | | | | | | |
| 26 00 00.00 20 | BASIC ELECTRICAL MATERIALS AND METHODS | | X | | Elec | Associated with site location |
| 26 05 48.00 10 | SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT | | | X | Elec/Struc | Associated with site location |
| 26 08 00 | APPARATUS INSPECTION AND TESTING | | | X | Elec | Associated with site work |
| 26 09 23.00 40 | LIGHTING CONTROL DEVICES | X | | | Elec | |
| 26 20 00 | INTERIOR DISTRIBUTION SYSTEM | X | | | Elec | |
| 26 28 01.00 10 | COORDINATED POWER SYSTEM PROTECTION | | X | | Elec | Associated with site work |
| 26 29 23 | VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS | | X | | Elec | Associated with site location (HVAC) |
| 26 41 01.00 10 | LIGHTNING PROTECTION SYSTEM | | X | | Elec | Associated with site location |
| 26 42 14.00 10 | CATHODIC PROTECTION (SYSTEM ANODE SACRIFICIAL) | | | X | Elec/Civil | Associated with site location |
| 26 51 00 | INTERIOR LIGHTING | X | | | Elec | |
| 26 56 00 | EXTERIOR LIGHTING | | | X | Elec | Associated with site location |
| | | | | | | |
| **DIVISION 27 - COMMUNICATIONS** | | | | | | |
| 27 05 14.00 10 | CABLE TELEVISION PREMISES DISTRIBUTION SYSTEM | | X | | Elec | Will need input from selected Base Comm |
| 27 10 00 | BUILDING TELECOMMUNICATIONS CABLING SYSTEM | | X | | Elec | Will need input from selected Base Comm |
| | | | | | | |
| **DIVISION 28 - ELECTRONIC SAFETY AND SECURITY** | | | | | | |
| 28 31 76 | INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM | | X | | Fire | |
| | | | | | | |
| **DIVISION 31 - EARTHWORK** | | | | | | |
| 31 00 00 | EARTHWORK | | | X | Civil | |
| 31 05 19 | GEOTEXTILE | | | X | Civil | |
| 31 11 00 | CLEARING AND GRUBBING | | | X | Civil | |
| 31 23 00.00 20 | EXCAVATION AND FILL | | | X | Civil | |
| 31 31 16 | SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL | | | X | Civil | |
| | | | | | | |
| **DIVISION 32 - EXTERIOR IMPROVEMENTS** | | | | | | |
| 32 01 19 | FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS | | | X | Civil | |
| 32 05 33 | LANDSCAPE ESTABLISHMENT | | | X | Civil | |
| 32 11 10 | DRAINAGE LAYER | | | X | Civil | |
| 32 11 16 | [BASE COURSE FOR RIGID][ AND ][SUBBASES FOR FLEXIBLE] [SUBBASE COURSE FOR PERVIOUS] PAVING | | | X | Civil | |
| 32 12 10 | BITUMINOUS TACK AND PRIME COATS | | | X | Civil | |
| 32 12 16 | HOT MIX BITUMINOUS PAVEMENT | | | X | Civil | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 32 13 13.06 | PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES | | | X | Civil | |
| 32 15 00 | AGGREGATE SURFACE COURSE | | | X | Civil | |
| 32 16 13 | CONCRETE SIDEWALKS AND CURBS AND GUTTERS | | | X | Civil | |
| 32 17 23.00 10 | PAVEMENT MARKINGS | | | X | Civil | |
| 32 31 13 | CHAIN LINK FENCES AND GATES | | | X | Civil | |
| 32 84 23 | UNDERGROUND SPRINKLER SYSTEMS | | | X | Civil | |
| 32 84 24 | IRRIGATION SPRINKLER SYSTEMS | | | X | Civil | |
| 32 92 19 | SEEDING | | | X | Civil | |
| 32 92 23 | SODDING | | | X | Civil | |
| 32 93 00 | EXTERIOR PLANTS | | | X | Civil | |
| 32 96 00 | TRANSPLANTING EXTERIOR PLANTS | | | X | Civil | |
| | | | | | | |
| **DIVISION 33 - UTILITIES** | | | | | | |
| 33 05 23.13 | UTILITY HORIZONTAL DIRECTIONAL DRILLING | | | X | Civil | |
| 33 11 00 | WATER DISTRIBUTION | | | X | Civil | |
| 33 11 23 | NATURAL GAS PIPING | | | X | Civil | |
| 33 12 33.00 30 | WATER UTILITY METERING | | | X | Civil | |
| 33 30 00 | SANITARY SEWERS | | | X | Civil | |
| 33 40 00 | STORM DRAINAGE UTILITIES | | | X | Civil | |
| 33 46 13 | FOUNDATION DRAINAGE SYSTEM | | | X | Civil | |
| 33 51 13.00 30 | NATURAL-GAS METERING | | | X | Civil | |
| 33 51 15 | NATURAL-GAS / LIQUID PETROLEUM GAS DISTRIBUTION | | | X | Civil | |
| 33 70 02.00 10 | ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND | | | X | Elec | Associated with site work |
| 33 71 01 | OVERHEAD TRANSMISSION AND DISTRIBUTION | | | X | Elec | Associated with site work |
| 33 82 00 | TELECOMMUNICATIONS OUTSIDE PLANT (OSP) | | | X | Elec | Associated with site work |
| | | | | | | |
| **DIVISION 34 - TRANSPORTATION** | | | | | | |
| | | | | | | |
| **DIVISION 40 - PROCESS INTEGRATION** | | | | | | |
| | | | | | | |
| **DIVISION 41 - MATERIAL PROCESSING AND HANDLING EQUIPMENT** | | | | | | |
| 41 22 13.14 | BRIDGE CRANES, OVERHEAD ELECTRIC, TOP RUNNING | | x | | struct | |
| | | | | | | |
| **DIVISION 46 - WATER AND WASTEWATER EQUIPMENT** | | | | | | |
| | | | | | | |
| | | | | | | |

# *Appendix 2*
# *Needs List*

# BMcD KC-46A TRAINERS STANDARD DEFINITIVE DESIGN ACTION ITEM TRACKING LIST

**KC-46A SIMs, FuT, & FTC**

BMcD PROJECT NUMBER = 71170, 71375, 71376, 71382
DATE: 16-Apr-2013

**URGENCY**
- Closed
- Current
- Lingering
- Urgent

**ORGINATION CODES**
- AETC = Air Education and Training Command
- AFCEC = Air Force Civil Engineering Center
- AMC = Air Mobility Command
- USACE = US Army Corps of Engineers Mobile District
- BMcD = Burns & McDonnell

*Current number of Open Action Items = 22*

| ACTION ITEM # | ACTION ITEM DESCRIPTION | REQUESTING ORG | RESPONSE ORG | DISCIPLINE | DATE REQUESTED | DATE NEEDED | DATE CLOSED | OPEN / CLOSED | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Demarcation between contractor and government with respect to power, communications, catwalks, draw bridge, stairs, etc. for simulator systems as well as fuselage trainer operation/systems. Where does the contractor's work end and the government's work begin? Which equipment, cabling, etc. will be furnished and installed by the contractor vs. government? | BMcD | AMC | Electrical | 3-Jan-2013 | 5-Mar-2013 | | Closed | Response from Ed Breen: *See C-17 Facility Design Plan page 37-38.* |
| 2 | Special fire protection requirements for WST or BOT areas? | BMcD | AMC | Fire | 3-Jan-2013 | 5-Mar-2013 | | Open | Memo to be sent to AFCEC for approval of FP system requirements for simulators. |
| 3 | Need clarification on the expected actual Full time, student and visitor occupancy of the buildings. | BMcD | AMC | Arch | 4-Jan-2013 | 1-Feb-2013 | 8-Jan-2013 | Closed | Email from Ed Breen confirmed BMcD assumptions. WST - 6 occupants<br>BOT - 3 occupants<br>Three shifts with 2 pilots briefing, 2 flying, and 2 debriefing. Same goes for the BOOM... 1 operator briefing, 1 riding, and 1 debriefing. |
| 4 | Need hours of operations for each building. | BMcD | AMC | Arch | 4-Jan-2013 | 5-Mar-2013 | | Open | 1-Bay & 2-Bay - 16 hrs/day, 6 days/wk at MOB, surge to 20 hrs. FuT - 14hrs / day, M-F. FTC - tbd with AETC. |
| 5 | Confirmation facilities will be registered with USGBC as past of Phase II | BMcD | USACE | LEED | 7-Jan-2013 | 17-Jan-2013 | 17-Jan-2013 | Closed | Confirmed per discussion with Phyllis. |

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|---|---|---|---|---|---|---|---|---|---|
| 6 | 50'x50'x50' clear requirement in WST - can ductwork, electrical, etc. encroach into this area? | BMcD | AMC/ AFCEC | Arch | 7-Jan-2013 | 17-Jan-2013 | 14-Jan-2013 | Closed | Email from Ed Breen - Simulator Facility: Define 50'x50'x50' clearance. Will this include HVAC/Lighting/ Columns & Bracing/ Bridge cranes? Same goes for 25' clearance for BOT.<br>ANSWER: The clearance figures provided must provide clearance from all obstructions to include the HVAC/Lighting/ Columns & Bracing/ Bridge cranes.<br>Additional Info from Kent Hadrava:You will not need to push the facility up further for the crane. The 50' clearance is a cautious figure. There will be no problem with beam and/or hook height if the crane is installed just below the 50' clearance area. That number accounts for a crane. The problem would be if you have lights, vents, ETC below 50' then have to put the crane below them.<br><br>Your estimated crane capacity is good. No issues with a 2 ton for the WST and 1 ton for BOT.<br>Thanks,<br>Kent |
| 7 | Any compressed air requirements? | BMcD | AMC | Mech | 7-Jan-2013 | 5-Mar-2013 | | Open | No, compressed air if required will be provided by the sim contractor. |
| 8 | Is copper and/or fiber optic horizontal cabling preferred in classified open storage areas (simulator bays, computer rooms, brief/debrief, instructor work areas, etc.)? Will both unclassified and classified cabling be required in classified open storage areas? | BMcD | AMC/ USACE | Arch | 8-Jan-2013 | 5-Mar-2013 | 6-Mar-2013 | Closed | All classrooms require unclassified network to instructor (students need power only). Classified BDS will need classified and unclassified network to workstation and unclassified network at table. Learning center unclassified network to each seat. |
| 9 | Can panelboards and transformers feeding simulator/computer room equipment be located in the computer room? | BMcD | AMC/AFCEC /AETC | Electrical | 8-Jan-2013 | 5-Mar-2013 | | Closed | Response from Ed Breen: *I think the preference is to have all facility electrical equipment separate in a mechanical closet. Locating power conditioning/transformers in the computer rooms has the potential to introduce "noise" on simulator subsystems.* |
| 10 | Expected trench dimensions and cable tray requirements for simulator power, comm, A/V, etc. | BMcD | AMC | Electrical | 9-Jan-2013 | 5-Mar-2013 | | Closed | Response from Ed Breen: *See C-17 Facility Design Plan pages 18 and 33. The trench locations will ultimately be determined by simulator configuration and site specific variables. There will need to be a trench coming from computer room to simulator and possibly a trench from motion cabinet to underside of simulator* |
| 11 | Can communication distribution be provided from open racks or cabinets in the computer room or is a separate communication room preferred within the classified open storage area? | BMcD | AMC / AETC | COMM | 9-Jan-2013 | 5-Mar-2013 | | Closed | Response from Ed Breen: *See C-17 Facility Design Plan page 26 for some guidance. Not sure what classified open storage requirements are, but I believe it would be preferred to keep as much non-simulator related equipment out of the computer rooms as possible.* |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Elevation of bridge crane/tonage requirements | BMcD | AMC | Structural | 10-Jan-2013 | | 14-Jan-2013 | Closed | Email from Kent Hadrava - *You will not need to push the facility up further for the crane. The 50' clearance is a cautious figure. There will be no problem with beam and/or hook height if the crane is installed just below the 50' clearance area. That number accounts for a crane. The problem would be if you have lights, vents, ETC below 50' then have to put the crane below them.*<br>*Your estimated crane capacity is good. No issues with a 2 ton for the WST and 1 ton for BOT. I was actually unaware of the 25' requirement for the BOT bay, but realistically that would be sufficient. I cannot see any issues with having the crane at or just below 25'. With no visual system attached to the top of the trainer, and a much smaller motion system expected, there is no way the trainer should sit above 20', so there would be no issues with hook heigh*t. |
| 13 | Copy of 1391's | BMcD | USACE | PM | 8-Jan-2013 | 17-Jan-2013 | 25-Jan-2013 | Closed | Email received from Mobile COE containg 1391's & DI's for MOB1 & FTC. (Note - facilities all grouped together and not broken out by square footages). |
| 14 | Will task lighting be included with workstation furniture? Need to know for LEED purposes. | BMcD | USACE | Electrical | 23-Jan-2013 | 5-Mar-2013 | 6-Mar-2013 | Closed | Will include task lighting with furniture in FF&E. |
| 15 | Fire protection within the fuselage of the FuT. Does the "plane" need fire sprinklers & strobes within it or only within the bay itself. | BMcD | AMC | Fire | 24-Jan-2013 | 1-Feb-2013 | 24-Jan-2013 | Closed | We never got the KC-10 CLT to put in the building...we lost the money. But, I've asked the KC-10 person at Travis about how we planned on integrating into the facility...no reply yet.<br><br>But, below are the KC-46 ATS System Specification requirements on what the ATS contractor is required to meet:<br><br>"3.2.3.7 FuT Facility Interface. FuT shall interface with the facility electrical system, fire detection, alerting, and suppression systems, and Heating, Ventilating, and Cooling (HVAC) system for climate control."<br><br>"3.4.4.1 Fire Detection and Suppression<br>3.4.4.1.1 The ATS shall comply with the requirements of AF Occupational Safety and Health (AFOSH) STD 91-118 and Uniform Fire Code (UFC) 3-600.<br>3.4.4.1.2 The ATS fire detection system shall consist of overheat and products-of-combustion sensors, and associated alarm units, which serve to locate overheating and combustion.<br>3.4.4.1.3 The ATS fire detection system shall interface with the facility fire detection system at each site and signal an emergency stop of the training device(s)."<br><br>"4.3.2.3.7 FuT Facility Interface<br>a. This requirement shall be verified by inspection. The inspection shall consist of reviews of the FuT's facility design drawings IAW the Facility Design Criteria (FDC) document, and a walkthrough of the completed FuT facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation and the FuT is connected into the facility electrical system, fire detection, alerting, and suppression systems, and HVAC system."<br><br>I spoke to Tim Lincourt who is the KC-46 ATS Lead Engineer and he said we are planning on having an ultra-sensitive smoke detector on the device but not a wet sprinkler system due to the electronics. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Comment regarding Response to AI #15: The lead engineer is not the appropriate authority on the requirements of the fire code. ETL 1-18 and UFC 3-600-01 actually says they are to put sprinklers in the systems.<br><br>ETL 1-18 7.2. Protection for Mission-Support Equipment. Provide normal facility protection as required for a non-electronic equipment facility. Provide additional protection for the electronic equipment as follows…(talks about smoke detectors)<br><br>UFC 3-600-01 6-8.1.1 Automatic Sprinkler Protection.<br>Electronic equipment installations must be located in buildings protected by wet pipe automatic sprinklers. Provide complete coverage throughout the building including electronic equipment areas. \1\ /1/ Electrical equipment \1\ should be protected /1/ by disconnecting the power upon activation of the fire protection system \1\ in the electronic spaces /1/. | BMcD | AMC | Fire | 28-Feb-2013 | 5-Mar-2013 | | Open | Response from Ed Breen: *See C-17 Facility Design Plan page 22, Paragraph 4.6.4 for current guidance.* |
| 17 | What location shall the cost estimates be based upon (changes based on labor rates). | BMcD | USACE | PM | 30-Jan-2013 | 5-Mar-2013 | | Open | |
| 18 | Is it acceptable to locate intrusion detection system (IDS) and access control system (ACS) panels in the computer room in each sim building or is a dedicated security closet or office required? | BMcD | AMC/AETC/ USACE | Electrical | 8-Feb-2013 | 5-Mar-2013 | | Closed | Response from Ed Breen: *I believe it would be preferred to keep as much non-simulator related equipment out of the computer rooms as possible. A dedicated security closet would make more sense.* |
| 19 | Provide number of DoD personnel routinely occupying the fuselage training area. | BMcD | AMC | Arch | 14-Feb-2013 | 5-Mar-2013 | | Open | Response from Ed Breen: *15 day-to-day. Maximum of about 30 when an academic class is also being taught in the classroom while cargo load training is being accomplished in the FuT.* |
| 20 | Confirmation of use/applicability of AFI 91-203 | BMcD | USACE | PM | 26-Feb-2013 | 5-Mar-2013 | | Open | |
| 21 | Standard height of Sims for access platforms and stairs to terminate. | BMcD | AMC | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | Response from Ed Breen: *See C-17 Facility Design Plan page 37-38.* |
| 22 | Validate BOT bay size. New ballast trainer at Scott for KC135 is approx 20'x25'. What is size & weight of BOT? | BMcD | AMC | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | BOT trainer for KC-46 does not exist yet, but 25'x25'x25' is anticipated to provided adequate space for the trainer. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 23 | Validate temperature & humidity requirements for Comm Rms, Sim Bays, and Computer room.<br>Trainer Bay: 65-72F / Humidity non-condensing 40-60%<br>Computer Room: 65-70 F / humidity non-condensing 40-60% | BMcD | AMC | Mech | 5-Mar-2013 | 12-Mar-2013 | | Open | Response from Ed Breen: *See C-17 Facility Design Plan page 21-22.* |
| 24 | Weight of FuT trainer loaded to design floor loads. | BMcD | USACE | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | |
| 25 | Depth of depressed slab under raised floor. Currently at 18" below finished floor. | BMcD | USACE | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | |
| 26 | Crane requirements for WST and BOT. | BMcD | USACE | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | |
| 27 | BMcD to write memo with fire protection design approach and questions for AFCEC review & approval for implementation at all Bases. | BMcD | USACE / AFCEC | Fire | 5-Mar-2013 | 12-Mar-2013 | | Open | Fire Protection Memo Prepared by BMcD and emailed to the COE on 13 March. Awaiting COE response. |
| 28 | Is air-conditioning inside the Sim device provided with the Sim or by the building? What is the point of connection? | BMcD | AMC | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | Response from Ed Breen: *The simulator is typically delivered with its own cockpit air conditioner. It usually requires facility power and chilled water inputs. See C-17 Facility Design Plan page 14, paragraph 4.1.7 and page 23, paragraph 4.6.6.1* |
| 29 | Confirm comm requirements for T1 line for DMO server. | BMcD | AMC | Comm | 5-Mar-2013 | 12-Mar-2013 | | Closed | Response from Ed Breen: *A single T-1 line for single WST site and a T-3 line for a multiple WST site.* |
| 30 | BIM requirements should follow standard Attachment F scope. Please confirm if there are any special AFCEC requirements for BIM. | BMcD | USACE | PM | 5-Mar-2013 | 12-Mar-2013 | 6-Mar-2013 | Open | |
| 31 | Validate Size of Part Task Training Equipment. How many devices per WST? | BMcD | USACE | PM | 5-Mar-2013 | 12-Mar-2013 | | Open | Basis of Design for equipment is assuming a 8'X12' device which includes a tabletop for review. Device can be up against wall on backside. Discussed 3 PTT devices for FTC. |
| 32 | Fuselage Trainer high bay clearance requirements. Also any service elements (MEP, Fire protection elements) can be in the clearance requirement. | BMcD | USACE | Arch | 5-Mar-2013 | 12-Mar-2013 | | Open | |
| 33 | Height of fuselage trainer opening stair. | BMcD | USACE | Arch | 5-Mar-2013 | 12-Mar-2013 | | Open | |
| 34 | Will a UPS be required for each WST and each BOT? Or will one UPS for each pair be acceptable? What voltage(s) will the WST and BOT require? | BMcD | AMC/AETC | Elec | 6-Mar-13 | 12-Mar-13 | | Closed | Response from Ed Breen: *Per ATS System Spec: "3.4.4.3 Uninterrupted Power Supply. An Uninterruptable Power Supply (UPS) shall be provided with at least 30 minutes operating time in excess of the time required for an orderly shutdown of all WSTs, BOTs, and FuTs."*<br><br>*I expect the ATS contractor's solution will include separate UPS systems for each device.*<br><br>*See C-17 Facility Design page 9, Table IV for notional power requirements.* |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 35 | Air conditioning in the FuT Fuselage has been discussed as from the building HVAC units. How does this air duct connect to the Fuselage? Does the Fuselage come with some interior ductwork or will this need to be installed by the building contractor? | BMcD | AMC/AETC | Mech | 6-Mar-13 | 12-Mar-13 | | Open | Response from Ed Breen: The ATS contractor will be required to connect the FuT device into the facility duct work for the HVAC. |
| 36 | Further details for the 'Cargo Support Structure' for the FuT. Need Finish floor level height and whether ramp is needed? | BMcD | AMC/AETC | PM | 11-Mar-13 | 12-Mar-13 | | Open | Response from Ed Breen: *No further details are available at this time. At the current time the estimated max height of the FuT is calculated at ~28 feet. In discussions with the KC-46 Program Office and Boeing to confirm actual max hright of the cargo door when in the full open position. A ramp is not required in the cargo yard, stairs will suffice.* |
| 37 | Validate how many PTT Devices are needed in each of the three (3) facilities. | BMcD | AMC/AETC | PM | 14-Jan-2013 | 14-Jan-2013 | 14-Jan-2013 | Closed | Email from Ed Breen: Simulator Facility: PTT room and final size of equipment? Will there be a separate piece of PTT equipment for Boom? ANSWER: *Unable to answer the final size of the PTT; At the FTU there will be both Pilot PTTs and Boom Operator PTTs; however at the MOBs there will only be Pilot PTTs.* |
| 38 | Is classifed (SIPR) network required in PTT rooms? | BMcD | AMC/AETC | Elec | 14-Mar-2013 | 19-Mar-2013 | | Closed | Response from Ed Breen: *No SIPR required in the PTT rooms.* |
| 39 | Need confirmation of classroom wall and door STC rating. UFC 4-171-01N page 29 requires that STC 50 at classrooms. BMCD is assuming that it is from old class room environment and high STC is not required anymore. | BMcD | AMC/AETC | Arch | 14-Mar-2013 | 19-Mar-2013 | | Open | Response from Ed Breen: *In checking with the Program Office IA folks there is no STC requirement for a SECRET level room which is what our requirement is.* |
| 40 | The MAF DMO Physical Security Guide requires open storage area acoustical security perimeter walls, doors, windows, floors and ceiling (including all openings) to provide sufficient sound attenuation to preclude inadvertent disclosure of classified discussions. With an STC of 45, loud speech can be faintly heard but not understood and normal speech is unintelligible. Is an STC of 45 acceptable for the open storage areas? | BMcD | USACE/ AMC/ AETC | Arch/Mech/ Elec | 26-Mar-2013 | 29-Mar-2013 | | Closed | Response from Ed Breen: ***BLUF 1:*** *MAF DMO Physical Security Guide does not dictate requirements - it is a "guide" to assist programs in securing sim facilities.* ***BLUF 2:*** *STC-45 is not required, according to the program office expert.* ***From Program Office IA*** *: The original guide listed acoustical concerns. During research, we learned accoustical requirements only existed for TS and higher level facilities. Since we have secret level facilities, it was removed in July of 2012. The new DoDM 5200.1 makes no mention of acoustic requirements, so we didn't either. The STC 45 number was in the original version, but not in the current one, so I don't know why it is even being addressed in the spreadsheet.* |
| 41 | Is the FTC Classroom 206 required to be an open storage area? Can classified materials be stored after use so that an intrusion detection and access control systems are not required? Does the VTRAT contain classified information and is it in a GSA-approved lockable container sufficient for closed storage of classified materials? Assuming classified discussions will be necessary in the room, sound transmission requirements would still be necessary. Please confirm. | BMcD | USACE/ AMC/ AETC | Arch/Mech/ Elec | 26-Mar-2013 | 29-Mar-2013 | | Closed | Response from Ed Breen: FTC room 206 does not have to be an open storage area. The classified hard drives can be removed when not in use and locked in a GSA-approved safe. The site requirements are detailed in the attached VTRAT document para 3.1.6. See number 39 above. There is no STC requirement for a room at the SECRET level. |

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|---|---|---|---|---|---|---|---|---|---|
| 42 | Please clarify where cable TV connections are desired (i.e. break rooms, classrooms, brief/debrief rooms, individual offices, etc.) in each building. | BMcD | USACE/ AMC/ AETC | Arch/Mech/ Elec | 26-Mar-2013 | 29-Mar-2013 | | Closed | Response from Ed Breen: *Provide cable TV connections in all breakrooms, classrooms, brief/debrief rooms, and offices in each building.* |

# *Appendix 3*
# *Sustainable Design Documentation*

Project Name: KC-46A Difinitive Design for 2BFS, 1BFS, FUT and FTC
Date: April 2013
Rating: Silver

**Burns & McDonnell**
LEED-NC 2009

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 12 | 14 | 0 | **Sustainable Sites** | | **Possible Points: 26** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | C | **Construction Activity Pollution Prevention** | Req'd |
| 1 | | | Credit 1 | D | **Site Selection** | 1 |
| | 5 | | Credit 2 | D | **Development Density & Community Connectivity** | 5 |
| | 1 | | Credit 3 | D | **Brownfield Redevelopment** | 1 |
| | 6 | | Credit 4.1 | D | **Alternative Transportation**, Public Transportation Access | 6 |
| | 1 | | Credit 4.2 | D | **Alternative Transportation**, Bicycle Storage & Changing Rooms | 1 |
| 3 | | | Credit 4.3 | D | **Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles | 3 |
| 2 | | | Credit 4.4 | D | **Alternative Transportation**, Parking Capacity | 2 |
| | 1 | | Credit 5.1 | C | **Site Development,** Protect or Restore Habitat | 1 |
| 1 | | | Credit 5.2 | D | **Site Development,** Maximize Open Space | 1 |
| 1 | | | Credit 6.1 | D | **Stormwater Design,** Quantity Control | 1 |
| 1 | | | Credit 6.2 | D | **Stormwater Design,** Quality Control | 1 |
| 1 | | | Credit 7.1 | C | **Heat Island Effect,** Non-Roof | 1 |
| 1 | | | Credit 7.2 | D | **Heat Island Effect,** Roof | 1 |
| 1 | | | Credit 8 | D | **Light Pollution Reduction** | 1 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 7 | 3 | 0 | **Water Efficiency** | | **Possible Points: 10** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | D | **Water Use Reduction**, 20% Reduction | Req'd |
| 4 | | | Credit 1 | D | **Water Efficient Landscaping** | 2 to 4 |
| | 2 | | Credit 2 | D | **Innovative Wastewater Technologies** | 2 |
| 3 | 1 | | Credit 3 | D | **Water Use Reduction** | 2 to 4 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 12 | 21 | 2 | **Energy & Atmosphere** | | **Possible Points: 35** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | C | **Fundamental Commissioning of the Building Energy Systems** | Req'd |
| Y | | | Prereq 2 | D | **Minimum Energy Performance** | Req'd |
| Y | | | Prereq 3 | D | **Fundamental Refrigerant Management** | Req'd |
| 7 | 12 | | Credit 1 | D | **Optimize Energy Performance** | 1 to 19 |
| | 7 | | Credit 2 | D | **On-Site Renewable Energy** | 1 to 7 |
| 2 | | | Credit 3 | C | **Enhanced Commissioning** | 2 |
| | 2 | | Credit 4 | D | **Enhanced Refrigerant Management** | 2 |
| 3 | | | Credit 5 | C | **Measurement & Verification** | 3 |
| | | 2 | Credit 6 | C | **Green Power** | 2 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 7 | 5 | 2 | **Materials & Resources** | | **Possible Points: 14** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | D | **Storage & Collection of Recyclables** | Req'd |
| | 3 | | Credit 1.1 | C | **Building Reuse**, Maintain Existing Walls, Floors and Roof | 1 to 3 |
| | 1 | | Credit 1.2 | C | **Building Reuse**, Maintain 50% Interior Non-Structural Elements | 1 |
| 2 | | | Credit 2 | C | **Construction Waste Management** | 1 to 2 |
| | | 2 | Credit 3 | C | **Materials Reuse** | 1 to 2 |
| 2 | | | Credit 4 | C | **Recycled Content** | 1 to 2 |
| 2 | | | Credit 5 | C | **Regional Materials** | 1 to 2 |
| | 1 | | Credit 6 | C | **Rapidly Renewable Materials** | 1 |
| 1 | | | Credit 7 | C | **Certified Wood** | 1 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 10 | 5 | 0 | **Indoor Environmental Quality** | | **Possible Points: 15** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | D | **Minimum IAQ Performance** | Req'd |
| Y | | | Prereq 2 | D | **Environmental Tobacco Smoke** (ETS) **Control** | Req'd |
| 1 | | | Credit 1 | D | **Outdoor Air Delivery Monitoring** | 1 |
| | 1 | | Credit 2 | D | **Increased Ventilation** | 1 |
| 1 | | | Credit 3.1 | C | **Construction IAQ Management Plan**, During Construction | 1 |
| 1 | | | Credit 3.2 | C | **Construction IAQ Management Plan**, Before Occupancy | 1 |
| 1 | | | Credit 4.1 | C | **Low-Emitting Materials**, Adhesives & Sealants | 1 |
| 1 | | | Credit 4.2 | C | **Low-Emitting Materials**, Paints & Coatings | 1 |
| 1 | | | Credit 4.3 | C | **Low-Emitting Materials**, Flooring Systems | 1 |
| 1 | | | Credit 4.4 | C | **Low-Emitting Materials**, Composite Wood & Agrifiber Products | 1 |
| 1 | | | Credit 5 | D | **Indoor Chemical & Pollutant Source Control** | 1 |
| 1 | | | Credit 6.1 | D | **Controllability of Systems**, Lighting | 1 |
| | 1 | | Credit 6.2 | D | **Controllability of Systems**, Thermal Comfort | 1 |
| 1 | | | Credit 7.1 | D | **Thermal Comfort**, Design | 1 |
| | 1 | | Credit 7.2 | D | **Thermal Comfort**, Verification | 1 |
| | 1 | | Credit 8.1 | D | **Daylight & Views**, Daylight 75% of Spaces | 1 |
| | 1 | | Credit 8.2 | D | **Daylight & Views**, Views for 90% of Spaces | 1 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 4 | 2 | 0 | **Innovation in Design** | | **Possible Points: 6** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| 1 | | | Credit 1.1 | D | **Exemplary:** SSc5.2 Maximize Open Space (double) | 1 |
| 1 | | | Credit 1.2 | C | **Exemplary:** MRc2 (95%), MRc4-5 (30%), MRc7 (95%), etc. | 1 |
| 1 | | | Credit 1.3 | C | **Innovation:** Reduced Mercury in Lamps | 1 |
| | 1 | | Credit 1.4 | C | **Innovation:** Building Envelope Cx, Energy Star Portfolio, etc. | 1 |
| | 1 | | Credit 1.5 | C | **Innovation:** Greenguard Furniture, Education Program, Pilot Credit, etc. | 1 |
| 1 | | | Credit 2 | C | **LEED Accredited Professional** | 1 |

*(Note: Projects can achieve up to 3 points for Exemplary Performance)*

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 2 | 2 | 0 | **Regional Priority** (zip code xxxxxx) | | **Possible Points: 4** |

| Yes | ? | No | Credit | | Name | Points |
|---|---|---|---|---|---|---|
| 1 | | | Credit 1.1 | D | **Insert** Credit Name | 1 |
| 1 | | | Credit 1.2 | D | **Insert** Credit Name | 1 |
| | 1 | | Credit 1.3 | D | **Insert** Credit Name | 1 |
| | 1 | | Credit 1.4 | D | **Insert** Credit Name | 1 |
| | | | Credit 1.5 | D | **Insert** Credit Name | |
| | | | Credit 1.6 | D | **Insert** Credit Name | |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 54 | 52 | 4 | **Total** | | **Possible Points: 110** |

**Certified** 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

D = Design Credit
C = Construction Credit

# Air Force MILCON Sustainability Requirements Scoresheet

**version LEED® 2009**

**General Information**

| | |
|---|---|
| | **Project ID (e.g. ABCD12345)** |
| KC-46A Flight Training Center | **Building Name** |
| Vertical With Climate Control | **Project Type** |
| | **Installation** |
| | **City** |
| | **State** |
| | **MAJCOM** |
| | **PM Name** |
| $12,400,000.00 | **PA ($k)** |
| 29,903 | **Building Size (SF)** |
| 2014 | **Program Year (FY####)** |
| Programming/Customer Concept Document | **Project Phase** |
| 2012 | **Design Started (FY####)** |
| | **BOD (MM/DD/YY)** |
| Yes | **Pursuing formal LEED® Certification** |
| | **Date Project Registered with USGBC (MM/DD/YY)** |
| LEED® 2009 | **LEED® Rating System** |
| 54 | **LEED® Credits Achievable** |
| Silver | **LEED® Certification Level Achievable (per AF SDD Policy (July 2007))** |
| | **LEED® Credits Awarded by GBCI (e.g. 42)** |
| | **LEED® Certification Level Awarded by GBCI** |
| | **Date Project Certified by GBCI (MM/DD/YY)** |
| $900 | **Registration Fees ($)** |
| | **Certification Fees ($)** |
| 97% | **HPSB Compliant** |
| 35% | **Water Conservation Achieved (% below EPAct 1992)** |
| 0% | **Energy Efficiency Achieved (% below ANSI/ASHRAE/IESNA Standard 90.1-2007)** |
| Project has not reached 35% design phase - EPAct score not yet determined | **Comments** |

# Air Force MILCON Sustainability Requirements Scoresheet

**version LEED® 2009**

| | | | | |
|---|---|---|---|---|
| **Federal Requirements for High Performance Sustainable Buildings (HPSB)** | | | | |
| **HPSB I: Employ Integrated Design Principles** | | | | |
| Achievable Points | 2 | | Possible Points | 2 |
| Yes | HPSB I.1 | **Integrated Design** | | 1 |
| Yes | HPSB I.2 | **Commissioning** | | 1 |
| **HPSB II: Optimize Energy Performance** | | | | |
| Achievable Points | 5 | | Possible Points | 5 |
| Yes | HPSB II.1 | **Energy Efficiency, Achieve Option 1 or 2 and insert design percentage** | | 1 |
| | 1 | Yes | Reduce energy use 30% Below ANSI/ASHRAE/IESNA Standard 90.1-2007, OR | |
| | 2 | | If not at least 30% below ANSI/ASHRAE/IESNA Standard 90.1- 2007, will the design achieve the maximum level of energy efficiency that is life-cycle cost-effective? | |
| | | | Insert percentage below ANSI/ASHRAE/IESNA Standard 90.1-2007 in terms of energy use (e.g. 32) | |
| | | | Insert building energy intensity (Btu/SF) calculated with the energy model per 10 CFR 433 | |
| | | Cool | Roof Attributes (Recommended) | |
| | | Cool | Cool roof (LEED SS cr 7.2 or Energy Star) | |
| | | | Green roof | |
| | | | Solar electric, thermal or passive | |
| | | Yes | Achieve "Designed to Earn the Energy Star" rating - Benchmark from first year of operation (Recommended) | |
| Yes | HPSB II.2 | **Preferential use of ENERGY STAR or FEMP-designated equipment, when lifecycle cost effective** | | 1 |
| Yes | HPSB II.3 | **On-site Renewable Energy - Solar Hot Water Heater System** | | 1 |
| | | | Lifecycle cost assessment found solar hot water heater system not effective | |
| | | Yes | When lifecycle cost effective, solar hot water system installed - min 30% demand | |
| | | | Insert percentage achieved | |
| Yes | HPSB II.4 | **On-site Renewable Energy** | | 1 |
| | | | Lifecycle cost assessment found renewable energy generation projects not effective | |
| | | Yes | When lifecycle cost effective, renewable energy generation projects installed | |
| | | Daylighting | Renewable energy type | |
| | | Daylighting | Insert first renewable energy type, if applicable | |
| | | | Insert second renewable energy type, if applicable | |
| | | | Insert generation capacity (kW) | |
| | | | Insert percentage of total building | |
| Yes | HPSB II.5 | **Measurement and Verification - Advanced Metering** | | 1 |
| | | Yes | Water Metering: Select N/A if not used | |
| | | Yes | Electric Metering: Select N/A if not used | |
| | | Yes | Natural Gas Metering: Select N/A if not used | |
| | | N/A | Steam Metering: Select N/A if not used | |
| Maybe | HPSB II.6 | **Project Case Study Entered in High Performance Federal Buildings Database (Recommended)** | | |
| Yes | EISA 2007 II.7 | **Reduction in fossil fuel-generated energy consumption (Recommended)** | | |
| Yes | EISA 2007 II.8 | **Data Center Energy Consumption (Recommended)** | | |
| **HPSB III: Protect and Conserve Water** | | | | |
| Achievable Points | 7 | | Possible Points | 7 |
| Yes | HPSB III.1 | **Indoor Water - 20% Reduction** | | 1 |
| | | 35.0% | Insert percentage achieved | |
| Yes | HPSB III.2 | **Outdoor Water - Reduce Potable Water Use by 50%** | | 1 |
| Yes | HPSB III.3 | **Outdoor Water - Stormwater runoff** | | 1 |
| Yes | HPSB III.4 | **Outdoor Water - Achieve Pre-Development Hydrology when technically feasible, when disturbance > 5,000 GSF** | | 1 |
| Yes | HPSB III.5 | **Process water potable water use** | | 1 |
| | | Yes | Energy efficiency measures using water were considered and the cost was included in lifecycle cost assessment | |
| | | | Energy efficiency measures using water were not considered for the design | |
| Yes | HPSB III.6 | **Water-Efficient Products** | | 1 |
| Yes | HPSB III.7 | **Water Efficient Products - Irrigation Contractors** | | 1 |

# Air Force MILCON Sustainability Requirements Scoresheet
## version LEED® 2009

| | | | | |
|---|---|---|---|---|
| **HPSB IV: Enhance Indoor Environmental Quality** | | | | |
| Achievable Points | **8** | | Possible Points | 9 |
| **Yes** | HPSB IV.1 | **Thermal Comfort, ASHRAE 55-2004** | | 1 |
| **Yes** | HPSB IV.2 | **Ventilation: ASHRAE 62.1-2007** | | 1 |
| **Yes** | HPSB IV.3 | **Moisture Control** | | 1 |
| **Maybe** | HPSB IV.4 | **Daylighting - 75% of Spaces** | | 1 |
| **Yes** | HPSB IV.5 | **Daylighting - Controllability of Systems** | | 1 |
| **Yes** | HPSB IV.6 | **Low Emitting Materials** | | 1 |
| **Yes** | HPSB IV.7 | **Protect Indoor Air Quality during Construction** | | 1 |
| **Yes** | HPSB IV.8 | **Protect Indoor Air Quality after Construction** | | 1 |
| **Yes** | HPSB IV.9 | **Environmental Tobacco Smoke (ETS) Control** | | 1 |
| **HPSB V: Reduce Environmental Impact of Materials** | | | | |
| Achievable Points | **6** | | Possible Points | 6 |
| **Yes** | HPSB V.1 | **Recycled Content** | | 1 |
| **Yes** | HPSB V.2 | **Biobased Content** | | 1 |
| **Yes** | HPSB V.3 | **Environmentally Preferable Products** | | 1 |
| **Yes** | HPSB V.4 | **Waste and Materials Management - Recycling** | | 1 |
| **Yes** | HPSB V.5 | **Waste and Materials Management - Divert 50% from Disposal** | | 1 |
| **Yes** | HPSB V.6 | **Ozone Depleting Compounds** | | 1 |
| **HPSB Totals** | | | Possible Points | **29** |
| 28 | **Federal Requirements Achieved (29 line items)** | | | |
| 1 | **Federal Requirements Maybe Achieved** | | | |
| 0 | **Federal Requirements Not Achieved** | | | |
| **97%** | **Percentage of Federal Requirements Achieved** | | | |

# Air Force MILCON Sustainability Requirements Scoresheet

## version LEED® 2009

**LEED® 2009 Checklist**

LEED® Credits and/or Prerequisites that meet HPSB Requirements

LEED® Credits and/or Prerequisites that align closely with HPSB Requirements

| | | | |
|---|---|---|---|
| **Sustainable Sites** | | | |
| Achievable Points | 12 | **Sustainable Sites** Possible Points | 26 |
| Yes | Prereq 1 | Construction Activity Pollution Prevention (HPSB GP3) | Required |
| Yes | Credit 1 | **Site Selection** | 1 |
| Maybe | Credit 2 | **Development Density & Community Connectivity** | 5 |
| Maybe | Credit 3 | **Brownfield Redevelopment** | 1 |
| Maybe | Credit 4.1 | **Alternative Transportation -** Public Transportation Access | 6 |
| Maybe | Credit 4.2 | **Alternative Transportation -** Bicycle Storage & Changing Rooms | 1 |
| Yes | Credit 4.3 | **Alternative Transportation -** Low-Emitting & Fuel Efficient Vehicles | 3 |
| Yes | Credit 4.4 | **Alternative Transportation -** Parking Capacity | 2 |
| Maybe | Credit 5.1 | **Site Development,** Protect or Restore Habitat | 1 |
| Yes | Credit 5.2 | **Site Development,** Maximize Open Space | 1 |
| Yes | Credit 6.1 | Stormwater Design, Quantity Control (HPSB GP3) | 1 |
| Yes | Credit 6.2 | Stormwater Design, Quality Control (HPSB GP3) | 1 |
| Yes | Credit 7.1 | **Heat Island Effect -** Non-Roof | 1 |
| Yes | Credit 7.2 | **Heat Island Effect -** Roof | 1 |
| Yes | Credit 8 | **Light Pollution Reduction** | 1 |
| **Water Efficiency** | | | |
| Achievable Points | 7 | Possible Points | 10 |
| Yes | Prereq 1 | Water Use Reduction - 20% Reduction (HPSB GP3) | Required |
| Yes | Credit 1.1 | Water Efficient Landscaping - Reduce Potable Water Use by 50% (HPSB GP3) | 2 |
| Yes | Credit 1.2 | Water Efficient Landscaping - No Potable Use or No Irrigation | 2 |
| Maybe | Credit 2 | **Innovative Wastewater Technologies** | 2 |
| 3 | Credit 3 | Water Use Reduction | 2 to 4 |
| | | 2 — 30% Reduction | 2 |
| | | 3 — 35% Reduction | 1 |
| | | 4 — 40% Reduction | 1 |
| **Energy & Atmosphere** | | | |
| Achievable Points | 12 | Possible Points | 35 |
| Yes | Prereq 1 | Fundamental Commissioning of the Building Energy Systems (HPSB GP1) | Required |
| Yes | Prereq 2 | Minimum Energy Performance (HPSB GP2) | Required |
| Yes | Prereq 3 | Fundamental Refrigerant Management (HPSB GP5) | Required |
| 7 | Credit 1 | Optimize Energy Performance (HPSB GP) | 1 to 19 |
| | | 1 — 12% for New Buildings/8% for Existing Building Renovations | 1 |
| | | 2 — 14% for New Buildings/10% for Existing Building Renovations | 1 |
| | | 3 — 16% for New Buildings/12% for Existing Building Renovations | 1 |
| | | 4 — 18% for New Buildings/14% for Existing Building Renovations | 1 |
| | | 5 — 20% for New Buildings/16% for Existing Building Renovations | 1 |
| | | 6 — 22% for New Buildings/18% for Existing Building Renovations | 1 |
| | | 7 — 24% for New Buildings/20% for Existing Building Renovations | 1 |
| | | 8 — 26% for New Buildings/22% for Existing Building Renovations | 1 |
| | | 9 — 28% for New Buildings/24% for Existing Building Renovations | 1 |
| | | 10 — 30% for New Buildings/26% for Existing Building Renovations | 1 |
| | | 11 — 32% for New Buildings/28% for Existing Building Renovations | 1 |
| | | 12 — 34% for New Buildings/30% for Existing Building Renovations | 1 |
| | | 13 — 36% for New Buildings/32% for Existing Building Renovations | 1 |
| | | 14 — 38% for New Buildings/34% for Existing Building Renovations | 1 |
| | | 15 — 40% for New Buildings/36% for Existing Building Renovations | 1 |
| | | 16 — 42% for New Buildings/38% for Existing Building Renovations | 1 |
| | | 17 — 44% for New Buildings/40% for Existing Building Renovations | 1 |
| | | 18 — 46% for New Buildings/42% for Existing Building Renovations | 1 |
| | | 19 — 48%+ for New Buildings/44%+ for Existing Building Renovations | 1 |
| 0 | Credit 2 | On-Site Renewable Energy (HPSB GP2) | 1 to 7 |
| | | 1 — On-site 1% | 1 |
| | | 2 — On-site 3% | 1 |
| | | 3 — On-site 5% | 1 |
| | | 4 — On-site 7% | 1 |
| | | 5 — On-site 9% | 1 |
| | | 6 — On-site 11% | 1 |
| | | 7 — On-site 13% | 1 |
| Yes | Credit 3 | Enhanced Commissioning (HPSB GP1) | 2 |
| Maybe | Credit 4 | Enhanced Refrigerant Management (HPSB GP5) | 2 |
| Yes | Credit 5 | Measurement & Verification (HPSB GP2) | 3 |
| No | Credit 6 | **Green Power** | 2 |

# Air Force MILCON Sustainability Requirements Scoresheet

**version LEED® 2009**

| | | | | |
|---|---|---|---|---|
| **Materials & Resources** | | | | |
| Achievable Points | 7 | | Possible Points | 14 |
| Yes | Prereq 1 | Storage & Collection of Recyclables (HPSB GP5) | | Required |
| 0 | Credit 1.1 | **Building Reuse,** Maintain Existing Walls, Floors & Roof | | 1 to 3 |
| | | 1 | Maintain 55% of Existing Walls, Floors & Roof | 1 |
| | | 2 | Maintain 75% of Existing Walls, Floors & Roof | 1 |
| | | 3 | Maintain 95% of Existing Walls, Floors & Roof | 1 |
| No | Credit 1.2 | **Building Reuse,** Maintain 50% of Interior Non-Structural Elements | | 1 |
| Yes | Credit 2.1 | Construction Waste Management | | 1 |
| Yes | Credit 2.2 | **Construction Waste Management,** Divert 75% from Disposal | | 1 |
| 0 | Credit 3 | **Materials Reuse** | | 1 to 2 |
| | | 1 | 5% | 1 |
| | | 2 | 10% | 1 |
| Yes | Credit 4.1 | Recycled Content, 10% (post-consumer +1/2 pre-consumer) (HPSB GP5) | | 1 |
| Yes | Credit 4.2 | Recycled Content, 20% (post-consumer +1/2 pre-consumer) | | 1 |
| 2 | Credit 5 | **Regional Materials** | | 1 to 2 |
| | | 1 | 10% Extracted, Processed & Manufactured | 1 |
| | | 2 | 20% Extracted, Processed & Manufactured | 1 |
| Maybe | Credit 6 | Rapidly Renewable Materials (HPSB GP5) | | 1 |
| Yes | Credit 7 | Certified Wood (HPSB GP5) | | 1 |
| **Indoor Environmental Quality** | | | | |
| Achievable Points | 10 | | Possible Points | 15 |
| Yes | Prereq 1 | Minimum IAQ Performance (HPSB GP4) | | Required |
| Yes | Prereq 2 | Environmental Tobacco Smoke (ETS) Control (HPSB GP4) | | Required |
| Yes | Credit 1 | **Outside Air Delivery Monitoring** | | 1 |
| Maybe | Credit 2 | **Increased Ventilation** | | 1 |
| Yes | Credit 3.1 | Construction IAQ Management Plan, During Construction (HPSB GP4) | | 1 |
| Yes | Credit 3.2 | Construction IAQ Management Plan, Before Occupancy (HPSB GP4) | | 1 |
| Yes | Credit 4.1 | Low Emitting Materials, Adhesives & Sealants (HPSB GP4) | | 1 |
| Yes | Credit 4.2 | Low Emitting Materials, Paints & Coatings (HPSB GP4) | | 1 |
| Yes | Credit 4.3 | Low Emitting Materials, Flooring Systems (HPSB GP4) | | 1 |
| Yes | Credit 4.4 | Low Emitting Materials, Composite Wood & Agrifiber Products (HPSB GP4) | | 1 |
| Yes | Credit 5 | **Indoor Chemical & Pollutant Source Control** | | 1 |
| Yes | Credit 6.1 | Controllability of Systems, Lighting (HPSB GP4) | | 1 |
| Maybe | Credit 6.2 | **Controllability of Systems,** Thermal Comfort | | 1 |
| Yes | Credit 7.1 | Thermal Comfort, Design (HPSB GP4) | | 1 |
| Maybe | Credit 7.2 | **Thermal Comfort,** Verification | | 1 |
| Maybe | Credit 8.1 | Daylight & Views - Daylight 75% of Spaces (HPSB GP4) | | 1 |
| Maybe | Credit 8.2 | **Daylight & Views** - Views for 90% of Spaces | | 1 |
| **Innovation & Design Process** | | | | |
| Achievable Points | 4 | | Possible Points | 6 |
| Yes | Credit 1.1 | **Innovation in Design** | | 1 |
| Yes | Credit 1.2 | **Innovation in Design** | | 1 |
| Yes | Credit 1.3 | **Innovation in Design** | | 1 |
| Maybe | Credit 1.4 | **Innovation in Design** | | 1 |
| Maybe | Credit 1.5 | **Innovation in Design** | | 1 |
| Yes | Credit 2 | **LEED® Accredited Professional** | | 1 |
| **Regional Priority Credits** | | | | |
| Achievable Points | 2 | | Possible Points | 4 |
| Yes | Credit 1.1 | **Regional Priority** | | 1 |
| Yes | Credit 1.2 | **Regional Priority** | | 1 |
| Maybe | Credit 1.3 | **Regional Priority** | | 1 |
| Maybe | Credit 1.4 | **Regional Priority** | | 1 |
| **LEED Project Totals** | **(pre-certification estimates)** | | Possible Points | 110 |
| 54 | LEED® Credits Achievable | | | |
| 17 | LEED® Credits Maybe Achievable | | | |
| 2 | LEED® Credits Not Achievable | | | |
| Silver | **LEED® Certification Level Achievable** | | | |
| N/A | **LEED® Horizontal Benchmark Level** | | | |
| N/A | **LEED® Utility Benchmark Level** | | | |
| N/A | **LEED® Industrial Benchmark Level** | | | |

**Certified:** 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80-110

# *Appendix 4*
# *User Requirements*

# SYSTEM SPECIFICATION

**FOR THE**

## KC-46 AIRCREW TRAINING SYSTEM

**5 March 2012**

**Contract FA8621-11-R-6251**

**Section J, Attachment 2**


**Prepared by:**
**KC-46 Aircrew Training System Program**
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Date: 8 Mar 2012

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# KC-46 AIRCREW TRAINING SYSTEM

# SYSTEM SPECIFICATION CHANGE LOG

| DATE | VERSION / REASON FOR CHANGE |
|---|---|
| 8 March 2012 | Version 0 / Initial release approved by HQ AMC/CC |
| 5 April 2012 | Version 0/ Admin change to update National Stock Numbers (NSN) |
| 11 April 2012 | Version 0 / Clarified BOT interior requirements as approved by AMC/A5Q e-mail dated 11 Apr 12 |
| 17 April 2012 | Version 0 / Admin change to remove incorrect TMS to GTIMS interface reference as approved by AMC/A5Q e-mail dated 17 Apr 12. |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

# 1 Introduction

**1.1 Scope**. This document establishes the requirements for an Aircrew Training System (ATS) to train aircrew members in the complete and full range of KC-46 Aircraft operations and missions, while minimizing in-flight instruction (see the Glossary in paragraph 5.1 for a definition of aircrew and Aircrew Training System).

## 1.2 Description

**1.2.1** The KC-46 ATS will be an integrated system including academic materials and classroom instruction, several types of Aircrew Training Devices (ATDs) with Interactive Courseware (ICW), trainer instruction, and a Training System Support Center (TSSC) (see the Glossary in paragraph 5.1 for a definition of system, Aircrew Training Device, and Training System Support Center).

**1.2.2** The KC-46 ATS will provide familiarization, initial qualification, continuation, upgrade, remedial, and requalification training for KC-46 aircrews (see the Glossary in paragraph 5.1 for a definition of provide and training).

**1.2.3** The TSSC will provide the resources to develop concurrency updates, manage functional and physical baselines, perform ATS depot-level maintenance, develop and modify courseware, and perform ATS student management and scheduling (see the Glossary in paragraph 5.1 for a definition of concurrency and courseware).

# 2 Documents and Assumptions

**2.1 Compliance Documents**. The documents listed below form a part of this document to the extent specified in KC-46 ATS System Specification Section 3, with the contractor responsible for ensuring the most current version of the documents are utilized.

**2.1.1 Government Documents**. Where a revision by supplement, amendment, or notice is called out, the entire document up to and including that revision is being referenced.

**Table 2.1.1 Government Documents**

| Number | Document Title | Date |
|---|---|---|
| 14 CFR Part 60 | Flight Simulation Training Device Initial and Continuing Qualification and Use | 8 Feb 2011 |
| AFDD 3-17 | Air Force Doctrine Document 3-17 - Air Mobility Operations | 28 July 2011 |
| AFH 63-1402 | Aircraft Information Program | 19 Mar 2001 |
| AFI 11-202 Vol 2 | Aircrew Standardization/Evaluation Program | 13 Sep 2010 |
| AFI 11-202 Vol 3 | General Flight Rules | 22 Oct 2010 |
| AFI 11-202 Vol 2 - AETCSUP 1 | Aircrew Standardization/Evaluation Program | 7 Dec 2010 |
| AFI 11-202 Vol 3 - AETCSUP 1 | General Flight Rules | 1 Sep 2011 |

| Number | Document Title | Date |
|---|---|---|
| AFI 11-202 Vol 2 - AMCSUP 1 | Aircrew Standardization/Evaluation Program – AMC Supplement 1 | 2 Mar 2011 |
| AFI 11-290 | Cockpit/Crew Resource Management Training Program | 11 Apr 2001 |
| AFI 11-2KC-46A, Vol 1 | Draft KC-46 Aircrew Training | TBD |
| AFI 33-210 | Air Force Certification and Accreditation (C&A) Program (AFCAP) | 19 Sep 2011 |
| AFI 36-2251 | Management of Air Force Training Systems | 5 Jun 2009 |
| AFMAN 11-210 | Instrument Refresher Program | 3 Feb 2005 |
| AFOSH STD 91-118 | Training Systems Fire Protection | 1 Apr 1997 |
| AFMAN 33-282 | Computer Security (COMPUSEC) | 27 Mar 2012 |
| AFTTP 3-3 | Air Force Tactics, Techniques, and Procedures | |
| ARASQ, Rev C | Aerial Refueling Airplane Simulator Qualification | 1 Sep 2009 |
| ATP-56(B) | Air-To-Air Refueling | 1 Feb 2010 and 14 Dec 2008 |
| DoD FLIP AP/1B | DoD Flight Information Publications (FLIP), Area Planning, Military Training Routes, North & South America | 9 Feb 2012 |
| DoDI 8500.02 | Information Assurance (IA) Implementation | 6 Feb 2003 |
| | IA Platform Information Technology (PIT) Guidebook | 23 Feb 2011 |
| | Aeronautical Systems Center Guidance Memorandum on IA C&A Requirements for PIT | 25 Apr 2010 |
| KC-46 System Spec | KC 46 System Specification | 5 Aug 2011 |
| MIL-HDBK-29612 | Development of Interactive Multimedia Instruction (IMI) | 20 Jun 2011 |
| MIL-HDBK-454B | General Guidelines For Electronic Equipment | 15 Apr 2007 |
| MIL-STD-882D | System Safety Program Requirements | 10 Feb 2000 |
| TO 00 35D 54 | Joint Deficiency and Reporting System (JDRS) | 4 Jun 2008 |
| UFC 3-600 | Fire Protection for Facilities | 14 Jul 2009 |
| | KC-46 Concept of Employment | Aug 2010 |
| | Mobility Air Force (MAF) Distributed Training Center Network (DTCN) Roles and Responsibilities | Jan 2011 |
| | Mobility Air Force Distributed Mission Operation Physical Security Guide | 23 Mar 2009 |

| Number | Document Title | Date |
|---|---|---|
| C-17 DTC B1711 | C-17 Weapon System Trainer (WST) Interface Control Document (ICD) for the C-17 DTCN for Distributed Mission Operations (DMO) | 4 Apr 2011 |
| C-17 DTC B1712 | C-17 WST ICD for Site Specific Information for the C-17 DTCN for DMO | 4 Apr 2011 |
| C-17 DTC B1713 A | C-17 Distributed Training Center (DTC) and Theory Of Operation for the AMC DMO Exercise Controller & Filtergate Software | 29 Mar 2011 |

**2.1.2 Non-Government Documents**. Where a revision by supplement, amendment, or notice is called out, the entire document up to and including that revision is being referenced.

**Table 2.1.2 Non-Government Documents**

| Number | Document Title | Date |
|---|---|---|
| SISO-REF 010-2006 | Enumeration and Bit Encoded Values for Use with Protocols for Distributed Interactive Simulation Applications | 12 May 2006 |
| SISO-STD-002-2006 | Standard for Link 16 Simulation | 10 Jul 2006 |
| IEEE 1278.1a-1998 | IEEE Standard for Distributed Interactive Simulation – Application Protocols (Supplement) | 19 Mar 1998 |
| IEEE 1278.1-1995 | IEEE Standard for Distributed Interactive Simulation – Application Protocols. | 11 Aug 2010 |
| IEEE 1278.2–1995 | IEEE Standard for Distributed Interactive Simulation – Communication Services and Profiles | 21 Sep 1995 |

### 2.1.3 <u>Order of Precedence</u>

**2.1.3.1** In the event of a conflict between the text of this specification and the references cited herein, the text of this specification takes precedence.

**2.1.3.2** Nothing in this specification, however, supersedes applicable United States (US) laws and US regulations unless a specific exemption has been obtained.

## 2.3 <u>Ground Rules and Assumptions</u>

**2.3.1** Entering student candidates will possess a broad range of experience from recent Specialized Undergraduate Pilot Training (SUPT) graduates and basic boom operator student candidates to pilots and boom operators with multiple hours in other Mission Design Series aircraft.

**2.3.2** Aircrew members will be qualified In Accordance With (IAW) AF Instruction (AFI) 11-202 Volume (Vol) 2, AFI 11-202 Vol 2 - Air Mobility Command Supplement (AMCSUP) 1, and

AFI 11-202 Vol 2 – Air Education and Training Command Supplement (AETCSUP) 1, through an evaluation conducted by Air Force (AF) personnel in the aircraft or in an appropriate ATD approved by AF (see the Glossary in paragraph 5.1 for a definition of qualified and evaluation).

**2.3.3** Contractor development and instruction of the Instrument Refresher Course (IRC) will not be required.

**2.3.4** The AF will approve courseware templates and will provide samples of existing government-owned templates, after contract award.

**2.3.5** Graduate Training Integration Management System (GTIMS Version 1.7.9) will be the standard Training Management System (TMS) software used by Air Mobility Command (AMC) for forthcoming flying training systems to provide flying training management, scheduling, accounting, and tracking for crew flight and ground training (see the Glossary in paragraph 5.1 for a definition of training system).

**2.3.6** The AF will define non-training times and day.

**2.3.7** Advanced Distributed Learning Service (ADLS) requirements can be found at the following website: https://golearn.csd.disa.mil/kc/login/SystemCheck.htm

**2.3.8** The AF will provide after contract award a prioritized list of Allied Technical Publication 56(B) (ATP-56(B)) aircraft to be modeled for the ATS.

# 3 Requirements

## 3.1 Aircrew Training System (ATS)

### 3.1.1 General ATS Requirements

**3.1.1.1** The ATS shall produce a qualified aircrew member, maintain and upgrade their qualification levels, and assist student's progression throughout the qualification continuums (see the Glossary in paragraph 5.1 for a definition of qualified aircrew member).

**3.1.1.2** The ATS shall produce aircrew members that meet the proficiency, knowledge, and performance requirements of AFI 11-202 Vol 2, AFI 11-202 Vol 2 - AMCSUP 1, and AFI 11-202 Vol 2 - AETCSUP 1 for qualification upon completion of ATS training (see the Glossary in paragraph 5.1 for a definition of proficiency, knowledge, and performance).

**3.1.1.3** A mixture of standalone, local network, and Distributed Mission Operations (DMO) mission profiles shall be provided with the KC-46 Weapon System Trainer (WST) and Boom Operator Trainer (BOT) (see the Glossary in paragraph 5.1 for a definition of local network, Distributed Mission Operations, Weapon System Trainer, and Boom Operator Trainer).

### 3.1.2 Student Throughput

**3.1.2.1** The ATS shall meet the student throughput requirements listed in Contract FA8621-11-R-6251, Section J, Attachment 3, Student Throughput Matrix.

**3.1.2.2** The ATS shall meet a 10% surge in the above student throughput requirements for any course, any part of a course, any combination of courses, and free play (see the Glossary in paragraph 5.1 for a definition of free play) within 1 days of AF notification.

**3.1.2.3** The ATS shall meet a 20% surge in the above student throughput requirements for any course, any part of a course, any combination of courses, and free play within 30 days of AF notification.

**3.1.3 <u>Types of Training</u>**

**3.1.3.1 <u>General Training Requirements</u>**

**3.1.3.1.1** The KC-46 ATS shall provide all types of training described in the specification, IAW AFI 11-2KC-46A Vol 1, AFI 11-202 Vol 2 and Vol 3, and AMC and AETCSUPs to AFI 11-202 volumes 2 and 3.

**3.1.3.1.2** ATS training shall provide for aircrew member progression from entry level qualification to the required qualification level.

**3.1.3.1.3** The ATS shall provide Aeromedical Evacuation (AE) familiarization training and AE continuation training.

**3.1.3.1.4** The ATS shall provide all training materials for ATS ground training.

**3.1.3.1.5** Crew Resource Management (CRM) training shall be provided throughout all course plans, IAW AFI 11-290 (see the Glossary in paragraph 5.1 for a definition of Crew Resource Management).

**3.1.3.2 <u>Formal Training Unit (FTU) Training</u>**

**3.1.3.2.1 <u>Basic Aircraft Qualification</u>**

**3.1.3.2.1.1** The ATS shall provide basic aircraft qualification training to enable aircrews to safely operate the KC-46 Aircraft, as verified by qualification IAW AFI 11-2KC-46A Vol 1 and AFI 11-202 Vol 2, and AMC and AETCSUPs to AFI 11-202 volumes 2 and 3.

**3.1.3.2.1.2** Basic aircraft qualification training shall provide training for the following:

a. Normal aircraft procedures (see the Glossary in paragraph 5.1 for a definition of normal aircraft procedures).

b. Abnormal aircraft procedures (see the Glossary in paragraph 5.1 for a definition of abnormal aircraft procedures).

c. Emergency aircraft procedures (see the Glossary in paragraph 5.1 for a definition of emergency aircraft procedures).

d. Foreign and domestic flight procedures.

e. Mission planning using AF-approved mission planning tools, i.e. Air Force Mission Support System (AFMSS) (see the Glossary in paragraph 5.1 for a definition of Air Force Mission Support System).

f. Crew coordination including CRM principles from AFI 11-290 (see the Glossary in paragraph 5.1 for a definition of principle).

g. Use of Large Aircraft Infrared Counter-Measures (LAIRCM) System and other defensive systems (including threat training using classified real-world data) (see the Glossary in paragraph 5.1 for a definition of Large Aircraft Infrared Counter-Measures System and real-world).

h. Procedures for planning, loading, and transportation of cargo to include hazardous cargo.

i. Procedures for passenger and aeromedical transport.

j. Principles of command and control as applicable to each crew position.

k. Aerial refueling both as the receiver and tanker for pilots in left and right seats (see the Glossary in paragraph 5.1 for a definition of aerial refueling).

l. Aerial refueling as a tanker using boom and every type of drogue, including Wing Aerial Refueling Pods (WARPs), and centerline drogue.

**3.1.3.2.1.3** The IRC, as specified in AF Manual (AFMAN) 11-210, shall be part of pilot initial qualification, upgrade training, and requalification courses to allow students to accomplish instrument refresher training.

**3.1.3.2.1.4** Boom operator training shall provide for the monitoring of Air Traffic Control (ATC) communications.

**3.1.3.2.1.5** Boom operator training shall provide for the monitoring of takeoff, departure, and approach procedures and advising pilots of any deviations that would compromise safety.

**3.1.3.2.1.6** Boom operator training shall provide Terminal Instrument Procedures (TERPS) training to include:

a. A breakdown of standard Department of Defense (DoD), Digital Aeronautical Flight Information File (DAFIF), and Jeppesen approach plates.

b. Explanation of aircraft navigation equipment.

c. Departure and terminal arrival procedures.

d. Instrument approach types.

e. Initial approach portion to the final approach portion.

f. Final approach procedures.

g. Basic weather radar interpretation.

**3.1.3.2.2** **<u>Mission Certification Preparation Training</u>**. The ATS shall provide the foundation of training at the Formal Training Unit (FTU) to prepare KC-46 aircrew members for certification at their operational unit to deploy and employ the KC-46 Aircraft (see the Glossary in paragraph 5.1 for a definition of Formal Training Unit).

**3.1.3.2.2.1** Mission certification preparation training shall provide boom, WARPs, and centerline drogue, day fighter (Q022) and night fighter (Q023) category receiver training IAW AFI 11-2KC-46A Vol 1 and ATP-56(B).

**3.1.3.2.2.2** Mission certification preparation training shall provide training in Forward Area Refueling Point (FARP) procedures (see the Glossary in paragraph 5.1 for a definition of Forward Area Refueling Point).

**3.1.3.2.2.3** Mission certification preparation training shall provide tactics training IAW AF Tactics, Techniques, and Procedures (AFTTP) 3-3.

**3.1.3.2.2.4** Mission certification preparation training shall provide training in datalink and Emission Control (EMCON).

**3.1.3.2.2.5** Mission certification preparation training shall provide training to support US Strategic Command Operations Plans (OPLANs) IAW AFI 11-2KC-46A Vol 1 to include ground servicing operations, and normal, abnormal, and emergency procedures for maximum effort operations.

**3.1.3.2.2.6** Mission certification preparation training shall provide formation training to enable both left and right seat pilots to plan for and operate in KC-10, KC-135, and KC-46 Aircraft formations using Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) procedures in day and night lighting environments to include normal, abnormal, and emergency procedures (see the Glossary in paragraph 5.1 for a definition of environment).

**3.1.3.2.2.6.1** VFR formation procedures training shall provide the following as defined in AFTTP 3-3:

a. Mission planning.

b. Departures and rejoins.

c. Visual geometries.

d. Aerial refueling formation procedures.

e. Recoveries and landings.

**3.1.3.2.2.6.2** IFR formation procedures training shall provide the following as defined in AFTTP 3-3:

a. Mission planning.

b. Enhanced Traffic-Alert and Collision Avoidance System (TCAS) employment.

c. Instrument Meteorological Conditions (IMC) formation flight.

d. Employment of on-board systems to maintain formation with other aircraft.

e. IMC departures and rejoins.

f. IMC aerial refueling formation procedures.

g. IMC recoveries and landings.

**3.1.3.2.3 Transition Training**. Transition training shall provide all instruction for pilots and boom operators transitioning from other airframes to qualify in the corresponding KC-46 Aircraft aircrew position.

**3.1.3.2.4 Requalification Training**. Requalification training shall qualify any previously qualified KC-46 Aircraft aircrew member to their previous qualification level.

**3.1.3.2.5 Instructor Training**. Instructor training shall emphasize principles of instruction to qualify candidate KC-46 Aircraft aircrew members to be pilot or boom operator instructors.

**3.1.3.2.6 FTU Continuation Training**. Continuation training shall provide recurring training events required by AFI 11 2KC-46A Vol 1.

**3.1.3.2.7 FTU Required Training Courses**. The ATS shall provide courseware and instruction to teach the knowledge, skills, and abilities required for aircrew member proficiency in the courses listed in Table 3.1.3.2.7 below.

**Table 3.1.3.2.7 FTU Required Training Courses**

| | Course Name | Course Description |
|---|---|---|
| a. | Pilot Transition Course 1 (KC46PTX1) | This course shall qualify pilots as KC-46 Aircraft Commanders who were previously qualified as Aircraft Commanders in non-tanker and non-receiver aircraft. |
| b. | Pilot Transition Course 2 (KC46PTX2) | This course shall qualify pilots as KC-46 Aircraft Commanders who were previously qualified as non-receiver aerial refueling Aircraft Commanders in KC-135 aircraft. |
| c. | Pilot Transition Course 3 (KC46PTX3) | This course shall qualify pilots as KC-46 Aircraft Commanders who were previously qualified as receiver aerial refueling qualified Aircraft Commanders in other heavy aircraft. |
| d. | Pilot Initial Qualification Course (KC46PIQ) | This course shall qualify pilots to fly in the left and right seat of the KC-46 Aircraft and accomplish flying related tasks except receiver aerial refueling shall be familiarization only, not qualification. It will not qualify them as an Aircraft Commander. The flying hour portion of this training will team KC46PIQ course pilots with KC46PTX, KC46PCO or KC46PRQ pilots. |
| e. | Pilot Checkout Course (KC46PCO) | This course shall upgrade current and qualified KC-46 pilots to Aircraft Commanders. It shall focus on receiver aerial refueling and general Aircraft Commander duties. |
| f. | Pilot Requalification Course (KC46PRC) | This course shall take previously qualified KC-46 Aircraft Commanders and Instructor Pilots and re-qualify them to their previous qualification level as KC-46 Aircraft Commanders or Instructor Pilots. |

| | Course Name | Course Description |
|---|---|---|
| g. | Instructor Aircraft Commander Course (KC46IAC) | This course shall take current and qualified KC-46 Aircraft Commanders and upgrade them to Instructor Pilots. The course shall also include operation of the WST Instructor/Operator Station (IOS) and procedures to power up, operate equipment, reboot systems, and shut down the WST, BOT, both types of Part Task Trainers (PTTs), the TMS, and the Learning Management System (LMS). |
| h. | Senior Officer Course (KC46SOC) | This course shall provide senior officers with exposure to the KC-46 Aircraft mission and teach basic KC-46 Aircraft operation (takeoff, landings, and emergency procedures) resulting in the issuance of a restricted AF Form 8. Successful completion of this course allows senior officers to operate the aircraft from the left seat under the direct supervision of an Instructor Pilot during critical phases of flight. |
| i. | Pilot Faculty Training Course (FTC) (FTU personnel only) | This advanced instructor course shall upgrade a current and qualified KC-46 Instructor Pilot to fly with initial qualification students. It focuses on common student errors and Air Education and Training Command (AETC) instructional and grading criteria. |
| j. | Boom Operator Transition Course (KC46BTX) | This course shall qualify boom operators in the KC-46 Aircraft. It shall train individuals who were previously qualified as KC-135 or KC-10 boom operators. |
| k. | Boom Operator Initial Qualification Course (KC46BIQ) | This course shall qualify individuals to perform duties as a KC-46 Boom Operator. Graduation from the Basic Boom Operator Course is required to attend this course. |
| l. | Boom Operator Requalification Course (KC46BRC) | This course shall take previously qualified KC-46 Boom Operators and re-qualify them to their previous qualification level. |
| m. | Instructor Boom Operator Course (KC46IB) | This course shall take current and qualified KC-46 Boom Operators and qualify them as Instructor Boom Operators. The course shall also include operation of the BOT IOS and ATS procedures to power up, operate equipment, reboot systems, and shut down the BOT, Boom Operator PTT, the Fuselage Trainer, the TMS, and the LMS. |
| n. | Boom Operator Faculty Training Course (FTC) (FTU personnel only) | This advanced instructor course shall upgrade a current and qualified KC-46 Instructor Boom Operator to fly with initial qualification students. It focuses on common student errors and AETC instructional and grading criteria. |

| | Course Name | Course Description |
|---|---|---|
| o. | Pilot Quarterly Refresher Continuation Training (PREF) | This course shall provide refresher training for pilots in three phases. Phase A shall be consecutive training days consisting of mission oriented profiles with emergency and abnormal procedures. Phase B shall be a separate training day consisting of takeoffs, approaches, formation, receiver aerial refueling, and other training events as determined by the Quarterly Refresher Training Profile Guide. Phase C shall be system refresher Computer Based Training (CBT) lessons that must be completed prior to Phase A. One Phase A training day per year shall be a dedicated CRM training and one Phase A training day per year shall be a locally networked mission. |
| p. | Boom Operator Quarterly Refresher Continuation Training (BREF) | This course shall provide refresher training for boom operators in three phases. Phase A shall be consecutive training days consisting of mission oriented profiles with emergency and abnormal procedures. Phase B shall be a separate training day consisting of cargo load training events as determined by the Quarterly Refresher Training Profile Guide. Phase C shall consist of system refresher CBT lessons that must be completed prior to Phase A. One Phase A training day per year shall be a dedicated CRM training and one Phase A training day per year shall be a locally networked mission. |
| q. | Senior Officer Familiarization Training (KC46SOF) | This course shall provide senior officers with familiarization to the KC-46 Aircraft mission and basic KC-46 Aircraft operation. Successful completion of this course does not result in the issuance of an AF Form 8 or allow senior officers to operate the aircraft. |
| r. | Maintenance Engine Run Qualification Course (MERQ) | This course shall qualify maintenance personnel in KC-46 Aircraft engine run procedures. It teaches normal operation as well as emergency procedures. |
| s. | Maintenance Engine Run Refresher Training (MERR) | This course shall provide refresher training for maintenance personnel in KC-46 Aircraft engine run procedures to include normal operation as well as emergency procedures. |

### 3.1.3.3 <u>Main Operating Base (MOB) Training</u>

**3.1.3.3.1 <u>Instructor Preparation Training</u>**. Instructor preparation training shall provide all instruction to enable aircrew members to qualify in the next higher qualification level.

