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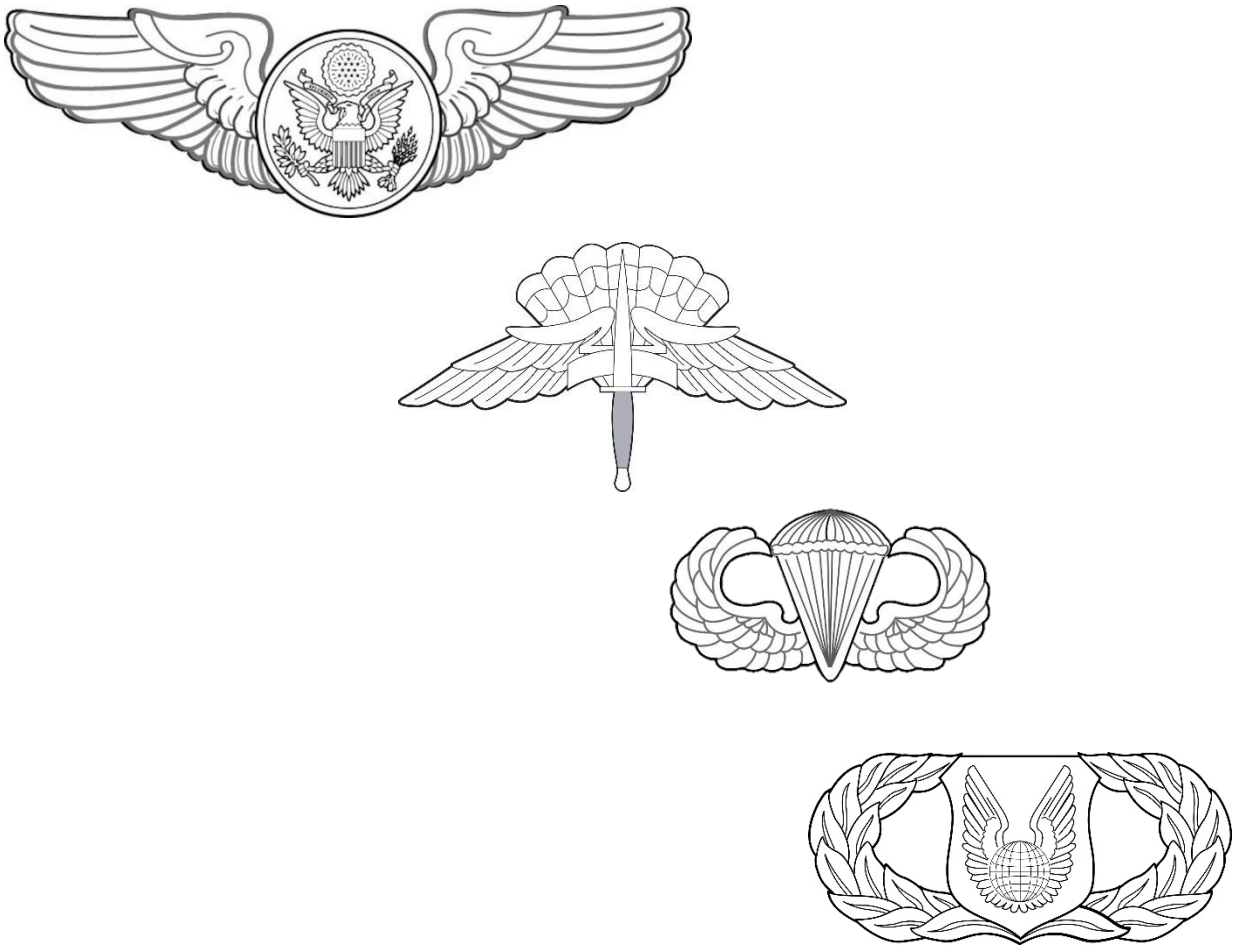
AFSC 1H0X1
AEROSPACE PHYSIOLOGY

AIRCREW TRAINER FUNDAMENTALS



QUALIFICATION TRAINING PACKAGE
(QTP)

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AEROSPACE PHYSIOLOGY

AFSC 1H0X1

QUALIFICATION TRAINING PACKAGE

Every year, Aerospace Physiology instructors spend thousands of hours in teaching environments across the globe educating AF aircrew on known human factor threats to their effectiveness and safety. The educational method used in this effort is for instructors to explain the physiological and/or anatomical causes of the threat. The educational effort is based on the threat, how to prevent it from occurring, and how to correct and recover if preventive efforts fail. This QTP is designed to strengthen understanding of the causes and countermeasures of human factor issues in AF aviation.

FORWARD

The Aerospace Physiology career field and the capabilities our Airmen bring to the fight are necessary to accomplish the Air Force mission to fly, fight and win. As, the Air Force's demand signal continues to escalate, our career field's ability to educate and prepare aircrew and parachutists to engage the enemy must remain second to none. To that end, leaders at all levels must recognize that an educated, informed, and qualified force is critical to the National Security and Military Strategy. Thus, this QTP introduces the *Aircrew Trainer Fundamentals* that will move the Aerospace Physiology training program into the 21st Century. The 1H0X1 Career Field Education Training Plan (CFETP) and this QTP enhance readiness, operational performance, and set the foundation for critical aircrew training, and mishap prevention efforts.

The persistence of our Airmen to solve complex problems is imperative to winning against those who challenge our way of life. Together with our officer counterparts, the *Aircrew Trainer Fundamentals* paradigm melds our talents to produce a team and an organization that is focused on mishap prevention and hazard mitigation. Like any other program, the AP training program levies its success on the effort and collaboration of Flight Leadership. It's incumbent upon Flight Commanders, Flight Chiefs, On-the-Job Training Managers, and supervisors to be actively engaged in ensuring appropriate Master Training Plans are developed, Master Task listings are designed, and an effective Upgrade Training Plan is implemented. While the trainee's role in the upgrade training process is vital, active leadership must never be absent.

The importance of active leadership engagement in any training program cannot be overstated. Leaders cannot afford to mismanage their resources and particularly their human capital. Leader's mentor, coach, train, and play a fundamental role in the Force Development ecosystem to develop their replacements. I have no doubt each of you is ready, willing, and able to accept the challenge. Employing the concepts of this QTP, along with an effective On-the-Job-Training program will ready the enterprise and give our Air Force the Aerospace Physiology Technicians it needs. The synergy of effort established by the *Aircrew Trainer Fundamentals* will build the foundation of a force that will remain unmatched.

I salute you for leading the way!

ISMAEL PÁEZ JR., CMSgt, USAF
Air Force Career Field Manager, 1H0X1

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INTRODUCTION

1. **PURPOSE.** This QTP provides useful guidance and documentation for trainers and trainees to meet Line of the Air Force physiological training needs at Aerospace Physiology Training Unit (APTU) locations. The goal is to provide AP personnel with an initial touch point for Aircrew Trainer Fundamentals within the continuum of learning. AP leadership values your expertise in meeting this goal.

2. **QTP 1H0X1, *AIRCREW TRAINER FUNDAMENTALS*.** This QTP is meant to provide an Aerospace Physiology Technician with their initial exposure to the continuum of learning. It provides a comprehensive, multi-purpose document encapsulating the expectation for Aircrew Trainer Fundamentals. This instructional package provides subject areas, training references, required equipment, objectives, and evaluation instructions to assist trainees to successfully conduct required 5-skill level upgrade training as identified in the 1H0X1 CFETP and mission requirements outlined in AFMAN 11-403, *Aerospace Physiology Training Program*. The QTP tasks are broken down into teachable capstones that will help trainers guide the trainee to become proficient with Aircrew Trainer Fundamentals.

2.1. This QTP is meant to fulfill the core tasks required of 5-skill level upgrade. The Specialty Training Standard (STS) line items in the CFETP require trainees to attain the necessary knowledge and experience to teach an initial course.

2.2. While similar core tasks/STS line items in the 1H0X1 CFETP are required of 7-skill levels, the expectation is for APTUs to focus its OJT on the necessary knowledge and experience required to qualify personnel to teach specific track courses e.g., Track A, E, H, J, T, etc.

2.3. There is no QTP associated with 7-level upgrade training, nor should one be expected.

3. **TRAINER INSTRUCTIONS:** Aerospace Physiology Training Flights (APTFs) have the flexibility to arrange training for each capstone in the order best suited for the situation e.g., multiple instructors in upgrade training, etc. Direct the trainee to review the associated training materials to better understand the objectives and task requirements of each capstone. Go through the steps in the performance checklist with the trainee and discuss the timeline for them to learn and practice each task. Direct the trainee to review the training references to better understand the objectives of each capstone. If the trainee has any questions about the objectives, clarify the expectation based on the objective of the capstone. Go through the performance checklist with the trainee and allow enough time to learn each objective. After the trainee reviews the provided materials and feels ready to be evaluated on a capstone, follow the evaluation instructions on respective performance checklists. Once you ensure the trainee is qualified to perform the task, a certifier will then evaluate him/her. Document successful task completion in the STS in part II of the 1H0X1 CFETP. If the trainee does not accomplish the objective(s), provide feedback on the areas/tasks needing more training and have them practice until the objective(s) are met. Completed QTPs are maintained with the CFETP.

4. **COORDINATION AND APPROVAL.** The AFCFM will initiate an annual review of this document and coordinate with AETC Training Pipeline Manager and AFPC and designated members of the Specialty Training Requirements Team (STRT) to ensure currency and accuracy. If you find discrepancies in the QTP, or if you have suggestions for improvement or additional QTP development, please send applicable inputs/changes to this QTP through MAJCOM Functional Managers to HQ USAF/A3TH, Attn: Air Force Career Field Manager, 1H0X1, 1480 Air Force Pentagon, Washington D.C. 20330-1480 or the following organizational email address: AF.A3.TH@us.af.mil.

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Approved By: CMSgt Ismael Páez Jr.

