DOCUMENT RESUME

ED 338 878 CE 059 589

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TITLE Aviation Pilot Training I and Aviation Technician I: Task Analyses. Semester I. Field Review Copy.
INSTITUTION Henrico County Public Schools, Glen Allen, VA. Virginia Vocational Curriculum Center.
SPONS AGENCY Virginia State Dept. of Education, Richmond. Div. of Vocational and Adult Education.
PUB DATE 90
NOTE 85p.; For related guides, see CE 059 590-593. Cover title varies slightly.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Aircraft Pilots; *Aviation Education; *Aviation Technology; *Behavioral Objectives; Career Awareness; Competency Based Education; Course Descriptions; Criterion Referenced Tests; Engines; Learning Activities; Navigation; Secondary Education; Task Analysis

ABSTRACT

This guide for aviation pilot and aviation technician training begins with a course description, resource information, and a course outline. Tasks/competencies are categorized into 10 concept/duty areas: understanding aviation career opportunities; comprehending the history of aviation; understanding classes, categories, and types of aircraft; using military time and phonetic alphabet in communication; explaining the functions of aircraft components; understanding the theory of flight; understanding the functions of aircraft flight instruments; understanding the functions of aircraft systems; understanding how to predict aircraft performance; and understanding how to compute weight and balance in a light aircraft. Three to nine tasks are listed for each concept/duty. A performance objective, criterion-referenced measure, and enabling objective are provided for each task/competency. At the end of each concept/duty category, resources are listed by task. (YLB)

VA90CD01

AVIATION PILOT TRAINING I

AVIATION TECHNICIAN TRAINING I

TASK ANALYSES

Semester I

Prepared by

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In cooperation with

Virginia Vocational Curriculum and Resource Center

1990

PREFACE

The task analyses for Aviation Pilot Training I and II and Aviation Technician I and the flight syllabus were prepared by Colonel Richard Upchurch (USMC Retired), Aviation Programs Supervisor for Henrico County Public Schools.

The curriculum will be field tested in the aviation programs at the Highland Springs Technical Center during the 1990-91 school year.

The guides were prepared for publication by the Virginia Vocational Curriculum and Resource Center, Vocational and Community Education, Henrico County Public Schools.

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COURSE DESCRIPTION AND RESOURCE INFORMATION

Course Description: **Aviation Pilot Training I (Semester I)**
Aviation Technician Training I (Semester I)

This course provides an introduction to the world of aviation and the aerospace industry. It is designed for students who intend to pursue either additional pilot training or aviation mechanics training. Course content includes careers in aviation; aviation history; types of aircraft; the language of aviation; aircraft instruments, systems, and components; and problems involving aircraft weight and balance. The course is taught in a two-hour block at the Highland Springs Technical Center. Many sessions are team-taught.

Resources:

Text: *Aviation Fundamentals*. 2nd ed. Englewood, Colorado: Jeppesen Sanderson, Inc., 1989.

Audiovisuals: Jeppesen Sanderson transparencies may be ordered from Jeppesen Sanderson, Inc., Englewood, Colorado.

Federal Aviation Administration films and videotapes may be acquired through the Virginia Department of Aviation, Virginia Aviation Museum, Richmond International Airport.

Equipment and Material:

Static aircraft: Beech "Sundowner" (nonflyable)
GAT-1 full motion light aircraft simulator
ATC 610 instrument panel simulator with engine and flight controls
Assorted aircraft parts, instruments, radios, and other components acquired from aircraft salvage units and Federal Surplus
Aeronautical charts, diagrams, photographs, and other documents acquired from military and civilian aviation agencies in the Richmond area

COURSE OUTLINE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

CONTENT	TASK NUMBER
I. CAREER OPPORTUNITIES	
A. Flight crews	1.1, 1.2
B. Ground crews	1.3, 1.4
II. AVIATION HISTORY	
A. First flight	2.1
B. Six milestones	2.2
C. World Wars I and II	2.3
D. Twentieth century	2.4
III. CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT	
A. The four classes	3.1
B. The nine categories	3.2
C. "Types"	3.3
IV. MILITARY TIME AND PHONETIC ALPHABET	
A. Military and civilian time	4.1, 4.2
B. Phonetic alphabet	4.3
C. Importance in communication	4.4
V. FUNCTIONS OF AIRCRAFT COMPONENTS	
A. Five major components	5.1
B. Four major control surfaces	5.2
C. Rudder, ailerons, and elevator	5.3
VI. THEORY OF FLIGHT	
A. Four forces of flight	6.1
B. Aerodynamics terminology	6.2
C. Airfoil	6.3
D. Angle of attack and airfoil stall	6.4
E. Role of rudder, ailerons, and elevator	6.5
F. Lift, weight, drag, and thrust	6.6
G. Centrifugal force, yaw, and skid	6.7
H. Five types of aircraft stability	6.8

COURSE OUTLINE (continued)

CONTENT	TASK NUMBER
VII. FUNCTIONS OF FLIGHT INSTRUMENTS	
A. Altimeter, vertical speed indicator, and airspeed indicator	7.1
B. Four types of airspeed	7.2
C. Five types of altitude	7.3
D. Altimeter error	7.4
E. Concept of the gyroscope	7.5
F. Gyroscopic instruments	7.6
G. True north and magnetic north	7.7
H. Three compass errors	7.8
VIII. FUNCTIONS OF AIRCRAFT SYSTEMS	
A. Four-stroke engine cycle	8.1
B. Denotation and preignition	8.2
C. Ignition system	8.3
D. Float-type carburetor	8.4
E. Oil system	8.5
F. Air cooling system	8.6
G. Thrust	8.7
H. Fuel systems	8.8
I. Electrical system	8.9
IX. PREDICTION OF AIRCRAFT PERFORMANCE	
A. Density altitude, wind, runway conditions, and humidity	9.1
B. Computation of performance data	9.2
C. Interpolation	9.3
X. WEIGHT AND BALANCE	
A. Airplane weight and empty weight	10.1
B. Terminology	10.2
C. Moment problems	10.3
D. Completion of balance forms using computation, graph, and table methods	10.4, 10.5
E. Weight shift formula	10.6

CONCEPT/DUTY AREAS

1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES
2. COMPREHENDING THE HISTORY OF AVIATION
3. UNDERSTANDING CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT
4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION
5. EXPLAINING THE FUNCTIONS OF AIRCRAFT COMPONENTS
6. UNDERSTANDING THE THEORY OF FLIGHT
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS
9. UNDERSTANDING HOW TO PREDICT AIRCRAFT PERFORMANCE
10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

CONCEPT/DUTY AREA

1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES

TASKS/COMPETENCIES

1.1 Identify aviation occupations for flight crews.

1.2 Describe career patterns for flight crews.

1.3 Identify aviation occupations for ground crews.

1.4 Describe career patterns for aviation ground crews.

CONCEPT/DUTY AREA	COURSE
1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

1.1 Identify aviation occupations for flight crews.

PERFORMANCE OBJECTIVE

P1.1 Given a cockpit/cabin diagram of a commercial airliner, identify with 80% accuracy the operating locations of four crew members, and list two duties associated with each crew member's job.