**3.1.3.3.2 <u>MOB Continuation Training</u>**. Continuation training shall provide recurring training events required by AFI 11 2KC-46A Vol 1.

**3.1.3.3.3 <u>MOB Required Training Courses</u>**. The ATS shall include courseware and instruction to teach the knowledge, skills, and abilities required for aircrew member proficiency in the courses listed in Table 3.1.3.3.3 below.

**Table 3.1.3.3.3 MOB Required Training Courses**

| | Course Name | Course Description |
|---|---|---|
| a. | Pilot Instructor Preparation Course (PIP) | This course shall prepare instructor candidates through an ATS-developed pre-attendance workbook, CBT lessons, and on-line examinations available on the ATS Learning Management System (Reference Paragraph 3.2.4; also see AFI 11-2KC-46A, Vol 1, Paragraph 1.15). |
| b. | Boom Operator Instructor Preparation Course (BIP) | This course shall prepare instructor candidates through an ATS-developed pre-attendance workbook, CBT lessons, and on-line examinations available on the ATS Learning Management System (Reference Paragraph 3.2.4; also see AFI 11-2KC-46A, Vol 1, Paragraph 1.15). |
| c. | Aeromedical Evacuation Familiarization Training (AEF) | This course shall familiarize aeromedical aircrew members with the operation of KC-46 Aircraft emergency egress systems, aircrew flight equipment, communications equipment, and the integration and operation of AE equipment aboard the KC-46 Aircraft. |
| d. | Pilot Quarterly Refresher Continuation Training (PREF) | This course shall provide refresher training for pilots in three phases over a three month period. Phase A shall be two consecutive training days consisting of mission oriented profiles with emergency and abnormal procedures. Phase B shall be a separate training day approximately one month after Phase A consisting of takeoffs, approaches, formation, receiver aerial refueling, and other training events as determined by the Quarterly Refresher Training Profile Guide. Phase C shall be the same as Phase B approximately one month after Phase B. One Phase A training day per year shall be a dedicated CRM training and one Phase A training day per year shall be a DMO mission. Phase A shall be preceded by a system refresher CBT lesson. |

| | Course Name | Course Description |
|---|---|---|
| e. | Boom Operator Quarterly Refresher Continuation Training (BREF) | This course shall provide refresher training for boom operators in four phases. Phase A shall be two consecutive training days consisting of mission oriented profiles with emergency and abnormal procedures. Phase B shall be a separate training day approximately one month after Phase A for practicing normal procedures and crew coordination as determined by the Quarterly Refresher Training Profile Guide. Phase C shall be the same as Phase B approximately one month after Phase B. Phase D shall be a separate training day consisting of cargo load training events as determined by the Quarterly Refresher Training Profile Guide. One Phase A training day per year shall be a dedicated CRM training and one Phase A training day per year shall be a DMO mission. Phase A shall be preceded by a system refresher CBT lesson. |
| f. | Senior Officer Familiarization Training (KC46SOF) | This course shall provide senior officers with familiarization to the KC-46 Aircraft mission and basic KC-46 Aircraft operation. Successful completion of this course does not result in the issuance of an AF Form 8 or allow senior officers to operate the aircraft. |
| g. | Maintenance Engine Run Qualification Course (MERQ) | This course shall qualify maintenance personnel in KC-46 Aircraft engine run procedures. It teaches normal operation as well as emergency procedures. |
| h. | Maintenance Engine Run Refresher Training (MERR) | This course shall provide refresher training for maintenance personnel in KC-46 Aircraft engine run procedures to include normal operation as well as emergency procedures. |

### 3.1.4 <u>ATS System Characteristics</u>

**3.1.4.1** The ATS shall provide training to meet the AFI 11-2KC-46A Vol 1 and AF Doctrine Document (AFDD) 3-17.

**3.1.4.2** The ATS shall provide subject matter to be taught in academics, practiced in training devices, and flown in the aircraft that logically follows and builds upon previously completed student training see the Glossary in paragraph 5.1 for a definition of training device).

**3.1.4.3** The ATS shall provide for aircrew members' retention, comprehension, and performance to be evaluated against defined training objectives approved by the AF.

**3.1.4.4** The ATS shall provide for the measurement and assessment of aircrew member achievement to be evaluated against defined training objective success criteria approved by the AF.

**3.1.4.5** The ATS shall provide written evaluation procedures and standards, approved by the AF, for training objectives requiring subjective evaluation (see the Glossary in paragraph 5.1 for a definition of standard).

**3.1.4.6** The ATS shall provide AF approved mechanisms to incrementally and objectively measure aircrew member performance to confirm student progress in attaining the knowledge, skills, and task proficiency required for aircrew qualification levels, to diagnose any aircrew member deficiencies, and prescribe remedial instruction.

**3.1.4.6.1** The ATS shall provide, prior to performance evaluation, training exercises in safety-of-flight, crew coordination, CRM, check ride preparation, and time task prioritization (see the Glossary in paragraph 5.1 for a definition of prioritization).

**3.1.4.7** The ATS shall organize sets of training elements such as instructional delivery periods, study, preparation and planning skills practice and feedback into common units of instruction.

**3.1.4.8** The ATS shall provide Computer-Based Training (CBT) courses that are self-paced (see the Glossary in paragraph 5.1 for a definition of Computer-Based Training).

**3.1.4.8.1** The self-paced CBT courses shall be proficiency or competency based (see the Glossary in paragraph 5.1 for a definition of proficiency and competency).

**3.1.4.8.2** In addition, the self-paced CBT courses shall be mastery or criterion referenced (see the Glossary in paragraph 5.1 for a definition of mastery and criterion).

**3.1.4.9** The ATS shall provide courses and their associated lessons, exercises, and evaluation instruments that take advantage of existing aircrew member knowledge and skills acquired from prerequisite training courses.

**3.1.4.10** The ATS course content shall be standardized for cross-course or cross-crew position training.

**3.1.4.11** The ATS shall provide pre-mission briefings using mission planning data and post-mission debriefings using relevant video, audio, and ATD instrumentation data captured during the mission.

**3.1.4.11.1** Aircrew member mission performance shall be critiqued with aircrew member strengths, weaknesses, and errors identified.

**3.1.4.11.2** Any aircrew member errors identified shall be diagnosed and remedial training prescribed.

**3.1.4.12** The ATS shall integrate networked training into formal qualification and continuation training courses.

**3.1.4.12.1** The ATS shall ensure all hardware, software, equipment, and protocols employed for networked training meet and maintain compliance with Mobility Air Force (MAF) DMO and Distributed Training Center (DTC) documents in Table 2.1.1, Institute of Electrical and Electronics Engineers (IEEE) standards, and Simulation Interoperability Standards Organization (SISO) standards in Table 2.1.2.

**3.1.4.13** The ATS shall generate modifiable training mission scenarios and objectives for ATD sessions (see the Glossary in paragraph 5.1 for a definition of scenario and session).

**3.1.4.13.1** Each mission scenario shall provide for instructor-programmable functions and Initial Conditions (ICs) in both the WST and BOT.

**3.1.4.14** The ATS mission profiles shall incorporate computer voice generation and recognition technology to simulate ATC communications, aerial refueling communications, Command and Control communications, and ATC chatter on non-AR primary radio for both the WST and BOT.

### 3.1.5 <u>Networked Training Modes</u>

#### 3.1.5.1 <u>General Network Training Requirements</u>

**3.1.5.1.1** Collocated KC-46 WST and BOT devices shall operate as linked devices, where both devices interoperate as part of a single virtual aircraft or as separate aircraft in a single training mission (see the Glossary in paragraph 5.1 for a definition of virtual).

**3.1.5.1.2** Required training capabilities, availability, and performance shall not be diminished in any way when operating in any network mode.

**3.1.5.1.3** The Instructor/Operator Station (IOS) for each networked training device shall provide one Secure Telephone Equipment (STE) phone for communication with other networked training devices and DMO network federates (see the Glossary in paragraph 5.1 for a definition of Instructor/Operator Station, Distributed Mission Operations (DMO) network and federate).

**3.1.5.1.4** In addition, the IOS for each networked training device shall provide one Voice Over Internet Protocol (VOIP) phone for communication with other networked training devices and DMO network federates via the MAF DMO network.

**3.1.5.1.5** The ATS shall provide for simulator enclave network health monitoring, management, and trouble-shooting (see the Glossary in paragraph 5.1 for a definition of enclave).

**3.1.5.1.6** The KC-46 ATS training devices shall provide a mechanism via a network operations page on the IOS to establish connectivity for and manage networked training events, exercises, and missions.

#### 3.1.5.2 <u>Local Network Mode at MOBs</u>

**3.1.5.2.1** The KC-46 ATS shall provide local networking for unclassified and classified (up to and including SECRET) training between KC-46 training devices within a single building and between buildings containing KC-46 training devices on the same base even when the locations are widely separated in other areas of the base.

**3.1.5.2.2** The local network architecture shall provide for tightly coupled interactions from boom operator control input, to refueling boom movement, to receiver aircraft response ensuring simulation fidelity for aerial refueling missions with no negative training cues due to network latency (see the Glossary in paragraph 5.1 for a definition of architecture, tightly coupled interactions, fidelity, and latency).

#### 3.1.5.3 Local Network Mode at FTU

**3.1.5.3.1** The KC-46 ATS shall provide a local networking capability allowing for unclassified training between KC-46 training devices within a single building, KC-46 training devices in separate buildings, and other MAF training devices at that base.

**3.1.5.3.2** The local network architecture shall provide for tightly coupled interactions from boom operator control input, to refueling boom movement, to receiver aircraft response ensuring simulation fidelity for aerial refueling missions with no negative training cues due to network latency.

#### 3.1.5.4 Distributed Mission Operations (DMO) Network

**3.1.5.4.1** The KC-46 ATS training devices at the Main Operating Bases (MOBs) shall be fully interoperable for classified training (SECRET) with any other training devices through the MAF DMO network (see the Glossary in paragraph 5.1 for a definition of Main Operating Base).

**3.1.5.4.2** The KC-46 ATS DMO network architecture at the MOBs, from the simulator device to the MAF DMO equipment, shall provide for tightly coupled interactions from boom operator control input, to refueling boom movement, to receiver aircraft response ensuring simulation fidelity for aerial refueling missions with no negative training cues due to network latency.

**3.1.5.4.3** MAF DMO network connectivity shall be through the MAF DTC.

**3.1.5.4.4** The KC-46 ATS DMO network interface shall provide a minimum of 50% spare bandwidth in a simulation environment with at least 1000 independent moving airborne or surface entities in any combination (see the Glossary in paragraph 5.1 for a definition of entity).

**3.1.5.4.5** Each DMO networked training device shall sort, prioritize, and process up to 500 entities in the scenario at any one time during MAF DMO training events, exercises, and missions according to mission and training objectives.

## 3.2 Aircrew Training Device Component Requirements

### 3.2.1 Weapon System Trainer (WST)

#### 3.2.1.1 General WST Requirements

**3.2.1.1.1** The WST shall provide training in airlift, aerial refueling, and other operations as listed in the KC-46 Aircraft System Specification (SS) and AFDD 3-17.

**3.2.1.1.2** The design, performance, and fidelity of the WST shall provide training for those Master Training Task List (MTTL) tasks assigned to the WST.

**3.2.1.1.3** The WST shall provide training for all fielded versions of KC-46 aircraft Operational Flight Programs (OFPs).

**3.2.1.1.4** The WST design shall provide Federal Aviation Administration (FAA) general performance and evaluation requirements, and Level D training functionality for a Full Flight Simulator (FFS) as defined in the FAA, 14 Code of Federal Regulations (CFR) Part 60 (see the Glossary in paragraph 5.1 for a definition of functionality).

**3.2.1.1.4.1** WST transport delay, as defined by 14 CFR Part 60, shall be 100 ms or less (see the Glossary in paragraph 5.1 for a definition of transport delay).

**3.2.1.1.5** The WST shall meet the Free Air, Tanker, and Receiver Simulator Standards, Validation, Function and Subjective Requirements of the Aerial Refueling Airplane Simulator Qualification (ARASQ) Rev C Document for Level D Airplane Simulators (see the Glossary in paragraph 5.1 for a definition of Aerial Refueling Airplane Simulator Qualification).

**3.2.1.1.6** At the MOBs, the WST shall operate as both an unclassified and a classified training device with classification-appropriate processing architectures and data storage mechanisms.

**3.2.1.1.6.1** Classified training requirements shall provide simulation of actual threat entities, threat behaviors, and threat signatures, and employment of LAIRCM System and other KC-46 Aircraft defensive systems (see the Glossary in paragraph 5.1 for a definition of training requirement).

**3.2.1.1.7** The WST shall automatically download and store, for later retrieval, flight data and simulation data identified in the Statement of Work (SOW) for Simulator Operational Quality Assurance (SOQA), after every WST training session.

**3.2.1.1.8** The WST shall correlate the visual simulation scene, radar imagery, motion system, ATC, landing aids, navigational and other KC-46 cockpit displays (see the Glossary in paragraph 5.1 for a definition of correlate).

**3.2.1.1.9** The WST shall have Night Vision Imaging System (NVIS) compatible lights for any lights visible within the cockpit during training or mission rehearsals (see the Glossary in paragraph 5.1 for a definition of night vision imaging system).

**3.2.1.1.10** The WST shall provide mission training using mission data produced by aircrew on an AF-approved mission planning tool and uploaded using the same media as the aircraft.

**3.2.1.1.11** The WST shall provide simulations of all aircraft systems and the following simulator subsystems:

a. Visual System.

b. Radar Simulation System.

c. Databases.

d. Cockpit.

e. Non-Cockpit Aircraft Systems.

f. Motion and Control Loading Systems.

g. Aural Cueing System.

h. Instructor Operator Station.

i. Brief/Debrief System.

j. Threat Generation System.

### 3.2.1.2 WST Visual System

**3.2.1.2.1** The visual system shall provide the aircrew with aircraft representative visual cues to support KC-46 Aircraft missions from pre-flight through post-flight, to include airlift, aerial refueling as a tanker and a receiver, formation, and other operational missions as defined by AFDD 3-17 and KC-46 Concept of Employment (CONEMP).

**3.2.1.2.2** The visual system shall meet the requirements of 14 CFR Part 60 for Level D unless otherwise noted herein.

**3.2.1.2.3** The visual scene simulation system shall provide the following capabilities:

**3.2.1.2.3.1** The visual system shall provide no less than 60 Hertz (Hz) non-interlaced refresh rate for day, night, and dusk scenes.

**3.2.1.2.3.2** The visual system shall provide anti-smearing that meets or exceeds the criteria of the FAA's National Simulator Program, Flight Simulation Training Device Qualification Guidance Bulletin 06-02.

**3.2.1.2.3.3** The visual system shall provide full color day, night both with and without NVIS, and dusk operations with no color, geometry, or intensity mismatches between adjacent display channels.

**3.2.1.2.3.4** The visual system shall provide spatial, behavioral, and temporal correlation with other subsystems supporting the WST, to include all radar systems, formation, approach and navigational radio aids, and the threat modeling component of LAIRCM System and other defensive systems.

**3.2.1.2.3.5** The visual system shall have no artifacts to include (see the Glossary in paragraph 5.1 for a definition of artifact):

a. Flickering.

b. Streaking.

c. Terrain and feature popping (see the Glossary in paragraph 5.1 for a definition of feature).

d. Level of detail blending.

e. Image jitter (see the Glossary in paragraph 5.1 for a definition of image jitter).

f. Terrain, feature, and moving model dropout (see the Glossary in paragraph 5.1 for a definition of model).

g. Scintillation of small surfaces and texture (see the Glossary in paragraph 5.1 for a definition of scintillation).

h. Quantization of scene elements (see the Glossary in paragraph 5.1 for a definition of quantization).

i. Loss of edge sharpness.

j. Temporal aliasing caused by interactions of scene elements with the display raster structure (see the Glossary in paragraph 5.1 for a definition of aliasing and temporal aliasing).

k. Blurring.

l. Occulting errors (see the Glossary in paragraph 5.1 for a definition of occult).

m. Texture interference.

n. Moiré patterns (see the Glossary in paragraph 5.1 for a definition of moiré pattern).

o. Variations in color, contrast, and intensity when the displayed scene is in motion.

**3.2.1.2.3.6** The visual system shall generate detailed worldwide database imagery out to a minimum range of 80 nautical miles (NM) and simulate horizon depression effects due to earth curvature.

**3.2.1.2.3.7** The visual system shall provide geo-specific terrain, cultural features, and moving models that are accurately rendered in relation to a World Geodetic System 1984 (WGS-84) earth model (see the Glossary in paragraph 5.1 for a definition of cultural features and World Geodetic System 1984).

**3.2.1.2.3.8** The visual system shall provide a worldwide database capability with a minimum of 30 airfield models and high resolution areas, paragraph 3.2.1.4 and subparagraphs, stored on-line and selectable at the IOS (see the Glossary in paragraph 5.1 for a definition of airfield models, high resolution areas, and on-line storage).

**3.2.1.2.3.9** The visual system shall provide a minimum of 100,000 potentially visible system polygons and light points per channel per display field (see the Glossary in paragraph 5.1 for a definition of polygon and potentially visible system polygons).

**3.2.1.2.3.9.1** Polygons shall be swappable one for one with light points.

**3.2.1.2.3.10** The visual system shall provide for polygons to be fully independent, textured, anti-aliased, lit, and shaded.

**3.2.1.2.3.11** The visual system shall provide light points and light sources that meet 14 CFR Part 60 Level D requirements for rendering light points.

**3.2.1.2.3.11.1** Light point processing shall provide for terrain occulting, feature occulting, and atmospheric fading with atmospheric burn-through effects.

**3.2.1.2.3.12** The visual system shall provide a continuous time of day function, with accurate sun model placement and accurate moon model placement, moon model phase, and moon model rotation based on time of day, date, month, and year through the year 2075.

**3.2.1.2.3.13** The visual system shall provide a celestial model that includes a sun disk, moon disk, and star field, with ambient illumination on all land and water surfaces, and a directional horizon glow due to the sun and moon (see the Glossary in paragraph 5.1 for a definition of ambient illumination).

**3.2.1.2.3.14** The visual system shall provide sun or moon shadows IAW the time of day as well as shadows from aircraft light sources.

**3.2.1.2.3.15** The visual system shall provide pixel-level and pixel-rate polygon and texture shading due to the sun and moon, with accurate specular and ambient illumination effects from the simulated environment (see the Glossary in paragraph 5.1 for a definition of specular illumination).

**3.2.1.2.3.16** The visual system shall provide steerable nose gear lights and all landing and taxi lights with adjustable size and shape lobe patterns, correct illumination of objects and ground planes, atmospheric glare, cloud deck and fog reflections, range and angle attenuation.

**3.2.1.2.3.17** The visual system shall provide a minimum of three local area, directed spotlight sources with visible illumination effects on the environment.

**3.2.1.2.3.18** The visual system shall provide ownship strobe lights with correct illumination of objects and ground planes, atmospheric glare, cloud deck and fog reflections.

**3.2.1.2.3.19** The visual system shall have no fill-rate penalty and no system penalty both when any one or more light sources are switched on.

**3.2.1.2.3.20** The visual system shall provide a minimum of 24 million active, full color, Red Green Blue Alpha (RGBA), tri-linear and anisotropic anti-aliased texels.

**3.2.1.2.3.21** The visual system shall provide system texture processing that is capable of rendering high-fidelity, mission area size, and geo-specific terrain textures with sufficient dynamic range such that no blurring occurs at close viewing ranges and no tiling patterns occur at long viewing ranges.

**3.2.1.2.3.22** The visual system shall provide a minimum of 64, six Degrees-of-Freedom (DOF) Dynamic Coordinate Systems (DCSs) (i.e., moving models), visible and moving simultaneously in the simulation and selectable from both the IOS and via automated mission profiles (see the Glossary in paragraph 5.1 for a definition of six degrees-of-freedom).

**3.2.1.2.3.23** The visual system shall provide a minimum of 64 different static terrain-insertable feature models, visible simultaneously in the simulation and selectable from both the IOS and via automated mission profiles.

**3.2.1.2.3.24** The visual system shall provide visual effects for the following weather phenomena:

a. Icing and contrails due to varying atmospheric temperature.

b. Three dimensional clouds, cloud decks, and thunderstorm cells.

c. Winds including wind shear.

d. Rain of varying intensity, including freezing rain.

e. Thunderstorms of varying intensity with lightning, lightning glare, entry and exit transitions, and hail.

f. Snow including blowing snow.

g. Fog.

h. Blowing dust.

i. Atmospheric haze.

**3.2.1.2.3.24.1** Blowing dust and blowing snow effects shall be relative to aircraft speed and direction.

**3.2.1.2.3.25** The visual system shall provide accurate occulting and transparency effects with automatic occulting prioritization of translucent objects.

**3.2.1.2.3.25.1** The visual system shall provide sub-pixel occulting equivalent to four sub-pixels per pixel.

**3.2.1.2.3.26** The visual system shall provide relative prioritization for co-planar polygons.

**3.2.1.2.3.27** The visual system shall provide real-time threat occlusion data to the threat generation system (see the Glossary in paragraph 5.1 for a definition of real-time and occlusion).

**3.2.1.2.3.28** The visual system shall simulate ownship crash and collision when any of the following occur:

a. Abnormal contact of any part of the aircraft with the terrain, surfaces, culture, or models.

b. The aircraft rate of descent at touchdown is exceeds aircraft technical manual rate of descent at touchdown.

c. The aircraft exceeds maximum gravity (G) force limits.

**3.2.1.2.3.28.1** An ownship crash and collision shall be indicated by a representative short duration crash noise and visual scene indication.

**3.2.1.2.3.29** The visual system shall provide a collimated, continuous cross-cockpit instantaneous Field of View (FOV) of no less than 225 degrees horizontal and no less than 60 degrees vertical for both the center eyepoint and the aircrew member's aerial refueling eyepoint (see the Glossary in paragraph 5.1 for a definition of center eyepoint and aerial refueling eyepoint).

**3.2.1.2.3.29.1** The visual system eyepoint shall be selectable, via the IOS, between the center eyepoint, the aircraft commander's aerial refueling eyepoint, and the pilot's aerial refueling eyepoint.

**3.2.1.2.3.29.2** When either aerial refueling eyepoint is selected the system shall relocate so the 60 degree vertical FOV provides out-the-window imagery to the top of the cockpit windows for all aerial refueling positions during receiver aerial refueling training.

**3.2.1.2.3.29.3** Visual system operation, functionality and performance fidelity shall not be diminished in any way when any eyepoint is selected and the WST articulated.

**3.2.1.2.3.30** The visual system shall provide a display resolution of 4 arc minutes per optical line pair or better at 10% contrast modulation and at the worst-case raster phasing of the test pattern (horizontal and vertical) (see the Glossary in paragraph 5.1 for a definition of resolution).

**3.2.1.2.3.31** The visual system shall provide a minimum display highlight luminance of 12 foot-lamberts per channel with no more than 40% luminance variation over the entire display region, and a minimum display contrast of 8:1 within the entire display region.

**3.2.1.2.3.32** The visual system image shall remain stable such that no color or hue variation or distortion occurs after a 15 minute warm-up from a cold start.

**3.2.1.2.3.33** The visual system shall provide auto-alignment functionality with color, intensity and geometry matching between any adjacent display channels.

**3.2.1.3 WST Radar Simulation System**

**3.2.1.3.1** The radar simulation system shall provide radar functionality that represents a form, fit, and function equivalent to that of the KC-46 Aircraft radar system.

**3.2.1.3.2** The radar simulation system shall function as a physics-based model in the same operating modes that the aircraft radar system displays.

**3.2.1.3.3** The radar simulation system shall provide no perceptible differences in display resolution, brightness, or contrast from the aircraft radar system.

**3.2.1.3.4** The radar simulation system shall exhibit no perceptible differences in display responses to both control movement and aircraft movement from the aircraft radar system.

**3.2.1.3.5** The radar simulation system shall provide radar scenes representative of the actual KC-46 Aircraft radar with the following special effects simulated:

a. Altitude errors (see the Glossary in paragraph 5.1 for a definition of altitude errors)

b. Ambiguities (see the Glossary in paragraph 5.1 for a definition of ambiguities).

c. Cardinal effect (see the Glossary in paragraph 5.1 for a definition of cardinal effect).

d. Clutter (see the Glossary in paragraph 5.1 for a definition of clutter).

e. Far shore brightening (see the Glossary in paragraph 5.1 for a definition of far shore brightening).

f. Feature scaling (see the Glossary in paragraph 5.1 for a definition of feature scaling).

g. Glitter (see the Glossary in paragraph 5.1 for a definition of glitter).

h. Jamming.

i. Layover (see the Glossary in paragraph 5.1 for a definition of layover).

j. Low level effect (see the Glossary in paragraph 5.1 for a definition of low level effect).

k. Motion compensation errors (see the Glossary in paragraph 5.1 for a definition of motion compensation errors).

l. Moving targets (see the Glossary in paragraph 5.1 for a definition of moving targets).

m. Multi-look (see the Glossary in paragraph 5.1 for a definition of multi-look).

n. Noise.

o. Range foreshortening (see the Glossary in paragraph 5.1 for a definition of range foreshortening).

p. Range and range rate distortion (see the Glossary in paragraph 5.1 for a definition of range and range rate distortion).

q. Speckle (see the Glossary in paragraph 5.1 for a definition of speckle).

r. Terrain masking (see the Glossary in paragraph 5.1 for a definition of terrain masking).

s. Weather.

**3.2.1.3.6** The radar simulation system databases shall provide terrain and feature models to perform the training missions and correlate with all WST databases.

**3.2.1.4 WST Databases**

**3.2.1.4.1 WST Worldwide Database.** A worldwide, contiguous, textured, round-earth database shall be provided with no breaks in terrain, features, models, or imagery.

**3.2.1.4.1.1** The worldwide database shall be supplemented with geo-positioned features, and detail blended geo-specific airfield models and other geo-specific high resolution areas as defined in Paragraph 3.2.1.4.2 and subparagraphs.

**3.2.1.4.1.2** The worldwide database shall provide for flying between airfield models and high resolution areas without visual interruptions, negative training cues, the artifacts described in paragraph 3.2.1.2.3.5, or the need to perform environmental changes to hide loading of new databases.

**3.2.1.4.1.3** The worldwide database elevations shall be from National Geospatial-Intelligence Agency (NGA) Digital Terrain Elevation Data (DTED) Level 1 for Continental United States (CONUS) or equivalent, and at least DTED Level 0 or equivalent, for Outside CONUS (OCONUS) areas.

**3.2.1.4.1.4** The worldwide database terrain imagery shall provide 15 m or better geo-specific imagery, or use dynamically-generated thematic imagery with better than 5 m imagery combined with at least 100 m (3 arc-second) placement data, and use at least 25 different land cover types (see the Glossary in paragraph 5.1 for a definition of thematic).

**3.2.1.4.1.4.1** Thematic imagery shall be blended using techniques that eliminate sudden changes in imagery and repeating patterns.

**3.2.1.4.1.5** The worldwide database shall be supplemented with geo-positioned and geo-typical features.

**3.2.1.4.1.6** The worldwide database shall meet the requirements of 14 CFR Part 60 for Class I and II Level D databases unless otherwise specified herein.

**3.2.1.4.2 WST Airfield Models and High Resolution Areas.** Airfield models and high resolution areas shall provide training for airlift, aerial refueling as a tanker and as a receiver, formation, and for all operational missions as defined by AFDD 3-17 and KC-46 CONEMP (see the Glossary in paragraph 5.1 for a definition of airfield model and high resolution area).

**3.2.1.4.2.1** The airfield models and high resolution areas shall meet the requirements of 14 CFR Part 60 for Class I and II Level D airport models unless otherwise specified herein.

**3.2.1.4.2.2** Airfield models and high resolution areas shall not require any specific routes for ingress and egress.

**3.2.1.4.2.3** Airfield models and high resolution areas shall be provided for actual locations, including the Air Force Bases (AFBs) at the FTU, the KC-46 MOBs, and other airfield and high resolution areas to be specified by AF, for a total of 30 airfield models and high resolution areas.

**3.2.1.4.2.4** Airfield models and high resolution areas shall provide features found on AF approved 1:62,500 scale quad charts to a distance of 15 NM from the airfield model and high resolution area center, including changes found in chart updating manuals.

**3.2.1.4.2.5** Airfield models and high resolution areas shall provide features found on AF approved 1:250,000 scale flight charts from 15 NM to a distance of 25 NM from the airfield model and high resolution area center, including changes found in chart updating manuals.

**3.2.1.4.2.6** Airfield models and high resolution areas shall provide high resolution geo-specific imagery with 1 m or better resolution out to 15 NM, and smoothly transition to 5 m or better resolution from 15 NM out to 25 NM from the airfield model and high resolution area center (see the Glossary in paragraph 5.1 for a definition of smoothly).

**3.2.1.4.2.7** At the 25 NM point from the airfield model and high resolution area center, terrain and features shall smoothly transition to the worldwide visual database.

**3.2.1.4.2.8** Airfield models and high resolution areas shall provide scene content and features in the vicinity of the runways and their approaches that maximizes Image Generator (IG) capacity and airfield models and high resolution area terrain and feature density.

**3.2.1.4.2.9** At least 55 photo-specific three-dimensional models shall be modeled per airfield model and high resolution area, and approved by the AF, in addition to all other features requirements.

**3.2.1.4.2.10** Airfield models and high resolution areas shall provide the types, locations, and densities for cultural lightpoints in the night and dusk scenes, to represent urban areas, commercial buildings and complexes, residential buildings, major highway interchanges, and vehicular lighting on major highways.

**3.2.1.4.3** **<u>WST Database Models</u>**. Airborne and ground moving models shall be modeled to provide visual cues for taxi, takeoff, and landing training, formation flight training, aerial refueling tanker training, and aerial refueling receiver training with KC-46, KC-10, and KC-135 tanker models.

**3.2.1.4.3.1** Moving models shall provide multiple levels of details to maintain the illusion of realism in case students stray closer to the moving model than anticipated.

**3.2.1.4.3.2** Moving models shall be provided with realistic behaviors that meet 14 CFR Part 60 Level D requirements.

**3.2.1.4.3.3** Companion and refueling tanker models shall display external lights, external NVIS lights, articulating boom, WARPs, and drogues with hoses.

**3.2.1.4.3.4** Refueling tanker models shall correctly display director lights based upon the WST's position within the aerial refueling envelope for aerial refueling training.

**3.2.1.4.3.5** Generic relocatable airfields shall be provided with the following IOS selectable parameters:

a. Runway dimensions, markings, and shape.

b. Runway configurations, orientation, crown, and grade.

c. Visual Approach Slope Indicator (VASI) type and angle.

d. Approach lighting.

e. Beacon type.

f. Terrain type to match the surrounding terrain.

**3.2.1.4.3.5.1** Each generic relocatable airfield shall be insertable via the IOS and via an automated mission profile at any location, elevation, or rotation and conform to the underlying terrain in the worldwide database.

**3.2.1.4.3.5.2** Each generic relocatable airfield shall provide for training the transition from instrument approach to visual contact at approach minimums during instrument landings and provide for landing, taxi, and take off.

**3.2.1.4.3.6** Selectable special effect models, approved by the AF, shall be provided for KC-46 Aircraft training to include:

a. Appropriate Weapons Engagement Zone (WEZ) effects and characteristics.

b. Formation aircraft moving models with articulating gear and flaps.

c. Flares.

d. Man-Portable Air-Defense System (MANPADS) and Rocket-Propelled Grenades (RPGs) fly outs with smoke trail.

e. Surface-to-Air Missile (SAM) fly outs with smoke trail.

f. Anti-Aircraft Artillery (AAA) muzzle flash, tracer, and airburst.

g. NVIS effects.

**3.2.1.4.4** **WST Database Correlation**. The source data for the worldwide database, airfield models, and high resolution areas shall be used as the source data for other ATS geo-spatial databases to ensure model, feature, and terrain correlation between the databases

**3.2.1.5** **WST Cockpit**

**3.2.1.5.1** The WST shall replicate the KC-46 Aircraft cockpit and seats as defined by aircraft data, from the flight deck partition forward using a combination of actual aircraft equipment and simulated hardware equivalent to the aircraft in form, fit, function, feel, and finish.

**3.2.1.5.2** The WST shall provide realistic communications to include intercom and interphone to and from the boom operator, and radio transmissions to and from other aircraft and ground stations (see the Glossary in paragraph 5.1 for a definition of interphone).

**3.2.1.5.3** The WST cockpit emergency equipment, including Aircrew Flight Equipment (AFE), shall be actual aircraft equipment in the same locations as in the aircraft (see the Glossary in paragraph 5.1 for a definition of aircrew flight equipment).

**3.2.1.5. 4** The WST cockpit shallhave NVIS compatible lights, displays, and controls IAW KC-46 Aircraft data.

**3.2.1.6 WST Non-Cockpit Aircraft Systems**. The WST shall functionally replicate all KC-46 Aircraft non-cockpit systems and subsystems and are equivalent to KC-46 Aircraft operations, performance, and interactions in all simulation environments.

**3.2.1.7 WST Motion and Control Loading Systems**. The WST shall include electrically controlled and actuated motion and control loading systems that meet 14 CFR Part 60 Level D and ARASQ Rev C Level D requirements.

**3.2.1.8 WST Aural Cueing System**. The WST shall include an aural cueing system that meets 14 CFR Part 60 Level D and ARASQ Rev C Level D requirements.

**3.2.1.9 WST Instructor Operator Station (IOS)**

**3.2.1.9.1** The IOS shall be mounted on the flight deck aft of the aircrews' positions.

**3.2.1.9.2** During real-time operations the IOS shall provide the instructor full control over the training event, and allow the instructor to switch to a different scenario within two minutes.

**3.2.1.9.3** The fully functional IOS shall provide for WST operations, WST hardware and software installation, integration, modification, and upgrades, and verification of the WST (see the Glossary in paragraph 5.1 for a definition of verification).

**3.2.1.9.4** The IOS shall provide a library of no less than 99 IC setup files for the WST and all the databases.

**3.2.1.9.5** The IOS shall provide control for weather and climate effects as specified in 14 CFR Part 60 for Level D.

**3.2.1.9.6** The IOS shall utilize computer workstations with touch screen input to present pertinent information for use in simulation exercise initialization, modification, control, and monitoring.

**3.2.1.9.7** The IOS lights, displays, and controls shall not be visible from the cockpit and not interfere with cockpit NVIS compatibility.

**3.2.1.9.8** The IOS shall provide a color printer for producing color hard copies of the data displayed on the IOS screens.

**3.2.1.9.9** The IOS shall have mechanical switches to accomplish the following functions:

a. Engage or disengage the motion system and access ramp.

b. Emergency power off capability.

c. Freeze and unfreeze the simulation exercise.

d. Shut down the electric control loading.

e. Variable brightness control of all IOS lights, displays, and controls from off to a maximum or full brightness level.

**3.2.1.9.10** The IOS shall provide a portable IOS control unit for over-the-shoulder instruction.

**3.2.1.9.11** IOS display and control software shall provide the following:

a. Multiple simultaneous windows

b. Color.

c. Graphical representations of data and systems.

d. Icons and icon bars.

e. Pop-up windows.

f. Menus.

g. Tool bars.

h. Button bars.

i. Data displays.

j. Map displays (cross country).

k. Refueling tracks.

l. Aircraft tracks.

m. Plot displays, including approach and departure, Instrument Landing System and Ground Control Approach (ILS/GCA), FARP, moving models, and threats.

n. Track erase.

**3.2.1.9.12** IOS pages shall have consistent layout and nomenclature.

**3.2.1.9.13** IOS instructional features software shall provide for the following:

a. Aircrew member switch monitoring.

b. Aircrew member display monitoring.

c. Problem freeze, parameter freeze, and system freeze.

d. Crash override.

e. Setting and resetting ICs in real-time.

f. Monitoring current conditions.

g. Mission recording and reviewing (automatic demonstrations, automatic playback, automatic voice record and playback system, automatic message system).

h. Event data logging.

i. Network data logging during local and DMO network events.

j. Displaying network health and status during local and DMO network events.

**3.2.1.9.14** The IOS shall display information about the mission and aircrew member performance with regards to planned versus actual mission execution.

**3.2.1.9.15** The IOS shall provide for instructor loading of predetermined missions and present on a single page mission flow, timeline, and pre-planned actions for the training session.

**3.2.1.9.16** The IOS shall provide for manual setup of mission parameters for a training session by the instructor.

**3.2.1.9.16.1** The IOS shall provide for storing an entire mission setup in the IC library and changing IC parameters for a mission both offline and in real-time.

**3.2.1.9.16.2** The IOS shall provide for the instructor to select an airfield to determine the particular approach, departure, and ILS/GCA plots.

**3.2.1.9.16.3** The IOS shall provide for the instructor to simulate activation of cargo compartment and ground crew controls and equipment.

**3.2.1.9.17** The IOS shall provide for the instructor to activate, deactivate, and set the parameters for relocatable airfields, threats, visual models, and weather conditions.

**3.2.1.9.18** The IOS shall provide for the instructor to manually and automatically activate deactivate, and monitor aircraft malfunctions identified in the aircraft data.

**3.2.1.9.18.1** Aircraft malfunctions shall accurately depict system responses to failures and to demonstrate system's performance and aircrew's responses for abnormal and emergency procedures contained in the approved aircraft flight manuals.

**3.2.1.9.19** The IOS shall be able to adjust KC-46 ownship (WST), tanker, and receiver parameters, including:

a. Position and Heading.

b. Ground Parameters.

c. Flight Parameters.

d. Environmental Conditions.

e. Aircraft configuration (see the Glossary in paragraph 5.1 for a definition of configuration).

f. Quick starts and resetting of variables for the engines, Auxiliary Power Units (APUs), and Inertial Reference Units (IRUs).

**3.2.1.9.20** The IOS shall provide control of airfield and approach lighting, and insertion and deletion of static and moving models as airfield obstacles.

**3.2.1.9.21** The IOS shall provide the instructor a graphic screen display(s) of the circuit breaker panels and provide for the instructor to open and close circuit breakers on the WST circuit breaker panels.

**3.2.1.9.22** The IOS shall provide the capability to place the tanker and receiver aircraft in predetermined aerial refueling tracks per ATP-56(B).

**3.2.1.9.22.1** Aerial refueling standardized positions shall start from Rendezvous Initial Point (RVIP) and end at post aerial refueling positions at the conclusion of aerial refueling.

**3.2.1.9.22.2** Movement between each position for the tanker and receiver aircraft shall be both instantaneous and transitional from one to another position.

**3.2.1.9.22.3** The IOS shall provide for the instructor to control breakaway scenarios per ATP-56B.

**3.2.1.9.23** The IOS shall provide for moving the tanker and receiver aircraft completely outside the refueling envelope to simulate overrun and underrun conditions.

**3.2.1.9.24** The IOS shall display the following tanker and receiver aircraft information:

a. Airspeed, heading, latitude, longitude, altitude, attitude, and rate of climb and descent (in feet per second).

b. Lateral, vertical, and longitudinal offsets relative to the tanker and receiver aircraft positions.

c. Relative offsets from the ideal contact position in degrees and feet in a map view.

d. Fuel transfer information.

e. Number and duration of receiver contacts.

f. Aerial refueling systems' status.

g. Rendezvous status and progress.

h. Rate of movement while moving to and from pre-contact (astern) and contact positions.

i. Display of tanker limits.

j. Tanker and receiver aircraft Identification, Friend or Foe (IFF) and Tactical Air Navigation (TACAN) frequencies.

**3.2.1.9.25** The IOS shall provide for a moving map display which shows the following:

a. Threats with range rings.

b. Obstacles.

c. Planned flight route to scale, to include enroute airways, waypoints, airway markers, and airports.

d. Aerial refueling tracks and areas.

e. Navigation aids (NAVAIDS).

f. Terrain features.

g. Instructor selected mission information.

h. Airspace restrictions and boundaries.

i. Receiver(s) and tanker(s) icons to include enroute formations.

j. Flight Information Region (FIR) boundaries.

**3.2.1.9.26** The IOS shall provide for the instructor to build mission routes using the map display.

**3.2.1.9.27** The IOS shall provide for the instructor to “Drag and Drop” threats, ownship, moving models, and obstacles at any location within the database.

**3.2.1.9.28** The IOS shall provide for the instructor to both compose and select a set of preprogrammed datalink messages, and set the conditions under which the datalink messages are automatically sent to the WST.

**3.2.1.9.28.1** The IOS shall provide for the instructor to enable and disable the automatic sending of data link messages.

**3.2.1.9.29** The IOS shall provide for the instructor to turn alarm bells and klaxon horns on and off.

**3.2.1.9.30** The IOS shall provide for instructor communication with the aircrew members over any ownship simulated radio and directly over the intercom and interphone system.

**3.2.1.9.31** When a WST and BOT are linked as a single aircraft, the IOS shall provide for communication directly between the pilot instructor and boom operator instructor over a private system or channel.

**3.2.1.9.32** The IOS shall provide for the instructor to select a computer generated communication simulation and act as a separate entity to communicate with the pilots.

**3.2.1.9.32.1** The IOS shall provide for the instructor to enable and disable the computer generated communication simulation.

**3.2.1.9.33** The IOS shall provide for the instructor to activate and control a minimum of 64 DCS models simultaneously.

**3.2.1.9.34** The DCS models shall be used for any combination of the following:

a. Airborne moving models, friendly and threat aircraft, with appropriate Infrared (IR) and Radio Frequency (RF) characteristics.

b. Ground moving models, friendly and threat vehicles, with appropriate IR and RF characteristics.

c. Thunderstorm models, with appropriate rain, visibility, and lightning effects.

**3.2.1.9.35** The IOS shall provide for the instructor to manually control moving models for a lead formation aircraft and any other moving models with a hardware joystick to "fly" the selected model.

**3.2.1.9.35.1** Joystick control shall include airspeed, heading, altitude, and attitude.

**3.2.1.9.35.2** Airspeed, heading, altitude, and attitude shall be displayed for the joystick controlled moving model.

**3.2.1.9.36** The IOS shall provide for the instructor to automatically control other aircraft, to include formation aircraft and tanker aircraft, based on:

a. Instructor inputs for external lights on and off.

b. Simulated pilot skill and aggression levels.

c. Altitude, closure, and maneuvering settings.

**3.2.1.9.36.1** The IOS shall provide for the instructor to select individual aircraft in the formation for automatic control.

**3.2.1.9.36.2** The IOS shall provide for the instructor to select the rendezvous procedures to be utilized by the tanker and receiver aircraft for the established aerial refueling routes and locations IAW ATP-56(B).

**3.2.1.9.37** The IOS shall provide a minimum of 20 TCAS profiles.

**3.2.1.9.38** A minimum of eight wind shear models shall be provided that meet the requirements of 14 CFR Part 60, and are selectable by the instructor.

**3.2.1.9.39** The IOS shall include help screens to provide explanations and assistance for specific IOS functions.

**3.2.1.9.40** The IOS shall provide separate pages for conducting automatic and manual tests for initial and annual Simulator Certifications (SIMCERTs) (see the Glossary in paragraph 5.1 for a definition of Simulator Certification).

**3.2.1.9.41** The IOS shall provide Snapshot Store and Recall Function to quickly save 20 or more snapshots of the WST's conditions and parameters at any time during the mission which can be used to restore the WST to that previous state.

**3.2.1.9.42** The IOS shall automatically make a continuous recording of the simulated mission, to include visual, cockpit video and audio, and aural cues that can be replayed in the WST or on the Brief/Debrief System (B/DS).

**3.2.1.9.42.1** The continuous mission recording shall be available for replay through an instant replay page at the IOS.

**3.2.1.9.42.2** The continuous mission recording shall not be erased if interrupted due to both computer stoppage or power failure.

**3.2.1.9.42.3** The continuous mission recording shall be paused whenever the simulator is in system freeze.

**3.2.1.9.42.4** The IOS shall allow the instructor to make 20 or more mark points per hour during mission recording for both debrief or replay purposes in the WST.

**3.2.1.9.42.5** The IOS shall provide for the instructor to add comments or notes to mark points.

**3.2.1.10 <u>WST Brief/Debrief System</u>**

**3.2.1.10.1** The B/DS shall provide for conducting WST training mission briefings and debriefings to include debriefing of aircrew member performance.

**3.2.1.10.2** The WST shall provide an off platform interactive aircrew member B/DS with the real-time capability to play, pause, stop, fast reverse, fast forward, zoom in and out, and pan through a re-creation of the training mission using both planning and recorded data and imagery.

**3.2.1.10.3** For training mission briefings using planning data, the B/DS shall provide:

a. An overhead view of the ownship's taxi path overlaid on a scalable approach plate graphic.

b. An overhead view of the ownship's flight path overlaid on a scalable topographic map.

**3.2.1.10.4** On-board video camera(s) and voice recorders shall capture aircrew member actions and audio, to include cockpit, instructor, and radio and interphone communications for debrief.

**3.2.1.10.5** Audio, video, and recorded WST mission data shall be stored electronically and downloaded to the B/DS within three minutes from activation at the B/DS.

**3.2.1.10.6** The B/DS shall provide for the instructor to play back the recorded training mission in its entirety, from any mark point, and from any point in time.

**3.2.1.10.7** For training mission debriefings using the recorded data downloaded from the WST, the B/DS shall provide:

a. An overhead view of the ownship's taxi path overlaid on a scalable approach plate graphic with a selectable transparent icon or aircraft model with the nose and main gear trucks and pilot's and copilot's seats so the aircrew can see the trucks' and pilots' positions during taxi playback.

b. An overhead view of the ownship's approach path overlaid on a scalable topographic map with glide slope indicated.

c. A side view of the ownship's approach path overlaid on a scalable terrain elevation graphic with glide slope indicated.

d. An overhead view of the KC-46 ownship's (WST) complete mission flight path overlaid on a scalable topographic map.

e. Other airborne models' flight path overlaid on the same scalable topographic map as the ownship's flight path.

f. Cockpit switch positions, control positions, display information, and indicator reading.

g. Forward FOV imagery for the selected eye point.

h. Timeline of the mission with event markers for all tankers and receivers.

i. Display of recorded audio and video from the WST cockpit.

**3.2.1.10.8** The B/DS shall provide a color printer to print copies of any of the B/DS's displays, to include printing of aircrew member performance data.

**3.2.1.11 WST Threat Generation System**

**3.2.1.11.1** The threat generation system shall use eXpert Common Immersive Theater Environment (XCITE) threat generation software and utilize the functions, capabilities, and models of that threat generation software.

**3.2.1.11.2** The threat generation system shall be provided to generate both threat and non-threat emitters as identified in the KC-46 Aircraft SS (see the Glossary in paragraph 5.1 for a definition of emitter).

**3.2.1.11.3** The threat generation system shall be a server-based computer system providing single ship, local network, and MAF DMO modes of operation.

**3.2.1.11.4** Threat generation system emitters shall be modeled in the visual system databases and displayed by the WST visual system.

**3.2.1.11.5** Threat generation system emitter signal sensing shall be correlated in real-time, with terrain and features in the visual system database.

**3.2.2 Boom Operator Trainer (BOT)**

**3.2.2.1 General BOT Requirements**

**3.2.2.1.1** The BOT shall provide for initial qualification, requalification, continuation, and upgrade training of boom operators in KC-46 Aircraft aerial refueling procedures as listed in Tables 3.1.3.2.7 and 3.1.3.3.3 above.

**3.2.2.1.2** The design, performance, and fidelity of the BOT shall provide training for those MTTL tasks assigned to the BOT.

**3.2.2.1.3** The BOT shall provide training for all fielded versions of KC-46 aircraft Operational Flight Programs (OFPs).

**3.2.2.1.4** The BOT shall replicate the KC-46 Aircraft Aerial Refueling Operator (ARO) station and the design shall meet the device Boom Operator Simulator Standards, Validation, Function and Subjective requirements set forth in ARASQ Rev C for Level 2 (see the Glossary in paragraph 5.1 for a definition of Aerial Refueling Operator).

**3.2.2.1.5** The BOT shall meet the Quality Performance Standards for a Level D FFS specified in 14 CFR Part 60 Table A2A, Full Flight Simulator (FFS) Objective Tests, Test Entry Numbers 2.c.9, Phugoid Dynamics, and 2.c.10, Short Period Dynamics (see the Glossary in paragraph 5.1 for a definition of phugoid).

**3.2.2.1.6** BOT transport delay, as defined for the WST, shall be 100 ms or less.

**3.2.2.1.7** At the MOBs, the BOT shall operate as both an unclassified and a classified training device with classification-appropriate processing architectures and data storage mechanisms.

**3.2.2.1.8** The BOT shall provide for visually scanning for air traffic and threats in all mission segments with the ARO station displays.

**3.2.2.1.9** The BOT shall automatically download and store, for later retrieval, flight data and simulation data identified in the SOW for SOQA, after every BOT training session.

**3.2.2.1.10** The BOT shall provide the following subsystems:

a. Image Generator System.

b. Databases.

c. ARO station.

d. Non-ARO station Aircraft Systems.

e. Motion and Control Loading Systems.

f. Aural Cueing System.

g. Instructor Operator Station.

h. Brief/Debrief System.

**3.2.2.2** **<u>BOT Image Generator (IG) System</u>**

**3.2.2.2.1** The BOT IG system shall provide the boom operator with visual representations to enable the boom operator to identify visual cues from the external environment, aerial refueling boom, centerline drogue, WARPs, and receiver aircraft, and provide the boom operator with situational awareness during the course of KC-46 Aircraft missions.

**3.2.2.2.2** The IG system provided shall be the same type of IG system used for the WST Visual System and meet the same requirements as described in Paragraph 3.2.1.2 and subparagraphs, except for specific requirements that relate to NVIS and display system.

**3.2.2.2.3** The IG system shall provide ARO imagery that meets the appearance, performance, and functional requirements of the actual KC-46 Aircraft imagery, including IR imagery.

**3.2.2.2.4** The IG system shall correlate receiver aircraft control surface articulation and animation with the control inputs generated by the respective receiver piloting algorithms (see the Glossary in paragraph 5.1 for a definition of algorithm).

**3.2.2.2.5** The IG system shall provide the display modes of the KC-46 Aircraft ARO station at the KC-46 Aircraft update rate in day, night or dusk modes both with and without weather and other effects as specified in Paragraph 3.2.1.2 and subparagraphs.

**3.2.2.2.6** In the event of IG system overload, scene overload management shall maintain the visible details on all the active aircraft to be refueled.

**3.2.2.3 BOT Databases**

**3.2.2.3.1** The BOT shall use the same worldwide database, airfield models, and high resolution areas as the WST and meet the same requirements as described in Paragraph 3.2.1.4 and subparagraphs.

**3.2.2.3.2** Aerial refueling boom and WARPs and centerline drogues graphic models that represent actual aircraft boom and WARPs and centerline drogues and their functionality shall be provided.

**3.2.2.3.2.1** Aerial refueling boom and WARPs and centerline drogues model textures shall be generated using accurate textures and photographic images of the boom and WARPs and centerline drogues.

**3.2.2.3.3** Receiver aircraft models that represent all the aircraft listed in ATP-56(B) shall be provided.

**3.2.2.3.3.1** The receiver aircraft model textures shall be generated using accurate textures and photographic images of the ATP-56(B) aircrafts.

**3.2.2.3.3.2** Tanker and receiver aircraft with correct aircraft lighting shall be provided to include:

a. Landing lights.
b. Taxi lights.
c. Upper and lower anti-collision lights.
d. Wing illumination lights.
e. Left and right position lights.
f. Left and right anti-collision lights.
g. Runway turnoff lights.
h. Air refueling Pilot Director Lights (PDL) (boom refueling).
i. Drogue contact/flow/disconnect lights.
j. Formation strip lights.
k. Aerial refueling illumination lights.
l. Boom lights.
m. Navigation lights.
n. Tail mounted flood lights.
o. Logo lights.
p. Engine nacelle lights.
q. Probe lights.

**3.2.2.3.3.3** Tanker and receiver aircraft with correct moving and non-moving features shall be provided to include:

a. Rudder.

b. Ailerons.

c. Flaps (trailing edge).

d. Slats (leading edge - sometimes called leading edge flaps).

e. Spoilers and speedbrakes.

f. Elevator.

g. Horizontal stabilizer.

h. Trim tabs (for rudder, ailerons, stabilizer, and elevator).

i. Receptacle, slipway, and receptacle doors.

j. Landing gear doors.

k. Boom and boom control surfaces including boom hoist cable.

l. Drogue and hose.

m. WARP drogues and ram air turbine.

n. Antenna(s).

o. Propellers.

p. Wing and engine movement.

q. Cabin entry doors (non-moving).

r. Cargo door (non-moving).

s. Cockpit windows (non-moving).

t. Ram air inlet door (non-moving).

u. Ram air exhaust door (non-moving).

v. APU air inlet door (non-moving).

w. Compartment access doors (non-moving).

x. Cabin pressure relief doors (non-moving).

**3.2.2.3.3.4** The greatest visual detail on the tanker and receiver aircraft shall be the boom nozzle area and from the receiver nose to the area one foot aft of the aerial refueling receptacle.

**3.2.2.3.4** A receiver aircraft pilot model shall be provided that has articulating arms, head, and fingers and a red moving and flashing light source for signaling the boom operator during aerial refueling without radio communications.

**3.2.2.4 BOT ARO station**

**3.2.2.4.1** The BOT shall replicate the KC-46 Aircraft interior, including ARO station and seats as defined by aircraft data, from the flight deck partition to a point at least 18 inches aft of both the ARO station and door one left using a combination of actual aircraft equipment and simulated hardware equivalent to the aircraft in form, fit, function, feel, and finish.

**3.2.2.4.2** The ARO station shall provide communications to include

a. Boom interphone.

b. Intercom and interphone to and from the WST.

c. Radio transmissions to and from the simulated receiver aircraft.

**3.2.2.4.3** The ARO station emergency equipment, including AFE, shall be actual aircraft equipment in the same locations as in the aircraft.

**3.2.2.5 BOT Non-ARO Station Aircraft Systems**. The BOT shall functionally replicate all KC-46 Aircraft non-ARO station systems and subsystems (excluding cabin doors and lavatory) and are equivalent to KC-46 Aircraft operations, performance, and interactions in all simulation environments.

**3.2.2.6 BOT Motion and Control Loading Systems**. The BOT shall include an electrically controlled and actuated motion and control loading systems that meets ARASQ Rev C Level 2 and meets the requirements for a Level D FFS under 14 CFR Part 60 Table A2A, Full Flight Simulator (FFS) Objective Tests, Test Entry Numbers 2.c.9, Phugoid Dynamics, and 2.c.10, Short Period Dynamics.

**3.2.2.7 BOT Aural Cueing System**

**3.2.2.7.1** The BOT shall use the same aural cueing system as the WST and meet the same requirements as described in Paragraph 3.2.1.8 and subparagraphs.

**3.2.2.7.2** The BOT shall provide audio cues that replicate the KC-46 Aircraft sounds heard by a boom operator.

**3.2.2.8 BOT Instructor Operator Station (IOS)**

**3.2.2.8.1** The BOT IOS shall be mounted on the motion base near the ARO station to allow a single instructor to operate the IOS.

**3.2.2.8.2** The IOS shall include a portable control unit to allow a single instructor to operate the IOS while seated at an ARO station position.

**3.2.2.8.3** The BOT shall use the same type of IOS as the WST and meet the same requirements as described in Paragraph 3.2.1.9 and subparagraphs.

**3.2.2.8.4** The IOS shall provide the following automated tanker maneuvers:

a. All-engine takeoff and landing.

b. Normal takeoff with straight and climbing turn departures.

c. Normal landing.

d. Crosswind takeoff.

e. Enroute climb.

f. Normal and penetration descent approach patterns.

g. Go-around.

h. Abort,

i. Underrun.

j. Overrun.

k. Tanker Breakaway.

**3.2.2.8.5** The IOS shall be able to adjust KC-46 ownship (BOT), and receiver parameters, including:

a. Position and heading.

b. Ground parameters.

c. Flight parameters.

d. Environmental conditions.

e. Aircraft configuration, including tanker autopilot on and tanker autopilot off.

f. Engines and APU starting and resetting of variables.

**3.2.2.8.5.1** Parameters that can be set by the instructor while mission building shall be adjustable during a training session without interruption.

**3.2.2.8.6** The IOS shall provide for the instructor to manually control the ownship and receiver model's airspeed, heading, altitude, and attitude.

**3.2.2.8.7** The IOS shall provide for the instructor to automatically control the ownship and receiver model based on instructor inputs.

**3.2.2.8.7.1** The IOS shall provide for the instructor to simultaneously position the ownship and receiver model in the lateral, longitudinal and vertical directions, and roll, pitch, and yaw axes; however, any changes shall not take effect until the instructor executes the change.

**3.2.2.8.7.2** The IOS shall provide for the instructor to modify ownship and receiver closure parameters from the observation position through the reform position (e.g., closure rate, high or low in envelope); however, any changes shall not take effect until the instructor executes the change.

**3.2.2.8.8** The IOS shall provide for the instructor to independently control the following:

a. Receiver external lights.

b. Ownship and receiver simulated pilot skill and aggression levels.

c. Receiver receptacle.

d. Receiver disconnects.

e. Receiver manual boom latch.

f. Receiver control surfaces.

g. Selection of individual receiver aircraft in formation for control.

h. Opening and closing the probe.

**3.2.2.8.9** The IOS shall provide for the instructor to automatically move the receiver model in response to the boom operator's actuation of the PDL and movement of the boom.

**3.2.2.8.10** The IOS shall provide for the instructor to place the receivers and ownship in predetermined aerial refueling tracks per DoD FLIP AP/1B and random tracks via latitude and longitude.

**3.2.2.8.10.1** Aerial refueling standardized positions shall start from RVIP and end at post aerial refueling positions at the conclusion of aerial refueling.

**3.2.2.8.10.2** Movement between each position for each individual receiver and ownship shall be both instantaneous and transitional from one to another position.

**3.2.2.8.10.3** The IOS shall provide for the instructor to control ownship and receiver breakaway scenarios per ATP-56(B), including single aircraft maneuvers.

**3.2.2.8.11** The IOS shall provide for moving the receiver and ownship completely outside the refueling envelope to simulate overrun and underrun conditions.

**3.2.2.8.12** The IOS shall display the following receiver and ownship information:

a. Airspeed, heading, latitude, longitude, altitude, and attitude.

b. Lateral, vertical and longitudinal offsets relative to the receiver and tanker position.

c. Relative offsets from the ideal contact position in degrees and feet with a map view.

d. Fuel transfer information.

e. Ownship gross weight and Center of Gravity (CG).

f. Number and duration of receiver contacts.

g. Aerial refueling systems' status.

h. Rendezvous status and progress.

i. Rate of movement while moving to and from astern (pre-contact) and contact positions.

j. PDL indications.

k. Communication panel settings and activation.

**3.2.2.8.13** The IOS shall provide for the instructor to monitor performance of boom operator checklists pertaining to aircraft operations by stepping through the checklist as it is processed and highlighting boom operator errors and omissions.

**3.2.2.8.13.1** The IOS shall provide for the instructor to both suspend and change the training mission as a result of the boom operator's proficiency, errors, and omissions.

**3.2.2.8.14** The IOS shall provide for the instructor to manually and automatically activate, deactivate, and monitor ARO station malfunctions identified in the aircraft data.

**3.2.2.8.15** ARO station malfunctions shall accurately depict system responses to failures and to demonstrate system's performance and flight crew responses for abnormal and emergency procedures contained in the approved aircraft flight manuals.

**3.2.2.9 BOT Brief/Debrief System**. The BOT shall use the same type of B/DS as the WST and meet the same requirements as described in Paragraph 3.2.1.10 and subparagraphs.

### 3.2.3 Fuselage Trainer (FuT)

### 3.2.3.1 General FuT Requirements

**3.2.3.1.1** The Fuselage Trainer (FuT) shall consist of a full-scale replica of the KC-46 Aircraft cargo compartment starting at and including door one left (forward entry door) including the aft entry door (bulk cargo door); fully functional cargo door; entry doors; an ARO station with all functionality for cargo ground training; the outside underbody of the fuselage from the forward edge of the FuT to a minimum of eight feet aft of the FARP/ground fueling and de-fueling panel or cargo door whichever is further aft; an aircraft interior cargo area with all contours, restrictions, cargo floor, rollers, permanent equipment, and attached equipment as in the actual aircraft. (see the Glossary in paragraph 5.1 for a definition of Fuselage Trainer).

**3.2.3.1.2** The FuT shall provide the KC-46 Aircraft equipment and components needed for cargo loading and unloading, AE, passenger handling, aircrew and passenger emergency egress and safety, firefighting, aircrew ground refueling and FARP training.

**3.2.3.1.3** The design, performance, and fidelity of the FuT shall provide training for those MTTL tasks assigned to the FuT.

**3.2.3.1.4** The FuT main cargo deck shall be the same distance above the ground as the aircraft main cargo deck and interface with AF aerial port material handling equipment (see the Glossary in paragraph 5.1 for a definition of aerial port).

**3.2.3.1.5** The FARP/ground refueling and de-fueling panel shall be the same distance above the ground as the aircraft FARP/ground refueling and de-fueling panel.

**3.2.3.1.6** The FARP refueling/defueling panel on the FuT shall have fuel hose connections that replicate those on the aircraft.

**3.2.3.1.7** Instructor controls, trainer controls, and flight deck displays necessary for training shall be placed in an easily accessible location adjacent to the FuT for crewmember and instructor use.

### 3.2.3.2 FuT Aural Cueing System

**3.2.3.2.1** The FuT shall use the same type of aural cueing system as the WST and shall replicate the amplitude and frequency of all aircraft alarms, warnings, PA system communications, and all system control station sounds heard during the course of cargo loading and unloading operations, to include all normal, abnormal, and emergency procedures.

**3.2.3.2.2** FuT aural cueing system volume control(s) shall have an indication of sound level setting which meets the requirements of 3.2.3.2.1.

### 3.2.3.3 FuT Emergency Egress and Safety Equipment

**3.2.3.3.1** The FuT shall include the emergency equipment IAW KC-46 Aircraft data and necessary for emergency egress and safety training.

**3.2.3.3.2** The FuT shall provide operational doors, emergency egress equipment, and safety equipment IAW KC-46 Aircraft data, except for the aft left door which shall operate but not include an operational slide raft.

**3.2.3.3.2.1** Doors, emergency egress equipment, and safety equipment shall be resettable within 30 minutes.

**3.2.3.3.3** The FuT shall provide aircrew training on the stowage and employment of AFE.

**3.2.3.3.3.1** The FuT shall provide a functional oxygen system with controls, displays, and breathable air.

**3.2.3.3.4** The FuT shall provide the aircrew firefighting equipment IAW KC-46 Aircraft data.

**3.2.3.3.4.1** The FuT shall provide functional fire warning systems, alarms, and displays to the extent necessary to accomplish firefighting training.

**3.2.3.4** **Cargo Material Handling Equipment**. The FuT shall provide the following equipment for securing cargo loads IAW the KC-46 Aircraft data:

a. Twenty (20) 463L Pallets (see the Glossary in paragraph 5.1 for a description of 463L pallets) (National Stock Number (NSN) 1670-00-820-4849 CT).

b. Eight (8) Cargo Pallet Tie-Down Top Nets (NSN 1670-00-969-4103 CT).

c. Sixteen (16) Cargo Pallet Tie-Down Side Nets (2 per top net) (NSN 1670-00-996-2780 CT).

d. Six (6) Pallet Couplers (see the Glossary in paragraph 5.1 for a description of pallet couplers) (NSN 1670-01-487-8743 CT).

e. Seventy (70) Nylon Tie-down Straps (NSN 1670-00-725-1437).

f. Four (4) Cargo Pallet Covers (NSN 3990-00-930-1480).

g. Twenty-four (24) 10,000 Pound Tie-down Chains (NSN 1670-00-518-8405).

h. Twenty-four (24) 10,000 Pound Chain Adjusters (NSN 1670-00-212-1149).

i. One (1) Halvorsen Loader (25K) (NSN 3930-01-480-9519CT)

j. One (1) Forklift (10K) (NSN 3930-01-087-3105)

**3.2.3.5 <u>Cargo Practice Loads</u>**. The FuT shall provide the following non-operational practice loads, using actual equipment and materials, for the assigned MTTL tasks:

a. One (1) M880 (Pickup Truck) or Equivalent (NSN 2320-00-579-8942).

b. One (1) Fighter Engine Trailer with a simulated fighter engine (NSN 1740-01-381-2919) (see the Glossary in paragraph 5.1 for a description of an engine trailer).

c. One (1) B-1 Stand (NSN 1730-00-390-5618) (see the Glossary in paragraph 5.1 for a description of a B-1 stand).

d. Five (5) F-22 Fighter Aircraft Jacks – Two (2) Nose Landing Gear (NSN1730-00-781-9711) and Three (3) Main Landing Gear (NSN 1730-00-865-7838).

e. Ten (10) Inert Fire Bottles (NSN 4210-01-140-2233).

f. One (1) Inert Liquid Oxygen (LOX) Cart (NSN 3655-00-043-4062).

g. Two (2) Purged F-16 Wing Tanks (NSN 1560-01-151-6156) and One (1) F-16 Wing Tank Trailer (NSN 1730-01-355-8410).

h. One (1) Stack of Fifteen 463L Pallets (NSN1670-00-820-4849 CT).

i. One (1) Stack of Five 463L Pallets (NSN1670-00-820-4849 CT).

j. Ten (10) 55 Gallon Drums (Metal or Plastic) filled with sand (NSN 8110-00-597-2353).

k. Ten (10) Generic Warehouse Wood Pallets (notionally 48"Wx40"L).

l. Ten (10) Empty Ammunition crates (NSN 8140-01-366-0523).

m. Two (2) Generic Empty Metal Tool Boxes with Operable Wheels (notionally 42"Wx18"Dx60"H).

n. Four (4) Generic Empty Wooden or Plastic Crates (notionally 36"Lx22"Wx22"H).

o. Two (2) Internal Airlift and Helicopter Slingable-Container Units (ISUs) 90KCI (see the Glossary in paragraph 5.1 for a description of an Internal Airlift and Helicopter Slingable-Container Unit) (NSN 8145-01-465-4140).

p. Two (2) ISU 80s (NSN 8145-01-501-0843).

q. Two (2) ISU 60s (NSN 8145-01-465-3629).

r. Two (2) 10 Passenger Seating Pallets (NSN 1680-01-572-0471).

s. Two (2) 15 Passenger Seating Pallets (NSN 1680-01-595-4110).

t. One (1) simulated Air Transportable Galley/Lavatory Comfort Pallet with functional installation connections (NSN 7360-01-328-5127).

**3.2.3.6** **Aeromedical Evacuation Equipment**. The FuT shall provide the following AE equipment:

a. One (1) Patient Support Pallet (PSP) (see the Glossary in paragraph 5.1 for a description of Patient Support Pallet) (NSN 6530-01-567-4805).

b. One (1) Litter Stanchion Augmentation Sets (LSAS) (NSN 1680-01-558-5867) (see the Glossary in paragraph 5.1 for a description of Litter Stanchion Augmentation Set).

c. One (1) Stanchion Litter System (SLS) (NSN 6530-01-589-2284) (see the Glossary in paragraph 5.1 for a description of Stanchion Litter System).

**3.2.3.7** **FuT Facility Interface**. FuT shall interface with the facility electrical system, fire detection, alerting, and suppression systems, and Heating, Ventilating, and Cooling (HVAC) system for climate control.

**3.2.4** **Learning Management System (LMS)**

**3.2.4.1** **General LMS Requirements**

**3.2.4.1.1** The Learning Management System (LMS) and courseware shall conform to the ADLS Shareable Content Object Reference Model (SCORM) specifications, and provide the following capabilities to manage courseware and users (see the Glossary in paragraph 5.1 for a definition of Learning Management System and Shareable Content Object Reference Model):

a. LMS system access control.

b. Courseware evaluation reporting.

c. Student progress monitoring.

d. Instructor intervention with individual students.

e. Formal test presentation.

f. Data transfer between LMS and the TMS.

**3.2.4.1.2** The design, performance, and fidelity of the LMS shall provide training for those MTTL tasks assigned to the LMS.

**3.2.4.1.3** At the FTU, the LMS shall run courseware for FTU students from an internal server.

**3.2.4.1.4** At the MOBs, the LMS shall use the ADLS to run the courseware for pilots, boom operators, AE personnel, and remote aircrews.

**3.2.4.1.4.1** At the MOBs, the LMS shall provide a secondary non-proprietary method to access and run the courseware when no access to the ADLS is available (see the Glossary in paragraph 5.1 for a definition of non-proprietary).

**3.2.4.1.5** The courseware shall mark student progress within the training material using a “bookmark” to allow the student to restart the lesson from the bookmark (see the Glossary in paragraph 5.1 for a definition of bookmark).

**3.2.4.1.6** The courseware shall provide for the student to browse course or lesson materials previously accomplished (see the Glossary in paragraph 5.1 for a definition of browse).

**3.2.4.1.7** The LMS shall provide for the collection of the following data:

a. CBT response data for time on question, lesson, page, and section.

b. Accumulated CBT response data for later analysis.

c. CBT decision (logic evaluation and program path) data.

d. Aircrew member comments.

e. Aircrew member performance, quizzes, and tests scores.

**3.2.4.2 <u>Learning Center Computer Workstations</u>**

**3.2.4.2.1** Student computer workstations shall be a computer capable of supporting two or more high definition monitors, full keyboard, optical mouse, 21 inch or larger touch screen high definition monitor(s), enhanced graphics, read and write portable media device, up-to-date Technical Orders and Associated Directives, digital audio and video, headset, and internet access (see the Glossary in paragraph 5.1 for a definition of high definition).