ABBREVIATIONS AND TERMS EXPLAINED

AIR FORCE CAREER FIELD MANAGER (AFCFM). Representative appointed by the respective HQ USAF Deputy Chief of Staff or Under Secretariat, to ensure assigned AF specialties are trained and utilized to support AF mission requirements. The AFCFM is a CMSgt in the career field. This individual has the responsibility of writing the CFETP, reviewing and updating the CFETP periodically, working with the respective AETC Training Pipeline Manager (TPM) and Training Manager (TM) to ensure technical training meets the needs of the career field. Additionally, the AFCFM works with the Career Development Course (CDC) writer to update CDC material to meet the ever-changing needs of the career field. The AFCFM is also the waiver authority for matters concerning personnel who fail to meet upgrade standards.

AF QUALIFICATION TRAINING PACKAGE (AFQTP). An instructional package designed for use at the unit to qualify, or aid qualification, in a duty position or program, or on a piece of equipment. It may be printed, computer-based, or in other audiovisual media.

CONTINUUM OF LEARNING. Career-long process of individual development where challenging experiences are combined with education and training through a common taxonomy to produce Airmen who possess the tactical expertise, operational competence, strategic vision, and joint proficiency to lead and execute the full spectrum of Air Force and joint missions.

EDUCATION. Process of imparting general bodies of knowledge and habits of mind applicable to a broad spectrum of endeavors to intellectually prepare individuals to deal with dynamic environments and solve ill-defined problems by using critical thought and reasoned judgment. Education programs prepare Airmen to anticipate and successfully meet challenges across the range of military operations and build a professional corp. Further, they positively impact both recruitment and retention efforts. Education can be further defined as developing a civilian's general knowledge, capabilities, and character through exposure to and learning of theories, concepts, and information. Education is traditionally delivered by an accredited institution and must relate to a current or future mission-related assignment.

LEARNING. Cognitive, affective, and/or physical process where a person assimilates information, and temporarily or permanently acquires or improves skills, knowledge, behaviors, and attitudes.

FORCE DEVELOPMENT. A deliberate process of preparing Airmen through the continuum of learning with the required competencies to meet the challenges of current and future operating environments. Institutional and joint development generally results in leadership, management, and warrior ethos proficiency. Occupational development generally results in technical skill proficiency.

MASTER TASK LISTING (MTL). A comprehensive list (100%) of all tasks performed within a work center and consisting of the current CFETP or AF Job Qualification Standard (JQS) and locally developed AF Forms 797 (as a minimum). Should include tasks required for deployment and/or unit type code requirements.

MASTER TRAINING PLAN (MTP). Employs a strategy for ensuring the completion of all work center job requirements by using a master task listing and provides milestones for task, Career Development Course completion, and prioritizes deployment/unit type code, home station training tasks, upgrade, and qualification tasks.

MENTOR. Wise, trusted, and experienced individual who shares knowledge, experience, and advice with a less experienced person.

ON-THE-JOB TRAINING (OJT). Hands-on, "over-the-shoulder" training or evaluation conducted to certify personnel in both upgrade (skill level award) and job qualification (position certification training).

SPECIALTY TRAINING REQUIREMENTS TEAM (STRT). Air Force career field managers use this forum and quality control tool to determine and manage career field education and training requirements.

UPGRADE TRAINING. Mandatory training that leads to attainment of higher level of proficiency.

QUALIFICATION TIMELINE

Implementation of this QTP timeline (see below) should begin upon entering the trainee into 5-Skill level upgrade. The goal is for respective Flight Commanders, Flight Chiefs, On-the-Job Training Managers, and supervisors to be actively engaged in ensuring personnel are properly trained. The following timeline does not have to be followed in the order as below (see Trainer Instructions).

MONTH 1	Prepare and deliver "Respiration and Circulation" CFETP/QTP Capstone 1
MONTH 2	Prepare and deliver "Human Factors in Aviation" CFETP/QTP Capstone 2
MONTH 3	Prepare and deliver "Introduction to Atmosphere," CFETP/QTP Capstone 3
MONTH 4	Prepare and deliver "Physiological Effects of Altitude" CFETP/QTP Capstone 4
MONTH 5	Prepare and deliver "Attention Management Threats to Situational Awareness" CFETP/QTP Capstone 5
MONTH 6	Prepare and deliver "Vision" CFETP/QTP Capstone 6
MONTH 7	Prepare and deliver "Unaided Night Vision" CFETP/QTP Capstone 7 (Use IBT and Unaided Night Vision Trainer)
MONTH 8	Prepare and deliver "Physiological Considerations of Aircrew Breathing Systems" CFETP/QTP Capstone 8
MONTH 9	Prepare and deliver "Cabin Pressurization and Decompression" CFETP/QTP Capstone 9
MONTH 10	Prepare and deliver "Performance Threats" CFETP/ QTP Capstone 10
MONTH 11	Prepare and deliver "Spatial Disorientation" CFETP/QTP Capstone 11
MONTH 12	Prepare and deliver "Noise and Vibration" CFETP/QTP Capstone 12
MONTH 13	Prepare and deliver "Acceleration" CFETP/QTP Capstone 13
MONTH 14	Prepare and deliver "Physiological Considerations of Aircraft Egress" CFETP/QTP Capstone 14

NOTES:

1. If an aerospace physiology technician is assigned to an APTF equipped with a Spatial Disorientation Training (SDT) device, every effort should be made to arrange for the trainee to fly simulator profiles in the device at least 2 hours per month during the 14-month training timeline outlined above. Simulator profiles should include, in addition to the available SDT profiles, practicing basic aircraft control, basic aerobatics, basic traffic patterns, visual flight rules (VFR)/instrument flight rules (IFR) takeoff and landing procedures, instrument landing system (ILS) approaches, and power-off/on stall entry and recovery. This will help to further familiarize the trainee with flight operations and will fulfill 20-hours of flight desired to teach Spatial Disorientation. Completion of 20 hours in the simulator will be documented on the JQS/STS within the CFETP.

2. Upon entering 5-skill level upgrade training the Flight Commander, Flight Chief, Unit Upgrade Training Monitor and assigned supervisor will ensure the trainee attends/sits in on one AFMAN 11-403, Track course during the 14-month training timeline outlined above. In most cases (at APTFs where at least one-Track course is offered per month), this will allow the trainee to observe no less than 14 courses.

3. The Aerospace Physiology Officer (APO) Course Study Guide can be found on the Aerospace Physiology SharePoint site: https://usaf.dps.mil/sites/AerospacePhysiology_APOCourseStudyGuide

CAPSTONE
RESPIRATION AND CIRCULATION
(MONTH 1)

SUBJECT AREA: Anatomy and Physiology of Body Systems

TRAINING REFERENCES:
AFMAN 11-403, Aerospace Physiological Training Program.
AETC Syllabus S-O-B/A-APH.
Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006.
Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008.
Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016.
APO Course Study Guide (L3OBP13HX00 AB)
4M051 Career Field Development Course (CDC) Volumes
Note: other peer-reviewed sources may be used as references

EQUIPMENT REQUIRED: CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the Aerospace Physiology Apprentice (APA) course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the structures and functions of the respiratory system and the circulatory system. Upon briefing, the trainee must understand the following topics:

- Structures and functions of the skeletal system
- Structures and functions of the muscular system
- Structures and functions of the nervous system
- Structures and functions of the respiratory system
- Structures and functions of the circulatory system

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on Respiration and Circulation using self-developed instructor-based training (IBT) and a plan of instruction (POI). It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:

1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
RESPIRATION AND CIRCULATION
(MONTH 1 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: LECTURE ON RESPIRATION AND CIRCULATION (STS ITEM 7.2.1 THROUGH 7.2.6.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Understood and explained the structures and functions of the skeletal system		
3. Understood and explained the structures and functions of the muscular system		
4. Understood and explained the structures and functions of the nervous system		
5. Understood and explained the structures and functions of the respiratory system		
6. Understood and explained the structures and functions of the circulatory system		
7. Explained any MAJCOM or mission design series (MDS)-specific interest items linked to the topics above		
8. IBT contains references		
9. IBT almost entirely free of spelling, punctuation, and grammatical errors.		
10. Provide a capstone lecture in a manner that is easy for students to understand		
11. Provide a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
INTRODUCTION TO HUMAN FACTORS IN AVIATION
(MONTH 2)

SUBJECT AREA:	Introduction to Human Factors in Aviation
TRAINING REFERENCES:	DAFI 91-204, Safety Investigations and Reports. AETC Syllabus S-O-B/A-APH. Handbook of Aviation Human Factors, Wise/Hopkin/Garland, 2nd Edition, 2009. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Human Error, Reason, 1990. Human Factors in Aviation, Sales/Maurino, 2010. Human Factors in Aircraft Maintenance and Inspection, Civil Aviation Authority, CAP 718 (previously ICAO Digest No.12, 2002. Human Factors in Simple and Complex Systems, Proctor/Van Zandt, 1994. AF Celebrities 'Best' Year in Aviation Safety, Ingalsbe, AF Public Affairs Agency, 2014. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. APO Course Study Guide (L3OBP13HX00 AB). 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references.
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the science of Human Factors and its role in aviation Upon briefing, the trainee must understand the following topics:

- Definition of Human Factors
- Human Factors challenges in USAF aviation and human performance implications
- Categories of human error
- DoD Human Factors Analysis and Classification system (HFACS) and its role in USAF aviation safety

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on Introduction to Human Factors in Aviation using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
INTRODUCTION TO HUMAN FACTORS IN AVIATION
(MONTH 2 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: LECTURE ON INTRODUCTION TO HUMAN FACTORS IN AVIATION (STS ITEM 7.3.1. THROUGH 7.3.5.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Understood and defined Human Factors		
3. Understood and explained Human Factors challenges in USAF aviation and the implications to human performance		
4. Understood and explained the categories of human error		
5. Understood and explained the DoD Human Factors analysis and Classification System (HFACS) and its role in USAF aviation safety		
6. Explained any MAJCOM or MDS-specific interest items linked to this topic		
7. IBT contained references		
8. IBT almost entirely free of spelling, punctuation, and grammatical errors.		
9. Provided a capstone lecture in a manner that is easy for students to understand		
10. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
INTRODUCTION TO ATMOSPHERE
(MONTH 3)