CRITERION-REFERENCED MEASURE

C1.1 Completed diagram, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review various aviation publications, and discuss the advertisements for flight crews.

2. View and discuss the film *Looking Up to Your Aviation Career.*

CONCEPT/DUTY AREA	COURSE
1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

1.2 Describe career patterns for flight crews.

PERFORMANCE OBJECTIVE

P1.2 Given information on the occupation of airline captain, describe with 80% accuracy at least five areas of experience necessary to achieve the position of airline captain.

CRITERION-REFERENCED MEASURE

C1.2 Written or oral test, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Research the *Federal Aviation Regulations* to determine flight and written requirements that airlines demand for upgrading from newly hired pilot to airline captain.
2. Read and report on the biography of an airline captain.
3. Invite flight crew members to speak to the class on their career patterns and typical job tasks.

CONCEPT/DUTY AREA	COURSE
1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

1.3 Identify aviation occupations for ground crews.

PERFORMANCE OBJECTIVE

P1.3 Given a list of four members of an airline ground crew, identify with 75% accuracy two duties performed by each crew member.

CRITERION-REFERENCED MEASURE

C1.3 Completed list, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. View and discuss the films *Aviation Mechanic* and *Flight Line Service*.

2. Collect advertisements for airline ground crew members, and make a list of occupational requirements.

CONCEPT/DUTY AREA	COURSE
1. UNDERSTANDING AVIATION CAREER OPPORTUNITIES	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

1.4 Describe career patterns for aviation ground crews.

PERFORMANCE OBJECTIVE

P1.4 Given information about the occupation of aircraft mechanic, describe with 75% accuracy the levels of training and experience necessary in order to be hired as a mechanic by a major airline.

CRITERION-REFERENCED MEASURE

C1.4 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Visit the Virginia Air National Guard Maintenance Facility and a general aviation hangar to determine the work routine of a typical military aviation technician.

2. Determine the similarities and differences in the work of a military aviation technician and the work of a civilian aviation technician.

3. Invite representatives of one or more aviation ground crew occupations (aircraft mechanic, air traffic controller, aircraft servicing personnel, ticket agent, etc.) to speak to the class on their career patterns and typical job tasks.

RESOURCES

TASK 1.1

Equipment and Material:	Cockpit diagrams Aviation publications
Audiovisuals:	*Looking Up to Your Aviation Career* (film). Jeppesen Sanderson.

TASK 1.2

References:	*Federal Aviation Regulations.* FAA.

TASK 1.3

Equipment and Material:	Advertisements for ground crew jobs
Audiovisuals:	*Aviation Mechanic* (film). Jeppesen Sanderson. *Flight Line Service* (film). Jeppesen Sanderson.

CONCEPT/DUTY AREA

2. COMPREHENDING THE HISTORY OF AVIATION

TASKS/COMPETENCIES

2.1 Describe the construction and initial flight of the first powered aircraft.

2.2 List the six major milestones in the development of aviation from Kitty Hawk to the present.

2.3 Describe the impact that World War I and World War II had on the development of aviation.

2.4 Explain how aviation has influenced the development of civilization in the 20th century.

CONCEPT/DUTY AREA	COURSE
2. COMPREHENDING THE HISTORY OF AVIATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

2.1 Describe the construction and initial flight of the first powered aircraft.

PERFORMANCE OBJECTIVE

P2.1 Given information on the Wright brothers and the first flight at Kitty Hawk, describe with 75% accuracy the construction and initial flight of the first powered aircraft. Description must include the following: (a) the occupations of the inventors; (b) how and why they became interested in aircraft construction; (c) how the aircraft was constructed; and (d) an account of the first flight.

CRITERION-REFERENCED MEASURE

C2.1 Written test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Construct a simple model of the first powered aircraft.
2. View and discuss the films *History of Flight--Wright Brothers* (Parts I and II).
3. Visit the aerospace section of the Smithsonian Institution in Washington, D. C., and list the five most interesting displays.

CONCEPT/DUTY AREA	COURSE
2. COMPREHENDING THE HISTORY OF AVIATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

2.2 List the six major milestones in the development of aviation from Kitty Hawk to the present.

PERFORMANCE OBJECTIVE

P2.2 Given information from the textbook, library resources, and class discussion, list with 75% accuracy the six major milestones in the history of aviation from Kitty Hawk to the present.

CRITERION-REFERENCED MEASURE

C2.2 Written test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Investigate resources on aviation and the aerospace industry in school and area libraries.

2. View and discuss the videotape *In Celebration of Flight.*

3. Visit the Virginia Aviation Historical Museum at Richmond International Airport, and make a written or oral report on any two of its displays.

CONCEPT/DUTY AREA

2. COMPREHENDING THE HISTORY OF AVIATION

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

2.3 Describe the impact that World War I and World War II had on the development of aviation.

PERFORMANCE OBJECTIVE

P2.3 Given information on aircraft performance before and after both world wars, describe with 75% accuracy the impact of the world wars on the development of world aviation and particularly on aviation in America.

CRITERION-REFERENCED MEASURE

C2.3 Written test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Invite a test pilot to speak to the class on the development of advances in aircraft performance.

2. View and discuss the following FAA videotapes:

   a. *On Wings of Courage*
   b. *The Golden Birds* (B-13 and DC-3).

CONCEPT/DUTY AREA	COURSE
2. COMPREHENDING THE HISTORY OF AVIATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

2.4 Explain how aviation has influenced the development of civilization in the 20th century.

PERFORMANCE OBJECTIVE

P2.4 Given information on the impact of aviation in the 20th century, explain with 70% accuracy in a written essay how aviation has influenced the following areas: (a) transportation; (b) foreign relations; (c) health care; (d) the environment; and (e) technology.

CRITERION-REFERENCED MEASURE

C2.4 Written essay, 70% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Research the influences of aviation on 20th century life, and conduct a class debate on the positive and negative effects of this influence.

2. Review and report on newspaper and magazine articles about the current role and impact of aviation on contemporary life.

RESOURCES

TASK 2.1

Equipment and Material: Materials to construct model aircraft

Audiovisuals: *History of Flight*, Parts I and II (films). FAA.

TASK 2.2

Audiovisuals: *In Celebration of Flight* (videotape). FAA.

TASK 2.3

Audiovisuals: *On Wings of Courage* (videotape). FAA.
The Golden Birds (videotape). FAA.

TASK 2.4

Equipment and Material: Current newspapers and magazines featuring articles on aviation

CONCEPT/DUTY AREA

3. UNDERSTANDING CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT

TASKS/COMPETENCIES

3.1 Describe the four classes of aircraft.

3.2 Identify the nine categories of aircraft.

3.3 Identify the "types" of aircraft.

CONCEPT/DUTY AREA

3. UNDERSTANDING CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

3.1 Describe the four classes of aircraft.

PERFORMANCE OBJECTIVE

P3.1 Given models or photographs of the four classes of aircraft, identify the class of each, and describe its capability and characteristics with 75% accuracy.

CRITERION-REFERENCED MEASURE

C3.1 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Define and identify characteristics of the four classes of aircraft.

2. View photographs of aircraft in various aviation magazines, and identify the class of each.

3. Read and discuss articles and short stories that include information on different aircraft. From the information provided, identify the class of aircraft involved.

CONCEPT/DUTY AREA

3. UNDERSTANDING CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

3.2 Identify the nine categories of aircraft.

PERFORMANCE OBJECTIVE

P3.2 Given 20 photographs of aircraft, including all nine categories, identify the category of each with 75% accuracy.

CRITERION-REFERENCED MEASURE

C3.2 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Define and describe the nine categories of aircraft.

2. View photographs of aircraft in various aviation magazines, and identify the category of each.

3. Review aviation history, noting the roles various classes and categories of aircraft have played in the development of aviation.

CONCEPT/DUTY AREA	COURSE
3. UNDERSTANDING CLASSES, CATEGORIES, AND TYPES OF AIRCRAFT	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

3.1 Identify the "types" of aircraft.

PERFORMANCE OBJECTIVE

P3.3 Given 20 photographs of aircraft, identify the type of each with 75% accuracy.

CRITERION-REFERENCED MEASURE

C3.3 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Define "types" of aircraft.
2. List the names of 25 aircraft on the chalkboard, and have students identify the class, category, and type of each.
3. Show slides of various aircraft, and have students identify the type of each.
4. Give students the type of aircraft, and have them respond with the class and category.

RESOURCES

TASK 3.1

Equipment and Material:

- Models or photographs of the four classes of aircraft
- Articles and short stories featuring aircraft
- Aviation magazines

TASK 3.2

Equipment and Material:

- Photographs of the nine categories of aircraft
- Aviation magazines

TASK 3.3

Equipment and Material:

- Photographs of "types" of aircraft

CONCEPT/DUTY AREA

4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION

TASKS/COMPETENCIES

4.1 State the time of day using 24-hour (military) time.

4.2 Convert civilian time to 24-hour (military) time and vice-versa.

4.3 List the 26 phonetic words for the letters of the alphabet.

4.4 Explain the utility of military time and the phonetic alphabet in aviation.

CONCEPT/DUTY AREA	COURSE
4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

4.1 State the time of day using 24-hour (military) time.

PERFORMANCE OBJECTIVE

P4.1 Given an illustrated list of 10 civilian times shown on a standard clock, state the equivalent military time with 80% accuracy.

CRITERION-REFERENCED MEASURE

C4.1 Written test, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use a standard clock for class practice in converting civilian time to military time.

CONCEPT/DUTY AREA	COURSE
4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

4.2 Convert civilian time to 24-hour (military time)and vice-versa.

PERFORMANCE OBJECTIVE

P4.2 Given 10 examples of civilian time and 10 of military time, convert each time to its civilian or military equivalent with 80% accuracy.

CRITERION-REFERENCED MEASURE

C4.2 Time conversions, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use an airline schedule to convert selected civilian time to military time.
2. Use a typical military flight schedule to convert military time to civilian time.
3. Examine the meridians on a globe. Note the 24 time zones of 15 degrees each, and relate the observation to military time.
4. Use JS transparency 7187 to explain time zones.

CONCEPT/DUTY AREA	COURSE
4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

4.3 List the 26 phonetic words for the letters of the alphabet.

PERFORMANCE OBJECTIVE

P4.3 Given the 26 letters of the alphabet, list with 80% accuracy the phonetic word that corresponds to each letter.

CRITERION-REFERENCED MEASURE

C4.3 Written word list, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Spell individual names, addresses, and the name of the textbook, using the phonetic alphabet.

2. Continue to use the phonetic alphabet and military time in all subsequent discussions and conversations in the aviation program.

CONCEPT/DUTY AREA	COURSE
4. USING MILITARY (24-HOUR) TIME AND PHONETIC ALPHABET IN COMMUNICATION	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

4.4 Explain the utility of military time and the phonetic alphabet in aviation.

PERFORMANCE OBJECTIVE

P4.4 Given a simulated aircraft emergency, provide two reasons why the use of military time and the phonetic alphabet would increase the probability of a successful resolution of the emergency. Answer must be 75% accurate.

CRITERION-REFERENCED MEASURE

C4.4 Written or oral analysis, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review accounts of aircraft emergencies and accidents, and discuss how use of military time and the phonetic alphabet increased the clarity of communication during times of congested and confusing radio transmissions.

RESOURCES

TASK 4.1

Equipment and Material:	Standard clock

TASK 4.2

Equipment and Material:	Airline schedule Military flight schedule Globe
Audiovisuals:	Transparency 7187. Jeppesen Sanderson.

TASK 4.4

Equipment and Material:	Written accounts of aircraft emergencies and accidents

CONCEPT/DUTY AREA

5. EXPLAINING THE FUNCTIONS OF AIRCRAFT COMPONENTS

TASKS/COMPETENCIES

5.1 Identify and explain the functions of the five major components of an airplane.

5.2 Identify and explain the functions of the four major control surfaces of an airplane.

5.3 Identify the rudder, ailerons, and elevator, and explain how the movements of each affect the flight path of an airplane.

CONCEPT/DUTY AREA	COURSE
5. EXPLAINING THE FUNCTIONS OF AIRCRAFT COMPONENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

5.1 Identify and explain the functions of the five major components of an airplane.

PERFORMANCE OBJECTIVE

P5.1 Given models or photographs of 10 different types of aircraft, identify the five major components of each aircraft, and explain the function of each component. Answer must be 70% accurate.

CRITERION-REFERENCED MEASURE

C5.1 Written or oral test, 70% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7051-7058 to illustrate the components of aircraft.
2. Identify the five major components of the static aircraft, and discuss the functions of each component.
3. Review photographs or slides of various aircraft, and identify the components and their functions.
4. Visit Richmond International Airport, and identify the components of several aircraft on various flight lines. Note how the components are designed to suit the purpose of the particular category or type of aircraft.

CONCEPT/DUTY AREA	COURSE
5. EXPLAINING THE FUNCTIONS OF AIRCRAFT COMPONENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

5.2 Identify and explain the functions of the four major control surfaces of an airplane.

PERFORMANCE OBJECTIVE

P5.2 Given models or photographs of 10 different types of airplanes, identify the four major control surfaces of each aircraft, and explain the function of each control surface. Answer must be 80% accurate.

CRITERION-REFERENCED MEASURE

C5.2 Written or oral test, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7051-7058 to illustrate the control surfaces of aircraft.
2. Identify the four major control surfaces of the static aircraft, and discuss the function of each surface.
3. Review photographs or slides of various aircraft, and identify the control surfaces and their functions.
4. Visit Richmond International Airport, and identify the control surfaces of several aircraft on various flight lines. Note how the surfaces are designed to suit the purpose of the particular category or type of aircraft.

CONCEPT/DUTY AREA	COURSE
5. EXPLAINING THE FUNCTIONS OF AIRCRAFT COMPONENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

5.3 Identify the rudder, ailerons, and elevator, and explain how the movements of each affect the flight path of an airplane.

PERFORMANCE OBJECTIVE

P5.3 Given an aircraft model, identify the rudder, ailerons, and elevator, and explain how movements of these controls affect the flight path of the aircraft. Answer must be 80% accurate.

CRITERION-REFERENCED MEASURE

C5.3 Written or oral test, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review JS transparencies 7051-7058 to illustrate the function of control surfaces.
2. Using paper airplanes, learn how a modified airfoil can function as a control surface and affect the flight path of even a paper airplane.
3. Buy or construct and fly a gas model aircraft.

RESOURCES

TASK 5.1

Equipment and Material:
- Models or photographs of 10 different types of aircraft
- Static aircraft

Audiovisuals:
- Transparencies 7051-7058. Jeppesen Sanderson.

TASK 5.2

Equipment and Material:
- Models or photographs of 10 different types of aircraft
- Static aircraft

Audiovisuals:
- Transparencies 7051-7058. Jeppesen Sanderson.

TASK 5.3

Equipment and Material:
- Model aircraft
- Paper airplanes
- Gas model aircraft (or materials to construct one)

Audiovisuals:
- Transparencies 7051-7058. Jeppesen Sanderson.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

TASKS/COMPETENCIES

6.1 Explain the four forces of flight and how each affects an aircraft in straight-and-level flight.

6.2 List and define common aerodynamic terms.

6.3 Explain how an airfoil's lift and angle of attack are affected by relative wind and airspeed.

6.4 Explain the concept of angle of attack and airfoil stall.

6.5 Explain how rudder, aileron, and elevator deflection move an airplane about the center of gravity through each of the three axes of flight.

6.6 Describe the role of lift, weight, drag, and thrust on a climbing, descending, and turning airplane.

6.7 Describe how centrifugal force, yaw, and skid are associated with a turning aircraft.

6.8 Explain the five types of aircraft stability.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.1 Explain the four forces of flight and how each affects an aircraft in straight-and-level flight.

PERFORMANCE OBJECTIVE

P6.1 Given an aircraft model, name the four forces of flight, and explain how each affects an aircraft in straight-and-level flight. Answer must be 75% accurate.

CRITERION-REFERENCED MEASURE

C6.1 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. View and discuss the following videos:

   Principles of Flight
   How Airplanes Fly.

2. View and discuss JS transparency 7052 (four forces of flight).

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.2 List and define common aerodynamic terms.

PERFORMANCE OBJECTIVE

P6.2 Given a list of 20 aerodynamic definitions, list the aviation term for each definition with 80% accuracy.

CRITERION-REFERENCED MEASURE

C6.2 Written test, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review selected JS transparencies to reinforce terms associated with aerodynamics.

2. Use the Appleworks CROSSWORD MAGIC computer program to construct crossword puzzles using aerodynamic terms.

3. Review aviation magazines and advertisements, and interpret the aviation terms used.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.3 Explain how an airfoil's lift and angle of attack are affected by relative wind and airspeed.

PERFORMANCE OBJECTIVE

P6.3 Given an airfoil, explain with 75% accuracy how lift and angle of attack are affected by relative wind and airspeed.

CRITERION-REFERENCED MEASURE

C6.3 Explanation of effect of relative wind and airspeed on lift and angle of attack, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparency 7079 to illustrate how Bernoulli's Principle is related to lift and angle of attack.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.4 Explain the concept of angle of attack and airfoil stall.

PERFORMANCE OBJECTIVE

P6.4 Given an airfoil or a chalkboard diagram of an airfoil, demonstrate with 75% accuracy the relationship between angle of attack and airfoil stall.

CRITERION-REFERENCED MEASURE

C6.4 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Using paper airplanes, demonstrate what happens when an aircraft stalls. Have students repeat the demonstration.

2. View and discuss the video *Stalling for Safety*.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.5 Explain how rudder, aileron, and elevator deflection move an airplane about the center of gravity through each of the three axes of flight.

PERFORMANCE OBJECTIVE

P6.5 Given an aircraft model, explain with 80% accuracy how rudder, aileron, and elevator deflection cause movement about the center of gravity through each of the three axes of flight.

CRITERION-REFERENCED MEASURE

C6.5 Demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Using a model aircraft as a prop, demonstrate movement through the center of gravity and the three axes of flight.

2. Discuss the movements of an aircraft in flight, using a model aircraft and JS transparencies 7066, 7076, and 7077 to illustrate.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.6 Describe the role of lift, weight, drag, and thrust on a climbing, descending, and turning airplane.

PERFORMANCE OBJECTIVE

P6.6 Given a model aircraft simulating climbs, turns, and descents, explain with 75% accuracy the role of lift, weight, drag, and thrust during each maneuver.

CRITERION-REFERENCED MEASURE

C6.6 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review JS transparency 7052 (four forces of flight).

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.7 Describe how centrifugal force, yaw, and skid are associated with a turning aircraft.

PERFORMANCE OBJECTIVE

P6.7 Given a model aircraft, explain with 75% accuracy how centrifugal force, yaw, and skid affect the aircraft in a turn.

CRITERION-REFERENCED MEASURE

C6.7 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Divide students into pairs. Give each pair a model aircraft, and have them demonstrate for each other the forces involved in climbs, turns, and descents.

2. Review JS transparencies 7066, 7076, and 7077.

CONCEPT/DUTY AREA

6. UNDERSTANDING THE THEORY OF FLIGHT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

6.8 Explain the five types of aircraft stability.

PERFORMANCE OBJECTIVE

P6.8 Given a model aircraft, explain with 75% accuracy the five types of aircraft stability.

CRITERION-REFERENCED MEASURE

C6.8 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review stability, using JS transparencies 7066, 7076, and 7077.
2. Use paper airplanes to demonstrate various types of aircraft stability.

RESOURCES

TASK 6.1

Equipment and Material: Model aircraft

Audiovisuals: *Principles of Flight* (videotape). Jeppesen Sanderson.
How Airplanes Fly (videotape). FAA.

Transparency 7052. Jeppesen Sanderson.

TASK 6.2

Equipment and Materials: Aviation magazines and advertisements

Audiovisuals: Appleworks CROSSWORD MAGIC (computer program). Apple.

TASK 6.3

Equipment and Material: Airfoil

Audiovisuals: Transparency 7079. Jeppesen Sanderson.

TASK 6.4

Equipment and Material: Airfoil
Paper airplanes

Audiovisuals: *Stalling for Safety* (videotape). FAA.

TASK 6.5

Equipment and Material: Model aircraft

Audiovisuals: Transparencies 7066, 7076, 7077. Jeppesen Sanderson.

CONCEPT/DUTY AREA

7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS

TASKS/COMPETENCIES

7.1 Explain how the aircraft's movement in the atmosphere is registered on the altimeter, vertical speed indicator, and airspeed indicator.

7.2 Explain the four types of airspeed and how the pilot determines each.

7.3 Explain the five types of altitude and how they affect the performance of an aircraft.

7.4 Explain the cause of altimeter error.

7.5 Explain how the concept of a gyroscope is used to register the position of an aircraft in relation to the horizon.

7.6 Explain how the three gyroscopic instruments--attitude indicator, heading indicator, and turn coordinator--indicate an aircraft's movement in space.

7.7 Explain the difference between true north and magnetic north and how the difference is corrected with variation and deviation information.

7.8 Explain the three compass errors encountered in acceleration, deceleration, and turning maneuvers.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.1 Explain how the aircraft's movement in the atmosphere is registered on the altimeter, vertical speed indicator, and airspeed indicator.

PERFORMANCE OBJECTIVE

P7.1 Given a model aircraft and a table as the earth's surface, explain with 80% accuracy how vertical and horizontal movement are registered on the altimeter, vertical speed indicator, and airspeed indicator.

CRITERION-REFERENCED MEASURE

C7.1 Demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Observe altimeters, vertical speed indicators, and airspeed indicators from an aircraft, and discuss how they are read by a pilot.

2. Use JS transparencies 7167, 7170, and 7175 to demonstrate how the static instruments record an aircraft's movement through the atmosphere.

3. Blindfold students in the GAT-1 or ATC simulator, and have them point to the normal positions of the altimeter, vertical speed indicator, and airspeed indicator.

4. Provide students with cockpit orientation in the simulator.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.2 Explain the four types of airspeed and how the pilot determines each.

PERFORMANCE OBJECTIVE

P7.2 Given a chalkboard and the cockpit registered indicated airspeed (IAS), explain with 75% accuracy how the pilot determines the other three airspeeds.

CRITERION-REFERENCED MEASURE

C7.2 Demonstration, 75% accuracy.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Discuss how airspeed indicators and the calibration from an aircraft are interpreted by the pilot.

2. Review JS transparencies on static instruments, and discuss the various airspeeds.

3. Blindfold students in the GAT-1 or ATC simulator, and have them point to the normal position of all static instruments.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.3 Explain the five types of altitude and how they affect the performance of an aircraft.

PERFORMANCE OBJECTIVE

P7.3 Given a model aircraft, a table used as the earth's surface, a temperature gauge, and a humidity gauge, explain with 75% accuracy the five types of altitude and how they affect the performance of an aircraft.

CRITERION-REFERENCED MEASURE

C7.3 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7101, 7111, 7112, and 7113 to explain how atmospheric conditions affect altimeter readings and aircraft performance.

CONCEPT/DUTY AREA

7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.4 Explain the cause of altimeter error.

PERFORMANCE OBJECTIVE

P7.4 Given information on changes in atmospheric pressure and a cockpit altimeter, explain with 80% accuracy how improper altimeter settings can cause the reading on the cockpit altimeter to be dangerously misleading.

CRITERION-REFERENCED MEASURE

C7.4 Oral test and demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Using an actual altimeter from an aircraft, change altimeter settings and note the effect each change has on altitude readings.

2. Review JS transparencies 7101, 7102, 7111, 7112, and 7113 to illustrate the effects of atmospheric conditions on flight performance.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.5 Explain how the concept of a gyroscope is used to register the position of an aircraft in relation to the horizon.

PERFORMANCE OBJECTIVE

P7.5 Given a toy gyroscope, explain with 75% accuracy how the concept of a gyroscope can be useful to drive a cockpit instrument that gives the aircraft's attitude in relation to the horizon.

CRITERION-REFERENCED MEASURE

C7.5 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use a toy gyroscope to demonstrate how it tends to remain rigid or fixed in space while spinning and its tendency to yield gradually to outside forces that over time cause a "precession" error.

2. Observe an actual gyro instrument taken from an aircraft, open its base, note the gyro inside, and examine how it provides the cockpit reading.

CONCEPT/DUTY AREA

7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.6 Explain how the three gyroscopic instruments--attitude indicator, heading indicator, and turn coordinator--indicate an aircraft's movement in space.

PERFORMANCE OBJECTIVE

P7.6 Given the three gyroscopic instruments, explain with 80% accuracy how the instruments indicate an aircraft's attitude, heading, and turning movement.

CRITERION-REFERENCED MEASURE

C7.6 Demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Place static and gyroscopic aircraft instruments side by side, and note the differences in operation and appearance.

2. Use JS transparencies 7167, 7172, and 7174 to demonstrate the peculiarites of gyroscopic instruments.

3. Use the simulators to orient students to the location and operation of the static and gyro instruments.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.7 Explain the difference between true north and magnetic north and how the difference is corrected with variation and deviation information.

PERFORMANCE OBJECTIVE

P7.7 Given a globe and a magnetic compass, explain with 80% accuracy the difference between true north and magnetic north and how the difference is corrected with variation and deviation information.

CRITERION-REFERENCED MEASURE

C7.7 Oral test and demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Observe an aeronautical sectional chart, noting the depictions of magnetic variation along lines of south and north.

2. Using a globe, note the location of the earth's magnetic fields and how they would affect a magnetic compass's indication of north when the compass is located at different positions on the earth.

3. Distribute cockpit compass deviation cards to students, and have them notice how the amount of correction varies with the cardinal compass headings.

4. Draw course lines on the sectional chart, and apply magnetic variation to arrive at a proper compass heading to fly the aircraft.

CONCEPT/DUTY AREA	COURSE
7. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT FLIGHT INSTRUMENTS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

7.8 Explain the three compass errors encounted in acceleration, deceleration, and turning maneuvers.

PERFORMANCE OBJECTIVE

P7.8 Given a magnetic compass in acceleration, deceleration, and turning motions, explain with 75% accuracy why the compass reading viewed by the pilot may not be the aircraft's actual magnetic heading.

CRITERION-REFERENCED MEASURE

C7.8 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Holding a magnetic compass, note how turn, acceleration, and deceleration affect the compass performance.

2. Blindfold students, and have them make a cockpit check on positions of all flight instruments (static and gyro) in the simulators.

3. Use JS transparencies 7167, 7171, and 7173 to discuss the characteristics of a magnetic compass.

RESOURCES

TASK 7.1

Equipment and Material:	Model aircraft Table Altimeters Vertical speed indicators Airspeed indicators GAT-1 or ATC simulator Blindfolds
Audiovisuals:	Transparencies 7167, 7170, 7175, Jeppesen Sanderson.

TASK 7.2

Equipment and Material:	GAT-1 or ATC simulator Blindfolds

TASK 7.3

Equipment and Material:	Model aircraft Table Temperature gauge Humidity gauge

TASK 7.4

Equipment and Material:	Altimeter
Audiovisuals:	Transparencies 7101, 7102, 7111, 7112, 7113, Jeppesen Sanderson.

TASK 7.5

Equipment and Material:	Toy gyroscope Aircraft gyroscopic instrument

RESOURCES (continued)

TASK 7.6

Equipment and Material:	Static aircraft instruments Gyroscopic instruments (altitude indicator, heading indicator, turn coordinator) GAT-1 or ATC simulator
Audiovisuals:	Transparencies 7167, 7172, 7173, 7174. Jeppesen Sanderson.

TASK 7.7

Equipment and Material:	Globe Magnetic compass Aeronautical sectional chart Cockpit compass deviation cards

TASK 7.8

Equipment and Material:	Magnetic compass Blindfolds GAT-1 or ATC simulator
Audiovisuals:	Transparencies 7167, 7171, 7173, Jeppesen Sanderson.

CONCEPT/DUTY AREA

8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS

TASKS/COMPETENCIES

8.1 Explain the four-stroke operating cycle of a reciprocating engine.

8.2 Explain the cause and effect of engine detonation and preignition and the corrective action the pilot should take in either case.

8.3 Explain the operation of the four major components in the reciprocating engine ignition system: magnetos, spark plugs, interconnecting wires, and ignition switch.

8.4 Explain the components of the float-type carburetor and how the carburetor's design enhances the formation of carburetor ice.

8.5 Explain the functions of the engine oil system and how the system is monitored in the cockpit.

8.6 Explain the operation of the air cooling system and how the system is monitored in the cockpit.

8.7 Explain how thrust is produced in both the fixed pitch and constant speed aircraft propellers and how RPM is registered on the tachometer.

8.8 Explain the operation of high and low wing aircraft fuel systems and how they are monitored in the cockpit.

8.9 Explain the operation of an aircraft's electrical system.

CONCEPT/DUTY AREA

8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.1 Explain the four-stroke operating cycle of a reciprocating engine.

PERFORMANCE OBJECTIVE

P8.1 Given a cross sectional diagram of the four cylinders in a reciprocating engine, diagram and label in sequence the positions of the pistons, valves, and direction of the gases during the four-stroke cycle. Answer must be 75% accurate.

CRITERION-REFERENCED MEASURE

C8.1 Completed diagram, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7061 and 7062 to illustrate operation of a four-stroke cycle.

2. Use a cross-section engine mockup to demonstrate the operation of the four-stroke cycle.

3. Invite a second-year auto mechanics student to explain the operation of a four-stroke cycle engine to the class.

CONCEPT/DUTY AREA

8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.2 Explain the cause and effect of engine detonation and preignition and the corrective action the pilot should take in either case.

PERFORMANCE OBJECTIVE

P8.2 Given information on detonation and preignition, explain with 75% accuracy the cause and probable result of these conditions and the corrective action the pilot should take in each case.

CRITERION-REFERENCED MEASURE

C8.2 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Review JS transparencies 7061 and 7062 to illustrate detonation and preignition.

2. Have students use the simulators to practice corrective action for detonation and preignition.

CONCEPT/DUTY AREA

8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.3 Explain the operation of the four major components in the reciprocating engine ignition system: magnetos, spark plugs, interconnecting wires, and ignition switch.

PERFORMANCE OBJECTIVE

P8.3 Given a diagram of an aircraft's ignition system, explain with 75% accuracy the functions of the magnetos, spark plugs, interconnecting wires, and ignition switch.

CRITERION-REFERENCED MEASURE

C8.3 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparency 7080 to illustrate operation of the ignition system.
2. Have students sit in cockpit of simulator and operate the switches and controls of the ignition system.
3. Invite an aircraft mechanic to discuss common problems encountered with an aircraft's ignition system.

CONCEPT/DUTY AREA	COURSE
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.4 Explain the components of the float-type carburetor and how the carburetor's design enhances the formation of carburetor ice.

PERFORMANCE OBJECTIVE

P8.4 Given a diagram of a float-type carburetor, explain with 75% accuracy the operation of each component (fuel-air mixture chamber, float chamber, fuel, venturi, discharge nozzle, mixture lever, fuel inlet, air intake, throttle valve, air bleed) and how carburetor design enhances the formation of carburetor ice.

CRITERION-REFERENCED MEASURE

C8.4 Oral test and demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Examine an old carburetor from an aircraft, and identify and manipulate the various parts and controls.
2. Use JS transparencies 7083-7086 to illustrate the operation of the float-type carburetor and the formation of carburetor ice.
3. Indicate the location where carburetor ice forms.

CONCEPT/DUTY AREA	COURSE
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.5 Explain the functions of the engine oil system and how the system is monitored in the cockpit.

PERFORMANCE OBJECTIVE

P8.5 Given a diagram of an engine oil system, explain with 80% accuracy the functions of the system components (oil pump, filler cap, dipstick, cooler, filter, and pump) and how the system components are monitored in the cockpit.

CRITERION-REFERENCED MEASURE

C8.5 Demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use static aircraft to demonstrate how to check the engine oil level.

CONCEPT/DUTY AREA	COURSE
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.6 Explain the operation of the air cooling system and how the system is monitored in the cockpit.

PERFORMANCE OBJECTIVE

P8.6 Given access to an aircraft engine, explain with 75% accuracy the operation of its cooling system and how the system is monitored in the cockpit.

CRITERION-REFERENCED MEASURE

C8.6 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Examine both a radial aircraft engine and an automobile engine, and discuss the differences in the two cooling systems.

2. Examine actual cockpit cylinder head temperature gauges, and discuss how monitoring of these gauges can be used to prevent detonation and preignition.

CONCEPT/DUTY AREA

8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.7 Explain how thrust is produced in both the fixed pitch and constant speed aircraft propellers and how RPM is registered on the tachometer.

PERFORMANCE OBJECTIVE

P8.7 Given a diagram of an engine with an attached propeller, explain with 75% accuracy how pitch and angle of attack in both constant speed and fixed pitch propellers produce thrust and how RPM is registered on the tachometer.

CRITERION-REFERENCED MEASURE

C8.7 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7060, 7061, 7150, and 7152 to illustrate propeller and tachometer operation.
2. Compare the hubs of variable pitched and fixed pitch propellers.
3. Compare the throttle quadrants of aircraft with variable pitched propellers and fixed pitch propellers.

CONCEPT/DUTY AREA	COURSE
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.8 Explain the operation of high and low wing aircraft fuel systems and how they are monitored in the cockpit.

PERFORMANCE OBJECTIVE

P8.8 Given diagrams of aircraft with high and low wings, explain with 80% accuracy the difference in their fuel systems and how the systems are monitored in the cockpit.

CRITERION-REFERENCED MEASURE

C8.8 Demonstration, 80% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7081 and 7082 to illustrate the two types of aircraft fuel systems.
2. Use the static aircraft to demonstrate how to take fuel samples from the fuel tanks.
3. Use JS transparency 7165 to illustrate the fuel quantity system.

CONCEPT/DUTY AREA	COURSE
8. UNDERSTANDING THE FUNCTIONS OF AIRCRAFT SYSTEMS	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

8.9 Explain the operation of an aircraft's electrical system.

PERFORMANCE OBJECTIVE

P8.9 Given a diagram of an aircraft's electrical system, explain with 75% accuracy the operation of the components: alternator, battery, master battery/alternator switch, circuit breakers, and ammeter.

CRITERION-REFERENCED MEASURE

C8.9 Demonstration, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Using the simulators, have students perform a blindfold check of all flight and engine instruments, operating switches, and controls found in a typical light aircraft.

2. Review JS transparency 7080 to identify the components of the electrical system.

RESOURCES

TASK 8.1

Equipment and Material:	Diagram of four-cylinder engine Mockup of cross-section of four-cylinder engine
Audiovisuals:	Transparencies 7061, 7062. Jeppesen Sanderson.

TASK 8.2

Equipment and Material:	GAT-1 or ATC simulator
Audiovisuals:	Transparencies 7061, 7062. Jeppesen Sanderson.

TASK 8.3

Equipment and Material:	Diagrams of aircraft ignition system GAT-1 or ATC simulator
Audiovisuals:	Transparency 7080. Jeppesen Sanderson.

TASK 8.4

Equipment and Material:	Diagrams of float-type carburetor Aircraft carburetor
Audiovisuals:	Transparencies 7083-7086. Jeppesen Sanderson.

RESOURCES (continued)

TASK 8.5

Equipment and Material:	Diagrams of engine oil system Static aircraft

TASK 8.6

Equipment and Material:	Radial aircraft engine Automobile engine Cylinder head, temperature gauges

TASK 8.7

Equipment and Material:	Diagram of aircraft engine with attached propeller Pitched and fixed pitch propellers Throttle quadrants
Audiovisuals:	Transparencies 7060, 7061, 7150, 7152. Jeppesen Sanderson.

TASK 8.8

Equipment and Material:	Diagrams of aircraft with high and low wings Static aircraft
Audiovisuals:	Transparencies 7165, 7081, 7082. Jeppesen Sanderson.

TASK 8.9

Equipment and Material:	Diagrams of aircraft electrical system Blindfolds GAT-1 or ATC simulator
Audiovisuals:	Transparency 7080. Jeppesen Sanderson.

CONCEPT/DUTY AREA

9. UNDERSTANDING HOW TO PREDICT AIRCRAFT PERFORMANCE

TASKS/COMPETENCIES

9.1 Explain how density altitude, wind, runway conditions, and humidity affect the performance of an aircraft.

9.2 Compute performance data from each of the 12 performance charts located in a pilot's operating handbook (POH).

9.3 Demonstrate the proper method of interpolation.

CONCEPT/DUTY AREA

9. UNDERSTANDING HOW TO PREDICT AIRCRAFT PERFORMANCE

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

9.1 Explain how density altitude, wind, runway conditions, and humidity affect the performance of an aircraft.

PERFORMANCE OBJECTIVE

P9.1 Given a surface temperature of 97° F, a cross wind component of 15 knots, a wet runway, and a relative humidity of 92%, describe with 75% accuracy how the aircraft will perform on takeoff and climb.

CRITERION-REFERENCED MEASURE

C9.1 Written or oral test, 75% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7101 and 7102 to illustrate the effect that atmospheric conditions have on an aircraft's performance.
2. View and discuss the film *Density Altitude.*
3. View and discuss the video *Aircraft Systems and Performance.*

CONCEPT/DUTY AREA

9. UNDERSTANDING HOW TO PREDICT AIRCRAFT PERFORMANCE

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

9.2 Compute performance data from each of the 12 performance charts located in a pilot's operating handbook (POH).

PERFORMANCE OBJECTIVE

P9.2 Given the pilot's operating handbook for the Cessna 152, compute one problem from each of the 12 performance charts for the aircraft. Answer must be within 15% of the exact figure for at least 10 of the 12 problems.

CRITERION-REFERENCED MEASURE

C9.2 12 computations, 85% accuracy for 10 of 12 problems

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Distribute samples of the 12 standard performance charts, and have students practice extracting data from each.

2. Have students work in pairs and practice extracting data from performance charts.

CONCEPT/DUTY AREA

9. UNDERSTANDING HOW TO PREDICT AIRCRAFT PERFORMANCE

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

9.3 Demonstrate the proper method of interpolation.

PERFORMANCE OBJECTIVE

P9.3 Given five computation problems with an aircraft performance chart, provide the best five answers by using the method of interpolation. Answers must be within 2% of the exact figure for four of the five problems.

CRITERION-REFERENCED MEASURE

C9.3 5 computations, 98% accuracy for 4 of 5 problems

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Distribute samples of each of the 12 performance charts, and have students practice extracting data using the interpolation method.

RESOURCES

TASK 9.1

Audiovisuals:

Transparencies 7101, 7102. Jeppesen Sanderson.
Density Altitude (film). FAA.
Aircraft Systems and Performance (videotape). Jeppesen Sanderson.

TASK 9.2

Equipment and Material:

Copies of the 12 standard performance charts
Pilot's operating handbook for the Cessna 152

TASK 9.3

Equipment and Material:

Copies of the 12 standard performance charts

CONCEPT/DUTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

TASKS/COMPETENCIES

10.1 Explain the difference between airplane weight and empty weight.

10.2 Define the following terms: empty weight, center of gravity, datum line, station, moment, and arm.

10.3 Compute moment problems with varied arms and weights.

10.4 Complete an aircraft weight and balance form using the computational method.

10.5 Complete weight and balance forms using both the graph and table methods.

10.6 Demonstrate use of the weight shift formula.

CONCEPT/DUTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.1 Explain the difference between airplane weight and empty weight.

PERFORMANCE OBJECTIVE

P10.1 Given a model aircraft, explain with 85% accuracy the difference between its airplane weight and empty weight.

CRITERION-REFERENCED MEASURE

C10.1 Demonstration, 85% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Distribute an aircraft POH, and have students look up the airplane weight and empty weight.

2. Use JS transparencies 7176 and 7177 to explain the importance of weight and balance.

CONCEPT/D JTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.2 Define the following terms: empty weight, center of gravity, datum line, station, moment, and arm.

PERFORMANCE OBJECTIVE

P10.2 Given a model or diagram of an aircraft, define with 100% accuracy five of the following six terms: empty weight, center of gravity, datum line, station, moment, and arm.

CRITERION-REFERENCED MEASURE

C10.2 Six definitions, 100% accuracy for five of the six

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Divide students into pairs, and have them study the POH, textbook, and diagrams of aircraft; then have students quiz each other on weight and balance terms.

2. Use JS transparency 7178 to explain how to find the balance point in an aircraft.

CONCEPT/DUTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.3 Compute moment problems with varied arms and weights.

PERFORMANCE OBJECTIVE

P10.3 Given a weight of 50 pounds and an arm of 100 feet on side A, a weight of 100 pounds on side B, and equal moments of 5000 pound-inches, solve with 85% accuracy for the moment arm on side B.

CRITERION-REFERENCED MEASURE

C10.3 Computation, 85% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. View FAA video *Weight and Balance* to help explain the procedures for computing the weight and balance of aircraft.

2. Have students use the textbook and solve several moment arm problems.

CONCEPT/DUTY AREA	COURSE
10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT	Aviation Pilot Training I (Semester I) Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.4 Complete an aircraft weight and balance form using the computational method.

PERFORMANCE OBJECTIVE

P10.4 Given a weight and balance form and the data for solving a normal loading problem, complete the form using the computational method, with 85% accuracy.

CRITERION-REFERENCED MEASURE

C10.4 Completed weight and balance form, 85% accuracy

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparency 7179 to explain the computational method for weight and balance problems.

2. Distribute five blank weight and balance forms with the accompanying data for each. Have students divide into pairs and practice completing the forms using the computational method.

CONCEPT/DUTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.5 Complete weight and balance forms using both the graph and table methods.

PERFORMANCE OBJECTIVE

P10.5 Given two weight and balance forms and two sets of weight and balance data, complete both forms, using the graph method for one and the table method for the other. Both forms must be completed with 85% accuracy.

CRITERION-REFERENCED MEASURE

C10.5 Two completed forms, 85% accuracy for each form

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use JS transparencies 7189 and 7181 to explain the graph and table methods of solving weight and balance problems.

2. Divide students into pairs, and distribute several weight and balance forms and accompanying data to each pair. Have one member of each group complete the forms using the graph method and the other using the table method. When they have completed the forms, have students compare results.

CONCEPT/DUTY AREA

10. UNDERSTANDING HOW TO COMPUTE WEIGHT AND BALANCE IN A LIGHT AIRCRAFT

COURSE

Aviation Pilot Training I (Semester I)
Aviation Technician Training I (Semester I)

TASK/COMPETENCY

10.6 Demonstrate use of the weight shift formula.

PERFORMANCE OBJECTIVE

P10.6 Given an airplane weight of 3200 pounds, cargo weight of 99.4 pounds, and a distance between cargo arms of 103 inches, determine within ± one inch the distance the center of gravity must be moved for a safe flight.

CRITERION-REFERENCED MEASURE

C10.6 Computation, accuracy of ± one inch.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

1. Use the static aircraft to demonstrate how weight shifts are determined and how center-of-gravity shifts can be dangerous to flight.

2. Divide students into pairs, and distribute several weight shift problems for each pair to solve.

RESOURCES

TASK 10.1

Equipment and Material:	Aircraft model Pilot's operating handbook
Audiovisuals:	Transparencies 7176, 7177. Jeppesen Sanderson.

TASK 10.2

Equipment and Material:	Aircraft models or diagram Pilot's operating handbook
Audiovisuals:	Transparency 7178. Jeppesen Sanderson.
Reference:	*Aviation Fundamentals.* Jeppesen Sanderson.

TASK 10.3

Audiovisuals:	*Weight and Balance* (videotape). FAA.
Reference:	*Aviation Fundamentals.* Jeppesen Sanderson.

TASK 10.4

Equipment and Material	Weight and balance forms Weight and balance data
Audiovisuals:	Transparency 7179. Jeppesen Sanderson.

TASK 10.5

Equipment and Material:	Weight and balance forms Weight and balance data
Audiovisuals:	Transparencies 7189, 7181. Jeppesen Sanderson.

TASK 10.6

Equipment and Material:	Static aircraft Weight shift problems

The activity which is the subject of this report was supported in whole or in part by the U.S. Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Department of Education, and not official endorsement by the U.S. Department of Education should be inferred.