**3.2.4.2.1.1** The student computer workstations shall be able to access the ADLS website via the LMS and run the KC-46 ATS lessons.

**3.2.4.2.2** Instructor computer workstations shall provide for classroom presentation of multimedia CBT and instructor-led training (see the Glossary in paragraph 5.1 for a definition of multimedia).

**3.2.4.2.2.1** Instructor computer workstation shall be a podium with a student computer workstation per paragraph 3.2.4.2.1, and a 50 inch or larger touch screen high definition display, self-powered speakers, a printed-material projector (e.g., overhead projector), electronic white boards, and internet access.

**3.2.4.2.2.2** The instructor computer workstation shall provide for access to the ADLS website via the LMS and run the KC-46 ATS lessons.

**3.2.4.3 <u>Learning Center Requirements</u>**

**3.2.4.3.1** A Learning Center shall be provided at each site to include all student computer workstations and classrooms with instructor computer workstations.

**3.2.4.3.2** For the Learning Center computer workstations, 60% shall have posters with half-size or larger photographic depictions of all the KC-46 cockpit control panels and 40% shall have posters with half-size or larger photographic depictions of all the KC-46 boom operator control panels.

**3.2.5 <u>Courseware</u>**

**3.2.5.1** Courseware shall provide aircrew trainees at each site with CBT, ATD, and instructor-led training on KC-46 Aircraft procedures, systems, principles, and operation.

**3.2.5.1.1** Courseware shall provide CRM training.

**3.2.5.1.2** Courseware shall provide “in-unit” KC-46 upgrade and preparation training (see Paragraph 3.1.3.3.1) and be accessible via the internet.

**3.2.5.2** Courseware shall consist of printed materials, digital materials, CBT lessons, classroom lessons, ATD exercises including flight training lesson plans, and student and instructor guides.

**3.2.5.2.1** Student and instructor guides for ATD exercises shall include a description of the Aircraft mission scenarios, ATD mission scenarios, and the IC sets selectable through the ATD IOS.

**3.2.5.3** CBT courseware shall be self-paced, stand-alone Interactive Multimedia Instruction (IMI) consistent with Level I through Level IV ICW definitions (see Military Handbook (MIL-HDBK-) 29612) for ICW definitions), and run on both the student and instructor workstations.

**3.2.5.4** Courseware shall be developed to provide no less than 10% ICW Level IV and no less than 25% ICW level IV and III combined.

**3.2.5.5** Courseware shall be developed using non-proprietary, commercially available tools compatible with ADLS.

**3.2.5.5.1** Courseware shall use standardized features, templates, and processes to provide uniformity within and between courses.

**3.2.5.5.2** Courseware shall include the Advanced Distributed Learning (ADL) registry specification metadata in Content Packages that are SCORM conformant (see the Glossary in paragraph 5.1 for a definition of metadata).

**3.2.5.5.3** Changes and modifications to the existing courseware lesson format, structure, or content shall comply with SCORM standards and specifications.

**3.2.6 Other Training Devices**

**3.2.6.1 Pilot Part Task Trainer (PTT)**

**3.2.6.1.1** The pilot Part Task Trainer (PTT) shall be a flat panel, touch screen interactive computer-based system to provide instructor independent aircraft commander and pilot training in avionics, mission computer, aircraft subsystems, and checklist procedures (see the Glossary in paragraph 5.1 for a definition of Part Task Trainer).

**3.2.6.1.2** The pilot PTT shall provide training in pre-flight, in-flight, and post-flight operations.

**3.2.6.1.3** The pilot PTT shall train all fielded versions of aircraft Operational Flight Programs (OFPs).

**3.2.6.2 Boom Operator Part Task Trainer (PTT)**

**3.2.6.2.1** The boom operator PTT shall be a flat panel, touch screen interactive computer-based system to provide instructor independent boom operator training in ARO station operation, aircraft subsystems, and checklists procedures.

**3.2.6.2.2** The boom operator PTT shall provide training in pre-flight, in-flight, and post-flight operations.

**3.2.6.2.3** The boom operator PTT shall train all fielded versions of aircraft OFPs.

### 3.2.7 Training Management System (TMS)

**3.2.7.1** The TMS shall use the Government owned GTIMS software and applications.

**3.2.7.2** The TMS shall provide for the following:

a. Flight and ground training management
b. Scheduling, accounting
c. Tracking of student training
d. Report generation
e. Electronic grade book functions.

**3.2.7.3** Flight and ground training management data requirements for the TMS shall include:

a. Flying Hours Data.
b. Simulator Hours Data.
c. Training Event Grade.
d. Student Biography Data.
e. Class Schedule.
f. Training Syllabus.
g. Simulator Training Grade.
h. Simulator Training Information.

**3.2.7.4** The TMS shall collect evaluations and feedback from aircrew members using the internet, Compact Disc - Read Only Memory (CD-ROM), or Digital Versatile Disc (DVD).

**3.2.7.5** All KC-46 ATS sites and devices shall interface via the TMS.

**3.2.7.6** The TMS system shall provide user accounts for AF-approved personnel.

**3.2.7.7** The TMS shall interface with the AETC Technical Training Management System (TTMS), the AMC Global Decision Support System (GDSS) and Aviation Resource Management System (ARMS), the LMS (see Paragraph 3.2.4), the ADLS (see Paragraph 3.2.4), and the internet including the .mil domain (see the Glossary in paragraph 5.1 for a definition of Global Decision Support System).

## 3.3 Training System Support Center (TSSC)

### 3.3.1 TSSC General Requirements

**3.3.1.1** The TSSC shall maintain, repair, update, modify, and support ATS courseware, software, databases, and hardware.

**3.3.1.2** The TSSC shall provide for electronic distribution of any ATS change to all sites.

**3.3.1.3** The TSSC systems shall provide user accounts for AF-approved personnel.

**3.3.1.4** The TSSC shall include the following subsystems:

a. Courseware Support System.

b. Software Support System.

c. Database Support System.

d. Logistics Support System.

e. Configuration Management System (see the Glossary in paragraph 5.1 for a definition of Configuration Management).

**3.3.2 <u>Courseware Support System (CSS)</u>.** The ATS Courseware Support System (CSS) shall provide for creating, maintaining, updating, and improving courseware that meets SCORM requirements as specified by paragraph 3.2.5, including lesson structure, text and graphics, simulations, and tests.

**3.3.3 <u>Software Support System (SSS)</u>**

**3.3.3.1** The Software Support System (SSS) shall provide for creating, maintaining, updating, improving, and distributing the software for the ATS.

**3.3.3.2** SSS shall include a computer system compatible with the all ATS computer-based systems.

**3.3.4 <u>Database Support System (DSS)</u>**

**3.3.4.1** The Database Support System (DSS) shall provide for creating, maintaining, updating, improving, and displaying the ATS visual, sensor, and threat generator databases, airfield models, and high resolution areas.

**3.3.4.1.1** The DSS shall provide for the insertion of new airfield models and high resolution areas and their associated radio aids and NAVAIDS in the ATS visual, sensor, and electric combat databases.

**3.3.4.1.2** The DSS shall provide for adding terrain and cultural features, threats (fixed and re-locatable), moving models, and changing model and feature types in the ATS visual, sensor, and electric combat databases.

**3.3.4.2** The DSS shall implement visual scene, airfield model, and all model modifications, within the times listed in 14 CRF Part 60, Appendix A, Attachment 3.

**3.3.4.3** The DSS shall provide for the importing and exporting of ATS visual and sensor databases, airfield models, and high resolution areas files into Common Database Standard formats.

**3.3.5 <u>Logistics Support System (LSS)</u>**

**3.3.5.1** The Logistics Support System (LSS) shall provide for updating, repairing and maintaining the hardware for the ATS.

**3.3.5.2** The LSS shall provide the following:

a. Maintenance data collection and reporting (see the Glossary in paragraph 5.1 for a definition of data collection).

b. Inventory control.

c. Logistics support analysis data collection.

d. Technical publications and engineering data maintenance and distribution.

e. Remote access to the LSS by the AF.

### 3.3.6 Configuration Management System (CMS)

**3.3.6.1** The Configuration Management System (CMS) shall provide for updating and maintaining the configuration documentation for the ATS and the TSSC technical library.

**3.3.6.2** The CMS shall provide the following:

a. Control ATS change activity.

b. Provide traceability to system requirements.

c. Provide traceability to training requirements.

d. Facilitate aircraft, mission, and objective change impact analysis.

e. Produce status accounting reports.

### 3.3.7 TSSC Facility Requirements

**3.3.7.1** TSSC equipment shall operate throughout the temperature range of 50 Degrees Fahrenheit (°F) to 85°F and relative humidity range of 20% to 80% (non-condensing).

**3.3.7.2** TSSC equipment shall operate with standard voltage 208/120 Volts (V), 60-Hz.

## 3.4 Design and Construction

### 3.4.1 Reserve Capacity and Growth Capability

**3.4.1.1** Computational system resources, memory, input and output, and processors shall have at least 100% spare capacity and in addition at least 100% expansion capabilities.

**3.4.1.2** Each Central Processing Unit (CPU) shall have a minimum Required Spare Time (RST) of 100% spare processing time capacity unless specifically exempted.

**3.4.1.3** RST shall be immediately available for additional CPU processing without any hardware modification or change to the software architecture.

**3.4.2** **Device and Equipment Relocation.** The ATS design shall facilitate device and equipment relocation, to include system tear down, movement, reassembly, test, and certification within six months.

**3.4.3** **Availability.** Each ATS device shall provide a minimum operational availability of 98% throughout the life of the contract (see the Glossary in paragraph 5.1 for how to calculate availability).

**3.4.4 Safety**. The ATS shall incorporate features that eliminate or control to an acceptable level, trainer specific hazards that affect the safety of aircrew members, instructors, and maintainers during operation, support, and maintenance IAW Military Standard (MIL-STD-) 882D and applicable Occupational Safety and Health Administration (OSHA) directives.

**3.4.4.1 Fire Detection and Suppression**

**3.4.4.1.1** The ATS shall comply with the requirements of AF Occupational Safety and Health (AFOSH) STD 91-118 and Uniform Fire Code (UFC) 3-600.

**3.4.4.1.2** The ATS fire detection system shall consist of overheat and products-of-combustion sensors, and associated alarm units, which serve to locate overheating and combustion.

**3.4.4.1.3** The ATS fire detection system shall interface with the facility fire detection system at each site and signal an emergency stop of the training device(s).

**3.4.4.2 Overload Protection**. Electrical overload protection shall be provided within the ATDs.

**3.4.4.3 Uninterrupted Power Supply**. An Uninterruptable Power Supply (UPS) shall be provided with at least 30 minutes operating time in excess of the time required for an orderly shutdown of all WSTs, BOTs, and FuTs.

**3.4.4.4 Master Power Off**. Each ATD shall have a master power off switch to cut off facility power going to that ATD.

**3.4.4.5 Emergency Power Off**

**3.4.4.5.1** Emergency Power Off (EPO) switches shall meet the requirements of AFOSH STD 91-118.

**3.4.4.5.2** System disruptions to the ATDs resulting from inadvertent EPO activation shall be recoverable within 30 minutes.

**3.4.4.6 Emergency Lighting**

**3.4.4.6.1** Each ATD shall provide emergency lighting inside the trainer, the IOS area, and in the egress area.

**3.4.4.6.2** The emergency lighting shall operate whenever electrical power to the load side of the main simulator circuit breaker is not available no matter the cause.

**3.4.4.6.3** Emergency lighting shall be operated by batteries maintained in a charged condition by an integral battery charger.

**3.4.4.7 Warning Notices**

**3.4.4.7.1** Where there is potential for personnel injury, warning notices in the form of audio or visual aids shall be provided on simulation equipment and in portions of the facility where the equipment is located.

**3.4.4.7.2** For electrical hazard areas, warning notices shall be placed on maintenance access to these areas and warning labels shall be placed on the covers of equipment containing voltages in excess of 50 V.

**3.4.4.8** **Hazardous Materials**. The use of hazardous materials shall be minimized in the design, development, manufacture, operation and maintenance of the ATS IAW MIL-STD-882D.

### 3.4.5 Electromagnetic Compatibility

**3.4.5.1** Each ATD shall meet the applicable portions of Part 15 of Federal Communications Commission (FCC) rules for Class A computing devices in controlling electromagnetic compatibility and radiation, as well as MIL-HDBK-454B.

**3.4.5.2** Training device components shall not interfere with nor be degraded by collocated standard office equipment while installed in the specified operating environment.

### 3.4.6 Security Requirements

**3.4.6.1** At the MOBs, the WSTs and BOTs shall operate in a secure facility, with a classification level of collateral SECRET, that meets the Open Storage facility requirements for Secure Rooms IAW DoD 5200.1-R, Appendix 7 and the MAF DMO Physical Security Guide.

**3.4.6.2** The WST and BOT shall incorporate diskless boot methods to reduce the need for numerous mass storage (hard disk drives or memory) devices to boot and operate the systems.

**3.4.6.3** Mass storage devices (hard disk drives or memory) shall be removable, and either volatile, non-volatile, or non-volatile that can be reset to an unclassified state IAW AFMAN 33-282 Computer Security (COMPUSEC).

**3.4.6.4** Removable classified mass storage (hard disk drives or memory) devices shall be securable in General Services Administration (GSA)-approved security containers within the facility.

**3.4.6.5** Removing and securing all classified mass storage (hard disk drives or memory) devices shall require no more than one hour.

**3.4.6.6** The ATS shall incorporate the applicable Information Assurance (IA) controls IAW AFI 33-210 as modified by Aeronautical Systems Center (ASC) Guidance Memorandum on IA C&A Requirements for Platform Information Technology (PIT) dated 25 April 2010, IA PIT Guidebook, and DoD Instruction (DoDI) 8500.02.

### 3.4.7 Facility Interfaces and Environmental Conditions

**3.4.7.1** The KC-46 ATS shall be compatible with and interface with typical United States Air Force (USAF) training facilities in that the devices do not require special electrical power requirements (see the Glossary in paragraph 5.1 for a definition of special electrical power requirements).

**3.4.7.2** The training devices shall operate throughout the temperature range of 65°F to 75°F and relative humidity range of 20% to 70% (non-condensing).

**3.4.7.3** The WST and FuT shall require a clear ceiling height less than 50 feet, other ATS training devices shall require a clear ceiling height less than 25 feet.

**3.4.8 Automatic Test Requirements**. The ATS shall provide for automatic testing for specification compliance, SIMCERT, and system health monitoring, with the following capabilities for automatic grading of Qualification Test Guides.

**3.4.8.1** The grading utility shall be selectable between manual and automatic.

**3.4.8.2** The auto grading utility shall indicate whether a test passes or fails and specify each parameter that is out of tolerance.

**3.4.8.3** The auto grading utility shall create plots and grade tests in the background with no operator interaction required other than enabling or disabling auto grading from the automatic testing menu.

**3.4.8.4** For tests that are graded by tolerances on plotted parameters, the auto grading utility shall indicate failing values in the test results by changing colors from green to red where the training device plot parameter is outside of its tolerance.

**3.4.8.4.1** The plotted parameter test result shall provide text describing each parameter's tolerances.

**3.4.8.5** For tests which include a tolerance on a snapshot value, the auto grading utility shall indicate in the test results whether the snapshot value passed or failed, the training device value, and the aircraft value.

**3.4.8.5.1** Snapshot test results shall be reported on a separate test result summary page, or on the test snapshot page with the ICs.

**3.4.8.6** The auto grading utility shall clearly label "allowed deviations" and "grading notes" (noted in the Automated Test Guide) on the test result pages for the purpose of documenting transient out-of-tolerance conditions which are repeatable and have been deemed acceptable by the AF.

**3.4.8.7** The auto grading utility shall grade each test and produce the test results within 40 seconds after completion of the test data collection.

## 4 Requirements Verification

### 4.1 Scope

**4.1.1** Section 3.0 requirements shall be verified during testing by means of analysis, inspection, demonstration, or test, or a combination thereof, as defined in Paragraph 4.2.1 and subparagraphs.

**4.1.2** Contractor conducted testing will be witnessed by the AF at its discretion.

**4.1.3** Verification activities shall address both the training system and the aircrew member's performance in the aircraft and training devices.

**4.1.4** The KC-46 ATS verification shall ensure that the requirements of this document are met.

**4.1.5** Verification for the WST shall comply with FAA general, performance and evaluation requirements to the qualification Level D for a FFS as defined in the Department of Transportation, 14 CFR Part 60.

**4.1.6** Verification for the WST shall meet the Free Air, Tanker, and Receiver Simulator verification Requirements of the ARASQ Rev C Document for Level D Airplane Simulators.

**4.1.7** Verification of the BOT shall meet the Boom Operator certification requirements set forth in ARASQ Rev C for Level 2.

**4.1.8** Verification of the BOT motion system shall meet ARASQ Rev C Level 2 verification requirements and shall meet requirements for a 14 CFR Part 60 Level D FFS, with the exception of landing gear operation, runway operations, and airfield approach and departure flight path operations.

**4.1.9** The Government reserves the right to require additional verification effort within the confines of the required verification methods.

**4.2 Verification Cross Reference Matrix**. The Verification Cross Reference Matrix (Table 4.2) shall identify the methods of verification to be used for each requirement listed in Section 3.0 of this specification.

**4.2.1 Verification Definitions**

**4.2.1.1** Inspection (Inspect): 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.

**4.2.1.1.1** Review of authenticated documentation is a form of this method.

**4.2.1.2** Analysis: This verification method consists of an evaluation of components or systems interacting with their intended environment, using technical calculations, mathematical modeling based on physical laws and empirical data, or training effectiveness assessments based on the course or lesson objectives.

**4.2.1.2.1** Sensitivity, similarity, and failure effects analyses are forms of this method.

**4.2.1.2.2** Training effectiveness shall be analyzed in terms of course or lesson run time and student performance.

**4.2.1.2.3** Analysis associated with refining test data is not a part of this method.

**4.2.1.3** Demonstration (Demo): This verification method consists of a non-instrumented operation of the actual component, course or lesson, or system under specified controlled conditions on the device or in an equivalent environment, where functional success is determined on a qualitative or pass-fail basis. (i.e., feel, sound, skills).

**4.2.1.4** Test: This verification method consists of quantitative measuring of the characteristics or performance of actual components or systems in controlled intended conditions (real or representative).

**4.2.1.4.1** Specific pass or fail criteria are established for each requirement using approved procedures.

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

**Table 4.2 Verification Cross Reference Matrix**

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3 | | | | | X |
| 3.1 | | | | | X |
| 3.1.1 | | | | | X |
| 3.1.1.1 | | X | X | | |
| 3.1.1.2 | | X | X | | |
| 3.1.1.3 | X | | | | |
| 3.1.2 | | | | | X |
| 3.1.2.1 | | X | X | | |
| 3.1.2.2 | | X | X | | |
| 3.1.2.3 | | X | X | | |
| 3.1.3 | | | | | X |
| 3.1.3.1 | | | | | X |
| 3.1.3.1.1 | X | | X | | |
| 3.1.3.1.2 | | X | X | | |
| 3.1.3.1.3 | X | | X | | |
| 3.1.3.1.4 | | X | X | | |
| 3.1.3.1.5 | | X | | | |
| 3.1.3.2 | | | | | X |
| 3.1.3.2.1 | | | | | X |
| 3.1.3.2.1.1 | | X | X | | |
| 3.1.3.2.1.2 | | X | X | | |
| 3.1.3.2.1.3 | | X | X | | |
| 3.1.3.2.1.4 | | X | X | | |
| 3.1.3.2.1.5 | | X | X | | |
| 3.1.3.2.1.6 | | X | X | | |
| 3.1.3.2.2 | | X | X | | |
| 3.1.3.2.2.1 | | X | X | | |
| 3.1.3.2.2.2 | | X | X | | |
| 3.1.3.2.2.3 | | X | X | | |
| 3.1.3.2.2.4 | | X | X | | |
| 3.1.3.2.2.5 | | X | X | | |
| 3.1.3.2.2.6 | | X | X | | |
| 3.1.3.2.2.6.1 | | X | X | | |
| 3.1.3.2.2.6.2 | | X | X | | |
| 3.1.3.2.3 | | X | X | | |
| 3.1.3.2.4 | | X | X | | |
| 3.1.3.2.5 | | X | X | | |
| 3.1.3.2.6 | | X | X | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.1.3.2.7 | | X | X | | |
| 3.1.3.3 | | | | | X |
| 3.1.3.3.1 | | X | X | | |
| 3.1.3.3.2 | | X | X | | |
| 3.1.3.3.3 | | X | X | | |
| 3.1.4 | | | | | X |
| 3.1.4.1 | | X | X | | |
| 3.1.4.2 | | X | X | | |
| 3.1.4.3 | X | X | X | | |
| 3.1.4.4 | X | X | | | |
| 3.1.4.5 | X | X | | | |
| 3.1.4.6 | | X | X | | |
| 3.1.4.6.1 | X | X | X | | |
| 3.1.4.7 | | X | X | | |
| 3.1.4.8 | | X | X | | |
| 3.1.4.8.1 | | X | X | | |
| 3.1.4.8.2 | | X | X | | |
| 3.1.4.9 | | X | X | | |
| 3.1.4.10 | | | X | | |
| 3.1.4.11 | | | X | | |
| 3.1.4.11.1 | | X | X | | |
| 3.1.4.11.2 | | X | X | | |
| 3.1.4.12 | X | | X | | |
| 3.1.4.12.1 | X | X | X | | |
| 3.1.4.13 | | X | X | | |
| 3.1.4.13.1 | | X | X | | |
| 3.1.4.14 | | | X | | |
| 3.1.5 | | | | | X |
| 3.1.5.1 | | | | | X |
| 3.1.5.1.1 | | X | X | | |
| 3.1.5.1.2 | | X | | | |
| 3.1.5.1.3 | X | | X | | |
| 3.1.5.1.4 | | | X | | |
| 3.1.5.1.5 | | | X | | |
| 3.1.5.1.6 | X | | X | | |
| 3.1.5.2 | | | | | X |
| 3.1.5.2.1 | X | X | | | |
| 3.1.5.2.2 | | X | X | X | |
| 3.1.5.3 | | | | | X |
| 3.1.5.3.1 | X | X | | | |
| 3.1.5.3.2 | | X | X | X | |
| 3.1.5.4 | | | | | X |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.1.5.4.1 | X | X | X | X | |
| 3.1.5.4.2 | | X | X | X | |
| 3.1.5.4.3 | X | | X | X | |
| 3.1.5.4.4 | | X | | X | |
| 3.1.5.4.5 | | X | | X | |
| 3.2 | | | | | X |
| 3.2.1 | | | | | X |
| 3.2.1.1 | | | | | X |
| 3.2.1.1.1 | | | X | | |
| 3.2.1.1.2 | | X | | | |
| 3.2.1.1.3 | | | X | | |
| 3.2.1.1.4 | | | | X | |
| 3.2.1.1.4.1 | | | | X | |
| 3.2.1.1.5 | | | | X | |
| 3.2.1.1.6 | X | X | | | |
| 3.2.1.1.6.1 | X | X | | | |
| 3.2.1.1.7 | | | X | | |
| 3.2.1.1.8 | | X | X | | |
| 3.2.1.1.9 | X | | | | |
| 3.2.1.1.10 | | | X | | |
| 3.2.1.1.11 | X | X | X | | |
| 3.2.1.2 | | | | | X |
| 3.2.1.2.1 | | X | X | | |
| 3.2.1.2.2 | | | | X | |
| 3.2.1.2.3 | | | | | X |
| 3.2.1.2.3.1 | | | | X | |
| 3.2.1.2.3.2 | | | | X | |
| 3.2.1.2.3.3 | | | X | | |
| 3.2.1.2.3.4 | | | X | | |
| 3.2.1.2.3.5 | | | X | | |
| 3.2.1.2.3.6 | | | X | X | |
| 3.2.1.2.3.7 | X | | | | |
| 3.2.1.2.3.8 | X | | | | |
| 3.2.1.2.3.9 | | | X | | |
| 3.2.1.2.3.9.1 | | | X | | |
| 3.2.1.2.3.10 | | | X | | |
| 3.2.1.2.3.11 | | | | X | |
| 3.2.1.2.3.11.1 | | | X | | |
| 3.2.1.2.3.12 | X | | | | |
| 3.2.1.2.3.13 | X | | | | |
| 3.2.1.2.3.14 | X | | | | |
| 3.2.1.2.3.15 | X | | | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.1.2.3.16 | X | | | | |
| 3.2.1.2.3.17 | X | | | | |
| 3.2.1.2.3.18 | X | | | | |
| 3.2.1.2.3.19 | X | | | | |
| 3.2.1.2.3.20 | | X | | | |
| 3.2.1.2.3.21 | | | X | | |
| 3.2.1.2.3.22 | | | X | | |
| 3.2.1.2.3.23 | | | X | | |
| 3.2.1.2.3.24 | | | X | | |
| 3.2.1.2.3.24.1 | | | X | | |
| 3.2.1.2.3.25 | | | X | | |
| 3.2.1.2.3.25.1 | | X | | | |
| 3.2.1.2.3.26 | | X | | | |
| 3.2.1.2.3.27 | | X | | | |
| 3.2.1.2.3.28 | | | X | | |
| 3.2.1.2.3.28.1 | | | X | | |
| 3.2.1.2.3.29 | | | | X | |
| 3.2.1.2.3.29.1 | | | X | | |
| 3.2.1.2.3.29.2 | | | X | | |
| 3.2.1.2.3.29.3 | | | X | | |
| 3.2.1.2.3.30 | | | | X | |
| 3.2.1.2.3.31 | | | | X | |
| 3.2.1.2.3.32 | | | X | | |
| 3.2.1.2.3.33 | | | X | | |
| 3.2.1.3 | | | | | X |
| 3.2.1.3.1 | X | X | X | | |
| 3.2.1.3.2 | | X | | | |
| 3.2.1.3.3 | | | | X | |
| 3.2.1.3.4 | | | X | | |
| 3.2.1.3.5 | | | X | | |
| 3.2.1.3.6 | | X | X | | |
| 3.2.1.4 | | | | | X |
| 3.2.1.4.1 | X | | | | |
| 3.2.1.4.1.1 | | | X | | |
| 3.2.1.4.1.2 | | | X | | |
| 3.2.1.4.1.3 | | X | | | |
| 3.2.1.4.1.4 | | X | | | |
| 3.2.1.4.1.4.1 | | | X | | |
| 3.2.1.4.1.5 | | | X | | |
| 3.2.1.4.1.6 | | | | X | |
| 3.2.1.4.2 | | | X | | |
| 3.2.1.4.2.1 | | | | X | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.1.4.2.2 | | X | X | | |
| 3.2.1.4.2.3 | | X | X | | |
| 3.2.1.4.2.4 | | X | X | | |
| 3.2.1.4.2.5 | | X | X | | |
| 3.2.1.4.2.6 | | X | X | | |
| 3.2.1.4.2.7 | | X | X | | |
| 3.2.1.4.2.8 | | X | X | | |
| 3.2.1.4.2.9 | | X | X | | |
| 3.2.1.4.2.10 | | X | X | | |
| 3.2.1.4.3 | | X | X | | |
| 3.2.1.4.3.1 | | X | X | | |
| 3.2.1.4.3.2 | | | | X | |
| 3.2.1.4.3.3 | | X | X | | |
| 3.2.1.4.3.4 | | X | X | | |
| 3.2.1.4.3.5 | | X | X | | |
| 3.2.1.4.3.5.1 | | | X | | |
| 3.2.1.4.3.5.2 | | | X | | |
| 3.2.1.4.3.6 | | X | X | | |
| 3.2.1.4.4 | | X | | | |
| 3.2.1.5 | | | | | X |
| 3.2.1.5.1 | X | | X | | |
| 3.2.1.5.2 | | | X | | |
| 3.2.1.5.3 | X | | | | |
| 3.2.1.5.4 | X | | X | | |
| 3.2.1.6 | X | | X | | |
| 3.2.1.7 | | | X | X | |
| 3.2.1.8 | | | X | X | |
| 3.2.1.9 | | | | | X |
| 3.2.1.9.1 | X | | | | |
| 3.2.1.9.2 | | | X | | |
| 3.2.1.9.3 | | | X | | |
| 3.2.1.9.4 | X | | X | | |
| 3.2.1.9.5 | | | X | | |
| 3.2.1.9.6 | X | | X | | |
| 3.2.1.9.7 | X | | X | | |
| 3.2.1.9.8 | X | | X | | |
| 3.2.1.9.9 | | | X | | |
| 3.2.1.9.10 | | | X | | |
| 3.2.1.9.11 | | | X | | |
| 3.2.1.9.12 | | | X | | |
| 3.2.1.9.13 | | | X | | |
| 3.2.1.9.14 | | | X | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.1.9.15 | | | X | | |
| 3.2.1.9.16 | | | X | | |
| 3.2.1.9.16.1 | | | X | | |
| 3.2.1.9.16.2 | | | X | | |
| 3.2.1.9.16.3 | | | X | | |
| 3.2.1.9.17 | | | X | | |
| 3.2.1.9.18 | | | X | | |
| 3.2.1.9.18.1 | | | X | | |
| 3.2.1.9.19 | | | X | | |
| 3.2.1.9.20 | | | X | | |
| 3.2.1.9.21 | | | X | | |
| 3.2.1.9.22 | | | X | | |
| 3.2.1.9.22.1 | | | X | | |
| 3.2.1.9.22.2 | | | X | | |
| 3.2.1.9.22.3 | | | X | | |
| 3.2.1.9.23 | | | X | | |
| 3.2.1.9.24 | X | | | | |
| 3.2.1.9.25 | | | X | | |
| 3.2.1.9.26 | | | X | | |
| 3.2.1.9.27 | | | X | | |
| 3.2.1.9.28 | | | X | | |
| 3.2.1.9.28.1 | | | X | | |
| 3.2.1.9.29 | | | X | | |
| 3.2.1.9.30 | | | X | | |
| 3.2.1.9.31 | | | X | | |
| 3.2.1.9.32 | | | X | | |
| 3.2.1.9.32.1 | | | X | | |
| 3.2.1.9.33 | | | X | | |
| 3.2.1.9.34 | | | X | | |
| 3.2.1.9.35 | | | X | | |
| 3.2.1.9.35.1 | | | X | | |
| 3.2.1.9.35.2 | X | | | | |
| 3.2.1.9.36 | | | X | | |
| 3.2.1.9.36.1 | | | X | | |
| 3.2.1.9.36.2 | | | X | | |
| 3.2.1.9.37 | | | X | | |
| 3.2.1.9.38 | | | X | | |
| 3.2.1.9.39 | | | X | | |
| 3.2.1.9.40 | | | X | | |
| 3.2.1.9.41 | | | X | | |
| 3.2.1.9.42 | | | X | | |
| 3.2.1.9.42.1 | | | X | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.1.9.42.2 | | | X | | |
| 3.2.1.9.42.3 | | | X | | |
| 3.2.1.9.42.4 | | | X | | |
| 3.2.1.9.42.5 | | | X | | |
| 3.2.1.10 | | | | | X |
| 3.2.1.10.1 | | | X | | |
| 3.2.1.10.2 | | X | X | | |
| 3.2.1.10.3 | | X | X | | |
| 3.2.1.10.4 | X | | X | | |
| 3.2.1.10.5 | | | X | | |
| 3.2.1.10.6 | | | X | | |
| 3.2.1.10.7 | | X | X | | |
| 3.2.1.10.8 | | | X | | |
| 3.2.1.11 | | | | | X |
| 3.2.1.11.1 | | | X | | |
| 3.2.1.11.2 | | | X | | |
| 3.2.1.11.3 | | | X | | |
| 3.2.1.11.4 | | | X | | |
| 3.2.1.11.5 | | | X | | |
| 3.2.2 | | | | | X |
| 3.2.2.1 | | | | | X |
| 3.2.2.1.1 | | | X | | |
| 3.2.2.1.2 | | X | | | |
| 3.2.2.1.3 | | | X | | |
| 3.2.2.1.4 | | | | X | |
| 3.2.2.1.5 | | | | X | |
| 3.2.2.1.6 | | | | X | |
| 3.2.2.1.7 | X | X | | | |
| 3.2.2.1.8 | | | X | | |
| 3.2.2.1.9 | | | X | | |
| 3.2.2.1.10 | X | X | X | | |
| 3.2.2.2 | | | | | X |
| 3.2.2.2.1 | | X | X | | |
| 3.2.2.2.2 | X | X | X | X | |
| 3.2.2.2.3 | X | | X | | |
| 3.2.2.2.4 | | | X | | |
| 3.2.2.2.5 | | | X | | |
| 3.2.2.2.6 | | | X | | |
| 3.2.2.3 | | | | | X |
| 3.2.2.3.1 | X | | X | | |
| 3.2.2.3.2 | X | | X | | |
| 3.2.2.3.2.1 | X | | | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.2.3.3 | X | | X | | |
| 3.2.2.3.3.1 | X | | X | | |
| 3.2.2.3.3.2 | X | | X | | |
| 3.2.2.3.3.3 | X | | X | | |
| 3.2.2.3.3.4 | X | | X | | |
| 3.2.2.3.4 | X | | X | | |
| 3.2.2.4 | | | | | X |
| 3.2.2.4.1 | X | X | X | | |
| 3.2.2.4.2 | | | X | | |
| 3.2.2.4.3 | X | | | | |
| 3.2.2.5 | X | | X | | |
| 3.2.2.6 | | | X | X | |
| 3.2.2.7 | | | | | X |
| 3.2.2.7.1 | X | | | X | |
| 3.2.2.7.2 | | | X | | |
| 3.2.2.8 | | | | | X |
| 3.2.2.8.1 | X | | | | |
| 3.2.2.8.2 | | | X | | |
| 3.2.2.8.3 | X | X | X | X | |
| 3.2.2.8.4 | | | X | | |
| 3.2.2.8.5 | | | X | | |
| 3.2.2.8.5.1 | | | X | | |
| 3.2.2.8.6 | | | X | | |
| 3.2.2.8.7 | | | X | | |
| 3.2.2.8.7.1 | | | X | | |
| 3.2.2.8.7.2 | | | X | | |
| 3.2.2.8.8 | | | X | | |
| 3.2.2.8.9 | | | X | | |
| 3.2.2.8.10 | | | X | | |
| 3.2.2.8.10.1 | | | X | | |
| 3.2.2.8.10.2 | | | X | | |
| 3.2.2.8.10.3 | | | X | | |
| 3.2.2.8.11 | | | X | | |
| 3.2.2.8.12 | | | X | | |
| 3.2.2.8.13 | | | X | | |
| 3.2.2.8.13.1 | | | X | | |
| 3.2.2.8.14 | | | X | | |
| 3.2.2.8.15 | | | X | | |
| 3.2.2.9 | X | X | X | X | |
| 3.2.3 | | | | | X |
| 3.2.3.1 | | | | | X |
| 3.2.3.1.1 | X | | | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.3.1.2 | X | | | | |
| 3.2.3.1.3 | | X | | | |
| 3.2.3.1.4 | X | | | | |
| 3.2.3.1.5 | X | | | | |
| 3.2.3.1.6 | X | | | | |
| 3.2.3.1.7 | X | | | | |
| 3.2.3.2 | | | | | X |
| 3.2.3.2.1 | X | | | X | |
| 3.2.3.2.2 | | | X | | |
| 3.2.3.3 | | | | | X |
| 3.2.3.3.1 | X | | | | |
| 3.2.3.3.2 | | | X | | |
| 3.2.3.3.2.1 | | | X | | |
| 3.2.3.3.3 | | X | | | |
| 3.2.3.3.3.1 | X | | | | |
| 3.2.3.3.4 | X | | | | |
| 3.2.3.3.4.1 | X | | | | |
| 3.2.3.4 | X | | | | |
| 3.2.3.5 | X | | | | |
| 3.2.3.6 | X | X | | | |
| 3.2.3.7 | X | | | | |
| 3.2.4 | | | | | X |
| 3.2.4.1 | | | | | X |
| 3.2.4.1.1 | | X | X | | |
| 3.2.4.1.2 | | X | | | |
| 3.2.4.1.3 | | | X | | |
| 3.2.4.1.4 | | | X | | |
| 3.2.4.1.4.1 | | | X | | |
| 3.2.4.1.5 | | | X | | |
| 3.2.4.1.6 | | | X | | |
| 3.2.4.1.7 | | | X | | |
| 3.2.4.2 | | | | | X |
| 3.2.4.2.1 | X | | | | |
| 3.2.4.2.1.1 | | | X | | |
| 3.2.4.2.2 | X | | | | |
| 3.2.4.2.2.1 | X | | | | |
| 3.2.4.2.2.2 | | | X | | |
| 3.2.4.3 | | | | | X |
| 3.2.4.3.1 | X | | | | |
| 3.2.4.3.2 | X | | | | |
| 3.2.5 | | | | | X |
| 3.2.5.1 | X | | | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.2.5.1.1 | X | | | | |
| 3.2.5.1.2 | X | | X | | |
| 3.2.5.2 | X | | | | |
| 3.2.5.2.1 | X | | | | |
| 3.2.5.3 | | | X | | |
| 3.2.5.4 | | X | | | |
| 3.2.5.5 | X | | | | |
| 3.2.5.5.1 | X | | | | |
| 3.2.5.5.2 | X | | | | |
| 3.2.5.5.3 | X | | | | |
| 3.2.6 | | | | | X |
| 3.2.6.1 | | | | | X |
| 3.2.6.1.1 | X | | X | | |
| 3.2.6.1.2 | | | X | | |
| 3.2.6.1.3 | | | X | | |
| 3.2.6.2 | | | | | X |
| 3.2.6.2.1 | X | | X | | |
| 3.2.6.2.2 | | | X | | |
| 3.2.6.2.3 | | | X | | |
| 3.2.7 | | | | | X |
| 3.2.7.1 | | X | | | |
| 3.2.7.2 | | | X | | |
| 3.2.7.3 | X | | X | | |
| 3.2.7.4 | X | | X | | |
| 3.2.7.5 | X | | X | | |
| 3.2.7.6 | | | X | | |
| 3.2.7.7 | X | | X | | |
| 3.3 | | | | | X |
| 3.3.1 | | | | | X |
| 3.3.1.1 | | X | X | | |
| 3.3.1.2 | | | X | | |
| 3.3.1.3 | | | X | | |
| 3.3.1.4 | X | X | X | | |
| 3.3.2 | | X | X | | |
| 3.3.3 | | | | | X |
| 3.3.3.1 | | X | X | | |
| 3.3.3.2 | | X | X | | |
| 3.3.4 | | | | | X |
| 3.3.4.1 | | X | X | | |
| 3.3.4.1.1 | | | X | | |
| 3.3.4.1.2 | | | X | | |
| 3.3.4.2 | | | X | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.3.4.3 | | | X | | |
| 3.3.5 | | | | | X |
| 3.3.5.1 | | X | X | | |
| 3.3.5.2 | | X | X | | |
| 3.3.6 | | | | | X |
| 3.3.6.1 | | X | X | | |
| 3.3.6.2 | | X | X | | |
| 3.3.7 | | | | | X |
| 3.3.7.1 | X | | | | |
| 3.3.7.2 | X | | | | |
| 3.4 | | | | | X |
| 3.4.1 | | | | | X |
| 3.4.1.1 | X | | | | |
| 3.4.1.2 | | | | X | |
| 3.4.1.3 | X | | | | |
| 3.4.2 | | X | | | |
| 3.4.3 | | X | | | |
| 3.4.4 | | X | X | | |
| 3.4.4.1 | | | | | X |
| 3.4.4.1.1 | X | | | | |
| 3.4.4.1.2 | X | | | | |
| 3.4.4.1.3 | X | | | X | |
| 3.4.4.2 | | | | X | |
| 3.4.4.3 | | | | X | |
| 3.4.4.4 | | | | X | |
| 3.4.4.5 | | | | | X |
| 3.4.4.5.1 | | | | X | |
| 3.4.4.5.2 | | | X | | |
| 3.4.4.6 | | | | | X |
| 3.4.4.6.1 | X | | | | |
| 3.4.4.6.2 | | | | X | |
| 3.4.4.6.3 | | | | X | |
| 3.4.4.7 | | | | | X |
| 3.4.4.7.1 | X | | | | |
| 3.4.4.7.2 | X | | | | |
| 3.4.4.8 | | X | | | |
| 3.4.5 | | | | | X |
| 3.4.5.1 | | | | X | |
| 3.4.5.2 | X | | | | |
| 3.4.6 | | | | | X |
| 3.4.6.1 | X | | | | |
| 3.4.6.2 | X | | X | | |

| Requirement Number | Verification Method | | | | |
|---|---|---|---|---|---|
| | Inspect | Analysis | Demo | Test | N/A |
| 3.4.6.3 | X | | X | | |
| 3.4.6.4 | | | X | | |
| 3.4.6.5 | | | X | | |
| 3.4.6.6 | | | | X | |
| 3.4.7 | | | | | X |
| 3.4.7.1 | X | | | | |
| 3.4.7.2 | | | X | | |
| 3.4.7.3 | X | | | | |
| 3.4.8 | | | X | | |
| 3.4.8.1 | | | X | | |
| 3.4.8.2 | | | X | | |
| 3.4.8.3 | | | X | | |
| 3.4.8.4 | | | X | | |
| 3.4.8.4.1 | | | X | | |
| 3.4.8.5 | | | X | | |
| 3.4.8.5.1 | | | X | | |
| 3.4.8.6 | | | X | | |
| 3.4.8.7 | | | X | | |

## 4.3 Requirements

a. Verification is N/A.

### 4.3.1 Aircrew Training System (ATS)

a. Verification is N/A.

#### 4.3.1.1 General ATS Requirements

a. Verification is N/A.

##### 4.3.1.1.1 General ATS Requirements Paragraph 3.1.1.1

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS can produce, maintain and update a qualified aircrew member.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the fully functioning ATS can produce a qualified aircrew member throughout the qualification continuum.

##### 4.3.1.1.2 General ATS Requirements Paragraph 3.1.1.2

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS can produce students that meet proficiency, knowledge and performance standards for qualification upon completion of ATS training.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully function ATS. This verification shall be considered successful when the full course tryouts demonstrate the ATS can produce students that meet proficiency, knowledge and performance standards for qualification upon completion of ATS training.

#### 4.3.1.1.3 General ATS Requirements Paragraph 3.1.1.3

a. This requirement shall be verified by inspection. This inspection shall consist of Subject Matter Expert (SME) review of mission profiles provided to support syllabi accomplishment. This verification shall be considered successful when the inspection confirms that an adequate mix of standalone, local and DMO mission profiles are provided to meet training requirements.

#### 4.3.1.2 Student Throughput

a. Verification is N/A.

#### 4.3.1.2.1 Student Throughput Paragraph 3.1.2.1

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, Small Group Tryout (SGTO) results and throughput analysis from formative evaluation. This verification shall be considered successful when the analysis confirms that the ATS can handle a full student training load as listed in Contract FA8621-11-R-6251, Section J, Attachment 3, Student Throughput Matrix.

b. This requirement shall be verified by demonstration. This demonstration shall consist of a full course tryout during summative evaluation of the ATS. This verification shall be considered successful when the full course tryouts demonstrate the ATS can produce students with a full student training load as listed in Contract FA8621-11-R-6251, Section J, Attachment 3, Student Throughput Matrix.

#### 4.3.1.2.2 Student Throughput Paragraph 3.1.2.2

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, and throughput analysis from formative evaluation. This verification shall be considered successful when the analysis confirms that the ATS can support a 10% surge for each course or combination of courses with a fully functioning ATS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the

ATS can produce students with a 10 % surge in student throughput for each course, any part of a course, any combination of courses, and free play.

#### 4.3.1.2.3 Student Throughput Paragraph 3.1.2.3

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, and throughput analysis from formative evaluation. This verification shall be considered successful when the analysis confirms that the ATS can support a 20% surge for each course or combination of courses with a fully functioning ATS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates the ATS can produce students with a 20 % surge in student throughput for each course, any part of a course, any combination of courses, and free play.

#### 4.3.1.3 Types of Training

a. Verification is N/A.

#### 4.3.1.3.1 General Training Requirements

a. Verification is N/A.

#### 4.3.1.3.1.1 General Training Requirements Paragraph 3.1.3.1.1

a. This requirement shall be verified by inspection. This inspection shall consist of review of the course syllabi to determine that all types of training are provided in the ATS. This verification shall be considered successful when the inspection confirms that all types of training are covered IAW AFI 11-2KC-46A Vol 1, AFI 11-202 Vol 2 and Vol 3 and AMC and AETCSUPs to AFI 11-202 Vol 2 and Vol 3 in the curriculum (see the Glossary in paragraph 5.1 for a definition of curriculum).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts for a fully functioning ATS. This verification shall be considered successful when the full course tryout confirms that all types of training are provided IAW AFI 11-2KC-46A Vol 1AFI 11-202 Vol 2 and Vol 3 and AMC and AETCSUPs to AFI 11-202 Vol 2 and Vol 3 and have been effectively delivered in the ATS.

#### 4.3.1.3.1.2 General Training Requirements Paragraph 3.1.3.1.2

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design and review of formative and summative evaluation results. The review shall focus on how the courses facilitate student progression throughout the qualification continuum from entry level qualification to the required qualification level. This verification shall be considered successful when the analysis confirms that the ATS can provide aircrew training throughout the qualification continuum from entry level qualification to the required qualification level.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts of a fully functioning ATS. This verification shall be considered successful when the evaluation demonstrates the ATS can provide aircrew training throughout the qualification continuum from entry level qualification to the required qualification level.

**4.3.1.3.1.3 General Training Requirements Paragraph 3.1.3.1.3**

a. This requirement shall be verified by inspection. This analysis shall consist of a review of the ATS design, syllabi, training devices and review of formative evaluation results. This verification shall be considered successful when the analysis confirms that AE familiarization and continuation training have been incorporated into the ATS curriculum and training devices support accomplishment of the AE training objectives.

b. This requirement shall be verified by demonstration. This demonstration shall consist of a tryout of the AE training using the associated AE equipment. This verification shall be considered successful when the tryout demonstrates the AE familiarization and continuation training support the AE training objectives.

**4.3.1.3.1.4 General Training Requirements Paragraph 3.1.3.1.4**

a. This requirement shall be verified by analysis. This analysis shall review the results of formative and summative evaluations for the ATS training materials. This verification shall be considered successful when the analysis confirms the correct training materials are included in the ATS to support ground training.

b. This requirement shall be verified by demonstration. This evaluation shall consist of full course tryouts for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the training materials support ground training.

**4.3.1.3.1.5 General Training Requirements Paragraph 3.1.3.1.5**

a. This requirement shall be verified by analysis. This analysis shall consist of SME review of syllabi, review of course materials, and results from formative evaluation. This verification shall be considered successful when the analysis confirms that CRM is integrated throughout each course.

**4.3.1.3.2 Formal Training Unit (FTU) Training**

a. Verification is N/A.

**4.3.1.3.2.1 Basic Aircraft Qualification**

a. Verification is N/A.

**4.3.1.3.2.1.1 Basic Aircraft Qualification Paragraph 3.1.3.2.1.1**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides basic aircraft qualification training IAW AFI 11-2KC-46A Vol 1, AFI 11-202 Vol 2, and AMC and AETCSUPs to AFI 11-202 Vol 2.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full class tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the ATS provides basics aircraft qualification training IAW AFI 11-2KC-46A Vol 1, AFI 11-202 Vol 2, and AMC and AETCSUPs to AFI 11-202 Vol 2.

**4.3.1.3.2.1.2 <u>Basic Aircraft Qualification Paragraph 3.1.3.2.1.2</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides basic aircraft qualification training items (a) – (l).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full class tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the ATS provides basic aircraft qualification training items (a) – (l).

**4.3.1.3.2.1.3 <u>Basic Aircraft Qualification Paragraph 3.1.3.2.1.3</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides IRC training integrated into the pilot initial qualification, upgrade training, and requalification courses.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of the fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that IRC training was effectively integrated into the pilot initial qualification, upgrade training, and requalification courses.

**4.3.1.3.2.1.4 <u>Basic Aircraft Qualification Paragraph 3.1.3.2.1.4</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that boom operator training syllabi events include scenarios that require the boom to monitor ATC communications.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full-course tryouts demonstrate that the boom operator training effectively integrated scenarios that require boom operator to monitor ATC communications.

**4.3.1.3.2.1.5 <u>Basic Aircraft Qualification Paragraph 3.1.3.2.1.5</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the boom operator training syllabi events include monitoring of takeoff, departure, and approach procedures.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full-course tryouts demonstrate that boom operator training effectively integrates scenarios in the curriculum that require the boom operator to monitor takeoff, departure, and approach procedures and advise pilots of deviations that would compromise safety.

### 4.3.1.3.2.1.6 Basic Aircraft Qualification Paragraph 3.1.3.2.1.6

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the boom operator training provides TERPS training to include items (a) – (g).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that boom operator training effectively integrated TERPS training to include items (a) – (g) into the curriculum.

### 4.3.1.3.2.2 Mission Certification Preparation Training

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides training at the FTU that prepares aircrew members to be certified at the operational unit.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates the ATS provides training at the FTU that prepares KC-46 aircrew members to be certified at the operational unit.

### 4.3.1.3.2.2.1 Mission Certification Preparation Training Paragraph 3.1.3.2.2.1

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training for boom, WARPs, and centerline drogue, Bravo, Charlie, and Golf category receiver training IAW AFI 11-2KC-46A Vol 1 and ATP-56(B).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of the ATS. This verification shall be considered successful when the full course tryouts demonstrate that mission certification preparation training for boom, WARPs, and centerline drogue, Bravo, Charlie, and Golf category receiver training IAW AFI 11-2KC-46A Vol 1 and ATP-56(B) prepares aircrew members for mission certification.

#### 4.3.1.3.2.2.2 Mission Certification Preparation Training Paragraph 3.1.3.2.2.2

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training in FARP procedures.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates the mission certification preparation training in FARP procedures effectively prepares aircrews for mission certification.

#### 4.3.1.3.2.2.3 Mission Certification Preparation Training Paragraph 3.1.3.2.2.3

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training for tactics IAW AFTTP 3-3.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates the mission certification preparation training IAW AFTTP 3-3 effectively prepares aircrews for mission certification.

#### 4.3.1.3.2.2.4 Mission Certification Preparation Training Paragraph 3.1.3.2.2.4

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training in datalink and EMCON.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that mission certification preparation training in datalink and EMCON effectively prepares aircrews for mission certification.

#### 4.3.1.3.2.2.5 Mission Certification Preparation Training Paragraph 3.1.3.2.2.5

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training that supports US Strategic Command OPLANs IAW AFI 11-2KC-46A Vol 1 to include ground servicing operations, and normal, abnormal, and emergency procedures for maximum effort operations.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that mission certification preparation training in US Strategic Command OPLANs IAW AFI 11-2KC-46A Vol 1 to include ground servicing operations, and normal, abnormal, and emergency procedures for maximum effort operations effectively prepares aircrews for mission certification.

**4.3.1.3.2.2.6 Mission Certification Preparation Training Paragraph 3.1.3.2.2.6**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides mission certification preparation training that provides formation training using VFR and IFR procedures in day and night lighting environments including normal, abnormal and emergency procedures.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that mission certification preparation training in formation training using VFR and IFR procedures in day and night lighting environments including normal, abnormal and emergency procedures effectively prepares aircrews for mission certification.

**4.3.1.3.2.2.6.1 Mission Certification Preparation Training Paragraph 3.1.3.2.2.6.1**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms the ATS provides VFR procedures training IAW AFTTP 3-3.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that VFR procedures training IAW AFTTP 3-3 effectively prepares aircrews for mission certification.

**4.3.1.3.2.2.6.2 Mission Certification Preparation Training Paragraph 3.1.3.2.2.6.2**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides IFR procedures training IAW AFTTP 3-3.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for the fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that IFR procedures training IAW AFTTP 3-3 effectively prepares aircrews for mission certification.

#### 4.3.1.3.2.3 Transition Training

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides transition training.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that transition training enables pilots and boom operators to qualify in the KC-46 aircraft.

#### 4.3.1.3.2.4 Requalification Training

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides requalification training.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for the fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrate that requalification training enables any previous qualified KC-46 aircrew member to requalify in the KC-46 aircraft.

#### 4.3.1.3.2.5 Instructor Training

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides training to qualify KC-46 aircrew members as pilot or boom operator instructors.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryout during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates that instructor training enables aircrew members to qualify as a KC-46 pilot or boom operator instructor.

#### 4.3.1.3.2.6 FTU Continuation Training

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides continuation training for recurring training events required by AFI 11-2KC-46A Vol 1.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that continuation training qualifies aircrews for recurring training events required by AFI 11-2KC-46A Vol 1.

**4.3.1.3.2.7 <u>FTU Required Training Courses</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design and syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS can provide courseware and instruction to support FTU training courses (a) – (s).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrates the ATS courseware and instruction produces a qualified aircrew member for (a) – (s) FTU training courses.

**4.3.1.3.3 <u>Main Operating Base (MOB) Training</u>**

a. Verification is N/A.

**4.3.1.3.3.1 <u>Instructor Preparation Training</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides training to prepare aircrew members to qualify as pilot or boom operator instructor.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryout during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the full course tryout demonstrates that instructor training prepares aircrew members to qualify as a pilot or boom operator instructor.

**4.3.1.3.3.2 <u>MOB Continuation Training</u>**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides continuation training for recurring training events required by AFI 11-2KC-46A Vol 1.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that continuation training qualifies aircrews for recurring training events required by AFI 11-2KC-46A Vol 1.

**4.3.1.3.3.3 MOB Required Training Courses**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design and syllabi, lesson plans, throughput analysis, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS can provide courseware and instruction to support FTU training courses (a) – (h).

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts of a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrates the ATS courseware and instruction produces a qualified aircrew member for (a) – (h) MOB training courses.

**4.3.1.4 ATS System Characteristics**

a. Verification is N/A.

**4.3.1.4.1 ATS System Characteristics Paragraph 3.1.4.1**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides training that meets AFI 11-2KC-46A Vol 1 and AFDD 3-17.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate the ATS provides training that meets AFI 11-2KC-46A Vol 1 and AFDD 3-17.

**4.3.1.4.2 ATS System Characteristics Paragraph 3.1.4.2**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS training logically follows and builds upon previously completed student training for academics, training devices, and the aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate that ATS academics, training devices, and the aircraft training logically follows and builds upon previously completed student training.

**4.3.1.4.3 ATS System Characteristics Paragraph 3.1.4.3**

a. This requirement shall be verified by inspection. This inspection shall consist of review of the training objectives. This verification shall be considered successful when the inspection determines that all the training objectives have a behavior, condition and standard that provides a measureable means to evaluate aircrew member performance.

b. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS provides training based on AF approved training objectives.

c. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation with the fully functioning ATS. This verification shall be considered successful when the full course tryouts demonstrate aircrew performance can be evaluated in measureable and observable terms.

**4.3.1.4.4 ATS System Characteristics Paragraph 3.1.4.4**

a. This requirement shall be verified by inspection. This inspection shall consist of review of the training objectives. This verification shall be considered successful when the inspection determines that all the training objectives have success criteria to assessing aircrew member achievement.

b. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, evaluation procedures and results from formative evaluation. This verification shall be considered successful when the analysis confirms that the ATS provides defined success criteria to measure aircrew member achievement of the training objectives.

**4.3.1.4.5 ATS System Characteristics Paragraph 3.1.4.5**

a. This requirement shall be verified by inspection. This inspection shall consist of review of the training objectives. This verification shall be considered successful when the inspection determines that all the training objectives have a written evaluation procedure for training objective requiring subjective evaluation.

b. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, evaluation procedures and results from formative evaluation. This verification shall be considered successful when the analysis reflects that the ATS provides written evaluation procedures for objectives that require subjective evaluation.

**4.3.1.4.6 ATS System Characteristics Paragraph 3.1.4.6**

a. This requirement shall be verified by inspection. This inspection shall consist of review of the evaluation instruments used to assess aircrew performance. This verification shall be considered successful when the inspection determines that the evaluation instruments incrementally and objectively measure aircrew member performance, diagnose any aircrew member deficiencies, and prescribe remedial instruction.

b. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms that the ATS objectively measures aircrew performance in order to confirm student progress in attaining aircrew qualification levels, and can diagnosis aircrew member deficiencies and can prescribe remedial instruction.

#### 4.3.1.4.6.1 ATS System Characteristics Paragraph 3.1.4.6.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of course syllabi developed for the KC-46 aircrew courses. This verification shall be considered successful when the inspection of the syllabi confirms that the courseware provides training in safety of flight, crew coordination, CRM, check ride preparation, and time task prioritization exercises.

b. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis reflects that the ATS provides exercises in safety-of-flight, crew coordination, CRM, check ride preparation, and time task prioritization exercises prior to performance evaluation.

c. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS has effectively integrated into the curriculum safety of flight, crew coordination, CRM, check ride preparation, and time task prioritization training prior to performance evaluation.

#### 4.3.1.4.7 ATS System Characteristics Paragraph 3.1.4.7

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms the training elements are organized into common units of instruction.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides training elements that are organized into common units of instruction.

#### 4.3.1.4.8 ATS System Characteristics Paragraph 3.1.4.8

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms the CBT courses are self-paced.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides CBT courses that are self-paced.

#### 4.3.1.4.8.1 ATS System Characteristics Paragraph 3.1.4.8.1

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms the self-paced CBT courses are proficiency or competency based.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides CBT courses that are proficiency or competency based.

#### 4.3.1.4.8.2 ATS System Characteristics Paragraph 3.1.4.8.2

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results from formative and summative evaluations. This verification shall be considered successful when the analysis confirms the self-paced CBT courses are mastery or criterion referenced.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides CBT courses that are mastery or criterion referenced.

#### 4.3.1.4.9 ATS System Characteristics Paragraph 3.1.4.9

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results of formative and summative evaluations. This verification shall be considered successful when the analysis confirms the courses build upon aircrew member’s knowledge and skills acquired from prerequisite courses.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides training that builds upon aircrew member’s knowledge and skills acquired from prerequisite courses.

#### 4.3.1.4.10 ATS System Characteristics Paragraph 3.1.4.10

a. This requirement shall be verified by analysis. This analysis shall consist of review of syllabi, lesson plans and results of formative and summative evaluations. This verification shall be considered successful when the analysis confirms the ATS course content is standardized for cross-course or cross-crew position training.

b. This requirement shall be verified by demonstration. This demonstration shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines that the ATS course content is standardized for cross-course or cross-crew position training.

#### 4.3.1.4.11 ATS System Characteristics Paragraph 3.1.4.11

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative and summative evaluations. This verification shall be considered successful when the B/DS can present mission briefings using mission planning data and debriefings using relevant video, audio, and ATD instrumentation data captured during a mission to support effective briefs and debriefs.

**4.3.1.4.11.1 ATS System Characteristics Paragraph 3.1.4.11.1**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the results from formative and summative evaluations. This verification shall be considered successful when the analysis reflects that the B/DB can be used to evaluate and critique aircrew member strengths, weaknesses and errors.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative and summative evaluations. This verification shall be considered successful when the B/DS can be used to successfully brief and debrief training missions and the B/DS can display aircrew member performance data for critiquing strengths, weaknesses, and.

**4.3.1.4.11.2 ATS System Characteristics Paragraph 3.1.4.11.2**

a. This requirement shall be verified by analysis. This analysis shall consist of review of the results from formative and summative evaluations. This verification shall be considered successful when the analysis reflects that the B/DB can be used to diagnose, explain, and prescribe remedial training for aircrew member’s errors.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative and summative evaluations. This verification shall be considered successful when the B/DS can be used to successfully brief and debrief training missions and the B/DS can be used to diagnose, explain, and prescribe remedial training for aircrew member’s errors.

**4.3.1.4.12 ATS System Characteristics Paragraph 3.1.4.12**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of course syllabi, lesson plans and results of formative and summative evaluations. This verification shall be considered successful when the inspection of the syllabi confirms that formal qualification and continuation courses incorporate networked training.

b. This requirement shall be verified by demonstration. This evaluation shall consist of full course tryouts for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS training provides formal qualification and continuation courses that effectively incorporate networked training.

**4.3.1.4.12.1 ATS System Characteristics Paragraph 3.1.4.12.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review during courseware development workshops and design reviews of hardware, software, configuration, equipment, and protocols. This verification shall be considered successful when the inspection confirms that networked training is designed using the documents listed in Tables 2.1.1 and 2.1.2.

b. This requirement shall be verified by analysis. This analysis shall consist of an assessment of the hardware, software, configuration, equipment, and protocols during courseware development workshops and design. This verification shall be considered successful when the analysis verifies the results of the inspection and that networked training satisfies the documents listed in Tables 2.1.1 and 2.1.2.

c. This requirement shall be verified by demonstration. This evaluation shall consist of LGTOs (IAW AF Handbook (AFH) 36-2235 Volume 3) to validate the training system's capability to accommodate incremental and systematic integration of all components of a training system without degradation to system performance and training effectiveness. This verification shall be considered successful when the evaluation determines the ATS can provide networked training that satisfies the documents listed in Tables 2.1.1 and 2.1.2.

#### 4.3.1.4.13 ATS System Characteristics Paragraph 3.1.4.13

a. This requirement shall be verified by analysis. This analysis shall consist of review of the ATS design, syllabi, ATD lesson plans, and results from formative and summative evaluations. This verification shall be considered successful when the analysis verifies that the training mission scenarios and objectives can be modified for each ATD session.

b. This requirement shall be verified by demonstration. This evaluation shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS generates modifiable training mission scenarios and objectives for each ATD session.

#### 4.3.1.4.13.1 ATS System Characteristics Paragraph 3.1.4.13.1

a. This requirement shall be verified by analysis. This analysis shall consist of an assessment of the training mission scenarios and the results of formative and summative evaluations. This verification shall be considered successful when the analysis verifies that the all mission scenarios can be modified by the instructors for the WST and the BOT.

b. This requirement shall be verified by demonstration. This evaluation shall consist of full course tryouts during summative evaluation of a fully functioning ATS. This verification shall be considered successful when the evaluation determines the ATS provides instructor-programmable functions and ICs in both the WST and BOT.

#### 4.3.1.4.14 ATS System Characteristics Paragraph 3.1.4.14

a. This requirement shall be verified by demonstration. This evaluation shall consist of full course tryouts during summative evaluation for a fully functioning ATS. This verification shall be considered successful when the computer-generated communication simulation (ATC, aerial refueling aircraft, Command and Control communications, and other simulated communications) can effectively communicate with the pilots and boom operators.

#### 4.3.1.5 Networked Training Modes

a. Verification is N/A.

#### 4.3.1.5.1 General Network Training Requirements

a. Verification is N/A.

#### 4.3.1.5.1.1 General Network Training Requirements Paragraph 3.1.5.1.1

a. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the network system at each design review. This verification shall be considered successful when the evaluation at the design reviews determines that the WST and BOT are able to operate as linked devices as part of a single virtual aircraft and as separate aircraft in a single training mission.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST and BOT operation during system and subsystem evaluations involving linked devices. This verification shall be considered successful when the demonstration shows that the WST and BOT operate as linked devices where both devices interoperate as part of a single virtual aircraft and as separate aircraft in a single training mission.

#### 4.3.1.5.1.2 General Network Training Requirements Paragraph 3.1.5.1.2

a. This requirement shall be verified by analysis. This analysis shall be made by data gathering and analysis during the formative and summative evaluation periods. This verification shall be considered successful when the ATS meets the required training capabilities, availability, and performance without being diminished in any way when operating in any network mode.

b. This requirement shall be verified by analysis. Training capabilities, availability, and performance fidelity of individual ATDs shall be verified IAW their development specifications. The ATS availability analysis shall be consistent with verified values of ATD availability. This verification shall be considered successful when a comprehensive analysis proves that the system meets the required training capabilities, availability, and performance of individual ATDs without being diminished in any way when operating in any network mode.

#### 4.3.1.5.1.3 General Network Training Requirements Paragraph 3.1.5.1.3

a. This requirement shall be verified by inspection. This inspection shall consist of reviews of the IOS and network design drawings, and a walkthrough of the completed IOS. This verification shall be considered successful when the IOS and network design drawings and the walkthrough examination show the STE is physically located at the IOS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the STE to communicate with another ATS. This verification shall be considered successful when the instructor can effectively communicate with the other ATS without problems.

#### 4.3.1.5.1.4 General Network Training Requirements Paragraph 3.1.5.1.4

a. This requirement shall be verified by inspection. This inspection shall consist of reviews of the IOS and network design drawings, and a walkthrough of the completed IOS. This verification shall be considered successful when the IOS and network design drawings and the walkthrough examination show the VOIP is physically located at the IOS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the VOIP to communicate with another ATS. This verification shall be considered successful when the instructor can effectively communicate with the other ATS without problems.

#### 4.3.1.5.1.5 General Network Training Requirements Paragraph 3.1.5.1.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during local and DMO testing, with the IOS set to log network data and display network health and status. This verification shall be considered successful when the IOS can log network data in real-time and display network health and status in real-time.

#### 4.3.1.5.1.6 General Network Training Requirements Paragraph 3.1.5.1.6

a. This requirement shall be verified by inspection. The inspection shall consist of reviews of the IOS display layout design drawings and a walkthrough of the completed IOS. The verification shall be considered successful when the IOS display layout design drawings show a network operations page and the IOS screen displays a network operations page that matches the IOS display layout design drawings.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to establish simulator enclave network connectivity and manage network training events, exercises, and missions. This verification shall be considered successful when the instructor can use the IOS for establishing network connectivity, and managing network training events, exercises, and missions.

#### 4.3.1.5.2 Local Network Mode at MOBs

a. Verification is N/A.

#### 4.3.1.5.2.1 Local Network Mode at MOBs Paragraph 3.1.5.2.1

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB ATS ATDs and local network to confirm that the hardware and software conform to the design requirements present at the design reviews. This verification shall be considered successful when the hardware and software can properly process and protect classified and unclassified data IAW security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the ATDs and local network at each design review to determine if the processing architecture and equipment are appropriate for the classification level(s) of the MOB ATS. This verification shall be considered successful when the evaluations at the design reviews determine that classified and unclassified data shall be processed and protected IAW security and IA procedures.

**4.3.1.5.2.2 Local Network Mode at MOBs Paragraph 3.1.5.2.2**

a. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the software architecture of the local network at each design review to determine if the software design reduces network latency effects on the MOB ATS. This verification shall be considered successful when the evaluations at the design reviews determine that latency for tightly coupled interactions shall produce no negative training cues for aerial refueling missions.

b This requirement shall be verified by demonstration. This demonstration shall consist of observations of the MOB WST and BOT operation during system and subsystem evaluations involving local network training missions. This verification shall be considered successful when the demonstration shows that the MOB WST and BOT are able to operate during local network training missions with no negative training cues due to local network latency.

c. This requirement shall be verified by test. This test shall consist of MOB local network latency measurements during formative, summative, and operational evaluation. This verification shall be considered successful when the ATS is approved for operation on the MOB local network.

**4.3.1.5.3 Local Network Mode at FTU**

a. Verification is N/A.

**4.3.1.5.3.1 Local Network Mode at FTU Paragraph 3.1.5.3.1**

a. This requirement shall be verified by inspection. This inspection shall examine the final FTU ATS ATDs and local network to confirm that the hardware and software conform to the design requirements present at the design reviews. This verification shall be considered successful when the hardware and software can properly process and protect unclassified data IAW security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the ATDs and local network at each design review to determine if the processing architecture and equipment are appropriate for the classification level(s) of the FTU ATS. This verification shall be considered successful when the evaluations at the design reviews determine that unclassified data shall be processed and protected IAW security and IA procedures.

**4.3.1.5.3.2 Local Network Mode at FTU Paragraph 3.1.5.3.2**

a. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the software architecture of the local network at each design review to determine if the software design reduces network latency effects on the FTU ATS. This verification shall be considered successful when the evaluations at the design reviews determine that latency for tightly coupled interactions shall produce no negative training cues for aerial refueling missions.

b This requirement shall be verified by demonstration. This demonstration shall consist of observations of the FTU WST and BOT operation during system and subsystem evaluations involving local network training missions. This verification shall be considered successful when the demonstration shows that the FTU WST and BOT are able to operate during local network training missions with no negative training cues due to local network latency.

c. This requirement shall be verified by test. This test shall consist of FTU local network latency measurements during formative, summative, and operational evaluation. This verification shall be considered successful when the ATS is approved for operation on the FTU local network.

#### 4.3.1.5.4 Distributed Mission Operations (DMO) Network

a. Verification is N/A.

#### 4.3.1.5.4.1 DMO Network Paragraph 3.1.5.4.1

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB ATS ATDs and DMO network interface to confirm that the hardware and software conform to the design requirements present at the design reviews. This verification shall be considered successful when the hardware and software can properly process and protect classified and unclassified data IAW DMO security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the ATDs and DMO network interface at each design review to determine if the processing architecture and equipment are appropriate for the classification level(s) of the DMO network. This verification shall be considered successful when the evaluations at the design reviews determine that classified and unclassified data shall be processed and protected IAW DMO security and IA procedures.

c. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST and BOT operation during formative, summative, and operational evaluations involving DMO network training missions. This verification shall be considered successful when the demonstration shows that the WST and BOT are able to operate as linked devices where both devices interoperate as part of a single virtual aircraft and as separate aircraft in DMO network training missions.

d. This requirement shall be verified by test. This test shall consist of MAF DMO approved test procedures. This verification shall be considered successful when the ATS is approved for operation on the MAF DMO network.

#### 4.3.1.5.4.2 DMO Network Paragraph 3.1.5.4.2

a. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the software architecture of the DMO network interface at each design review to determine if the software design reduces adverse latency effects on the MOB ATS. This verification shall be considered successful when the evaluations at the design reviews determine that latency for tightly coupled interactions shall produces no negative training cues for aerial refueling missions using the DMO network.

b This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST and BOT operation during system and subsystem evaluations involving DMO network training missions. This verification shall be considered successful when the demonstration shows that the WST and BOT are able to operate during DMO network training missions with no negative training cues due to DMO network latency.

c. This requirement shall be verified by test. This test shall consist of MAF DMO approved test procedures. This verification shall be considered successful when the ATS is approved for operation on the MAF DMO network.

### 4.3.1.5.4.3 DMO Network Paragraph 3.1.5.4.3

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB ATS ATDs and DMO network interface design to confirm that the hardware and software conform to the design requirements present at the design reviews. This verification shall be considered successful when the design shows that the hardware and software interfaces to the MAF DTC connection point.

b This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST and BOT operation during system and subsystem evaluations involving DMO network training missions. This verification shall be considered successful when the demonstration shows that the WST and BOT are able to interoperate through the MAF DTC during DMO network training missions.

c. This requirement shall be verified by test. This test shall consist of MAF DMO approved test procedures. This verification shall be considered successful when the ATS is approved for operation on the MAF DMO network.

### 4.3.1.5.4.4 DMO Network Paragraph 3.1.5.4.4

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the DMO network interface documentation, including hardware and software technical data, operating system specifications and manuals, vendor supplied documentation for hardware and software, and other technical data and manuals. This verification shall be considered successful when the analysis determines that DMO network interface spare bandwidth requirement can be met without hardware modification or change to the software architecture.

b. This requirement shall be verified by test. This test shall consist of MAF DMO approved test procedures. This verification shall be considered successful when the DMO network interface has at least 50% spare bandwidth and the ATS is approved for operation on the MAF DMO network.

#### 4.3.1.5.4.5 DMO Network Paragraph 3.1.5.4.5

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the DMO network interface documentation, including hardware and software technical data, operating system specifications and manuals, vendor supplied documentation for hardware and software, and other technical data and manuals. This verification shall be considered successful when the analysis determines that DMO network interface can sort, prioritize, and process at least 500 entities without hardware modification or change to the software architecture.

b. This requirement shall be verified by test. This test shall consist of MAF DMO approved test procedures. This verification shall be considered successful when the DMO network interface can sort, prioritize, and process at least 500 entities and the ATS is approved for operation on the MAF DMO network.