SUBJECT AREA:	Introduction to Atmosphere
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations. APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the structures and functions of the Atmosphere. Upon briefing, the trainee must understand the following topics:

- Characteristics of the Atmosphere
  - Gaseous composition
  - Measurement of atmospheric pressure and its impact at the physiological division zone and FL180
  - Divisions of the atmosphere e.g., Exosphere, Thermosphere (Ionosphere), Mesosphere, Stratosphere, Tropopause, Troposphere
- Gas Laws
  - Dalton's Law,
  - Boyle's Law
  - Henry's Law
  - Ideal Gas Law
  - Law of Gaseous Diffusion

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on the Introduction to the Atmosphere using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance. APTFs have the flexibility to combine the requirements of Capstone 3 with those of Capstone 4 as best suited for the situation and individual accommodation.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
INTRODUCTION TO THE ATMOSPHERE
(MONTH 3 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: LECTURE ON INTRODUCTION TO THE ATMOSPHERE (STS ITEM 7.4 THROUGH 7.4.3.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Explained the characteristics of the Earth's atmosphere		
3. Identified divisions of the atmosphere		
4. Explained the gaseous composition of the atmosphere		
5. Explained how altitude is measured		
6. Identified the Altitude – Pressure relationship		
7. Defined Dalton's Law and its impact on the human body as altitude increases.		
8. Defined Boyle's Law and its impact on the human body as altitude increases.		
9. Defined Henry's Law and the concerns associated with its impact as altitude increases.		
10. Defined Ideal Gas Law and its impact on the human body as altitude increases.		
11. Defined the Law of Gaseous Diffusion and its impact within the human body.		
12. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
13. IBT contained references		
14. IBT almost entirely free of spelling, punctuation, and grammatical errors		
15. Provided a capstone lecture in a manner that is easy for students to understand		
16. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
PHYSIOLOGICAL EFFECTS OF ALTITUDE
(MONTH 4)

SUBJECT AREA:	Physiological Effects of Altitude
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations. AFPAM 11-406, Aerospace Physiology Program Guidance. APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the physiological effects of altitude. Upon briefing, the trainee must understand the following topics:

- Hypoxia
    - Hypemic, Hypoxic, Histotoxic, and Stagnant
- Hypoxia recognition, prevention, symptoms, and treatment
- Characteristics of pressure breathing
- Characteristics of Hypocapnia
- Characteristics of Hyperventilation
- Causes, symptoms, prevention, and treatment for mechanical effects of trapped gasses
- Types of Decompression Sickness
    - Musculoskeletal, Skin, Respiratory, and Neurological manifestations

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on the Introduction to the Atmosphere using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance. APTFs have the flexibility to combine the requirements of Capstone 4 with those of Capstone 3 as best suited for the situation and individual accommodation.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
PHYSIOLOGICAL EFFECTS OF ALTITUDE
(MONTH 4 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: PHYSIOLOGICAL EFFECTS OF ALTITUDE (STS ITEM 7.5.1. THROUGH 7.5.7.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Defined and explained the characteristics of the four types of Hypoxia		
3. Explained Hypoxia recognition, symptoms, prevention, and treatment		
4. Defined and explained the characteristics of pressure breathing to include the short- and long-term effects		
5. Defined and explained the characteristics of Hypocapnia		
6. Defined and explained the characteristics of Hyperventilation		
7. Explained the causes, symptoms, prevention, and treatment for mechanical effects of trapped gasses		
8. Defined and explained the characteristics of the four types of Decompression Sickness		
9. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
10. IBT contained references		
11. IBT almost entirely free of spelling, punctuation, and grammatical errors		
12. Provided a capstone lecture in a manner that is easy for students to understand		
13. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
ATTENTION MANAGEMENT THREATS TO SITUATIONAL AWARENESS
(MONTH 5)

SUBJECT AREA:	Attention Management Threats to Situational Awareness
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Crew Resource Management, Kanki/Helmreich/Anca (ed), 2nd Edition, 2010. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the attention management threats to situational awareness (SA). Upon briefing, the trainee must understand the following topics.

- Definition of SA
- Predominant causes of loss of SA
- Primary types of information processing
- SA prevention, recognition, and recovery

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on the attention management threats to situational awareness using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance:

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
ATTENTION MANAGEMENT THREATS TO SITUATIONAL AWARENESS
(MONTH 5 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: ATTENTION MANGEMENT THREATS TO SITUATIONAL AWARENESS (STS ITEM 7.6.1 THROUGH 7.6.5.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Defined SA and explained levels of awareness		
3. Explained the differences between the primary types of information processing		
4. Explained the predominant causes of loss of SA		
5. Identified how SA can be deterred, how loss of SA can be recognized, and how to recover from a loss of SA		
6. Explained any MAJCOM or MDS-specific interest items linked to the topic		
7. IBT contained references		
8. IBT almost entirely free of spelling, punctuation, and grammatical errors		
9. Provided a capstone lecture in a manner that is easy for students to understand		
10. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
VISION
(MONTH 6)

SUBJECT AREA: Vision

TRAINING REFERENCES:
AFMAN 11-403, Aerospace Physiological Training Program.
AETC Syllabus S-O-B/A-APH.
Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006.
Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008.
Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016.
AFPAM 11-406, Aerospace Physiology Program Guidance.
AFPAM 11-417, Orientation in Aviation.
APO Course Study Guide (L3OBP13HX00 AB)
4M051 Career Field Development Course (CDC) Volumes.
Note: other peer-reviewed sources may be used as references

EQUIPMENT REQUIRED: CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses anatomical and physiological aspects of vision. Upon briefing, the trainee must understand the following topics:

- Anatomy and function of the eye
- Characteristics of the Visual Field
- Physiological and perceptual limitations
- Physiology of Night Vision
- Laser Threats

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on vision using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
VISION
(MONTH 6 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	**3b**
PROFICIENCY CODE DEFINITION	**Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)**

TASK: VISION	**(STS ITEM 7.7.1 THROUGH 7.7.6.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Defined the anatomy and function of the eye		
3. Identified the characteristics of the visual field		
4. Explained the physiological and perceptual limitations		
5. Explained physiology of night vision		
6. Explained the limitations and visual illusions associated with low light/night flying		
7. Identified measures to maximize visual acuity in night flying condition		
8. Identified laser threats		
9. Explained any MAJCOM or MDS-specific interest items linked to this topic		
10. IBT contained references		
11. IBT almost entirely free of spelling, punctuation, and grammatical errors		
12. Provided a capstone lecture in a manner that is easy for students to understand		
13. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explain = make (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
UNAIDED NIGHT VISION LAB
(MONTH 7)

SUBJECT AREA:	Unaided Night Vision Lab
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations AFPAM 11-406, Aerospace Physiology Program Guidance. AFPAM 11-417, Orientation in Aviation. APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses the anatomical and physiological aspects to consider while using unaided night vision. Upon briefing, the trainee must understand the following topics:

- How Dark Adaptation functions and its effect on photopic, mesopic and scotopic vision
- Role of Rhodopsin, light bleaching effects, Vitamin A, and role of prolonged darkness
- Anatomical and Physiological blind spots
- Characteristics of Visual illusions and how to counteract their deception
- Autokinesis, Purkinje Shift, Flash Blindness

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on unaided night vision using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
UNAIDED NIGHT VISION
(MONTH 7 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: UNAIDED NIGHT VISION	**(STS ITEM 7.8.1 THROUGH 7.8.6.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified the functions of Dark Adaptation and its effect on photopic, mesopic, and scotopic vision		
3. Explained the role of Rhodopsin, light bleaching effects and protective measures		
4. Identified the pros and cons of vitamin A		
5. Identified and explained anatomical and Physiological blind spots		
6. Identified the characteristics of visual illusions and how to counteract their deception		
7. Demonstrated Autokinesis, Purkinje Shift, Flash blindness and strobe light demo		
8. IBT contained references		
9. IBT almost entirely free of spelling, punctuation, and grammatical errors		
10. Provided a capstone lecture in a manner that was easy for students to understand		
11. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
PHYSIOLOGICAL CONSIDERATIONS OF AIRCREW BREATHING SYSTEMS
(MONTH 8)

SUBJECT AREA:	Physiological Considerations of Aircrew Breathing Systems
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. AETC Oxygen Equipment Practical Guide Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. T.O. 14P3-1-161, Combined Advanced Technology Enhanced Design "G" Ensemble (Combat Edge Equipment) T.O. 15X-1-1, Maintenance Instructions – Oxygen Equipment T.O. 15X1-4-2-12, Operation and Field Maintenance Instructions; Emergency Bail-Out Oxygen Cylinder Assemblies T.O. 15X3-3-6-1, Operation, Fitting, Inspection, and Maintenance Instructions with Illustrated Parts Breakdown for MBU-12/P Pressure-Demand Oxygen Mask T.O. 15X5-4-1-101, Oxygen Mask to Regulator Connector Assesmblies T.O. 15X5-2-4-1, Mask, Passenger Type and Emergency Passenger Oxygen System (EPOS) T.O. 15X6-3-13-3, Overhaul Instructions – Pressure Demand Oxygen Regulator Type 68/A T.O. 15X6-3-21-13, Overhaul Instructions; Depot; Diluter Demand Pressure Breathing; Oxygen Regulator T.O. 42B5-1-2, Gas Cylinders (Storage Type) Use, Handling, and Maintenance APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses physiological considerations of aircrew breathing systems. Upon briefing, the trainee must understand the following topics:

- Types of oxygen storage systems
- Types of oxygen delivery systems
- Emergency oxygen systems
- Personal equipment (e.g., CRU-60/P, regulator, helmet, mask)
- PRICE check

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on physiological considerations of aircrew breathing systems using self-developed IBT and POI. An IBT is not necessary for the Oxygen Equipment Practical portion of this Capstone. Additionally, the trainee must deliver an oxygen equipment lab in the altitude chamber using AETC Bookstore published Oxygen Equipment Practical guide. It is recommended the trainee's teaching session in the classroom be videotaped and used to debrief their performance. Videotaping the practical portion of this lesson is optional.