#### 4.3.2 Aircrew Training Device Component Requirements

a. Verification is N/A.

#### 4.3.2.1 Weapon System Trainer (WST)

a. Verification is N/A.

#### 4.3.2.1.1 General WST Requirements

a. Verification is N/A.

#### 4.3.2.1.1.1 General WST Requirements Paragraph 3.2.1.1.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of Large Group Tryouts (LGTOs) (IAW AFH 36-2235 Volume 3) to exercise the WST course material in an operational training environment with a variety of students. This verification shall be considered successful when the demonstration determines the training material provides the training and the students have acquired the knowledge required by the objectives to support training in airlift, aerial refueling, and other operation listed in the KC-46 Aircraft SS and AFDD 3-17.

#### 4.3.2.1.1.2 General WST Requirements Paragraph 3.2.1.1.2

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the different WST courses during courseware development workshops, Individual Tryouts (ITOs), and SGTOs measuring the course lengths, number of lesson hours, number of WST hours, and number of aircraft hours. This verification shall be considered successful when the analysis establishes that the contractor provides training for the MTTL tasks assigned to the WST.

#### 4.3.2.1.1.3 General WST Requirements Paragraph 3.2.1.1.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting specific training missions using a fielded OFP, reconfiguring the WST as necessary, and then flying the same mission using another fielded OFP. This verification shall be considered successful when the aircrew can use the WST to receive training using different OFP configurations IAW KC-46 aircraft data.

#### 4.3.2.1.1.4 General WST Requirements Paragraph 3.2.1.1.4

a. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 test requirements for Level D FFS. This verification shall be considered successful when the WST meets 14 CFR Part 60 requirements for Level D FFS.

#### 4.3.2.1.1.4.1 General WST Requirements Paragraph 3.2.1.1.4.1

a. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 test requirements for transport delay. This verification shall be considered successful when the WST transport delay is 100 ms or less.

#### 4.3.2.1.1.5 General WST Requirements Paragraph 3.2.1.1.5

a. This requirement shall be verified by test. This testing shall be accomplished IAW ARASQ Rev C Free Air, Tanker, and Receiver Simulator Standards, Validation, Function and Subjective requirements for Level D simulators. This verification shall be considered successful when the WST meets ARASQ Rev C Free Air, Tanker, and Receiver Simulator Standards, Validation, Function and Subjective requirements for Level D.

#### 4.3.2.1.1.6 General WST Requirements Paragraph 3.2.1.1.6

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB WST device and confirm that the data storage mechanisms and devices conform to the design requirements present at the design reviews. This verification shall be considered successful when the data storage mechanisms and devices can properly store and protect classified data IAW security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs at each design review to determine if the processing architecture and data storage mechanisms are appropriate for the classification level(s) of the ATS. This verification shall be considered successful when the evaluation at the design reviews determine that classified data shall be processed and stored IAW security and IA procedures.

#### 4.3.2.1.1.6.1 General WST Requirements Paragraph 3.2.1.1.6.1

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB WST device and confirm that the data storage mechanisms and devices for threat and defensive systems simulation conform to the design requirements present at the design reviews. This verification shall be considered successful when the data storage mechanisms and devices can properly store and protect classified threat and defensive systems data IAW security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the threat and defensive systems simulation subsystems at each design review to determine if the processing architecture and data storage mechanisms are appropriate for the classification level(s) of the KC-46 aircraft threat and defensive systems. This verification shall be considered successful when the evaluation at the design reviews determine that classified threat and defensive systems data shall be processed and stored IAW security and IA procedures.

#### 4.3.2.1.1.7 General WST Requirements Paragraph 3.2.1.1.7

a. This requirement shall be verified by demonstration. This demonstration shall consist of conducting a training mission during an SGTO or LGTO and confirming the WST downloads the flight and simulation data identified in the SOW for SOQA for later retrieval. This verification shall be considered successful when the downloaded data can be retrieved after completion of the training mission and the downloaded data matches the data identified in the SOW for SOQA.

#### 4.3.2.1.1.8 General WST Requirements Paragraph 3.2.1.1.8

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called Database Working Groups (DBWGs), where SMEs will analyze and give advice on the development of database features, models, terrain, and other elements to correlation these elements in all the needed databases. This verification shall be considered successful when the analysis at the DBWGs determines that the correlation needed for training can be achieved in the databases.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system imagery, radar simulation displays, motion system movements, ATC communications, landing aids, navigational and other KC-46 cockpit displays during WST flight tests. This verification shall be considered successful when the demonstration shows that the above listed system correlate the cues provided to aircrews and are capable of supporting the required WST training.

#### 4.3.2.1.1.9 General WST Requirements Paragraph 3.2.1.1.9

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the WST has NVIS compatible lights for any lights directly or indirectly illuminating the cockpit during training or mission rehearsals.

#### 4.3.2.1.1.10 General WST Requirements Paragraph 3.2.1.1.10

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew planning a mission using an AF-approved mission planning tool, downloading the data to the same media as used in the aircraft for mission data transfer, uploading the data to the WST, and then flying the mission as planned. This verification shall be considered successful when the aircrew can use the WST to receive mission training using mission plans created on AF-approved mission planning tools.

#### 4.3.2.1.1.11 General WST Requirements Paragraph 3.2.1.1.11

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST includes the subsystems identified in paragraph 3.2.1.1.11.

b. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the WST design incorporates the subsystems identified in paragraph 3.2.1.1.11. This verification shall be considered successful when the WST design is finalized.

c. This requirement shall be verified by demonstration. This demonstration shall consist of LGTOs (IAW AFH 36-2235 Volume 3) to exercise the WST in an operational training environment. This verification shall be considered successful when the demonstration determines the WST and its subsystems provide a realistic simulation environment that can replicate operating the KC-46 aircraft for pilot training.

**4.3.2.1.2 WST Visual System**

a. Verification is N/A.

**4.3.2.1.2.1 WST Visual System Paragraph 3.2.1.2.1**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database features, models, terrain, texture, and other elements to integrate the needed visual cues into the database. This verification shall be considered successful when the analysis at the DBWGs ensures that the visual cues needed for the required training are included in the database.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system imagery during WST flight tests. This verification shall be considered successful when the demonstration shows that the visual cues are capable of supporting the required WST training.

**4.3.2.1.2.2 WST Visual System Paragraph 3.2.1.2.2**

a. This requirement shall be verified by test. This test shall consist of the procedures identified in 14 CFR Part 60. This verification shall be considered successful when the visual system satisfies the requirements for a Level D FFS from 14 CFR Part 60.

**4.3.2.1.2.3 WST Visual System Paragraph 3.2.1.2.3**

a. Verification is N/A.

**4.3.2.1.2.3.1 WST Visual System Paragraph 3.2.1.2.3.1**

a. This requirement shall be verified by test. This test shall consist of the procedures to measure the refresh rate using calibrated test equipment. This verification shall be considered successful when the visual system satisfies the requirements for no larger than a 60 Hz non-interlaced refresh rate.

#### 4.3.2.1.2.3.2 WST Visual System Paragraph 3.2.1.2.3.2

a. This requirement shall be verified by test. This test shall consist of the procedures listed in the FAA's National Simulator Program, Flight Simulation Training Device Qualification Guidance Bulletin 06-02. This verification shall be considered successful when the visual system satisfies the requirements identified in the FAA's National Simulator Program, Flight Simulation Training Device Qualification Guidance Bulletin 06-02.

#### 4.3.2.1.2.3.3 WST Visual System Paragraph 3.2.1.2.3.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system operates with no color, geometry, or intensity mismatches between adjacent display channels in day, night, and dusk modes.

#### 4.3.2.1.2.3.4 WST Visual System Paragraph 3.2.1.2.3.4

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system provides spatial, behavioral, and temporal correlation with other subsystems supporting the WST, to include ground mapping and weather radar, formation, approach and navigational radio aids, and the threat modeling component of LAIRCM System and other defensive systems.

#### 4.3.2.1.2.3.5 WST Visual System Paragraph 3.2.1.2.3.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system has no artifacts such as those listed in paragraph 3.2.1.2.3.5 to include items (a) – (o).

#### 4.3.2.1.2.3.6 WST Visual System Paragraph 3.2.1.2.3.6

a. This requirement shall be verified by demonstration. This demonstration shall consist of moving the visual system's eyepoint to successively higher altitudes. This verification shall be considered successful when the test shows horizon depression effects due to earth curvature increasing with increasing altitude.

b. This requirement shall be verified by test. This test shall consist of visual system's line of sight ranging function to determine the maximum visual range. This verification shall be considered successful when the test shows a minimum visual range of 80 NM.

#### 4.3.2.1.2.3.7 WST Visual System Paragraph 3.2.1.2.3.7

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots using each different eyepoint. This verification shall be considered successful when the inspection confirms that the WST visual system renders geo-specific terrain, cultural features, and moving models that are accurate in relation to WGS-84 (see the Glossary in paragraph 5.1 for a definition of experienced).

**4.3.2.1.2.3.8 WST Visual System Paragraph 3.2.1.2.3.8**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides a worldwide database capability with a minimum of 30 airfield models and high resolution areas stored on-line and selectable from the IOS.

**4.3.2.1.2.3.9 WST Visual System Paragraph 3.2.1.2.3.9**

a. This requirement shall be verified by demonstration. This demonstration shall display a pattern of 400 by 250 polygons in groups of 100 (10 X 10) in each channel. This verification shall be considered successful when a count confirms that each visual system channel can display a minimum of 100,000 polygons without experiencing any overload or distracting effects.

b. This requirement shall be verified by demonstration. This demonstration shall display a pattern of 400 by 250 light points in groups of 100 (10 X 10) in each channel. This verification shall be considered successful when a count confirms that each visual system channel can display a minimum of 100,000 light points without experiencing any overload or distracting effects.

**4.3.2.1.2.3.9.1 WST Visual System Paragraph 3.2.1.2.3.9.1**

a. This requirement shall be verified by demonstration. This demonstration shall display a pattern of 400 by 250 polygons in groups of 100 (10 X 10) in each channel, then begin swapping polygons for light points at the rate of 100 every 2 seconds. This verification shall be considered successful when a count confirms that each visual system channel can display a minimum of 100,000 polygons, and then swap polygons for lightpoints until each visual system channel can display a minimum of 100,000 light points without experiencing any overload or distracting effects in the swap process. (This demonstration should be combined with the demonstrations in paragraph 4.3.2.1.2.3.9, with the starting point being the demonstration in paragraph 4.3.2.1.2.3.9.a, and the ending point being the demonstration in paragraph 4.3.2.1.2.3.9.b.)

**4.3.2.1.2.3.10 WST Visual System Paragraph 3.2.1.2.3.10**

a. This requirement shall be verified by demonstration. This demonstration shall display a pattern of 400 by 250 polygons in groups of 100 (10 X 10) in each channel with each polygon being fully independent, fully textured, anti-aliased, lit, and shaded. This verification shall be considered successful when a count confirms that each visual system channel can display a minimum of 100,000 polygons, with each polygon being fully independent, fully textured, anti-aliased, lit, and shaded without experiencing any overload or distracting effects. (This demonstration should be combined with the demonstrations in paragraph 4.3.2.1.2.3.9.)

**4.3.2.1.2.3.11 WST Visual System Paragraph 3.2.1.2.3.11**

a. This requirement shall be verified by test. This test shall measure light point size, highlight brightness, and contrast ratio IAW 14 CFR Part 60 for a Level D FFS. This verification shall be considered successful when the light points meet the requirements in 14 CFR Part 60 for a Level D FFS.

**4.3.2.1.2.3.11.1 WST Visual System Paragraph 3.2.1.2.3.11.1**

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and observing the behavior of light points while traversing the database and varying atmospheric haze. This verification shall be considered successful when the demonstration confirms that the light points are occulted correctly by terrain and features and fade away as the atmospheric haze increases.

**4.3.2.1.2.3.12 WST Visual System Paragraph 3.2.1.2.3.12**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots and varying the time of day, date, month, and year. This verification shall be considered successful when the inspection confirms that the WST visual system provides a continuous time of day function, with accurate sun model placement and moon model placement, phase, and rotation based on the time of day, date, month, and year through 2075 in paragraph 3.2.1.2.3.12.

**4.3.2.1.2.3.13 WST Visual System Paragraph 3.2.1.2.3.13**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides a celestial model that includes a sun disk, moon disk, and star field, with ambient illumination on all land and water surfaces, and a directional horizon glow due to the sun and moon.

**4.3.2.1.2.3.14 WST Visual System Paragraph 3.2.1.2.3.14**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides sun or moon shadows IAW time of day as well as shadows from aircraft light sources without visual artifacts.

**4.3.2.1.2.3.15 WST Visual System Paragraph 3.2.1.2.3.15**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides pixel-level and pixel-rate solar and lunar polygon and texture shading with accurate specular and ambient illumination effects.

**4.3.2.1.2.3.16 WST Visual System Paragraph 3.2.1.2.3.16**

a. This requirement shall be verified by inspection. This inspection shall consist of free play setting by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides steerable landing lights with adjustable size and shape lobe patterns, correct illumination of objects and ground planes, atmospheric glare, cloud deck and fog reflections, range and angle attenuation.

#### 4.3.2.1.2.3.17 WST Visual System Paragraph 3.2.1.2.3.17

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides a minimum of three local area, directed spotlight sources with visible illumination effects on the environment.

#### 4.3.2.1.2.3.18 WST Visual System Paragraph 3.2.1.2.3.18

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system provides ownship strobe lights with correct illumination of objects and ground planes, atmospheric glare, cloud deck and fog reflections.

#### 4.3.2.1.2.3.19 WST Visual System Paragraph 3.2.1.2.3.19

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST visual system has no fill-rate penalty or system penalty both when any one or more light sources are switched on.

#### 4.3.2.1.2.3.20 WST Visual System Paragraph 3.2.1.2.3.20

a. This requirement shall be verified by analysis. This analysis shall consist of a review of IG specifications and capabilities. This verification shall be considered successful when the analysis shows that the IG provides a minimum of 24 million active, full color, RGBA, tri-linear and anisotropic anti-aliased texels.

#### 4.3.2.1.2.3.21 WST Visual System Paragraph 3.2.1.2.3.21

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system provides system texture processing that is capable of rendering high-fidelity, mission area size, and geo-specific terrain textures with sufficient dynamic range such that no blurring occurs at close viewing ranges and no tiling patterns occur at long viewing ranges.

#### 4.3.2.1.2.3.22 WST Visual System Paragraph 3.2.1.2.3.22

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and an instructor inserting at least 64 six DOF moving models. This verification shall be considered successful when the visual system is capable of processing and displaying at least 64 six DOF moving models without experiencing any overload or visual artifacts.

#### 4.3.2.1.2.3.23 WST Visual System Paragraph 3.2.1.2.3.23

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and an instructor inserting at least 64 different static terrain-insertable models. This verification shall be considered successful when the visual system is capable of processing and displaying at least 64 different static terrain-insertable models without experiencing any overload or visual artifacts.

#### 4.3.2.1.2.3.24 WST Visual System Paragraph 3.2.1.2.3.24

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and an instructor selecting weather and climate effects as specified in paragraph 3.2.1.2.3.24. This verification shall be considered successful when the weather and climate effects are accurately simulated IAW Paragraph 3.2.1.2.3.24.

#### 4.3.2.1.2.3.24.1 WST Visual System Paragraph 3.2.1.2.3.24.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and an instructor selecting blowing dust and blowing snow. This verification shall be considered successful when the blowing dust and blowing snow effects are accurately simulated relative to aircraft speed and direction.

#### 4.3.2.1.2.3.25 WST Visual System Paragraph 3.2.1.2.3.25

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system provides accurate occulting and transparency effects with automatic occulting prioritization of translucent objects.

#### 4.3.2.1.2.3.25.1 WST Visual System Paragraph 3.2.1.2.3.25.1

a. This requirement shall be verified by analysis. This analysis shall consist of a review of IG specifications and capabilities. This verification shall be considered successful when the analysis shows that the IG provides sub-pixel occulting equivalent to for sub-pixels per pixel.

#### 4.3.2.1.2.3.26 WST Visual System Paragraph 3.2.1.2.3.26

a. This requirement shall be verified by analysis. This analysis shall consist of a review of IG specifications and capabilities. This verification shall be considered successful when the analysis show that the IG provides a relative prioritization for co-planar polygons using either a hierarchical z-buffering or other skip-over scheme.

#### 4.3.2.1.2.3.27 WST Visual System Paragraph 3.2.1.2.3.27

a. This requirement shall be verified by analysis. This analysis shall consist of a review of IG specifications and capabilities. This verification shall be considered successful when the analysis finds that the IG can output, in real-time, sufficient threat occlusion data for accurate threat simulation.

#### 4.3.2.1.2.3.28 WST Visual System Paragraph 3.2.1.2.3.28

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and intentionally crashing the ownship IAW the three conditions listed in paragraph 3.2.1.2.3.28. This verification shall be considered successful when the demonstration confirms that the WST simulates a crash when any of the three conditions occur.

#### 4.3.2.1.2.3.28.1 WST Visual System Paragraph 3.2.1.2.3.28.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and intentionally crashing the ownship IAW the three conditions listed in paragraph 3.2.1.2.3.28. This verification shall be considered successful when the demonstration confirms that the WST simulates a crash with a representative short duration crash noise and visual scene indication when any of the three conditions occur. (This demonstration should be conducted with the demonstration in paragraph 3.2.1.2.3.28.)

#### 4.3.2.1.2.3.29 WST Visual System Paragraph 3.2.1.2.3.29

a. This requirement shall be verified by test. This test shall consist of placing a theodolite at each eyepoint in the WST and measuring the vertical and horizontal FOV. This verification shall be considered successful when the test confirms that the FOV replicates the aircraft's FOV for each eyepoint.

#### 4.3.2.1.2.3.29.1 WST Visual System Paragraph 3.2.1.2.3.29.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and selecting each different eyepoint from the IOS. This demonstration shall be considered successful when the WST visual system correctly renders the imagery for each selected eyepoint.

#### 4.3.2.1.2.3.29.2 WST Visual System Paragraph 3.2.1.2.3.29.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots and selecting each different aerial refueling eyepoint from the IOS. This demonstration shall be considered successful when the WST visual system correctly renders the imagery to the top of the cockpit window for all aerial refueling positions for each aerial refueling eyepoint.

#### 4.3.2.1.2.3.29.3 WST Visual System Paragraph 3.2.1.2.3.29.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots using each different eyepoint. This demonstration shall be considered successful when the WST visual system's capabilities and performance fidelity are not reduced or degraded when operating at any eyepoint and any WST articulation.

**4.3.2.1.2.3.30 WST Visual System Paragraph 3.2.1.2.3.30**

a. This requirement shall be verified by test. This test shall use a theodolite to measure the display resolution on a test pattern with 10% contrast modulation and worst-case raster phasing (horizontal and vertical). This verification shall be considered successful when the test measures a resolution of 4 arc-minutes per optical line pair or better.

**4.3.2.1.2.3.31 WST Visual System Paragraph 3.2.1.2.3.31**

a. This requirement shall be verified by test. This test shall measure highlight luminance and contrast ratio IAW 14 CFR Part 60 for a Level D FFS. This verification shall be considered successful when the highlight brightness is a minimum of 12 foot-lamberts per channel and the contrast ratio is a minimum of 8:1 within the entire display region.

b. This requirement shall be verified by test. This test shall measure highlight luminance IAW 14 CFR Part 60 for a Level D FFS at several different locations across the entire display region. This verification shall be considered successful when the variation across the entire display region is no more than 40%.

**4.3.2.1.2.3.32 WST Visual System Paragraph 3.2.1.2.3.32**

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system during formative, summative, and operational evaluations. This verification shall be considered successful when the visual system image remains stable with respect to color, hue, or distracting effects after a 15 minute warm-up from a cold start.

**4.3.2.1.2.3.33 WST Visual System Paragraph 3.2.1.2.3.33**

a. This requirement shall be verified by demonstration. This demonstration shall consist of intentionally misaligning the color, intensity, and geometry between all channels, and performing the auto-alignment function on the visual system. This verification shall be considered successful when the demonstration confirms that the WST visual system has been adjusted so that color, intensity and geometry match between adjacent display channels.

**4.3.2.1.3 WST Radar Simulation System**

a. Verification is N/A.

**4.3.2.1.3.1 WST Radar Simulation System Paragraph 3.2.1.3.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and software components, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the WST provides radar functionality that is form, fit, and function equivalent to the KC-46 Aircraft.

b. This requirement shall be verified by analysis. This analysis shall consist of a review of the WST technical data, engineering drawings, and software components, and actual WST hardware equipment. This verification shall be considered successful when the analysis verifies that the WST provides radar functionality that is form, fit, and function equivalent to the KC-46 Aircraft.

c. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST radars during system and subsystem evaluations. This verification shall be considered successful when the radar systems in WST perform according to the aircraft simulation, and operates like the actual aircraft.

### 4.3.2.1.3.2 WST Radar Simulation System Paragraph 3.2.1.3.2

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the WST technical data, engineering drawings, and software components, and actual WST hardware equipment. This verification shall be considered successful when the analysis verifies that the WST provides radar functionality that is physics-based and operates in all modes IAW aircraft data.

### 4.3.2.1.3.3 WST Radar Simulation System Paragraph 3.2.1.3.3

a. This requirement shall be verified by test. This test shall consist of procedures to measure ARO station displays' resolution, brightness, and contrast. This verification shall be considered successful when the test results are the same as in the aircraft data.

### 4.3.2.1.3.4 WST Radar Simulation System Paragraph 3.2.1.3.4

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST radars during system and subsystem evaluations. This verification shall be considered successful when the radar systems in WST perform according to the aircraft simulation with no perceptible differences in response to control or aircraft movements.

### 4.3.2.1.3.5 WST Radar Simulation System Paragraph 3.2.1.3.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST radars during system and subsystem evaluations. This verification shall be considered successful when the radar systems in WST provide scenes representative of the actual KC-46 Aircraft radar, to include the special effects in items (a) through (s).

### 4.3.2.1.3.6 WST Radar Simulation System Paragraph 3.2.1.3.6

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of radar models and features needed in the database. This verification shall be considered successful when the analysis at the DBWGs ensures that the radar models and features for training are included in the database.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the radar imagery on the WST radar system during system and subsystem evaluations. This verification shall be considered successful when the demonstration shows that the radar models and features are capable of supporting the required training and correlate with other WST databases.

**4.3.2.1.4 <u>WST Databases</u>**

a. Verification is N/A.

**4.3.2.1.4.1 <u>WST Worldwide Database</u>**

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the inspection confirms that the WST provides a worldwide, contiguous, textured round-earth database.

**4.3.2.1.4.1.1 <u>WST Worldwide Database Paragraph 3.2.1.4.1.1</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that the WST worldwide database is supplemented with geo-positioned features, detail blended geo-specific airfield models, and other geo-specific high resolution areas as defined in Paragraph 3.2.4.1.2 and subparagraphs.

**4.3.2.1.4.1.2 <u>WST Worldwide Database Paragraph 3.2.1.4.1.2</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that the WST is able to fly between airfield models and high resolution areas without noticing the loading of new databases.

**4.3.2.1.4.1.3 <u>WST Worldwide Database Paragraph 3.2.1.4.1.3</u>**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the worldwide database. This verification shall be considered successful when the analysis at the DBWGs confirms that the worldwide database is built using NGA DTED Level 1 or equivalent for CONUS areas and at least DTED Level 0 or equivalent for OCONUS areas.

**4.3.2.1.4.1.4 <u>WST Worldwide Database Paragraph 3.2.1.4.1.4</u>**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the worldwide database. This verification shall be considered successful when the analysis at the DBWGs confirms that the worldwide database terrain imagery is built using 15 m or better geo-specific imagery or dynamically-generated thematic imagery with better than 5 m imagery combined with at least 100m (3 arc-second) placement data, and using at least 25 different land cover types.

#### 4.3.2.1.4.1.4.1 WST Worldwide Database Paragraph 3.2.1.4.1.4.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that the WST worldwide database thematic imagery eliminates sudden changes in imagery and repeating patterns.

#### 4.3.2.1.4.1.5 WST Worldwide Database Paragraph 3.2.1.4.1.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that the WST worldwide database is supplemented with geo-positioned and geo-typical features.

#### 4.3.2.1.4.1.6 WST Worldwide Database Paragraph 3.2.1.4.1.6

a. This requirement shall be verified by test. This test shall consist of the procedures identified in 14 CFR Part 60. This verification shall be considered successful when the worldwide database satisfies the requirements for Class I and II Level D databases from 14 CFR Part 60.

#### 4.3.2.1.4.2 WST Airfield Models and High Resolution Areas

a. This requirement shall be verified by demonstration. This demonstration shall consist of LGTOs (IAW AFH 36-2235 Volume 3) to exercise the WST airfield models and other high resolution areas in an operational training environment with a variety of students. This verification shall be considered successful when the demonstration determines the airfield models and other high resolution areas provide training in airlift, aerial refueling as a tanker and as a receiver, formation, and for all operational missions.

#### 4.3.2.1.4.2.1 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.1

a. This requirement shall be verified by test. This test shall consist of the procedures identified in 14 CFR Part 60. This verification shall be considered successful when the airfield models and other high resolution areas satisfy the requirements for Class I and II Level D airport models from 14 CFR Part 60.

#### 4.3.2.1.4.2.2 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.2

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution do not require specific routes for ingress and egress.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that airfield models and high resolution areas do not require specific routes for ingress and egress.

#### 4.3.2.1.4.2.3 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.3

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas represent actual locations.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that airfield models and high resolution areas provided represent actual locations.

#### 4.3.2.1.4.2.4 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.4

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide real-world features found on up to date 1:62,500 scale quad charts out to 15 NM from the airfield models and high resolution areas center, including changes found in chart updating manuals.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide real-world features found on up to date 1:62,500 scale quad charts out to 15 NM from the airfield models and high resolution areas center, including changes found in chart updating manuals.

#### 4.3.2.1.4.2.5 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.5

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide real-world features found on up to date 1:250,000 scale flight charts from 15 NM out to 25 NM from the airfield models and high resolution areas center, including changes found in chart updating manuals.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide real-world features found on up to date 1:250,000 scale flight charts from 15 NM out to 25 NM from the airfield models and high resolution areas center, including changes found in chart updating manuals.

#### 4.3.2.1.4.2.6 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.6

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide high resolution geo-specific imagery with 1 m or better resolution out to 15 NM and smoothly transition to 5 m resolution from 15 NM out to 25 NM from the airfield models and high resolution areas center.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide high resolution geo-specific imagery with 1 m or better resolution out to 15 NM and smoothly transition to 5 m resolution from 15 NM out to 25 NM from the airfield models and high resolution areas center.

**4.3.2.1.4.2.7 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.7**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that the airfield models and high resolution areas provide terrain and features that smoothly transition to the worldwide database after 25 NM from the airfield models and high resolution areas center.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide terrain and features that smoothly transition to the worldwide database after 25 NM from the airfield models and high resolution areas center.

**4.3.2.1.4.2.8 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.8**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide scene content (three dimensional buildings, towers, lights, trees, etc.) consistent with the maximum IG capacity and airfield models design, in the vicinity of the runways and their approach corridor.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide scene content (three dimensional buildings, towers, lights, trees, etc.) consistent with the maximum IG capacity and airfield models design, in the vicinity of the runways and their approach corridor.

**4.3.2.1.4.2.9 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.9**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide at least 55 photo-specific three-dimensional models in addition to all other features requirements.

b. This requirement shall be verified by demonstration. This demonstration shall consist of free play by experienced pilots. This verification shall be considered successful when the WST airfield models and high resolution areas provide at least 55 photo-specific three-dimensional models in addition to all other features requirements.

### 4.3.2.1.4.2.10 WST Airfield Models and High Resolution Areas Paragraph 3.2.1.4.2.10

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of airfield models and high resolution areas. This verification shall be considered successful when the analysis at the DBWGs ensures that airfield models and high resolution areas provide the types, locations, and densities for cultural lightpoints in night and dusk scenes to represent the areas identified in paragraph 3.2.1.4.2.10.

b. This requirement shall be verified by demonstration. This inspection shall consist of free play by experienced pilots. This verification shall be considered successful when the demonstration confirms that airfield models and high resolution areas provide the types, locations, and densities for cultural lightpoints in night and dusk scenes to represent the areas identified in paragraph 3.2.1.4.2.10.

### 4.3.2.1.4.3 WST Database Models

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the KC-46 database models. This verification shall be considered successful when the analysis at the DBWGs ensures that airborne and ground moving models are modeled and provide visual cues to support the training identified in paragraph 3.2.1.4.3.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides airborne and ground moving models with the visual cues to support the training identified in paragraph 3.2.1.4.3.

### 4.3.2.1.4.3.1 WST Database Models Paragraph 3.2.1.4.3.1

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the KC-46 database models. This verification shall be considered successful when the analysis at the DBWGs ensures that airborne and ground moving models are modeled with multiple levels to maintain the illusion of realism in case student stray closer to the moving model than anticipated.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides airborne and ground moving models with multiple levels to maintain the illusion of realism in case student stray closer to the moving model than anticipated.

**4.3.2.1.4.3.2 <u>WST Database Models Paragraph 3.2.1.4.3.2</u>**

a. This requirement shall be verified by test. This test shall consist of the procedures identified in 14 CFR Part 60. This verification shall be considered successful when the moving models meet the requirements for Level D simulators from 14 CFR Part 60.

**4.3.2.1.4.3.3 <u>WST Database Models Paragraph 3.2.1.4.3.3</u>**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the companion and refueling tanker models. This verification shall be considered successful when the analysis at the DBWGs ensures that companion and refueling tanker models display external lights, articulating boom, and drogue with hoses.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides a companion and refueling tanker models which display external lights, articulating boom, and drogue with hoses.

**4.3.2.1.4.3.4 <u>WST Database Models Paragraph 3.2.1.4.3.4</u>**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the refueling tanker models. This verification shall be considered successful when the analysis at the DBWGs ensures that refueling tanker models correctly display director lights based upon the WST's position within the aerial refueling envelop.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides a refueling tanker models that correctly display director lights based upon the WST's position within the aerial refueling envelop.

**4.3.2.1.4.3.5 <u>WST Database Models Paragraph 3.2.1.4.3.5</u>**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the relocatable airfield model. This verification shall be considered successful when the analysis at the DBWGs ensures that relocatable airfields model have the IOS selectable items in paragraph 3.2.1.4.3.5 items (a) through (f).

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides relocatable airfields model having the IOS selectable items in paragraph 3.2.1.4.3.5 items (a) through (f).

### 4.3.2.1.4.3.5.1 WST Database Models Paragraph 3.2.1.4.3.5.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of inserting the relocatable airfield via the IOS and automated mission profile into the WST database during system and subsystem evaluations. This verification shall be considered successful when the IOS inserts a relocatable airfield model at any location, elevation, or rotation that conforms to the underlying terrain.

### 4.3.2.1.4.3.5.2 WST Database Models Paragraph 3.2.1.4.3.5.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of inserting the relocatable airfield into the WST database during system and subsystem evaluations. This verification shall be considered successful when the relocatable airfield model provides for training the transition from instrument approach to visual contact at approach minimums during instrument landings and provide the capability to land, taxi, and take off.

### 4.3.2.1.4.3.6 WST Database Models Paragraph 3.2.1.4.3.6

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the KC-46 special effects models. This verification shall be considered successful when the analysis at the DBWGs ensures that the WST provides selectable special effects models for KC-46 Aircraft training, as identified in paragraph 3.2.1.4.6 items (a) through (g).
b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST database during system and subsystem evaluations. This verification shall be considered successful when the WST provides selectable special effects models for KC-46 Aircraft training, as identified in paragraph 3.2.1.4.6 items (a) through (g).

### 4.3.2.1.4.4 WST Databases Correlation

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of the WST databases. This verification shall be considered successful when the analysis at the DBWGs ensures that all the WST geo-spatial databases correlate with the models, features, and terrain of the worldwide database, airfield models, and high resolution areas by using the same source data.

### 4.3.2.1.5 WST Cockpit

a. Verification is N/A.

### 4.3.2.1.5.1 WST Cockpit Paragraph 3.2.1.5.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the

WST replicates KC-46 cockpit and seats, and is equivalent to the aircraft in form, fit, function, feel, and finish IAW aircraft data.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST during system and subsystem evaluations. This verification shall be considered successful when the cockpit and seats in WST performs according to the aircraft data, and operates like the actual aircraft.

**4.3.2.1.5.2 WST Cockpit Paragraph 3.2.1.5.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the pilots communicating with the boom operator over the aircraft intercom and interphone during training missions. This verification shall be considered successful when the pilots can communicate with the BOT over the intercom and interphone, without interference from or to other communication systems.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the pilots communicating over the radios during training missions. This verification shall be considered successful when the pilots can communicate with other aircraft and ground stations over the radios, without interference from or to other communication systems.

**4.3.2.1.5.3 WST Cockpit Paragraph 3.2.1.5.3**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the WST emergency equipment, including AFE, is actual aircraft equipment and in the correct location IAW aircraft data.

**4.3.2.1.5.4 WST Cockpit Paragraph 3.2.1.5.4**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the WST replicates KC-46 cockpit NVIS compatible lights, displays, and controls IAW aircraft data.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST during system and subsystem evaluations. This verification shall be considered successful when the cockpit compatible lights, displays, and controls in WST perform according to the aircraft data, and operate like the actual aircraft.

**4.3.2.1.6 WST Non-Cockpit Aircraft Systems**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware and software. This verification shall be considered successful when the inspection confirms that the WST functionally replicates KC-46 Aircraft non-cockpit system and is equivalent to the operation, performance, and interaction of the aircraft in all simulation environments.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST during system and subsystem evaluations. This verification shall be considered successful when the non-cockpit aircraft systems in WST perform according to the aircraft data, and are equivalent to the operation, performance, and interaction of the aircraft in all simulation environments.

**4.3.2.1.7 <u>WST Motion and Control Loading Systems</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced aircrew members during WST flight tests. This verification shall be considered successful when the motion and control loading operation and cues are perceptually equivalent to those experienced in the aircraft.

b. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 and ARASQ Rev C motion and control loading test requirements for Level D simulators. This verification shall be considered successful when the WST meets 14 CFR Part 60 and ARASQ Rev C motion and control loading requirements for Level D simulators.

**4.3.2.1.8 <u>WST Aural Cueing System</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced aircrew members during WST flight tests. This verification shall be considered successful when the aural cues are perceptually equivalent to those experienced in the aircraft.

b. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 aural cueing test requirements for Level D simulators. This verification shall be considered successful when the WST meets 14 CFR Part 60 aural cueing requirements for Level D simulators.

**4.3.2.1.9 <u>WST Instructor Operator Station (IOS)</u>**

a. Verification is N/A.

**4.3.2.1.9.1 <u>WST IOS Paragraph 3.2.1.9.1</u>**

a. This requirement shall be verified by inspection. This inspection shall consist of visually examining the IOS and the flight deck. This verification shall be considered successful when the visual examination confirms the IOS is mounted on the flight deck aft of the pilots' positions.

**4.3.2.1.9.2 <u>WST IOS Paragraph 3.2.1.9.2</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor controlling a real-time scenario from the IOS, and selecting another scenario to be loaded. This verification shall be considered successful when the instructor can activate another scenario on the IOS within two minutes.

**4.3.2.1.9.3 <u>WST IOS Paragraph 3.2.1.9.3</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor controlling WST operations during a standard training scenario, and the IOS being used to support hardware and software installation, integration, modification, and upgrades and verification of the WST. This verification shall be considered successful when the instructor has full control of all WST operations for training, and the IOS supports hardware and software installation, integration, modification, and upgrades and verification of the WST.

#### 4.3.2.1.9.4 WST IOS Paragraph 3.2.1.9.4

a. This requirement shall be verified by inspection. The inspection shall consist of review of the IC setup files at the IOS. The verification shall be considered successful when the IOS has no less than 99 IC setup files.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting an IC file set for a scenario, initializing the scenario, stopping the scenario, selecting a different IC file set, and initializing the simulation with the newly-chosen IC file set. This verification shall be considered successful when the WST accurately initializes to the newly-chosen IC file set after selection by the instructor.

#### 4.3.2.1.9.5 WST IOS Paragraph 3.2.1.9.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting weather and climate effects as specified in 14 CFR Part 60 for Level D. This verification shall be considered successful when the weather and climate effects are accurately simulated IAW 14 CFR Part 60 for Level D.

#### 4.3.2.1.9.6 WST IOS Paragraph 3.2.1.9.6

a. This requirement shall be verified by inspection. The inspection shall consist of reviews of the IOS design drawings, and a walkthrough of the completed IOS. The verification shall be considered successful when the IOS design drawings match the IOS hardware and computer workstations with touch screen input.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to initialize the WST, modify and control various parameters such as weather and aircraft location on a map. This verification shall be considered successful when the instructor can use the IOS for initialization, modification, control and monitoring of the WST.

#### 4.3.2.1.9.7 WST IOS Paragraph 3.2.1.9.7

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST technical data, engineering drawings, and actual WST hardware equipment. This verification shall be considered successful when the inspection confirms that the IOS lights, displays, and controls are not visible from the cockpit.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the WST during system and subsystem evaluations. This verification shall be considered successful when the IOS lights, displays, and controls do not interfere with cockpit NVIS compatibility.

**4.3.2.1.9.8 <u>WST IOS Paragraph 3.2.1.9.8</u>**

a. This requirement shall be verified by inspection. This inspection shall consist of reviews of the IOS design drawings, and a walkthrough of the completed IOS. This verification shall be considered successful when the IOS design drawings and examination shows the color printer is physically located at the IOS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting various IOS screen displays and printing the displays on the color printer. This verification shall be considered successful when the color printer can produce color hard copies of the selected screen displays.

**4.3.2.1.9.9 <u>WST IOS Paragraph 3.2.1.9.9</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using IOS mechanical switches to:

   1. Engage the motion system.
   2. Disengage the motion system.
   3. Lower the access ramp.
   4. Raise the access ramp.
   5. Power off the simulator using an emergency power off button.
   6. Freeze the simulation exercise.
   7. Unfreeze the simulation exercise.
   8. Shut down the electric control loading.
   9. Variable brightness control of all IOS lights, displays, and controls from off to a maximum or full brightness level.

   This verification shall be considered successful when the instructor is able to use the IOS mechanical switches to successfully perform functions 1) through 9) above without the switches failing or sticking in position.

**4.3.2.1.9.10 <u>WST IOS Paragraph 3.2.1.9.10</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using a portable IOS unit to control elements of the simulation exercise while not physically located at the IOS. This verification shall be considered successful when the instructor is able to control the simulation using the portable IOS control unit for WST training.

**4.3.2.1.9.11 <u>WST IOS Paragraph 3.2.1.9.11</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS controls and displays during WST testing. This verification shall be considered successful when the IOS employs the items listed in paragraph 3.2.1.9.11 to display WST and training mission information and control the WST and mission execution.

### 4.3.2.1.9.12 WST IOS Paragraph 3.2.1.9.12

a. This requirement shall be verified by demonstration. This demonstration shall consist of a review of the various IOS pages on the displays. This verification shall be considered successful when the IOS pages have a consistent layout and nomenclature.

### 4.3.2.1.9.13 WST IOS Paragraph 3.2.1.9.13

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during WST testing. This verification shall be considered successful when the IOS can employ the instructional features listed in paragraph 3.2.1.9.13 to support WST training.

### 4.3.2.1.9.14 WST IOS Paragraph 3.2.1.9.14

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to conduct a simulator mission, with mission information and aircrew member performance selected for display on the IOS. This verification shall be considered successful when the training mission information and aircrew member performance is displayed on the IOS in real-time.

### 4.3.2.1.9.15 WST IOS Paragraph 3.2.1.9.15

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during a pre-determined mission loaded by the instructor. This verification shall be considered successful when the IOS can display the mission flow, timeline and pre-planned actions of the loaded mission on a single page, without requiring multiple pages/screens.

### 4.3.2.1.9.16 WST IOS Paragraph 3.2.1.9.16

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor manually setting mission parameters for a training session. This verification shall be considered successful when the mission parameters can be loaded and displayed in the WST.

### 4.3.2.1.9.16.1 WST IOS Paragraph 3.2.1.9.16.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of:

   1. The instructor developing a simulator mission and storing the entire mission setup in the IC library.

   2. The instructor changing IC parameters offline (the simulator isn't using those ICs.

3. The instructor changing IC parameters in real-time (the simulator is initialized at those ICs).

This verification shall be considered successful when the instructor can develop and store a mission setup in the IC library, confirm the mission is stored in the library, and make changes to the stored mission both offline and in real-time.

**4.3.2.1.9.16.2 WST IOS Paragraph 3.2.1.9.16.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting an airfield, and an associated instrument departure and approach procedure, from a list of airfields stored in the database. This verification shall be considered successful when the instructor can select an airfield from a stored list, select a particular instrument departure and approach procedure associated with that runway, and display the departure plot, approach procedure plot and ILS/GCA plot on the IOS.

**4.3.2.1.9.16.3 WST IOS Paragraph 3.2.1.9.16.3**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS display to simulate activation of cargo compartment and ground crew controls. This verification shall be considered successful when IOS can simulate activation of cargo and ground crew controls, and the aircrew in the WST is aware of those control activations.

**4.3.2.1.9.17 WST IOS Paragraph 3.2.1.9.17**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor manually activating, deactivating, and setting parameters for relocatable airfields, threats, visual models and weather conditions during a training mission. This verification shall be considered successful when the WST can display the changes made by the instructor to the relocatable airfields, threats, visual models and weather conditions.

**4.3.2.1.9.18 WST IOS Paragraph 3.2.1.9.18**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting each aircraft malfunction identified in the aircraft data, and then choosing to:

1. Manually activate it.
2. Manually deactivate it.
3. Automatically active it.
4. Automatically deactivate it.

This verification shall be considered successful when the instructor can both manually and automatically activate and deactivate each aircraft malfunction identified in the aircraft data, the WST accurately responding IAW those malfunctions, and that response being displayed at the IOS.

#### 4.3.2.1.9.18.1 <u>WST IOS Paragraph 3.2.1.9.18.1</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting each aircraft malfunction identified in the aircraft data, and then choosing to:

   1. Manually activate it.
   2. Manually deactivate it.
   3. Automatically active it.
   4. Automatically deactivate it.

   This verification shall be considered successful when the instructor can both manually and automatically activate and deactivate each aircraft malfunction identified in the aircraft data and the WST accurately depicting the system's performance and boom operator's responses for abnormal and emergency procedures contained in the approved flight manuals.

#### 4.3.2.1.9.19 <u>WST IOS Paragraph 3.2.1.9.19</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during WST testing to adjust the KC-46 ownship (WST), tanker, and KC-46 receiver parameters. This verification shall be considered successful when the IOS can set the different types of parameters listed in paragraph 3.2.1.9.19 to support WST training.

#### 4.3.2.1.9.20 <u>WST IOS Paragraph 3.2.1.9.20</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting an airfield in the database and doing the following:

   1. Adjusting the airfield lighting.
   2. Adjusting the approach lighting.
   3. Inserting static models.
   4. Inserting moving models.
   5. Deleting static models.
   6. Deleting moving models.

   This verification shall be considered successful when the instructor can use the IOS to select an airfield in the database and perform tasks 1) through 6) above and the associated changes being accurately displayed on the IOS and in the WST.

#### 4.3.2.1.9.21 <u>WST IOS Paragraph 3.2.1.9.21</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS displaying each aircraft circuit breaker panel on the display, and the instructor opening and closing each circuit breaker on those panels. This verification shall be considered successful when the instructor opens a circuit breaker all affected aircraft systems react accordingly, and when instructor closes a circuit breaker all affected aircraft systems return to normal operation.

**4.3.2.1.9.22 WST IOS Paragraph 3.2.1.9.22**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting a rendezvous procedure for the tanker and receiver aircraft IAW ATP-56(B). This verification shall be considered successful when the instructor can select a rendezvous procedure and the IOS and WST displays accurately portray the rendezvous procedure for the established aerial refueling routes and locations.

**4.3.2.1.9.22.1 WST IOS Paragraph 3.2.1.9.22.1**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the tanker and receiver aircraft at each standardized position from RVIP to the post aerial refueling positions at the conclusion of aerial refueling. This verification shall be considered successful when the IOS accurately places the tanker aircraft at the each of the standardized positions and can reposition the tanker and receiver aircraft from any standardized position to any other standardized position.

**4.3.2.1.9.22.2 WST IOS Paragraph 3.2.1.9.22.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the tanker aircraft at the RVIP then repositioning it to the next standardized positions using instantaneous movement of the tanker and receiver aircraft. This verification shall be considered successful when the IOS accurately places the tanker and receiver aircraft at the each of the standardized positions.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the tanker aircraft at the RVIP then repositioning it to the next standardized positions using a smooth transitional movement of the tanker and receiver aircraft. This verification shall be considered successful when the IOS accurately places the tanker and receiver aircraft at the each of the standardized positions.

**4.3.2.1.9.22.3 WST IOS Paragraph 3.2.1.9.22.3**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the aircrew flying the WST while refueling another aircraft, and the instructor at the IOS initiating different breakaway scenarios. This verification shall be considered successful when the instructor is able to control the breakaway scenarios IAW ATP-56(B) and observe the aircrew and WST actions.

**4.3.2.1.9.23 WST IOS Paragraph 3.2.1.9.23**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting and initiating an overrun condition and an underrun condition. This verification shall be considered successful when the IOS moves the tanker and receiver aircraft completely outside the refueling envelope based on instructor inputs of overrun and underrun conditions.

#### 4.3.2.1.9.24 WST IOS Paragraph 3.2.1.9.24

a. This requirement shall be verified by inspection. This inspection shall consist of visually examining the IOS display to observe the parameters of the tanker and receiver aircraft moving model. This verification shall be considered successful when the examination shows the tanker and receiver aircraft information on the IOS in an easy to read format and location.

#### 4.3.2.1.9.25 WST IOS Paragraph 3.2.1.9.25

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during WST testing to display a moving map with all the items listed in paragraph 3.2.1.9.25. This verification shall be considered successful when the IOS moving map display can show the different items listed in paragraph 3.2.1.9.25 to support WST training.

#### 4.3.2.1.9.26 WST IOS Paragraph 3.2.1.9.26

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor building a mission route on the map display. This verification shall be considered successful when the instructor can successfully build a mission route on the map display.

#### 4.3.2.1.9.27 WST IOS Paragraph 3.2.1.9.27

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor individually selecting the ownship, threats, moving models, and obstacles, and moving them using a “Drag and Drop” method to different locations in the database. This verification shall be considered successful when the instructor can move the items listed above to different locations in the database using the “Drag and Drop” method, and the WST accurately display the changes.

#### 4.3.2.1.9.28 WST IOS Paragraph 3.2.1.9.28

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor both composing a data link message and selecting pre-programmed data link messages and setting the conditions under which the messages are automatically sent to the WST. This verification shall be considered successful when the instructor can both compose data link messages and select pre-programmed data link messages, set the conditions under which they are inserted, and confirm the messages were sent to the WST when the those conditions are met.

#### 4.3.2.1.9.28.1 WST IOS Paragraph 3.2.1.9.28.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to enable and disable the automatic sending of data link messages to the WST. This verification shall be considered successful when the system stops sending data link messages when disable is selected and starts sending data link messages when enable is selected.

**4.3.2.1.9.29 WST IOS Paragraph 3.2.1.9.29**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor turning the alarm bells and the klaxon horns off when activated and then turning them back on. This verification shall be considered successful when the alarm bells and klaxon horns turn off and on IAW the instructor's selection.

**4.3.2.1.9.30 WST IOS Paragraph 3.2.1.9.30**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor at the IOS transmitting and receiving over each ownship simulated radio, and over the intercom and interphone systems. This verification shall be considered successful when the instructor and aircrew can communicate over each ownship simulated radio, and over the intercom and interphone systems without interference.

**4.3.2.1.9.31 WST IOS Paragraph 3.2.1.9.31**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the pilot instructor and the boom operator instructor communicating with each other over a private system or channel, while the WST and BOT are linked together for training. This verification shall be considered successful when the pilot instructor and boom operator instructor can communicate with each other over a private system or channel, without the aircrew hearing either instructor.

**4.3.2.1.9.32 WST IOS Paragraph 3.2.1.9.32**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor acting as another entity to communicate with the pilots. This verification shall be considered successful when the instructor can act as another entity in the simulation and effectively communicate with the pilots.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting a computer-generated communication simulation to communicate with the pilots. This verification shall be considered successful when the computer-generated communication simulation can effectively communicate with the pilots.

**4.3.2.1.9.32.1 WST IOS Paragraph 3.2.1.9.32.1**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to enable and disable the computer-generated communication simulation. This verification shall be considered successful when the instructor can enable and disable the computer-generated communication simulation, and the communication simulation starts and stops accordingly

**4.3.2.1.9.33 WST IOS Paragraph 3.2.1.9.33**

a. This requirement shall be verified by demonstration. This demonstration shall consist of an instructor at the IOS activating and controlling a minimum of 64 DCS models simultaneously. This verification shall be considered successful when the instructor can activate and control a minimum of 64 DCS models simultaneously during a WST mission.

#### 4.3.2.1.9.34 <u>WST IOS Paragraph 3.2.1.9.34</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor activating and controlling DCS models that consist of any combination of the models listed in paragraph 3.2.1.9.34. This verification shall be considered successful when the instructor can activate and control any combination of the models listed in paragraph 3.2.1.9.34 during a WST mission.

#### 4.3.2.1.9.35 <u>WST IOS Paragraph 3.2.1.9.35</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using a joystick at the IOS to manually “fly” a lead formation aircraft moving model during a simulator mission. The instructor shall also perform a demonstration of “flying” any other moving model during a simulator mission. This verification shall be considered successful when the instructor is able to control a lead formation aircraft moving model and any other moving model with the joystick, and the moving models react to joystick inputs without delay.

#### 4.3.2.1.9.35.1 <u>WST IOS Paragraph 3.2.1.9.35.1</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using a joystick to control airspeed, heading, altitude and attitude of a moving model. This verification shall be considered successful when the instructor can control the airspeed, heading, altitude and attitude of a moving model, with no delay between joystick inputs and performance of the moving model.

#### 4.3.2.1.9.35.2 <u>WST IOS Paragraph 3.2.1.9.35.2</u>

a. This requirement shall be verified by inspection. This inspection shall consist of visually examining the IOS display to observe the parameters of the joystick-controlled moving model. This verification shall be considered successful when the airspeed, heading, altitude and attitude of the joystick-controlled moving model can be displayed on the IOS in an easy to read format and location.

#### 4.3.2.1.9.36 <u>WST IOS Paragraph 3.2.1.9.36</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS providing automatic control of moving models, to include formation and tanker aircraft, based on the instructor’s selection of the following inputs for those moving models:

1. External lights on.

2. External lights off.

3. Simulated pilot skill and aggression levels.
4. Altitude setting.
5. Closure setting.
6. Maneuvering setting.

This verification shall be considered successful when the IOS can automatically and accurately control moving models, to include formation and tanker aircraft, based on instructor inputs for external lights on or off, simulated pilot skill and aggression levels, and altitude, closure, and maneuvering settings.

**4.3.2.1.9.36.1 <u>WST IOS Paragraph 3.2.1.9.36.1</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS display to select and position individual aircraft in a formation. This verification shall be considered successful when the instructor can select and position individual aircraft in a formation, and the WST accurately displaying the changes.

**4.3.2.1.9.36.2 <u>WST IOS Paragraph 3.2.1.9.36.2</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting a rendezvous procedure for the tanker and receiver aircraft IAW ATP-56(B). This verification shall be considered successful when the instructor can select a rendezvous procedure and the IOS can display and WST can accurately portray the rendezvous procedure for the established aerial refueling routes and locations.

**4.3.2.1.9.37 <u>WST IOS Paragraph 3.2.1.9.37</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting TCAS profiles from a list of at least 20 profiles. This verification shall be considered successful when the instructor can select TCAS profiles, and the IOS can display and WST can accurately portray the selected TCAS profile.

**4.3.2.1.9.38 <u>WST IOS Paragraph 3.2.1.9.38</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting any wind shear model from a list of at least eight choices. This verification shall be considered successful when the WST can accurately simulate the wind shear models IAW 14 CFR Part 60.

**4.3.2.1.9.39 <u>WST IOS Paragraph 3.2.1.9.39</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting help screens for specific IOS functions. This verification shall be considered successful when the IOS can display explanations and assistance for those functions.

**4.3.2.1.9.40 <u>WST IOS Paragraph 3.2.1.9.40</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using separate pages at the IOS to initiate automatic and manual tests for SIMCERTs. This verification shall be considered successful when the instructor can select and run automatic and manual tests for SIMCERTs.

**4.3.2.1.9.41 WST IOS Paragraph 3.2.1.9.41**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the Snapshot Store and Recall Function to quickly Store the simulator's conditions and parameters a minimum of 20 times during a mission, and later Recall those conditions and parameters to restore the simulator to that previous state. This verification shall be considered successful when the instructor can use the IOS Snapshot Store and Recall Function a minimum of 20 times to quickly Store the WST conditions and parameters, later Recall those conditions and parameters, and the WST being restored to that previous state.

**4.3.2.1.9.42 WST IOS Paragraph 3.2.1.9.42**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor controlling a WST mission while a continuous recording of the simulated mission, to include visual, cockpit video and audio, and aural cues, is made. This verification shall be considered successful when a previously-recorded mission can be accurately replayed in the WST and at the B/DS.

**4.3.2.1.9.42.1 WST IOS Paragraph 3.2.1.9.42.1**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using an instant replay page at the IOS to run a previously-recorded WST mission. This verification shall be considered successful when a previously-recorded mission can be accurately replayed in the WST.

**4.3.2.1.9.42.2 WST IOS Paragraph 3.2.1.9.42.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor removing power to the WST, simulating a power failure, while a continuous recording of the WST mission is made. This verification shall be considered successful when, after the WST is re-started, the interrupted mission recording is available for the instructor to replay.

**4.3.2.1.9.42.3 WST IOS Paragraph 3.2.1.9.42.3**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor putting the WST in system freeze, and then restarting the simulation. This verification shall be considered successful when the mission recording was paused during the time the simulator was in system freeze.

**4.3.2.1.9.42.4 WST IOS Paragraph 3.2.1.9.42.4**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor making a minimum of 20 mark points in an hour during a WST mission.

This verification shall be considered successful when the 20 mark points in the mission recording are available for replaying the mission in the WST and B/DS.

#### 4.3.2.1.9.42.5 WST IOS Paragraph 3.2.1.9.42.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor adding comments or notes when making a mark points. This verification shall be considered successful when the instructor's comments or notes made at a mark point in the mission recording are available during replay of the mission.

#### 4.3.2.1.10 WST Brief/Debrief System

a. Verification is N/A.

#### 4.3.2.1.10.1 WST Brief/Debrief Paragraph 3.2.1.10.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the B/DS can be used to successfully brief and debrief training missions to include debriefing aircrew member performance.

#### 4.3.2.1.10.2 WST Brief/Debrief System Paragraph 3.2.1.10.2

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the B/DS design is consistent with the requirements in paragraph 3.2.1.10.2. This verification shall be considered successful when the B/DS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the B/DS can be used to successfully brief and debrief training missions using planning or recorded data and imagery.

#### 4.3.2.1.10.3 WST Brief/Debrief System Paragraph 3.2.1.10.3

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the B/DS design is consistent with the requirements in paragraph 3.2.1.10.3. This verification shall be considered successful when the B/DS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the B/DS can display the briefing material as specified in paragraph 3.2.1.10.3 using mission planning data.

#### 4.3.2.1.10.4 WST Brief/Debrief System Paragraph 3.2.1.10.4

a. This requirement shall be verified by inspection. This inspection shall consist of reviews of the B/DS design drawings, and a walkthrough of the completed WST. This verification shall be considered successful when the B/DS design drawings and examination shows the on-board video camera and voice recorders are physically located in the WST as depicted in the drawings.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the B/DS can replay the on-board video and audio recorded during training missions.

#### 4.3.2.1.10.5 WST Brief/Debrief System Paragraph 3.2.1.10.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when audio, video, and recorded WST mission data can be electronically stored and downloaded to the B/DS in three minutes or less.

#### 4.3.2.1.10.6 WST Brief/Debrief System Paragraph 3.2.1.10.6

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the recorded training mission data, including audio and video, can be played back in its entirety, from any mark point, and from any point in time selected by the instructor.

#### 4.3.2.1.10.7 WST Brief/Debrief System Paragraph 3.2.1.10.7

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the B/DS design is consistent with the requirements in paragraph 3.2.1.10.7. This verification shall be considered successful when the B/DS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the B/DS during formative, summative, and operational evaluations. This verification shall be considered successful when the B/DS can display the debriefing material as specified in paragraph 3.2.1.10.7 using recorded data downloaded from the WST after a mission.

#### 4.3.2.1.10.8 WST Brief/Debrief System Paragraph 3.2.1.10.8

a. This requirement shall be verified by inspection. This inspection shall consist of reviews of the B/DS design drawings, and a walkthrough of the completed B/DS. This verification shall be considered successful when the IOS design drawings and examination shows the color printer is physically located at the B/DS.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting various B/DS screen displays and printing the displays on the color printer. This verification shall be considered successful when the color printer can produce color hard copies of the displays, to include aircrew member performance data.

#### 4.3.2.1.11 WST Threat Generation System

a. Verification is N/A.

#### 4.3.2.1.11.1 WST Threat Generation System Paragraph 3.2.1.11.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the threat generation system technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the inspection confirms that the threat generation system computer equipment is acceptable for running XCITE.

b. This requirement shall be verified by analysis. This analysis shall consist of a review of the threat generation system technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the analysis confirms that the threat generation system software uses XCITE.

c. This requirement shall be verified by demonstration. This demonstration shall consist of use of the threat generation system during formative, summative, and operational evaluations. This verification shall be considered successful when the threat generation system provides the threat data and models to support WST training.

#### 4.3.2.1.11.2 WST Threat Generation System Paragraph 3.2.1.11.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of use of the threat generation system during formative, summative, and operational evaluations. This verification shall be considered successful when the threat generation system provides the threat and non-threat emitters reference in the KC-46 Aircraft SS to support WST training.

#### 4.3.2.1.11.3 WST Threat Generation System Paragraph 3.2.1.11.3

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the threat generation system technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the inspection confirms that the threat generation system computer equipment is a server based computer system capable of supporting single ship, local network, and MAF DMO modes of operation.

#### 4.3.2.1.11.4 WST Threat Generation System Paragraph 3.2.1.11.4

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual threat models needed in the database. This verification shall be considered successful when the analysis at the DBWGs ensures that the threat models needed for training are included in the database.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual imagery on the WST visual system during system and subsystem evaluations. This verification shall be considered successful when the demonstration shows that the threat models are display on the visual system.

#### 4.3.2.1.11.5 WST Threat Generation System Paragraph 3.2.1.11.5

a. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs of the threat and defensive systems simulation subsystems at each design review to determine how the emitter signal sensing is calculated. This verification shall be considered successful when the evaluation at the design reviews determines that occlusion data from the visual system is used to calculate emitter signal sensing.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual system threat models and the emitter signal sensing in the WST during system and subsystem evaluations. This verification shall be considered successful when the demonstration shows that the threat models are properly occulted based on visual database terrain data.

#### 4.3.2.2 Boom Operator Trainer (BOT)

a. Verification is N/A.

#### 4.3.2.2.1 General BOT Requirements

a. Verification is N/A.

#### 4.3.2.2.1.1 General BOT Requirements Paragraph 3.2.2.1.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of LGTOs (IAW AFH 36-2235 Volume 3) to exercise the BOT course material in an operational training environment with a variety of students. This verification shall be considered successful when the demonstration determines the training material provides the training and the students have acquired the knowledge required by the objectives to support initial qualification, requalification, continuation and upgrade training.

#### 4.3.2.2.1.2 General BOT Requirements Paragraph 3.2.2.1.2

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the different BOT courses during courseware development workshops, ITOs, and SGTOs measuring the course lengths, number of lesson hours, number of BOT hours, and number of aircraft hours. This verification shall be considered successful when the analysis establishes that the contractor provides training for the MTTL tasks assigned to the BOT.

#### 4.3.2.2.1.3 General BOT Requirements Paragraph 3.2.2.1.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting pecific training missions using a fielded OFP, reconfiguring the BOT, and then flying the same mission using another fielded OFP. This verification shall be considered successful when the aircrew can use the BOT to receive training using different OFP configurations IAW KC-46 aircraft data.

#### 4.3.2.2.1.4 General BOT Requirements Paragraph 3.2.2.1.4

a. This requirement shall be verified by test. This testing shall be accomplished IAW ARASQ Rev C Boom Operator Simulator Standards, Validation, Function and Subjective requirements for Level 2 simulators. This verification shall be considered successful when the BOT meets ARASQ Rev C Boom Operator Simulator Standards, Validation, Function and Subjective requirements for Level 2.

#### 4.3.2.2.1.5 General BOT Requirements Paragraph 3.2.2.1.5

a. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 test requirements for Level D FFS Quality Performance Standards specified in Table A2A, Full Flight Simulator (FFS) Objective Tests, Test Entry Numbers 2.c.9, Phugoid Dynamics, and 2.c.10, Short Period Dynamics. This verification shall be considered successful when the BOT meets 14 CFR Part 60 requirements for Level D FFS Quality Performance Standards specified in Table A2A, Full Flight Simulator (FFS) Objective Tests, Test Entry Numbers 2.c.9, Phugoid Dynamics, and 2.c.10, Short Period Dynamics.

#### 4.3.2.2.1.6 General BOT Requirements Paragraph 3.2.2.1.6

a. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 test requirements for transport delay. This verification shall be considered successful when the BOT transport delay is 100 ms or less.

#### 4.3.2.2.1.7 General BOT Requirements Paragraph 3.2.2.1.7

a. This requirement shall be verified by inspection. This inspection shall examine the final MOB BOT device and confirm that the data storage mechanisms and devices conform to the design requirements present at the design reviews. This verification shall be considered successful when the data storage mechanisms and devices can properly store and protect classified data IAW security and IA procedures.

b. This requirement shall be verified by analysis. The analysis shall consist of a thorough examination and evaluation of the hardware and software engineering designs at each design review to determine if the processing architecture and data storage mechanisms are appropriate for the classification level(s) of the ATS. This verification shall be considered successful when the evaluation at the design reviews determine that classified data shall be processed and stored IAW security and IA procedures.

#### 4.3.2.2.1.8 General BOT Requirements Paragraph 3.2.2.1.8

a. This requirement shall be verified by demonstration. During summative evaluation LGTOs shall confirm the BOT's capability to allow the student to visually scan for air traffic and threat in all mission segments. This verification shall be considered successful when the demonstration determines that the student can visually scan for air traffic and threats in all mission segments.

#### 4.3.2.2.1.9 General BOT Requirements Paragraph 3.2.2.1.9

a. This requirement shall be verified by demonstration. This demonstration shall consist of conducting a training mission during a SGTO or LGTO and confirming the BOT downloads the flight and simulation data identified in the SOW for SOQA for later retrieval. This verification shall be considered successful when the downloaded data can be retrieved after completion of the training mission and the downloaded data matches the data identified in the SOW for SOQA.

**4.3.2.2.1.10 General BOT Requirements Paragraph 3.2.2.1.10**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT's technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the BOT includes the subsystems identified in paragraph 3.2.2.1.10.

b. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the BOT design incorporates the subsystems identified in paragraph 3.2.2.1.10. This verification shall be considered successful when the BOT design is finalized.

c. This requirement shall be verified by demonstration. This demonstration shall consist of LGTOs (IAW AFH 36-2235 Volume 3) to exercise the BOT in an operational training environment. This verification shall be considered successful when the demonstration determines the BOT and its subsystems provide a realistic simulation environment that can replicate the actual ARO station in the KC-46 aircraft for boom operator training.

**4.3.2.2.2 BOT Image Generator (IG) System**

a. Verification is N/A.

**4.3.2.2.2.1 BOT IG System Paragraph 3.2.2.2.1**

a. This requirement shall be verified by analysis. The analysis shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database features, models, terrain, texture, and other elements to integrate the needed visual cues into the database. This verification shall be considered successful when the analysis at the DBWGs ensures that the visual cues needed for training are included in the database.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the visual imagery on the ARO displays during system and subsystem evaluations. This verification shall be considered successful when the demonstration shows that the visual cues are capable of supporting the required training.

**4.3.2.2.2.2 BOT IG System Paragraph 3.2.2.2.2**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT IG system's technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST and BOT IG systems are the same.

b. This requirement shall be verified by analysis. This analysis shall repeat selected WST visual system analyses for the BOT IG system. This verification shall be considered successful when the BOT IG system meets the success criteria of the selected WST visual system analyses.

c. This requirement shall be verified by demonstration. This analysis shall repeat selected WST visual system demonstrations for the BOT IG system. This verification shall be considered successful when the BOT IG system meets the success criteria of the selected WST visual system demonstrations.

d. This requirement shall be verified by test. This test shall repeat selected WST visual system tests for the BOT IG system. This verification shall be considered successful when the BOT IG system meets the success criteria of the selected WST visual system tests.

#### 4.3.2.2.2.3 BOT IG System Paragraph 3.2.2.2.3

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT display's technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the BOT displays look, perform, and operate the same as the ARO displays

b. This requirement shall be verified by demonstration. This demonstration shall consist of using the BOT IG to generate and display imagery on the BOT displays. This verification shall be considered successful when the BOT can display IG imagery that is representative of the type of imagery seen on the actual aircraft.

#### 4.3.2.2.2.4 BOT IG System Paragraph 3.2.2.2.4

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft on the BOT displays during system and subsystem evaluations. This verification shall be considered successful when the receiver aircraft control surface articulations and animations are operating correctly for the maneuvers the receiver aircraft performs.

#### 4.3.2.2.2.5 BOT IG System Paragraph 3.2.2.2.5

a. This requirement shall be verified by demonstration. This demonstration shall consist of using the BOT IG to generate and display day, night and dusk imagery, with and without weather, on the BOT displays. This verification shall be considered successful when the BOT can display IG imagery that is representative of the type of day, night and dusk imagery, with and without weather, seen on the actual aircraft.

#### 4.3.2.2.2.6 BOT IG System Paragraph 3.2.2.2.6

a. This requirement shall be verified by demonstration. This demonstration shall consist of inserting more models and features into the mission to cause the BOT IG to overload the system. This verification shall be considered successful when the BOT IG can maintain the visible details of the current active aircraft to be refueled while the system operates in an overload condition.

#### 4.3.2.2.3 BOT Databases

a. Verification is N/A.

#### 4.3.2.2.3.1 BOT Databases Paragraph 3.2.2.3.1

a. This requirement shall be verified by inspection. This inspection shall consist of free play by experienced boom operators. This verification shall be considered successful when the inspection confirms that the WST and BOT databases are the same.

#### 4.3.2.2.3.2 BOT Databases Paragraph 3.2.2.3.2

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent the aerial refueling boom and drogue(s) in the database. This verification shall be considered successful when the DBWGs ensure that the aerial refueling boom and drogue(s) appear realistic and operate similar to the actual KC-46 aircraft systems.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the aerial refueling boom and drogue(s) during system and subsystem evaluations. This verification shall be considered successful when the aerial refueling boom and drogue(s) articulations and animations appear to be operating correctly and similar to the actual KC-46 aircraft systems.

#### 4.3.2.2.3.2.1 BOT Databases Paragraph 3.2.2.3.2.1

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements represent the aerial refueling boom and drogue(s) in the database. This verification shall be considered successful when the DBWGs ensure that the aerial refueling boom and drogue(s) appear realistic and operate similar to the actual KC-46 aircraft systems.

#### 4.3.2.2.3.3 BOT Databases Paragraph 3.2.2.3.3

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft models in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft models appear realistic and operate similar to the ATP-56(B) aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft models during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft models appear to be operating correctly and similar to the ATP-56(B) aircraft.

#### 4.3.2.2.3.3.1 BOT Databases Paragraph 3.2.2.3.3.1

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft models in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft models appear realistic and operate similar to the ATP-56(B) aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft models during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft models appear to be operating correctly and similar to the ATP-56(B) aircraft.

#### 4.3.2.2.3.3.2 BOT Databases Paragraph 3.2.2.3.3.2

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft models in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft models appear realistic and operate similar to the ATP-56(B) aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft models during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft models appear to be operating correctly and similar to the ATP-56(B) aircraft.

#### 4.3.2.2.3.3.3 BOT Databases Paragraph 3.2.2.3.3.3

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft models in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft models appear realistic and operate similar to the ATP-56(B) aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft models during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft models appear to be operating correctly and similar to the ATP-56(B) aircraft.

#### 4.3.2.2.3.3.4 BOT Databases Paragraph 3.2.2.3.3.4

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft models in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft models appear realistic and operate similar to the ATP-56(B) aircraft.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft models during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft models appear to be operating correctly and similar to the ATP-56(B) aircraft.

#### 4.3.2.2.3.4 BOT Databases Paragraph 3.2.2.3.4

a. This requirement shall be verified by inspection. The inspection shall consist of in-process reviews called DBWGs, where SMEs will analyze and give advice on the development of visual database models, texture, animations, articulations, and other elements to represent receiver aircraft pilot model(s) in the database. This verification shall be considered successful when the DBWGs ensure that the receiver aircraft pilot model(s) appear realistic and operate similar to actual receiver aircraft pilots.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the receiver aircraft pilot model(s) during system and subsystem evaluations. This verification shall be considered successful when receiver aircraft pilot model(s) appear to be operating correctly and similar to actual receiver aircraft pilots.

#### 4.3.2.2.4 BOT ARO station

a. Verification is N/A.

#### 4.3.2.2.4.1 BOT ARO Station Paragraph 3.2.2.4.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT technical data, engineering drawings, and actual BOT hardware equipment. This verification shall be considered successful when the inspection confirms that the BOT replicates KC-46 ARO station and seats, and is equivalent to the aircraft in form, fit, function, feel, and finish IAW aircraft data.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the BOT during system and subsystem evaluations. This verification shall be considered successful when the ARO station and seats in the BOT performs according to the aircraft data, and operates like the actual aircraft.

#### 4.3.2.2.4.2 BOT ARO Station Paragraph 3.2.2.4.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator communicating over the boom interphone during training missions. This verification shall be considered successful when the boom operator can communicate with the receiver aircraft over the boom interphone, without interference from or to other communication systems.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator communicating with the other aircrew members over the aircraft intercom and interphone during training missions. This verification shall be considered successful when the boom operator can communicate with the WST over the boom interphone, without interference from or to other communication systems.

c. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator communicating over the radios during training missions. This verification shall be considered successful when the boom operator can communicate with the receiver aircraft over the radios, without interference from or to other communication systems.

#### 4.3.2.2.4.3 BOT ARO Station Paragraph 3.2.2.4.3

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT technical data, engineering drawings, and actual BOT hardware equipment. This verification shall be considered successful when the inspection confirms that the BOT emergency equipment, including AFE, is actual aircraft equipment and in the correct location IAW aircraft data.

#### 4.3.2.2.5 BOT Non-ARO Station Aircraft Systems

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT technical data, engineering drawings, and actual BOT hardware and software. This verification shall be considered successful when the inspection confirms that the BOT functionally replicates KC-46 Aircraft non-ARO station system and is equivalent to the operation, performance, and interaction of the aircraft in all simulation environments.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations of the BOT during system and subsystem evaluations. This verification shall be considered successful when the non-ARO station aircraft systems in BOT perform according to the aircraft data, and are equivalent to the operation, performance, and interaction of the aircraft in all simulation environments as defined in the Design Criteria.

#### 4.3.2.2.6 BOT Motion and Control Loading Systems

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced boom operators during BOT flight tests. This verification shall be considered successful when the motion and control loading operation and cues are perceptually equivalent to those experienced in the aircraft.

b. This requirement shall be verified by test. This testing shall be accomplished IAW motion and control loading tests imposed by 14 CFR Part 60 for Level D simulators, excluding Table A2A, entry number 3.e.2, and imposed by ARASQ Rev C for Level 2 simulators. This verification shall be considered successful when the BOT meets motion and control loading requirements for Level D simulators in 14 CFR Part 60, and for Level 2 simulators in ARASQ Rev C.

#### 4.3.2.2.7 BOT Aural Cueing System

a. Verification is N/A.

#### 4.3.2.2.7.1 BOT Aural Cueing System Paragraph 3.2.2.7.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT aural cueing system technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST and BOT systems are the same.

b. This requirement shall be verified by test. This testing shall be accomplished IAW 14 CFR Part 60 aural cueing test requirements for Level D simulators. This verification shall be considered successful when the BOT meets 14 CFR Part 60 aural cueing requirements for Level D simulators.

#### 4.3.2.2.7.2 <u>BOT Aural Cueing System Paragraph 3.2.2.7.2</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced boom operators during BOT flight tests. This verification shall be considered successful when the aural cues are perceptually equivalent to those experienced in the aircraft.

#### 4.3.2.2.8 <u>BOT Instructor Operator Station (IOS)</u>

a. Verification is N/A.

#### 4.3.2.2.8.1 <u>BOT IOS Paragraph 3.2.2.8.1</u>

a. This requirement shall be verified by inspection. This inspection shall consist of visually examining the BOT IOS and the ARO station. This verification shall be considered successful when the visual examination confirms the BOT IOS is mounted on the platform near the ARO station to allow a single instructor to operate the IOS.

#### 4.3.2.2.8.2 <u>BOT IOS Paragraph 3.2.2.8.2</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using a portable IOS unit to control elements of the training exercise while not physically located at the IOS. This verification shall be considered successful when the instructor is able to control the simulation using the portable IOS control unit for BOT training.

#### 4.3.2.2.8.3 <u>BOT IOS Paragraph 3.2.2.8.3</u>

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the WST IOS and BOT IOS technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST and BOT systems are the same.

b. This requirement shall be verified by analysis. This analysis shall repeat selected WST IOS analyses for the BOT IOS system. This verification shall be considered successful when the BOT IOS system meets the success criteria of the selected WST IOS analyses.

c. This requirement shall be verified by demonstration. This analysis shall repeat selected WST IOS demonstrations for the BOT IOS system. This verification shall be considered successful when the BOT IOS system meets the success criteria of the selected WST IOS demonstrations.

d. This requirement shall be verified by test. This test shall repeat selected WST IOS tests for the BOT IOS system. This verification shall be considered successful when the BOT IOS system meets the success criteria of the selected WST IOS tests.

#### 4.3.2.2.8.4 <u>BOT IOS Paragraph 3.2.2.8.4</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting and initiating each the automated tanker maneuvers listed in paragraph 3.2.2.8.4 from the IOS. This verification shall be considered successful when the BOT correctly performs the automated tanker maneuvers listed in paragraph 3.2.2.8.4.

**4.3.2.2.8.5 <u>BOT IOS Paragraph 3.2.2.8.5</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations and use of the IOS during BOT testing to adjust the KC-46 ownship (BOT) and receiver aircraft parameters listed in paragraph 3.2.2.8.5. This verification shall be considered successful when the IOS can set the different types of parameters listed in paragraph 3.2.2.8.5 to support BOT training.

**4.3.2.2.8.5.1 <u>BOT IOS Paragraph 3.2.2.8.5.1</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor at the IOS building a mission, starting a training session using that mission, and changing parameters that were set when the mission was built. This verification shall be considered successful when the parameters that were set during mission building can be changed and the BOT responds accordingly.

**4.3.2.2.8.6 <u>BOT IOS Paragraph 3.2.2.8.6</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor manually controlling airspeed, heading, altitude and attitude for both the tanker aircraft and the receiver aircraft moving models. This verification shall be considered successful when the instructor can control the airspeed, heading, altitude and attitude of the tanker aircraft and the receiver aircraft moving model, with no delay between inputs and performance of the tanker aircraft and the receiver aircraft model.

**4.3.2.2.8.7 <u>BOT IOS Paragraph 3.2.2.8.7</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to select and initiate automatic control of the tanker and the receiver aircraft model. This verification shall be considered successful when the system can automatically control the tanker and the receiver aircraft based on instructor selected inputs.

**4.3.2.2.8.7.1 <u>BOT IOS Paragraph 3.2.2.8.7.1</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS position the tanker and the receiver aircraft models in the lateral, longitudinal and vertical directions, as well as the roll, pitch and yaw axes, with the changes not taking effect until the instructor executes the action. This verification shall be considered successful when the instructor can position the tanker and the receiver aircraft models in the lateral, longitudinal and vertical directions, as well as the roll, pitch and yaw axes, with the changes taking effect when the instructor executes the change and the BOT responds accordingly.

### 4.3.2.2.8.7.2 BOT IOS Paragraph 3.2.2.8.7.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor using the IOS to modify tanker and receiver aircraft closure parameters (closure rate, high in envelope, low in envelope), from the observation position through the reform position. This verification shall be considered successful when the instructor can modify the parameters of the tanker and the receiver aircraft listed above with the changes taking effect when the instructor executes the change and the BOT responding accordingly.

### 4.3.2.2.8.8 BOT IOS Paragraph 3.2.2.8.8

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor controlling the receiver aircraft model parameters listed in paragraph 3.2.2.8.8. This verification shall be considered successful when the instructor can control the receiver aircraft model and parameters listed in paragraph 3.2.2.8.8 and the BOT responding accordingly.

### 4.3.2.2.8.9 BOT IOS Paragraph 3.2.2.8.9

a. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator actuating the different PDL (go down, go up, go forward, go aft) with a receiver aircraft in position. This verification shall be considered successful when the receiver aircraft automatically moves IAW the different director lights activation.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator moving the aerial refueling boom in various directions with a receiver aircraft in position. This verification shall be considered successful when the receiver aircraft automatically moves IAW the different aerial refueling boom movements.

### 4.3.2.2.8.10 BOT IOS Paragraph 3.2.2.8.10

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting an aerial refueling track per ATP-56(B), reverse aerial refueling tracks, and random tracks for the ownship and receiver aircraft. This verification shall be considered successful when the instructor can select an aerial refueling track and the BOT and receiver aircraft accurately proceed to the aerial refueling track.

### 4.3.2.2.8.10.1 BOT IOS Paragraph 3.2.2.8.10.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the ownship and receiver(s) aircraft at each standardized position from RVIP to the post aerial refueling position(s) at the conclusion of aerial refueling. This verification shall be considered successful when the IOS accurately places the ownship and receiver aircraft at the each of the standardized positions and can reposition the ownship and receiver aircraft from any standardized position to any other standardized position.

### 4.3.2.2.8.10.2 BOT IOS Paragraph 3.2.2.8.10.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the ownship and receiver(s) aircraft at the RVIP then repositioning it to the next standardized positions using instantaneous movement of the ownship and receiver aircraft. This verification shall be considered successful when the IOS accurately places the ownship and receiver aircraft at the each of the standardized positions.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the IOS placing the ownship and receiver(s) aircraft at the RVIP then repositioning it to the next standardized positions using a smooth transitional movement of the ownship and receiver aircraft. This verification shall be considered successful when the IOS accurately places the ownship and receiver aircraft at the each of the standardized positions.

**4.3.2.2.8.10.3 <u>BOT IOS Paragraph 3.2.2.8.10.3</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator flying the BOT while refueling another aircraft, and the instructor at the IOS initiating different breakaway scenarios. This verification shall be considered successful when the instructor is able to control the ATP-56(B) breakaway scenarios, including single aircraft maneuvers and observe the boom operator and BOT actions.

**4.3.2.2.8.11 <u>BOT IOS Paragraph 3.2.2.8.11</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting and initiating an overrun condition and an underrun condition. This verification shall be considered successful when the IOS moves the ownship and receiver aircraft completely outside the refueling envelope based on instructor inputs of overrun and underrun conditions.

**4.3.2.2.8.12 <u>BOT IOS Paragraph 3.2.2.8.12</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of visually examining the IOS display to observe the information of the ownship and receiver aircraft moving model. This verification shall be considered successful when the demonstration shows the information of the ownship and receiver aircraft moving model on the IOS in an easy to read format and location, separate from the aircraft parameters.

**4.3.2.2.8.13 <u>BOT IOS Paragraph 3.2.2.8.13</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator running the boom operator checklists and making intentional errors and omissions. This verification shall be considered successful when the IOS correctly displays the boom operator checklists, correctly tracks boom operator performance, and correctly highlights the boom operator’s errors and omissions.

**4.3.2.2.8.13.1 <u>BOT IOS Paragraph 3.2.2.8.13.1</u>**

a. This requirement shall be verified by demonstration. This demonstration shall consist of the boom operator running the boom operator checklists and making intentional errors and omissions. This verification shall be considered successful when the IOS correctly displays the boom operator checklists, correctly tracks boom operator performance, correctly highlights the boom operator's errors and omissions, and gives the instructor the option to suspend or change the training mission.

#### 4.3.2.2.8.14 <u>BOT IOS Paragraph 3.2.2.8.14</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting each ARO station malfunction identified in the aircraft data, and then choosing to:

1. Manually activate it
2. Manually deactivate it
3. Automatically active it
4. Automatically deactivate it.

This verification shall be considered successful when the instructor can both manually and automatically activate and deactivate each ARO station malfunction identified in the aircraft data, the BOT accurately responding IAW those malfunctions, and that response being reflected at the IOS.

#### 4.3.2.2.8.15 <u>BOT IOS Paragraph 3.2.2.8.15</u>

a. This requirement shall be verified by demonstration. This demonstration shall consist of the instructor selecting each ARO station malfunction identified in the aircraft data, and then choosing to:

1. Manually activate it
2. Manually deactivate it
3. Automatically active it
4. Automatically deactivate it.

This verification shall be considered successful when the instructor can both manually and automatically activate and deactivate each aircraft malfunction identified in the aircraft data and the BOT accurately depicting the system's performance and boom operator's responses for abnormal and emergency procedures contained in the approved flight manuals.

#### 4.3.2.2.9 <u>BOT Brief/Debrief System</u>

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the BOT B/DS technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST and BOT B/DSs are the same.

b. This requirement shall be verified by analysis. This analysis shall repeat selected WST B/DS analyses for the BOT B/DS. This verification shall be considered successful when the BOT B/DS meets the success criteria of the selected WST B/DS analyses.

c. This requirement shall be verified by demonstration. This analysis shall repeat selected WST B/DS demonstrations for the BOT B/DS. This verification shall be considered successful when the BOT B/DS meets the success criteria of the selected WST B/DS demonstrations.

d. This requirement shall be verified by test. This test shall repeat selected WST B/DS tests for the BOT B/DS. This verification shall be considered successful when the BOT B/DS meets the success criteria of the selected WST B/DS tests.

#### 4.3.2.3 Fuselage Trainer (FuT)

a. Verification is N/A.

#### 4.3.2.3.1 General FuT Requirements

a. Verification is N/A.

#### 4.3.2.3.1.1 General FuT Requirements Paragraph 3.2.3.1.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT replicates the actual KC-46 cargo compartment as specified in paragraph 3.2.3.1.1.

#### 4.3.2.3.1.2 General FuT Requirements Paragraph 3.2.3.1.2

a. This requirement shall be verified by inspection. This inspection shall consist of an examination the FuT for the equipment listed in paragraphs 3.2.3.3, 3.2.3.4, 3.2.3.5, and 3.2.3.6. This verification shall be considered successful when the inspection confirms that all the items in paragraphs 3.2.3.3, 3.2.3.4, 3.2.3.5, and 3.2.3.6 are the actual equipment and are available for training cargo loading and unloading as needed.

#### 4.3.2.3.1.3 General FuT Requirements Paragraph 3.2.3.1.3

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the different FuT courses during courseware development workshops, ITOs, and SGTOs measuring the course lengths, number of lesson hours, number of FuT hours, and number of aircraft hours. This verification shall be considered successful when the analysis establishes that the contractor can provide training for the MTTL tasks assigned to the FuT.

#### 4.3.2.3.1.4 General FuT Requirements Paragraph 3.2.3.1.4

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT replicates the actual KC-46 cargo compartment main deck height.

#### 4.3.2.3.1.5 General FuT Requirements Paragraph 3.2.3.1.5

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT FARP/ground refueling and de-fueling panel height replicates the actual KC-46 FARP/ground refueling and de-fueling panel height.

#### 4.3.2.3.1.6 General FuT Requirements Paragraph 3.2.3.1.6

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT FARP/ground refueling and de-fueling panel hose connections replicate the actual KC-46 FARP/ground refueling and de-fueling hose connections.

#### 4.3.2.3.1.7 General FuT Requirements Paragraph 3.2.3.1.7

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT instructor controls, trainer controls, and flight deck displays necessary for training are placed in an easy to access location adjacent to or on the FuT.

#### 4.3.2.3.2 FuT Aural Cueing System

a. Verification is N/A.

#### 4.3.2.3.2.1 FuT Aural Cueing System Paragraph 3.2.3.2.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT aural cueing system’s technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the WST and FuT systems are the same type.

b. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced boom operators during FuT test. This verification shall be considered successful when aircraft alarms, warnings, PA system communications, and all system control station sounds are perceptible and realistic to the crew and passengers at the ARO station and in the cargo area during normal, abnormal, and emergency operations.

c. This requirement shall be verified by test. This testing shall be accomplished by measuring the frequency and amplitude of the sounds generated by the aural cuing system. This verification shall be considered successful when the frequency and amplitude of aircraft alarms, warnings, and all system control station sounds at the ARO station and in the cargo area are as in the actual aircraft.

#### 4.3.2.3.2.2 FuT Aural Cueing System Paragraph 3.2.3.2.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of observations by experienced boom operators during FuT tests. This verification shall be considered successful when the volume control provides the necessary sound performance at the indicated setting for meeting the requirements of 3.2.3.2.1

#### 4.3.2.3.3 FuT Emergency Egress and Safety Equipment

a. Verification is N/A.

#### 4.3.2.3.3.1 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT includes the actual cargo compartment emergency equipment IAW KC-46 aircraft data.

#### 4.3.2.3.3.2 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of opening and operating all the cargo compartment doors, emergency egress equipment, and safety equipment. This verification shall be considered successful when all the cargo compartment doors, emergency egress equipment, and safety equipment can be opened and operated IAW KC-46 aircraft data.

#### 4.3.2.3.3.2.1 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.2.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of opening and operating all the cargo compartment doors, emergency egress equipment, and safety equipment and resetting them to their initial condition within 30 minutes. This verification shall be considered successful when all the cargo compartment doors, emergency egress equipment, and safety equipment can be reset within 30 minutes.

#### 4.3.2.3.3.3 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.3

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the different FuT courses during courseware development workshops, ITOs, and SGTOs measuring the course lengths, number of lesson hours, number of FuT hours, and number of aircraft hours. This verification shall be considered successful when the analysis establishes that the contractor can adequately train the stowage and employment of AFE.

#### 4.3.2.3.3.3.1 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.3.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT provides an operating oxygen system (breathable air) with controls and displays IAW KC-46 aircraft data.

#### 4.3.2.3.3.4 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.4

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT includes the actual aircrew firefighting equipment IAW KC-46 aircraft data.

#### 4.3.2.3.3.4.1 FuT Emergency Egress and Safety Equipment Paragraph 3.2.3.3.4.1

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the FuT technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the inspection confirms that the FuT provides a fire warning system, alarms, and displays IAW KC-46 aircraft data.

#### 4.3.2.3.4 Cargo Material Handling Equipment

a. This requirement shall be verified by inspection. This inspection shall consist of an examination the FuT for the equipment listed in paragraph 3.2.3.4. This verification shall be considered successful when the inspection confirms that all the items in paragraph 3.2.3.4 are the actual equipment and are available for training cargo loading and unloading as needed.

#### 4.3.2.3.5 Cargo Practice Loads

a. This requirement shall be verified by inspection. This inspection shall consist of an examination the FuT practice loads for the equipment listed in paragraph 3.2.3.5. This verification shall be considered successful when the inspection confirms that all the items in paragraph 3.2.3.5 are non-operational versions of the actual equipment and materials and are available for training the assigned MTTL tasks.

#### 4.3.2.3.6 Aeromedical Evacuation Equipment

a. This requirement shall be verified by inspection. This inspection shall consist of an examination the FuT for the AE equipment listed in paragraph 3.2.3.6. This verification shall be considered successful when the inspection confirms that all the items in paragraph 3.2.3.6 are the actual equipment and are available for training AE tasks as needed.

b. This requirement shall be verified by demonstration. This demonstration shall consist of loading, assembling, connecting, and operating each item listed in paragraph 3.2.3.6. This verification shall be considered successful when the test confirms that the AE equipment in paragraph 3.2.3.6 can be loaded, assembled, connected, and functions according to its appropriate TOs or technical manuals.

#### 4.3.2.3.7 FuT Facility Interface

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the FuT's facility design drawings IAW the Facility Design Criteria (FDC) document, and a walkthrough of the completed FuT facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation and the FuT is connected into the facility electrical system, fire detection, alerting, and suppression systems, and HVAC system.

### 4.3.2.4 Learning Management System (LMS)

a. Verification is N/A.

### 4.3.2.4.1 General LMS Requirements

a. Verification is N/A.

### 4.3.2.4.1.1 General LMS Requirements Paragraph 3.2.4.1.1

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the LMS specification(s), courseware design documentation/specification, the ADL SCORM specifications, and the ADL Conformance Test Suite logs. The verification shall be considered successful when the analysis establishes that the LMS is a proven certified SCORM LMS and the courseware can pass the ADL SCORM Conformance Test Suite.

b. This requirement shall be verified by demonstration. This demonstration shall consist of viewing the courseware through the LMS. This verification shall be considered successful when the demonstration proves that the prototype courseware functions correctly within the LMS and the LMS has the user interface capabilities to provide all the SCORM tracking information listed in paragraph 3.2.4.1.1 item (a) through (f).

### 4.3.2.4.1.2 General LMS Requirements Paragraph 3.2.4.1.2

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the different LMS courses during courseware development workshops, ITOs, and SGTOs measuring the course lengths, number of lesson hours, number of LMS hours, and number of aircraft hours. This verification shall be considered successful when the analysis establishes that the contractor provides training for the MTTL tasks assigned to the LMS.

### 4.3.2.4.1.3 General LMS Requirements Paragraph 3.2.4.1.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of an observation that the LMS is not using an external server to access the courseware. This verification shall be considered successful when the demonstration shows that the LMS runs the courseware for FTU students from an internal server.

### 4.3.2.4.1.4 General LMS Requirements Paragraph 3.2.4.1.4

a. This requirement shall be verified by demonstration. This demonstration shall consist of an observation that the LMS can interface with the ADLS. This verification shall be considered successful when the demonstration shows that at the MOBs the LMS interfaces with ADLS to run the courseware for pilots, boom operators, AE personnel and remote aircrews.

### 4.3.2.4.1.4.1 General LMS Requirements Paragraph 3.2.4.1.4.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of an observation that at the MOBs the LMS can access the courseware without using an external server. This verification shall be considered successful when the demonstration shows that at the MOBs the LMS can access and run the courseware from an internal server.

**4.3.2.4.1.5 General LMS Requirements Paragraph 3.2.4.1.5**

a. The requirement shall be verified by demonstration. This demonstration shall consist of a student exiting and restarting a courseware lesson. This verification shall be considered successful when the demonstration shows that the student can return and continue training at the same location in the lesson without loss of previous lesson results.

**4.3.2.4.1.6 General LMS Requirements Paragraph 3.2.4.1.6**

The requirement shall be verified by demonstration. This demonstration shall consist of a student accessing course or lesson materials previously accomplished. This verification shall be considered successful when the demonstration shows that the LMS provides the student the capability to browse course or lesson materials previously accomplished.

**4.3.2.4.1.7 General LMS Requirements Paragraph 3.2.4.1.7**

a. This requirement shall be verified by demonstration. This demonstration shall consist of showing that the LMS provides the capability to collect data. This verification shall be considered successful when the demonstration proves that the LMS has the capability to collect the data listed in paragraph 3.2.4.1.6 item (a) through (e).

**4.3.2.4.2 Learning Center Computer Workstations**

a. Verification is N/A.

**4.3.2.4.2.1 Learning Center Computer Workstations Paragraph 3.2.4.2.1**

a. This requirement shall be verified by inspection. This inspection shall consist of inspecting the student computer workstations tech data. This verification shall be considered successful when the inspection confirms that student computer workstations consist of:

1. An ATS provided computer capable of supporting two or more high definition monitors.
2. Full keyboard.
3. Optical mouse.
4. 21 inch or larger touch screen high definition monitor(s).
5. Enhanced graphics.
6. Read and write portable media device.
7. Digital audio and video.
8. Headsets.

9. Internet access.

**4.3.2.4.2.1.1 Learning Center Computer Workstations Paragraph 3.2.4.2.1.1**

a. This requirement shall be verified by demonstration. This demonstration shall consist of a student accessing the ADLS website via the LMS and running the KC-46 ATS lessons on their student computer workstation. This verification shall be considered successful when the demonstration shows that the student computer workstation is able to access the ADLS website via the LMS and run the KC-46 ATS lessons.

**4.3.2.4.2.2 Learning Center Computer Workstations Paragraph 3.2.4.2.2**

a. This requirement shall be verified by inspection. This inspection shall consist of inspecting the instructor computer workstations tech data. This verification shall be considered successful when the inspection confirms that the instructor computer workstations support classroom presentation of multimedia CBT and instructor-led training.

**4.3.2.4.2.2.1 Learning Center Computer Workstations Paragraph 3.2.4.2.2.1**

a. This requirement shall be verified by inspection. This inspection shall consist of inspecting the instructor computer workstation tech data. This verification shall be considered successful when the inspection confirms that the instructor computer workstation consists of:

1. A podium with a student computer workstation per paragraph 3.2.4.2.1
2. A 50 inch or larger computer controlled touch screen high definition display
3. Self-powered speakers
4. A printed-material projector (e.g. overhead projector)
5. Electronic white boards
6. Internet access.

**4.3.2.4.2.2.2 Learning Center Computer Workstations Paragraph 3.2.4.2.2.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of an instructor accessing the ADLS website via the LMS and running the KC-46 ATS lessons on their instructor computer workstation. This verification shall be considered successful when the demonstration shows that the instructor computer workstation is able to access the ADLS website via the LMS and run the KC-46 ATS lessons.

**4.3.2.4.3 Learning Center Requirements**

a. Verification is N/A.

**4.3.2.4.3.1 Learning Center Requirements Paragraph 3.2.4.3.1**

a. This requirement shall be verified by inspection. The inspection shall consist of inspecting the learning center documentation for each site. This verification shall be considered successful when the inspection confirms that the learning center accommodates student computer workstations and includes classrooms with instructor computer workstations.

**4.3.2.4.3.2 Learning Center Requirements Paragraph 3.2.4.3.2**

a. This requirement shall be verified by inspection. This inspection shall consist of visually examining the Learning Center computers. This verification shall be considered successful when the inspection confirms that 60% of the Learning Center computers workstations have posters with half-size or larger photographic depictions of all the KC-46 cockpit control panels and 40% of the Learning Center computers workstations have posters with half-size or larger photographic depictions of all the KC-46 boom operator control panels.

**4.3.2.5 Courseware**

a. Verification is N/A.

**4.3.2.5.1 Courseware Paragraph 3.2.5.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the ATS syllabi. This verification shall be considered successful when the inspection confirms that the ATS syllabi includes CBT, ATD, and instructor-led training on KC-46 Aircraft procedures, systems, principles, and operation.

**4.3.2.5.1.1 Courseware Paragraph 3.2.5.1.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the ATS syllabi. This verification shall be considered successful when the inspection confirms that the ATS syllabi include CRM training.

**4.3.2.5.1.2 Courseware Paragraph 3.2.5.1.2**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the ATS syllabi. This verification shall be considered successful when the inspection confirms that the ATS syllabi include "in-unit" KC-46 upgrade and preparation training (see Paragraph 3.1.3.3.1).

b. This requirement shall be verified by demonstration. This demonstration shall consist of accessing the courseware via the internet. This verification shall be considered successful when the evaluation confirms that the courseware is accessible via the internet.

**4.3.2.5.2 Courseware Paragraph 3.2.5.2**

a. This requirement shall be verified by inspection. This inspection shall consist of a visual inspection of all the courseware materials. This verification shall be considered successful when the inspection confirms that the courseware consists of printed materials, digital materials, CBT lessons, classroom lessons, ATD exercises including flight training lesson plans, and student and instructor guides.

**4.3.2.5.2.1 Courseware Paragraph 3.2.5.2.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a visual inspection of the student and instructor guides. This verification shall be considered successful when the inspection confirms that the student and instructor guides for ATD exercises include a description of the ATD mission scenarios and the IC sets selectable through the ATD IOS.

#### 4.3.2.5.3 Courseware Paragraph 3.2.5.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of viewing courseware that is Level I, Level II, Level III, and Level IV. This verification shall be considered successful when the demonstration shows that the CBT courseware is self-paced, stand-alone IMI that is consistent with Level I through Level IV ICW definitions per MIL-HDBK-29612 and runs on both the student and instructor workstations.

#### 4.3.2.5.4 Courseware Paragraph 3.2.5.4

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the course hours. This verification shall be considered successful when the analysis confirms that the courseware provides no less than 10% ICW Level IV and no less than 25% ICW Level IV and III combined.

#### 4.3.2.5.5 Courseware Paragraph 3.2.5.5

a. This requirement shall be verified by inspection. This inspection shall consist of comparing the courseware design and documentation against current non-proprietary commercially available tools compatible with ADLS. This verification shall be considered successful when the inspection confirms that the courseware was developed using non-proprietary commercially available tools compatible with ADLS.

#### 4.3.2.5.5.1 Courseware Paragraph 3.2.5.5.1

a. This requirement shall be verified by inspection. This inspection shall consist of inspecting the courseware design and documentation. This verification shall be considered successful when the inspection confirms that the courseware uses standardized features, templates, and processes to provide the uniformity within and between courses.

#### 4.3.2.5.5.2 Courseware Paragraph 3.2.5.5.2

a. This requirement shall be verified by inspection. This inspection shall consist of inspecting the Courseware Content Packages and the ADL SCORM Conformance Test Suite logs. This verification shall be considered successful when the inspection shows that the courseware content packages metadata imports directly into the ADL registry and passes the ADL SCORM Conformance Test Suite.

#### 4.3.2.5.5.3 Courseware Paragraph 3.2.5.5.3

a. This requirement shall be verified by inspection. The inspection shall consist of running individual Sharable Content Objects and lessons against the ADL SCORM Conformance

Test Suite. This verification shall be considered successful when the test logs for the updated Sharable Content Objects and lessons show that they successfully pass the ADL SCORM Conformance Test Suite.

**4.3.2.6 Other Training Devices**

a. Verification is N/A.

**4.3.2.6.1 Pilot Part Task Trainer (PTT)**

a. Verification is N/A.

**4.3.2.6.1.1 Pilot PTT Paragraph 3.2.6.1.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the pilot PPT technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the inspection confirms that the pilot PPT provides a system that meets the requirements of paragraph 3.2.6.1.1.

b. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting specific training missions requiring the use of aircraft avionics, the mission computer, checklist procedures, and aircraft subsystems. This verification shall be considered successful when the aircrew can use the PTT to receive training on the employment of aircraft avionics, the mission computer, checklist procedures, and aircraft subsystems IAW KC-46 aircraft data.

**4.3.2.6.1.2 Pilot PTT Paragraph 3.2.6.1.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting specific training missions requiring pre-flight, in-flight, and post-flight operations. This verification shall be considered successful when the aircrew can use the PTT to receive training on pre-flight, in-flight, and post-flight operations IAW KC-46 aircraft data.

**4.3.2.6.1.3 Pilot PTT Paragraph 3.2.6.1.3**

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting a specific training missions using a fielded OFP, reconfiguring the PTT, and then flying the same mission using another fielded OFP. This verification shall be considered successful when the aircrew can use the PTT to receive training using different OFP configurations IAW KC-46 aircraft data.

**4.3.2.6.2 Boom Operator Part Task Trainer (PTT)**

a. Verification is N/A.

**4.3.2.6.2.1 Boom Operator PTT Paragraph 3.2.6.2.1**

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the boom operator PPT technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the inspection confirms that the boom operator PPT provides a system that meets the requirements of paragraph 3.2.6.1.1.

b. This requirement shall be verified by demonstration. This demonstration shall consist of a boom operator conducting specific training missions requiring the use of the ARO station, aircraft subsystems, and checklist procedures. This verification shall be considered successful when the boom operator can use the PTT to receive training on the employment of the ARO station, aircraft subsystems, and checklist procedures IAW KC-46 aircraft data.

**4.3.2.6.2.2 Boom Operator PTT Paragraph 3.2.6.2.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of a boom operator conducting specific training missions requiring pre-flight, in-flight, and post-flight operations. This verification shall be considered successful when the aircrew can use the PTT to receive training on pre-flight, in-flight, and post-flight operations IAW KC-46 aircraft data.

**4.3.2.6.1.3 Boom Operator PTT Paragraph 3.2.6.2.3**

a. This requirement shall be verified by demonstration. This demonstration shall consist of an aircrew conducting a specific training missions using a fielded OFP, reconfiguring the PTT, and then flying the same mission using another fielded OFP. This verification shall be considered successful when the boom operator can use the PTT to receive training using different OFP configurations IAW KC-46 aircraft data.

**4.3.2.7 Training Management System (TMS)**

a. Verification is N/A.

**4.3.2.7.1 TMS Paragraph 3.2.7.1**

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the TMS technical data, engineering drawings, software components, and hardware equipment. This verification shall be considered successful when the analysis confirms that the TMS software uses GTIMS software and applications.

**4.3.2.7.2 TMS Paragraph 3.2.7.2**

a. This requirement shall be verified by demonstration. This demonstration shall consist of use of the TMS during formative, summative, and operational evaluations. This verification shall be considered successful when the TMS provides the data identified in paragraph 3.2.7.2 items (a) through (e).

**4.3.2.7.3 TMS Paragraph 3.2.7.3**

a. This requirement shall be verified by inspection. This inspection shall examine TMS records, either on-line or off-line, for data fields associated with the data requirements identified in paragraph 3.2.7.3 items (a) through (h). This verification shall be considered successful when the inspection identifies data fields in each record for documenting the data requirements identified in paragraph 3.2.7.3 items (a) through (h).

b. This requirement shall be verified by demonstration. This demonstration shall consist of use of the TMS during formative, summative, and operational evaluations. This verification shall be considered successful when the TMS reports provide the data identified in paragraph 3.2.7.3 items (a) through (h).

### 4.3.2.7.4 TMS Paragraph 3.2.7.4

a. This requirement shall be verified by inspection. This inspection shall examine TMS records, either on-line or off-line, for aircrew evaluation and feedback data. This verification shall be considered successful when the inspection identifies that aircrew evaluation and feedback is collected and stored for later examination.

b. This requirement shall be verified by demonstration. This demonstration shall consist of use of the TMS during formative, summative, and operational evaluations. This verification shall be considered successful when the aircrew member evaluations and feedback are collected by the TMS and available for examination.

### 4.3.2.7.5 TMS Paragraph 3.2.7.5

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the interface specification, software components, and other technical data for the ATS TSSC and TMS. This verification shall be considered successful when the inspection confirms that the TSSC and TMS interface has been designed to transfer data needed for ATS operations and support.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the ATS TSSC sending modified ATS files (e.g. text file, object file, executable file, database file, courseware file, etc.) to the TMS at another ATS site. This verification shall be considered successful when the modified ATS files are received at the TMS and confirmed to be identical to the original files sent by the TSSC.

### 4.3.2.7.6 TMS Paragraph 3.2.7.6

a. This requirement shall be verified by demonstration. This demonstration shall consist of a TMS administrator creating TMS user accounts with different access permissions for selected individuals. This verification shall be considered successful when the selected individuals can log on to the TMS and use the TMS IAW the access permissions granted to the account.

### 4.3.2.7.7 TMS Paragraph 3.2.7.7

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the interface specification, software components, and other technical data for the systems identified in paragraph 3.2.7.7 and the ATS TMS. This verification shall be considered successful when the inspection confirms that the ATS TMS interface has been designed to transfer data needed for ATS operations and support to and from the systems identified in paragraph 3.2.7.7.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the ATS TMS sending and receiving data from the systems identified in paragraph 3.2.7.7. This verification shall be considered successful when the data exchanged between the ATS TMS and the systems identified in paragraph 3.2.7.7 can be confirmed to be identical to the original data.

### 4.3.3 Training System Support Center (TSSC)

a. Verification is N/A.

#### 4.3.3.1 TSSC General Requirements

a. Verification is N/A.

##### 4.3.3.1.1 TSSC General Requirements Paragraph 3.3.1.1

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the TSSC design is consistent with the requirement in paragraph 3.3.1.1. This verification shall be considered successful when the TSSC design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can maintain, repair, update, and support ATS courseware, software, databases, and hardware.

##### 4.3.3.1.2 TSSC General Requirements Paragraph 3.3.1.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the ATS TSSC sending modified ATS files (e.g. text file, object file, executable file, database file, courseware file, etc.) to another ATS site. This verification shall be considered successful when the modified ATS files are received at the other ATS site and confirmed to be identical to the original files sent by the TSSC.

##### 4.3.3.1.3 TSSC General Requirements Paragraph 3.3.1.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of a TSSC administrator creating TSSC user accounts with different access permissions for selected individuals. This verification shall be considered successful when the selected individuals can log on to the TSSC and use the TSSC IAW the access permissions granted to the account.

##### 4.3.3.1.4 TSSC General Requirements Paragraph 3.3.1.4

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the TSSC's technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the inspection confirms that the TSSC includes the subsystems identified in paragraph 3.3.1.4.

b. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the TSSC design incorporates the subsystems identified in paragraph 3.3.1.4. This verification shall be considered successful when the TSSC design is finalized.

c. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can maintain, repair, update, and support ATS courseware, software, databases, and hardware.

#### 4.3.3.2 Courseware Support System (CSS)

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the CSS design satisfies the requirements identified in paragraph 3.3.2. This verification shall be considered successful when the CSS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS courseware.

#### 4.3.3.3 Software Support System (SSS)

a. Verification is N/A.

##### 4.3.3.3.1 SSS Paragraph 3.3.3.1

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the SSS design satisfies the requirements identified in paragraph 3.3.3.1. This verification shall be considered successful when the SSS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS software.

##### 4.3.3.3.2 SSS Paragraph 3.3.3.2

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the SSS's technical data, engineering drawings, hardware equipment, and software components. This verification shall be considered successful when the analysis confirms that the ATS and SSS computer-based systems are compatible.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can maintain, repair, update, and support ATS software.

#### 4.3.3.4 Database Support System (DSS)

a. Verification is N/A.

#### 4.3.3.4.1 DSS Paragraph 3.3.4.1

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the DSS design satisfies the requirements identified in paragraph 3.3.4.1. This verification shall be considered successful when the DSS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS databases.

#### 4.3.3.4.1.1 DSS Paragraph 3.3.4.1.1

a. This requirement shall be verified by demonstration. This demonstration shall consist of the insertion of a new airfield area with associated radio and NAVAIDS into an existing database(s). This verification shall be considered successful when the modified database is flown in the ATDs and the visual, sensor, and electronic combat databases accurately display the new airfield area and the associated radio and NAVAIDS function correctly.

#### 4.3.3.4.1.2 DSS Paragraph 3.3.4.1.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the insertion of a terrain features, cultural features, threats, and moving models into an existing database(s). This verification shall be considered successful when the modified database is flown in the ATDs and the visual, sensor, and electronic combat databases accurately display the new terrain features, cultural features, threats, and moving models and the threats and moving models function correctly.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the modification of model and feature types in an existing database(s). This verification shall be considered successful when the modified database is flown in the ATDs and the visual, sensor, and electronic combat databases accurately display the modified model and feature types and the model and feature types function correctly.

#### 4.3.3.4.2 DSS Paragraph 3.3.4.2

a. This requirement shall be verified by demonstration. This demonstration shall consist of the monitoring the time it takes to accomplish the demonstrations in paragraphs 4.3.3.4.1.1 and 4.3.3.4.1.2. This verification shall be considered successful when the times required to complete the database modification is IAW 14 CFR Part 60, Appendix A, Attachment 3.

#### 4.3.3.4.3 DSS Paragraph 3.3.4.3

a. This requirement shall be verified by demonstration. This demonstration shall consist of importing and using data in the Common Database Standard formats, then exporting and verifying the exported data format. This verification shall be considered successful when the DSS can import and use Common Database Standard data, and export database data into Common Database Standard formats.

#### 4.3.3.5 Logistics Support System (LSS)

a. Verification is N/A.

##### 4.3.3.5.1 LSS Paragraph 3.3.5.1

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the LSS design satisfies the requirements identified in paragraph 3.3.5.1. This verification shall be considered successful when the LSS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS hardware.

##### 4.3.3.5.2 LSS Paragraph 3.3.5.2

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the LSS design provides the capabilities identified in paragraph 3.3.5.2. This verification shall be considered successful when the LSS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS hardware.

#### 4.3.3.6 Configuration Management System (CMS)

a. Verification is N/A.

##### 4.3.3.6.1 CMS Paragraph 3.3.6.1

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the CMS design satisfies the requirements identified in paragraph 3.3.6.1. This verification shall be considered successful when the CMS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS courseware, software, databases, and hardware configuration documentation.

##### 4.3.3.6.2 CMS Paragraph 3.3.6.2

a. This requirement shall be verified by analysis. Analysis during design reviews shall verify that the CMS design provides the capabilities identified in paragraph 3.3.6.2. This verification shall be considered successful when the CMS design is finalized.

b. This requirement shall be verified by demonstration. This demonstration shall consist of the supportability demonstration identified in SOW paragraph 3.5.2.1. This verification shall be considered successful when analysis of the supportability demonstration results confirms that the TSSC can create, maintain, update, and improve ATS courseware, software, databases, and hardware configuration documentation.

#### 4.3.3.7 TSSC Facility Requirements

a. Verification is N/A.

##### 4.3.3.7.1 TSSC Facility Requirements Paragraph 3.3.7.1

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation

##### 4.3.3.7.2 TSSC Facility Requirements Paragraph 3.3.7.2

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation

### 4.3.4 Design and Construction

a. Verification is N/A.

#### 4.3.4.1 Reserve Capacity and Growth Capability

a. Verification is N/A.

##### 4.3.4.1.1 Reserve Capacity and Growth Capability Paragraph 3.4.1.1

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the computational system documentation, including hardware and software technical data, operating system specifications and manuals, vendor supplied documentation for hardware and software, and other technical data and manuals. This verification shall be considered successful when the analysis determines a minimum of 100% spare capacity has been provided and 100% expansion capability is available.

##### 4.3.4.1.2 Reserve Capacity and Growth Capability Paragraph 3.4.1.2

a. This requirement shall be verified by test. This test shall consist of the system operating with time burner software. This verification shall be considered successful when the test results show at least 100% spare processing time.

##### 4.3.4.1.3 Reserve Capacity and Growth Capability Paragraph 3.4.1.3

a. This requirement shall be verified by analysis. This analysis shall consist of a review of the computational system documentation, including hardware and software technical data, operating system specifications and manuals, vendor supplied documentation for hardware and software, and other technical data and manuals. This verification shall be considered successful when the analysis determines that RST is immediately available for additional CPU processing without hardware modification or change to the software architecture.

#### 4.3.4.2 Device and Equipment Relocation

a. This requirement shall be verified by analysis. This analysis shall consist of examination of manufacturing procedures and processes, and analysis of system product baselines, engineering drawings, and packing, handling, and transport requirements and procedures. This verification shall be considered successful when the analysis determines that a device can be relocated within the six month time period.

#### 4.3.4.3 Availability

a. This requirement shall be verified by analysis. This analysis shall be made by data gathering and analysis during the formative and summative evaluation periods. This verification shall be considered successful when each ATD meets the required 98% availability requirement.

b. This requirement shall be verified by analysis. Availability of individual ATDs shall be verified IAW their development specifications. The ATD availability analysis shall be consistent with verified values of component availability. This verification shall be considered successful when a comprehensive analysis proves that the system has the 98% availability required.

#### 4.3.4.4 Safety

a. This requirement shall be verified by analysis. This analysis shall be of the systems design documentation for incorporation of the results of MIL-STD-882D and OSHA safety analyses. This verification shall be considered successful when the systems designs are modified to account for the results of the safety analyses.

b. This requirement shall be verified by demonstration. This demonstration shall consist of safe system operation during all sub-system and system level testing. This verification shall be considered successful when the ATS and all it sub-systems are shown to be operating safely.

##### 4.3.4.4.1 Fire Detection and Suppression

a. Verification is N/A.

###### 4.3.4.4.1.1 Fire Detection and Suppression Paragraph 3.4.4.1.1

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of both the facility and the ATS design drawings IAW the FDC document, and a walkthrough of the completed training system simulator and the facility. The verification shall be considered successful when both the ATS and the facility meets all design criteria standards and is certified for occupancy and operation.

###### 4.3.4.4.1.2 Fire Detection and Suppression Paragraph 3.4.4.1.2

a. This requirement shall be verified by inspection. Inspection is done is accordance with UFC 3-601-02, Operation and Maintenance, Inspection, Testing, and Maintenance of Fire Protection Systems, and the National Fire Protection Association (NFPA) 72 standards. The verification shall be considered successful when the fire detection and suppression meets the criteria standards and is certified for occupancy and operation.

#### 4.3.4.4.1.3 Fire Detection and Suppression Paragraph 3.4.4.1.3

a. This requirement shall be verified by inspection. The inspection shall consist of reviews of the ATS and facility design drawings, and a walkthrough of the completed trainer facility. The verification shall be considered successful when it is certified for occupancy and operation.

b. This requirement shall be verified by test. Testing is done is accordance with UFC 3-601-02, Operation and Maintenance, Inspection, Testing, and Maintenance of Fire Protection Systems, and the NFPA 72 standards. The verification shall be considered successful when the facility meets all design and testing criteria standards and is certified for occupancy and operation.

#### 4.3.4.4.2 Overload Protection

a. This requirement shall be verified by test. Testing shall be IAW the NFPA 70, National Electric Code (NEC) Article 90, and Underwriters Laboratory (UL) 1077 and manufacture's specified operating requirements. The verification shall be considered successful when the ATDs safely interrupt short-circuits.

#### 4.3.4.4.3 Uninterrupted Power Supply

a. This requirement shall be verified by test. The UPS system shall be tested to the manufacture's specified operating requirements and with the Standard for Protection of Electronic Computer/Data-Processing Equipment, American National Standards Institute (ANSI)/NFPA 75. The verification shall be considered successful when the UPS allows the specified devices to be shutdown normally should power failures/fluctuations occurs.

#### 4.3.4.4.4 Master Power Off

a. This requirement shall be verified by test. The Master Power Off switch shall be tested to the manufacture's specified operating requirements and with NEC/NFPA 70. The verification shall be considered successful when the switch cuts off facility power going to that ATD.

#### 4.3.4.4.5 Emergency Power Off

a. Verification is N/A.

#### 4.3.4.4.5.1 Emergency Power Off Paragraph 3.4.4.5.1

a. This requirement shall be verified by test. The EPO shall be tested to the manufacture's specified operating requirements and with the Standard for Protection of Electronic Computer/Data-Processing Equipment, ANSI/NFPA 75. The verification shall be considered successful when the EPO allows the device to be shutdown should an emergency occur.

**4.3.4.4.5.2 <u>Emergency Power Off Paragraph 3.4.4.5.2</u>**

a. This requirement shall be verified by demonstration. Following the test of the EPO operation (paragraph 4.3.4.4.5.1) the ATS shall be powered up and returned to full operation. The verification shall be considered successful when the ATS is fully functional within the specified time limit.

**4.3.4.4.6 <u>Emergency Lighting</u>**

a. Verification is N/A.

**4.3.4.4.6.1 <u>Emergency Lighting Paragraph 3.4.4.6.1</u>**

a. This requirement shall be verified by inspection. The inspection shall consist of reviews of the ATS design drawings and a walkthrough of the completed training facility and ATDs. The verification shall be considered successful when it is certified for occupancy and operation.

**4.3.4.4.6.2 <u>Emergency Lighting Paragraph 3.4.4.6.2</u>**

a. This requirement shall be verified by test. The test shall consist of reviews of the manufacture's specified operating requirements and NFPA Standard 101. The verification shall be considered successful when the emergency lighting activates when electrical power is lost.

**4.3.4.4.6.3 <u>Emergency Lighting Paragraph 3.4.4.6.3</u>**

a. This requirements shall be verified by test. The test shall consist of a 90 minute full function test. The verification shall be considered successful when the criteria has been met and the ATD is approved for operation,

**4.3.4.4.7 <u>Warning Notices</u>**

a. Verification is N/A.

**4.3.4.4.7.1 <u>Warning Notices Paragraph 3.4.4.7.1</u>**

a. This requirements shall be verified by inspection. The inspection shall consist of a walkthrough of the completed training facility and ATDs for warning notices and nameplates. The verification shall be considered successful when the training facility and ATDs meets the MIL-STD-882D and OSHA standards and is certified for occupancy and operations.

**4.3.4.4.7.2 <u>Warning Notices Paragraph 3.4.4.7.2</u>**

a. This requirements shall be verified by inspection. The inspection shall consist of a walkthrough of the completed training facility and ATDs for warning notices and nameplates. The verification shall be considered successful when the training facility and

ATDs meets the MIL-STD-882D and OSHA standards and is certified for occupancy and operations

### 4.3.4.4.8 Hazardous Materials

a. This requirement shall be verified by analysis. The analysis shall consist of verifying the reduction in use of hazardous materials throughout the design, development, manufacture, operation and maintenance of the ATS. The verification shall be considered successful when the use of hazardous materials is IAW MIL-STD-882D.

### 4.3.4.5 Electromagnetic Compatibility

a. Verification is N/A

### 4.3.4.5.1 Electromagnetic Compatibility Paragraph 3.4.5.1

a. This requirement shall be verified by test. The test shall consist of electronic surges, defined by standards, against electronic equipment used throughout the simulator facility. The test should be implemented IAW MIL-HDBK-2165. The verification shall be considered successful when electronic devices prove immune to electromagnetic interference.

### 4.3.4.5.2 Electromagnetic Compatibility Paragraph 3.4.5.2

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility and the training device meets all design criteria standards and is certified for occupancy and operation

### 4.3.4.6 Security Requirements

a. Verification is N/A.

### 4.3.4.6.1 Security Requirements Paragraph 3.4.6.1

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility meets all design criteria standards for Secure Rooms IAW DoD5200.1-R, Appendix 7 and the MAF DMO Physical Security Guide.

### 4.3.4.6.2 Security Requirements Paragraph 3.4.6.2

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the ATS technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the ATS uses either removable, volatile, removable non-volatile, non-volatile mass storage devices that can be reset to an unclassified state IAW AFMAN 33-282, or diskless boot methods.

b. This requirements shall be verified by demonstration. The demonstration shall consist of reviews of the system’s design drawings, a walkthrough of the completed ATS, and the actual booting of the ATS. The verification shall be considered successful when the ATS can be brought from a power off state to an operational state using diskless boot methods.

#### 4.3.4.6.3 Security Requirements Paragraph 3.4.6.3

a. This requirement shall be verified by inspection. This inspection shall consist of a review of the ATS technical data, engineering drawings, and hardware equipment. This verification shall be considered successful when the inspection confirms that the ATS uses either removable, volatile, removable non-volatile, non-volatile mass storage devices that can be reset to an unclassified state IAW AFSSI-8580.

b. This requirements shall be verified by demonstration. The demonstration shall consist of reviews of the system's design drawings, a walkthrough of the completed ATS, and the actual removal or reset of selected mass storage devices. The verification shall be considered successful when the ATS mass storage devices can be removed or reset to an unclassified state IAW AFMAN 33-282.

#### 4.3.4.6.4 Security Requirements Paragraph 3.4.6.4

a. This requirements shall be verified by demonstration. The demonstration shall consist of reviews of the system's design drawings, a walkthrough of the completed ATS, and the actual removal and securing mass storage devices. The verification shall be considered successful when the ATS mass storage devices are can be secured within GSA-approved security containers within the facility.

#### 4.3.4.6.5 Security Requirements Paragraph 3.4.6.5

a. This requirements shall be verified by demonstration. The demonstration shall consist of reviews of the system's design drawings, a walkthrough of the completed ATS, and the actual removal and securing mass storage devices. The verification shall be considered successful when the ATS mass storage devices are can be secured in no more than one hour.

#### 4.3.4.6.6 Security Requirements Paragraph 3.4.6.6

a. This requirements shall be verified by test. The test shall be IAW AFI 33-210, IA PIT Guidebook, and DoDI 8500.02. The verification shall be considered successful when the ATS is certified and accredited for IA operation.

#### 4.3.4.7 Facility Interfaces and Environmental Conditions

a. Verification is N/A.

#### 4.3.4.7.1 Facility Interfaces and Environmental Conditions Paragraph 3.4.7.1

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation

### 4.3.4.7.2 Facility Interfaces and Environmental Conditions Paragraph 3.4.7.2

a. This requirements shall be verified by demonstration. The demonstration shall consist of reviews of the facility design drawings IAW the FDC document, a walkthrough of the completed training system simulator facility, and the running of the HVAC system during operation of the ATD to verify temperature and humidity ranges. The verification shall be considered successful when the HVAC system meets all design criteria standards and the facility is certified for occupancy and operation

### 4.3.4.7.3 Facility Interfaces and Environmental Conditions Paragraph 3.4.7.3

a. This requirements shall be verified by inspection. The inspection shall consist of reviews of the facility design drawings IAW the FDC document, and a walkthrough of the completed training system simulator facility. The verification shall be considered successful when the facility meets all design criteria standards and is certified for occupancy and operation

### 4.3.4.8 Automatic Test Requirements

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when automatic testing meets the requirements of paragraph 3.4.8.

### 4.3.4.8.1 Automatic Test Requirements Paragraph 3.4.8.1

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when grading utility can be set to manual or automatic.

### 4.3.4.8.2 Automatic Test Requirements Paragraph 3.4.8.2

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when the auto grading utility indicates pass or fail, and specifies the parameter that is out of tolerance.

### 4.3.4.8.3 Automatic Test Requirements Paragraph 3.4.8.3

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when auto grading utility works in the background with no operator interaction.

### 4.3.4.8.4 Automatic Test Requirements Paragraph 3.4.8.4

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when auto grading utility indicates failure values by changing colors from green to red when the plotted parameter is out of its tolerance.

### 4.3.4.8.4.1 Automatic Test Requirements Paragraph 3.4.8.4.1

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when the plotted parameter test results describe each parameter's tolerance.

#### 4.3.4.8.5 Automatic Test Requirements Paragraph 3.4.8.5

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when snapshot values include a tolerance, the test results indicate whether the snapshot value passed or failed, the training device value, and the aircraft value.

#### 4.3.4.8.5.1 Automatic Test Requirements Paragraph 3.4.8.5.1

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when snapshot test results are reported on a separate page or on a test snapshot page with the ICs.

#### 4.3.4.8.6 Automatic Test Requirements Paragraph 3.4.8.6

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when auto grading utility clearly labels "allowed deviations" and "grading notes" for transient out-of-tolerance conditions which are repeatable have been deemed acceptable by the AF.

#### 4.3.4.8.7 Automatic Test Requirements Paragraph 3.4.8.7

a. This requirements shall be verified by demonstration. The demonstration shall consist of using the automatic test software during system verification. The verification shall be considered successful when auto grading utility produces results within 40 seconds after completion of the test data collection.

# 5 Definitions

## 5.1 Glossary

463L Pallet: The term 463L Pallet means a pallet with dimensions of 88 +0/-.125 inches wide by 108 +0/-.125 inches long. Weight of the pallet is specified not to exceed 300 pounds. Maximum pallet loading weight, including pallet weight, is 10,000 pounds.

Abnormal Aircraft Procedures: Procedures used by the crew when conditions concerning aircraft safety exist but do not require immediate attention. Aircraft and crew safety is not directly involved due to systems failure or unusual events.

Aerial Port: An AF organization which operates and provides the military logistical functions, including processing personnel and cargo, rigging for airdrop, packing parachutes, loading equipment, preparing air cargo and load plans, loading and securing aircraft, and supervising units engaged in aircraft loading and unloading operations.

<u>Aerial Refueling</u>: Either the offload or onload of fuel during flight as a tanker or receiver respectively (See onload and offload below).

<u>Aerial Refueling Airplane Simulator Qualification (ARASQ)</u>: AMC Test Standard equivalent to 14 CFR Part 60 for aerial refueling flight simulators. In the KC-46 ATS it applies to the WST and BOT.

<u>Aerial Refueling Eyepoint</u>: The eyepoint the aircraft commander or pilot will have while conducting aerial refueling with the seat lowered between 0 and 2 inches and moved forward between 0 and 2 inches from their respective reference eyepoint.

<u>Aerial Refueling Operator (ARO)/Boom Operator</u>: ARO duties include in-flight refueling systems operation, cargo handling.

<u>Aliasing</u>: Having jagged edges, as a result of a discrete approach to scan conversion in which each pixel either is replaced with the primitive's (i.e., point, line) color or is left unchanged

<u>Air Force Mission Support System (AFMSS)</u>: A family of systems that provide advanced automation tools for aircrews to perform pre-mission planning, which includes Mission Planning System (MPS) I, MPS II, and PFPS.

<u>Aircrew</u>: 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.

<u>Aircrew Flight Equipment</u> : Personnel flight equipment such as parachutes, helmets, oxygen equipment, anti-gravity garments, anti-exposure suits, aircrew ocular devices, survival kits, life preservers, rafts, electronic communications, helmet mounted weapons integration devices, and aircrew Chemical, Biological, Radiological, Nuclear (CBRN) equipment.

<u>Aircrew Training Device (ATD)</u>: Generic term for any device that provides artificial training in which aircrews learn, develop, improve, and integrate mission skills associated with their crew positions in a specific weapon system (see weapon system).

<u>Aircrew Training System (ATS)</u>: A contractor-produced, -operated, and -maintained ground-based system used to train aircrew members. This includes training equipment, software, firmware, hardware, devices, courseware, training system support, logistics support, ground-based instruction, media, and facilities. Typically it does not include flight training or aircraft support.

<u>Airfield Models</u>: Geo-specific, high feature density areas that are inserted into a contiguous, worldwide database.

<u>Algorithm</u>: A prescribed set of well defined unambiguous rules or processes for the solution of a problem in a finite number of steps.

<u>Alternate Missions</u>: If an ATD becomes less than Fully Mission Capable during a scheduled mission, the ATD instructors will have the option to use it for an Alternate Mission or declare a mission abort. If the ATD instructor elects to use the ATD for an alternate mission it must be

agreed upon by the Contracting Officer Representative (COR) or other appropriate government representative. Successful completion shall be documented as an Alternate Mission. For the purposes of computing credited availability, the Alternate Mission Hours will be added to denominator of the availability equation.

Alternate Missions Hours: Hours not previously scheduled but added after being agreed upon by the COR or other appropriate government representative and contractor.

Altitude Error: Errors due to mountains, depressions, orbit error, air turbulence, or altimeter error distort the radar image. Altitude errors will cause the perceived image to shift in a direction perpendicular to the aircraft's velocity vector.

Ambiguities: If the radar's pulse repetition frequency is so high that return signals from two successive transmitted pulses arrive simultaneously at the receiver there will be ambiguity in the response. Conversely, if the radar's pulse repetition frequency is so low that the reflected signal phase of any target changes by a full pulse period or more between two successive pulses, there will again be ambiguity in the response.

Ambient Illumination: The level of diffuse and background light in the environment due to natural or mechanical sources of light.

Architecture: The structure of components in a program/system, their interrelationships, and the principles and guidelines governing their design and evolution over time

Artifact: An inaccurate observation, effect, or result.

Availability: Availability is calculated as follows:

$$\left(\frac{\text{Total Scheduled Hours - Chargeable Downtime + Alternate Mission Hours}}{\text{Total Scheduled Hours}}\right) \times 100\%$$

B-1 Stand: An aerospace ground equipment variable height platform with self-leveling stairs that is used to work on an aircraft.

Bookmark: An electronic record used to identify student location in a training lesson and store student data and training information so that the student can easily return and continue training at the same location in a lesson without loss of previous lesson results. Not to be confused with web bookmarks.

Boom Operator/Aerial Refueling Operator (ARO): Boom operator duties include in-flight refueling systems operation, cargo handling.

Boom Operator Trainer (BOT): A device that provides an artificial training and tactics environment in which boom operators learn, develop, improve, and integrate aerial refueling mission skills associated with their crew positions in a specific weapon system.

Browse: To freely examine and peruse through the contents of a database. Browsing can be both unfocused and focused. Unfocused browsing refers to reading and navigating in a system without a definite or explicit goal for the users to accomplish. Focused browsing is one where users have an idea of what they want to do to accomplish a task.

Cardinal Effect: This effect develops from long linear-connected alignments of homogenous directional reflectors, such as roads, rivers, railroad tracks, fences, brush, and ditches. When these lineal features become aligned perpendicular to the angle of view, the total return becomes greater than the sum of its parts. Cardinal effect is also known as orientation effect.

Center Eyepoint: The point located midway between the aircraft commander's reference eyepoint and the pilot's reference eyepoint.

Chargeable Downtime: That portion of lost time which is attributed to the contractor. Chargeable downtime to the schedule will be determined by the COR and will be based on causes within the control of the contractor (see Non-Chargeable Downtime).

Clutter: Traditionally, this has been defined as any unwanted radar echo. Clutter includes the random components of: terrain texturing, target complexity, minor multi-reflections, weather clutter, and target and background fluctuations due to wind. Clutter is also known as fluctuations.

Competency: A specific range of skills, knowledge, or abilities.

Computer-Based Training (CBT): The use of computers to aid in the delivery and management of training. Computer-Based Instruction (CBI) is synonymous and used interchangeably with CBT. Computer-Aided Instruction (CAI) and Computer-Managed Instruction (CMI) are both elements of CBT.

Concurrency: The process of ensuring that the baseline configuration for each ATD and the ATS is initially fielded and subsequently updated to reflect the aircraft's product configuration baseline, as defined in SCR H002 of the KC-46 aircraft contract. To be "concurrent" is the state of being current with the weapons system's product configuration baseline in training equipment, other training media, weapons system missions and weapons system procedures.

Configuration: A collection of an item's descriptive and governing characteristics, which can be expressed in functional terms.

Configuration Management (CM): The application of technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a item or system, control changes, and record and report change processing and implementation status.

Contracting Officer Representative (COR): The AMC/AETC/Air National Guard (ANG)/AF Reserve Command (AFRC) designated individual at each base assigned as liaison between the AF and the contractor and also exercises surveillance over the quality of the contractor's work.

Courseware: All instructional material including technical data, textual materials, audio tapes, slides, movies, video tapes, video discs, and other audiovisual materials as well as computer-based instructional materials.

Correlate: To be comparable, similar or consistent; match in their characteristics. Characteristics can include any element or parameter of an item such as; color, x, y, z position, visible parts, composition, electronic or heat emissions.

Crew Resource Management (CRM): A training concept which emphasizes team effectiveness by enhancing individual and aircrew performance in communication, situational awareness, effective leadership/management, and crew coordination.

Criterion: The standard by which something is measured. In training, the task or learning objective standard is the measure of student performance.

Cultural Features: Features of the environment that have been constructed by man. Included are such items as roads, buildings, canals, marker buoys; boundary lines, and, in a broad sense, all names and legends on a map.

Curriculum: A particular course of study. It includes all courses required to satisfy specified training requirements.

Data Collection: The process of obtaining information that supports a functional activity, or information requirement.

Distributed Interactive Simulation: A networking standard that specifies the format and structure in which data will be organized. The general purpose is to facilitate the electronic transfer of data between Agencies with software; specifically, DIS Protocol Data Units are designed to enable communications between different types of simulators, simulations, and models.

Distributed Mission Operations (DMO): Warfighter training that utilizes the integration (networking) of live-fly, virtual (man in the loop), and constructive (computer generated) entities, systems, and environments to complete mission essential competencies required for a combat ready force. DMO focuses on individual and small team unit-level training, utilizing a unit's organic resources to train assigned warfighters to perform their wartime tasks. It also expands a unit's training capabilities and resources to facilitate inter-team training among geographically separated and composite force teams to execute missions (or significant portions of missions) and mission rehearsal scenarios.

Distributed Mission Operations (DMO) Network: A specific Long-Haul Network for connecting Government owned/operated training devices (see Long-Haul Network).

Emergency Aircraft Procedures: Procedures used by the crew when a condition of imminent danger exists that is of a serious nature requiring immediate crew actions to maintain aircraft safety and prevent an aircraft accident, injury, or loss of life.

Emitter: A device that is able to discharge detectable electromagnetic energy.

Enclave: A group of training devices that are located at a single site and considered a discrete unit for the purposes of delineating DMO network roles and responsibilities, site DMO kit requirements, and IA program management.

Engine Trailer: A trailer used to remove and replace, transport, and store aircraft engines.

Entity: A distinguishable person, place, unit, thing, event, or concept about which information is kept.

Environment: The texture or detail of the natural domain, and the external objects, conditions, and processes that influence the behavior of a system.

Evaluation: A judgment expressed as a measure or ranking of trainee achievement, instructor performance, process, application, training material, and other factors (see MIL-STD-1379D).

Experienced: An individual who has received training and a minimal amount of time spent doing a job to be considered fully qualified.

Far Shore Brightening: The far shore of a special forward scattering medium, like water, sand, or dry lake beds, will be illuminated with more radar energy than that of the direct illuminating ray. Far shore brightening is also known as multi-path effect.

Feature Scaling: This is the increasing of feature extent for off-broadside radar geometries. Feature scaling is also known as feature scaling expansion.

Forward Area Refueling Point (FARP): FARP operation is the overall mission to include the transfer of fuel. Hot refueling is the actual transfer of fuel from any aircraft fuel source with one or more engines operating. Hot refueling includes fuel transfer from internal aircraft fuel tanks, auxiliary tanks, or internally loaded fuel bladders, such as the Aerial Bulk Fuel Delivery System (ABFDS) with or without Alternate Capability Equipment (ACE). When the ABFDS is equipped with ACE, fuel transfer to another aircraft is possible. FARP operations are normally conducted at night in an austere environment. A comprehensive mission briefing and strict compliance of guidance and procedures will ensure an expeditious and safe refuel or defuel operation. The term FARP applies to all such operations with the following distinctions made for specific activities:

1. Tanker Operations is the act of providing fuel from a non-fixed source in a FARP environment.

2. Receiver Operations is the act of receiving fuel from a non-fixed source in a FARP environment.

3. ABFDS Operations is the act of providing fuel from the ABFDS fuel bladders to various receivers.

Feature: A static element of the synthetic environment that exists but does not actively participate in synthetic environment interactions. Features are represented in the simulation environment by cartographic databases that are used by simulation assets. Entities can interact with features, but features are passive in that they do not initiate action. When features are dynamic they are called environmental entities.

Federate: A member of a High Level Architecture Federation. All applications participating in a Federation are called Federates. This may include federation managers, data collectors, real-world ("live") systems, simulations, passive viewers and other utilities.

Federation: A named set of interacting federates, a common federation object model, and supporting Runtime Infrastructure (see below), that are used as a whole to achieve some specific objective.

Fidelity: The accuracy of the representation when compared to the real world.

Formal Training Unit (FTU): The organization that shall train all basic KC-46 crewmembers for the DoD.

Free play: See the definition of browse above, specifically unfocused browsing.

Fully Mission Capable: All ATD systems, subsystems, and equipment available and functioning correctly.

Functionality: Set of functions required to produce a particular output. Simple functionality is an ordered sequence of functional processes that operate on a single input to produce a specific output. There may be many inputs required to produce the output in question, but this simple functionality is only related to one of the inputs. Complete functionality is a complete set of coordinated processes that operate on all the necessary inputs for producing a specific output.

Fuselage Trainer (FuT): A device that provides an artificial training and tactics environment in which boom operators learn, develop, improve, and integrate cargo mission skills associated with their crew positions in a specific weapon system.

Glitter: Coherent and real beam radar exhibit a strong return phenomenon that appears on one or several scans and then disappears. This phenomenon is called glitter and is caused when objects on the ground align and become like a radar corner reflector for a brief period. Glitter is also known as multi-path effect.

Global Decision Support System (GDSS): Command and control system for Air Mobility Command's mobility airlift and air refueling assets. It provides aircraft schedules, arrival and/or departure, and aircraft status data to support in-transit visibility of aircraft and aircrews.

High Definition: A resolution of 1600×1200 pixels (UXGA) or better.

High Level Architecture: Major functional elements, interfaces, and design rules, pertaining as feasible to all DoD simulation applications, and providing a common framework within which specific system architectures can be defined.

High Resolution Area: Geo-specific, high feature density areas that are inserted into a contiguous, worldwide database.

Image Jitter: Small rapid variations in an image due to low frame rates.

Initial Condition: The values assumed by the variables in a system, model, or simulation at the beginning of some specified duration of time.

Instructor/Operator Station (IOS): The software and consoles for control of an ATD, seats, emergency controls, audio components, and visual displays needed by instructors /operators to monitor and manage student training.

Interactive Courseware (ICW): An aspect of IMI, ICW is computer-controlled training designed to allow the student to interact with the learning environment through input devices such as keyboards and light pens. The student's decisions and inputs to the computer determine the level, order, and pace of instructional delivery and the forms of visual and aural output.

Interactive Multimedia Instruction (IMI): An all inclusive term relating to any instructional material incorporating multiple mediums where the user interacts with the material. IMI products include instructional software and software management tools used in support of instructional programs. IMI products are teaching tools and may be used in combination with stand-up instruction or individually.

Internal Airlift and Helicopter Slingable-Container Unit (ISU): A category of lightweight air-mobile containers. The number following the ISU acronym (ISU 90 or ISU 60) indicates the overall height of the container in inches. The ISU series of containers are intended for air movement, either pallet-loaded inside of an aircraft or sling-loaded under a helicopter.

Intercommunication Control System (ICS): A communication control system that allows connection to external communication sources.

Interphone: Part of the ICS used for internal aircraft communications only.

Knowledge: Use of the mental processes that enable a person to recall facts, identify concepts, apply rules or principles, solve problems, and think creatively. Knowledge is not directly observable. A person manifests knowledge through performing associated overt activities.

Large Aircraft Infrared Counter-Measures (LAIRCM) System: A defensive system that includes a combined missile detection warning and IR countermeasures system.

Latency: The time required for a device to begin physical output of a desired piece of data once processing is complete.

Layover: Feature layover is a geometrical phenomenon which affects the image portrayal of tall features. Layover is a special subset of range foreshortening. An extensive feature side may as a bright trace due to the longer slant range interval between the top and the bottom of the feature. Layover is also known as feature scaling and range foreshortening.

Learning Management System (LMS): An enterprise level, server-based software system used to manage and deliver (through a web browser) learning of many types, particularly asynchronous e-learning. They generally also include the capability of tracking and managing many kinds of learner data, especially that of learner performance.

Litter Stanchion: An upright support bar or post mounted in a standard airline seat track rail and secured to structural hard points that, when used in pairs, are capable of holding a patient(s) in a litter.

Litter Stanchion 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.

Local Network: A class of data network that provides high data rate interconnection between network nodes in close physical proximity.

Long-Haul Network: A communications network of devices that are separated by substantial geographical distance. A Long-Haul Network could be any of numerous networks available commercially or through the Government.

Low Level Effects: An aircraft flying at low absolute altitudes will illuminate the earth at significantly smaller grazing angles than normal. Returns from many features are radar significant only at these low grazing angles. Crops, grass, power pylons, bridge superstructures, are some of the features that exhibit increasingly higher returns at decreasing aircraft altitude. This effect is more visible at the higher radar resolutions. Low level effects are also known as low level reversal.

Main Operating Base (MOB): A KC-46 training location that has co-located ATDs.

Mastery: Attainment of a competency or proficiency in ability.

Media: The delivery vehicle for presenting instructional material or basic communication stimuli to a student to induce learning. Examples are instructors, textbooks, slides, and ICW.

Metadata: Information describing the characteristics of data; data or information about data; descriptive information about an organization's data, data activities, systems, and holdings.

Model: A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.

Moiré Pattern: An undesired artifact of images produced by various digital imaging and computer graphics techniques, for example when scanning a halftone picture or tracing a checkered plane on a Cathode Ray Tube (CRT) raster. Halftone is the reprographic technique that simulates continuous tone imagery through the use of dots, varying either in size, in shape or in spacing

Motion Compensation Errors: Radar antennas are controlled by the inertial navigation system of the aircraft to compensate for aircraft rotational and translational motion. If the relative position of the antenna, with respect to the desired flight path changes, the Doppler frequency experienced will be different from the frequency expected. Any change in velocity will cause a change in Doppler and, if allowed to remain uncorrected, will produce erroneous phase information. The common sources of these phase errors are: faulty inertial navigation system signals, uncorrected velocity error, uncorrected acceleration along the line of sight curing array time, non-linear motion of the aircraft, equipment imperfections, processing approximations, and atmospheric disturbances. Motion compensation errors are also known as uncompensated motion errors and velocity errors.

Moving Targets: In synthetic aperture radar a moving object’s shadow is mapped in the same location as in a real aperture radar, but the moving object itself is displaced. The imaged moving object will displace in azimuth from its actual instantaneous ground position. Moving objects are detected in synthetic aperture radars by evaluation the Doppler shift caused by the velocities of the moving object. The motion component that causes the Doppler spectrum to shift is the radial velocity component. Moving targets is also known as relative motion error, velocity errors, moving object displacement or location error.

Multilook: Multilook involves the averaging of successive maps or looks of the same area. The superimposing of multiple looks has the effect of reducing random components of wind, clutter, fluctuations, speckle, and rough water scintillation. Multilook is also known as multilook averaging.

Multimedia: The use of more than one medium to convey the content of instruction. Media available for use include, but need not be limited to, text, programmed instruction, audio tapes, videotapes, discs, slides, film, televisions, and computers. Ref: AFH 36-2235, Vol. 8.

Night Vision Imaging System: An electro-optical system that uses image intensifier tubes to detect visible and infrared energy and produce an enhanced image of a scene in light conditions too low for normal operations. The KC-46 will use existing Class B/C night vision imaging systems as defined in MIL-STD-3009.

Non-Chargeable Downtime: Hours lost for which the contractor is not held responsible. Non-chargeable downtime includes one or more of the following conditions:

1. Facility power outage, when not caused by contractor negligence.
2. Fire or other facility problems, when not caused by contractor negligence.
3. Negligence on the part of Government personnel.
4. Natural disaster and inclement weather as determined by the base commander.
5. Criminal acts by persons not employed by the contractor.
6. Failure of the Government to supply the necessary materials and responses for which they have responsibility, to include modifications, updates, and changes by any company other than the ATS contractor, its subcontractor, and its vendors. For this condition, lost time will commence upon receipt of such request by the Government, and will terminate upon delivery to the ATS contractor].
7. Non-serviceability of equipment and software systems which are solely the responsibility of the Government, as determined by the COR.
8. Aircrew no-shows, if more than 15 minutes beyond the schedule start time without prior notification.
9. Site alerts/exercises.