EVALUATION INSTUCTIONS:

1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
PHYSIOLOGICAL CONSIDERATIONS OF AIRCREW BREATHING SYSTEMS
(MONTH 8 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: PHYSIOLOGICAL CONSIDERATIONS OF AIRCREW BREATHING SYSTEMS (STS ITEM 7.9.1 THROUGH 7.9.6.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified the characteristics of aircraft oxygen storage systems		
3. Explained the safety concerns and characteristics of aviator's breathing oxygen		
4. Identified and explained emergency oxygen systems		
5. Identified the proper use of helmet, mask, and connector assemblies		
6. Discussed the P.R.I.C.E. check		
7. Described why and when pressure breathing is necessary		
8. Explained any MAJCOM or MDS-specific interest items linked to this topic		
9. IBT contains references		
10. IBT almost entirely free of spelling, punctuation, and grammatical errors		
11. Provided a capstone lecture in a manner that was easy for students to understand		
12. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
PHYSIOLOGICAL CONSIDERATIONS OF AIRCREW BREATHING SYSTEMS
(MONTH 8 PERFORMANCE CHECKLIST CONT.)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: OXYGEN EQUIPMENT PRACTICAL		**(STS ITEM 7.9.5.)**
STEPS: Based on Oxygen Equipment Practical Guide	**SAT**	**UNSAT**
1. Developed a POI		
2. Demonstrated visual inspection of aircrew flight equipment (mask/helmet)		
3. Demonstrated visual inspection of CRU-60/P connector		
4. Identified line pressure of multi-place/fighter aircraft (P)		
5. Demonstrated visual inspection of narrow panel regulator (R)		
6. Performed functional check of narrow panel regulator (R)		
7. Performed visual check of regulator indicator (I)		
8. Demonstrated proper connections check of aircrew flight equipment (C)		
9. Identified emergency low-pressure systems (E)		
10. Identified emergency high-pressure systems (E)		
11. Demonstrated P.R.I.C.E. check on emergency back-up oxygen systems (high/low press)		
14. Provided a capstone lecture in a manner that was easy for students to understand		
15. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
CABIN PRESSURIZATION AND DECOMPRESSION
(MONTH 9)

SUBJECT AREA:	Cabin Pressurization and Decompression
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses cabin pressurization and decompressions. Upon briefing, the trainee must understand the following topics:

- Cabin Pressurization and its advantages/ disadvantages
- Pressurization schedules
- Principles of cabin pressurization, physical and physiological effects
- Types, indicators, and factors influencing decompressions
- Precautionary and corrective procedures

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on cabin pressurization and decompressions using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
CABIN PRESSURIZATION AND DECOMPRESSION
(MONTH 9 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: CABIN PRESSURIZATION AND DECOMPRESSION (STS ITEM 7.10.1 THROUGH 7.10.6.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified the purpose of cabin pressurization systems		
3. Identified the advantages and disadvantages of pressurization systems		
4. Described pressurization schedules		
5. Explained the types of cabin decompressions and factors affecting the severity of each		
6. Identified the physical and physiological indications of a decompression		
7. Explained effective corrective actions to be taken following a decompression		
8. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
9. IBT contained references		
10. IBT almost entirely free of spelling, punctuation, and grammatical errors		
11. Provided a capstone lecture in a manner that was easy for students to understand		
12. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
PERFORMANCE THREATS
(MONTH 10)

SUBJECT AREA:	Performance Threats
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fatigue in Aviation, Caldwell/Caldwell, 2003. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations DAFMAN 48-123, Medical Examinations and Standards. APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses performance threats. Upon briefing, the trainee must understand the following topics:

- Self-medication and supplements
- Alcohol, Tobacco, Nutrition, Fatigue, Sleep Hygiene
- Thermal Stress
- Stress Management

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on aircrew performance threats using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
PERFORMANCE THREATS
(MONTH 10 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES)

TASK: PERFORMANCE THREATS	**(STS ITEM 7.11.1 THROUGH 7.11.9.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified types of common OTC medications and their effects		
3. Described the effects of supplements on human performance		
4. Identified the effects of alcohol on human performance		
5. Explained physiological effects of tobacco use		
6. Described the physiological effects of diet on human performance		
7. Described the symptoms, causes, and remedies for chronic and acute fatigue		
8. Explained proper sleep hygiene		
9. Described how to minimize the effects of circadian rhythm disruptions		
10. Explained the effects of caffeine on the body and impacts on performance		
11. Identified impacts to performance resulting from heat/cold stress		
12. Identified recommendations for protection from heat/cold stress		
13. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
14. IBT contained references		
15. IBT almost entirely free of spelling, punctuation, and grammatical errors		
16. Provided a capstone lecture in a manner that was easy for students to understand		
17. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
SPATIAL DISORIENTATION (SD)
(MONTH 11)

SUBJECT AREA: Spatial Disorientation

TRAINING REFERENCES:
AFMAN 11-403, Aerospace Physiological Training Program.
AETC Syllabus S-O-B/A-APH.
Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006.
Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008.
Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016.
Spatial Disorientation in Aviation, Previc/Ercoline, 2004.
AFMAN 11-202v3, Flight Operations.
AFPAM 11-406, Aerospace Physiology Program Guidance.
AFPAM 11-417, Orientation in Aviation.
APO Course Study Guide (L3OBP13HX00 AB)
4M051 Career Field Development Course (CDC) Volumes.
Note: other peer-reviewed sources may be used as references

EQUIPMENT REQUIRED: CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses Spatial Disorientation. Upon briefing, the trainee must understand the following topics:

- Human orientation systems
- SD Factors
- SD Prevention
- Motion Sickness
- SD Illusions e.g., Graveyard Spin/Spiral/Nystagmus, Leans, and Coriolis

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on Spatial Disorientation using self-developed IBT and a POI. Additionally, utilizing the Barany Chair replicate Nystagmus, Leans, and Coriolis illusions. It is recommended the trainee's teaching session be videotaped and used to debrief their performance. If an aerospace physiology technician is assigned to an APTF equipped with a Spatial Disorientation Training (SDT) device, every effort should be made to arrange for the trainee to fly simulator profiles in the device at least 2 hours per month during the 14-month training timeline outlined above. Simulator profiles should include, in addition to the available SDT profiles, practicing basic aircraft control, basic aerobatics, basic traffic patterns, VFR/IFR takeoff and landing procedures, ILS approaches, and power-off/on stall entry and recovery. This will help to further familiarize the trainee with flight operations and will fulfill 20-hours of flight desired to teach Spatial Disorientation. Completion of 20 hours in the simulator will be documented on the JQS/STS within the CFETP.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
SPATIAL DISORIENTATION
(MONTH 11 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: SPATIAL DISORIENTATION (SD)	**(STS ITEM 7.12.1 THROUGH 7.12.8.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Described the four sensory systems used for orientation		
3. Explained environmental/physiological factors that can lead to spatial disorientation		
4. Identified methods used to prevent spatial disorientation		
5. Explained procedures to overcome spatial disorientation		
6. Explained causes and treatment for motion sickness		
7. Demonstrated Graveyard Spin/Spiral, Nystagmus, Leans, and Coriolis illusions		
8. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
9. IBT contained references		
10. IBT almost entirely free of spelling, punctuation, and grammatical errors		
11. Provided a capstone lecture in a manner that was easy for students to understand		
12. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
NOISE AND VIBRATION
(MONTH 12)

SUBJECT AREA:	Noise and Vibration
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses Noise and Vibration. Upon briefing, the trainee must understand the following topics:

- Characteristics of noise
- Effects of hazardous noise
- Protective measures
- Effects of aircraft vibration

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on noise and vibration using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
NOISE AND VIBRATION
(MONTH 12 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: NOISE AND VIBRATION	**(STS ITEM 7.13.1 THROUGH 7.13.5.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Defined the characteristics of noise (frequency, intensity, and duration)		
3. Identified characteristics of noise that affect hearing		
4. Identified types of hearing loss associated with high intensity noise		
5. Identified devices and techniques that help minimize hazardous noise exposure		
6. Defined the characteristics of vibration		
7. Explained the effects of prolonged exposure to aircraft vibration		
8. Identified ways to minimize negative effects/symptoms of vibration		
9. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
10. IBT contained references		
11. IBT almost entirely free of spelling, punctuation, and grammatical errors		
12. Provided a capstone lecture in a manner that was easy for students to understand		
13. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
ACCELERATION
(MONTH 13)

SUBJECT AREA: Acceleration

TRAINING REFERENCES:
AFMAN 11-403, Aerospace Physiological Training Program.
AETC Syllabus S-O-B/A-APH.
Ernsting's Aviation Medicine, Rainford/Gradwell (ed), 5th Edition, 2006.
Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008.
Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016.
AFPAM 11-406, Aerospace Physiology Program Guidance.
AFPAM 11-417, G Awareness for Aircrew.
AFMAN 11-202v3, Flight Operations.
APO Course Study Guide (L3OBP13HX00 AB)
4M051 Career Field Development Course (CDC) Volumes.
Note: other peer-reviewed sources may be used as references

EQUIPMENT REQUIRED: CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses acceleration. Upon briefing, the trainee must understand the following topics:

- Characteristics of G-Forces
- Characteristics of G induced loss of consciousness (G-LOC)
- How to prevent G-LOC
- Perform Anti-G Straining Maneuver

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on acceleration using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
ACCELERATION
(MONTH 13 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3b (Step 8 is 2b)
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can determine step by step procedures for doing the task. (PROCEDURES) Can do most of the task. Needs help only on hardest parts. (PARTIALLY PROFICIENT).

TASK: ACCELERATION	**(STS ITEM 7.14.1 THROUGH 7.14.5.)**	
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified the characteristics of G forces		
3. Explained the factors determining the effects of G force on the body		
4. Identified the physiological effects and symptoms of G force exposure		
5. Defined causes and characteristic of G-LOC		
6. Explained methods used to help prevent G-LOC		
7. Identified common errors while performing the AGSM		
8. Demonstrated proper AGSM		
9. Explained methods used to increase tolerance to positive G-forces		
10. Explained any MAJCOM or MDS-specific interest items linked to this topic		
11. IBT contained references		
12. IBT almost entirely free of spelling, punctuation, and grammatical errors		
13. Provided a capstone lecture in a manner that was easy for students to understand		
14. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

CAPSTONE
PHYSIOLOGICAL CONSIDERTAIONS OF AIRCRAFT EGRESS
(MONTH 14)

SUBJECT AREA:	Physiological Considerations of Aircraft Egress
TRAINING REFERENCES:	AFMAN 11-403, Aerospace Physiological Training Program. AETC Syllabus S-O-B/A-APH. Fundamentals of Aerospace Medicine, Davis/Johnson/Stepanek/Fogarty (ed), 5th Edition, 2008. Handbook of Aerospace and Operational Physiology, Woodrow/Webb, 2016. AFMAN 11-202v3, Flight Operations. TO 14P3-1-112, Nomex Flight Gear Coveralls, Type Cold Weather Unit (CWU)-27/P and Gloves, Type GS/FRP-2 Jacket, Flyer's Summer, Type CWU-36/P Jacket, Flyer's, Winter, Type CWU-45/P Hood, Winter, Flyer's (CWU-17P Jacket) Trousers, Flyer's, Extreme Cold Weather, CWU-18/P Army Aircrew Combat Uniform (A2CU). APO Course Study Guide (L3OBP13HX00 AB) 4M051 Career Field Development Course (CDC) Volumes. Note: other peer-reviewed sources may be used as references
EQUIPMENT REQUIRED:	CAC-enabled computer w/network access and Microsoft Word (or equivalent installed).

OBJECTIVE: Using the lessons learned in the APA course, implement Aerospace Physiology Instructional Techniques, and develop a presentation that addresses physiological considerations of aircraft egress. Upon briefing, the trainee must understand the following topics:

- Basic principles of aided escape in relation to design
- Common aided escape injuries
- Basic principle of unaided escape
- Common unaided escape injuries
- Physiological threats of high-altitude egress
- Ways to improve survivability before, during, and after a crash

REMARKS/NOTES:
In addition to the above, a trainee must prepare and deliver a capstone lecture on physiological considerations of aircraft egress using self-developed IBT and a POI. It is recommended the trainee's teaching session be videotaped and used to debrief their performance.

EVALUATION INSTRUCTIONS:
1. Use this QTP to evaluate the performance of the task/assignment to the trainee. To receive a satisfactory rating, the trainee must satisfactorily complete all sections of the assignment without assistance. The trainee must receive a "sat" on all capstone objectives before being qualified on the block of instruction.

2. Use the provided performance checklist when evaluating the assignment to ensure the trainee addresses all the topics. Upon satisfactory completion of the evaluation, document the trainee's competency on the associated JQS/STS within the CFETP.

CAPSTONE
PHYSIOLOGICAL CONSIDERATIONS OF AIRCRAFT EGRESS
(MONTH 14 PERFORMANCE CHECKLIST)

PROFICIENCY CODE	3c
PROFICIENCY CODE DEFINITION	Can do all parts of the task. Needs only a spot check of completed work. (COMPETENT). Can identify why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)

TASK: PHYSIOLOGICAL CONSIDERATIONS OF AIRCRAFT EGRESS (STS ITEM 7.15.1 THROUGH 7.15.7.)		
STEPS: Based on AETC Syllabus S-O-B/A-APH	**SAT**	**UNSAT**
1. Developed an IBT and POI		
2. Identified basic principles of aided escape in relation to design.		
3. Described common injuries of aided escape		
4. Described basic principles and common injuries of unaided escape		
5. Identified the physiological threats of high-altitude egress		
6. Explained ways to improve survivability before, during, and after a crash		
7. Explained any MAJCOM or MDS-specific interest items linked to the topics above		
8. IBT contained references		
9. IBT almost entirely free of spelling, punctuation, and grammatical errors		
10. Provided a capstone lecture in a manner that was easy for students to understand		
11. Provided a capstone lecture in a sufficient amount of time to adequately cover the content		
Explained = made (an idea, situation, or problem) clear to someone by describing it in detail by revealing relevant facts or ideas		
FEEDBACK: Annotate notes regarding the trainee's performance (strengths, weaknesses, suggested improvements, etc.) and discuss with the trainee		

AIRCRAFT FACT SHEETS

PURPOSE: The following aircraft fact sheets are provided to assist those in UGT gain familiarity with various MDSs in the AF inventory. Trainees are encouraged to conduct independent research to further their knowledge and enhance the content of their courses.

T-6A TEXAN II

MISSION
The T-6A Texan II is a single-engine, two-seat primary trainer designed to train Joint Primary Pilot Training, or JPPT, students in basic flying skills common to U.S. Air Force and Navy pilots.

FEATURES
Produced by Raytheon Aircraft, the T-6A Texan II is a military trainer version of Raytheon's Beech/Pilatus PC-9 Mk II. Stepped-tandem seating in the single cockpit places one crewmember in front of the other, with the student and instructor positions being interchangeable. A pilot may also fly the aircraft alone from the front seat. Pilots enter the T-6A cockpit through a side-opening, one-piece canopy that has demonstrated resistance to bird strikes at speeds up to 270 knots.

The T-6A has a Pratt & Whitney Canada PT6A-68 turbo-prop engine that delivers 1,100 horsepower. Because of its excellent thrust-to-weight ratio, the aircraft can perform an initial climb of 3,100 feet (944.8 meters) per minute and can reach 18,000 feet (5,486.4 meters) in less than six minutes. The aircraft is fully aerobatic and features a pressurized cockpit with an anti-G system, ejection seat and an advanced avionics package with sunlight-readable liquid crystal displays**.**

BACKGROUND
The T-6A is used to train JPPT students, providing the basic skills necessary to progress to one of four training tracks: the Air Force bomber-fighter or the Navy strike track, the Air Force airlift-tanker or Navy maritime track, the Air Force or Navy turboprop track and the Air Force-Navy helicopter track.

Instructor pilot training in the T-6A began at Randolph AFB in 2000. JPPT began in October 2001 at Moody AFB, Ga., and is currently at Columbus AFB, Miss., Vance AFB, Okla, and Laughlin AFB and Sheppard AFB in Texas**.**

CEILING: 31,000 feet (9448.8 meters)

CREW: Two, student pilot and instructor pilot

T-7A RED HAWK

MISSION
The aircraft, along with simulators and associated ground equipment, will replace Air Education and Training Command's aging fleet of T-38C Talon aircraft.

FEATURES
The T-7A went from concept to first flight in three years because of a "breaking the norm" paradigm that includes a modular design of the aircraft developed specifically for maintainers, highly immersive training and offloading of skills and advanced fighter-like performance features that are commensurate with today's 4th and 5th-gen fighter aircraft.

Ground-Based Training Systems (GBTS), encompassing a full range of physical devices and instructional techniques, will prepare students for and supplement training conducted in the T-7A. The aircraft is a flexible, modifiable solution that adapts easily to people, software and systems so future technologies can be easily implemented, pilots can adjust to their personal preferences and the entire system can be applied to other missions. By adapting to changing technologies and learning methods, and by downloading more expensive training, the T-7A produces better prepared pilots in less time.

The T-7A's design includes provisions for growth as requirements evolve for additional missions such as an aggressor, light attack / fighter variant.

CEILING: 50,000 feet (15,000 meters) +

CREW: Two, student and instructor

T-38 TALON

MISSION
The T-38 Talon is a twin-engine, high-altitude, supersonic jet trainer used in a variety of roles because of its design, economy of operations, ease of maintenance, high performance, and exceptional safety record. Air Education and Training Command is the primary user of the T-38 for joint specialized undergraduate pilot training. Air Combat Command, Air Force Materiel Command and the National Aeronautics and Space Administration also use the T-38A in various roles.

FEATURES
The T-38 has swept wings, a streamlined fuselage and tricycle landing gear with a steerable nose wheel. Two independent hydraulic systems power the ailerons, rudder, and other flight control surfaces. Critical aircraft components are waist high and can be easily reached by maintenance crews.

The T-38C incorporates a "glass cockpit" with integrated avionics displays, head-up display and an electronic "no drop bomb" scoring system. The AT-38B has a gun sight and practice bomb dispenser. The T-38 needs as little as 2,300 feet (695.2 meters) of runway to take off and can climb from sea level to nearly 30,000 feet (9,068 meters) in one minute. T-38s modified by the propulsion modernization program have approximately 19 percent more thrust, reducing takeoff distance by 9 percent. The instructor and student sit in tandem on rocket-powered ejection seats in a pressurized, air-conditioned cockpit.

BACKGROUND
Air Education and Training Command uses the T-38C to prepare pilots for front-line fighter and bomber aircraft such as the F-15E Strike Eagle, F-15C Eagle, F-16 Fighting Falcon, B-1B Lancer, A-10 Thunderbolt and F-22 Raptor.

Advanced JSUPT students fly the T-38C in aerobatics, formation, night, instrument and cross-country navigation training. Test pilots and flight test engineers are trained in T-38s at the U.S. Air Force Test Pilot School at Edwards Air Force Base, Calif. Air Force Materiel Command uses the T-38 to test experimental equipment such as electrical and weapon systems.

Pilots from most North Atlantic Treaty Organization countries train in the T-38 at Sheppard AFB, Texas, through the Euro-NATO Joint Jet Pilot Training Program.

CEILING: Above 55,000 feet (16,764 meters)

CREW: Two, student and instructor

U-2 DRAGON LADY

MISSION
The U-2 provides high-altitude, all-weather surveillance and reconnaissance, day, or night, in direct support of U.S. and allied forces. It delivers critical imagery and signals intelligence to decision makers throughout all phases of conflict, including peacetime indications and warnings, low-intensity conflict, and large-scale hostilities.

FEATURES
The U-2S is a single-seat, single-engine, high-altitude/near space reconnaissance and surveillance aircraft providing signals, imagery, and electronic measurements and signature intelligence, or MASINT. Long and narrow wings give the U-2 glider-like characteristics and allow it to quickly lift heavy sensor payloads to unmatched altitudes, keeping them there for extended periods of time. The U-2 can gather a variety of imagery, including multi-spectral electro-optic, infrared, and synthetic aperture radar products which can be stored or sent to ground exploitation centers. In addition, it also supports high-resolution, broad-area synoptic coverage provided by the optical bar camera producing traditional film products which are developed and analyzed after landing. The U-2 also carries a signals intelligence payload. All intelligence products except for wet film can be transmitted in near real-time anywhere in the world via air-to-ground or air-to-satellite data links, rapidly providing critical information to combatant commanders. MASINT provides indications of recent activity in areas of interest and reveals efforts to conceal the placement or true nature of man-made objects.

Routinely flown at altitudes over 70,000 feet, the U-2 pilot must wear a full pressure suit like those worn by astronauts. The low-altitude handling characteristics of the aircraft and bicycle-type landing gear require precise control inputs during landing; forward visibility is also limited due to the extended aircraft nose and "taildragger" configuration. A second U-2 pilot normally "chases" each landing in a high-performance vehicle, assisting the pilot by providing radio inputs for altitude and runway alignment. These characteristics combine to earn the U-2 a widely accepted title as the most difficult aircraft in the world to fly.

BACKGROUND
U-2s are home based at the 9th Reconnaissance Wing, Beale Air Force Base, California, but are rotated to operational detachments worldwide. U-2 pilots are trained at Beale using five two-seat aircraft designated as TU-2S before deploying for operational missions.

CEILING: Above 70,000 feet (21,212+ meters)

CREW: One (two in trainer models)

F-15E STRIKE EAGLE

MISSION
The F-15E Strike Eagle is a dual-role fighter designed to perform air-to-air and air-to-ground missions. An array of avionics and electronics systems gives the F-15E the capability to fight at low altitude, day, or night and in all weather.

FEATURES
The aircraft uses two crew members, a pilot, and a weapon systems officer. Previous models of the F-15 are assigned air-to-air roles; the "E" model is a dual-role fighter. It has the capability to fight its way to a target over long ranges, destroy enemy ground positions and fight its way out. The APG-70 radar system allows aircrews to detect ground targets from long ranges. One feature of this system is that after a sweep of a target area, the crew freezes the air-to-ground map then goes back into air-to-air mode to clear for air threats. During the air-to-surface weapon delivery, the pilot is capable of detecting, targeting, and engaging air-to-air targets while the WSO designates the ground target.

The low-altitude navigation and targeting infrared for night, or LANTIRN, system allows the aircraft to fly at low altitudes, at night and in any weather conditions, to attack ground targets with a variety of precision-guided and unguided weapons. The LANTIRN system, consisting of two pods attached to the exterior of the aircraft, gives the F-15E unequaled accuracy in weapons delivery day or night and in poor weather. The navigation pod contains terrain-following radar which allows the pilot to safely fly at a very low altitude following cues displayed on a heads-up display. This system also can be coupled to the aircraft's autopilot to provide "hands off" terrain-following capability.

BACKGROUND
The F-15's superior maneuverability and acceleration are achieved through its high engine thrust-to-weight ratio and low-wing loading. It was the first U.S. operational aircraft whose engines' thrust exceeded the plane's loaded weight, permitting it to accelerate even while in vertical climb. Low-wing loading (the ratio of aircraft weight to its wing area) is a vital factor in maneuverability and, combined with the high thrust-to-weight ratio, enables the aircraft to turn tightly without losing airspeed.

CEILING: 60,000 feet (18,288 meters)

CREW: Pilot and weapon systems officer

F-16 FIGHTING FALCON

MISSION
The F-16 Fighting Falcon is a compact, multi-role fighter aircraft. It is highly maneuverable and has proven itself in air-to-air combat and air-to-surface attack. It provides a relatively low-cost, high-performance weapon system for the United States and allied nations.

FEATURES
In an air combat role, the F-16's maneuverability and combat radius (distance it can fly to enter air combat, stay, fight and return) exceed that of all potential threat fighter aircraft. It can locate targets in all weather conditions and detect low flying aircraft in radar ground clutter. In an air-to-surface role, the F-16 can fly more than 500 miles (860 kilometers), deliver its weapons with superior accuracy, defend itself against enemy aircraft, and return to its starting point. An all-weather capability allows it to accurately deliver ordnance during non-visual bombing conditions.

In designing the F-16, advanced aerospace science and proven reliable systems from other aircraft such as the F-15 and F-111 were selected. These were combined to simplify the airplane and reduce its size, purchase price, maintenance costs and weight. The light weight of the fuselage is achieved without reducing its strength. With a full load of internal fuel, the F-16 can withstand up to nine G's -- nine times the force of gravity -- which exceeds the capability of other current fighter aircraft.

The cockpit and its bubble canopy give the pilot unobstructed forward and upward vision, and greatly improved vision over the side and to the rear. The seat-back angle was expanded from the usual 13 degrees to 30 degrees, increasing pilot comfort and gravity force tolerance. For easy and accurate control of the aircraft during high G-force combat maneuvers, a side stick controller is used instead of the conventional center-mounted stick. Hand pressure on the side stick controller sends electrical signals to actuators of flight control surfaces such as ailerons and rudder.

BACKGROUND
The F-16 was built under an unusual agreement creating a consortium between the United States and four NATO countries: Belgium, Denmark, the Netherlands, and Norway. These countries jointly produced with the United States an initial 348 F-16s for their air forces. Final airframe assembly lines were in Belgium and the Netherlands. The consortium's F-16s are assembled from components manufactured in all five countries.

CEILING: Above 50,000 feet (15 kilometers)

CREW: F-16C, one; F-16D, one or two

F-22
RAPTOR

MISSION
The F-22 Raptor is combination of stealth, super cruise, maneuverability, and integrated avionics, coupled with improved supportability, represents an exponential leap in warfighting capabilities. The Raptor performs both air-to-air and air-to-ground missions allowing full realization of operational concepts vital to the 21st century Air Force. The F-22, a critical component of the Global Strike Task Force, is designed to project air dominance, rapidly and at great distances and defeat threats attempting to deny access to our nation's Air Force, Army, Navy, and Marine Corps. The F-22 cannot be matched by any known or projected fighter aircraft.

FEATURES
A combination of sensor capability, integrated avionics, situational awareness, and weapons provides first-kill opportunity against threats. The F-22 possesses a sophisticated sensor suite allowing the pilot to track, identify, shoot, and kill air-to-air threats before being detected. Significant advances in cockpit design and sensor fusion improve the pilot's situational awareness. The F-22 has a significant capability to attack surface targets. In the air-to-ground configuration the aircraft can carry two 1,000-pound GBU-32 Joint Direct Attack Munitions internally and will use on-board avionics for navigation and weapons delivery support. In the future air-to-ground capability will be enhanced with the addition of an upgraded radar and up to eight small diameter bombs.

The F-22 engines produce more thrust than any current fighter engine. The combination of sleek aerodynamic design and increased thrust allows the F-22 to cruise at supersonic airspeeds (greater than 1.5 Mach) without using afterburner -- a characteristic known as super cruise. Super cruise greatly expands the F-22 's operating envelope in both speed and range over current fighters, which must use fuel-consuming afterburner to operate at supersonic speeds. The F-22's characteristics provide a synergistic effect ensuring F-22A lethality against all advanced air threats. The combination of stealth, integrated avionics and super cruise drastically shrinks surface-to-air missile engagement envelopes and minimizes enemy capabilities to track and engage the F-22. The combination of reduced observability and super cruise accentuates the advantage of surprise in a tactical environment.

CEILING: Above 50,000 feet (15 kilometers)

CREW: One

F-35 LIGHTNING II

MISSION
The F-35A is the U.S. Air Force's latest fifth-generation fighter. It will replace the U.S. Air Force's aging fleet of F-16 Fighting Falcons and A-10 Thunderbolt II's, which have been the primary fighter aircraft for more than 20 years and bring with it an enhanced capability to survive in the advanced threat environment in which it was designed to operate. With its aerodynamic performance and advanced integrated avionics, the F-35A will provide next-generation stealth, enhanced situational awareness, and reduced vulnerability for the United States and allied nations.

FEATURES
The conventional takeoff and landing (CTOL) F-35A gives the U.S. Air Force and its allies the power to dominate the skies anytime, anywhere. The F-35A is an agile, versatile, high-performance, 9g capable multirole fighter that combines stealth, sensor fusion and unprecedented situational awareness. The F-35's helmet mounted display system is the most advanced system of its kind. All the intelligence and targeting information an F-35 pilot needs to complete the mission is displayed on the helmet's visor.

The F-35 contains state-of-the-art tactical data links that provide the secure sharing of data among its flight members as well as other airborne, surface and ground-based platforms required to perform assigned missions. The commitment of JSF partner nations to common communications capabilities and web-enabled logistics support will enable a new level of Coalition interoperability. These capabilities allow the F-35 to lead the defense community in the migration to the net-centric war fighting force of the future.

The F-35 is designed to provide the pilot with unsurpassed situational awareness, positive target identification and precision strike in all weather conditions. Mission systems integration and outstanding over-the-nose visibility features are designed to dramatically enhance pilot performance.

With nine countries involved in its development (United States, United Kingdom, Italy, Netherlands, Turkey, Canada, Denmark, Norway, and Australia), the F-35 represents a new model of international cooperation, ensuring U.S. and Coalition partner security well into the 21st Century. The F-35 also brings together strategic international partnerships, providing affordability by reducing redundant research and development and providing access to technology around the world. Along these lines, the F-35 will employ a variety of US and allied weapons.

CEILING: Above 50,000 feet (15 kilometers)

CREW: One

B-1B LANCER

MISSION
Carrying the largest conventional payload of both guided and unguided weapons in the Air Force inventory, the multi-mission B-1 is the backbone of America's long-range bomber force. It can rapidly deliver massive quantities of precision and non-precision weapons against any adversary, anywhere in the world, at any time.

FEATURES
The B-1B's blended wing/body configuration, variable-geometry wings, and turbofan afterburning engines, combine to provide long range, maneuverability and high speed while enhancing survivability. Forward wing settings are used for takeoff, landings, air refueling and in some high-altitude weapons employment scenarios. Aft wing sweep settings - the main combat configuration -- are typically used during high subsonic and supersonic flight, enhancing the B-1B's maneuverability in the low- and high-altitude regimes. The B-1B's speed and superior handling characteristics allow it to seamlessly integrate in mixed force packages. These capabilities, when combined with its substantial payload, excellent radar targeting system, long loiter time and survivability, make the B-1B a key element of any joint/composite strike force. The B-1 is a highly versatile, multi-mission weapon system. The B-1B's synthetic aperture radar is capable of tracking, targeting, and engaging moving vehicles as well as self-targeting and terrain-following modes. In addition, an extremely accurate Global Positioning System-aided Inertial Navigation System enables aircrews to navigate without the aid of ground-based navigation aids as well as engage targets with a high level of precision. The addition of a fully integrated data link (FIDL) with Link-16 capability provides improved battlefield situation awareness and secure beyond line of sight reach back connectivity.

The B-1B's onboard self-protection electronic jamming equipment, radar warning receiver (ALQ-161) and expendable countermeasures (chaff and flare) system and a towed decoy system (ALE-50) complements its low-radar cross-section to form an integrated, robust defense system that supports penetration of hostile airspace. The ALQ-161 electronic countermeasures system detects and identifies the full spectrum of adversary threat emitters then applies the appropriate jamming technique either automatically or through operator inputs.

BACKGROUND
The B-1B was first used in combat in support of operations against Iraq during Operation Desert Fox in December 1998. In 1999, six B-1s were used in Operation Allied Force, delivering more than 20 percent of the total ordnance while flying less than 2 percent of the combat sorties. The B-1B holds almost 50 world records for speed, payload, range, and time of climb in its class. The National Aeronautic Association recognized the B-1B for completing one of the 10 most memorable record flights for 1994. The most recent records were made official in 2004

CEILING: More than 30,000 feet (9,144 meters)

CREW: Four (aircraft commander, copilot, and two combat systems officers)

B-52 STRATOFORTRESS

MISSION
The B-52H Stratofortress is a long-range, heavy bomber that can perform a variety of missions. The bomber can fly at high subsonic speeds at altitudes of up to 50,000 feet (15,166.6 meters). It can carry nuclear, or precision guided conventional ordnance with worldwide precision navigation capability.

FEATURES
In a conventional conflict, the B-52 can perform strategic attack, close-air support, air interdiction, offensive counter-air, and maritime operations. During Desert Storm, B-52s delivered 40 percent of all the weapons dropped by coalition forces. It is highly effective when used for ocean surveillance and can assist the U.S. Navy in anti-ship and mine-laying operations. In two hours, two B-52s can monitor 140,000 square miles (364,000 square kilometers) of ocean surface.

Pilots wear night vision goggles, or NVGs, to enhance their vision during night operations. Night vision goggles provide greater safety during night operations by increasing the pilot's ability to visually clear terrain, increasing the peacetime and combat situational awareness of the aircrew and improving their ability to visually acquire other aircraft.

B-52s are equipped with advanced targeting pods. Targeting pods provide improved long-range target detection, identification, and continuous stabilized surveillance for all missions, including close air support of ground forces. The advanced targeting and image processing technology significantly increases the combat effectiveness of the B-52 during day, night and less than ideal weather conditions when attacking ground targets with a variety of standoff weapons (e.g., laser-guided bombs, conventional bombs, and GPS-guided weapons).

The use of aerial refueling gives the B-52 a range limited only by aircrew endurance. It has an unrefueled combat range more than 8,800 miles (14,080 kilometers).

BACKGROUND
For more than 60 years, B-52s have been the backbone of the strategic bomber force for the United States. The B-52 can drop or launching the widest array of weapons in the U.S. inventory. This includes gravity bombs, cluster bombs, precision guided missiles and joint direct attack munitions. Updated with modern technology, the B-52 can deliver the full complement of joint developed weapons and will continue into the 21st century as an important element of our nation's defenses. The Air Force currently expects to operate B-52s through 2050.

CEILING: 50,000 feet (15,151.5 meters)

CREW: Five (aircraft commander, pilot, radar navigator, navigator, and electronic warfare officer)

B-21 RAIDER

MISSION
The B-21 Raider will be a dual-capable penetrating strike stealth bomber capable of delivering both conventional and nuclear munitions. The B-21 will form the backbone of the future Air Force bomber force consisting of B-21s and B-52s. Designed to operate in tomorrow's high-end threat environment, the B-21 will play a critical role in ensuring America's enduring airpower capability.

FEATURES
The B-21 Raider will be a component of a larger family of systems for conventional Long-Range Strike, including Intelligence, Surveillance and Reconnaissance, electronic attack, communication, and other capabilities. It will be nuclear capable and designed to accommodate manned or unmanned operations. Additionally, it will be able to employ a broad mix of stand-off and direct-attack munitions.

The B-21 is being designed with open systems architecture to reduce integration risk and enable competition for future modernization efforts to allow for the aircraft to evolve as the threat environment changes.

BACKGROUND
In 2019, the Air Force completed the Strategic Basing Process announcing Ellsworth Air Force Base, South Dakota; Whiteman Air Force Base, Missouri; and Dyess Air Force Base, Texas are the preferred locations for B-21 main operating bases.

After completing the Environmental Impact Statement process as required by the National Environmental Policy Act and other regulatory processes, in 2021, the Air Force named Ellsworth Air Force Base, South Dakota as the first B-21 main operating base and location of the Formal Training Unit.

The B-21 Raider is named in honor of the historic Doolittle Raiders, U.S. Army Air Force men who are known for their surprise attack against Japan during World War II on April 18, 1942, which forced the Japanese to recall combat forces for home defense, and boosted morale among Americans and U.S. allies abroad. The designation B-21 recognizes the Raider as the first bomber of the 21st century.

CEILING: 49,213 feet (15,000 meters)

CREW: Two, pilot and copilot

E-7A WEDGETAIL

MISSION
The Department of the Air Force has decided to replace a portion of the E-3 Sentry Airborne Warning and Control System fleet with the E-7 Wedgetail, which is produced by The Boeing Company.

The Boeing E-7 is the only platform capable of meeting the requirements for the Defense Department's tactical battle management, command and control and moving target indication capabilities within the timeframe needed to replace the aging E-3. It is a highly advanced aircraft, providing an airborne early warning and control platform that can gather information from a wide variety of sources, analyze it, and distribute it to other assets.

A contract award is planned in fiscal year 2023.

FEATURES
Unlike the E-3, which uses an iconic rotating radome mounted ahead of its vertical tail, the Wedgetail uses an Active Electronically Scanned Array radar mounted in a blade-like structure on the back of a 737 airframe. Because it is digital, the blade antenna has a faster revisit time than the mechanical radome, which has some latency. It also requires less maintenance. The gaps at either end of the blade are filled in by sensors in an overhanging lip, called the "Top Hat."

The Wedgetail is equipped with multiple radars and tech that allows it to scan and communicate with up to 80 aircraft and sea units over up to 4 million square kilometers during a single 10-hour mission.

CEILING: 41,010 feet (12,500 meters)

CREW: Pilot, Co-Pilot, Air Battle Managers and Airborne Electronics Analysts

C-130 HERCULES

MISSION
The C-130 Hercules primarily performs the tactical portion of the airlift mission. The aircraft is capable of operating from rough, dirt strips and is the prime transport for airdropping troops and equipment into hostile areas. The C-130 operates throughout the U.S. Air Force, serving with Air Mobility Command, Air Force Special Operations Command, Air Combat Command, U.S. Air Forces in Europe, Pacific Air Forces, Air National Guard, and the Air Force Reserve Command, fulfilling a wide range of operational missions in both peace and war situations. Basic and specialized versions of the aircraft airframe perform a diverse number of roles, including airlift support, Antarctic ice resupply, aeromedical missions, weather reconnaissance, aerial spray missions, firefighting duties for the U.S. Forest Service and natural disaster relief missions.

FEATURES
Using its aft loading ramp and door, the C-130 can accommodate a wide variety of oversized cargo, including everything from utility helicopters and six-wheeled armored vehicles to standard palletized cargo and military personnel. In an aerial delivery role, it can airdrop loads up to 42,000 pounds or use its high-flotation landing gear to land and deliver cargo on rough, dirt strips.

The flexible design of the Hercules enables it to be configured for many different missions, allowing one aircraft to perform the role of many. Much of the special mission equipment added to the Hercules is removable, allowing the aircraft to return to its cargo delivery role if desired. Additionally, the C-130 can be rapidly reconfigured for the various types of cargo such as palletized equipment, floor-loaded material, airdrop platforms, container delivery system bundles, vehicles and personnel or aeromedical evacuation.

The C-130J is the latest addition to the C-130 fleet and has replaced aging C-130Es and some of the high time C-130Hs. The C-130J incorporates state-of-the-art technology, which reduces manpower requirements, lowers operating and support costs, and provides life-cycle cost savings over earlier C-130 models. Compared to older C-130s, the J model climbs faster and higher, flies farther at a higher cruise speed, and takes off and lands in a shorter distance. The C-130J-30 is a stretch version, adding 15 feet to the fuselage, increasing usable space in the cargo compartment.