Non-Proprietary: Non-proprietary information is data which is not considered proprietary. Proprietary information is sensitive information that is owned by a company and which gives the company certain competitive advantages. Proprietary information and intellectual assets are critical to the success of many, perhaps most businesses and are highly valuable commodities.

Normal Aircraft Procedures: Procedures used by the crew to insure the aircraft condition is acceptable for each phase flight. These procedures assume that all systems are operating normally.

Occlusion: The vision effect of closer objects overlapping or occluding more distant ones, providing visual clues to judge how close objects are from the viewer. Slight head motions provide more information about occlusions.

Occult: To hide or become hidden or block from view

On-line Storage: On-line storage provides more immediate retrieval of data than off-line storage and usually refers to non-removable magnetic or optical hard disk drives.

Offload: The removal of fuel from the aircraft via the aerial refueling system itself, thru the boom or centerline hose unit or WARPs, or the amount of fuel either in one session or collectively per a mission removed from the aircraft via the aerial refueling system itself, thru the boom or centerline hose unit or WARPs.

Onload: The addition of fuel to the aircraft, in the air, via the receiver system.

Part Task Trainer (PTT): An aircrew trainer that allows selected aspects of a task to be practiced and a high degree of skill to be developed independent of other elements of the task.

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.

Pallet Couplers: Aluminum pallet spacers used to connect more than one pallet in a train for the transport of items exceeding the usable dimensions of a single pallet.

Performance: Part of a criterion objective that describes the observable student behavior, or the product of that behavior, that is acceptable to the instructor as proof that learning has occurred.

Phugoid: An aircraft motion where the vehicle pitches up and climbs, and then pitches down and descends, accompanied by speeding up and slowing down as it goes "uphill" and "downhill." This is one of the basic flight dynamics modes of an aircraft (others include short period, dutch roll, and spiral divergence), and a classic example of a positive feedback system.

Polygon: A flat plane figure with multiple sides, the basic building block of virtual worlds. The more polygons a computer can display and manipulate per second, the more realistic the virtual world will appear.

Potentially Visible System Polygon: A polygon that has been fully processed by an IG environment and geometry transformation processor, and may or may not be submitted for further processing by the display processor, due to culling. The culling process removes polygons from display processing for any of the following conditions:

1. Outside the viewing frustum (i.e., a truncated cone or pyramid).
2. Back-facing.
3. Occulted by other polygons.

Principle: The underlying or guiding theory concerning the behavior of a system, process, or natural phenomenon.

Priority: A particular order, or sequence, in which things take place (items processed, users served, etc.). A priority is based on a predetermined assignment of value, or importance, to different types of events and people.

Prioritization: To list or rate in order of priority (see priority)

Proficiency: Ability to perform a specific behavior (e.g., task, learning objective) to the established performance standard in order to demonstrate mastery of the behavior.

Protocol Data Unit: DIS terminology for a unit of data that is passed on a network between simulation applications.

Provide(s): Includes all necessary attributes to enable personnel or equipment to accomplish a specified requirement.

Qualified: A qualified individual is a person that has received training and can accomplish the task. However, the individual may not be able to meet the time standard for completion of the task.

Qualified Aircrew Member: A qualified graduate shall be defined as having attained proficiency IAW AFI 11-2KC-46A Vol 1 and the associated syllabus, been qualified IAW AFI 11-2KC-46A Vol 2 and AFI 11-202 Vol 2 and shall have successfully completed an AF administered evaluation.

Quantization: For image processing; a compression technique achieved by compressing a range of values to a single quantum value or a smaller range of values. Data encoding used to compress imagery discards or loses some of the data in order to achieve its goal, with the result that decompressing the data yields content that is different from the original, though similar enough to be useful.

Range Foreshortening: This is the reduction in the apparent feature dimension along the range axis in the image which results from the non-linear mapping of ground range (scene coordinates) into slant range (image coordinates). Range foreshortening is also known as ground range to slant range mapping.

Range and Range Rate Distortion: Synthetic aperture radar imagery is based on boundaries defined by arcs. Due to this, the underlying geometry of the scene is distorted when synthetic aperture radar imagery in presented in an orthogonal display grid format. Since this distortion is defined by a deterministic geometric transformation, known effects may be compensated for in the sensor with appropriate processing. Range and range rate distortion is also known as isodoppler mapping.

Real-Time: In modeling and simulation, simulated time advances at the same rate as actual time; for example, running the simulation for one second results in the model advancing time by one second.

Real-World: The set of real or hypothetical causes and effects that simulation technology attempts to replicate.

Reference Eyepoint: The aircraft position where the aircraft commander or pilot is intended to view the cockpit instrumentation. The reference eyepoint represents the ideal but notional location of the aircraft commander’s or pilot’s eyepoint and is usually expressed as a monocular point mid-way between the pupils of the average pilot.

Resolution: The degree of detail and precision used in the representation of real world aspects in a model.

Runtime Infrastructure: The general purpose distributed operating system software that provides the common interface services during the runtime of a High Level Architecture federation.

Scenario: Description of an exercise. It is part of the session database that configures the units and platforms and places them in specific locations with specific missions. An initial set of conditions and time line of significant events imposed on trainees or systems to achieve exercise objectives.

Scintillation: A rapid change in brightness, color, or detail.

Session: A portion of an exercise that is contiguous in wall-clock (sidereal) time and that is initialized per an exercise database.

Shareable Content Object Reference Model (SCORM): A collection of specifications that defines a browser-based learning Content Aggregation Model, Runtime Environment, and Sequencing and Navigation protocols for reusable content objects to meet DoD high-level requirements for distributed learning content.

Simulate: To represent certain behavioral features of a physical system by the behavior of another system.

Simulator: (a) Hardware and software designed or modified exclusively for training purposes, involving simulation or stimulation in its construction or operation, to demonstrate or illustrate a concept or to simulate an operational circumstance or environment. Training simulators and devices are considered part of the overall training system that may or may not be identified as part of the parent defense system; (b) Training equipment that imitates operational equipment both physically and functionally, such as a cockpit procedures trainer (CPT), flight training device (FTD), or weapon system trainer (WST).

Simulator Certification (SIMCERT): The process of ensuring, through validation (see below) of hardware and software baselines, that a training system and its components provide the capability to train personnel to do specific tasks. SIMCERT ensures that the device continues to perform to the delivered specifications, performance criteria, and configuration levels. Also sets up an audit trail regarding specification and baseline data for compliance and subsequent contract solicitation or device modification.

Six Degrees-of-Freedom: Refers to the number of simultaneous directions or inputs a system can move; typically used to describe the combination of spatial positions (X, Y, and Z) and orientation (roll, pitch, and yaw).

Smoothly: Interpolating the previous state of a model or entity to the current state, creating a smooth transition between two successive entity state updates.

Special Electrical Power Requirements: Anything other than 60 Hz or 400 Hz, single or three phase, 120, 208/120, or 277/480 V.

Speckle: This is the granular appearance of the imagery. Speckle is cause by destructive and constructive interference which results in the further breakup of the returning signal at the receiving antenna. Speckle is also known as scintillation.

Specular Illumination: The level of light in the environment due to light that is perfectly reflected in a mirror-like way from the light source to the viewer.

Stanchion Litter System (SLS): A man-portable lightweight replacement for a PSP that attaches directly into the airline seat track and to structural hard points in the aircraft.

Standard: A rule, principle, or measurement established by authority, custom, or general consent as a representation or example

Subject Matter Expert (SME): (a) An individual who has thorough knowledge of a job, specific duties and tasks, or a particular topic, which qualifies the individual to assist in the training development process; (b) A person who has a high-level of knowledge and skill in the performance of a job.

System: A collection of components organized to accomplish a specific function or set of functions.

Temporal Aliasing: One example of a range of phenomena called aliasing that occurs when continuous motion is represented by a series of short or instantaneous samples. It occurs when (a) the view of a moving object is represented by a series of short samples as distinct from a continuous view, and (b) the moving object is in rotational or other cyclic motion at a rate close to the quantization sampling rate.

Terrain Masking: This refers to the absence of radar return from certain regions within the radar footprint due to obstructions of the "line-of-sight" from the radar to these regions. Terrain masking is most noticeable at higher resolutions. Note that obstructions of the radar signal will also mask transmissions from: electronic countermeasures, friendly sources, moving targets, as well as image of the landmass being masked. Terrain masking is also known as shadowing and occulting.

Thematic: Of, relating to, or being a theme (see below).

Theme: The unifying type of land cover associated with a geographic region.

Tightly Coupled Interactions: A condition that exists when simulation entities are involved in interactions within a small region in space such that every action of an entity must be immediately accounted for by the other entities. Aerial refueling with a receiver model is an example of tightly coupled entities for a BOT, and aerial refueling with a tanker model is an example of tightly coupled entities for a WST.

Total Scheduled Hours: The projected utilization hours, for each training device as published on the schedule. The Government will establish the core availability period in conjunction with the training schedule and the contracted availability. The scheduled hours shall be established by device, be continuous hours per day, and not exceed the number of hours in the selected contract options. The published schedule shall include the projected training sessions during each period. Personnel changes shall be construed as training session changes and may be made at any time.

Training: A set of events or activities presented in a structured or planned manner, through one or more medium, for the attainment and retention of skills, knowledge, and attitudes required to meet job performance requirements.

Training Device: Hardware and software designed or modified exclusively for training purposes, involving simulation or stimulation in its construction or operation to demonstrate or illustrate a concept or simulate an operational circumstance or environment. Also see Simulator.

Training Requirement: The skills and knowledge that are needed to satisfy the job performance requirements and that are not already in the student's repertoire.

Training System: A systematically developed curriculum including, but not necessarily limited to, courseware, classroom aids, training simulators and devices, operational equipment, embedded training capability, and personnel to operate, maintain, or employ a system. A Training System includes all necessary elements of logistic support.

Training System Support Center (TSSC): A consolidated function that contains the personnel, equipment, facilities, tools, and data necessary to provide life cycle hardware, software, courseware, visual and other geographic databases, relational databases, documentation, and network support, maintenance, and improvement for a training system. These functions also include training management, logistics management, configuration management, change management, data management, records management, and all associated management reporting responsibilities.

Transport Delay: The time that elapses between an input or stimulus to a system and the system response to that input or stimulus.

Validation: The process of determining the degree to which a model or simulation is an accurate representation of the real-world from the perspective of the intended uses of the model or simulation.

Verification: The process of determining that a model or simulation implementation accurately represents the developer's conceptual description and specification. Verification also evaluates the extent to which the model or simulation has been developed using sound and established software engineering techniques

Virtual: Refers to the essence or effect of something, not the fact.

Weapon System: A combination of one or more weapons with all related equipment, materials, services, personnel, training, and means of delivery and deployment (if applicable) required for self-sufficiency.

Weapon System Trainer (WST): A device that provides an artificial training and tactics environment in which operators learn, develop, improve, and integrate mission skills associated with their crew positions in a specific weapon system.

World Geodetic System 1984 (WGS-84): A geocentric coordinate system which describes a basic frame of reference and geometric figure for the Earth, and which models the Earth from a geometric, geodetic, and gravitational standpoint. The WGS-84 coordinate system origin and axes also serve as the x, y, and z axes of the WGS-84 ellipsoid, the z axis being the rotational axis.

### 5.2 Acronyms

| | |
|---|---|
| °F | Degrees Fahrenheit |
| AAA | Anti-Aircraft Artillery |
| ABFDS | Aerial Bulk Fuel Delivery System |
| ACE | Alternate Capability Equipment |
| ADL | Advanced Distributed Learning |
| ADLS | Advanced Distributed Learning Service |
| AE | Aeromedical Evacuation |
| AEF | Aeromedical Evacuation Familiarization |
| AETC | Air Education and Training Command |
| AETCSUP | Air Education and Training Command Supplement |
| AF | Air Force |
| AFB | Air Force Base |
| AFCAP | Air Force Certification and Accreditation Program |

| | |
|---|---|
| AFDD | Air Force Doctrine Document |
| AFE | Aircrew Flight Equipment |
| AFH | Air Force Handbook |
| AFI | Air Force Instruction |
| AFMAN | Air Force Manual |
| AFMSS | Air Force Mission Support System |
| AFOSH | Air Force Occupational Safety and Health |
| AFRC | Air Force Reserve Command |
| AFTTP | Air Force Tactics, Techniques, and Procedures |
| AMC | Air Mobility Command |
| AMCSUP | Air Mobility Command Supplement |
| ANG | Air National Guard |
| ANSI | American National Standards Institute |
| APU | Auxiliary Power Unit |
| ARASQ | Aerial Refueling Airplane Simulator Qualification |
| ARMS | Aviation Resource Management System |
| ARO | Aerial Refueling Operator |
| ASC | Aeronautical Systems Center |
| ATC | Air Traffic Control |
| ATD | Aircrew Training Device |
| ATP | Allied Technical Publication |
| ATS | Aircrew Training System |
| B/DS | Brief/Debrief System |
| B-1 (w/ Stand) | Name for a type of Aerospace Ground Equipment Work Stand |
| BIP | Boom Operator Instructor Preparation |
| BOT | Boom Operator Trainer |
| BREF | Boom Operator Quarterly Refresher Continuation Training |
| C-17 | Cargo Aircraft Mission Design Series 17 |
| C&A | Certification and Accreditation |
| CAI | Computer-Aided Instruction |
| CBI | Computer-Based Instruction |
| CBRN | Chemical, Biological, Radiological, Nuclear |
| CBT | Computer Based Training |
| CD-ROM | Compact Disc – Read Only Memory |
| CFR | Code of Federal Regulations |
| CG | Center of Gravity |
| CM | Configuration Management |
| CMI | Computer Managed Instruction |
| CMS | Configuration Management System |
| CONEMP | Concept of Employment |
| CONUS | Continental United States |
| COR | Contracting Officer Representative |
| CPT | Cockpit Procedures Trainer |

| | |
|---|---|
| CPU | Central Processing Unit |
| CRM | Crew Resource Management |
| CRT | Cathode Ray Tube |
| CSS | Courseware Support System |
| DAFIF | Digital Aeronautical Flight Information File |
| DBWG | Database Working Group |
| DCS | Dynamic Coordinate System |
| DIS | Distributed Interactive Simulation |
| DMO | Distributed Mission Operations |
| DoD | Department of Defense |
| DoDI | Department of Defense Instruction |
| DOF | Degrees-of-Freedom |
| DSS | Database Support System |
| DTC | Distributed Training Center |
| DTCN | Distributed Training Center Network |
| DTED | Digital Terrain Elevation Data |
| DVD | Digital Versatile Disc |
| EMCON | Emission Control |
| EPO | Emergency Power Off |
| °F | Degrees Fahrenheit |
| FAA | Federal Aviation Administration |
| FARP | Forward Area Refueling Point |
| FCC | Federal Communications Commission |
| FDC | Facility Design Criteria |
| FFS | Full Flight Simulator |
| FIR | Flight Information Region |
| FLIP | Flight Information Publications |
| FOV | Field of View |
| FTC | Faculty Training Course |
| FTD | Flight Training Device |
| FTU | Formal Training Unit |
| FuT | Fuselage Trainer |
| G | Gravity |
| GCA | Ground Control Approach |
| GDSS | Global Decision Support System |
| GSA | General Services Administration |
| GTIMS | Graduate Training Integration Management System |
| HDBK | Handbook |
| HVAC | Heating, Ventilating, and Cooling |
| Hz | Hertz |
| IA | Information Assurance |
| IAW | In Accordance With |
| IC | Initial Conditions |

| | |
|---|---|
| ICD | Interface Control Document |
| ICS | Intercommunication Control System |
| ICW | Interactive Courseware |
| IEEE | Institute of Electrical and Electronics Engineers |
| IFF | Identification, Friend or Foe |
| IFR | Instrument Flight Rules |
| IG | Image Generator |
| ILS | Instrument Landing System |
| IMC | Instrument Meteorological Conditions |
| IMI | Interactive Multimedia Instruction |
| IOS | Instructor/Operator Station |
| IR | Infrared |
| IRC | Instrument Refresher Course |
| ISU | Internal Airlift and Helicopter Slingable-Container Unit |
| ITO | Individual Tryouts |
| JDRS | Joint Deficiency and Reporting System |
| K | Thousand |
| KC-10 | Tanker Cargo Aircraft Mission Design Series 10 |
| KC-135 | Tanker Cargo Aircraft Mission Design Series 135 |
| KC-46 | Tanker Cargo Aircraft Mission Design Series 46 |
| KC46BIQ | KC-46 Boom Operator Initial Qualification Course |
| KC46BRC | KC-46 Boom Operator Requalification Course |
| KC46BTX | KC-46 Boom Operator Transition Course |
| KC46IAC | KC-46 Instructor Aircraft Commander Course |
| KC46IB | KC-46 Instructor Boom Operator Course |
| KC46PCO | KC-46 Pilot Checkout Course |
| KC46PIQ | KC-46 Pilot Initial Qualification Course |
| KC46PRC | KC-46 Pilot Requalification Course |
| KC46PTX1 | KC-46 Pilot Transition Course 1 |
| KC46PTX2 | KC-46 Pilot Transition Course 2 |
| KC46PTX3 | KC-46 Pilot Transition Course 3 |
| KC46SOC | KC-46 Senior Officer Course |
| KC46SOF | KC-46 Senior Officer Familiarization |
| LAIRCM | Large Aircraft Infrared Counter Measures |
| LGTO | Large Group Tryout |
| LMS | Learning Management System |
| LOX | Liquid Oxygen |
| LSAS | Litter Stanchion Augmentation Set |
| LSS | Logistics Support System |
| m | Meter |
| M880 | 1 ¼ Ton 4x4 Commercial Utility Cargo Vehicle (4x4 Pickup Truck) |
| MAF | Mobility Air Force |
| MANPADS | Man-Portable Air-Defense System |

| | |
|---|---|
| MERQ | Maintenance Engine Run Qualification |
| MERR | Maintenance Engine Run Refresher |
| MIL | Military |
| MOB | Main Operating Base |
| MPS | Mission Planning System |
| MTTL | Master Training Task List |
| N/A | Not Applicable |
| NAVAIDS | Navigation Aids |
| NEC | National Electric Code |
| NFPA | National Fire Protection Association |
| NGA | National Geospatial-Intelligence Agency |
| NM | Nautical Miles |
| NSN | National Stock Number |
| NVIS | Night Vision Imaging System |
| OCONUS | Outside the Continental United States |
| OFP | Operational Flight Program |
| OPLAN | Operations Plan |
| OSHA | Occupational Safety and Health Administration |
| PDL | Pilot Director Lights |
| PFPS | Portable Flight Planning Software |
| PIP | Pilot Instructor Preparation |
| PIT | Platform Information Technology |
| PREF | Pilot Quarterly Refresher Continuation Training |
| PSP | Patient Support Pallet |
| PTT | Part Task Trainer |
| REF | Reference |
| RF | Radio Frequency |
| RGBA | Red Green Blue Alpha |
| RPG | Rocket-Propelled Grenade |
| RST | Required Spare Time |
| RVIP | Rendezvous Initial Point |
| SAM | Surface-to-Air Missile |
| SCORM | Shareable Content Object Reference Model |
| SGTO | Small Group Tryout |
| SIMCERT | Simulator Certification |
| SISO | Simulation Interoperability Standards Organization |
| SLS | Stanchion Litter System |
| SME | Subject Matter Expert |
| SOQA | Simulator Operational Quality Assurance |
| SOW | Statement of Work |
| SS | System Specification |
| SSS | Software Support System |
| STD | Standard |

| | |
|---|---|
| STE | Secure Telephone Equipment |
| SUPT | Specialized Undergraduate Pilot Training |
| TACAN | Tactical Air Navigation |
| TBD | To Be Determined |
| TCAS | Traffic-Alert and Collision Avoidance System |
| TERPS | Terminal Instrument Procedures |
| TMS | Training Management System |
| TO | Technical Order |
| TSSC | Training System Support Center |
| TTMS | Technical Training Management System |
| UFC | Uniform Fire Code |
| UL | Underwriters Laboratory |
| UPS | Uninterruptable Power Supply |
| US | United States |
| USAF | United States Air Force |
| UXGA | Ultra eXtended Graphics Array |
| V | Volts |
| VASI | Visual Approach Slope Indicator |
| VFR | Visual Flight Rules |
| VOIP | Voice Over Internet Protocol |
| WARPs | Wing Aerial Refueling Pods |
| WEZ | Weapons Engagement Zone |
| WGS-84 | World Geodetic System 1984 |
| WNSPA | Simulators Division's Tanker and Mobility Training Systems Branch |
| WST | Weapon System Trainer |
| XCITE | eXpert Common Immersive Theater Environment |

# *Appendix 5*
# *Life Cycle Cost Analysis*

APPENDIX 5 – LIFE CYCLE COST ANALYSIS
Definitive Design Submittal
KC46-A FLIGHT TRAINING CENTER
TBD AFB, USA

1. APPLICABLE PUBLICATIONS.

(a) ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality (2007)

(b) ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (2007)

(c) ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (2010)

(d) ASHRAE 189.1 – Standard for the Design of High-Performance Green Buildings (2011)

(e) Energy Policy Act of 2005 (EPACT 05) (Public Law 109-58)

(f) Energy Independence and Security Act of 2007 (EISA 2007)

(g) Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management

(h) LEED® (Leadership in Energy and Environmental Design) NC – 2009 Reference Guide

(a) UFC 1-200-02 – High Performance and Sustainable Building Requirements

(b) UFC 3-400-02 – Design: Engineering Weather Data

(c) UFC 3-410-01FA – Design: Heating, Ventilating, and Air Conditioning

2. LIFE CYCLE COST ANALYSIS:

(a) The mechanical design provides a prototype design that can be modified by the designer of record based on the selection of site and equipment to be utilized inside the building.

(b) A life cycle cost analysis (LCCA) and an energy analysis shall be performed during the design phase for final system selection and to demonstrate compliance with EISA 2007 energy reduction requirements. Perform the LCCA as specified in UFC 1-200-02. The project also has a goal to achieve LEED Silver as a minimum and shall comply with requirements of UFC 1-200-02.

(c) The purpose of the life cycle cost analysis is to evaluate alternative Heating, Ventilating and Air-Conditioning (HVAC) systems. The life cycle cost calculation will indicate which alternative has the lowest Cost of Ownership to the Government for the period of study. This information is then used to select the HVAC system to be designed and installed for the project.

(d) The life cycle cost analysis shall be performed based on the criteria included in UFC 1-200-02 – High Performance and Sustainable Building Requirements, and UFC 3-410-01FA – Design: Heating, Ventilating, and Air Conditioning.

(e) Three options are required for consideration for the systems serving the building. The cooling system for the Communication and UPS Rooms will need to be independent systems and can be modeled identically for all three alternatives. Potential options for evaluation are as follows (designer of record may vary from this list based on base preferences or special climate attributes):

- (a) Variable Air Volume (VAV)with economizer
- (b) Energy recovery or demand control ventilation
- (c) Ground source heat pumps with dedicated outdoor air (DOAS)
- (d) Fan coil units with dedicated outdoor air (DOAS)
- (e) Chilled Water
- (f) Refrigerant (DX)Cooling
- (g) Hot Water Heating
- (h) Electric Heat
- (i) Economizer (Water Side)

2. DESIGN REQUIREMENTS:

(a) Refer to CHAPTER IX – HEATING, VENTILATION, AND AIR CONDITIONING for building design parameters and other requirements.

(b) Each alternative shall be modeled for energy usage and utility cost. The building operation used the projected actual occupancy and schedule of operations, and actual site utility rates. Weather data, inside design conditions and any special system requirements shall be based on the Mechanical Design Analysis narrative.

(C) The energy usage of each alternative shall be compared against each other for the LCCA. Model the building as designed or would be designed for the different alternatives. The life cycle cost analysis shall include costs for investment, maintenance, replacement, and annual energy usage.

(D) Wall and roof R-Values shall be in accordance with ASHRAE 90.1-2007.

3. LIFE CYCLE COST ANALYSIS REPORT:

(a) Provide a report summarizing the methodology used, brief descriptions of the systems analyzed, design conditions and utility rates used. The report shall summarize the result of the analysis.

(b) Provide appendices including the costs for investment, maintenance, replacement, and annual energy usage.

# *Appendix 6*
# *Meeting Minutes*

# Meeting Notes

Date: 17 April 2013

Location: Teleconference

Purpose: KC-46A FTC Interim Definitive Design Review Meeting

Project: KC-46A SIMs, FuT, & FTC Definitive Design

Meeting started at 9:30 a.m. and was attended by the following individuals:

a. Dave Stewart, AETC
b. Dave Irwin, AFCEC
c. Phyllis Smith, USACE PM
d. Maj Brian Ellis, AMC A7
e. David Koch, AFCEC CFM-A
f. Amy Clement, Burns & McDonnell (B&M) Project Manager
g. Andy Mashek, Burns & McDonnell (B&M) Project Manager
h. Erin Allen, B&M Interior Designer
i. Kyle Warta, B&M Civil Engineer
j. Barie Brettmann, B&M Structural Engineer
k. TJ Kim, B&M Architect
l. Austin Berke, B&M Architect
m. Tom Karre, B&M Mechanical Engineer
n. Casey Sanborn, B&M Electrical Engineer
o. Chris Cahill, B&M Fire Protection Engineer
p. Carrie Bradley, B&M Sustainability Specialist
q. Ed Breen, HQAMC/A3TK – *separate conf call on 16 April (see items 6-9 below)*
r. Kent Hadrava, AMCAOS – *separate conf call on 16 April (see items 6-9 below)*

***Action Items are noted in Bold.**

**General**

1. Overall Trainers Program Summary
    a. Flight Training Center is currently at 30,125sf which is a slight increase over charrette sf which was 29,700sf, however the estimated cost of construction is down to $10.4m - 11.9m vs $11.2m - 12.4m at the charrette. (*Please note that the SF briefed during the conference call was incorrectly shown at 29,900sf. Correct sf is 30,125sf*).
    b. The Flight Simulators and Fuselage Trainer facility costs and areas are tracking similarly.
    c. Estimates were developed based on an 'average' Base condition with area cost factors applied for the 4 candidate Bases to determine the cost range.
2. Cost Estimate Discussion

   a. Supporting facility cost is estimated at roughly 20% of total cost until site selection is announced and site design developed.
   b. SDD/EPACT05 (3%) and ATFP (2%) programmed costs are included as budgetary line item costs until site selection is made and these costs are incorporated into the overall design.
   c. Construction contingency is at 5%.
   d. SIOH is at 5.7%.
3. Schedule
   a. AMC was just notified that the Base selections have been postponed to 15-16 May from the previous date of 1 May.
   b. After announcement, the Bases will have 1-2 weeks to complete their 1391s.
   c. Burns & McDonnell has subconsultants available to get started on site investigations as soon as approved.
   d. Dave Irwin suggested to check Base access and take any steps needed to avoid 30 day delays with security to get access on Base and perform work necessary.
      i. BMcD noted the longer lead item will be the dig permits (utility locates) required for the survey and geotechnical investigations.

**Design Overview**

4. Rendering Updates
   a. Current exterior rendering has been sent out to AFCEC (Wayne Reber) for review. Current rendering incorporated all previous design comments.
5. Floor Plan Updates
   a. Door from Corridor (143) to Conf. Manager (139) has been deleted (Sheet A-111)
   b. Two flat screen and desk has been added in Conference (137, Sheet A-701)

**AMC User Review Comments**

6. A conference call with Ed Breen and Kent Hadrava was conducted on 16 April to discuss the following AMC review comments from Ed.
7. Parts Storage
   a. Concern was raised over providing adequate storage in the Parts Storage room to support the initial 2 WSTs & BOTs, and ability to support future parts storage when additional WSTs and BOTs are added in future phases.
   b. Parts Storage room currently does not have overhead space for a future mezzanine due to a large amount of ductwork passing thru the space between the mechanical room and sim bay.
   c. High density storage carousels are an option and can be specified to meet specific storage parts sizes and ceiling height restrictions.

   d. The wall separating Parts Storage 124 and Shipping/Receiving 125 is not required. Overhead door from exterior into 125 can be reduced to a pair of 4'x8' doors and the man door to exterior in 125 eliminated. This will allow for more functional space in Parts Storage.
   e. Additional parts storage areas may be needed to support future expansion with the planned growth for additional WSTs and BOTs and can be incorporated into those expansion plans at that time based on requirement.
8. Access Stairs & Catwalks to WST and BOT
   a. Preferred access to the WST and BOT is by stairs & platform (by building contractor) with a drawbridge to the device provided by the device contractor.
   b. Concept discussed for 2-Bay flight simulator was presented and approved for design planning purposes for the FTC.
   c. Platform & stairs will likely be installed after the sims are installed to allow full access for device installation. Sections of platform & stairs will be removable for future sim device replacement as needed.
9. Windows in Open Storage (for AMC flight simulator facilities).
   a. The current security measures in the design should cover any security concerns from the Base security, and may be able to reduce or eliminate some of the requirements after discussing with Base security. Window construction type provides protection from forced entry, are inoperable, prevent visual observation, and are protected with an IDS system. A wire mesh screen behind the windows and translucent panels is also provided for windows and translucent panels below 18' in the open storage areas.

**USACE Dr Checks Review Comments**

1. No review comments in DrChecks at the time of the review conference call.

**Attachments**

Briefing Slides

# KC-46A Trainers
# Flight Training Center

Interim Definitive Design Submittal Review
17 April 2013

# Agenda

- Introductions
- Inbrief
- Cost Estimate Review
- DrChecks Review
- Architectural Discussion
- Open Discussion
- Action Items Tracking
- Way Ahead

*Flight Training Center*

# Introductions

- AETC
- AFCEC
- AMC
- Mobile District  Corps of Engineers
- Burns & McDonnell

*1-Bay Flight Simulator*

*2-Bay Flight Simulator*

*Fuselage Trainer*



# Overall Program - Trainers

| Facility | Charrette SF | Current SF | Charrette Cost Range | Interim Submittal Cost Range* |
|---|---|---|---|---|
| Flight Training Center (FTC) | 29,700 | 30,125 | $11.2m to $12.4m | $10.4m to $11.9m |
| 2-Bay Flight Sim (2BFS) | 19,500 | 20,655 | $9m to $11.7m | $8.2m to $9.3m |
| 1-Bay Flight Sim (1BFS) | 11,600 | 12,044 | $6.5m to $8.3m | $5.9m to $6.7m |
| Fuselage Trainer (FuT) | 10,600 | 11,008 | $5.5m to $6.7m | $5.3m to $6.0m |

*The cost estimates have been developed based on labor rates for McConnell AFB as the “average” of the four bases under consideration (as determined from Means 2013). The interim submittal cost range shown above is derived based upon the comparison of the lowest to the highest base cost factors.

# Preliminary 1391 Breakdown

| 9. COST ESTIMATES | | | | |
|---|---|---|---|---|
| ITEM | U/M | QTY | UNIT COST | COST ($000) |
| **Primary Facility** | | | | **7,538** |
| AETC Flight Training Center | SF | 29,966 | 240 | (7,179) |
| SDD & EPACT05 (3.0%) | LS | | | (215) |
| Anti-Terrorism Measures (2.0%) | LS | | | (144) |
| **Supporting Facilities** | | | | **1,858** |
| Pavements | LS | | | (350) |
| Site Improvements | LS | | | (1,125) |
| Utilities | LS | | | (370) |
| LEED Silver Certification | LS | | | (14) |
| **Subtotal (CCL)** | | | | **9,396** |
| Contingency (5.0%) | | | | 470 |
| **Total Contract** | | | | **9,866** |
| Supervision, Inspection & Overhead (5.7%) | | | | 562 |
| Design-Build - Design Cost | | | | - |
| Total Request | | | | 10,428 |
| **Total Request (Rounded)** | | | | **10,400** |
| Equipment FROM OTHER APPROPRIATIONS (NON-ADD) | | | | - |

KC-46A Trainers - FTC
Interim Submittal Review – 17 April 2013

# Submittal Schedule

- Draft Definitive Design – 19 February 2013
  - Review (at AMC) – 5-7 March 2013
  - Review (at AETC) – 19 March 2013
- Interim Definitive Design – 25 March 2013 (5 April FTC)
  - Review (Telecon) – 9 April 2013 (17 April FTC)
- Standard Definitive Design – 19 April 2013 (26 April FTC)
- Base Announcements MOB1 & 2 – May 2013
- Site Design Start – Jul/Aug 2013
  - Surveys, fire flow test, geotech, env studies start
  - Draft Submittal & Review
  - Final Submittal & Review

KC-46A Trainers - FTC
Interim Submittal Review – 17 April 2013

# Design Overview



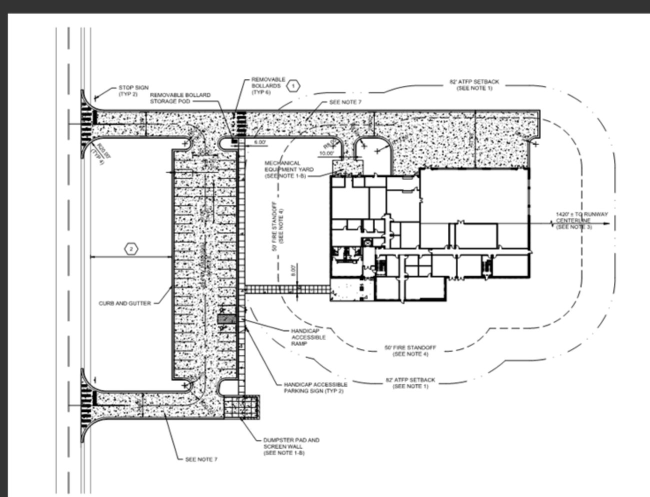
# Flight Training Center (FTC)

KC-46A Trainers - FTC
Interim Submittal Review – 17 April 2013

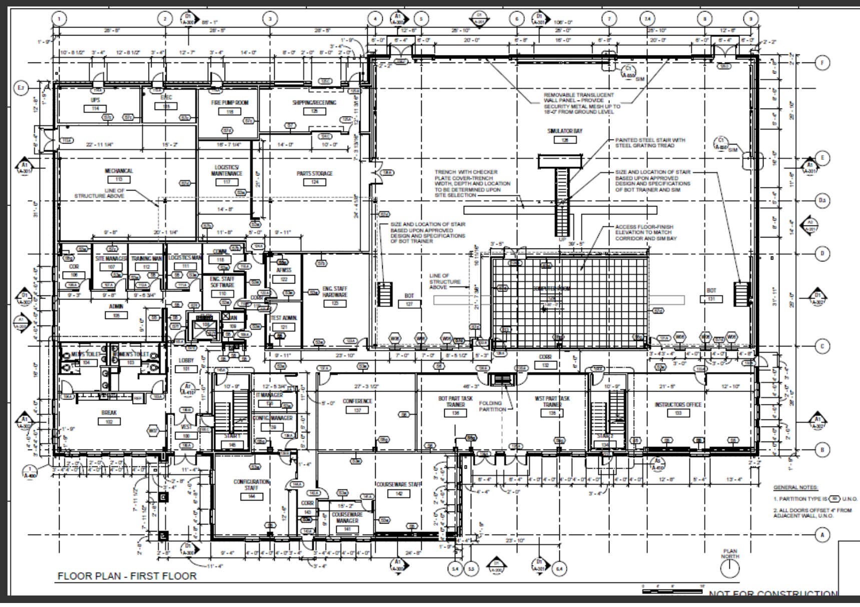
# Flight Training Center



# FTC – Concept Site Plan

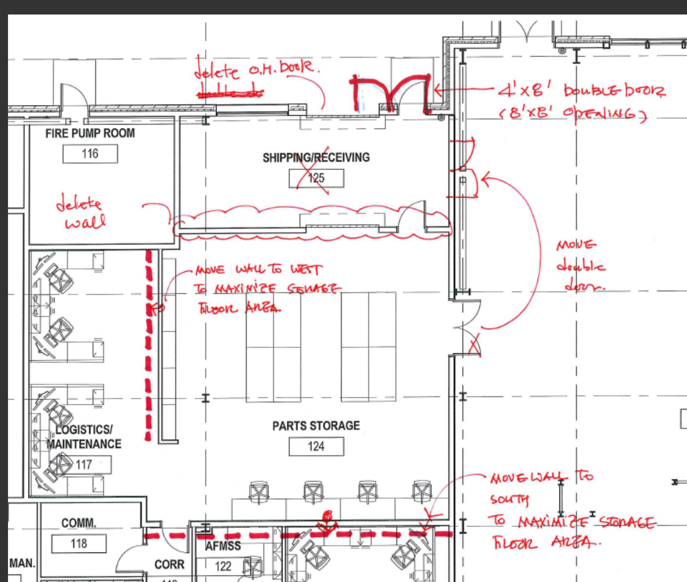


## FTC –Floor Plan – first floor

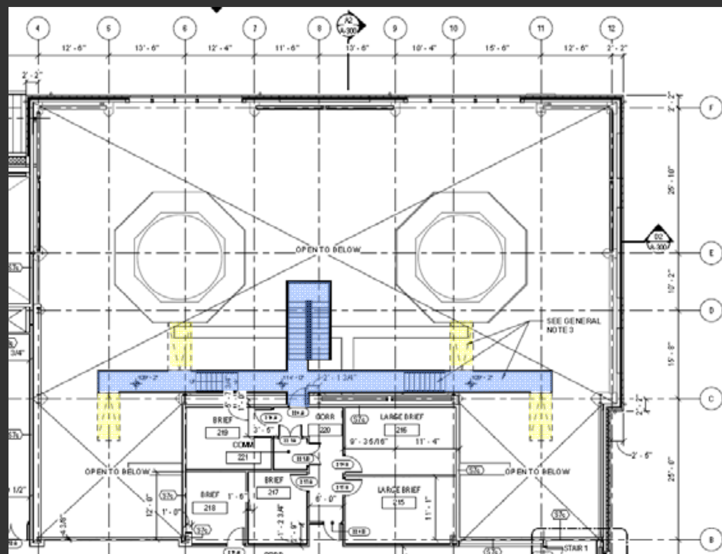





## FTC – Revised Parts Storage - first floor



## 2-Bay – WST & BOT Access – first floor






# Submittal Expectations

<u>Estimated % Complete Before Site Selection</u>

| | |
|---|---|
| • Civil | 20% |
| • Architectural | 70% |
| • Interior Design | 80% |
| • Structural | 50% |
| • HVAC | 60% |
| • Fire Protection | 90% |
| • Plumbing | 80% |
| • Electrical | 60% |

➢ *Provide 'Definitive Design Notes' on first sheet of each discipline to explain basis of design*

# Meeting Notes

Date: 19 March 2013

Location: Randolph AFB, TX

Purpose: Draft Design Submittal Review Meeting

Project: KC-46A Flight Training Center (FTC)

Meeting Minutes Table of Contents

- Attachment A: Attendance Sheet
- Attachment B: Meeting Agenda
- Attachment C: InBrief Presentation

***Action Items are noted in Bold.**

**General**

1. 1391's are still draft and have yet to be finalized. Changes to facility square footages need to be provided to AETC (Janie) ASAP in order to incorporate.
2. 01 May 2013 Preferred Base announced.
3. Systems furniture to be provided by others.
4. AHSRAE 189.1 only applies to a project if the LCCA supports the requirements.
   a. UFC 1-200-02 additionally says to employ ASHRAE 189.1 only as appropriate to the complexity and size of project.
5. FTC will not be an add/alter project. Whether located at Altus AFB or McConnell AFB; the facility will be new construction.
6. MOB 1 SIM facilities will be add/alter.
7. FTC pilot training starts in February 2016.
8. FTC hours of operation to be determined.

**Architectural**

1. Instructors Office – Provide two 6'x8' workstations for lead pilot and lead boom operator otherwise maximize number of desks without increasing square footage.
   a. "hot seat" function for instructors.
   b. Provide cubbies or lockers for instructors
   c. Review updated 32-1084 for minimum square footage allowed.
2. PTT's Rooms (#135, #136) to be divided by soft wall removable partition. Two PTT devices per room in first phase of facility. Rooms to be repurposed for additional instructors space during expansion.
3. Learning Center – Provide larger workstations for students. Classroom (#214) to be repurposed during expansion to absorb overflow of Learning Center workstations.
4. Future phase additions to facility – add a door between SIM bays. Exterior wall shall remain. Keep all PTT functions, Learning Center functions, and Instructors functions together.

**Communications**

1. No SIPR is needed for the FTC facility per Ed Breen.
2. FTC will connect to other MOB's.

AIR FORCE CIVIL ENGINEER CENTER | AIR EDUCATION & TRAINING COMMAND | AIR MOBILITY COMMAND

**SIGN-IN SHEET**
**FLIGHT TRAINING CENTER (FTC)**
**DRAFT DESIGN SUBMITTAL REVIEW MEETING**
**RANDOLPH AFB, TEXAS**
**19 MARCH 2013**

| NAME (& RANK) | ORGANIZATION | PHONE | E-MAIL |
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| | | | |
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US Army Corps of Engineers

Burns & McDonnell SINCE 1898

# Meeting Agenda

**Project:** KC-46A Flight Training Center (FTC)

**Purpose:** Draft Design Review Meeting

**Meeting Location:** Innovations Conference Room - Building 905, Randolph AFB, Texas

**Tuesday, 19 March 2013**

| | |
|---|---|
| 0800 | Opening Remarks / In-Brief – Introductions, Agenda Overview, Review Scope and Expectations |
| 0900 | Facility Overview |
| 1000 | DrChecks/Comments Review – review of all non-concurs & check/resolve comments. |
| 1200 | Lunch |
| 1300 | Architectural & Interior Design Discussions |
| 1400 | Mechanical & Fire Protection Design Discussions |
| 1430 | Electrical/Communications Design Discussions |
| 1500 | Structural Design Discussions |
| 1530 | Misc. Discussions, Action Items, & Project Way Ahead |
| 1600 | Adjourn |

# KC-46A
# Flight Training Center

Draft Design Submittal Review
19 March 2013

# Agenda

- 13 March
  - Introductions & Inbrief
  - Facility Overview
  - Review Comments
  - Architectural
  - Civil
  - Mech / Plumbing
  - Fire Protection
  - Electrical / Comm
  - Structural
  - Outbrief / Recap / Determine Way Ahead

*Flight Training Center*

# Program Cost

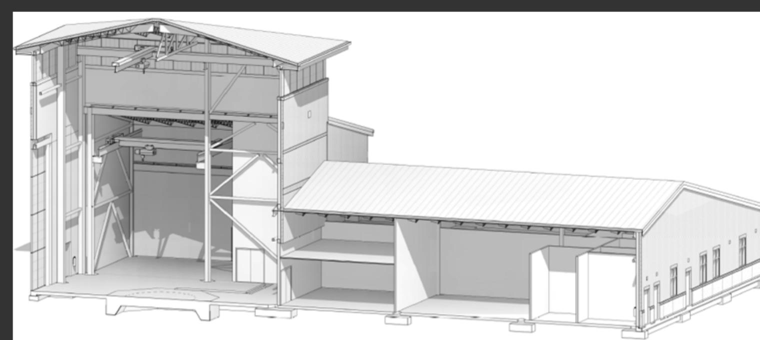
| Facility | Charrette SF | Current SF | Cost Range* | Draft 1391 |
|---|---|---|---|---|
| **Flight Training Center (FTC)** | **29700** | **29903** | **$11.2m to $12.4m** | **$13.4M** |
| 2-Bay Flight Sim (2BFS) | 19,500 | 20,406 | $9m to $11.7m | |
| 1-Bay Flight Sim (1BFS) | 11,600 | 11,885 | $6.5m to $8.3m | |
| Fuselage Trainer (FuT) | 10,600 | 10,653 | $5.5m to $6.7m | |

*The estimated cost of construction based on early programming. Range of cost dependent upon site selection. Estimate will be updated with the Interim Design submittal.

# Submittal Schedule

- Draft Design – 19 February 2013
  - Review (at AMC) – 5-7 March 2013
  - Review (at AETC) – 19 March 2013
- Interim Design – 25 March 2013 (**5 April FTC**)
  - Review (Telecon) – 4 April 2013 (17 April FTC)
- Final Design – 15 April 2013 (**26 April FTC**)
- Base Announcements MOB1 & 2 – May/June 2013
- Site Design Start – Jul/Aug 2013
  - Surveys, fire flow test, geotech, env studies start
  - Draft Submittal & Review
  - Final Submittal & Review

# Design Overview

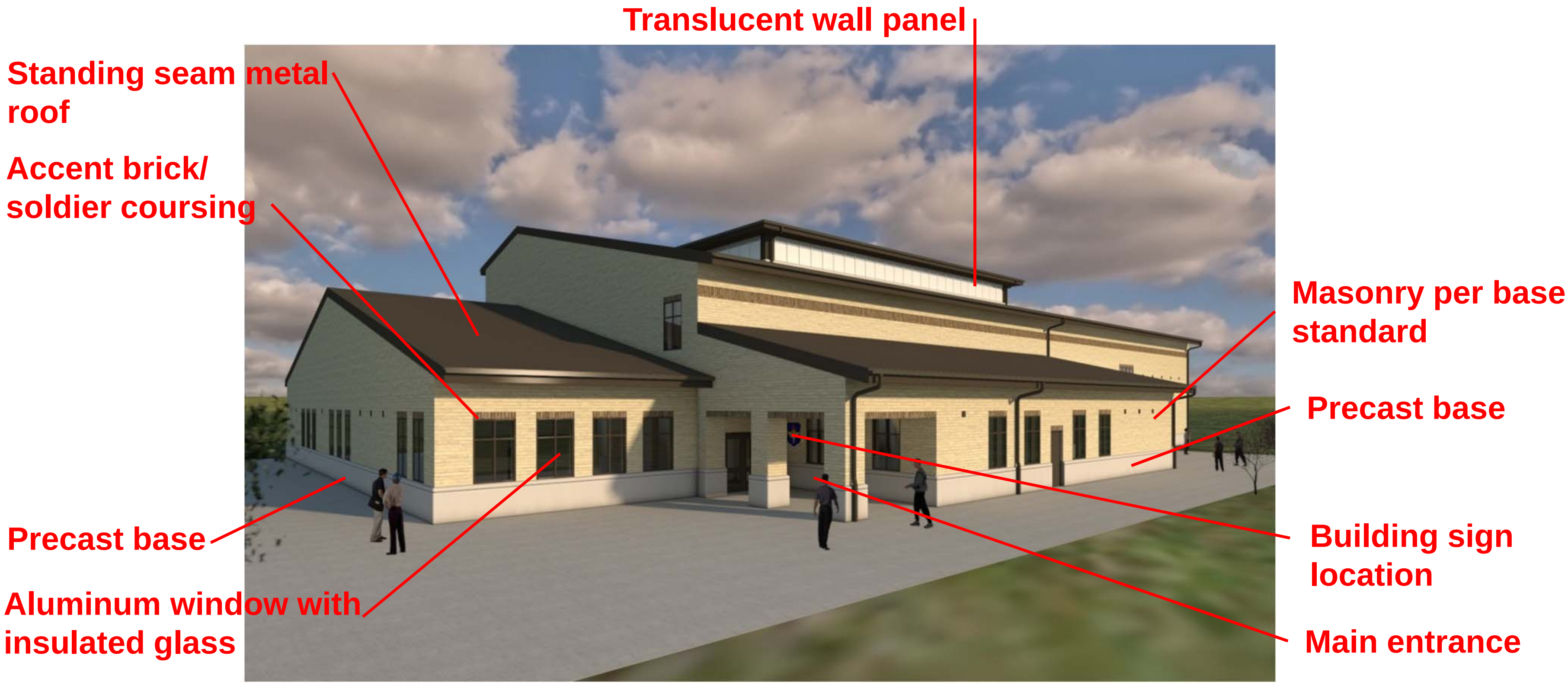



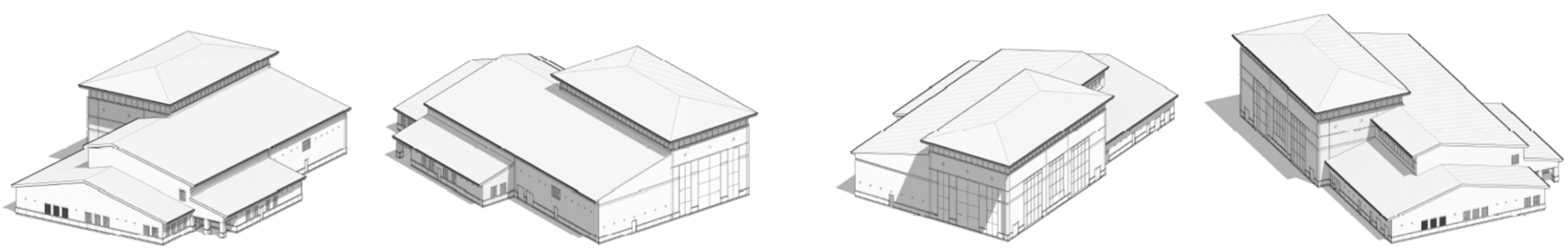
# Flight Training Center (FTC)

# Flight Training Center

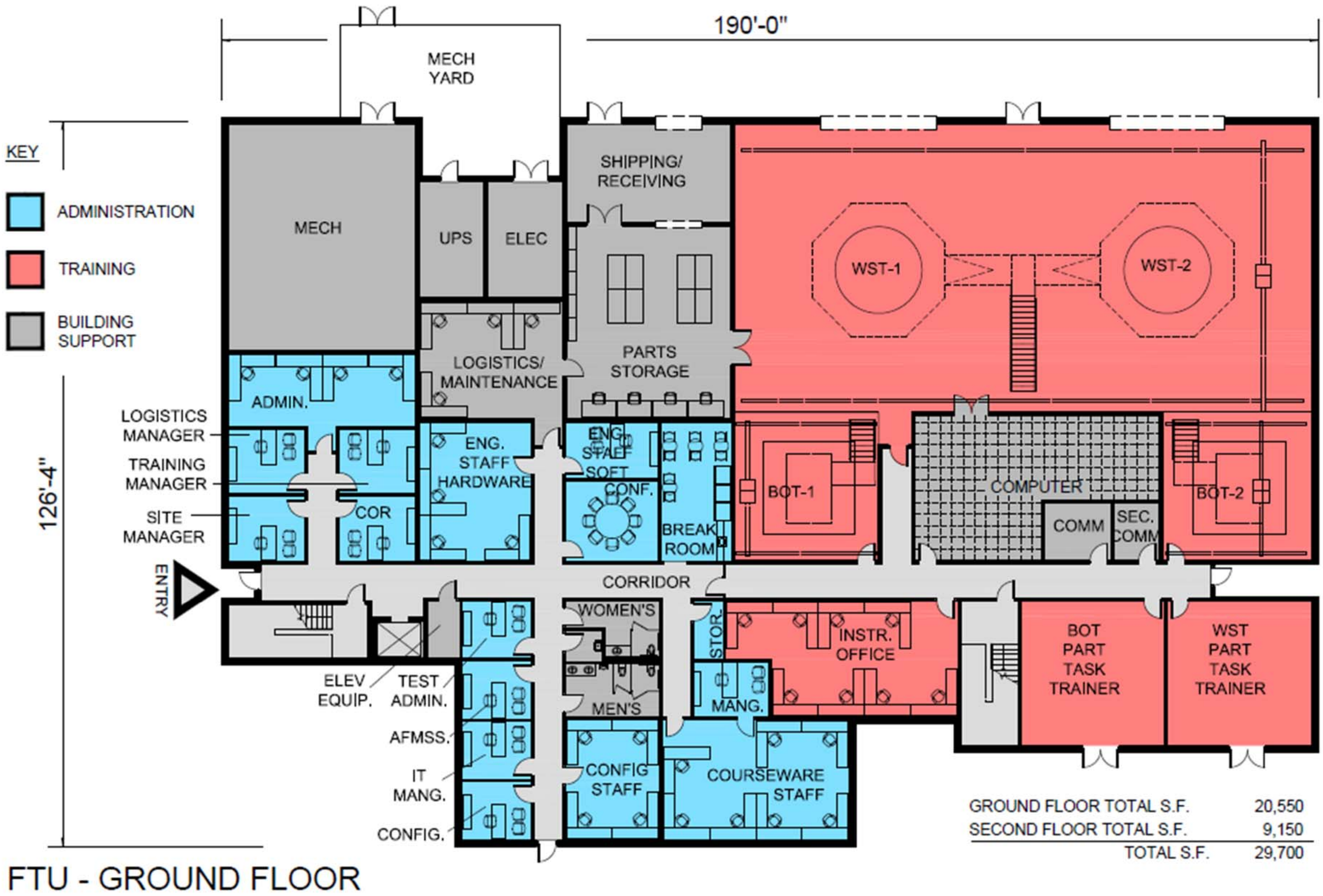
KC-46A Flight Training Center
Draft Submittal Review – 19 March 2013

# FTC – Perspective

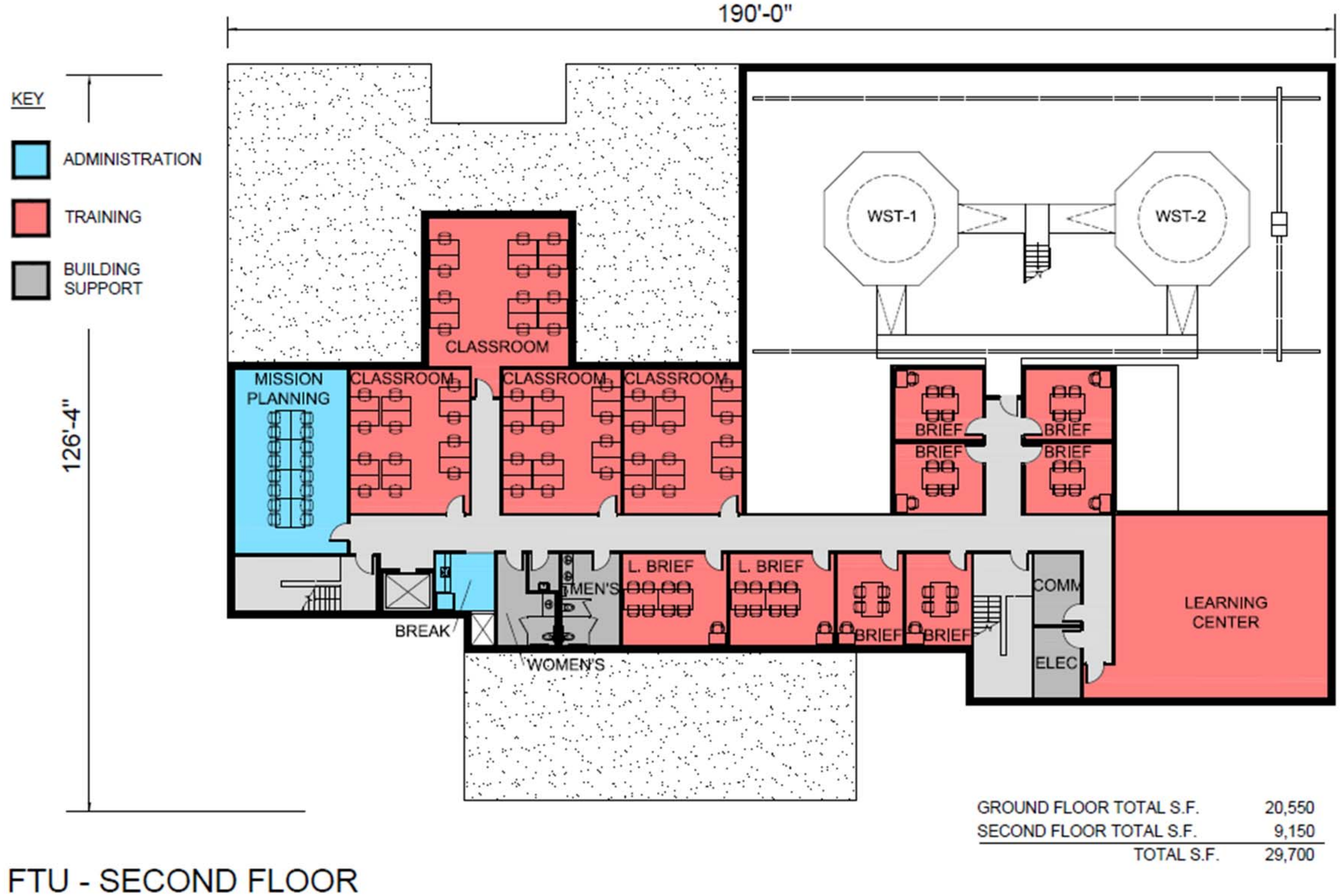


# FTC – Charrette Floor Plan – first level



# FTC – Charrette Floor Plan – second level




| | |
|---|---|
| GROUND FLOOR TOTAL S.F. | 20,550 |
| SECOND FLOOR TOTAL S.F. | 9,150 |
| TOTAL S.F. | 29,700 |

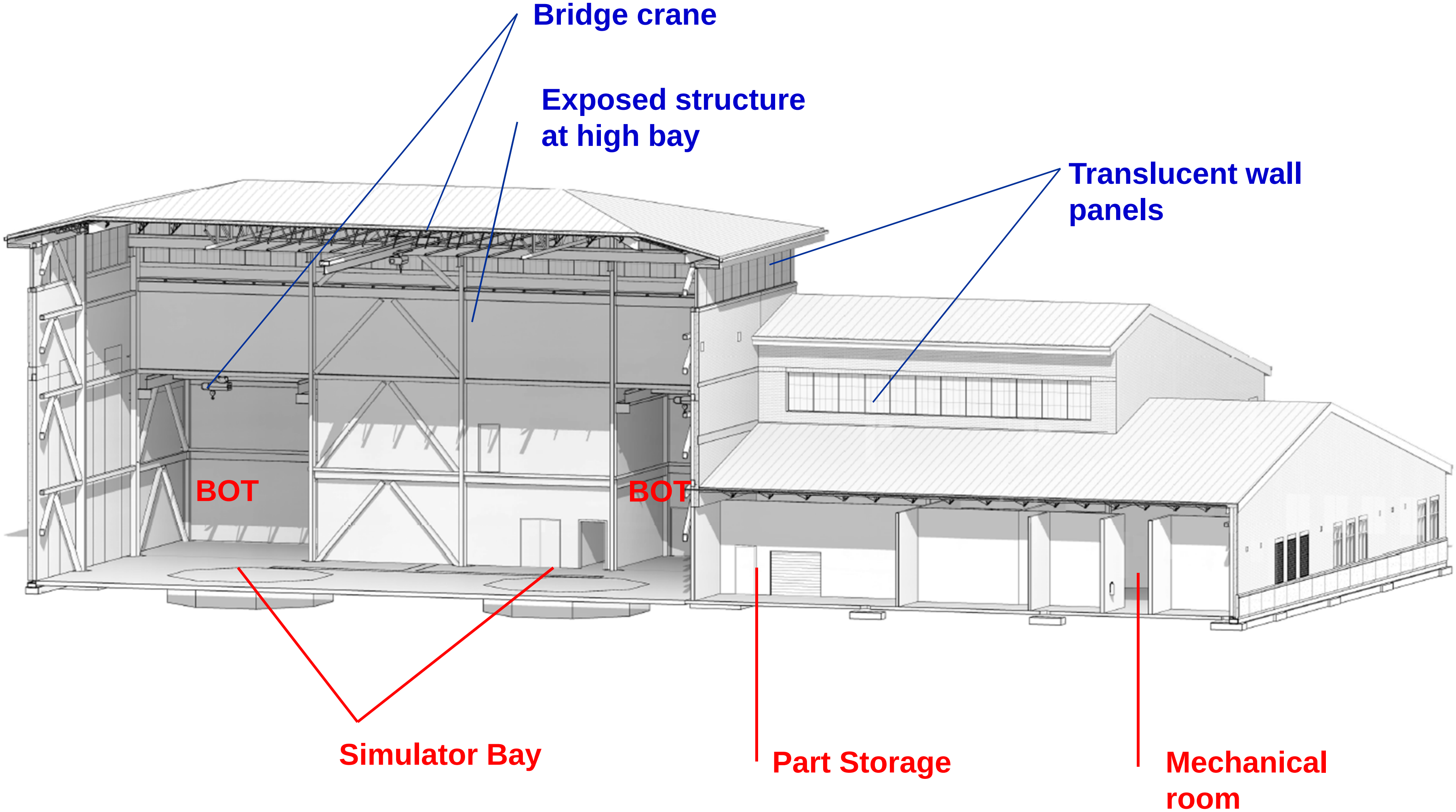
# FTC – Draft Design Floor Plan – First Level

# FTC – Draft Design Floor Plan – Second Level

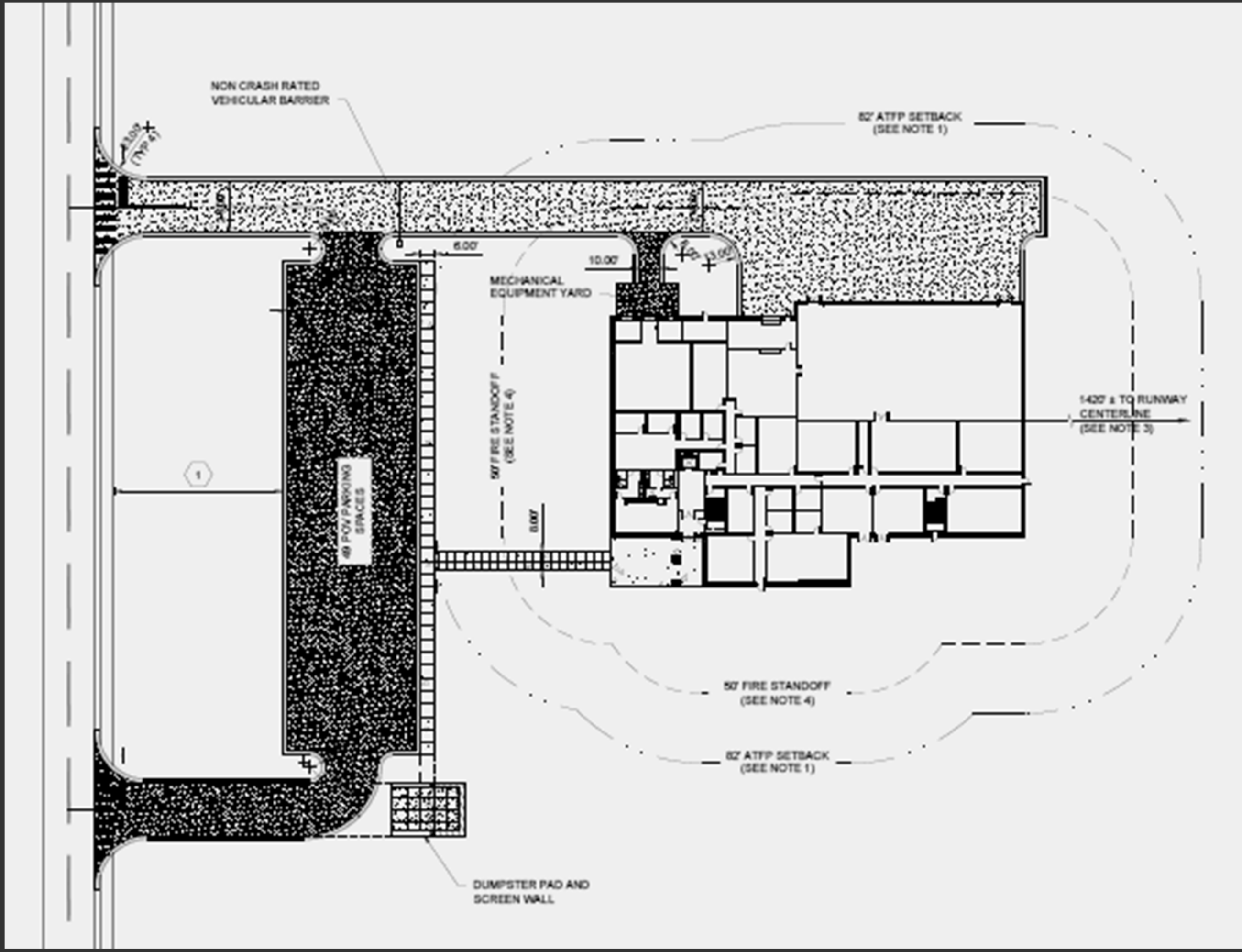
# FTC – Current Design Floor Plan – First Level

# FTC – Current Design Floor Plan – Second Level

# FTC – Section Perspective



# FTC – Concept Site Plan



# Comments Review

- DrChecks Comments

- New Comments?

# Submittal Expectations

<u>Estimated % Complete Before Site Selection</u>

| | |
|---|---|
| • Civil | 20% |
| • Architectural | 70% |
| • Interior Design | 80% |
| • Structural | 50% |
| • HVAC | 60% |
| • Fire Protection | 90% |
| • Plumbing | 80% |
| • Electrical | 60% |

➢ *Provide ‘Design Notes on first sheet of each discipline to explain basis of design*

# Submittal Expectations – Specs

- Draft Design Submittal
  - List of Specs to be provided and indicate which ones will be completed, partially completed, or unedited for Final Design
- Final Design Submittal
  - Edit sections when possible
  - List sections to be developed after site selection
  - Partial edits to some sections to limit scope

# Submittal Expectations - Arch

- Architectural (approx 70% complete)
- Info that will be included:
  - Floor plans, elevation, wall section, RCP, key details, all schedules, standard details, signage schedule
- Info that will be provided after site selection:
  - Exterior elevations to match AFB standards
  - All details, door hardware, interior elevations, enlarged plans, signage details

# Submittal Expectations - Interiors

- Interiors (approx 80% complete)
  - Per SOW : *Select furniture, but allow range of fabrics and structural finishes to choose from*
- Info that will be included:
  - Generic furniture placement plans
  - Finish schedule
- Info that will be provided after site selection:
  - Finish selections to match AFB installation standards
  - FF&E (Corps to determine if one standard for all)

# Interiors - Finishes

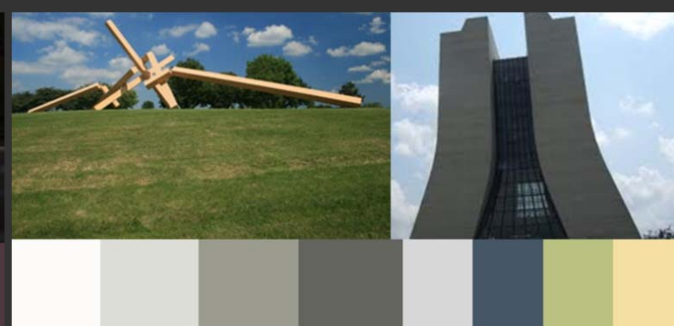
- Interior finishes will be; durable, sustainable and easy to maintain
- Interior finish minimum level of quality to be established
- All interior finishes qualities will be compatible with any site selected
- Color themes will be developed with regional influences that are timeless and coordinated to Base standards

# Interiors – Color Themes examples

varied color schemes timeless in nature

Inspiration from nature and regional materials

- regional woods / stone
- Water
- Earth
- Sky
- Sunset





Burns & McDonnell SINCE 1898

# Interiors – FF&E

- Space planning test fits validates spatial requirements
- FF&E placement plans verifies spatial orientation and interior architecture
- FF&E placement plans are coordinated to building systems, i.e. electrical and data locations

# Submittal Expectations - Civil

- Civil (approx 20% complete)
- Info that will be included:
  - Generic site plans & concept utility plans
- Info that will be provided after site selection:
  - Survey, geotech, environmental studies as required
  - Plans
  - Specs

# Submittal Expectations - HVAC

- HVAC (approx 60% complete)
- Info that will be included:
  - Description of systems proposed for LCCA for each possible site
  - Preliminary plans
- Info that will be provided after site selection:
  - LCCA
  - Equipment selections

# Submittal Expectations - HVAC

- Unknowns and assumptions:
  - Geographic location
  - Building orientation
  - Simulator equipment loads
  - Schedule of operations

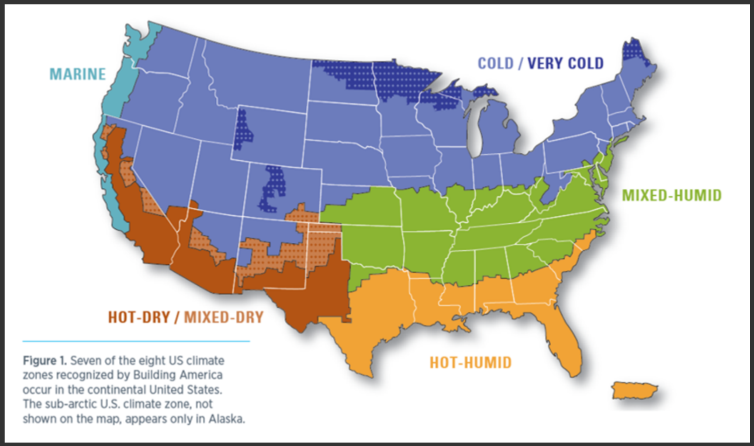


**Figure 1.** Seven of the eight US climate zones recognized by Building America occur in the continental United States. The sub-arctic U.S. climate zone, not shown on the map, appears only in Alaska.

# Submittal Expectations - HVAC

- Design Priorities:
  - Space planning for mechanical rooms
  - Suitability of routing ductwork and piping in building

- Approach:
  - Load and site assumptions
  - Large footprint equipment
    - VAV Systems, Chilled Water, Hot Water Heat

# Submittal Expectations - HVAC

- Final Submittal
  - Layout of mechanical rooms
  - Layout of diffusers and terminal units (Fan Coils)
  - Skeleton arrangement of ductwork
  - Piping not shown
  - Equipment schedules – outlines
  - Details
  - Control Diagrams – Architecture, common elements only

# Submittal Expectations - Plumb

- Plumbing (approx 80% complete)
- Info that will be included:
  - Plans
- Info that will be provided after site selection:
  - LCCA
  - Underground piping plans

# Submittal Expectations - Plumb

- Final Submittal
  - Above ground domestic water, sanitary and vent piping plans
  - Schedules
  - Details
  - Above ground riser diagrams

# Submittal Expectations - Fire

- Fire Protection (approx 90% complete)
  - Fire suppression and fire alarm
- Info that will be included:
  - Plans
  - Specs
  - Fire Alarm plans are performance based
- Info that will be provided after site selection:
  - Fire Flow Test / Fire pump requirement
  - Fire Alarm plans are performance based

# Submittal Expectations – Elec

- Electrical / Comm/Sec (approx 60% complete)
- Info that will be included:
  - Legend, plans, one-line, risers, details, calculations
  - Plans: Equipment and device locations only
  - No schedules or circuiting yet
  - Lighting control
- Info that will be provided after site selection:
  - Site plans, schedules, circuiting, final calculations

# Submittal Expectations - Struct

- Structural (approx 50% complete)
  - Assume shallow foundation with a bearing capacity of 2000 PSF
- Info that will be included:
  - General notes, preliminary plans, typical slab details, typical framing details, preliminary specs, and preliminary calculations.
- Info that will be provided after site selection:
  - Final plans, final foundation sections, final framing sections, final specs, and final calculations.

# Sustainable Strategies

- Air Force LEED Checklist
- Register after site selection
- Owner's Project Requirements
- PV
  - Determine after site selection
- Solar water heating
  - Not likely to be LCCA for these types of facilities
- Lighting controls

# Thank You

# Meeting Notes

Date: 5-6 March 2013

Location: AMC Headquarters, Scott AFB, Illinois

Purpose: KC-46A Trainers Draft Definitive Design Review Meeting

Project: KC-46A SIMs, FuT, & FTC Definitive Design

***Action Items are noted in Bold.**

**Design Overview**

1. Site selections late April.
2. New UFC 3-600-01 has been released and will be followed.
3. New UFC 1-200-02 has been released and will be followed.
4. Design should follow safety requirements per AFI 91-203 *Air Force Consolidated Occupational Safety Instruction*. Chapter 45 addresses training simulator devices.
5. The Corps has initiated an independent VE Study to be performed on the Draft Definitive Design Submittals for both the trainers and the hangars. Results will be incorporated after the Definitive Designs have been completed, and applied to the design of MOB 1 & 2 facilities and addressed in the Definitive Designs in the scope of work after site selection to allow team to continue development of Definitive Designs to meet schedule.

**AMC User Review Comments**

1. **Overall Comments**
    a. Final FF&E will be developed before construction.
    b. Ed Breen requested a list of FF&E for review.
    c. Ed Breen prefers to have lights mounted around perimeter of bay as opposed to overhead lighting (not concerned with lighting top of devices) in 1BFS, 2BFS and FuT.
    d. Windows should be minimized in open storage areas with shades.
    e. Gable vs. hip roof discussion and future addition considerations for FTC discussed. Proceeding with hip roof.
    f. Landing and stair are part of facility, drawbridge part of simulator. ***Ed Breen to provide standard elevation for platform access to simulators**. Contractor will have to do final coordination of platform elevation with actual simulator to be installed.
    g. Simulator Buildings – Sim M/X Parts room: Ed Breen requests no suspended ceiling in the room and also ability to put tall storage system carousel equipment in the room.
    h. Sims will need floor trenches from computer room to the WST and BOT device locations. Trenches are currently shown as 24” wide x 18” deep. Approximate locations are shown.
    i. Ed Breen prefers the briefing rooms to have a wall mounted LCD screen and not to have LCD projectors.

j. Simulator building schedules: Mon-Saturday; 7am to 11pm
k. BOT bays may need separate foundation for simulator. BOT sim is not anticipated to be as heavy as WST, but will be a motion load trainer.
l. BOT – one door to BOT next to SIM entrance door from corridor can be deleted. (2BFS and FTC).
m. All panels serving sensitive loads will be provided with a surge protection device.
n. Simulators need UPS backup for 30 minutes. Not sure yet if individual UPS are required or if they can be shared.
o. Minimum distance from Runway centerline based on UFC 3-260-01 for Class B Runways. Assumed a 60-ft tall building at 7:1 slope (420ft) in addition to the 1000' from runway centerline. Therefore minimum total distance for assumed building height=60', will be 1420-ft from runway centerline.
p. Once the sites have been selected, an analysis for asphaltic-concrete pavement vs. Portland cement concrete will take place for the roadways and parking lots.
q. Handicap accessible ramp will be added from the parking lot to the facilities.
r. All non-crash rated vehicular barriers (swing gates) should be replaced with removable bollards. These are preferred by the user. Gate or bollard option will be reviewed with the Base upon site selection.
s. Trash enclosures and mechanical/electrical yard enclosures will be based on selected sites base design standards. All enclosures will comply with UFC 4-010-01 concealment standards. Shall be coordinated with Base when site selected to provide screening.

**2. 1-Bay Flight Simulator**

a. Only device, brief/debrief and computer rooms require open storage. Learning center and instructor workstation areas are not required to be in the open storage area, but can be if corridor requirements deem it necessary in the 1BFS.
b. Switch Learning Center and Instructor prep areas. Neither area needs requires Open Storage so it should be located outside the secure area. Learning center will be larger than instructors room for 1BFS.
c. Add parts storage high-bay storage unit in furniture package. Also discussed mezzanine but would be counted as square footage and increase overall building size and therefore rejected. Space should have no ceiling to allow high stack storage system was discussed. Typ for 2BFS and FTC.
d. Current size of maintenance parts storage is 225sf which is much larger that parts storage in existing KC-135 facilities.
e. Per Ed Breen, past Simulator unloading was accomplished using a low-boy semi-trailer outside the facility. The trailer will pull up and two forklifts will lift the simulator, while the truck pulls away. The forklifts will then continue moving the simulator into the building.

f. Additional concrete pavement added to the 'plan east' of large bay doors to allow easy access for unloading simulator(s) and forklift movement.

**3. 2-Bay Flight Simulator**

a. 2BFS part task trainer must be included in open storage area. On the second floor, only include the block on the north side of the corridor according to Ed's comment, plus the small brief room to the left in open storage area. (Rooms 215, 216, 217, 218, and 219.
b. 20' (W) x 24' (H) clear opening is required to bring SIM into facility.
c. Simulators will be unloaded using a low-boy semi-trailer outside the facility. The trailer will pull up and two forklifts will lift the simulator, while the truck pulls away. The forklifts will then continue moving the simulator into the building.
d. Additional concrete pavement added to the 'plan north' of large bay doors to allow easy access for unloading simulator(s) and forklift movement.

**4. FuT – Fuselage Trainer**

a. Door for emergency slide-raft from aircraft (10'x10'), door for fueling training (10'x10'), door for cargo loading (22' wide x min height match to top of aircraft hinged door). Cargo loading would be open more than the other doors.
b. FuT large roll-up door on end could be translucent panels similar to flight simulator bays – only need to bring fuselage in once. Not anticipated to be replaced for several years.
c. FuT tail end roll-up doors to move to align with aircraft exit.
d. Provide channel (trench) drain for each roll-up door.
e. Provide exterior man doors on opposite corners of FuT bay.
f. Discussed possible need for a crane at rear of fuselage trainer to get fuselage in place. There are no large parts on the trainer that would need a crane to move them after the trainer is installed. ***Ed Breen to confirm that it a crane not required in the FuT bay**. Design is proceeding without a crane.
g. Ed said 3-4 students, 1 instructor, 1 driver and 1 evaluator in the FuT bay at one time. Confirming occupancy for ATFP requirements and roll-up door requirements. Want to avoid sliding blast doors. May occasionally have groups of 10-12 for tour, but short duration and no regular schedule for when these visits may occur. A total of 7-8 personnel for cargo training is the standard usage for this space.
h. Schedule of operation will be Mon-Friday; 7am to 9pm.
i. FuT bay and briefing rooms would be used daily. Classroom would not.
j. Can have people in FuT bay, briefing, and classroom simultaneously.

k. Fuselage could have open top. This was proposed by the bidders as a cost saving, but is not yet known if this is what will eventually be installed.
l. FuT bids have been received but not awarded.
m. Cargo will not be hazardous or combustible materials. No fuels.
n. Roller floor inside fuselage trainer where pallets enter. Some seating will be loaded as part of training exercises.
o. FuT building will be ADA compliant, but fuselage training device will not be. Covered canopy storage area is not required to be ADA compliant. Personnel will be active duty able-bodied airmen.
p. FuT stairs at each end of fuselage does not come with fuselage. Provide stairs with building. ***Ed to provide elevation of trainer floor for coordination with access stairs**.
q. Need to determine if fuselage is mezzanine, floor, etc. with respect to building code. If floor, need rated stairwell (not just open stair). May need to be totally enclosed stair with direct access to exterior. May be furniture or part of building. Base fire marshal/AHJ may impact this decision. Phyllis suggested posing the question to AFCEC and the base AHJ's (through Phyllis). ***BMcD to prepare a Memo outlining FP interpretations and send through Phyllis to AFCEC for approval**. This should facilitate discussions with the Base Fire Marshal / AHJ when the designs are presented to the installations.
r. No compressed air piping required from building. The trainer manufacturer will provide any breathing and compressed air needed.
s. Air conditioning is required in the Fuselage Bay, however the ambient space does not need tight temperature control which would be difficult with the overhead doors which are typically open during training exercises. The fuselage trainer device will be air conditioned for comfort cooling. Conditioned air will be provided from the building systems. Number, size and connection points for routing ductwork to the Fuselage are to be determined. ***Ed Breen to provide additional info on how air duct connects to the Fuselage and if the Fuselage comes with interior ductwork or if this will need to be installed by the building contractor**.
t. Need a single power connection to the fuselage for outlets and lights inside. Fuselage trainer will be pre-wired by manufacturer. Might have connection at front right of fuselage (typical ground power connection location). Will assume

208/120, 60A panel connection, but it is unknown. ***Ed Breen to provide information on power connection for trainer**.

5. **FTC**
   a. Conference room on first floor needs to be enlarged to have a 20 person table with 25 chairs around walls for weekly staffing meetings to accommodate 45 people.
   b. Courseware staff – 6'x8', admin – 6'x6' workstation.
   c. Combine configuration and courseware open offices.
   d. Brief/debrief rooms are used as a classroom for instruction. Briefings are approx. 2 hours for pre-brief and 2 hours for de-brief after simulation training is completed.
   e. BOT Task Trainer is approximately 8'x12' but will need size confirmed by device manufacturer. Will need 3 of these in the BOT Task Trainer room. PTT will be similar size and 3 required.
   f. Only one second floor classroom requires open storage in FTC for VTRAT. Rest of building is unclassified. Not linking into DMO in this building. No SIPR required in FTC classroom or anywhere in the building (encryption device in classroom).
   g. Red beacons will be installed throughout open storage areas to alert when uncleared person enters. Beacon device will be confirmed with Base security.
   h. 4-5 people typically in brief room – pilot instructor, boom instructor and 3 students.
   i. Remote annunciator panel requested in main entry vestibule as coordinated with base AHJ.
   j. VTRAT classroom requires tower, TV monitor.
   k. Learning center – need unclassified network and power at each CBT desk (three flat panels each desk).
   l. Classrooms – instructor needs unclassified network, students desks need power only. VTRAT (FTC open storage) instructor does not need class network – Maj Lilly to confirm.
   m. Classrooms will need desks with outlets as students will have laptop computers.
   n. Schedule of operations to be discussed at AETC review meeting.
   o. Classroom and Large conference and Brief rooms will need 2 LCD screens. LCD projectors are requested to not be installed.
   p. Classified conference room on 2nd floor to have VTRAT unit.

**USACE Dr Checks Review Comments**

6. Kent Hadrava at Altus may be able to help with load and UPS requirements for Simulators – 580-481-6740.
7. No phone required outside main entry for each building.
8. Cooling and humidity requirements for communications rooms, computer rooms and simulator bays are very tight according to comments compared to what is typically provided for these types of areas. ***Ed to confirm cooling & humidity requirements**.
9. Adding 1 male and 1 female restrooms in FuT. Industrial sink not required.
10. Power to FuT – need trench or pop up through floor?
11. Provide site lighting in cargo loading area and under cargo shelter. Add a couple outlets at the shelter.
12. Learning centers – providing powered tables with 4 outlets each seat (and unclass network).
13. Ed Breen was concerned about computers in the learning center being surge protected. The entire building will be surge protected. Ed was not sure whether UPS backup is required for the learning center computers, but seemed more concerned about surge protection. B&McD will coordinate with Kent Hadrava on UPS requirements as well as network/communication requirements.
14. Kent said there is no crane at either of the FuT facilities.
15. 1BFS & 2BFS will operate 16 hours/day, 6 days/week. Sometimes 20 hours/day. Typically 7am – 11pm. 4am – 12am worst case.
16. FuT will operate 14 hours/day, Mon-Fri.
17. AETC to indicate operating hours for FTC.
18. Need unclass and class network in BDS rooms. Class and unclass to computer table in corner. Unclass to table.
19. Electronic displays, video cable and connections will not be in FF&E package and will be done by others.

**Combined Meeting with Hangar Design Team (3-6-13)**

20. Need to include assumptions on legend sheets with respect to climate, seismic, base standards, etc. Information should be on first sheet of each discipline.
21. Discussed that assumption of sizing is based on Grand Forks, North Dakota climate for ‘definitive’ design for mechanical systems.
22. Discussed that assumption of sizing is based on McConnell in Wichita, Kansas for ‘definitive’ structural design loads.
23. Only the criteria will be indicated. Do not identify AF installation in the criteria.

24. Discussed using common standard details for both sets of projects, however facilities are different and not all details will be developed until after site selection. Therefore it was determined that common standard details would not provide additional benefit beyond coordinating standard approach to use similar design approaches where applicable.
25. Any parts of specs which may be affected by base standards/preferences – leave open.
26. Specs shall be submitted with redline/strikeout edits so that reviewers can see what has been edited out of the specs. Hard copies can be printed 'clean' without edits showing.
27. There were a few mechanical comments on the Trainers that were in DrChecks for the hangars. The Corps will notify the reviewer and have these comments transferred to the Trainers review section.
28. The hangars are not currently pursuing LEED Silver, but the Trainers are all pursuing LEED Silver.

**MECHANICAL**

29. Use 65-72°F with 40-60% humidity in the Trainer Bays. Need to add humidifier to plans. Will add to action item list to verify.
30. Use 65-70°F with 40-60% humidity in the Trainer Bay computer room. During site walk, observed the Computer Room air conditioner set points in the KC-135 Simulator building was set at 66°F and 25-75% RH, high temp alarm set at 80°F.

**ELECTRICAL**

31. Building electrical load will be affected by selected simulator load and HVAC load.
32. Conductors must be derated based on climate in unconditioned spaces.
33. Base standards will affect communication design (colors, connectors, VoIP, etc.).
34. Device materials/colors preference.
35. Assume no security systems other than those required by MAF DMO for sim operations.
36. Provide a matrix of responsibilities to identify scope of work for building Contractor installed equipment and cabling vs. govt. responsibilities.
37. Assume building contractor covers all electrical work (primary, transformer, etc.).

**PLUMBING**

38. KC-135 simulator building has portable eyewash stations where simulator maintenance is done, this would correspond to the SIM MX Parts room in the new buildings.

**Attachments**

Sign-In Sheet
Briefing Slides
Draft Fire Protection Memo

Burns & McDonnell
SINCE 1898

031011 Form GCO-29B

Client ______ Page ______ of ______

Project ______ Date ______ Made By ______

______ Checked By ______

______ Preliminary ______ Final ______

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# KC-46A Trainers
# Flight Simulators, Fuselage Trainer, and Flight Training Center

Draft Definitive Design Submittal Review
5-7 March 2013

# Agenda

- 5 March
  - Overview
  - Review Comments
  - Mech / Plumbing
  - Fire Protection
  - Electrical / Comm
- 6 March
  - Structural
  - Walk-thru of KC-135 Simulator
  - Civil
  - Architectural
  - Trainer Outbrief / Recap / Determine Way Ahead
- 7 March
  - Joint Discussions with Hangar Team

*2-Bay Flight Simulator*

# In-Brief Agenda

- Introductions
- Project Execution Overview
- Design Overview
- Concept Plans
- Submittal Expectations
- Action Items Tracking

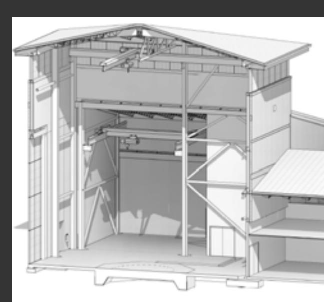
*Fuselage Trainer*

*1-Bay Flight Simulator*



# Introductions

- AMC
- AETC
- Mobile District Corps of Engineers
- Burns & McDonnell
  - Architects: TJ Kim, Austin Berke
  - Mechanical/Plumbing: Tom Karre
  - Electrical/Comm: Casey Sanborn
  - Civil/PM: Andy Mashek, Kyle Warta
  - PM: Amy Clement
  - Interiors: Erin Allen
  - Structural: Barie Brettmann
  - Fire Protection: Chris Cahill



*1-Bay Flight Simulator*

# Overall Program - Trainers

| Facility | Charrette SF | Current SF | Cost Range* |
|---|---|---|---|
| 2-Bay Flight Sim (2BFS) | 19,500 | 20,406 | $9m to $11.7m |
| 1-Bay Flight Sim (1BFS) | 11,600 | 11,885 | $6.5m to $8.3m |
| Fuselage Trainer (FuT) | 10,600 | 10,653 | $5.5m to $6.7m |
| Flight Training Center (FTC) | 29,700 | 29,903 | $11.2m to $12.4m |

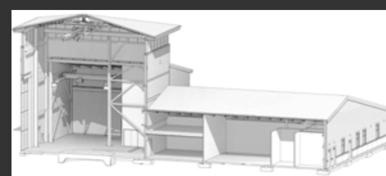
*The estimated cost of construction based on early programming. Range of cost dependent upon site selection. Estimate will be updated with the Interim Definitive Design submittal.



# Submittal Schedule

- Draft Definitive Design – 19 February 2013
  - Review (at AMC) – 5-7 March 2013
  - Review (at AETC) – 19 March 2013
- Interim Definitive Design – 25 March 2013 (5 April FTC)
  - Review (Telecon) – 4 April 2013 (17 April FTC)
- Standard Definitive Design – 15 April 2013 (26 April FTC)
- Base Announcements MOB1 & 2 – May/June 2013
- Site Design Start – Jul/Aug 2013
  - Surveys, fire flow test, geotech, env studies start
  - Draft Submittal & Review
  - Final Submittal & Review

# Design Overview





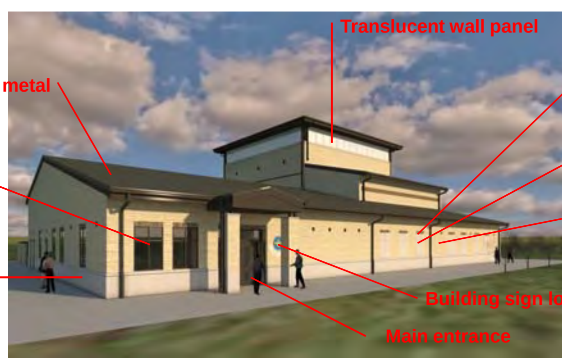
# 1 Bay Flight Simulator (1BFS)

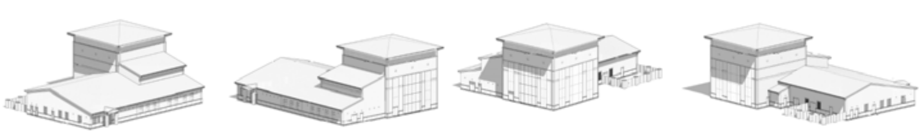
KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

# 1 Bay Flight Simulator

KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

## 1BFS – Perspective



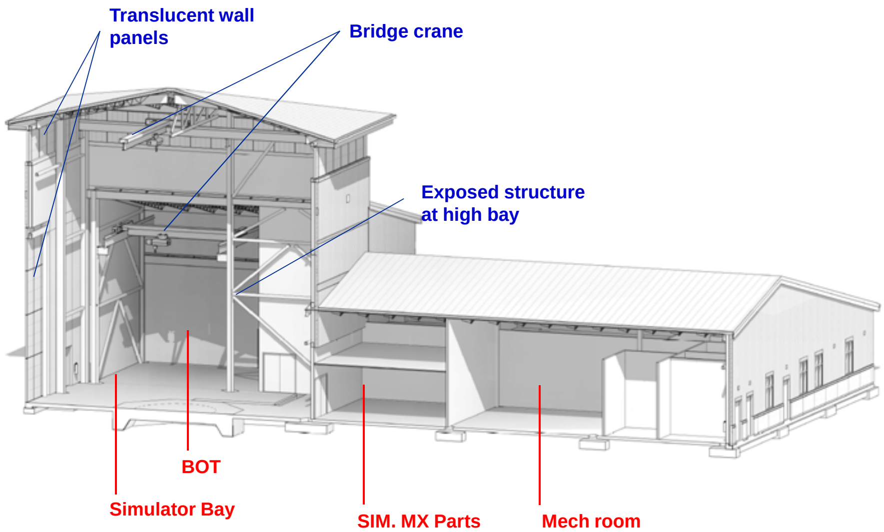
## 1BFS – Charrette Floor Plan


Burns & McDonnell SINCE 1898

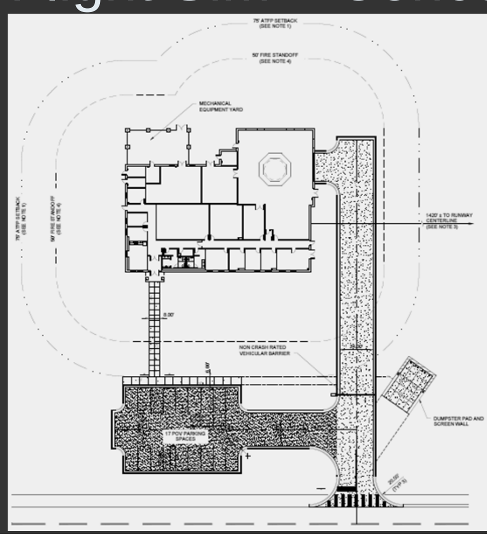
## 1BFS – New Floor Plan


Burns & McDonnell SINCE 1898

## 1BFS – Section Perspective




# 1-Bay Flight Sim – Concept Site



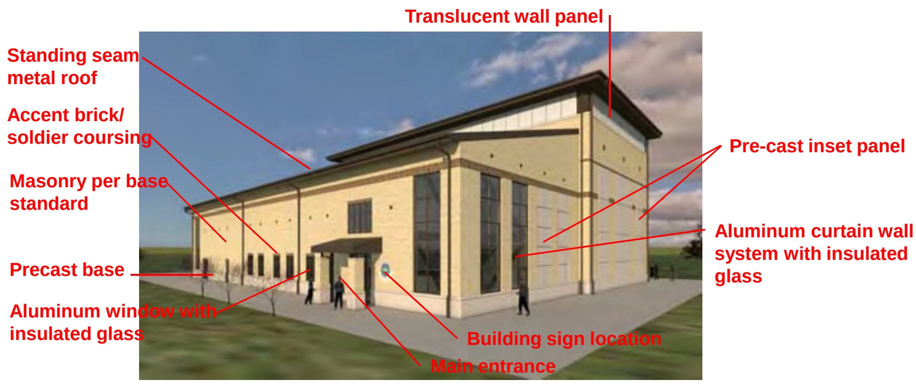
# 2 Bay Flight Simulator
# (2BFS)

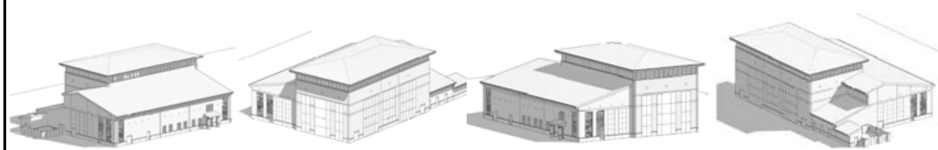


# 2 Bay Flight Simulator

KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

## 2BFS – Perspective



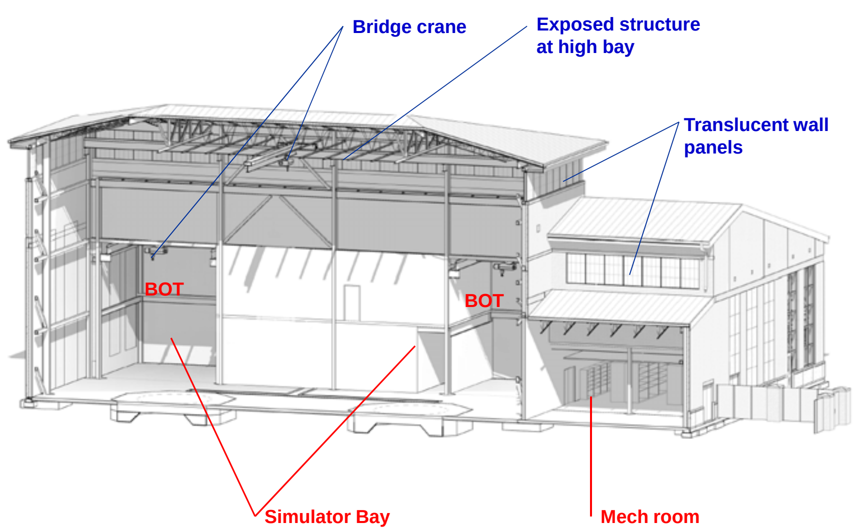
## 2BFS – Charrette Floor Plan – first floor

## 2BFS – Charrette Floor Plan – second floor

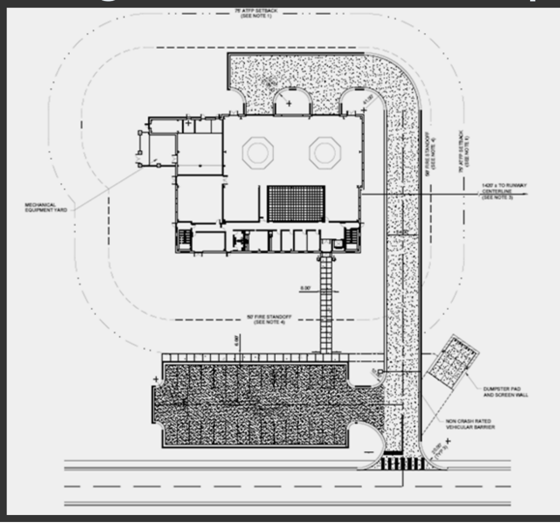
## 2BFS – New Floor Plan – first floor

## 2BFS – New Floor Plan – second floor

## 2BFS – Section Perspective



# 2-Bay Flight Sim – Concept Site



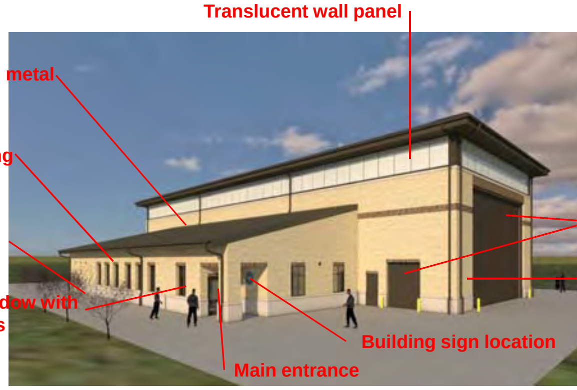


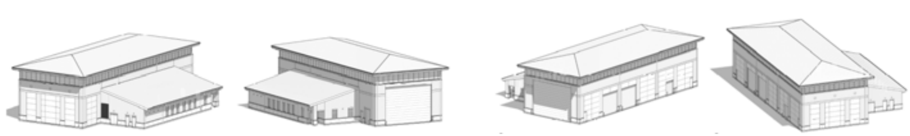
# Fuselage Trainer (FuT)

# Fuselage Trainer

KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

## FuT – Perspective



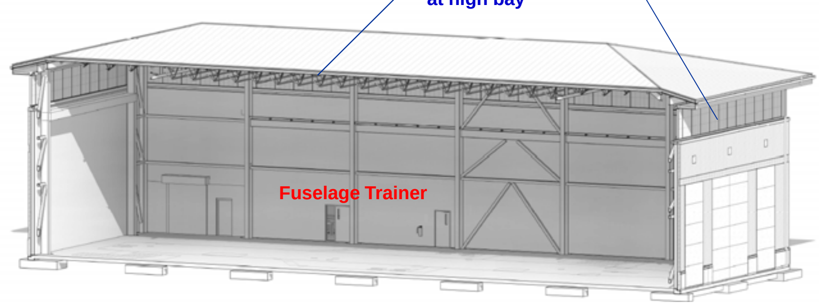
## FuT – Charrette Floor Plan



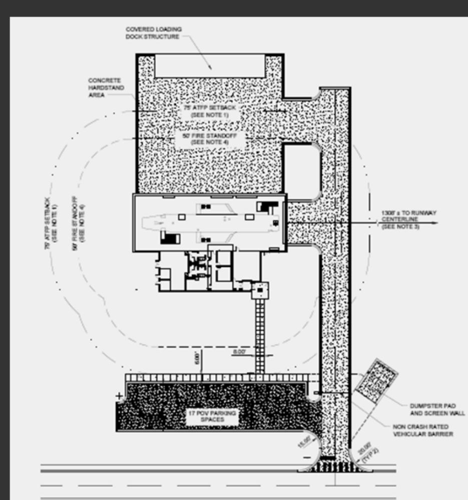

## FuT – New Floor Plan


Burns & McDonnell SINCE 1898

## FuT – Section Perspective




# Fuselage Trainer – Concept Site



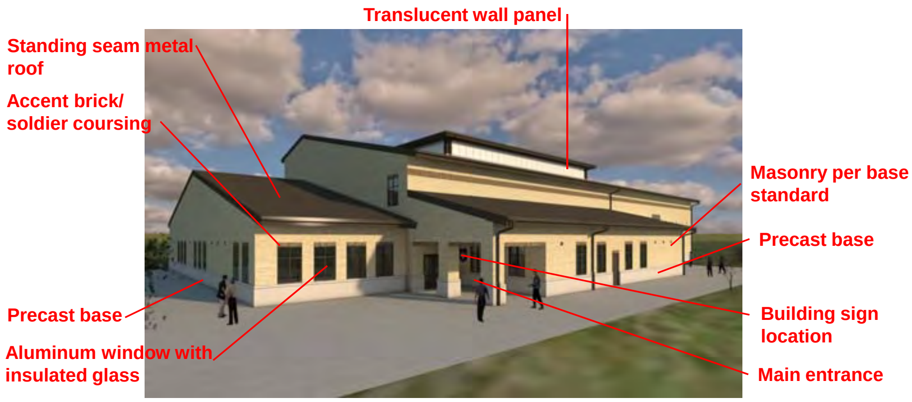
# Flight Training Center
# (FTC)

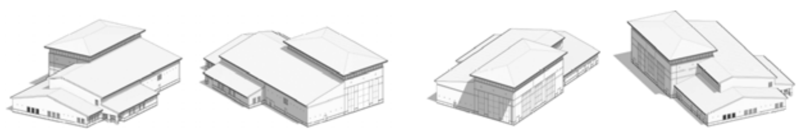
KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

# Flight Training Center

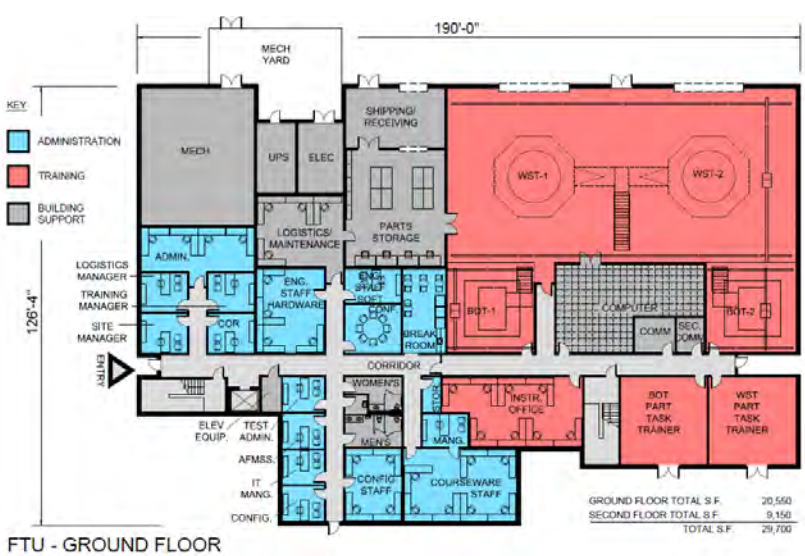
KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

## FTC – Perspective



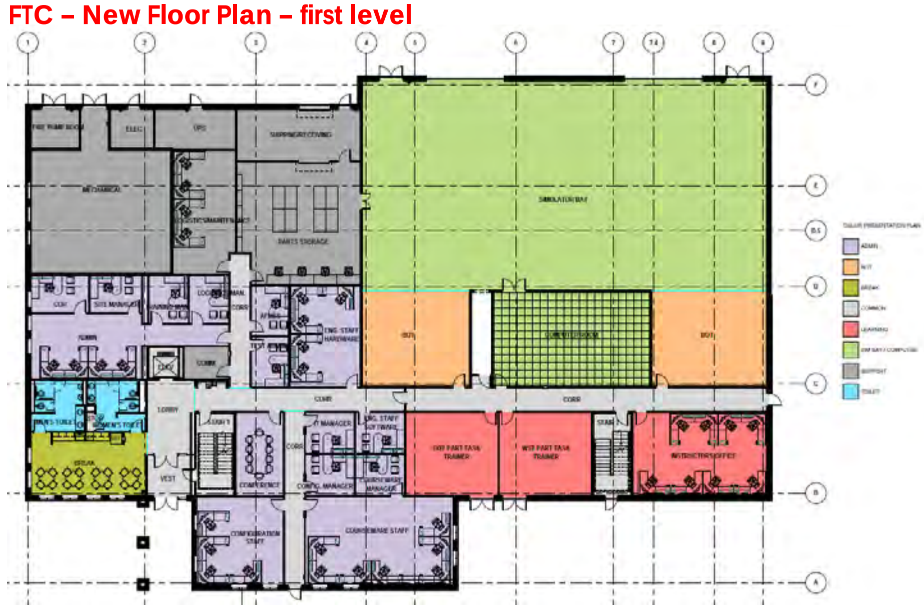



## FTC – Charrette Floor Plan – first level

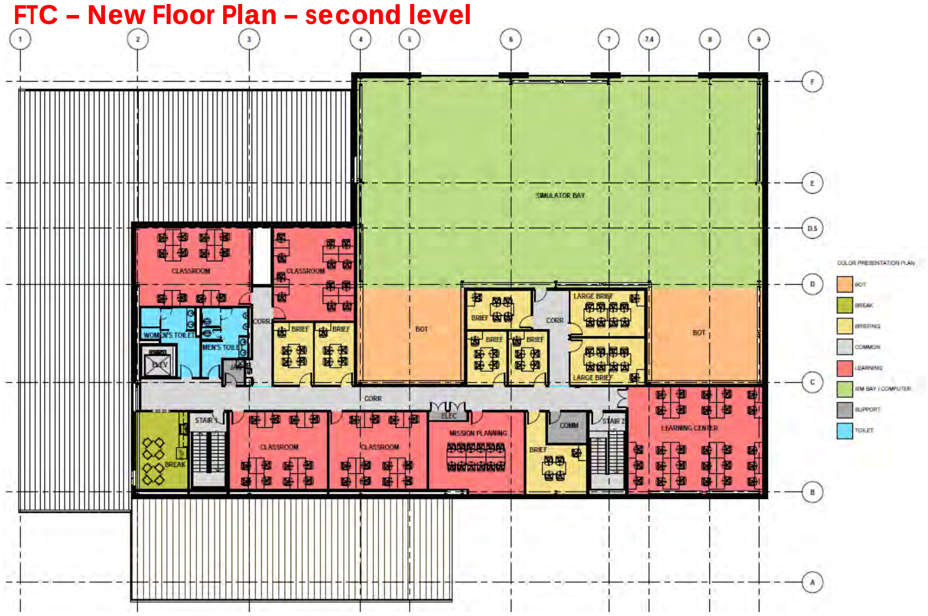


## FTC – Charrette Floor Plan – second level

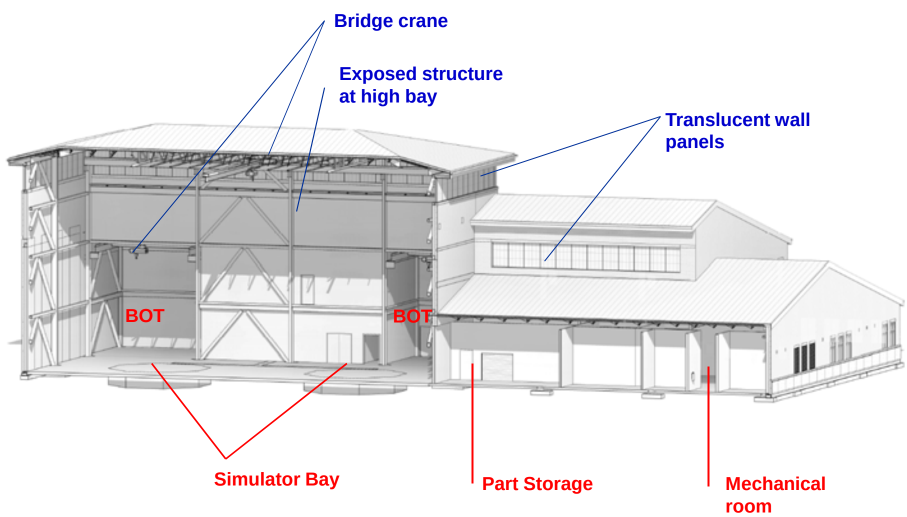

## FTC – New Floor Plan – first level



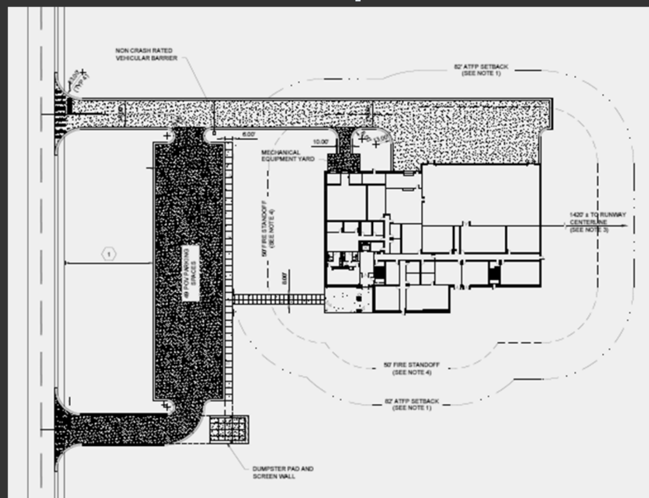
## FTC – New Floor Plan – second level




## FTC – Section Perspective



# FTC – Concept Site Plan






# Submittal Expectations

<u>Estimated % Complete Before Site Selection</u>

| | |
|---|---|
| • Civil | 20% |
| • Architectural | 70% |
| • Interior Design | 80% |
| • Structural | 50% |
| • HVAC | 60% |
| • Fire Protection | 90% |
| • Plumbing | 80% |
| • Electrical | 60% |

➢ *Provide 'Definitive Design Notes' on first sheet of each discipline to explain basis of design*

## Submittal Expectations – Specs

- Draft Definitive Design
  - List of Specs to be provided and indicate which ones will be completed, partially completed, or unedited for Definitive Design
- Final Definitive Design
  - Edit sections when possible
  - List sections to be developed after site selection
  - Partial edits to some sections to limit scope



## Submittal Expectations - HVAC

- HVAC (approx 60% complete)
- Info that will be included:
  - Description of systems proposed for LCCA for each possible site
  - Preliminary plans
- Info that will be provided after site selection:
  - LCCA
  - Equipment selections

# Submittal Expectations - HVAC

- Unknowns and assumptions:
  - Geographic location
  - Building orientation
  - Simulator equipment loads
  - Schedule of operations




# Submittal Expectations - HVAC

- Design Priorities:
  - Space planning for mechanical rooms
  - Suitability of routing ductwork and piping in building

- Approach:
  - Load and site assumptions
  - Large footprint equipment
    - VAV Systems, Chilled Water, Hot Water Heat

# Submittal Expectations - HVAC

- Final Submittal
  - Layout of mechanical rooms
  - Layout of diffusers and terminal units (Fan Coils)
  - Skeleton arrangement of ductwork
  - Piping not shown
  - Equipment schedules – outlines
  - Details
  - Control Diagrams – Architecture, common elements only



# System Types - HVAC

- List of Potential Systems to Life Cycle
  - Variable Air Volume (VAV)
  - Variable Refrigerant Volume (VRF)
    - May not be viable due to 'Buy American Act'
  - Dedicated Outdoor Air (DOAS)
  - Ground Source Heat Pumps
  - Chilled Water (Air Cooled Chillers)
  - Hot Water Heating
  - Economizer
    - Air Side
    - Water Side

# Submittal Expectations - Plumb

- Plumbing (approx 80% complete)
- Info that will be included:
  - Plans
- Info that will be provided after site selection:
  - LCCA
  - Underground piping plans



# Submittal Expectations - Plumb

- Final Submittal
  - Above ground domestic water, sanitary and vent piping plans
  - Schedules
  - Details
  - Above ground riser diagrams

## Submittal Expectations - Fire

- Fire Protection (approx 90% complete)
  - Fire suppression and fire alarm
- Info that will be included:
  - Plans
  - Specs
  - Fire Alarm plans are performance based
- Info that will be provided after site selection:
  - Fire Flow Test / Fire pump requirement
  - Fire Alarm plans are performance based



## Submittal Expectations – Elec

- Electrical / Comm/Sec (approx 60% complete)
- Info that will be included:
  - Legend, plans, one-line, risers, details, calculations
  - Plans: Equipment and device locations only
  - No schedules or circuiting yet
  - Lighting control
- Info that will be provided after site selection:
  - Site plans, schedules, circuiting, final calculations

# Submittal Expectations - Struct

- Structural (approx 50% complete)
  - Assume shallow foundation with a bearing capacity of 2000 PSF
- Info that will be included:
  - General notes, preliminary plans, typical slab details, typical framing details, preliminary specs, and preliminary calculations.
- Info that will be provided after site selection:
  - Final plans, final foundation sections, final framing sections, final specs, and final calculations.



# Submittal Expectations - Civil

- Civil (approx 20% complete)
- Info that will be included:
  - Generic site plans & concept utility plans
- Info that will be provided after site selection:
  - Survey, geotech, environmental studies as required
  - Plans
  - Specs

KC-46A Trainers
Draft Submittal Review – 5-7 March 2013

# Submittal Expectations - Arch

- Architectural (approx 70% complete)
- Info that will be included:
  – Floor plans, elevation, wall section, RCP, key details, all schedules, standard details, signage schedule
- Info that will be provided after site selection:
  – Exterior elevations to match AFB standards
  – All details, door hardware, interior elevations, enlarged plans, signage details



# Submittal Expectations - Interiors

- Interiors (approx 80% complete)
  – Per SOW : *Select furniture, but allow range of fabrics and structural finishes to choose from*
- Info that will be included:
  – Generic furniture placement plans
  – Finish schedule
- Info that will be provided after site selection:
  – Finish selections to match AFB installation standards
  – FF&E (Corps to determine if one standard for all)

# Interiors - Finishes

- Interior finishes will be; durable, sustainable and easy to maintain
- Interior finish minimum level of quality to be established
- All interior finishes qualities will be compatible with any site selected
- Color themes will be developed with regional influences that are timeless and coordinated to Base standards

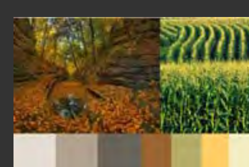


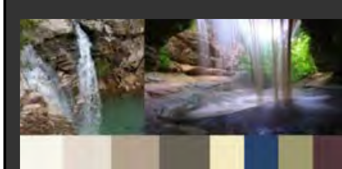
# Interiors – Color Themes examples

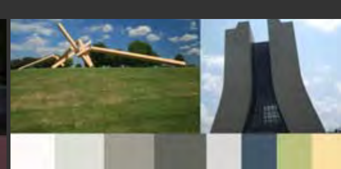
varied color schemes timeless in nature

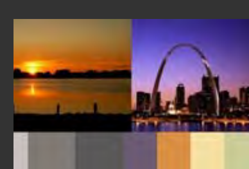
Inspiration from nature and regional materials

- regional woods / stone
- Water
- Earth
- Sky
- Sunset









# Interiors – FF&E

- Space planning test fits validates spatial requirements
- FF&E placement plans verifies spatial orientation and interior architecture
- FF&E placement plans are coordinated to building systems, i.e. electrical and data locations



# 2-Bay Flight Sim – Interiors

- Interior design emphasis will be in the public spaces; lobby, corridor, break room
- Interior architectural elements transition with the interior finishes to create a functional, aesthetically pleasing environment
- Integrated signage provides information and supports wayfinding

# Sustainable Strategies

- Air Force LEED Checklist
- Register after site selection
- Owner's Project Requirements
- PV
  - Determine after site selection
- Solar water heating
  - Not likely to be LCCA for these types of facilities
- Lighting controls

# Memorandum

Date: March 13, 2013

To: Ms. Phyllis Smith
Mobile District Army Corps of Engineers

From: Chris Cahill, PE
Fire Protection Engineer

Subject: KC-46A Simulator Training Facilities – Definitive Designs
Fire Protection Design for Training Systems

This Memorandum addresses several questions regarding the design of fire protection systems for the Flight Simulator and Fuselage Training Facilities that we are designing to support the KC-46A beddown.

At the project review meeting this week with AMC to review the draft Definitive Design, it was determined that it would be advantageous to get approval from AFCEC Fire Protection for the fire protection systems to facilitate design coordination with the Installations after a site has been selected and the AHJ is engaged in the project.

Please let us know if a conference call is needed to discuss these issues.

The design interpretations needing approval are described below.

**Issue #1 – Use of Classroom Occupant Load Factor for Briefing Rooms:**

We recommend that the occupant load factor for Briefing Rooms use a Classroom load factor (20 sf per person) based on the fixed mission and fixed number of occupants in these spaces.

Based on the furniture layout and room size these spaces could be interpreted as conference rooms which would use an Assembly occupant load factor (15 sf per person). The rooms are not large enough to be an Assembly occupancy.

In working with the AMC user representative, Ed Breen, at the charrette and subsequent design review meeting, he has described the space function to be interpreted as a Classroom use. This is based on a fixed mission use of the space with a known number of occupants. By contrast a Conference Room has an undefined use, undefined function and undefined occupants. As a result we are proceeding with the Briefing Rooms using a Classroom occupant load (20 sf per person) versus an Assembly use (15 sf per person).

To further support our recommendation, NFPA requirements for the use of a Classroom occupant load factor for non K-12 facility was reviewed. NFPA 101 6.1.3.1 and 6.1.3.3 speak to the classification of occupancy not the use of a space which may be different. This concept is discussed in the attached scan from the NFPA 101 handbook. This section specifically discusses adult classrooms indicating an educational use (20 square feet per person) is appropriate.

We request your acceptance of this interpretation of the occupancy use for Briefing Rooms as Classroom.

**Issue #2 – Fire Protection for Aircraft Training Systems**

We have reviewed UFC 1-200-01, UFC 3-600-01, ETL 1-18 and AFI 91-203 (15 June 2012) Chapter 45 Training Systems, with respect to aircraft training systems. We have a few clarifications on the applicability of those standards for the Fuselage Trainer and the Flight Simulators for the KC-46A.

Fuselage Trainer:
The Fuselage Trainer (FuT) device is a full size KC-46A fuselage minus the cockpit, tail and most of the wings. It is yet to be determined if an actual fuselage will be modified or a custom built mock-up will be constructed. Attached is a preliminary plan showing the device and training facility. The fixture is essentially fixed and is not intended to be moved after it is installed. This raises some questions in how applicable the codes and standards are. The following is how we understand these codes and standards to apply to the fuselage trainer.

1. FuT – We believe the fuselage (aircraft) should be treated as a piece of equipment or walk in display element. Should it be regulated as a mezzanine or a story? We do not believe it is possible to meet many of the requirements such as exiting or separations if it is a mezzanine or story.

2. FuT – Based on discussions with the user, we are assuming that the trainer will be for active duty able-bodied airmen training and instructors only. Is the training floor of the device required to be handicap accessible? The most significant issue would be the addition of an elevator.

3. FuT – The area underneath the fuselage (aircraft) training device is an accessible space greater than 4' wide and in theory available for storage, although typically items are not stored in this area and are not anticipated to be stored here. Are sprinklers required under the training device?

4. FuT – Are sprinklers required inside the training device? This space is normally occupied (during training exercises). Materials will be loaded and unloaded, although some materials may be combustible these would be limited.

5. FuT – If sprinklers are not provided in or under the devices, is the proper density Extra Hazard II?

   *NFPA 13 5.4.2* Extra Hazard (Group 2). Extra hazard (Group 2) occupancies shall be defined as occupancies or portions of other occupancies with moderate to substantial amounts of flammable or combustible liquids or occupancies where shielding of combustibles is extensive*.

6. FuT - Is FA/MNS notification required in the device?

<u>Flight Simulators:</u>
The simulators are full motion electric motor driven training devices. There are no hydraulics. These are not unlike offices or workstations anywhere else in the building. However, they clearly have a different function and move. Attached is a preliminary plan showing the floor plan of the facility with the simulator bays.

7. Sim – We believe the device should be treated as a piece of equipment or walk in display element. Should it be regulated as a mezzanine or a story? We do not believe it is possible to meet many of the requirements such as exiting or separations if it is a mezzanine or story.

8. Sim – Is the device required to be handicap accessible? Based on discussions with the user, the occupants will be active duty able-bodied airmen and instructors.

9. Sim – The area underneath the training device is greater than 4' wide but not available for storage due to the motors, equipment and wiring to run the devise. We do not believe sprinklers would operate due to how far down from the bottom of the trainer (effective ceiling) they would need to be to avoid contact with the moving device. Are sprinklers required under the training device?

10. Sim – Are sprinklers or other fire suppression systems required inside the training device? This space is normally occupied (during training exercises). The electronics of the device introduce combustibles and egress is somewhat delayed compared to a normal office space.

11. Sim – If sprinklers are not provided in or under the devices is the proper density Extra Hazard II?

12. Sim – Are the rooms housing the sims required to be other than wet-pipe sprinklers? The program representative is concerned with wet systems. We would propose a double interlock pre-action if permitted.

13. Sim – Is the computer room supporting the sims required to be other than wet-pipe sprinklers? The program representative is concerned with wet systems. We would propose using the same system as the sim bay.

14. Sim – ETL 1-18, are the smoke detection requirements for mission-support equipment to cover the room or the device?

15. Sim – Is the computer room supporting the sim required to have smoke detection for mission-support equipment under ETL 1-18?

16. Sim – Is smoke detection required in the device?

17. Sim - Is FA/MNS notification required in the device?

18. Sim – With the only function of this building being the simulators and support spaces for the simulator training is a 1 hour rated wall required by AFI 91-203 Chapter 45 to separate the simulator from the remainder of the building? If so, which side of the rated wall does the computer room go? If so can the wall stop at the adjacent lower roof or must it go to the simulator roof?

Attachments:

- Excerpt from NFPA 101 Handbook
- FuT Draft Definitive Design Floor Plan
- 2-Bay Flight Simulator Draft Definitive Design Floor Plan (1st and 2nd Floor Plans)

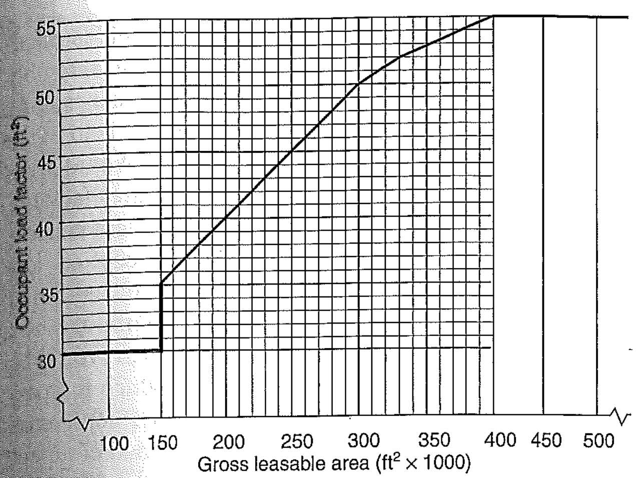



*Figure 7.3.1.2(a) Mall Building Occupant Load Factors (U.S. Customary Units).*

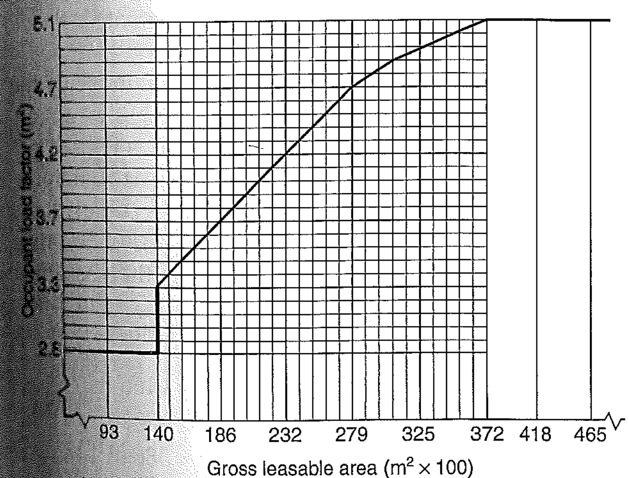



*Figure 7.3.1.2(b) Mall Building Occupant Load Factors (SI Units).*

devoted to the use for which the gross area figure is specified and by applying the net area figure to the net area of the portion of the building devoted to the use for which the net area figure is specified.

**A.7.3.1.2** The normal occupant load is not necessarily a suitable criterion, because the greatest hazard can occur when an unusually large crowd is present, which is a condition often difficult for authorities having jurisdiction to control by regulatory measures. The principle of this *Code* is to provide means of egress for the maximum probable number of occupants, rather than to attempt to limit occupants to a number commensurate with available means of egress. However, limits of occupancy are specified in certain special cases for other reasons.

Suggested occupant load factors for components of large airport terminal buildings are given in Table A.7.3.1.2. However, the authority having jurisdiction might elect to use different occupant load factors, provided that egress requirements are satisfied.

***Table A.7.3.1.2 Airport Terminal Occupant Load Factors***

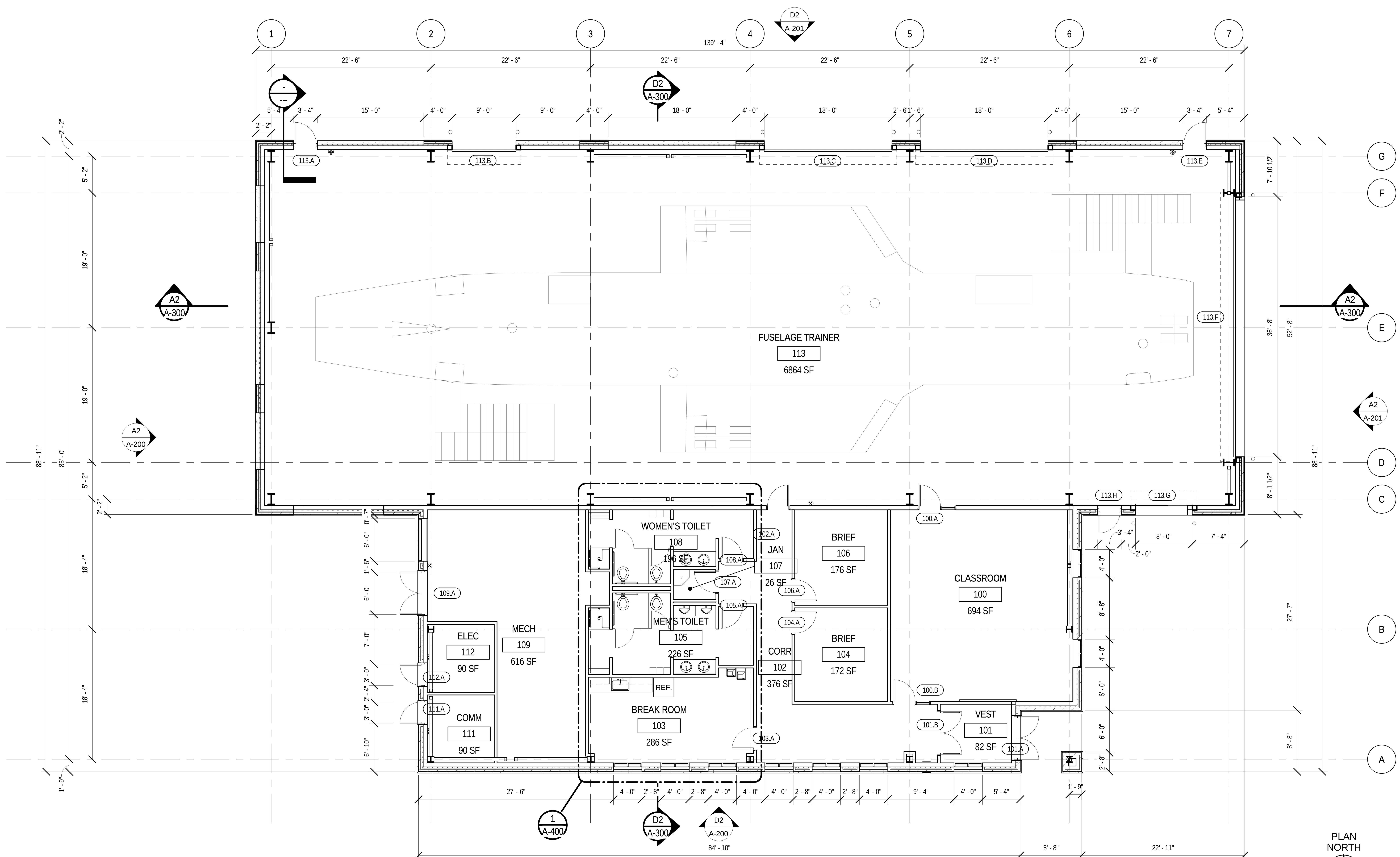
| Airport Terminal Area | ft² (gross) | m² (gross) |
|---|---|---|
| Concourse | 100 | 9.3 |
| Waiting areas | 15 | 1.4 |
| Baggage claim | 20 | 1.9 |
| Baggage handling | 300 | 27.9 |

The figure used in determining the occupancy load for mall shopping centers of varying sizes was arrived at empirically by surveying over 270 mall shopping centers, by studying mercantile occupancy parking requirements, and by observing the number of occupants per vehicle during peak seasons.

These studies show that, with an increase in shopping center size, there is a decrease in the number of occupants per square foot of gross leasable area.

This phenomenon is explained when one considers that, above a certain shopping center gross leasable area [approximately 600,000 ft² (56,000 m²)], there exists a multiplicity of the same types of stores. The purpose of duplicate types of stores is to increase the choices available to a customer for any given type of merchandise. Therefore, when shopping center size increases, the occupant load increases as well, but at a declining rate. In using Figure 7.3.1.2(a) or Figure 7.3.1.2(b), the occupant load factor is applied only to the gross leasable area that uses the mall as a means of egress.

Occupant load is determined by the nature of the use of a building or space and the amount of space available for that use. Since different generic uses are characterized by different occupant densities, Table 7.3.1.2 has established occupant load factors for each use. The first column of the table is deliberately headed "use" rather than "occupancy," because the use of an area might differ from its occupancy classification. For example, a meeting room for fewer than 50 people in an office building is not an assembly occupancy; it is a business occupancy [see 6.1.14.1.3(2)], but its occupant load is based on an assembly use. The same concept applies to a classroom in a university, which, although classified as a business occupancy, has an occupant load based on educational use (for traditional classroom style) or assembly use (for lecture style with theater-type seating).




FLOOR PLAN

0 4' 8' 16'
SCALE:1/8"=1'

NOT FOR CONSTRUCTION
DRAFT DEFINITIVE DESIGN

US ARMY CORPS OF ENGINEERS ®
MOBILE DISTRICT

REVISIONS

| SYMBOL | DESCRIPTION | DATE | APPR. |
| --- | --- | --- | --- |

DESIGNED BY: T.J. KIM
DRAWN BY: C. SPRINKLE
CHECKED BY: Checker
DATE: 2/19/2013
SCALE: 1/8" = 1'-0"
DRAWING CODE: EP14A-111
T.J. KIM 2/19/2013
PROJECT ENGINEER/ARCHITECT DATE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MOBILE, ALABAMA

BURNS & McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
(816) 333-9400

FY-13 KC-46A FUSELAGE TRAINER
BASE X, CONUS
PROJECT NO. 71376

FLOOR PLAN

SHEET REFERENCE NUMBER:
A-111
SHEET ____ OF ____



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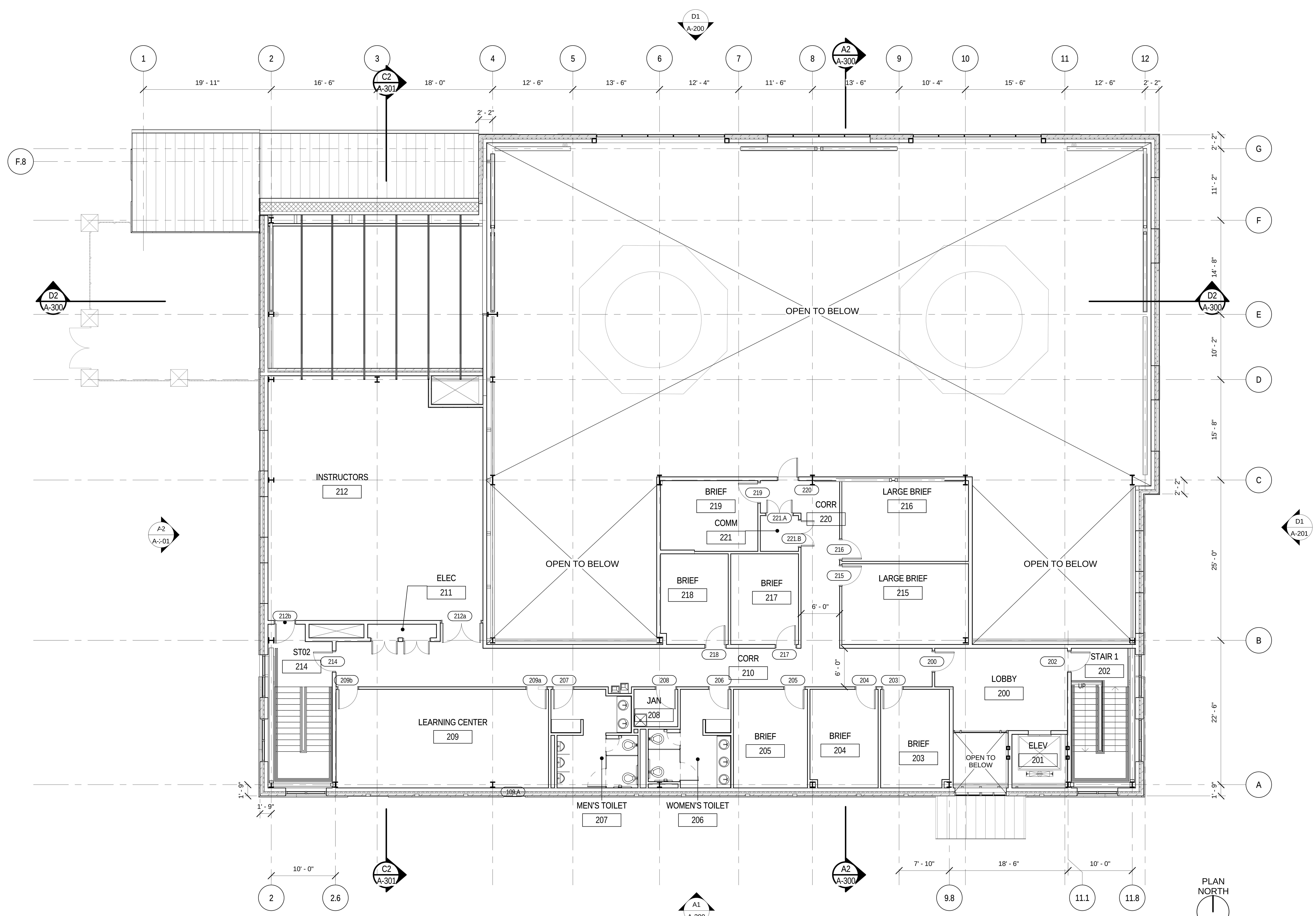


02 SECOND FLOOR

0 4' 8' 16'
SCALE:1/8"=1'

NOT FOR CONSTRUCTION
DRAFT DEFINITIVE DESIGN

US ARMY CORPS OF ENGINEERS ®
MOBILE DISTRICT

| SYMBOL | REVISIONS DESCRIPTION | DATE | APPR. |
|---|---|---|---|

DESIGNED BY: Designer
DRAWN BY: Author
CHECKED BY: Checker
Designer
PROJECT ENGINEER/ARCHITECT DATE
DATE: Issue Date
SCALE: 1/8" = 1'-0"
DRAWING CODE: EP12A-112
Issue Date

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MOBILE, ALABAMA

BURNS & McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
(816) 333-9400

FY-13 KC-46A 2-BAY FLIGHT SIMULATOR
BASE X, CONUS
PROJECT NO. 71170

FLOOR PLAN - SECOND FLOOR

SHEET REFERENCE NUMBER:
A-112
SHEET ____ OF ____



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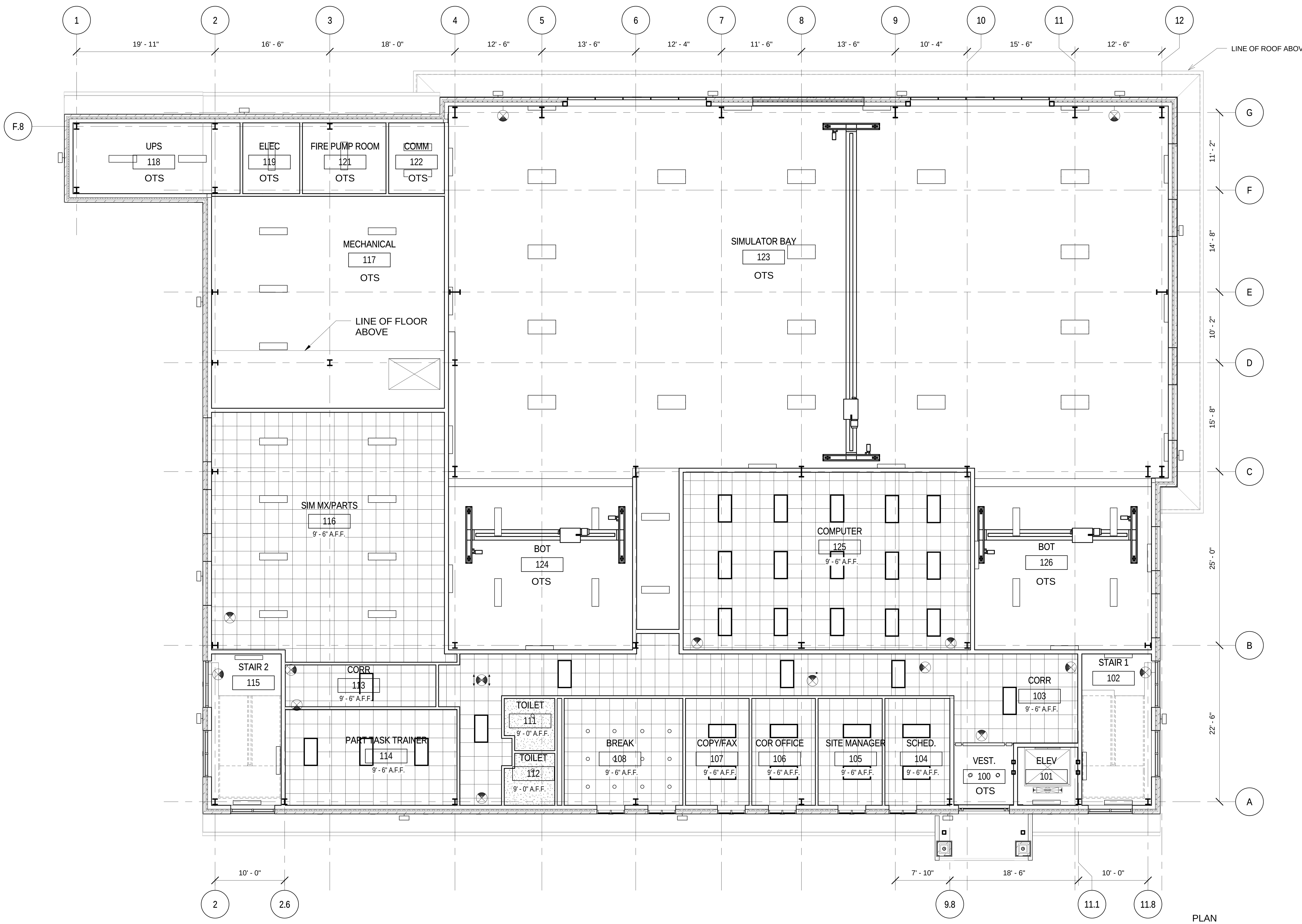


# FIRST FLOOR REFLECTED CEILING PLAN

PLAN NORTH

0 4' 8' 16'
SCALE:1/8"=1'

## CEILING LEGEND

| | |
|---|---|
| | 24"x24" ACOUSTIC CEILING TILE |
| | GYPSUM BOARD CEILING - PAINTED |
| | METAL CEILING |
| OTS | OPEN TO STRUCTURE |

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REVISIONS
SYMBOL | DESCRIPTION | DATE | APPR.

DATE: Issue Date
SCALE: 1/8" = 1'-0"
DRAWING CODE: EP12A-121
Issue Date DATE
DESIGNED BY: Designer
DRAWN BY: Author
CHECKED BY: Checker
Designer PROJECT ENGINEER/ARCHITECT

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(816) 333-9400

Burns & McDonnell SINCE 1898

FY-13 KC-46A 2-BAY FLIGHT SIMULATOR
BASE X, CONUS
PROJECT NO. 71170

REFLECTED CEILING PLAN - FIRST FLOOR

SHEET REFERENCE NUMBER:
A-121
SHEET ____ OF ____

NOT FOR CONSTRUCTION
DRAFT DEFINITIVE DESIGN



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# Meeting Notes

Date: 17 January 2013

Location: Mobile COE District Offices, Alabama

Purpose: KC-46A Trainers Definitive Design Kickoff Meeting

Project: KC-46A SIMs, FuT, & FTC Definitive Design

***Action Items are noted in Bold.**

**General**

1. MOB selection to be approximately June/July 2013.
2. Base selection site surveys being held at the end of the month.
3. Need to provide a note or similar stating what the definitive design was based (for example seismic, climate, etc.)
    a. The first sheet of each discipline should include a list of general ’Standard Definitive Design Notes’ – what is the design based on etc. that will be helpful as the designs are executed at different locations over the next 5-10 years as the program is executed. For example, structural Definitive Design Notes will include seismic criteria used for developing the definitive design.
4. **Phyllis to check with Tom Hodges on status of 1391’s.**
5. First submittal will only be a list of specs. This spec list will include all specs required for the full design.
    a. From this at the review meeting the reviewers and AFCEC will assist in determining which specs need to be developed and to what extent.
6. Phyllis to provide direction/approval on title blocks.
    a. Border file and title block information confirmed by Phyllis at end of meeting.
    b. Base location should be indicated as ‘TBD AFB, USA’.
7. First aircraft set to arrive June of 2013.
8. Projects are currently funded in FY14 and need to be operational by July 2016.
9. Standard Definitive Design
    a. Draft “Draft Definitive Design”
    b. Interim “Interim Definitive Design”
    c. Final “Standard/Final Definitive Design
10. After Base locations are announced survey & geotechnical investigations will likely be in Burns & McDonnell’s SOW and will need to be executed quickly to prepare for final design phase.
11. The Air Force is currently developing a Standard website that will provide a central location for design standards and make them more universal across the Air Force. It is anticipated that many finishes will be standardized. Brian to check on status of website and standards and send link if there is information that can be incorporated at this time.
12. KC-46A Program Design Consistency –

   a. Phyllis indicated a desire to develop a consistent design theme across all KC-46A facilities such that they are readily identified as being part of the mission. JSF Beddown facilities at Eglin, for example, all had similar architectural elements, colors, and interior finishes. AFCEC to keep consistency between facility types and have final say on changes to configurations.
   b. At some point, will need to get the design teams together to develop this consistency across hangars – sims – squad ops.
13. Design Analysis format will follow Mobile standard.
14. An additional chapter (XVI-1) will be added to the Design Analysis to summarize Cost Reduction Strategies.
15. Room Data Sheets are not required as this information should be incorporated into the plans & specs.
16. Specifications:
   a. The Draft Definitive Design submittal will include an Appendix with a list of specifications anticipated, and an indication of the spec status at the end of Definitive Design. Some specs will be un-edited until site selection, some will be fully edited, and some will be partially edited. Will review this list at Draft Review meeting and discuss any specific challenges with partial spec editing of some sections.
17. Cost Estimate:
   a. It is acceptable for cost estimates to be developed based on the submittal documents are provided at the review meeting or just prior to the review meeting.

**<u>Interiors</u>**
1. First phase of definitive design will be approximately 50-60%.
2. The Corps agreed with the expectations presented and equated them to a 60-70% completion level. Furniture layout will be provided at first phase for head counts and verify room size. Quality of furniture and finish levels will also be included in phase 1. Furniture and final color schematics will be selected at phase 2.
3. FF&E will be included in the second phase.

**<u>Structural</u>**
1. Include in general notes – seismic assumptions, etc.
2. Basic framing diagram will be provided at first phase. Foundation and site specific structural requirement will be added and structural design will be finalized after site selection.