CEILING: C-130J**:** 28,000 feet (8,615 meters) with 42,000 pounds (19,090 kilograms) payload

CREW: C-130J/J-30: Three (two pilots and loadmaster)
C-130E/H: Five (two pilots, navigator, flight engineer and loadmaster)

AC-130J GHOSTRIDER

MISSION
The AC-130J Ghostrider's primary missions are close air support, air interdiction and armed reconnaissance. Close air support missions include troops in contact, convoy escort and point air defense. Air interdiction missions are conducted against pre-planned targets or targets of opportunity and include strike coordination and reconnaissance and overwatch mission sets. The AC-130J provides ground forces an expeditionary, direct-fire platform that is persistent, ideally suited for urban operations and delivers precision low-yield munitions against ground targets.

FEATURES
The AC-130J is a highly modified C-130J aircraft that contains many advanced features. It contains an advanced two-pilot flight station with fully integrated digital avionics. The aircraft is capable of extremely accurate navigation due to the fully integrated navigation systems with dual inertial navigation systems and global positioning system. Aircraft defensive systems and color weather radar are integrated as well. The aircraft is capable of air refueling with the Universal Air Refueling Receptacle Slipway Installation system.

Additionally, the AC-130J is modified with the Precision Strike Package, which includes a mission management console, robust communications suite, two electro-optical/infrared sensors, advanced fire control equipment, precision guided munitions delivery capability, as well as trainable 30mm and 105mm weapons. The mission management system fuses sensor, communication, environment, order of battle and threat information into a common operating picture.

BACKGROUND
The AC-130J is the fifth-generation gunship replacing the aging fleet of AC-130U/W gunships. AC-130 gunships have an extensive combat history dating back to Vietnam where gunships destroyed more than 10,000 trucks and were credited with many lifesavings, close air support missions. Over the past four decades, AC-130s have deployed constantly to hotspots throughout the world in support of special operations and conventional forces. In South America, Africa, Europe and throughout the Middle East, gunships have significantly contributed to mission success.

CEILING: 28,000 feet

CREW: Two pilots, one combat systems officers, one weapon system operator, one sensor operator and four special mission aviators

CV-22 OSPREY

MISSION
The CV-22 Osprey is a tiltrotor aircraft that combines the vertical takeoff, hover, and vertical landing qualities of a helicopter with the long-range, fuel efficiency and speed characteristics of a turboprop aircraft. The mission of the CV-22 is to conduct long-range infiltration, exfiltration, and resupply missions for special operations forces.

FEATURES
This versatile, self-deployable aircraft offers increased speed and range over other rotary-wing aircraft, enabling Air Force Special Operations Command aircrews to execute long-range special operations missions. The CV-22 can perform missions that normally would require both fixed-wing and rotary-wing aircraft. The CV-22 takes off vertically and, once airborne, the nacelles (engine and prop-rotor group) on each wing can rotate into a forward position.

The CV-22 is equipped with integrated threat countermeasures, terrain-following radar, forward-looking infrared sensor, and other systems that allow it to operate in various austere conditions.

BACKGROUND
The CV-22 is the Special Operation Forces variant of the U.S. Marine Corps MV-22 Osprey. The first two test aircraft were delivered to Edwards Air Force Base, California in September 2000. The 58th Special Operations Wing at Kirtland AFB, New Mexico began CV-22 aircrew training with the first two production aircraft in August 2006.

The first operational CV-22 was delivered to Air Force Special Operations Command in January 2007. Initial operational capability was achieved in 2009. A total of 54 CV-22 aircraft are scheduled to be delivered by the end of 2021.

CEILING: 25,000 feet (7,620 meters)

CREW: four (pilot, copilot and two flight engineers)

C-17 GLOBEMASTER III

MISSION

The C-17 Globemaster III is the most flexible cargo aircraft to enter the airlift force. The C-17 is capable of rapid strategic delivery of troops and all types of cargo to main operating bases or directly to forward bases in the deployment area. The aircraft can perform tactical airlift and airdrop missions and can transport litters and ambulatory patients during aeromedical evacuations. The inherent flexibility and performance of the C-17 force improve the ability of the total airlift system to fulfill the worldwide air mobility requirements of the United States.

The ultimate measure of airlift effectiveness is the ability to rapidly project and sustain an effective combat force close to a potential battle area. Threats to U.S. interests have changed in recent years, and the size and weight of U.S.-mechanized firepower and equipment have grown in response to improved capabilities of potential adversaries. This trend has significantly increased air mobility requirements, particularly in the area of large or heavy outsize cargo. As a result, newer and more flexible airlift aircraft are needed to meet potential armed contingencies, peacekeeping, or humanitarian missions worldwide. The C-17 is capable of meeting today's demanding airlift missions.

FEATURES

Reliability and maintainability are two outstanding benefits of the C-17 system. Current operational requirements impose demanding reliability and maintainability. These requirements include an aircraft mission completion success probability rate of 92 percent, only 20 aircraft maintenance man-hours per flying hour, and full and partial mission availability rates of 74.7 and 82.5 percent, respectively**.** Cargo is loaded onto the C-17 through a large aft ramp and door system that accommodates virtually all the Army's air-transportable equipment such as a 69-ton M1 Abrams main battle tank, armored vehicles, trucks, and trailers. Additionally, the cargo floor has rollers that can be flipped from a flat floor to accommodate wheeled or tracked vehicles to rollerized conveyers to accommodate palletized cargo. The C-17 is designed to airdrop 102 paratroopers with their accompanying equipment.

BACKGROUND

The C-17 is operated by Air Mobility Command from Travis AFB, California, Dover AFB, Delaware. Joint Base Lewis-McChord, Washington; Joint Base Charleston, and Joint Base McGuire-Dix-Lakehurst, New Jersey.

Pacific Air Forces operates C-17s from Joint Base Elmendorf-Richardson, Alaska, and Joint Base Pearl Harbor-Hickam, Hawaii.

Air Education and Training Command performs C-17 aircrew training from Altus AFB, Oklahoma

CEILING: 45,000 feet at cruising speed (13,716 meters)

CREW: Three (two pilots and one loadmaster)

AEROMEDICAL EVACUATION CREW: A basic crew of five (two flight nurses and three medical technicians)

KC-46A
PEGASUS

MISSION
The KC-46A is the first phase in recapitalizing the U.S. Air Force's aging tanker fleet. With greater refueling, cargo and aeromedical evacuation capabilities compared to the KC-135, the KC-46A will provide next generation aerial refueling support to Air Force, Navy, Marine Corps, and partner-nation receivers.

FEATURES
At full operational capability, the KC-46A will be able to refuel most fixed-wing, receiver-capable aircraft. The KC-46A is equipped with a refueling boom driven by a fly-by-wire control system and is capable of fuel offload rates required for large aircraft. Its hose and drogue system adds additional mission capability that is independently operable from the refueling boom system. The aircraft's fuel can be pumped through the boom, drogue and wing aerial refueling pods. All KC-46As are capable of being configured with WARPs, and when equipped, the aircraft is capable of multi-point simultaneous aerial refueling. The Boom Operator controls the boom, centerline drogue and WARPs during refueling operations. The Air Refueling Operator station includes panoramic displays giving the ARO wingtip to wing-tip situational awareness.

The KC-46A can accommodate a mixed load of passengers, aeromedical evacuation, and cargo capabilities. Two high-bypass turbofans power the KC-46A to takeoff at gross weights up to 415,000 pounds. Depending on fuel storage configuration, the aircraft can carry a palletized load of up to 65,000 pounds of cargo. The KC-46A can carry up to 18 463L cargo pallets. Seat tracks and the onboard cargo handling system make it possible to simultaneously carry palletized cargo and passenger seats in a variety of combinations.

BACKGROUND
The KC-46A represents the beginning of a new era in air-to-air refueling capability for the joint force. The aircraft has been in development since Feb. 24, 2011, and its initial flight occurred in Dec. 2014. The current contract, with options, provides Air Mobility Command an inventory of 179 KC-46A tankers. The first KC-46A was delivered to McConnell Air Force Base, Kansas on Jan. 25, 2019. The aircraft will soon undergo operational test and evaluation on the way to initial operating capability.

CEILING: 43,000 ft.

CREW: 15 permanent seats for aircrew, including aeromedical evacuation aircrew

AEROMEDICAL EVACUATION CREW: Expected to add a basic crew of five (two flight nurses and three medical technicians) for aeromedical evacuation missions.

AIR FORCE ONE

MISSION
Presidential transport. Technically, "Air Force One" is used to designate any Air Force aircraft carrying the President, but it is now standard practice to use the term to refer to specific planes that are equipped to transport the Commander-in-Chief. Today, this name refers to one of two highly customized Boeing 747-200B series aircraft.

FEATURES
Capable of refueling midair, Air Force One has unlimited range and can carry the President wherever he or she needs to travel. The onboard electronics are hardened to protect against an electromagnetic pulse, and Air Force One is equipped with advanced secure communications equipment, allowing the aircraft to function as a mobile command center in the event of an attack on the United States.

Inside, the President and his or her travel companions enjoy 4,000 square feet of floor space on three levels, including an extensive suite for the President that features a large office, lavatory, and conference room. Air Force One includes a medical suite that can function as an operating room, and a doctor is permanently on board. The plane's two food preparation galleys can feed 100 people at a time.

Air Force One also has quarters for those who accompany the President, including senior advisors, Secret Service officers, traveling press, and other guests. Several cargo planes typically fly ahead of Air Force One to provide the President with vehicles and services needed in remote locations.

BACKGROUND
Air Force One is maintained and operated by the Presidential Airlift Group, part of the White House Military Office. The Airlift Group was founded in 1944 as the Presidential Pilot Office at the direction of President Franklin D. Roosevelt. For the next 15 years, various propeller-driven aircraft served the President until President Dwight D. Eisenhower flew to Europe aboard VC-137A, a Boeing 707 Stratoliner, in August 1959.

In 1962, President John F. Kennedy became the first President to fly in a jet specifically built for presidential use — a modified Boeing 707. Over the years, several other jet aircraft have been used, with the first of the current aircraft being delivered in 1990 during the administration of President George H.W. Bush.

CEILING: 45,100 feet (13,747 meters)

CREW: 26 (passenger/crew capacity: 102)