**<u>Architectural</u>**
1. Architecture will be 70% complete for final standard definitive design. Final standard definitive design will include all floor plans, roof plan, RCP, building elevation, building

sections, typical key wall sections, draft schedule and standard details. Building specific details will be added after site is selected for each building.

2. BMCD designed is based on AMC design guide line and available Architectural compatibility plan ( Fairchild and McConnell)
3. Building exterior will be masonry wall with metal roof. Reference attached architectural presentation for more information.
4. Jim Tamblyn suggested minimizing amount of glass in stairways based on final orientation to reduce cooling loads in these unoccupied spaces.
5. Thermal bridge will be minimized in details

**Fire**

1. Buildings are provided with fire sprinklers and mass notification and fire alarms.
2. There has yet to be identified any specific UFC or ETL other than ETL 1-18 applying to simulators thus the current design is for a wet sprinkler throughout the building.
3. Sprinkler demands are approximately 1,300 gpm. A pump will most likely be required for each building or cluster is located close to each other where there is more than one.
4. Mass notification and fire alarm are standard in accordance with applicable UFC's.
5. ETL 1-18 requires smoke detection in the simulator bays and control rooms under mission support equipment.
6. Both sprinkler and alarms will be design as a performance based plan and specification. Individual components such as sprinklers, pipes and alarm notification devices will not be shown and up to the final contractor to space in accordance with the plans, specification and Code requirements.
7. Brian requested that demand requirements (flow and pressure) for each facility be provided in the Definitive Design documents for coordination when Bases are selected. Fire flow tests will be performed at the site when the locations are selected.

**Mechanical**

1. Design parameters and assumptions used to come up with the design and instructions to the future designers may need to be included on the drawings in a box as definitive design notes.
2. Editing specs that we can, and just listing the others would be fine. The draft submittal will include a list of specifications that we will indicate whether the spec will be edited or not for the definitive design.
3. Stay away from listing the VRF systems due to 'Buy American'.
4. Add air side heat recovery for the list.
5. Jim Tamblyn agrees with how we are approaching the design drawings.
6. Consider heat pump water heaters to pull heat off of the computer room systems.

7. Suggestions from Jim Tamblyn-
    a. Prefers phenolic or cellular glass insulation for chilled water piping in humid climates.
    b. Temporary flushing or bypass flushing equipment should not have PVC components.

**Electrical / Communications**

1. Definitive design for electrical, communications and security will include legend, floor plans, one-lines, risers and details. Circuiting and panelboard schedules will not be provided until the site specific design is developed and loads are further defined.
2. Lighting layouts and description of controls will be included for definitive design.
3. Security system equipment layouts and door details will be included for definitive design.
4. Assumptions will be made with respect to simulator system loads and demarcation points between contractor and government responsibilities. For example, power panelboards will be provided in the computer rooms and simulator bays, but no branch circuiting will be shown as this may be part of government responsibilities.
5. Assumptions will be made on UPS room sizing to support simulator systems. The actual simulator load will determine the UPS size and voltages utilized and government preferences will affect wall and floor space required for the disconnects/termination boxes, panelboards and transformers. Whether some of this equipment will be allowed to be mounted in the computer room or simulator bay is unknown.
6. Assumptions will be made with respect to horizontal voice/data cabling. The presence of unclassified and classified cabling with classified open storage areas lend to all fiber optic cabling, but could be copper or a combination of the two based on the site security representative's preference.
7. Whether HVAC, lighting and other loads will be fed from separate panels is to be determined. If necessary to meet LEED M&V credit, these loads would need to be metered separately.
8. Classified open storage areas will be either compartmentalized (single access controlled entrance) or consolidated (multiple access controlled entrances) according to the DMO Guide.
9. Workstation furniture task lighting will be assumed for LEED purposes. If it is determined that task lighting will not be included, the ambient lighting will be switched as required to meet the credit.
10. Daylighting controls will be incorporated in the simulator bays with step-dimming or fractional lamp-switching.
11. Exterior lights will be LED for definitive design and revisited after site selection.

**Sustainable Design**

1. Projects will be registered on-line after site selection.
2. Follow Air Force sustainable design policy and checklist and include checklist in submittals.

Date: 17-Jan-2013

Location: USACE Mobile District Offices

Purpose: Definitive Design Kickoff

# MEETING ATTENDANCE

## KC-46A TRAINERS DEFINITIVE DESIGN

US Army Corps of Engineers
Mobile District

Burns & McDonnell SINCE 1898

| Attend | No. | Name | Organization | Area of Focus | Phone | Email |
|---|---|---|---|---|---|---|
| | 1 | Clyde Ashley, Jr. | USACE | Civil/Site | 251-694-4075 | clyde.m.ashley.jr@usace.army.mil |
| | 2 | Austin Berke | Burns & McDonnell | Architecture | 816-823-7010 | aberke@burnsmcd.com |
| | 3 | Joshua Blevins | USACE | Geotech | 251-694-3625 | joshua.c.blevins@usace.army.mil |
| | 4 | Ron Brannon | USACE | SDD | 251-694-4095 | ronald.b.brannon@usace.army.mil |
| | 5 | Mike Childs | USACE | Architecture | 251-690-3505 | james.m.childs@usace.army.mil |
| | 6 | Amy Clement | Burns & McDonnell | Proj Mgr | 816-822-3153 | aclement@burnsmcd.com |
| | 7 | Larry Covert | USACE | Eletrical | 251-694-3737 | larry.covert@usace.army.mil |
| | 8 | Brian Dykes | USACE | Proj Mgr | | brian.m.dykes@usace.army.mil |
| | 9 | Joe Findley | USACE | Environmental Eng. | 251-694-4012 | joseph.w.findley@usace.army.mil |
| | 10 | Tom Karre | Burns & McDonnell | Mechanical | 816-822-3161 | tkarre@burnsmcd.com |
| | 11 | Mike Keating | USACE | Cost | 251-694-3751 | michael.keating@usace.army.mil |
| | 12 | TJ Kim | Burns & McDonnell | Architecture | 816-333-9400 | tkim@burnsmcd.com |
| | 13 | Billy Knapp | USACE | Mechanical | 251-694-4048 | william.j.knapp@usace.army.mil |
| | 14 | Jason Krik | USACE | Chief of Geotech | 251-690-2320 | jason.b.krik@usace.army.mil |
| | 15 | Andy Mashek | Burns & McDonnell | Proj Mgr & Civil | 816-349-6707 | amashek@burnsmcd.com |
| | 16 | Courtney Perry | USACE | Project Engineer | 251-441-5118 | courtney.l.perry@usace.army.mil |
| | 17 | George Poiroux | USACE | Geotech/Water/Waste | 251-694-4082 | george.w.poiroux@usace.army.mil |
| | 18 | Casey Sanborn | Burns & McDonnell | Eletrical | 816-822-3905 | csanborn@burnsmcd.com |
| | 19 | Phyllis Smith | USACE | Proj Mgr | | phyllis.c.smith@usace.army.mil |
| | 20 | Jim Tamblyn | USACE | Mechanical | 251-694-4071 | james.p.tamblyn.jr@usace.army.mil |
| | 21 | Micheal Thompson | USACE | Structural | 251-690-2623 | michael.d.thompson@usace.army.mil |
| | 22 | Gary Whigham | USACE | Chief Design Branch | 251-690-2669 | gary.w.whigham@usace.army.mil |
| | 23 | | | | | |
| | 24 | | | | | |
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| | 26 | | | | | |

# KC-46A Trainers
# Flight Simulators, Fuselage Trainer, and Flight Training Center

Design Kick-Off Overview
17 January 2013

# Today's Agenda

- Introductions
- Execution Overview
- Submittal Expectations by Discipline
- Design Overview
- Architectural Theme
- Concept Plans
- Action Items Tracking

KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# Introductions

- Burns & McDonnell
  - Architects:  TJ Kim, Austin Berke
  - Mechanical/Plumbing:  Tom Karre
  - Electrical/Comm:  Casey Sanborn
  - Civil/PM:  Andy Mashek
  - PM:  Amy Clement
  - Interiors:  Erin Allen
  - Structural:  Barie Brettman
  - Fire Protection:  Chris Cahill



# Overall Program - Trainers

| Facility | Charrette SF | Current SF |
|---|---|---|
| 2-Bay Flight Sim (2BFS) | 19,500 | 20,100 |
| 1-Bay Flight Sim (1BFS) | 11,600 | 12,000 |
| Fuselage Trainer (FuT) | 10,600 | 10,700 |
| Formal Training Center (FTC) | 29,700 | 29,700 |

# Submittal Schedule

- Draft Definitive Design – 19 February 2013
  - Review (at AMC) – 5 March 2013
- Interim Definitive Design – 25 March 2013
  - Review (Telecon) – 4 April 2013
- Standard Definitive Design – 15 April 2013
- Base Announcements MOB1 & 2 – Jun/Jul 2013
- Site Design Start – Jul/Aug 2013
  - Surveys, fire flow test, geotech, env studies start
  - Draft Submittal & Review
  - Final Submittal & Review



# Submittal Expectations

| Estimated % Complete Before Site – Per SOW | | Estimated % Complete Before Site - Actual | |
|---|---|---|---|
| Civil | 20% | Civil | 20% |
| Architectural | 70% | Architectural | 70% |
| Interior Design | 80% | Interior Design | 60% |
| Structural | 50% | Structural | 50% |
| HVAC | 60% | HVAC | 50% |
| Fire Protection | 90% | Fire Protection | 90% |
| Plumbing | 80% | Plumbing | 80% |
| Electrical | 60% | Electrical | 60% |

- *Provide 'Definitive Design Notes' on first sheet of each discipline to explain basis of design*

# Submittal Expectations - Civil

- Civil (20% complete per SOW)
- Actual estimated % complete - 20%
- Info that will be included:
  - Generic site plans & concept utility plans
- Info that will be provided after site selection:
  - Survey, geotech, environmental studies as required
  - Plans
  - Specs



# Submittal Expectations - Arch

- Architectural (70% complete per SOW)
- Actual estimated % complete - 70%
- Info that will be included:
  - Floor plans, elevation, wall section, RCP, key details, all schedules, standard details, signage schedule
- Info that will be provided after site selection:
  - Exterior elevations to match AFB standards
  - All details, door hardware, interior elevations, enlarged plans, signage details

# Submittal Expectations - Interiors

- Interiors (80% complete per SOW)
  - Per SOW : *Select furniture, but allow range of fabrics and structural finishes to choose from*
- Actual estimated % complete - 60%
- Info that will be included:
  - Generic furniture placement plans
  - Finish schedule
- Info that will be provided after site selection:
  - Finish selections to match AFB installation standards
  - FF&E (Corps to determine if one standard for all)



# Submittal Expectations - Struct

- Structural (50% complete per SOW)
  - Assume shallow foundation with a bearing capacity of 2000 PSF
- Actual estimated % complete - 50%
- Info that will be included:
  - General notes, preliminary plans, typical slab details, typical framing details, preliminary specs, and preliminary calculations.
- Info that will be provided after site selection:
  - Final plans, final foundation sections, final framing sections, final specs, and final calculations.

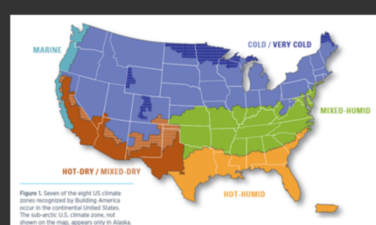
# Submittal Expectations - HVAC

- HVAC (60% complete per SOW)
- Actual estimated % complete - 50%
- Info that will be included:
  – Description of systems proposed for LCCA for each possible site
  – Preliminary plans
- Info that will be provided after site selection:
  – LCCA
  – Equipment selections



# Submittal Expectations - HVAC

- Unknowns and assumptions:
  – Geographic location
  – Building orientation
  – Simulator equipment loads
  – Schedule of operations




KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# Submittal Expectations - HVAC

- Design Priorities:
  - Space planning for mechanical rooms
  - Suitability of routing ductwork and piping in building
- Approach:
  - Load and site assumptions
  - Large footprint equipment
    - VAV Systems, Chilled Water, Hot Water Heat



# Submittal Expectations - HVAC

- Final Submittal
  - Layout of mechanical rooms
  - Layout of diffusers and terminal units (Fan Coils)
  - Skeleton arrangement of ductwork
  - Piping not shown
  - Equipment schedules – outlines
  - Details
  - Control Diagrams – Architecture, common elements only

KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# System Types - HVAC

- List of Potential Systems to Life Cycle
  - Variable Air Volume (VAV)
  - Variable Refrigerant Volume (VRF)
    - May not be viable due to 'Buy American Act'
  - Dedicated Outdoor Air (DOAS)
  - Ground Source Heat Pumps
  - Chilled Water (Air Cooled Chillers)
  - Hot Water Heating
  - Economizer
    - Air Side
    - Water Side



# Submittal Expectations - Plumb

- Plumbing (80% complete per SOW)
- Actual estimated % complete - 80%
- Info that will be included:
  - Plans
- Info that will be provided after site selection:
  - LCCA
  - Underground piping plans

KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# Submittal Expectations - Plumb

- Final Submittal
  - Above ground domestic water, sanitary and vent piping plans
  - Schedules
  - Details
  - Above ground riser diagrams



# Submittal Expectations - Fire

- Fire Protection (90% complete per SOW)
  - Fire suppression and fire alarm
- Actual estimated % complete - 90%
- Info that will be included:
  - Plans
  - Specs
  - Fire Alarm plans are performance based
- Info that will be provided after site selection:
  - Fire Flow Test / Fire pump requirement
  - Fire Alarm plans are performance based

## Submittal Expectations – Elec

- Electrical / Comm/Sec (60% complete per SOW)
- Actual estimated % complete - 60%
- Info that will be included:
  - Legend, plans, one-line, risers, details, calculations
  - Plans: Equipment and device locations only
  - No schedules or circuiting yet
  - Lighting control
- Info that will be provided after site selection:
  - Site plans, schedules, circuiting, final calculations



## Submittal Expectations – Specs

- Draft Definitive Design
  - List of Specs to be provided and indicate which ones will be completed, partially completed, or unedited for Definitive Design
- Final Definitive Design
  - Edit sections when possible
  - List sections to be developed after site selection
  - Partial edits to some sections to limit scope

# Sustainable Strategies

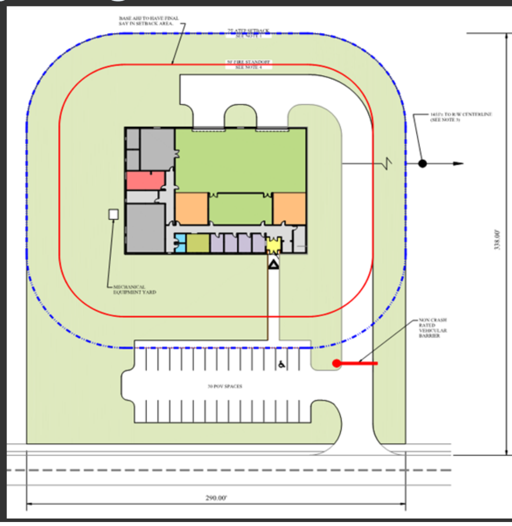
- Air Force LEED Checklist
- Register after site selection
- Owner's Project Requirements
- PV
  – Determine after site selection
- Solar water heating
  – Not likely to be LCCA for these types of facilities
- Lighting controls



# 2-Bay Flight Sim - General

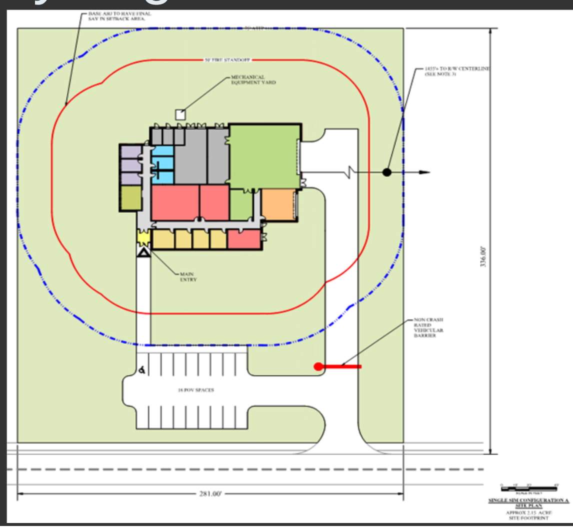
- Sim Bays
  – 50'x50'x50' clear, 2-ton bridge crane
  – BOT Bays 25'x25'x25' clear
- Sim Support Areas
  – Computer Room w/ raised floor (depressed slab)
  – Sim Mx / Parts
- Training Areas
  – Part Task Trainer (PTT)
  – Learning Center
  – Instructor Workstations
  – Briefing Rooms
  – Offices

# 2-Bay Flight Sim – Concept Site



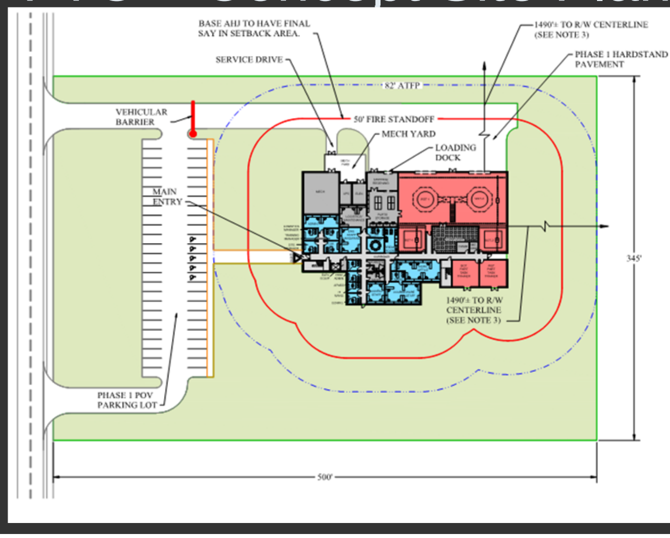

KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# 1-Bay Flight Sim – Concept Site



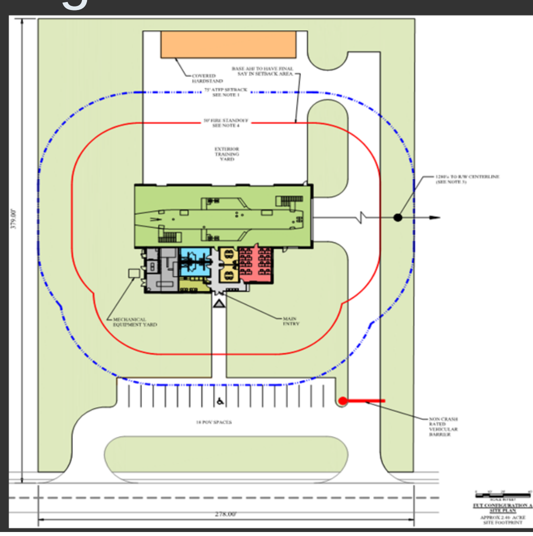
KC-46A Trainers
Design Kick-Off Meeting – 17 Jan 2013

# FTC – Concept Site Plan






# Fuselage Trainer – Concept Site



# Interiors - Finishes

- Interior finishes will be; durable, sustainable and easy to maintain
- Interior finish minimum level of quality to be established
- All interior finishes qualities will be compatible with any site selected
- Color themes will be developed with regional influences that are timeless and coordinated to Base standards

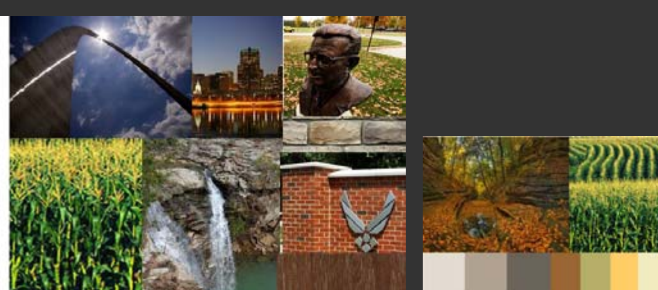


# Interiors – Color Themes examples

varied color schemes timeless in nature

Inspiration from nature and regional materials

- regional woods / stone
- Water
- Earth
- Sky
- Sunset



# Interiors – FF&E

- Space planning test fits validates spatial requirements
- FF&E placement plans verifies spatial orientation and interior architecture
- FF&E placement plans are coordinated to building systems, i.e. electrical and data locations



# 2-Bay Flight Sim – Interiors

- Interior design emphasis will be in the public spaces; lobby, corridor, break room
- Interior architectural elements transition with the interior finishes to create a functional, aesthetically pleasing environment
- Integrated signage provides information and supports wayfinding

# Action Items

- Utilize Action Items spreadsheet to track information
- Locate on AF project site for accessibility by AFCEC, AETC, AMC, USACE, design team

KC-46 Trainers - General Info

Needs List

Last Update: 16 January 2013

| Item No. | Action Item | Responsible Person | Date Initiated | Date Needed | Date Received | Comments |
|---|---|---|---|---|---|---|
| 1 | Specific requirements for WST, BOT and computer room power and communications. Contractor vs. Govt. responsibilities. | AMC/AETC | 1/3/2013 | 2/1/2013 | | |
| 2 | Consolidated or compartmentalized approach to security? Level of classifications for simulator bays, computer room, briefing rooms, instructor workstations, etc. Classified network requirements? | AMC/AETC | 1/3/2013 | 2/1/2013 | | |
| 3 | Special fire protection requirements for WST or BOT areas? | AMC/AETC | 1/3/2013 | 2/1/2013 | | |
| 4 | Need clarification on the expected actual Full time, student and visitor occupancy of the buildings. | AMC/AETC | 1/4/2013 | 2/1/2013 | 1/8/2013 | Email from Ed Breen confirmed BMcD assumptions.<br>WST - 6 occupants<br>BOT - 3 occupants<br>Three shifts with 2 pilots briefing, 2 flying, and 2 debriefing. Same goes for the BOOM... 1 operator briefing, 1 riding, and 1 debriefing. |
| 5 | Need hours of operations for each building. | AETC | 1/4/2013 | 2/1/2013 | | |
| 6 | Confirmation facilities will be regerstied with USGBC as past of Phase II | Mobile COE | 1/7/2013 | 1/17/2013 | 1/17/2013 | Confirmed per discussion with Phyllis. |
| 7 | 50'x50'x50' clear - can duct work encroach into this area? | AMC/AETC | 1/7/2013 | 1/17/2013 | 1/14/2013 | Email from Ed Breen - Simulator Facility: Define 50'x50'x50' clearance. Will this include HVAC/Lighting/ Columns & Bracing/ Bridge cranes? Same goes for 25' clearance for BOT.<br>ANSWER: The clearance figures provided must provide clearance from all obstructions to include the HVAC/Lighting/ Columns & Bracing/ Bridge cranes. |
| 8 | Any compressed air requirements? | AMC/AETC | 1/7/2013 | 2/1/2013 | | |

# KC-46A Trainers

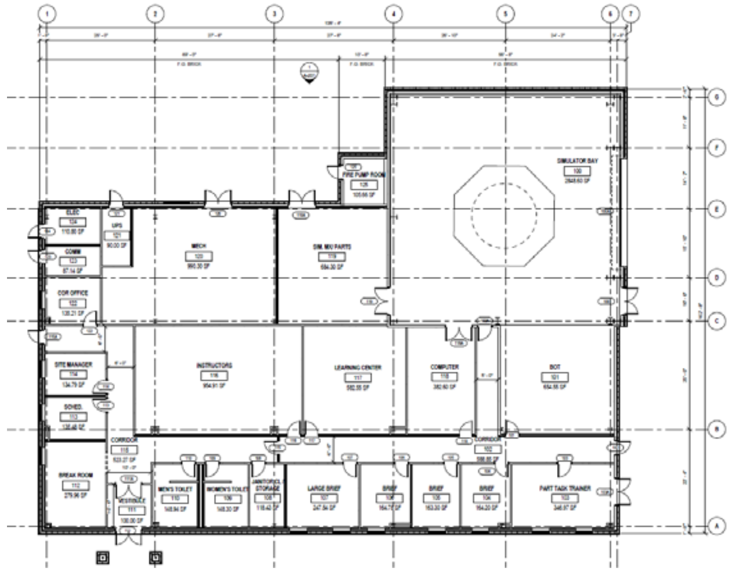
**Flight Simulators, Fuselage Trainer, and Flight Training Center**

**Architecture**



## 1BFS – Charrette Floor Plan

## 1BFS – New Floor Plan

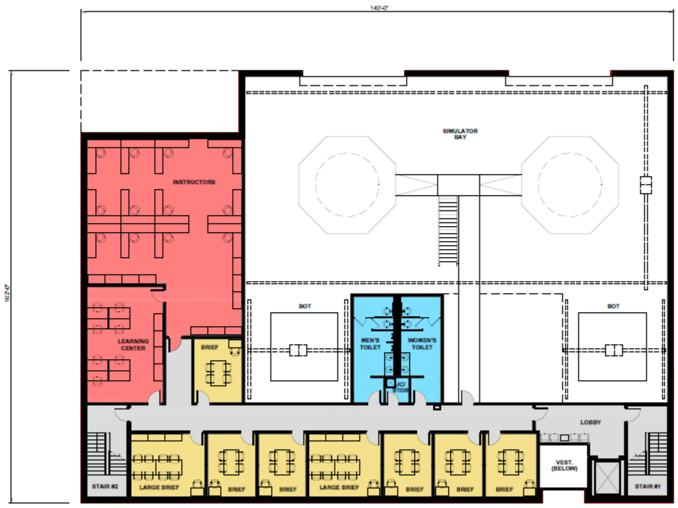


**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## 2BFS – Charrette Floor Plan – first floor


**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

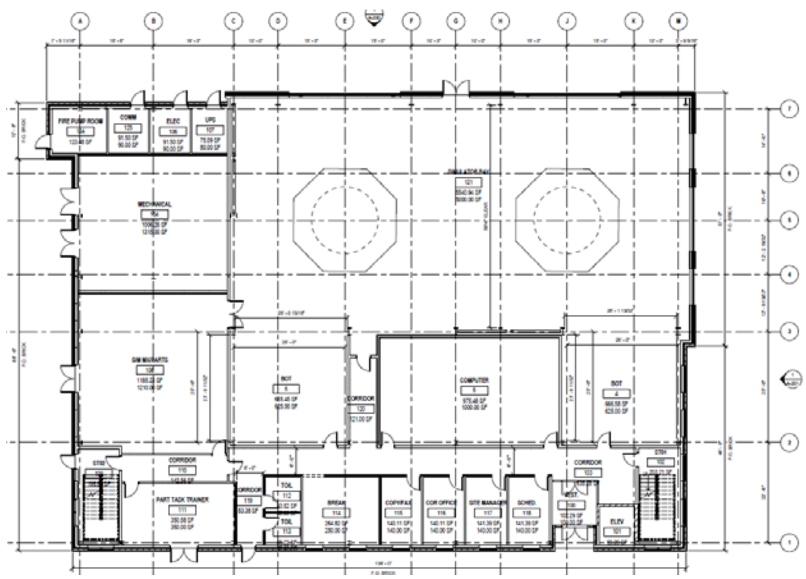
## 2BFS – Charrette Floor Plan – second floor




**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

Burns & McDonnell SINCE 1898

## 2BFS – New Floor Plan – first floor

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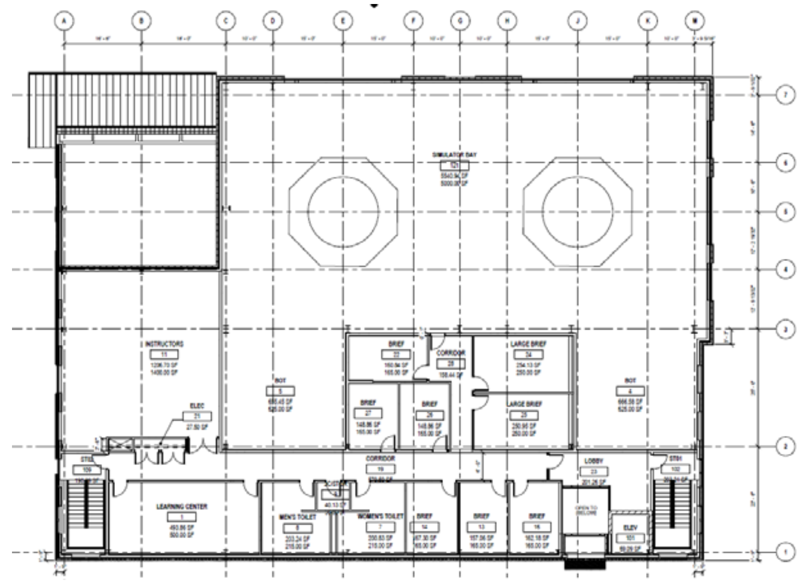
Burns & McDonnell SINCE 1898

## 2BFS – New Floor Plan – second floor



**KC-46A Trainers** : Architecture
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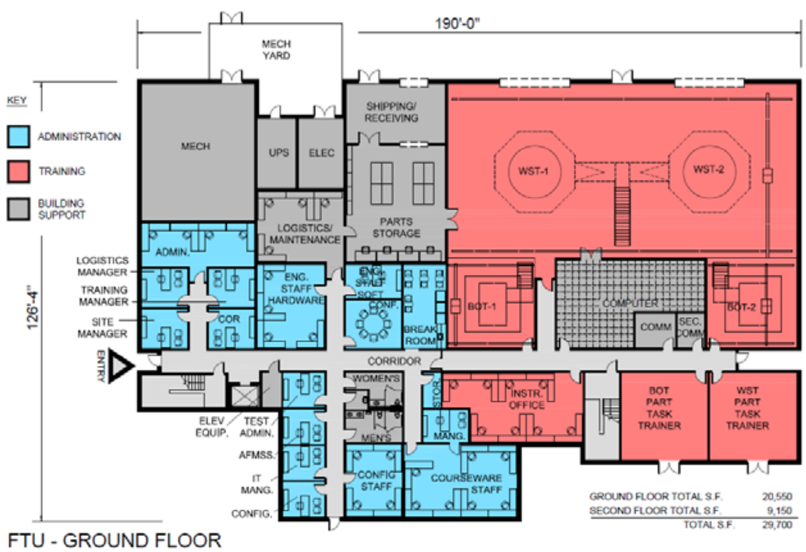
## FTC – Charrette Floor Plan – first level

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Design Kick-Off Meeting – 17 Jan 2013

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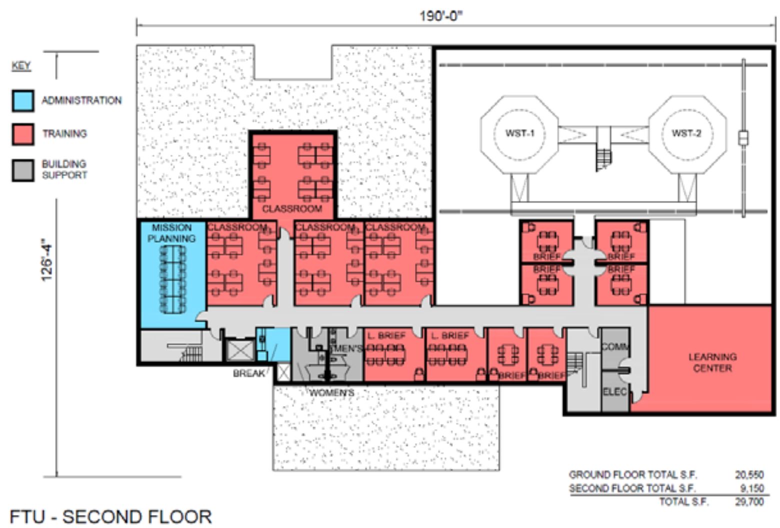
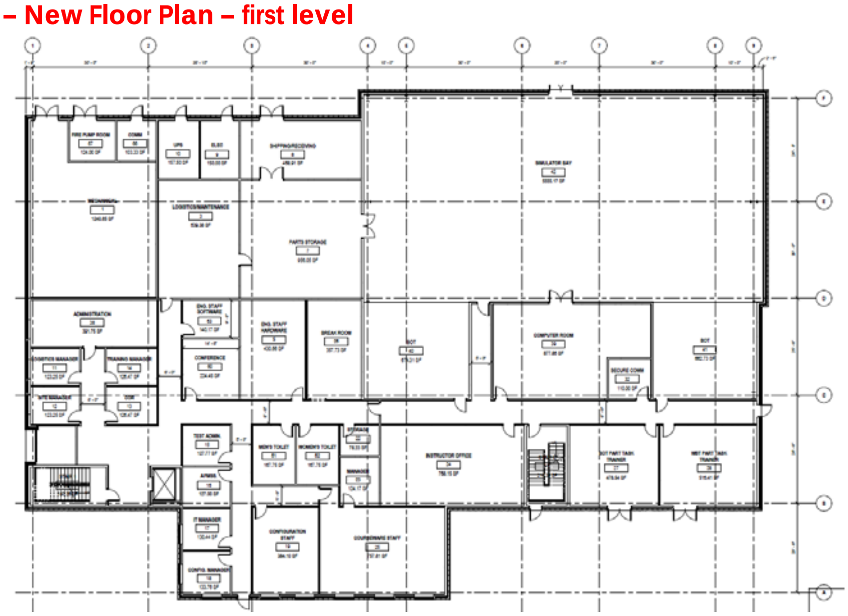
## FTC – Charrette Floor Plan – second level






## FTC – New Floor Plan – first level



**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

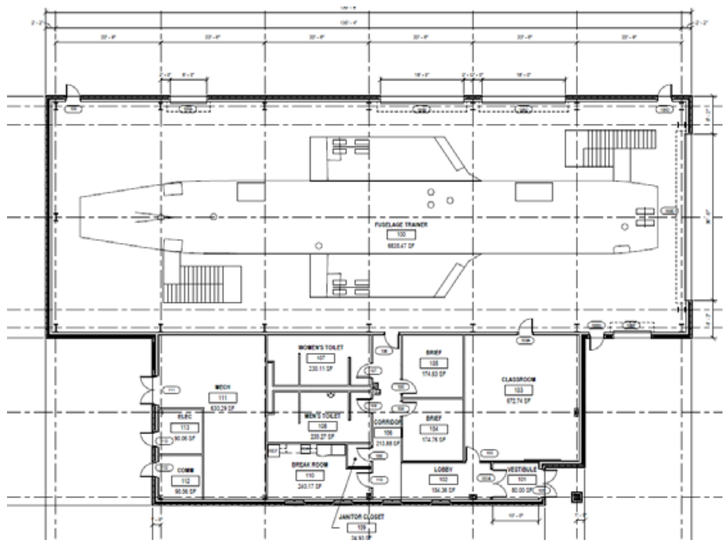
## FTC – New Floor Plan – second level

**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## FuT – Charrette Floor Plan


**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

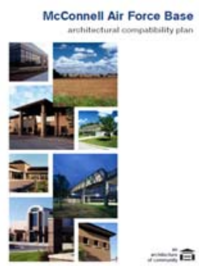
## FuT – New Floor Plan





## Architectural Compatibility Plan






- Style and form –
  - Rectangular elements massing with horizontal proportion
- Wall system –
  - Brick, Architectural precast, limited metal panel
- Roof system –
  - Standing seam metal roof with 3/12 slope. Combination of hip roof and gabled roof.

## Challenge - Potential Site location

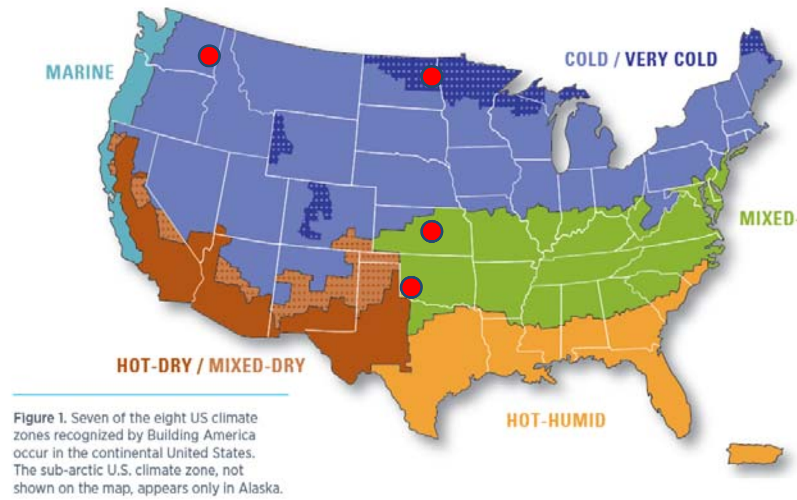
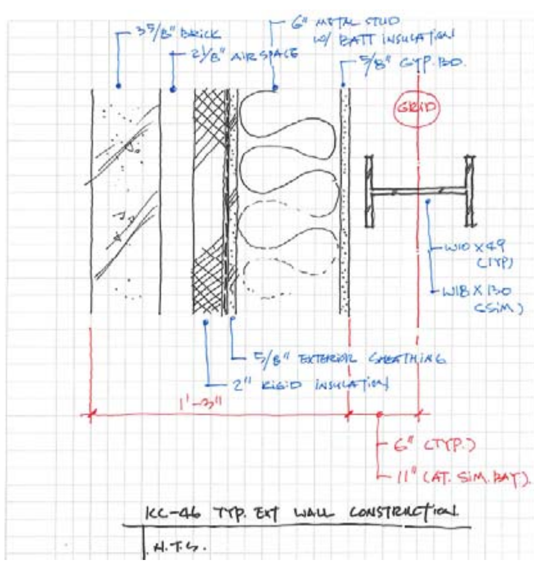



Figure 1. Seven of the eight US climate zones recognized by Building America occur in the continental United States. The sub-arctic U.S. climate zone, not shown on the map, appears only in Alaska.



## Exterior Wall Assembly




**KC-46A Trainers** : Architecture
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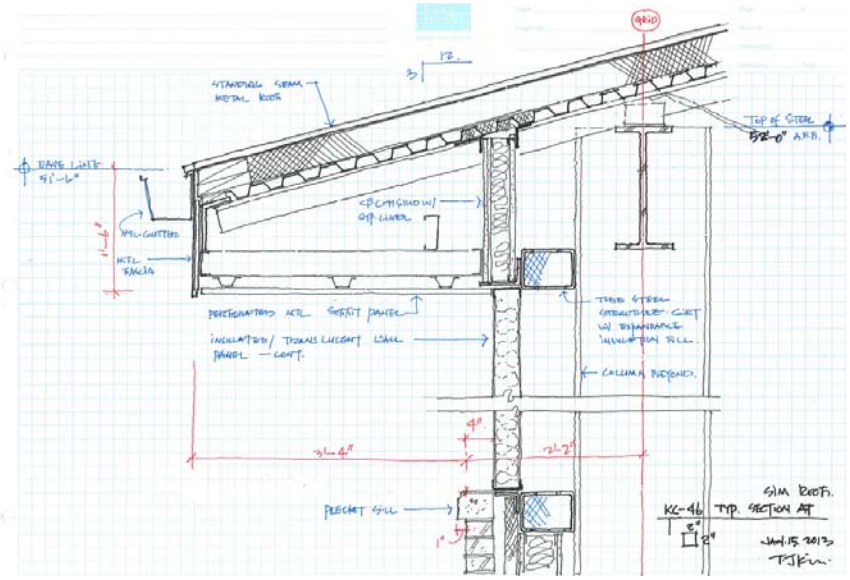
## Exterior Roof Assembly

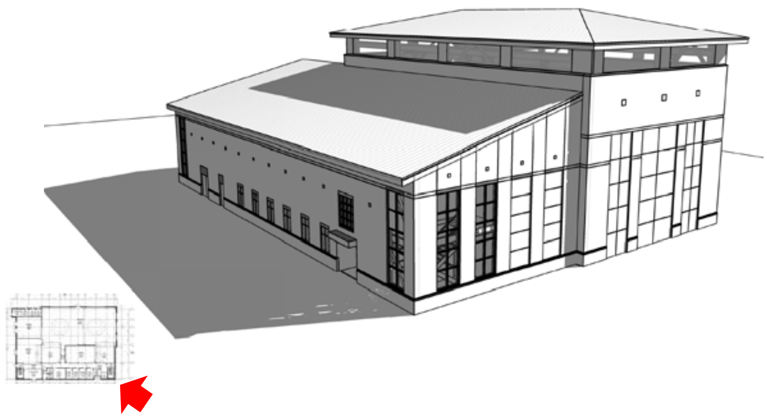





## Architectural Design Elements

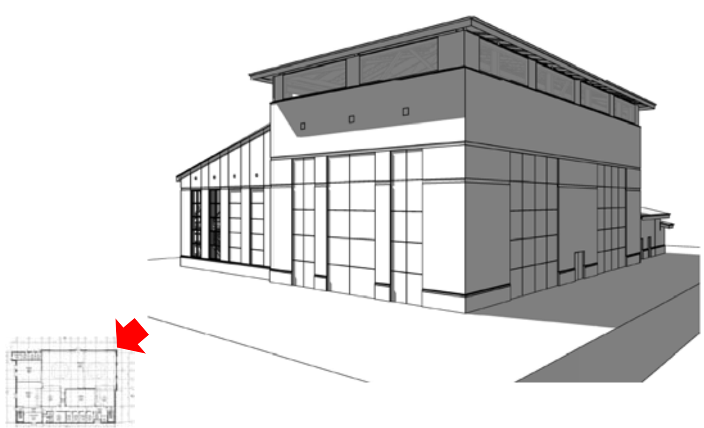
- Architectural precast concrete base
- Brick wall with soldier coursing horizontal band
- Precast medallion accent
- Precast inset panel
- Aluminum window system with precast/brick lintel
- Insulated/ translucent wall panel (kalwall) clearstory
- Standing seam metal roof with combination of hip and gabled roof
- Highlighted entry canopy
- Large window at stairwell

## Massing and elevation study – 2BFS



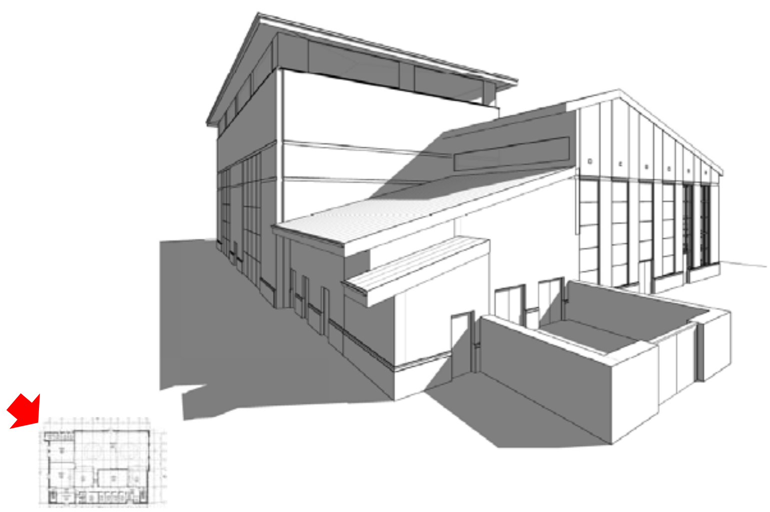
**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Massing and elevation study – 2BFS



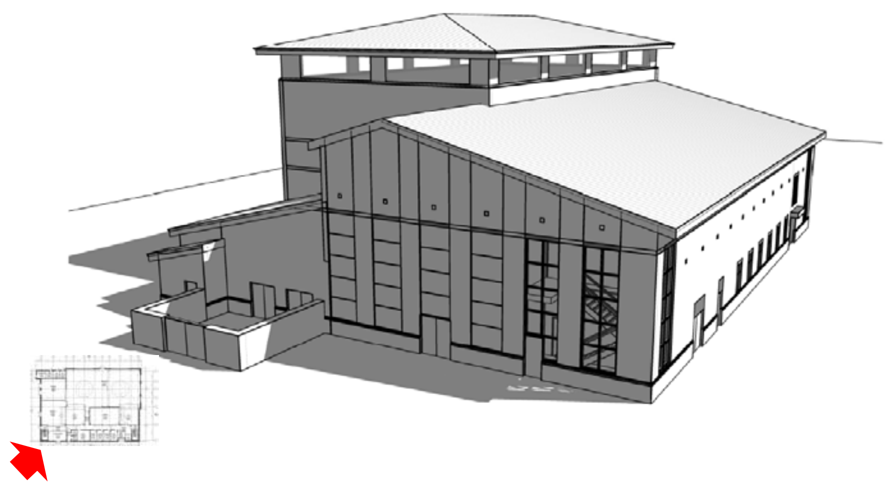
**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Massing and elevation study – 2BFS



**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Massing and elevation study – 2BFS



**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Concept rendering – 2-Bay Flight Sim

**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Concept rendering – 2-Bay Flight Sim

**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

## Concept rendering – 2-Bay Flight Sim

**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013


## Concept rendering – 2-Bay Flight Sim



**KC-46A Trainers** : Architecture
Design Kick-Off Meeting – 17 Jan 2013

# Appendix 7
# Review Comments

## STANDARDIZED COMMENT MATRIX PRIMER

The matrix below is a Word document table to be used as a template for submitting comments on draft publications, draft program directives, and draft documents. Except as noted below, an entry is required in each of the columns. To facilitate consolidating matrixes from various sources, ***do not adjust the column widths***.

### Column 1 – ITEM

Numeric order of comments. Accomplish when all comments from all sources are entered and sorted. To number the matrix rows, highlight this column only and then select the numbering ICON on the formatting tool bar.

### Column 2 - #

Used to track comments by source. Manually enter numbers from the first comment to the last comment. These numbers will stay with the comment and will not change when consolidated with other comments.

**NOTE:** For column 2 do not use the auto numbering feature or these numbers will change when matrices are merged.

### Column 3 – SOURCE

Insert office symbol/name/phone number.

### Column 4 – TYPE

C – Critical (Contentious issue that will cause non-concurrence with publication)
M – Major (Incorrect material that may cause non-concurrence with publication)
S – Substantive (Factually incorrect material)
A – Administrative (grammar, punctuation, style, etc.)

### Column 5 – PAGE

Page numbers expressed in decimal form using the following convention:
(Page I-2 = 1.02, Page IV-56 = 4.56, etc.) This format enables proper sorting of consolidated comments.

0 – General Comments
0.xx - Preface, TOC, Executive Summary (Page i = 0.01, Page xi = 0.11)
1.xx – Chapter I
2.xx – Chapter II
3.xx – Chapter III
x.xx – Chapter x, etc.
51.xx – Appendix A
52.xx – Appendix B
52.01.xx - Annex A to Appendix B
53.xx – Appendix C, etc.
99.xx – Glossary

**NOTE:** For Program Directives enter the page number as a whole number, (1, 2, 3, etc.) PDs are normally sorted by paragraph and line number and the page number helps to find the paragraph.

**NOTE:** Since joint publications (JPs) do not contain an appendix I, the number 59.00 will be skipped.

### Column 6 – PARA

Paragraph number that pertains to the comment expressed. (i.e. 4a, 6g, etc.)

**NOTE:** An entry in this column should be used when commenting on draft program directives. An entry is optional for comments on draft joint publications.

### Column 7 – LINE

Line number on the designated page that pertains to the comment, expressed in decimal form (i.e., line 1=1, lines 4-5 = 4.5, lines 45-67 = 45.67, etc.) For figures where there is no line number, use "F" with the figure number expressed in decimal form (i.e. figure II-2 as line number F2.02). For appendices, use the "F" and the appendix letter with the figure number (i.e appendix D, figure 13 as line number FD.13; appendix C, annex A, figure 7 as line number FCA.07)

### Column 8 – COMMENT

Provide comments using line-in-line-out format according to JSM 5711.01A, *Joint Staff Correspondence Preparation* (Examples are provided in CJCSI 5120.02, Joint Doctrine Development System. To facilitate adjudication of comments, copy and insert complete sentences into the matrix. This makes it unnecessary to refer back to the publication to understand the rationale for the change. Do not use Tools, Track Changes mode to edit the comments in the matrix. Include deleted material in the comment in the strike through mode. Add material in the comment with underlining. Do not combine separate comments into one long comment in the matrix, (i.e. 5 comments rolled up into one).

### Column 9 - RATIONALE

Provide concise, objective explanation of the rationale for the comment.

### Column 10 - DECISION

A - Accept
R – Reject (Rationale required for rejection.)
M - Accept with modification (Rationale required for modification.)

**NOTE:** <u>This column is for OPR use only</u>. No rationale required for accepted items. Rationale for rejection is placed in the rationale comment box and highlighted for clarity. For modifications, the complete modified language will be placed (and annotated) as the bottom entry for that item in the "Comments" column and the rationale for the modification placed in the rationale comment box and highlighted for clarity.

### TIPS AND TRICKS OF THE TRADE

**Headers and Footers**

1. Publication name
2. Classification (Unclassified/Secret/ etc.)
3. Column headings
4. Filename (insert from header/footer drop down menu)
5. As of "date" (insert from header/footer drop down menu—manually enter date when finalized for tracking purposes)
6. Page X of Y (insert from header/footer drop down menu—manually enter last page number for Y when finalized—tracks total # of pages and does not default back to actual page #)

**Combining Matrixes**

1. Select all and correct for font and font size (Times New Roman, #10).
2. Copy one entire matrix and paste it a few lines below the last row of another matrix.
3. Adjust column widths as necessary to match one matrix with the other (use the column headings in the document header as a guide).
4. Merge the matrices into one by deleting the lines between the two.

**Item (row) numbering (automatic numbering)**

1. Highlight column number 1 from top to bottom.
2. Delete the existing number and then renumber by selecting automatic line numbering on the formatting tool bar.

**Sorting**

1. Select: "Table" on top menu toolbar.
2. Select: "Sort."
3. Select: "Sort by, Column 5 (Page column), Number, Ascending."
4. Select: "Then by, Column 7 (Line column), Number, Ascending."
5. Select: "Then by, Column 4 (Type column), Text, Descending."

| ITEM # | SOURCE | TYPE | PAGE | PARA | LINE | COMMENT | RATIONALE | DECISION (A/R/M) |
|---|---|---|---|---|---|---|---|---|
| 1 | AMC/A3TK Ed Breen D779-3584 | S | A-101 | | | Placement of the catwalk and stairs should imitate the placement used in the 2-Bay facility. **BMcD Response:** Concur, will provide catwalk and stairs similar to those discussed for 2-Bay flight sim facility. | Entry to WSTs is at the back of the device (south end). | |
| 2 | AMC/A3TK Ed Breen D779-3584 | S | A-301 | | | Is there a mezzanine for parts storage in room 124? **BMcD Response:** Currently there is no space for a mezzanine in this area due to large amount of ductwork overhead. Other options were discussed to provide more storage and ultimately the wall separating Parts Storage 124 and Shipping/Receiving 125 was removed. High density storage units can be specified to the height available within the space. Additional parts storage areas may be needed to support future expansion with the planned growth for additional WSTs and BOTs and can be incorporated into those expansion plans at that time based on requirement. | Number of aircrew training devices in the FTC will result in a large parts storage area . | |
| 3 | AMC/A3TK Ed Breen D779-3584 | S | A-701 | | | Door for room 139 opens into the door from room 144 into room 139. Recommend removing the door from the hallway (143) into room 139. **BMcD Response:** Concur, door from Corridor (143) to Conf. Manager (139) has been deleted. | Traffic flow | |
| 4 | AMC/A3TK Ed Breen D779-3584 | S | A-701 | | | Add a computer workstation in conference room (137) as well as 2 large flat panel monitor mounts on east wall. **BMcD Response:** Two flat screens and a desk have been added in Conference Room (137). | Need computer workstation for driving presentations. | |
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Public / SBU / FOUO

Comment Report: All Comments
Project: KC-46A Fuselage Trainer and Flight Simulator Facilities
Review: DRAFT Submittal - FLIGHT TRAINING CENTER
Displaying 48 comments for the criteria specified in this report.

| Id | Discipline | DocType | Spec | Sheet | Detail |
|---|---|---|---|---|---|
| 5064196 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-2 item 2.d)

Systems should begin with the current ASHRAE 90.1 baseline prescriptive system and improve energy performance based on LCCA results. The systems must meet the energy efficieny baselines as a minimum. It appears that the current paragraph allows the designer to go purely LCCA - which will produce very cheap systems. Please tighten up this language.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Some of these requirements are addressed in item 2.b, will add some further description to item 2.b and will add into item 2.d that the systems must comply with the energy performance and ASHRAE requirements.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| Id | Discipline | DocType | Spec | Sheet | Detail |
|---|---|---|---|---|---|
| 5064197 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-2 item 3(a))

Suggest adding 1%WB to verbiage or other language to cover humidity considerations (as appropriate).

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will add the 1% WB to item 3(a) as suggested.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| Id | Discipline | DocType | Spec | Sheet | Detail |
|---|---|---|---|---|---|
| 5064199 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-2 item 3(b))

State whether humidification is required to achieve humidity range specified.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Humidification may be required for areas where the simulator equipment will be located only. Will add to design analysis.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5064201 Mechanical Design Analysis n/a n/a n/a
Comment Classification: **Public (Public)**
(Document Reference: pg IX-3 item 3(b))

Shop and Support Areas show 65-80 cooling range. Is the designer responsible for designing the shop to be capable of cooling to 65 on a design cooling day? Please clarify requirement.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
This item will be corrected to indicate 75 degrees to match the Office areas.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5064205 Mechanical Design Analysis n/a n/a n/a
Comment Classification: **Public (Public)**
(Document Reference: pg IX-3 item 3(c))

Verify whether designers are required to meet ASHRAE 62 requirements (critical space calc's, etc.). Currently, you give fixed vent rates for items, but have only referenced the minimum area vent requirement in ASHRAE 62 - which could be misleading if ASHRAE 62 will be required in it's entirety. Note that this is revised/modified by 5(g), pg IX-4 where you require application of ASHRAE 62 for each space. Suggest you re-organize to get all of the vent considerations in one place.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will correct language of Item 3(c) to read 'exhaust air rate' instead of 'ventilation air rate' to avoid confusion. Item 3(d) will be further clarified to follow ASHRAE 62.1. The area and person rate shown will be identified as that used during the preparation of the definitive design.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064207 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-4 item 5(d,e,etc))

Suggest rewording defitive design descriptions from 'will be provided by...' to 'defitive design is based on...' This will be converted to a design-build contract document and we need to make sure the verbiage clearly indicates which items we want the designer to come up with versus which items we want to nail down.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Have further edited these items to remove 'will' statements.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064209 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-4)

Verify that airside heat recovery requirements are incorporated as dictated by applicable criteria.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Have incorporated airside heat recovery in parts 2(d), 5(g)1, and also 6(d).

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064213 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-6)

Consider whether your freeze protection for mech/fire pump rooms should be from the central heating system or not. You may want to let the designer determine this due to the propensity for certain installations to "declare seasons" based on energy consumption rather than need. Just a suggestion.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Paragraph revised to state 'Heat service rooms with unit heaters.' This will let the designer determine type of heater based on how each base utilizes heating seasons.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064217 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: pg IX-8-9)

Public law concerning 30% solar is as follows "if lifecycle cost-effective, as compared to other reasonably available technologies, not less than 30 percent of the hot water demand for each new Federal building or Federal building undergoing a major renovation be met through the installation and use of solar hot water heaters." You should require the design/build contractor to compare heat pump water heating, and waste heat recovery, as well has the gas and electric common alternatives.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Have rewritten the life cycle cost description to incorporate the suggested alternatives. This is now located in 2(b) of the plumbing section.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064221 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: General)

I couldn't find the requirements for the emergency air shutdown and low leakage ventilation dampers. Please verify the ATFP requirements have been addressed.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

These were identified in section IX part 7. Further clarification for the low leakage dampers and the shut-off switch locations will be added.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064222 | Mechanical | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

(Document Reference: General)

**Coordinating Discipline(s)**: Architectural

It appears that the air barrier spec has been included in your outline, however, only casually mentioned in the wall description "air/water barrier...". Please clarify the intent. Specify whether or not the building will be tested for leakage, or merely have an air barrier installed as part of the overall construction.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Air barrier test will be required and specified in section 070827.0010.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064286 | Mechanical | Plans and Specs | n/a | M-101 | n/a |

Comment Classification: **Public (Public)**

Plan shows mech room conditioned by computer room unit. Please verify.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Mechanical room will be ventilated, not cooled. Drawing plans updated to remove any computer room units in the mechanical rooms.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064355 | Mechanical | Plans and Specs | n/a | M-101 | n/a |

Comment Classification: **Public (Public)**

If the heating water and cooling water systems are to have glycol, you need to require packaged glycol/water solution feed units such as the GMU 30 or GMU60 by Bell&Gossett. Accordingly, you must have some floor space to put them, so your conceptual layout should include these pieces of equipment. Shot feeders are of little value in glycol systems - suggest you eliminate (appears to be what you have beside one of te boilers).

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Will incorporate.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064369 | Mechanical | Plans and Specs | n/a | M-101 & M-102 | n/a |

Comment Classification: **Public (Public)**

Note that fresh air intakes must be at least 10 feet above finished grade due to ATFP requirements. Please verify that your floor plan can accommodate this.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Yes, next submittal will show these at the required height.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064548 | Mechanical | Plans and Specs | n/a | M-101, P-102 | n/a |

Comment Classification: **Public (Public)**

If you spec condensing boilers, add requirement for acid neutralizers in boiler condensate drains.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Will add to note on the hot water boiler schedule. Selection of type of boiler will be done by designer of record.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| | | | | | |
|---|---|---|---|---|---|
| 5064555 | Plumbing | Plans and Specs | n/a | P-102 | n/a |

Comment Classification: **Public (Public)**

Suggest identifying wall hydrants as freeze-proof type to avoid confusion during bidding.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Have identified wall hydrants as freeze-proof in specification 220000.

Submitted By: Thomas Karre (816-333-9400) Submitted On: Mar 18 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| | | | | | |
|---|---|---|---|---|---|
| 5064725 | Fire Protection/Life Safety | Plans and Specs | n/a | FP-101 | n/a |

Comment Classification: **Public (Public)**

General note 1 refers to drawing FP-000 which doesn't appear in the package. Please check.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Concur. Will revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| | | | | | |
|---|---|---|---|---|---|
| 5064747 | Structural | Plans | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

Check that all notes with component descriptions are called out on plans. also check current note callouts corresponds with the appropriate note.

Submitted By: Brent McGuire (251-690-2701). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Have revised and checked all component descriptions are called out on plans and current note callouts correspond with the appropriate note.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

| | | | | | |
|---|---|---|---|---|---|
| 5064748 | Structural | Plans | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

typical details are not sufficient for an adequate description of wall & roof types/ building components. draw section cuts corresponding to building envelope and place callouts to adequately represent wall and framing system

Submitted By: Brent McGuire (251-690-2701). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Will add some structural sections to adequately represent typical wall and framing systems.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064749 | Structural | Plans | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

coordinate with Architect on elevations and dimensions. it does not appear Architectural drawings are developed well enough to conclude bearing elevations, slab depressions an finish floor heights as called out on structural plans.

Submitted By: Brent McGuire (251-690-2701). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Will coordinate with architect.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5064766 | Fire Protection/Life Safety | Plans and Specs | n/a | FP-101 | n/a |

Comment Classification: **Public (Public)**

Simulators show Light Hazard on drawings (no hatch). However, DA, pg XVII-9 shows Extra Hazard Group II. Please coordinate.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**

Concur. Will coordinate and revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

*Backcheck not conducted*

Current Comment Status: **Comment Open**

5064784 Fire Protection/Life Safety Plans and Specs n/a FP--001 n/a
Comment Classification: **Public (Public)**

Symbol legend shows "existing foam fire department..." Please check and correct.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Concur. Will review and revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5064821 Fire Protection/Life Safety Plans and Specs n/a FP--001 n/a
Comment Classification: **Public (Public)**

Wet riser line is labeled "TO WEST SYSTEM". Please clarify.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Concur. Will clarify.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5064833 Fire Protection/Life Safety Plans and Specs n/a FP--001 n/a
Comment Classification: **Public (Public)**

It appears that you have a shutoff valve between your FDC and sprinkler system. Please verify that this is NOT a code violation.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Valve will be removed.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5064841 Fire Protection/Life Safety Plans and Specs n/a FP--001 n/a

Comment Classification: **Public (Public)**

Verify connection point of FDC to wet system riser.

Submitted By: Jim Tamblyn (251-694-4071). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5065270 Communications Plans n/a T-101 n/a

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Ensure all areas are labeled across all disciplines. (i.e. sheet T-101 rooms 137, 141, 112, 111, 108, 101, etc)

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Concur. Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5065272 Communications Plans n/a T-101 n/a

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Recommend providing comm outlets in room 137.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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5065275 Communications Plans n/a T-101 n/a

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Room 141 is missing comm outlet on north wall.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065282 | Communications | Plans | n/a | T-103 & T-104 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Recommend Keyed Note 1 indicate conduit is to include pull string.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065292 | Communications | Plans | n/a | T-701 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

The Communication Drops table incorrectly list the following: Room 112 - Comm Room, Room 135 - Computer Room, Room 215 Comm Room.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065300 | Communications | Plans | n/a | T-701 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Indicate room numbers for COMM 1, COMM 2, and COMPUTER 1.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065303 | Electrical | Plans | n/a | E-101 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Provide power for the refrigerator, microwave, and dishwasher in room 102 Break.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065310 | Electrical | Plans | n/a | E-101 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Clarify the purpose of the Combo Motor Starter/Disconnect with surface Jbox in Room 101 Lobby.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
The combination starter will be deleted. The elevator control panel for the machine-room-less elevator will be located in the second floor lobby.

Submitted By: Casey Sanborn ((816) 822-3905) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065312 | Electrical | Plans | n/a | E-101 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Recommend to provide power for the rack in room 100 Comm. The current rack location appears to conflict with the door swing.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will review and revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065313 | Electrical | Plans | n/a | E-101 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Recommend providing power in room 116 UPS.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065320 | Electrical | Plans | n/a | E-103 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Room 203 Toilet, recommend relocating power to sink area.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will review and revise.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065323 | Electrical | Plans | n/a | E-103 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Room 202 Toilet, recommend relocating power to sink area.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will review.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065347 | Electrical | Plans | n/a | E-103 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Room 200 Break , recommend providing power adjacent to CATV drop.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065351 | Electrical | Plans | n/a | E-104 | n/a |

Comment Classification: **Public (Public)**
(Document Reference: FTC Drawings)

Room 213 Elec, recommend providing power for maintenance purposes.

Submitted By: David Koch (210-395-8467). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will comply.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065502 | Electrical | Plans and Specs | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: E-701)

Why are there two small 208/120 transformers instead of a single larger transformer?

Submitted By: Greg Hall (251-694-4062). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will consider a single transformer.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065508 | Electrical | Plans and Specs | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: E-102)

There are no receptacles shown on south wall of room 133.

Submitted By: Greg Hall (251-694-4062). Submitted On: Mar 04 2013

**1-0** Evaluation **Concurred**
Will add.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5065513 | Electrical | Plans and Specs | n/a | n/a | n/a |

Comment Classification: **Public (Public)**
(Document Reference: ALL)

Is the designated firepump room designed to accomedate electric or diesel/electric operated pumps?

Submitted By: Greg Hall (251-694-4062). Submitted On: Mar 04 2013

**1-0** Evaluation **For Information Only**
Unknown at this time. Will be determine once site is selected.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013
*Backcheck not conducted*
Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5066534 | General | Other | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

A3T Comments for the Flight Training Center (Attached)

(Attachment: Flight_Training_Center_A3T_comments_-_CM.docx)

Submitted By: Courtney Perry (2514415118). Submitted On: Mar 05 2013

**1-0** Evaluation **For Information Only**
Concured to all but one. See clarification below (or attached):
Comment: Design needs to allow for adding more WST and BOT bays to the facility, Current roof design (D5) for the high bay area does not appear to account for later "add ons".
BMCD: Hip roof is key design element of high bay. Also lower flat roof with expansion joint is recommended for future expansion to minimize possible roof leak and maintenance issue.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 25 2013
(Attachment: Flight_Training_Center_A3T_comments_-_CM1.docx)

*Backcheck not conducted*

Current Comment Status: **Comment Open**

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| | | | | | |
|---|---|---|---|---|---|
| 5066556 | LEED | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

General – Add ASHRAE 189.1 to each chapter as a Design Reference requirement.

Submitted By: Ron Brannon (251.694.4095). Submitted On: Mar 05 2013

**1-0** Evaluation **Concurred**
Will add in next submittal - applicable chapters include Ch.3 Site Development, Ch. 4 Landscape, Ch. 7 Architectural, Ch. 9 Mechanical,
Ch. 10 Electrical and Ch. 13 Sustainable Design. Will also include UFC
1-200-02 (1 March 2013).

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

**1-1** Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ron Brannon (251.694.4095) Submitted On: Apr 02 2013

Current Comment Status: **Comment Closed**

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| | | | | | |
|---|---|---|---|---|---|
| 5066557 | LEED | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

General – In Design References or Applicable Publications correct the designation for the LEED Reference Guide in all locations to read "LEED Reference Guide for Green Building Design and Construction, 2009 Edition".

Submitted By: Ron Brannon (251.694.4095). Submitted On: Mar 05 2013

**1-0** Evaluation **Concurred**
Will revise list of references as indicated.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

**1-1** Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ron Brannon (251.694.4095) Submitted On: Apr 02 2013
Current Comment Status: **Comment Closed**

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| | | | | | |
|---|---|---|---|---|---|
| 5066558 | LEED | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

General – Confirm the requirement for not going through the formal process of submitting all documentation to GBCI for Silver certification. the bid option for LEED Certification. Four projects do not require the option and five projects do.

Submitted By: Ron Brannon (251.694.4095). Submitted On: Mar 05 2013

**1-0** Evaluation **For Information Only**
Comment not applicable to training facilities. Training facilities will go thru certification process.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

**1-1** Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ron Brannon (251.694.4095) Submitted On: Apr 02 2013
Current Comment Status: **Comment Closed**

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| | | | | | |
|---|---|---|---|---|---|
| 5066559 | LEED | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

General – provide task lighting with workstations, where applicable, to provide controllability of lighting (LEED Credit IEQ Controllability of Systems, Lighting).

Submitted By: Ron Brannon (251.694.4095). Submitted On: Mar 05 2013

**1-0** Evaluation **Concurred**
Design Analysis will be updated to include task lighting with workstations (per IEQ Credit 6.1).

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

**1-1** Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ron Brannon (251.694.4095) Submitted On: Apr 02 2013

Current Comment Status: **Comment Closed**

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| | | | | | |
|---|---|---|---|---|---|
| 5066560 | LEED | Design Analysis | n/a | n/a | n/a |

Comment Classification: **Public (Public)**

Chapter XIII-1, b. 3 add: upon the LEED Online project registration that Mobile District Sustainable Design and Development point of contact shall be assigned to the LEED Online project with a role of Corps of Engineers Representative Project with a Authorization level of Project Team Manager.

Submitted By: Ron Brannon (251.694.4095). Submitted On: Mar 05 2013

**1-0** Evaluation **Concurred**
Will include for next submittal.

Submitted By: Andy Mashek (816-349-6707) Submitted On: Mar 19 2013

**1-1** Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ron Brannon (251.694.4095) Submitted On: Apr 02 2013

Current Comment Status: **Comment Closed**

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# *Appendix 8*
# *Demarcation Matrix*

# BMcD KC-46A TRAINERS DEMACATION MATRIX

**KC-46A SIMs, FuT, & FTC**

BMcD PROJECT NUMBER = 71170, 71375, 71376, 71382
DATE: 16-Apr-2013

| ITEM # | DISCIPLINE | COORDINATION ITEM DESCRIPTION | DEFINITIVE DESIGN RESPONSIBILITY | SYSTEM CTR RESPONSIBILITY | REMARKS |
|---|---|---|---|---|---|
| 1 | FP | Sprinklers Inside and Under FuT Device | Bldg CTR provides valve for FuT CTR final connection. | FUT CTR provides sprinklers IAW UFC 3-600-01 for spacing and design pressure and makes final connection to a valve provided by building CTR in the FUT bay for this purpose | If building provides, CTR coordination required with regards to pipe location and hanging on the device. |
| 2 | FP | Sprinklers under the access stairs in FUT | Building CTR responsibility | Building CTR responsibility | Coordination required if stairs are not installed with building consturction. |
| 3 | FP | Fire alarm inputs and output for sims. | One FA output from sim to be picked up for all sims FA devices. Two input to sim from FA for notification appliances in sim and EPO to sim. | Sims CTR to coordination wiring and programming of FA after connections are made | Coordination required for proper number and types of inputs/outputs based on sim final design. |
| 4 | FP | Fire alarm devices in sims and FUT | FA detection and notification devices are provided by system CTR. | Provide detection in sims per AFI 91-203. Provide notification appliances in sim and FUT per AFI 91-203 and UFC 3-600-01. | AFI 91-203 requires at least detection in the sim, a fire alarm station and an EPO switch in the sim. AFI 91-203 requires notification appliances to be triggered off FA system . AFI 91-203 requires sim EPO on building suppression operation. FUT requires notification appliances in the trainer. |
| 5 | FP | Are BOT's designed and operate the same as the sim | Assumes BOT and sim is the same for FP purposes. | Design BOT to sim requirements | |
| 6 | Civil | Fuselage pavement offloading area (FuT). | Assume FuT will be delivered in multiple pieces on semi truck. Size is unknown at the time of dfinitive design. Offloaded using K-loader forklifts and maneuvered inside the facility. | Coordinate the pavement dimensions based on unloading of FuT and delivering into the facility. | Currently the pavement offloading area plan west of the facility is approximately 60' x 58'. Depending on the means and methods, surrounding roadway layout of site, and FuT pieces and sizes, offloading pavement size area may need to be revised. |
| 7 | Elec | Power to computer room, WST's and BOT's. | Provide feeder from terminal box on load side of each UPS to disconnect in computer room. | Provide UPS's and feeders from main distribution panel to UPS's and to terminal boxes on load side of UPS's. Provide feeder from each disconnect in the computer room to the associated system panelboard. Provide panelboard and all branch circuits to associated computer room and sim bay components. | Assumptions were made on the simulator loads. The CTR will need to coordinate the final power requirements for the simulators, computer room equipment and any integral air conditioning equipment with the definitive design. |
| | Elec | Power to fuselage. | Provide power feeder to disconnect on wall at front end of fuselage. | Confirm power feeder meets fuselage requirements and provide connection from disconnect to panelboard provided with fuselage. | Assumptions were made on the fuselage load. The CTR will need to coordinate the final power requirements for the fuselage with the definitive design. |
| 8 | Elec/Comm | Communications to computer room, WST's and BOT's. | Provide pathways and fiber optic cabling from communications rooms to computer room and trenches to simulator devices. | Confirm whether cabling assumptions are correct and provide equipment rack, patch panels and horizontal cabling as required to support the simulator systems. | |

| | | | | | |
|---|---|---|---|---|---|
| 9 | Elec/Comm | Grounding for computer room, WST's and BOT's. | Provide a single-point ground system which interconnects ground buses and raised floor in the computer room and simulator bays. | Confirm whether the ground system configuration assumptions are correct and provide ground connections from the computer room and simulator equipment to the ground system. | |
| 10 | Elec | Lighting in simulator bays | Wall-mounted, aimable, fluorescent lighting is provided in the WST and BOT bays to light the floor and stair/walkway areas as well as the tops of the WST's and BOT's. | Confirm the lighting provided will be adequate for the simulator systems and fuselage. Provide lighting for the fuselage interior with the fuselage. | |
| 11 | Mech | Simulator equipment cooling connections. | Assume designer of record to coordinate chilled water connections to any simulator equipment. | CTR to provide chilled water piping and connections to equipment as necessary. | Coordination of loads, connection points, sizes, etc. |
| 12 | Mech | FuT Fuselage air conditioning connection. | HVAC duct shown for connection to Fuselage. | CTR to provide ductwork, connection will be by the Fuselage equipment installer. | Coordination of loads, connection points, sizes, etc. |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |