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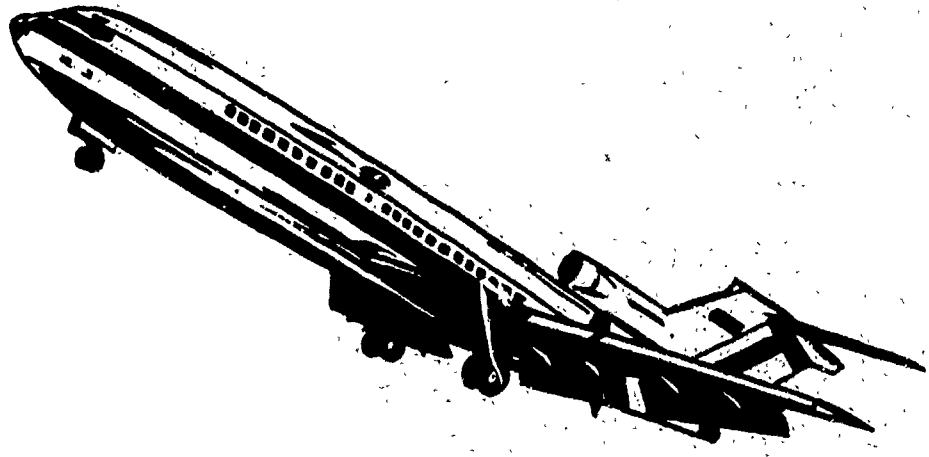
ABSTRACT

The guide was developed to provide secondary students the opportunity to study aviation and aerospace education from the conceptual and career approach coupled with general education specifically related to science. Unit plans were prepared to motivate, develop skills, and offer counseling to the students of aviation science and occupational aerospace education. The course is designed as a three-year study program comprising Aviation Science One (First Semester, 10 units); Aviation Science Two (Second Semester, 10 units); Occupational Aerospace Three (Second Year, 11 units); Occupational Aerospace Four (Third Year, 14 units). Each unit is outlined under the following headings: teaching unit objectives; recommended prerequisites; teaching unit length; evaluation; teacher competency; instructional materials; general comment; student behavioral objective; and for each objective, content, suggested learning experiences, evaluation techniques, and instructional materials. Texts and audiovisual instructional resources are listed for use in the program as well as tools and equipment needed for the study of aerospace/aviation science. (Author/EC)

AEROSPACE/AVIATION SCIENCE OCCUPATIONS



Aerospace I 7397
Aerospace II 7398

TRADE AND INDUSTRIAL EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION
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PREFACE

In terms of time for communication and transportation, the world has shrunk. We are able to observe olympic activities taking place in Munich, Germany instantaneously by satellite. We can transact business person to person by telephone three thousand miles away. Man has traveled to the moon and returned in less than ten days. However, for fast mass transportation, the airplane is the prime vehicle. It has played a tremendous part and still is in bringing about interaction of people of diverse cultural and ethnic backgrounds.

This interaction has resulted in great interdependence of people and the concomitant problems. The industry, generated by the airplane, employs one of every fifteen adults earning a living in manufacturing. This industry is growing rapidly in the general, commerce, and military aspects of aviation. The combination of aviation and aerospace promises many new vista for the future.

With the foregoing as backdrop, this guide has been developed to provide secondary students the opportunity to have the specific experience of studying aviation and aerospace education from the occupational and career approach as well as general education, specifically related to science.

It is hoped that these units developed in aviation science and occupational aerospace education will motivate, develop skills, and offer counseling to those students who would like to know more about aerospace education.

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science

DESCRIPTION: The career cluster of aviation science is a broad-based high school one or two semester laboratory science course designed to give students an insight into the many facets of aviation. The design of the course is one of a group of related teaching units pertaining to the scientific aspects of aviation. It is anticipated that use and emphasis of particular units will depend on the nature of the community and needs of the students. The student is introduced to basic aeronautical topics such as aerodynamics, aircraft components, meteorology, navigation, principles of flight, instruments and systems, power plants, weight and balance, and flight computer functions. The units are designed to begin aviation/aerospace education at the secondary level.

PURPOSES: The purpose of the course is to generate student interest in and an awareness of the impact of the aviation industry upon our society as well as to provide the students with the necessary background for them to make a decision as whether they should pursue an aviation/aerospace occupation. Learning activities designed to accomplish these purposes will be centered around supervised classroom and laboratory experiences as well as actual flight experiences.

CREDITS: The course may be offered as:

1. a one hour, one semester course, with one half unit credit for 90 hours.
2. a one hour, one year course, with one unit credit for 180 hours.
3. two units of credit for 300 hours of scheduled instruction.
4. three units of credit for 450 hours of scheduled instruction.

SPECIAL OR UNIQUE ASPECTS OF PROGRAM: This program will combine general education and occupational education by utilizing the science cluster as a prerequisite to the occupational clusters. The program includes a cross-country flight of approximately 40 miles for the student.

PHYSICAL FACILITIES: For a comprehensive offering in the area of aviation science, the following facilities are needed:

1. 30 - 35 square feet of classroom space per pupil.
2. Access to a science laboratory with flat top desks.

EQUIPMENT: Basic physical science equipment and classroom, also individual computers are necessary.

RECOMMENDED CLASS SIZE: A maximum of twenty-five students. The physical facilities available will aid in determining the class size. The nature of the offering and expertise of teacher will effectively determine the number of students that can be enrolled.

TEACHER CERTIFICATION: Possess a valid state teaching certificate and:

1. attend North Carolina aviation science workshop. Work toward a valid FAA Private Pilot certificate or higher.
2. or possess a valid FAA Basic Ground Instructor certificate or higher.
3. or have earned six semester hours in an aviation/aerospace course or workshop.

EVALUATION: In addition to periodic evaluation by the Division of Science Education of the North Carolina State Department of Public Instruction, the following self and local evaluations should be made:

1. Are units taught which are relative to the needs of students and the

community?

2. How many students enter the field of aviation/aerospace after graduation?

3. How many students continue their education in the area of aviation/aerospace after graduation?

UNIT DESIGN: Each unit in the cluster aviation science has a recommended number of hours of instruction that the unit should require. The career cluster of aviation is designed with a total of 180 hours of instruction. The program is constructed in such a way that a student may select to complete from one semester up to the full three year program - i.e. including occupational aerospace II and III.

TEACHING UNITS: Aviation Science I:

1. Instruction to Aerospace (History)
2. Principles of Flight
3. Weight and Balance
4. Basic Engine Instruments
5. Basic Aeronautical Meteorology
6. Introduction to Power Plants
7. Flight Computer Functions
8. Basic Navigation
9. Aeronautical Communications
10. Physiology of Flight

Units of Aviation Science II offer learning experiences that begin where those of Aviation Science I end.

1. Principles of Flight
2. Weight and Balance

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: The Career Cluster of Occupational Aerospace consists of a varied group of teaching units pertaining to the broad field of aviation/aerospace. Subject matter and learning experiences are designed so units may be used as a complete course, or as separate teaching units. It is primarily a shop course, but may be structured to fit the situation.

PURPOSES: Instruction is provided to acquaint students with the overall impact of aviation/aerospace on society, develop skills in industry related fields, impart knowledge of operations, and familiarize participants with the many opportunities and occupations of the industry.

CREDITS: Occupational Aerospace II is offered as one hour, one year course, with one unit credit for 180 hours. Occupational Aerospace III is offered as a two hour block, one year course, with two units of credit for 360 hours.

SPECIAL OR UNIQUE ASPECTS OF PROGRAM: The program is unique in requiring a general education course as a prerequisite. Units of this course may be used in any course if content is acceptable.

PHYSICAL FACILITIES:

1. Adequate classroom space - 30 - 40 square feet per student.
2. Storage space for teaching materials 100 square feet minimum.
3. Available shop area of 2,500 - 3,000 square feet, with adequate storage for tools, materials and equipment.

RECOMMENDED CLASS SIZE: The number of students should be determined by facilities available, nature of units offered and qualifications of teacher.

EVALUATION: Evaluation will be made on a continuing basis by the Division of Occupational Education of The North Carolina State Department of Public Instruction. In addition, the following evaluations should also be made:

1. Evaluation by State Aerospace Education Advisory Committee.
2. Local evaluation as to needs, interest and results.

UNIT DESIGN: Units of Occupational Aerospace have a suggested number of hours of instruction. It is recommended the local teacher consider this a guide, tailoring his course offering to fit his situation.

WORK COPY

UNITS OF INSTRUCTION:

Occupational Aerospace II

1. Orientation
2. Aircraft Components
3. Aircraft Construction Materials
4. Aircraft Structures
5. Power Plants
6. Advanced Aerodynamics
7. Aircraft Design and Construction
8. Careers and Opportunities
9. Rules of Flight
10. Introduction to Flight Maneuvers
11. Man in Space

Occupational Aerospace III

1. F. A. A. Regulations
2. Aviation Meteorology
3. Advanced Flight Computer
4. Radio Aids and Communication
5. Pre-Flight
6. Airports and Airways
7. Flight Planning
8. Flight Maneuvers
9. Applied Navigation
10. Basic Air Frame and Power Plant Maintenance and Inspection
11. Optional Flight Training
12. The Social, Political, Economic and Cultural Impact of Aerospace
13. Career Counseling and Career Experience
14. Specialized Group Instruction

PROPOSED NORTH CAROLINA TEACHER CERTIFICATION REQUIREMENTS
FOR AVIATION/AEROSPACE EDUCATION

I. FOR AVIATION SCIENCE I AND II

A. Possess a valid state teaching certificate.

AND

1. Attend North Carolina Aviation Science Workshop.
   Work toward a valid FAA Private Pilot Certificate or higher.

OR

2. Possess a valid FAA Basic Ground Instructor Certificate or higher.

OR

3. Have earned six semester hours in an aviation/aerospace course or workshop.

II. FOR OCCUPATIONAL AEROSPACE II AND III

A. Possess a valid state teaching certificate.

AND

1. Possess a valid FAA Private Pilot Certificate or higher.

OR

2. Possess a valid FAA Basic Ground Instructor Certificate or higher.

OR

3. Have earned six semester hours in an aviation/aerospace course or workshop and have verified actual operational experience in:
   a. Air Traffic Control and/or
   b. Aircraft operation as a required flight crew member.
   c. Two years experience or equivalent training in aviation field in areas allied to curriculum taught.

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I OE CODE: 13.0499

TEACHING UNIT NO. 1

TEACHING UNIT TITLE: Introduction to Aerospace (History)

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. show awareness of the courage and sacrifices made by aviation explorers and pioneers, past and present, by written report of some aspect of aviation history.
2. demonstrate various theories of flight proposed by the early pioneers of flight.
3. recognize uses of aviation and space flights and changes they have produced in modern life.
4. list in order the general stages of development of the heavier-than-air and powered craft.
5. construct an aviation history project.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 15 hours (1 hour per day)

EVALUATION: A combination of student-teacher evaluation to include: (1) teacher-student, (2) written test, (3) evaluation of early proposed theories of flight, (4) explain application of flight innovations in daily life, (5) teacher evaluation.

TEACHER COMPETENCY: Knowledge of various aspects of aviation and the role it plays in society - past, present, and future.

INSTRUCTIONAL MATERIALS:

Visuals:	Films	- Aeronautical Oddities - FAA From Kitty Hawk to Aerospace - Air Force
	Filmstrip	- Aviation History - Sanderson The Airplane Changes America - Eye Gate
Book:		- Aviation/Aerospace Fundamentals Aeroscience
Other:		- Bunsen burner
Consumable:		- Balloons, balsa wood, wax, feathers, sticks, tape, wire, string and tissue paper

GENERAL COMMENT: To appreciate the contributions aviation has made to modern life, and to anticipate future contributions, one needs to understand the long, cumulative processes involved in the development of modern aviation. To achieve this objective, the unit should include both supervised and individual research and experiments to involve the student rationally, emotionally and physically.

WORK COPY

UNIT TITLE: Introduction to Aerospace (History)

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. trace on paper, in chronological order, the technological development of general, military, and commercial aviation and include 75% of the technical advances.

2. demonstrate his knowledge of early pioneers of flight and subsequent technical advances by building a model of an early aircraft and submitting in writing, along with his model, a structural comparison of his model and a contemporary model.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Early attempts at flight--mythology - design models: Da Vinci, Henson, Stringfellow, Maerwein, Ader	Select and read to class several myths involving flight. Check reasons behind myths. Study pictures and construct models of early flight designs. Read references. See film - Aeronautical Oddities	Test the early theories behind these designs by attempting to fly models of these designs and evaluating the theories on paper.	Mythology books (Edith Menry's Greek Mythology) Balsa wood, string, rubber bands, glue, wire, tissue paper, pipe cleaners Aviation/Aerospace Fundamentals or Aeroscience - texts Aeronautical Oddities - film
Lighter-than-air flight attempts by Cavendish, Montogolfier Brothers, Orlandes, Lowe	Study drawings and records of early ballon flight. Fill balloon with hot air and room temperature air. Compare results when balloons are released.	Make oral statement on conclusion.	Use text, enlarged drawings of early balloons Balloons, Bunsen burner, string.

WORK COPY

UNIT TITLE: Introduction to Aerospace (History)

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Heavier-than-air flight (gliders) Experiments by: Chanute, Lilienthal, Caley, Maloney	Make models of early gliders and compare them to present day models.		
Powered flight: Wright Brothers, Langley, Fokker Sikorsky, Bleriot, Curtiss, Voisin, DeHavilland	Make models of early powered craft and list the structural advances, in chronological order. See filmstrip: Aviation History along with the class, take part in field trips to Smithsonian Institute, Kitty Hawk, or Wings and Wheels, Santee, S. C. Observe antique aircraft and other related objects, visit EAA Fly-In.	Students will list in order the general stages of development of the heavier-than-air and powered craft and submit to teacher for evaluation. Written report relating to any aircraft or historical event covered on the trip. Submit to teacher.	Model kites, glue, balsa wood, tissue paper, string, wires, etc. Aviation History - Sanderson
"Kitty Hawk to the Moon" Technical advances and effects on life: During World War I	Study accounts of aerial warfare in World War I. Read stories about World War I aces. See film - From Kitty Hawk to Aerospace - Air Force		Reference books from library From Kitty Hawk to Aerospace - Air Force

WORK COPY

UNIT TITLE: Introduction to Aerospace (History)

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Between World Wars I and II	Reports on establishment and effect of: Lindbergh's flight, first commercial flight of passengers, first global flight, Clipper service to Orient, air shows.	Student evaluation and teacher evaluation of written and oral reports.	Resource materials from library, periodicals, text Above and Beyond - encyclopedia.
	Compare these early achievements to present day "daily occurrences".	Write paper making comparison between past achievements and present daily occurrences.	
Post-war developments	Reports on developments of jets, expansion of airline, role of private aviation.	Student and teacher evaluation of reports.	Resource materials from library, periodicals, text.
	See filmstrip: The Airplane Changes America		The Airplane Changes
Aerospace age	Write a paper or make oral reports on practical results of space trips.	Evaluate content of paper.	Resource materials from library, periodicals, text.
		Written test to conclude unit.	

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PROGRAM AREA: Transportation Occupations OE CODE: 13.0499

CAREER CLUSTER: Aviation Science I

TEACHING UNIT NO. 2

TEACHING UNIT TITLE: Principles of Flight

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. differentiate the various layers of the atmosphere, troposphere, stratosphere, mesosphere, and thermosphere.
2. identify control surfaces of an airplane: rudder, elevator, and aileron.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours

EVALUATION: A combination of student-teacher evaluation to include: (1) Pre-test, (2) post-test, (3) student (self) evaluation of constructed substances, (4) teacher observations.

TEACHER COMPETENCY: Working knowledge of principles of flight.

INSTRUCTIONAL MATERIALS:

Visuals: Film - How an Airplane Flies - FAA
Filmstrips: - The Path of Least Resistance - Sanderson
Science of Flight - Sanderson

Book: - Aeroscience - Misenhimer

Other: - Model plane or actual airplane surfaces, vacuum pump bell jar

Consumables: - Cotton - 4 colors and tin can
Paper for construction surfaces

GENERAL COMMENT: This unit is designed to provide students with knowledge of the atmosphere plus an understanding of the control surfaces of an airplane. Students should be provided opportunities to engage in work experiences, exploratory and leadership activities.

WORK COPY

UNIT TITLE: Principles of Flight

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. differentiate the various layers of the atmosphere by placing four different colors of cotton on a globe in the proper order: troposphere, stratosphere, mesosphere, and thermosphere.
2. identify the 3 control surfaces of an airplane by labeling the control surfaces on a model plane.
3. illustrate the decrease in pressure as altitude increases by using a pressure-altitude graph.
4. analyze the relationship of flight and control surfaces by observing air flowing over a variety of paper structures and list in order which surfaces provide greatest lift.

CONTRAST	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Earth's atmospheric layers troposphere, stratosphere, mesosphere, thermosphere	Observe the teacher illustrating the 4 layers of the atmosphere by placing various colors of cotton on a globe. View filmstrip - The Path of Least Resistance	Have students list the 4 layers of the atmosphere and explain how you would identify each.	Book: Aeroscience- Misenhimer Globe - 4 colors of cotton Filmstrip: The Path of Least Resistance - Sanderson
Airplane control surfaces: rudder, elevator, aileron	Observe the teacher illustrating the 3 control surfaces on a model plane. Visit an airstrip and observe the control surfaces of an actual plane. View film - How an Airplane Flies	Have students label the control surfaces on a drawing of an airplane prepared by the teacher.	Model airplane Film: How an Airplane Flies - FAA

WORK COPY

UNIT TITLE: Principles of Flight

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Relation of pressure and altitude	Construct a pressure-altitude graph. Observe as teacher demonstrates atmospheric pressure with a bell jar. Pump air from a tin can and watch it collapse. View filmstrip - Science of Flight	Teacher observation.	Ruler Bell jar Vacuum pump Tin can Filmstrip: Science of Flight - Sanderson
Relation of control surfaces and lift	Fold paper into various shapes: round, square, concave. Force air to flow over paper. Have students observe effects paper goes up, paper goes down, paper goes to side. Use LAP No. 2.	Have students list types of surfaces best suited for airplane structures.	Paper LAP No. 2

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WORK COPY

PROGRAM AREA: Transportation Occupations OE CODE: 13.0499

CAREER CLUSTER: Aviation Science I

TEACHING UNIT NO. 3

TEACHING UNIT TITLE: Weight and Balance

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. demonstrate a basic knowledge of weight and balance by solving problems using the computation method.
2. explain the importance of the center of gravity by using a model to show effects of misplaced center of gravity on aircraft performance.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: (1) Teacher evaluation of written sample problems, (2) student-teacher evaluation of oral explanations, (3) post test.

TEACHER COMPETENCY: Scientific knowledge of weight and balance and its effects on flight.

INSTRUCTIONAL MATERIALS:

Visuals:	Filmstrip	- Sanderson's Weight and Balance No. 0213
	Transparencies	- Sanderson's Weight and Balance packet No. 7010
Books:		- Aeroscience, Aviation/Aerospace Fundamentals, and General Aeronautics
Consumables:		- 1 gallon gas, 1 gallon oil
Other:		- Model plane, scales, teeter-totter

GENERAL COMMENT: All aircraft are designed for certain load and balance conditions. The responsibility for meeting these requirements rests with the pilot. The teacher must make the student aware of this responsibility in concurrence with FAA regulations.

WORK COPY

UNIT TITLE: Weight and Balance

STUDENT BEHAVIORAL OBJECTIVES: (Teaching Unit Objectives) Upon completion of this unit, the student will be able to:

demonstrate a basic knowledge of weight and balance and the importance of having a proper center of gravity by correctly solving 80% of weight and balance problems using the computation method.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Factors of weight and balance	Read text and view filmstrip or transparencies. Weight and Balance		Filmstrip: Sanderson's Weight and Balance No. 0213 Transparancies: Sanderson's Weight and Balance No. 7010 Text: Aeroscience, Chapter 8 or Aviation/Aerospace Fundamentals chapter 6
Importance of weight	Use see-saw to experiment with weight and balance by placing even and uneven weights at equal and unequal distances from the fulcrum. Locate the center of gravity each time.		
Checking gross weight	Weigh 1 gallon of gas and 1 gallon of oil. Using an Owner's Handbook determine a sample gross weight by adding the weight of: the empty aircraft, usable fuel on board, oil on board, removable equipment, occupants, and baggage. Read text.	Evaluation of sample gross weight problems done in class.	Scales, 1 gallon each gas and oil, Owner's Handbook from aircraft. See above text.

WORK COPY

UNIT TITLE: Weight and Balance

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Importance of balance	Using Model airplane, attach weight (1) at center of gravity, (2) aft of center of gravity, (3) forward of center of gravity. Write conclusions concerning the effect of placement of weight on aircraft performance.	Oral explanation of conclusion concerning placement of balance.	Model
Weight and balance theory	Observe teacher's demonstration using a teeter-totter to explain datum, arm, pound-inches, etc.	Check written definition of terms.	Teeter-totter
Computation method	After observing sample problems worked on overhead projector, work problems using the computation method.	Evaluate written problems, Post unit test.	See above transparencies

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PROGRAM AREA: Transportation Occupations OE CODE: 13.0499

CAREER CLUSTER: Aviation Science I

TEACHING UNIT NO. 4

TEACHING UNIT TITLE: Basic Engine Instruments

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. recognize and interpret engine instruments.
2. demonstrate an understanding of scientific principles of selected instruments by diagrams or written explanations.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) Post-test, (3) student - teacher oral identification test.

TEACHER COMPETENCY: A general knowledge of engine instrument operation.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Airplane Systems and Instruments - Sanderson
Tachometer, manifold pressure gage, oil pressure gage, oil temperature gage, cylinder head temperature gage, outside air temperature gage, fuel pressure gage, instrument posters from aircraft companies.

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is necessary to understand basic engine instruments related to flying an airplane.

WORK COPY

UNIT TITLE: Basic Engine Instruments

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objectives) Upon completion of this unit, the student will be able to:

1. recognize and read basic engine instruments.
2. demonstrate an understanding of scientific principles of selected instruments by diagrams or written explanations.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Engine instruments: Tachometers Manifold pressure gage Oil pressure gages Oil temperature gages Cylinder head temperature gages Fuel pressure gages	Study posters on instruments. Hold and learn to read and interpret the various engine instruments. Observe teacher doing experiments to illustrate oil pressure gage. View film - Airplane Systems and Instruments Visit airstrip and observe instruments in actual aircraft. Read pp. 82 - 86 in text. Listen as teacher explains how the various instruments function. View transparencies, discuss scientific principles involved.	Question-answer session with students identifying and interpreting instruments. Written examination to conclude unit.	Text: Aeroscience - Misenhimer Instruments in Content column Materials for experiments Filmstrip: Airplane Systems and Instruments - Sanderson Transparencies - Sanderson or teacher-constructed

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WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I OE CODE: 13,0499

TEACHING UNIT NO. 5

TEACHING UNIT TITLE: Basic Aeronautical Meteorology

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. express a working knowledge of vocabulary and language of weather.
2. make simple forecast by his own observations.
3. know where to go for source of weather information.
4. understand scientific impact in weather forecasting.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours

EVALUATION: (1) Teacher, (2) Written test

TEACHER COMPETENCY: Scientific knowledge of basic weather concept.

INSTRUCTIONAL MATERIALS:

Visuals: Films - Bell T & T - Unchained Goddess
FAA's #AP1 - The Atmosphere, AP3 - Air Masses

Books: - APR, Inc. - Aeroscience
C. N. Van Deventers - General Aeronautics
Sanderson - Aviation/Aerospace Fundamentals

Consumables: - Daily weather maps - Superintendent of Documents Washington, D. C.

GENERAL COMMENT: Upon completing this unit, a student would have a knowledge of weather as it applies to aviation.

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UNIT TITLE: Basic Aeronautical Meteorology

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. express a working knowledge of vocabulary and language of weather.
2. make simple forecast by his own observations.
3. know where to go for source of weather information.
4. understand scientific impact in weather forecasting.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Basic weather vocabulary Reading Speaking	Check daily weather map Check daily on weather stories in local news. A. Observe TV weather forecast. B. Make posters on news stories.	Have students report on weather daily. Have students give oral forecast from reading previous reports.	Daily weather map - U. S. Superintendent of Documents, Washington, D.C. Texts: APR, Inc. - Aero-science, C. N. Van Deventer-General Aeronautics Sanderson - Aviation/Aerospace Fundamentals
Services provided by the National Weather Service Weather maps Forecasts	Visit local Weather Bureau	Have students write the most important point of interest on visit to Weather Bureau.	
Composition of the Earth's atmosphere.	Listen to speakers on weather subjects: A. Military B. Farm Agent C. Weather Bureau personnel		
Temperature Temperature measurment Daily range of temperature Temperatures aloft	Visit to FAA's flight service station. Build model weather station.		

WORK COPY

UNIT TITLE: Basis Aeronautical Meteorology

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	View film on weather - Unchained Goddess Filmstrip: The Atmosphere		Film: Unchained Goddess Southern Bell T & T Filmstrips: The Atmosphere - FAA AP1 Air Masses and Fronts - FAA AP3
Surface temperature distribution Atmospheric pressure Barometers Station pressure Sea Level pressure	Do experiments to gain an understanding of the instruments used to measure the different weather factors. Use LAP No. 5	Teacher observation of experiments.	Meteorology
Wind Basic theory of the general circulation Large wind systems Local winds	View transparencies		Transparencies from Milliken Company or teacher constructed
Moisture Changes of state Moisture content Condensation and sublimation products			
Stability Lapse rates Stability determinations Effects of stability and instability	Construct a lapse rate chart.	Written unit test	

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WORK COPY

PROGRAM AREA: Transportation Occupations OE CODE: 13.0499

CAREER CLUSTER: Aviation Science I

TEACHING UNIT NO. 6

TEACHING UNIT TITLE: Introduction to Power Plants

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. recognize the seven types of reciprocating aircraft engines.
2. illustrate the four strokes of the engine cycle by drawing diagrams of the various strokes.
3. recognize the seven types of propellers.
4. list the components of a propeller.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) Post-test, (3) student-teacher evaluation

TEACHER COMPETENCY: An understanding of reciprocating aircraft engines.

INSTRUCTIONAL MATERIALS:

Visuals: - Propeller - Pictures of various propeller types
Pictures of different reciprocating engines
Slides: - Power for Aircraft - C.A.P.
Filmstrip- Reciprocating Engine and Related Systems
Transparencies - The Four Strokes, Propeller, Power Source - Sanderson
Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to introduce the students to power plants in air craft.

WORK COPY

UNIT TITLE: Introduction to Power Plants

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. recognize the seven types of reciprocating aircraft engines.
2. illustrate the four strokes of the engine cycle by drawing diagrams of the various strokes.
3. list the components of a propeller.
4. recognize the seven types of propellers.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Reciprocating engines: History of development Types Radial Opposed Obsolescent Rotary In - line V - type Double - V Engine cycle Intake Compression Power Exhaust	Read p. 58 Listen to teacher explain history of reciprocating engines. Read pp. 59 - 60 Identify the different reciprocating engines from pictures. View Power for Aircraft View Power Source and The Four Strokes Draw pictures to illustrate cycle. View Reciprocating Engine and Related Systems	Have students identify different engines. Evaluate drawings.	Text: Aeroscience- Misenhimer Pictures of reciprocating engines. Slides: Power for Aircraft - C.A.P. Transparency: Power Source The Four Strokes - Sanderson Filmstrip: Reciprocating Engine and Related Systems Sanderson

WORK COPY

UNIT TITLE: Introduction to Power Plants

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Propellers Theory Momentum Blade element Tip speed Propeller components Hub Blade Tip Leading edge Trailing edge Pitch Types Fixed pitch Metal Wood Adjustable Pitch Variable pitch Electric Hydraulic Mechanical Two-position Constant speed Reversible pitch	Read pp. 88 - 93 Observe an actual propeller and locate the various propeller types. Identify pictures of the various propeller types. View Propeller	Have students identify propeller types. Written exam to conclude unit.	Propeller Pictures of various propeller types. Transparency: Propeller - Sanderson

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I OE CODE: 13.0499

TEACHING UNIT NO. 7

TEACHING UNIT TITLE: Flight Computer Functions

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. make decisions involving flight computations with confidence through basic knowledge of the computer.
2. use the flight computer in planning a cross - country flight.
3. solve calculation and conversion problems involved with flight.
4. describe relationship between the computer, graphs and slide rules.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour daily)

EVALUATION: Combination teacher - student to include (1) teacher evaluation of problems solved - oral and written, (2) student evaluation of other students' explanation of use of computer, (3) student - teacher evaluation of student planned cross-country.

TEACHER COMPETENCY: Ability to use slide rule and computer efficiently.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip: - Basic Flight Computer Sections A and B
Transparencies: - Computer side of Sanderson Flight Computer (movable scales)

Book: - Aviation/Aerospace Fundamentals
General Aeronautics

Equipment: - Computer for each student and teacher
Classroom size computer

GENERAL COMMENT: Pre-flight and in-flight computations require much of a pilot's time and energy. The flight computer enables the pilot to make these computations quickly and easily. Every pilot should have a thorough understanding of the flight computer in order to fully utilize his capabilities.

WORK COPY

UNIT TITLE: Flight Computer

STUDENT BEHAVIORAL OBJECTIVES: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. demonstrate understanding of and proficient use of calculator side of the computer by working problems involving multiplication and division; time - distance - speed; fuel consumption; temperature and mileage conversions; and multipart problems.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Calculation side:			
A, B, C scales	Observe demonstration of use and location of A, B, and C scales. View Basic Flight Computer		Text: General Aeronautics Aviation/Aerospace Fundamentals Aeroscience Filmstrip: Basic Flight Computer Section A
Changing values Speed index	Explain location and use of scales, index, and explain changing values.	Evaluate students' explanation of scales and changing values.	
Multiplication and Division	Observe demonstration of and solve sample problems of calculation. View Flight Computer	Teacher evaluation of written problems.	Text and Section A of filmstrip by Sanderson - Flight Computer. Transparency: Sanderson 7136 - Computer Side
Time, distance, speed Fuel consumption and gallons per hour True air speed	Read in text and observe demonstrations or problems. Work time, speed, distance and fuel problems encountered in flight from point A to point B. View Computer Side	Teacher evaluation of written problems	

WORK COPY

UNIT TITLE: Flight Computer

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Nautical and statute conversion	View Basic Flight Computer Compare distances from point A to points B, C, and D in nautical and statute miles. Observe demonstration of and do sample conversions.		Filmstrip: Basic Flight Computer Section B Text
Temperature conversions	Chart daily temperatures in centigrade and farenheit. Read text and do sample conversion problems.	Oral test of conversion problems with each student doing 1 temperature and 1 nautical - statute conversions.	
Multipart problems	Plan a cross - country flight and do all calculator side computer problem encountered.	Evaluate written problems involved in the predetermined flight. Unit test.	Sectional chart

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I OE CODE 13.0499

TEACHING UNIT NO. 8

TEACHING UNIT TITLE: Basic Aerial Navigation

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. explain different types of navigation.
2. read compass.
3. read navigational map (sectional).
4. work simple wind drift problem by mathematical computation.

RECOMMENDED PREREQUISITES: None - Aviation Science is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: (1) Teacher evaluation, (2) student - teacher evaluation, (3) written test

TEACHER COMPETENCY: Having working knowledge of aerial navigation.

INSTRUCTIONAL MATERIALS:

Visuals: Films: - FAA's Using the Airspace: Navigation and Communication

Filmstrip: - Navigation and the Weather

Books: - APR. Inc. - Aeroscience
C. N. Van Deventer - General Aeronautics
Sanderson - Aviation/Aerospace Fundamentals

Equipment: - Plotter - ruler - compass - globe

Consumables: - Maps and charts (city, state, sectional, World Air Charts, map of world variation)

GENERAL COMMENT: This unit is designed to prepare students with a workable knowledge of navigation, to read charts and work simple wind drift problems.

WORK COPY

UNIT TITLE: Basic Aerial Navigation

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. explain different types of navigation.
2. read a compass.
3. read a navigational map (sectional).
4. work simple wind drift problems by mathematical computations.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Globe Position in space Revolution Rotation The Earth's Axis	Listen to explanation.		Globe maps City State Sectional World Air Charts
Grid System Prime meridian Parallel (Equator) Longitude Latitude	Refer to text. Locate positions on chart or globe using coordinates	Written exercise finding position on charts.	Texts: APR, Inc. - Aeroscience C. N. Van Deventer - General Aeronautics Sanderson - Aviation/ Aerospace Fundamentals
Projections Mercator Conic (Lambert) Gnomonic Polar	Read references. Study examples.		Maps: Mecator Conic Gnomonic Polar
Charts: Basic Chart symbols Populated areas Hydrographic features	View Filmstrip: Aeronautical Charts Study	Written exercise on symbols	Aeronautical Charts - Sanderson

WORK COPY

UNIT TITLE: Basic Aerial Navigation

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Use of compass Deviation Variation	Point out directions using compass.	Have student explain points of compass.	Compass Map of world variation
Methods used in navigation Pilotage Dead reckoning Radio Celestial	View filmstrip: Dead Reckoning Navigation Plot and draw course on sectional map.	Have student explain orally different types of basic aerial navigation. Have student work simple wind drift problem.	Filmstrip: Dead Reckoning Navigation - Sanderson Sectional map, plotter
Navigation from point of departure to destination by pilotage and dead reckoning	Listen to resource person discuss navigation.	Written unit examination.	

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WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I OE CODE: 13.0499

TEACHING UNIT NO. 9

TEACHING UNIT TITLE: Aeronautical Communications

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. demonstrate proper microphone technique by transmitting given message to tape recorder.
2. illustrate two-way radio communication with 100% proficiency in identifying major components, using blank diagrams.

RECOMMENDED PREREQUISITES: None - Aviation Science I is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: Student participation using microphone and recorder.
Teacher observation and comments.
Use Post test for entire unit.

TEACHER COMPETENCY: A knowledge of two-way communication.

INSTRUCTIONAL MATERIALS:

Visuals:	Film	- Basic Radio Procedures for Pilots - 16mm FAA film #FA-902
	Filmstrip	- Sanderson filmstrip recording - Communications
Books:		- Aviation/Aerospace Fundamentals
Equipment:		- Microphone and tape recorder Aircraft radio, posters or diagrams

GENERAL COMMENT: This unit will acquaint students with basic aircraft communications.

WORK COPY

UNIT TITLE: Aeronautical Communications

STUDENT BEHAVIORAL OBJECTIVES: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. demonstrate proper microphone technique by transmitting given message to tape recorder. Student should record 100% of content and rate 75% procedure.
2. illustrate two-way radio communication with 100% proficiency in identifying major components, using blank diagrams.
3. demonstrate ability to tune simple radio, getting steps in proper sequence, by using radio or mock-up.
4. recite basic radio phraseology.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Correct microphone technique Hold microphone near lips; speak directly into mike.	Observe teacher demonstrating correct microphone procedure. Student practice with dead mike before class members.	Have student speak prepared message into microphone, tape message for playback.	Microphone Tape recorder Text: Aviation Fundamentals Film: Basic Radio Procedure for Pilots - FAA #FA902
Two-way radio communications: voice vibrations are converted to radio waves by transmitter for movement through atmosphere to receiver for conversion.	1 - study diagrams of two-way voice transmitter and receivers. 2 - listen to explanation of radio transmission by resource persons. 3 - read references.	Student will draw diagram of voice transmitting and receiving station. Identifying major components.	Text: Aviation Fundamentals or Aeroscience Diagrams or transparencies of transmitting and receiving stations. Sanderson's filmstrip and recording Communications
Tune radio - power switch on, select frequency, adjust sound.	Teacher supervised student demonstrations of radio tuning. View Sanderson filmstrip on Communications		Radio or mock-up of radio controls Transparencies or chalk board diagrams.

WORK COPY

UNIT TITLE: Aeronautical Communications

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Radio phraseology	Listen to recordings of correct phraseology. Record practice messages of phraseoloby. Study references - use LAP No. 9 if available.	Assign messages for class recording, play back before group.	Tower recordings - order from Aviation Supply Text: Aviation Fundamentals or Aeroscience
License requirements	View film Basic Radio Procedure for Pilots	Unit post test	Text: Aviation Fundamentals

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science I

TEACHING UNIT NO. 10

TEACHING UNIT TITLE: Physiology of Flight

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. describe atmospheric effects on respiration and circulation.
2. demonstrate physiological changes due to pressure differences.
3. summarize atmospheric effects on vision.
4. describe physiological effects of noise, vibration, and highspeed flight.

RECOMMENDED PREREQUISITES: None - Aviation Science is a semester course serving as a prerequisite for Aviation Science II and Occupational Aerospace.

TEACHING UNIT LENGTH: 15 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) Post-test, (3) teacher - student evaluation (4) teacher initiated question - answer period.

TEACHER COMPETENCY: A working knowledge of atmospheric effects on the body at different altitudes.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Physiology of Flight - Sanderson
Films - RX for Flight - FAA-606
Medical Facts for Pilots - FAA-01-70
Charlie - FAA-618

Books: - Aeroscience - Misenhimer
Aviation/Aerospace Fundamentals - Sanderson

Equipment: - Swivel chair, charts on respiration, circulation, ear, eye, ear muffs and plugs, camera, writing samples at different altitudes.

Consumables: - Colored chalk.

GENERAL COMMENT: Unit designed to teach atmospheric effects on the body at different altitudes.

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WORK COPY

UNIT TITLE: Physiology of Flight

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. describe atmospheric effects on respiration and circulation by a written report submitted to the teacher explaining hypoxia and hyperventilation.
2. summarize atmospheric effects on vision by presenting an oral report to be judged by the teacher.
3. describe physiological effects of noise, vibration on flight by listing the effects and submitting them to the teacher.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Atmospheric effects on respiration and circulation.	Illustrate the four physiological divisions of the atmosphere.	Question - Answer period	Colored chalk Book: Aeroscience - Misenhimer
	Review circulation and respiration charts.	Question - Answer period	Charts on human circulation and respiration.
Physiological changes due to pressure differences.	Define and discuss hypoxia and hyperventilation - use pressure differences students have experienced Example - driving up a mountain	Written examination Discussion	
	Review anatomy of the ear	Have students explain why ears "pop".	Chart on anatomy of ear
Atmospheric effects on vision.		Question - Answer period	Camera - chart on anatomy of eye. Filmstrip: Physiology of Flight - Sanderson

WORK COPY

UNIT TITLE: Physiology of Flight

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Physiological effects of noise, vibrations, and highspeed flying	Describe how sound is measured. Describe effects of different noise levels on ears. List protective devices Illustrate how vibration blurrs vision.	Do exercise to illustrate how vibration affects vision.	Ear muffs and ear plugs
	Simulate sensory illusion of flight by having student "ride" swivel chair.	Written examination	Swivel chair.
Decreasing atmospheric pressure causes physiological changes: hypoxia and hyperventilation	Listen as the teacher explains the physiological divisions of the atmosphere: 1. Physiological zone 2. The physiological deficient zone 3. The partially and totally space equivalent zone 4. Outer space		Book: Aeroscience - Misenhimer
	View filmstrip Physiology of Flight		Filmstrip: Physiology of Flight - Sanderson
	Review charts on circulation and respiration		Charts on human circulation and respiration
	Listen as teacher defines and discusses hypoxia and hyperventilation.		
	Review chart on ear		Chart on ear

WORK COPY

UNIT TITLE: Physiology of Flight

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	Recall pressure changes you have experiences - Example: driving up a mountain. View Rx for Flight Use LAP No 10	Have students explain why ears "pop".	Film: Rx for Flight - FAA 606
Eyes - most important sensory faculty	Compare your eye to a camera. Review charts on anatomy Determine your dominant eye and locate your blind spot according to the instructor. Use LAP No. 10 View film: Medical Facts for Pilots	Written essay comparing eye to camera. Why do we have a dominant eye and a blind spot	Camera Charts on anatomy of eye Film: Medical Facts for Pilots - FAA
Effects of vibration and noise	Observe teacher demonstrate and explain how sound is measured. Read effects of different noise levels. View film: Charlie Experience how vibration blurrs vision by running in place. Observe protective devices for eyes and ears Simulate sensory illusion of flight by "riding" in a swivel chair. Use LAP No. 10	Oral reports assigned by teacher Written examination	Film: Charlie - FAA618 Ear muffs and plugs Swivel chair

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 11

TEACHING UNIT TITLE: Principles of Flight

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. describe three experiments to illustrate Bernoulli's Axes.
2. list four forces acting on a plane in flight.
3. list and describe three exis of an aircraft.

RECOMMENDED PREREQUISITES: Aviation Science I - Aviation Science I is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) Post-test, (3) student - teacher evaluation of experiments.

TEACHER COMPETENCY: An understanding of theory of flight.

INSTRUCTIONAL MATERIALS:

Visuals: Transparencies - (Make)
Filmstrip - Science of Flight - Sanderson
Films - Air Flow - Forces Acting on an Air Foil
Air foil - roller skates and model plane
Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to aid the student in understanding how and why a plane flies.

WORK COPY

UNIT TITLE: Principles of Flight

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. describe three experiments to illustrate Bernoulli's principle.
2. draw six airfoil development phases.
3. relate Newton's third law to angle of incidence, angle of attack, and attitudes at which an airplane stalls.
4. list four forces acting on a plane in flight.
5. list and demonstrate the three axes of an aircraft by using a model plane.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Theories of flight	Observe the teacher perform several experiments to illustrate Bernoulli's principle. View film: Aerodynamics - Air Flow Use LAP No. 11	Have students summarize Bernoulli's principle.	Text: Aeroscience - Misenhimer Materials needed to perform experiments. Film: Aerodynamics - Air Flow
Air Foils	Complete assignments prepared by teacher to illustrate relation between Bernoulli's principle and air foils.	Have students relate Bernoulli's principle and air foils	Air foils - ex. cross section of wings of different types
Newton's third law	Experience Newton's third law by pushing against a wall with roller skates on your feet.	Have students explain how Newton's third law helps create lift.	Roller skates
Attitudes and stalling	Compare angle of attack to water skiing.	Let students explain when a plane might stall.	

WORK COPY

UNIT TITLE: Principles of Flight

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Angle of Attack Angle of Incidence	Read pp. 11 - 24 Differentiate between angles of attack and angle of incidence. View filmstrip - Science of Flight Use LAP No. 11	Let students explain when a plane might stall.	Film: Science of Flight - Sanderson
Four forces acting on a plane in light: lift thrust drag gravity	View transparencies on four forces. Observe as teacher demonstrates with a model plane the four forces acting on a plane in straight and level flight. View transparencies on axis.	Have students label four forces on drawing of aircraft.	Transparencies Model plane
Axes of an aircraft: vertical axis (yaw) Longitudinal axis (roll) Lateral axis (pitch)	Observe as teacher illustrates with a model plane the three axis of an aircraft. View film: Aerodynamics - Forces Acting on an Airfoil Use LAP No. 11	Have students label and draw 3 axis on sketch of aircraft. Written exam to conclude unit.	Film: Aerodynamics - Forces Acting on an Airfoil - Air Force

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WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 12

TEACHING UNIT TITLE: Weight and Balance

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. interpret weight and balance charts and graphs.
2. solve sample loading problems using data from owners manual.
3. state the effects of over loading in terms of roll, pitch and yaw.
4. demonstrate weight and balance by locating weights on a model plane.

RECOMMENDED PREREQUISITES: Aviation Science 1 - Aviation Science is a two semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 7 hours (1 hour per day)

EVALUATION: Teacher observation - problems - post unit test.

TEACHER COMPETENCY: A working knowledge of physics.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Weight and Balance A,B, and C - Sanderson

Transparencies - teacher constructed

Books: - Aviation/Aerospace Fundamentals - Sanderson
Aeroscience - Misenhimer
owners manual

Equipment: - Meter stick - model plane - weights - Load Adjuster

Consumables: - String - Loading - graphs - Loading tables - Weight and Balance forms.

GENERAL COMMENT: This unit is designed to acquaint students with problems of weight and balance as they relate to flying an aircraft.

WORK COPY

UNIT TITLE: Weight and Balance

STUDENT BEHAVIORAL OBJECTIVES: (Teaching Unit Objectives) Upon completion of this unit, the student will be able to:

1. interpret weight and balance charts and graphs.
2. solve sample loading problems using data from owners manual.
3. state the effects of over loading in terms of pitch, yaw, and roll.
4. demonstrate weight and balance by locating weights on a model plane.

CONTENT	SUGGESTED LEARNING EXPERIENCE	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Graph Method	Study sample graph and work sheet.		Text - Aviation/Aerospace Fundamentals - Sanderson
	Solve problems in weight and balance using two methods. 1. Graph 2. Moment equation	Evaluate problems.	Aeroscience - Misenhimer
	View - Weight and Balance Part A		Filmstrip - Weight and Balance Parts A, B, and C.
	Load a real plane using owners manual.	Check weight and Balance forms for accuracy.	Owners manual
Table - Method	Listen as FAA Representative discusses regulations governing saftey in aircraft loading.		Meter stick. Weights. Model plane. String.
	View - Weight and Balance Part B. Locate fulcrum by calculation.	Teacher observation.	

WORK COPY

UNIT TITLE: Weight and Balance

CONTENT	SUGGESTED LEARNING EXPERIENCE	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
50 Load Adjuster	Locate fulcrum using suspended meter stick and weights. Locate weights on suspended model plane and observe effects. View - Weight and Balance Part C View - teacher constructed transparencies.	Post unit test	Transparencies. Loading graphs. Loading tables. Load Adjuster. Weight and Balance forms.

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 13

TEACHING UNIT TITLE: Instruments and Systems

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. read and interpret basic flight instruments by using actual aircraft instruments or transparencies.
2. draw and explain the operations of the pitot and vacuum systems.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 8 hours (1 hour per day)

EVALUATION: (1) Identification, (2) written test, (3) teacher observation.

TEACHER COMPETENCY: Basic knowledge of flight instruments and systems.

INSTRUCTIONAL MATERIALS:

Visuals: Transparencies - Flight Instruments
Airspeed indicator- Altimeter - Vertical Speed indicator - Magnetic compass - Turn and Slip Indicator - Directional gyro - Artificial Horizon - Pitot Static System - Vacuum system - Sanderson

Filmstrip - Flight control systems and Instruments - Sanderson

Book: - Aeroscience and Aviation/Aerospace Fundamentals

GENERAL COMMENT: This unit is designed to introduce the students to the purpose and functions of the flight instruments and systems.

WORK COPY

UNIT TITLE: Instruments and Systems

STUDENT BEHAVIORAL OBJECTIVES: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. read and interpret basic flight instruments by using actual aircraft instruments.
2. draw and explain the operation of the pitot and vacuum systems.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Flight Instruments: 1. Airspeed Indicator	View - Flight Control Systems and Instruments		Aviation/Aerospace Fundamentals - Sanderson Text - Aeroscience - Misenhimer Filmstrip - Flight Control Systems and Instruments Sanderson
2. Altimeter	Practice Altimeter reading exercise.	Written exercise on flight instruments.	
3. Vertical speed indicator	Read and interpret transparencies. of various flight instruments.		Transparencies - Flight Instruments Airspeed Indicator Altimeter Vertical Speed Indicator Magnetic compass
4. Magnetic Compass	Study FAA Exam - O - Grams of the Magnetic Compass.		FAA Exam-O-Gram

WORK COPY

UNIT TITLE: Instruments and Systems

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Gyro Flight Instruments: 1. Turn and Slip Indicator 2. Directional Gyro 3. Artificial Horizon Systems: 1. Pitot 2. Vacuum	View transparencies on gyro flight instruments. Visit local airport, observe various instruments and systems in a actual aircraft. View transparencies on pitot and vacuum systems. Draw diagram of pitot system and explain operation.	Evaluated diagrams. Post unit examination.	Transparencies - Turn and Slip Indicator Directional Gyro Artificial Horizon Pitot Static System Vacuum System

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 14

TEACHING UNIT TITLE: Aeronautical Meteorology

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will will be able to:

1. collect and classify data.
2. apply collected data to future forecase.
3. give observations on air masses and fronts.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 15 hours (1 hour per day)

EVALUATION: Teacher observation.
Written tests as required.

TEACHER COMPETENCY: Basic knowledge of physics.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Meteorology series - Sanderson
FAA - Fan - 103 The Cold Front
Fan - 104 The Warm Front
Fan - 101 Fog and low ceiling clouds - Avection Fog and ground Fog
Fan - 102 Fog and low ceiling clouds - Upslope Fog and Frontal Fog

Books: - C. N. Van Deventer General Aeronautics
APR. Inc. Aeroscience
Sanderson- Aviation/Aerospace Fundamentals

Consumables: - Daily Weather maps Superintendent of Documents, Washington, D.C.

GENERAL COMMENT: Student will collect data on weather and make observations on air masses and fronts.

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WORK COPY

UNIT TITLE: Aeronautical Meteorology

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. collect and classify data.
2. apply collected data to future forecast.
3. give observations on air masses and fronts.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATIONS TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Basic laws of meteorology Earth's Science Physical Science	Study assigned text. View Sanderson Filmstrip Weather Theory	Draw diagram of earth's atmosphere as it applies to man.	Text. C. N. Van Deventer General Aeronautics APR, Inc. Aeroscience Sanderson's Aviation/Aerospace Fundamentals
Clouds Families and types Combinations	Study Cloud Chart.		
Atmosphere Composition of air Temperature Pressure Dew Point and Humidity Stability and lapse	Observe and classify clouds on different days	Give Oral Observations regarding frontal weather	Films: FAA - Meteorology Fan - 103 "The Cold Front" Fan - 104 "The Warm Front". Fan - 101 Fog and Low Ceiling Clouds - Avection Fog and Ground Fog Fan - 102 "Fog and Low Ceiling Clouds Slope Fog and Frontal Fog"
Air Masses and Fronts Classification and characteristics. Fronts Cold Warm Stationary front Occluded	Read references View - The Cold Front View - The Warm Front		
	Operate model weather station and keep records of same.		Cloud Chart

WORK COPY

UNIT TITLE: Aeronautical Meteorology

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATIONS TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	Observe frontal weather and classify.		Daily weather maps superintendent of documents, Washington, D.C.
Atmospheric Conditions Thermals Fog Density Altitude Turbulence Icing Hail Barometric Pressure	View Films: Fan - 101 "Fog and Low Ceiling - Avection Fog and Ground Fog" Fan - 102 Fog and Low Ceiling - Upslope Fog and Frontal Fog"	Written Symbol Exercise	Weather station model kit Meteorology series Filmstrips and Recordings Sanderson
Weather Symbols	Study References		
Teletype Reports Sequence Winds aloft	View Filmstrip Weather Reports Listen to resource person	Have student read simple sequence report Written Unit Test	Teletype reports Weather services.

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER; Aviation Science II

TEACHING UNIT NO. II - 15

TEACHING UNIT TITLE: Basic Aircraft Control

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. illustrate the effect of control surfaces on flight of a fixed wing aircraft by use of a model.
2. show in writing a basic knowledge of the principle involved in the flight of rotary wing aircraft.
3. show in writing a general knowledge of the principle involved in introduction to wingless flight.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: (1) Teacher - student evaluation of wind tunnel test.
(2) Teacher evaluation written findings.
(3) Post-test.

TEACHER COMPETENCY: Working knowledge of principles involved in aircraft control.

INSTRUCTIONAL MATERIALS:

Visuals: Films - Flight Without Wings
How an Airplane Flies
Beyond the Stick and Rudder
Helicopter Orientation
Filmstrip - The Dawning Space Age

Books: - General Aeronautics
Aviation/Aerospace Fundamentals
Aeroscience

Equipment: - Wind tunnel
Model plane

GENERAL COMMENT: The knowledge involved with basic aircraft control is also basic to most other aspects of aviation. Therefore, to fully understand flight, the understanding of what controls flight is essential.

WORK COPY

UNIT TITLE: Basic Aircraft Control

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. illustrate, by using a model and wind tunnel, the effect of 90% of the control surfaces of a fixed wing aircraft.
2. show a basic knowledge of the control of rotary wing aircraft by discussing in writing 75% of the principles involved in rotary wing flight.
3. summarize on paper 70% of the principles involved in wingless flight.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Fixed wing aircraft - primary systems: aileron elevator and stabilator rudder or rudder-vator secondary systems: flaps trim tabs spoilers Rotary wing aircraft: Helicopters and gyrocopters Regimes of flight Gyroscopic precession Collective pitch Cyclic Pitch Dis-symmetry of lift Axis of rotation Coriolis effect	Read in text Listen to teacher explanation of how control systems work. Use a wind tunnel and model plane with movable control surfaces, or mock-ups of control systems to demonstrate how the controls effect flight. Write results. Read text. View Film - How an Airplane Flies Listen to resource person explain characteristics of the helicopter. View - Beyond the Stick and Rudder. View - Helicopter Orientation	Teacher-student evaluation of wind tunnel text. Evaluation of written results of test.	General Aeronautics - Pages 92 - 98 Aviation/Aerospace Fundamentals pages 5-5 through 5-12 Wind tunnel Model plane Mock-up of control systems "How an Airplane Flies" - parts III-VI Air Force "Beyond the Stick and Rudder" Air Force Text: Aeroscience - Chap. 10 General Aeronautics - Chap.17 Film - "Helicopter Orientation Air Force Experienced helicopter pilot

WORK COPY

UNIT TITLE: Basic Aircraft Control

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Missiles and Spacecraft 1. Thrust required. 2. Guidance system.	View Film. Flight Without Wings. Read text. Listen to resource personnel explain basic rocketry and wingless flight. View filmstrip. The Dawning Space Age.	Post test of unit.	Flight Without Wings - Aeroscience - Unit 7 Aviation/Aerospace Fundamentals chapter 15 Resource person. The Dawning Space Age - filmstrip - CAP

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE: 13.0499

TEACHING UNIT NO. 11 - 16

TEACHING UNIT TITLE: Introduction to Power Plants

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. demonstrate the reaction theory by performance before group exhibiting a working knowledge of Newton's third law.
2. comment on and compare reaction engines by listing some advantages and disadvantages of each.
3. list historical developments leading to the present day practical reaction engine, selecting developments from random group.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: Written test - teacher observation - post unit test.

TEACHER COMPETENCY: Basic scientific knowledge of power plants and ability to locate reference materials.

INSTRUCTIONAL MATERIALS:

Visuals:	Model of Wankel Engine
Film	- ABC's of Jet Propulsion
Filmstrip	- Don't Build that Rocket Alone
Slide Series	- Power for Aircraft
Books:	- Aeroscience, General Aeronautics, Exploring in Aerospace Rocketry
Equipment:	- Rocket kit
Consumables;	- Launched rockets

GENERAL COMMENT: This unit will give the student a basic understanding of the reaction theory and the application of this theory to engines of this era.

WORK COPY

UNIT TITLE: Introduction to Power Plants

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Reaction engines - reaction engine development.	View 16mm film - ABC's of Jet Propulsion Read references.	Written test on developments.	16mm film - ABC's of Jet Propulsion Aeroscience
Reaction theory.	Relate reaction performance to Newton's third law by balloon on wire or can with water activity. Use LAP No. 16	Teacher will evaluate student experiment as to knowledge application.	LAP No. 16
Air breathing engines. Non-air breathing engines.	View slides, Power for Aircraft Read references.		Slide series - Power for Aircraft - CAP Exploring in Aerospace Rocketry - NASA
Solid fuels. Liquid fuels.	Listen to explanation of advantages and disadvantages of solid and liquid fuels. Read references. View Filmstrip - Don't Build that Rocket Alone. Construct Rocket.		Text: Aeroscience or Aviation/Aerospace Fundamentals Filmstrip: Don't Build that Rocket Alone - NASA Rocket kit - Estes Industries

WORK COPY

UNIT TITLE: Introduction to Power Plants

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Pulsejet Ramjet Turbojet Turbofan Wankel Engine	Read references. Study diagrams and pictures. Write reports on each different type of reaction engine listed.	Teacher evaluation of reports.	Book: Exploring in Aerospace Rocketry
☺ ☺	Study diagram and model.	Discuss possible use relating to times.	Cut-away engine - hobby shop
Turboprop Turboshaft	Study diagram or transparencies for operation. Read references for power application.	Oral questions	Diagrams or teacher - constructed transparencies References: Aeroscience Above and Beyond

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 17

TEACHING UNIT TITLE: Flight Computer Functions

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. make decisions involving flight computations efficiently by using the computer.
2. use the wind side of the computer in planning a cross-country flight and solving the problems involved.
3. work wind problems using a wind triangle and the computer. Compare the two methods orally or in writing.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 10 (1 hour per day)

EVALUATION:
1. Teacher evaluation of sample problems.
2. Teacher-student evaluation of cross-country flight problems-written and oral.
3. Student evaluation of student's oral explanation.

TEACHER COMPETENCY: Ability to use slide rule and computer efficiently.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Flight Computer Section C - Sanderson
Transparency - Flight Computer: Wind Side - Sanderson

Books: - Aviation/Aerospace Fundamentals
General Aeronautics

Equipment: - Sectionals
Computers

GENERAL COMMENT: The flight computer aids the pilot in making all computations necessary for a successful flight. Thus a basic understanding of the wind side of the computer is invaluable to the pilot.

WORK COPY

UNIT TITLE: Flight Computer Functions

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. use the wind side of the computer to solve navigation problems with 80% efficiency.
2. illustrate the effect of wind on aircraft navigation and how to correct for these winds by using the computer.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Flight computer: wind side	After reviewing text and observing instructor's overhead projector demonstration, work a problem using the wind triangle. Work identical problem with computer. Compare flight computer with mathematical wind vector. State observations orally. Work sample problems.	Check results of mathematical wind vector and computer problem solving.	Text: Aviation/Aerospace Fundamentals chap. 8-12 - 8-17; 8-24; 8-26. Filmstrip: Sanderson's Flight Computer Part C
Wind side components: Sliding grid Azimuth True index Grommet	View filmstrip. Flight Computer Part C Follow on your individual computer as the teacher points out and explains the components of the computer.	Oral or written test on location and uses of components on wind side of computer	Classroom size computer or transparency Individual computers

WORK COPY

UNIT TITLE: Flight Computer Functions

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Ground speed True course True heading Wind correction angle	Read text. Observe teacher and overhead projector or classroom computer demonstration showing how to determine ground speed, true heading, and wind correction angle with wind side of computer. Work sample problems. Plot a 3-leg cross-country flight to points designated by the teacher. Using data given by the teacher, work all problems using the wind side of the computer. Explain to other students how to solve problems on the wind side of the computer.	Evaluate cross-country problems. Post test.	Aviation/Aerospace Fundamentals or General Aeronautics Transparencies from Sanderson, "Flight Computer" 7136 or Classroom size computer Sectional and computer for each student.

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE: 13.0499

TEACHING UNIT NO. II - 18

TEACHING UNIT TITLE: Basic Navigation

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. read and speak basic vocabulary of navigation.
2. use tools and materials used in navigation.
3. use radio as method of navigation.
4. demonstrate principles of basic navigation by planning a simulated cross country using sectional charts.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: (1) Teacher evaluation, (2) student-teacher evaluation, (3) post test.

TEACHER COMPETENCY: Understanding of scientific principles of navigation.

INSTRUCTIONAL MATERIALS:

Visuals:
- FAA FA-02-70 "Area Navigation"
FAA FA-902 "Basic Radio Procedures for Pilots"
FAA FA-104 "This is Vortac"

Books:
- C. N. Van Deventers General Aeronautics
APR, Inc. Aeroscience
Sanderson Aviation/Aerospace Fundamentals

Equipment:
- Globe
Art paper
Printed visual flight logs
Ruler
Protractor
Computer
Symbol Flash Cards
Aircraft radio (if possible)

Consumables:
- Sectional maps, world air charts, world variation map, radio navigational charts.

GENERAL COMMENT: This unit is designed to give the student a working knowledge of basic navigation.

WORK COPY

UNIT TITLE: Basic Navigation

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. read and speak vocabulary of navigation.
2. use tools and materials used in navigation.
3. use radio as method of navigation.
4. demonstrate principles of basic navigation by planning a simulated cross country using sectional charts.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Mechanics of Navigation: Develop an adequate reading and speaking vocabulary of navigation. Introduction of most commonly used methods of navigation. . Pilotage . Dead reckoning . Radio . Celestial . Inertial Interpret charts and symbols. Concept of time in navigation. Radio Navigation Develop use of radio in navigation. Basic radio navigation principles	Using sectional chart and ruler, draw straight line between two airports. Name various features encountered in flying between these two airports . Simulate cross-country flight from standpoint of pilotage on sectional chart. Outline steps used. Use flight log and flight plan. . Visit FAA radio facility. . On flight in aircraft, observe Vor, DME, A.D.F. and other radio navigation aids.	Have students do simple navigation problem. Assign problems applied to simple navigation problem - time - distance-speed. Evaluate Student explanation of flight using radio navigation. Post test of unit.	Globe Art paper Printed visual flight log Ruler Plotter Protractor Computer Symbol flash cards Aircraft radio (if possible) Sectional maps World air charts World variation map Radio-navigational charts Controller's radio charts Films: FAA FA-02-70 (25 min.) "Area Navigation" FAA FA-902 (30 min.) "Basic Radio Procedures for Pilots' FAA FA-104 (15 min.) "This is Vortac" Text: C. N. De Venters General Aeronautics APR, Inc. Aeroscience Sanderson Aviation/Aerospace Fundamentals

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II OE CODE 13.0499

TEACHING UNIT NO. II - 19

TEACHING UNIT TITLE: Aeronautical Communications

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. show knowledge of use of radio facilities by demonstrating the use of radio communication.
2. use with 100% efficiency the phonetic alphabet and the 24 hour clock.
3. define in writing the L/MF, VHF, and UHF bands and frequencies.

RECOMMENDED PREREQUISITES: Aviation Science I. 'Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: (1) teacher evaluation, (2) teacher-student evaluation (3) post test.

TEACHER COMPETENCY: Basic knowledge of radio communications.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Radio Communications - Sanderson
Air Traffic Control and Communications - Sanderson
Film - AAAARK - Something about communications

Books: - Airman's Information Manual, Aeroscience Aviation/Aerospace Fundamentals

Equipment: - Radio receiver to pick up FAA communications facilities.

GENERAL COMMENT: Students must be made aware of the facilities available to help them in planning and executing flights. Also the student should be aware of agencies available to help him in emergencies. This unit provides this basic knowledge.

WORK COPY

UNIT TITLE: Aeronautical Communications

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. show knowledge of the use of radio facilities by demonstrating the use of radio communications in a given situation.
2. recite 100% of the phonetic alphabet and tell time with 100% efficiency, using the 24 hour clock.
3. define in writing the L/MF, HF and VHF and UHF bands and their frequencies with 90% efficiency.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Basic communications: Phonetic alphabet 24 hour clock	Memorize the phonetic alphabet: take part in a "Spelling Bee" type recitation of the alphabet.	Short written test on alphabet and 24 hour clock	
Greenwich mean time	Review with teacher the 24 hour clock. Write the school bell schedule using the 24 hour clock. Write your daily schedule in Zulu time View Filmstrip Radio Communications		
Frequency bands and utilization L/MF bands	Read text. Explain orally the limitations of the L/MF ranges	Teacher-Student evaluation of oral explanation.	Radio Communications - Sanderson Aeroscience pp.373 - 376 Aviation/Aerospace Fundamental pp.10-20 to 10-27
HF and VHF band	Read AIM and Text Observe filmstrip Air Traffic Control and Communications		Airman's Information Manual Aeroscience pp. 369 - 373 Air Traffic Control and Communications
UHF bands	Listen to teacher explanation of military use of UHF		
		Unit Test	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aviation Science II

TEACHING UNIT NO. II - 20

TEACHING UNIT TITLE: High Speed Aerodynamics

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. describe three types of high speed flight, by listing speed range to each.
2. relate phenomena of the sound and heat barriers.
3. state ecological aspects of high speed flight.

RECOMMENDED PREREQUISITES: Aviation Science I. Aviation Science II is a semester course serving as a prerequisite for Occupational Aerospace.

TEACHING UNIT LENGTH: 10 hours (1 hour per day)

EVALUATION: (1) Pre-test (2) Post-test (3) Student-teacher evaluation

TEACHER COMPETENCY: Have a wealth of resources related to high speed aerodynamics.

INSTRUCTIONAL MATERIALS:

Visuals: Slides - The Dawning Space Age - C.A.P.

Films - Research Project X-15 - NASA; The Aircraft Called Seventy - Air Force; High Speed Flight (3); (2) Transonic, (3) Supersonic - Shell Oil Co.; air foils

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to aid the student in understanding all aspects of high speed flight.

WORK COPY

UNIT TITLE: High Speed Aerodynamics

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. describe three types of high speed flight by listing speed range of each.
2. relate ~~phenomena~~ of the sound and heat barriers.
3. state ecological aspects of high speed flight.
4. illustrate various air foils associated with high speed flight by comparing them to air foils in ordinary flight.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Subsonic Flight Transonic flight Supersonic flight	View slides - The Dawning Space Age. View films: High Speed Flight: (1) Subsonic (2) Transonic (3) Supersonic		Slides: The Dawning Space Age - C.A.P. Films: High Speed Flight: (1) Subsonic (2) Transonic (3) Supersonic
Sound Barrier	Listen as the teacher describes the sound barrier and how it effects high speed flight. Experiment with a starters gun and stop watch to illustrate speed of sound.		
Airfoils for high speed flight	Compare airfoils for high speed flight to airfoils used for normal flight.	Have students sketch and describe four supersonic airfoil sections.	Airfoils - for ordinary flight and high speed flight.
Thermal barrier	Observe aerospace engineer invited by teacher to lecture and demonstrate models. Use LAP No. 20 Read pp. 492 - 502		

WORK COPY

UNIT TITLE: High Speed Aerodynamics

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	View film: Research Project X-15		Film: Research Project X-15 NASA
	Listen as an expert invited by the teacher explains the ecological aspects of high speed flight.	Have students list problems associated with high speed flight.	
	Use LAP No. 20		
	View film: The Aircraft Called Seventy		Film: The Aircraft Called Seventy - Air Force
		Written examination to conclude unit.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 21

TEACHING UNIT TITLE: Orientation

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. practice individual and group safety under actual trade conditions.
2. recognize and demonstrate use of correct trade language.

RECOMMENDED PREREQUISITES: Aviation Science I and II

TEACHING UNIT LENGTH: 5 hours (1 hour per day)

EVALUATION: Teacher observation - student discussion - written unit test.

TEACHER COMPETENCY: A knowledge of shop procedure and aviation language.

INSTRUCTIONAL MATERIALS:

Visuals: Film - Today for Tomorrow - FAA #FA907

Books: - Above and Beyond
Aeroscience
Aviation/Aerospace Fundamentals

GENERAL COMMENT: This unit may be used to orient students to second and third year content. Gives students an understanding of safety required in the aviation/aerospace.

WORK COPY

UNIT TITLE: Orientation

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. practice individual and group safety under actual trade conditions.
2. recognize and demonstrate use of correct trade language of aerospace industry.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Type of Course Class rules and regulations. Shop safety.	Read list of units offered. Listen to instructor's explanation. Make shop safety posters. View film: Today for Tomorrow.		Film: Today for Tomorrow - FAA - #FA 907 16mm
Attitudes and work habits.	Listen to resource personnel explain safety and working conditions.		
Trade language.	Read references. Study vocabulary of aviation - aerospace terms from a prepared list.	Match words with definitions. Unit test	References: Above and Beyond Aeroscience Aviation/Aerospace Fundamentals

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE 13.0499

TEACHING UNIT NO. III - 22

TEACHING UNIT TITLE: Aircraft Components

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. list and locate major and minor components of aircraft using diagrams, models or selection of actual parts.
2. assemble components of aircraft in correct order by using model parts or non-flyable aircraft.

RECOMMENDED PREREQUISITES: Aviation Science I and II

TEACHING UNIT LENGTH: 12 hours (1 hour per day)

EVALUATION: Teacher evaluation of shop work. Exercise sheets for units. Unit test.

TEACHER COMPETENCY: Aircraft experience in maintenance or construction helpful.

INSTRUCTIONAL MATERIALS:

Visuals: - Aircraft structural diagrams
Aircraft parts
Transparencies

Book: - Aeroscience - Misenhimer

Equipment: - Un-flyable aircraft

Consumables: - Model materials

GENERAL COMMENT: Space for shop work is necessary for this unit. This unit gives the student knowledge of aircraft make-up and develops industry related skills.

WORK COPY

UNIT TITLE: Aircraft Components

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. list and locate major and minor components of aircraft using diagrams, models or selection of actual parts.
2. assemble components of aircraft in correct order by using model parts of non-flyable aircraft.
3. contrast components of different aircraft types by defining operations.
4. demonstrate assembly skill by displaying completed shop project.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Fixed wing aircraft components. Major components.	Observe identification demonstration through use of models, diagrams, pictures, or actual aircraft components. Visit experimental aircraft association meet, or any air show. View transparencies.	Exercise sheets composed of numbered displays.	Diagrams - Piper Aircraft Co. Pictures - All-Aircraft Co. Models Any available aircraft Text: Aeroscience Transparencies.
Aircraft assembly.	Build large scale glider model from selected plans. Read assigned references.	Observe flight characteristics.	Model kit of large scale glider or aircraft. Aircraft Modeler
Aircraft disassembly.	Take apart non-flyable aircraft - identify and label all parts.	Teacher evaluation of shop work.	Old un-flyable aircraft
Rotary wing components - Helicopter Gyrocopter	Observe operation of helicopter by National Guard or Air Force unit. Read references.	Class comparison of observations. Unit test.	Helicopter visit to school Text: Aeroscience

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE 13.0499

TEACHING UNIT NO. III - 23

TEACHING UNIT TITLE: Aircraft Construction Materials

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. list materials used in small aircraft construction.
2. state component parts for which each material is used.
3. identify materials from cut-away section of actual aircraft.

RECOMMENDED PREREQUISITES: Aviation Science 1 and 2

TEACHING UNIT LENGTH: 12 hours (1 hour per day)

EVALUATION: (1) student evaluation.
(2) teacher evaluation.
(3) post test.

TEACHER COMPETENCY: Basic knowledge of aircraft construction and materials used.

INSTRUCTIONAL MATERIALS:

Visuals: Film _ The Wind is Right - FAA

Books: - Aeroscience
EAA Manual 17

Consumables: _ Aircraft wood and metals

GENERAL COMMENT: This unit is designed to acquaint the student with the various materials and their uses in aircraft construction.

WORK COPY

UNIT TITLE: Aircraft Construction Materials

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objectives) Upon completion of this unit, the student will be able to:

1. list materials used in small aircraft construction.
2. state component part for which each material is used.
3. identify materials from cut-away section of a real aircraft.
4. demonstrate skill using materials by completing shop project.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Aircraft Woods: Spruce Fir Hemlock Pine (white) Cedar (white) Poplar (yellow) Mahogany	Compare strength using charts.	Written exercise.	FAA 4313-1 Aircraft Wood Structures.
Wood Joints: Butt Scarf	Construct example of each joint using aircraft material.	Teacher evaluation of projects.	Text: Aeroscience - Misenhimer FAA Manuals
Glues and Fasteners.	Observe demonstration by resource personnel.		
Aircraft Construction.	Observe demonstration of aircraft tubing welding.		Resource personnel FAA members of aviation mechanic.
Metals: Pure Alloys			
Plastics and New Materials	Read references	Unit test or shop project.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 24

TEACHING UNIT TITLE: Aircraft Structures

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. show basic knowledge of aircraft construction by building sample or examples of: fuselage section, ribs, controls, and landing gears.
2. identify on slide all major aircraft structures.
3. demonstrate stress, fatigue and load in classroom experiments.

RECOMMENDED PREREQUISITES: Aviation Science I and II.

TEACHING UNIT LENGTH: 20 hours (1 hour per day)

EVALUATION: (1) Teacher evaluation, (2) Teacher-student evaluation, (3) Post test.

TEACHER COMPETENCY: Knowledge of methods of construction used in aircraft and familiarity of materials involved.

INSTRUCTIONAL MATERIALS:

Visuals: Films - The Wind is Right - FAA
Transport Crash Safety Tests - Parts I and II FAA

Books: - Aeroscience
EAA - How To: series of books.

Equipment: - Camera, phased out landing gear, various types of shock obsorbers, object showing fatigue cracks.

Consumables: - Film, aircraft wood, materials to construct mock-up of controls, sample sections of fuselage, and ribs.

GENERAL COMMENT: In aircraft, construction, one must always achieve maximum strength with minimum weight. To understand how designers do this, and to aid one in understanding preventative maintenance, a basic knowledge of aircraft construction is the goal of this unit.

WORK COPY

UNIT TITLE: Aircraft Structures

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. identify by pointing out on slides all major aircraft structures.
2. show basic knowledge of aircraft construction by constructing: sample section of a fuselage; a rib of a wing; a mock-up of a landing gear; a mock-up controls - or mock-up controls on an aircraft, with 80% proficiency.
3. demonstrate stress, fatigue, and load through use of simple classroom experiments and load tests.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Aircraft structures: Wings Landing gear Fuselage Controls	Read references. Make slides, close-ups of aircraft parts. Use slides in identification of structures.		Aeroscience - pp 38 - 39 EAA - How To: series Slides made by students camera, film projector, screen
Fuselage construction types Truss Semi-monocoque	Observe types of fuselage construction. Listen to instructor's explanation of method of construction of types. Using actual aircraft materials, or mock materials, construct sample section of each type of fuselage.	Teacher-student evaluation of construction samples of fuselage types.	Aircraft materials to construct fuselage samples on mock materials for constructing fuselage.
Wings: Component parts: Spars Ribs Coverings Arrangement: Cantilevered Externally braced Biplane Triplane	Read references. While looking at a cut-away of an actual wing, listen to the teacher's instruction concerning wings, wing parts, and wing construction.		Aeroscience -pp 40-47 EAA - How To: series Cut-away wing

WORK COPY

UNIT TITLE: Aircraft Structures

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Classification: Low wing Mid-wing High wing Parasol wing Gull wing Inverted gull wing	Observe diagrams and pictures of, and identify from the pictures, the various wing types.		Pictures of wing types. Diagrams put out by aircraft companies.
Plan Forms: Tapered leading edge Tapered trailing edge Double tapered Elliptical Rectangular	Draw diagrams of each of of the plan forms.	Teacher evaluation of diagrams.	Drawings of wing plan forms.
Stability elements: Dihedral Sweepback Taper	Construct at least 1 rib of a wing, using aircraft wood (1 rib per student)	Teacher-student evaluation of individual rib construction.	Aircraft wood, and equipment needed for construction of a rib.
Landing gear: Conventional tricycle Fixed retractable Skis Floats	Read references. Study pictures of types of landing gears. Observe actual landing gear and listen to teacher's instruction concerning the gear. Learn nomenclature of landing gear.	Written test on nomenclature.	Aeroscience - pp.50-53 EAA - How To: series Old landing gear.

WORK COPY

UNIT TITLE: Aircraft Structures

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Shock absorbers: Hydraulic and pneumatic Rubber, disc or cord steel, spring or coil	Observe various shocks. Explain to another student how the various types of shock absorbers function.	Student evaluation of explanation.	Examples of various types of shock absorbers. Phased out Air Force mock-up of gear.
Controls: Nomenclature Linkage and cables	Read references. Observe film: The Wind is Right Under instructor's guidance, study diagrams showing controls cables and linkage. Draw diagrams of basic control hook-ups. Dismantle controls on old aircraft. Hook up controls on actual aircraft or construct mock-up of controls.	Evaluation of diagrams by teacher. Teacher-student evaluation of control hook-up.	Aeroscience EAA - How To: series Film: The Wind is Right - FAA Diagrams put out by various aircraft companies. Discarded aircraft Materials to build mock-up of controls.
Stress: Tension Bending Compression Shear Torsion	Read references. Observe film: Transport Crash Safety Test - Parts I and II. Demonstrate each type of stress, using basic materials (i.e. torsion: wring a wash cloth)	Teacher-student evaluation of demonstrations.	Aeroscience - pp 54 - 57 FAA - How To: series Film: Transport Crash Safety Test - Parts I and II. Materials for stress demonstration.

WORK COPY

UNIT TITLE: Aircraft Structures

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Fatigue: Fatigue resistance Endurance limit Local stress concentration Stop drilling	Read references. Demonstrate fatigue by bending wire until it breaks. Examine fatigue cracks in objects such as car bumpers, aircraft surfaces etc. Observe instructor's demonstration of stop drilling.		Aeroscience: pp 54-57 EAA - How To: series Objects showing fatigue cracks.
Load: - Basic load Maximum applied load Ultimate load Applied load factor Safety factor	Read references. Do load tests under supervision of instructor.	Post test	Aeroscience: pp 54-57 EAA - How To: series

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupation Aerospace Ed. II OE CODE: 13.0499

TEACHING UNIT NO. III - 25

TEACHING UNIT TITLE: Power Plants

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. recognize the types of aircraft reciprocating engines.
2. identify the various parts of a reciprocating engine by dismantling and remounting an engine.
3. demonstrate skills related to actual industry occupations.

RECOMMENDED PREREQUISITES: Aviation Science I and II.

TEACHING UNIT LENGTH: 20 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) post-test, (3) student-teacher evaluation.

TEACHER COMPETENCY: A working knowledge of and resource materials for teaching aircraft power plants.

INSTRUCTIONAL MATERIALS:

Visuals: Film - Do's and Don'ts - Teledyne Continental Motors
Turboprop/turboshaft Engines - U. S. Navy
Filmstrip - Aircraft Ignition Systems - Sanderson
Chart - Continental Aircraft Engine - Teledyne Continental Motors

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: Upon completion of this unit, the student will be able to understand reciprocating and reaction engines.

WORK COPY

UNIT TITLE: Power Plants

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. recognize the types of aircraft and reciprocating engines.
2. identify the various parts of a reciprocating engine by dismantling and remounting an engine.
3. describe the types and utilizations of reaction engines.
4. demonstrate skills related to actual industry occupations.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Types of aircraft. Reciprocating engines: Radial Opposed Obsolescent Rotary In-line V-type Double-V	Read pp. 58-60 View pictures of the different types of engines and identify each. View: Continental Aircraft Engine Brochure View: Do's and Don'ts	Evaluate identifying of reciprocating engines.	Text: Aeroscience - Misenhimer Pictures of the different reciprocating engines. Continental Aircraft Engine Brochure Film: Do's and Don'ts Teledyne Continental Motors
Nomenclature Cylinder Piston Connecting rod Crankshaft Camshaft Crankcase Valves	Read pp. 63-67 Dismantle and remount an engine. Use LAP No. 25		A reciprocating engine
Engine systems: Lubrication Carburetion Induction Ignition Electrical Exhaust Cooling Fuel	Read pp. 67-78 Construct mock-up of the various systems. Use LAP No. 25 View: Aircraft Ignition System	Evaluate mock-ups	Filmstrip: Aircraft Ignition Systems - Sanderson

WORK COPY

UNIT TITLE: Power Plants

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Fundamentals of engine design: Power Plant Horsepower Super charger Reliable Compact Low fuel and oil consumption Smooth operation Readily accessible	Read pp. 79-82 Listen as a guest lectures on the fundamentals of engine design.		
Reaction engines: Types Nomenclature Utilization	Read pp. 93-107 Identify pictures of reaction engines. View: Turboprop/turboshaft Engines Listen as teacher describes the uses of reaction type engines.	Identification of reaction engines. Written examination to conclude unit.	Film: Turboprop/turboshaft Engines - NM-8812T - Navy

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 26

TEACHING UNIT TITLE: Advanced Aerodynamics

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. describe aircraft stability, how an aircraft flies.
2. relate different aircraft performances to aircraft design.

RECOMMENDED PREREQUISITES: Aviation Science I and II.

TEACHING UNIT LENGTH: 20 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) student-teacher evaluation, (3) post-test.

TEACHER COMPETENCY: Working knowledge of applied physics.

INSTRUCTIONAL MATERIALS:

Visuals: - AFTF1-160 Aerodynamics - Air Flow
AFTF1-161 Aerodynamics - Forces Acting on an Air Foil
FAA FA-704 Stable and Safe
AFTF1-5340 Part 1 High Speed Flight - Approaching the Speed of Sound
AFTF1-5341 Part 2 High Speed Flight - Transonic
AFTF5550 Part 3 High Speed Flight - Beyond the Speed of Sound

Filmstrip - Sanderson #0197 Airplane Performance

Books: - APR. Inc. Aeroscience
Sanderson Aviation/Aerospace Fundamentals
C. N. Van Deventer General Aeronautics
C.A.P. Aircraft in Flight

Equipment: - Ball, cardboard, gliders, model airplane owner's and operator's manual.

Consumables: - Performance charts, photos of aircraft.

GENERAL COMMENT: Upon completion of this unit, student will have an understanding of flight problems of modern aircraft.

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WORK COPY

UNIT TITLE: Advanced Aerodynamics

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. describe aircraft stability, how the airplane flies.
2. relate different aircraft performances to aircraft design.
3. demonstrate through experiments various stability effects.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Develop nomenclature of aerodynamics.	Refer to text.	Build models of air foils and label each part.	Texts: APR, Inc. Aeroscience Sanderson Aviation/Aerospace Fundamentals C. N. Van Deventer General Aeronautics C.A.P. Aircraft in Flight
Aircraft stability. Positive Negative Neutral	Demonstrate types of stability, use ball on curved cardboard.		
Inherent stability. Static stability. Catastrophic instability. Dynamic stability.	View films: Aerodynamics - Air Flow Aerodynamics - Forces Acting on an Airfoil		Films: Aerodynamics - Air Flow Aerodynamics - Forces Acting on an Airfoil - Air Force
Aircraft reference. Longitudinal Lateral Vertical	Fly gliders and model aircraft. View film: FA-704 Stable and Safe	Demonstrate on model action around axis of aircraft.	FAA FA-704 Stable and Safe
Longitudinal stability. Lateral stability. Dihedral Keel effect Sweepback Weight distribution Directional stability.	Rig models to observe stability effects.	Written exercise on definitions.	

UNIT TITLE: Advanced Aerodynamics

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Controls and auxiliary controls Rudder Elevator Aileron	Visit airport and inspect aircraft. Flight in aircraft to observe effects of controls, also torque.		
Trim tabs Flaps Slots			
Unconventional controls and surfaces. V-tail Spoilers Speed brakes Full length flaps Fences Nose mounted controls	Examine photos of aircraft. Read references. Visit by aircraft designer or builder.		Photos of different types and configuration of aircraft. Performance charts. Owner's and operator's manual of different aircraft.
Performance of different aircraft. Review weight and balance Center of gravity Moment envelope Take off performance Chart Koch chart Cruise performance Chart Landing performance Chart	Use charts to observe performance of aircraft under different conditions of weights and weather. View films: High Speed Flight - Parts 1, 2, and 3 View filmstrip: Airplane Performance		Films: AFTF1-5340 Part 1 High Speed Flight - Approaching Speed of Sound AFTF1-5341 Part 2 High Speed Flight - Transonic AFTF550 Part 3 High Speed Flight Beyond the Speed of Sound Filmstrip: Sanderson #0197 Airplane Performance
Loads and load factors		Written unit test.	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE 13.0499

TEACHING UNIT NO. III - 27

TEACHING UNIT TITLE: Aircraft Design and Construction

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. interpret plans and specifications of aircraft components by shop projects or answering written questions.
2. create original designs for testing.
3. evaluate shop projects by applying pre-stated rules.
4. use aircraft related shop tools with acceptable skill, judged by inspection of products.

RECOMMENDED PREREQUISITES: Aviation Science I and II.

TEACHING UNIT LENGTH: 27 hours (1 hour per day)

EVALUATION: Teacher evaluation of projects
FAA inspection of any aircraft

TEACHER COMPETENCY: Working knowledge of light aircraft design and construction.

INSTRUCTIONAL MATERIALS:

Visuals: - The Wind is Right - FAA 16mm

Book: - Aeroscience
FAA Aircraft Files

Equipment: - Basic drafting equipment
Shop equipment for jig and pattern making.

Consumables: - Aircraft construction materials

GENERAL COMMENT: This unit should be taught during entire year as the students become experienced in various construction techniques. Construction of a large scale model can be substituted for actual aircraft.

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UNIT TITLE: Design and Construction

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. interpret plans and specifications of aircraft components by shop projects or answering written questions.
2. create original designs for testing.
3. evaluate shop projects by applying pre-stated rules.
4. use aircraft related shop tools with acceptable skill judged by inspection or products.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Working drawings . Basic principles Lines and symbols Scale and measurement	Read references. Study sample plans. Design and draw to scale small structural component.	Teacher guidance and evaluation of designs.	Aircraft plans and specifications. Basic drafting equipment
Jigs and patterns	Build jig for some structural part using aircraft plans.	Teacher evaluation of shop project.	EAA Aircraft Design - Vols. 1, 2, and 3 Reference: FAA's A.C. #43.13-1 A.C. #43.13-2
	Make pattern of actual aircraft part.		
Fuselage construction	Cut, weld, and finish fuselage section. Read references. Study diagrams. Listen to resource person.	Teacher evaluation of shop projects. FAA inspector - for experimental aircraft.	Aircraft plans Aircraft tubing
Wing construction	Build wing from plans for aircraft or model.	FAA inspection	Aircraft wing materials E.A.A. Manuals.
Control surfaces	Construct necessary control surfaces for aircraft or model.	Evaluation by resource personnel. FAA inspection	Aircraft materials for control surfaces.

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UNIT TITLE: Design and Construction

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Assembly of structural parts.	Assemble and finish structural components under direction of resource person.	Evaluation of project by instructor, resource personnel and F.A.A. inspector.	F.A.A. regulations on aircraft construction.
Control panel and instruments.	Construct and install control panel in aircraft or model.	Inspection by authorized personnel.	Raw materials.
Rigging.	Rig aircraft or model according to specifications.	Teacher evaluation. Inspector's report.	F.A.A. regulations
Painting.	Paint aircraft or project following directions.	Inspection by teacher, students, and resource personnel.	
Power plant installation.	Follow instructions and aid resource person in power plant installation.	Evaluation by inspector and engine ground test.	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 28

TEACHING UNIT TITLE: Careers and Opportunities

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. show an awareness of the tremendous array of career and occupational opportunities in the areas of aviation and aerospace.
2. select fields of study directed toward their occupational choice.

RECOMMENDED PREREQUISITES: Aviation Science I and II.

TEACHING UNIT LENGTH: 15 hours (1 hour per day)

EVALUATION: (1) Written report on selected occupational area, (2) student-teacher evaluation.

TEACHER COMPETENCY: A working knowledge of careers and opportunities in Aviation.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrips - Careers in Aviation and Aerospace - Sanderson
Aviation - Where Career Opportunities Are Bright - FAA
Looking Ahead - Piper
Training for Perfectionists - Air Force

Film - Brother - FAA
How to Succeed Without Really Flying - FAA
It Takes A Man - Air Force
Engineer: Man of Destiny - Sterling
Aviation Mechanic - FAA
Aviation Work Shop - FAA
Holes in our Pockets - Sales Training Associates

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to teach students about the many career opportunities in aviation. This unit can be taught as a continuous unit throughout the year.

WORK COPY

UNIT TITLE: Careers and Opportunities

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1 show an awareness of the tremendous array of career and occupational opportunities in the area of aviation and aerospace.
2 select fields of study directed toward their occupational choice.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Career planning	Read pp. 769 - 771 View Careers in Aviation and Aerospace		Text: Aeroscience - Misenhimer Filmstrip: Careers in Aviation and Aerospace- Sanderson
General Aviation Careers	Select the career you would most like in aviation. Read pp. 754 - 766 View Aviation - Where Career Opportunities Are Bright Listen to a guest lecture discuss general aviation careers. View Brother Visit an airport and list the jobs observed.		Filmstrip: Aviation - Where Career Opportunities Are Bright - FAA Film: Brother - FAA
F.A.A. careers	Read pp. 767 - 769 Listen to FAA personnel director explain career opportunities with the F.A.A. View Aviation Workshop and How To Succeed Without Really Flying		Films: Aviation Workshop - FAA How To Succeed Without Really Flying - FAA

WORK COPY

UNIT TITLE: Careers and Opportunities

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Armed Services Careers	Listen to guest speaker from armed services discuss career possibilities. View Aviation Mechanic		Film: Aviation Mechanic - FAA
Airline Careers	Read pp. 776 - 781 View Holes in our Pockets and Engineer - Man of Destiny Discuss career Opportunities with a representative of an airline. View Training for Perfectionist and Looking Ahead		Film: Holes in our Pockets - Sales Training Associates Film: Engineer - Man of Destiny - Sterling Movies Filmstrip: Training for Perfectionist - Air Force Looking Ahead - Piper
	Undergo a job interview arranged by teacher.	Prepare a list of the career oppprtunities in the following 4 areas: 1. General Aviation 2. F.A.A. 3. Armed Services 4. Airline Have students select careers they would most like in aviation and compare to their choice at beginning of unit. This unit can be taught as a continuous unit throughout the year.	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace Ed. II

TEACHING UNIT NO. III - 29

TEACHING UNIT TITLE: Rules of Flight

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. illustrate a general knowledge of rules of flight by passing a written examination.

RECOMMENDED PREREQUISITES: Aviation Science I and II

TEACHING UNIT LENGTH: 12 hours (1 hour per day)

EVALUATION: (1) Pre-test, (2) Post-test, (3) student - teacher evaluation

TEACHER COMPETENCY: An understanding of and resource materials for teaching rules of flight.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrips - Airports - Sanderson
Airspace Utilization - Sanderson

Films: - The Flight Service Station - FAA
What's My Traffic - FAA

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to provide the student with a general knowledge of rules of flight.

WORK COPY

UNIT TITLE: Rules of Flight

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. illustrate a general knowledge of rules of flight by passing a written examination.
2. describe the orderly movement of air traffic on the ground and in flight.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Good operating practices: Alertness Judgement Clearing procedures	Read pp. 384-385 Listen as teacher discusses importance of alertness, judgement, and clearing procedures.		Aeroscience - Misenhimer text
Air traffic control Traffic pattern Airways Air navigation radio aids Radar	Read pp. 385-396 View: Flight Service Station View: Air Space Utilization Listen as an invited controller discusses Air Traffic Control. Attend FAA safety clinic.		Film: The Flight Service Station - FAA Filmstrip: Air Space Utilization - Sanderson
Airport, Air Navigation Lighting, and Marking Aids: Lighting Airport Runway Airport markings	Read pp. 397-400 View Airports Construct a model Airport and include as many markings and lights as possible. Use LAP No. 29	Written exercise Evaluate models	Filmstrip: Airports - Sanderson
Control Areas: Departure Enroute Continental Positive Arrival	View: What's My Traffic Listen as teacher describe the various control areas.		Film: What's My Traffic - F.A.A.

WORK COPY

UNIT TITLE: Rules of Flight

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Landing Approach control Tower - controlled Non-tower airports	Listen as teacher compares and contrasts landings at tower - controlled and non-towered airports.		References: Airman's Information Manual
Emergency procedures: Uncertain of position Radio failure Search and rescue	Listen as an invited member of the C.A.P. tells you what to do in case of an emergency.	Written examination to conclude unit.	
Close Flight Plan			

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 30

TEACHING UNIT TITLE: Introduction to Flight Maneuvers

TEACHING UNIT OBJECTIVES: Upon completion of this unit, students will be able to:

1. list 90% of steps involved in a preflight inspection.
2. demonstrate with model plane 85% of maneuvers covered in unit while giving oral explanation of each.

RECOMMENDED PREREQUISITES: Aviation Science I and II

TEACHING UNIT LENGTH: 12 hours (1 hour per day)

EVALUATION: (1) teacher evaluation, (2) student - teacher evaluation, (3) post test

TEACHER COMPETENCY: Basic knowledge of aerodynamics and flight maneuvers

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrips: - Aircraft Ground Operation - Sanderson
Basic Flight Maneuvers - Sanderson

Film: - Flight Training Series: (1) Crosswind Approaches, Landings (2) Before You Fly (3) Take Offs, Approaches, Landings

Books: - Above and Beyond
General Aeronautics
FAA Flight Handbook

Equipment: - Model plane

GENERAL COMMENT: This unit is designed to prepare the student for an actual flying experience, during which he may pilot the plane. These maneuvers are the basic maneuvers encountered in every flight.

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UNIT TITLE: Introduction to Flight Maneuvers

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. list on paper 90% of the steps involved in preflighting an aircraft.
2. relate orally an example of a typical roll out, run up, etc. with 80% of the usual procedures included.
3. demonstrate with a model a take off, climb out, basic flight maneuvers, approach, and landing, while giving oral explanation of each step, including 85% of maneuvers covered in this unit.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Preflight 101	Read references Review elements involved in preflight inspection. Observe demonstration of preflight inspection. See film: Flight Training-Take-offs, Approaches, Landings		Above and Beyond Air Encyclopedia of Aerospace and Aviation General Aeronautics FAA Flight Handbook Film: Flight Training - Take-offs, Approaches, Landings
Taxiing	View filmstrip: Aircraft Ground Operation Answer questions about filmstrip - orally	Teacher evaluation of oral questions.	Filmstrip: Aircraft Ground Operation - Sanderson
Take offs - climb out	Observe film: Before You Fly Read references given at beginning of unit.		Film: Before You Fly - Navy
Basic flight maneuvers: Straight and level flight Medium turn Climbing turns Descents and gliding turns Slow flight	Listen to flight instructor discuss proper execution of flight maneuvers. Watch filmstrip: Basic Flight Maneuvers Answer written questions on filmstrip. On a field trip to airport, observe flight		Filmstrip: Basic Flight Maneuvers - Sanderson

WORK COPY

UNIT TITLE: Introduction to Flight Maneuvers

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	maneuvers as an instructor on the ground commentates.		
Approach and landing	Using a model, duplicate the instructor's flight and give commentary on your demonstration.		Model plane
	See film: Crosswind Approaches, Landings, and Take-offs		Navy film: Flight Training Crosswind Approaches, Landings, and Take-offs
	Take a "flight" in a simulator - discuss this experience with the class.	Student - teacher evaluation of simulater flight	Simulator
		Post test	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace II OE CODE: 13.0499

TEACHING UNIT NO. III - 31

TEACHING UNIT TITLE: Man in Space

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. recite facts pertaining to the early history of space flight.
2. describe how a body can be placed into space by referring to thrust, guidance systems, launching, and escape velocity.
3. summarize what lies ahead for space travel.

RECOMMENDED PREREQUISITES: Aviation Science I and II

TEACHING UNIT LENGTH: 25 hours (1 hour per day)

EVALUATION: (1) Pre - test, (2) Post - test, (3) student - teacher evaluation

TEACHER COMPETENCY: A knowledge of and resource for teaching about man in space.

INSTRUCTIONAL MATERIALS:

Visuals: Films: - Universe
The Mastery of Space
America in Space: The First Decade
Before Saturn
Friendship 7
Space Navigation
The Vital Link
Living in Space: Parts I and II
International Cooperation in Space
Ariel - The First International Satellite
By - Products of Space Research

Book: - Aeroscience

GENERAL COMMENT: This unit is designed to allow the student to explore what man has accomplished in his quest of space.

WORK COPY

UNIT TITLE: Man in Space

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. recite facts pertaining to the early history of space flight.
2. describe how a body can be placed into space by referring to thrust, guidance systems, launching and escape velocity.
3. demonstrate international cooperation in space and state examples.
4. summarize what lies ahead for space travel through research of predictions.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Early history of space flight Solar system: Sun Planets Earth: Size Shape Position Moon	Take a pre-test to find out how much you know about space flight. View films - America in Space: The First Decade Before Saturn Friendship 7 The Mystery of Space Read pp. 526-541 Use LAP No. 31 Construct simulator of universe. View film: Universe Listen as teacher relates facts about the Earth.	Pre-test Assign written reports related to history of man in space. Evaluate structures.	Text: Aeroscience - Misenhimer Films: America in Space The First Decade Before Saturn Friendship 7 The Mystery of Space - NASA Film: Universe - NASA
Thrust required for space flight.	Visit planatarium. Construct and launch rocket. Use LAP No. 31 Read pp. 542-549	Have students compare solid and liquid propellants.	
Guidance systems for space flight	View The Vital Link Read pp. 550-552 Construct mock-up of guidance system. Use LAP No. 31	Evaluate structures.	Film: The Vital Link - NASA

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UNIT TITLE: Man in Space

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Launching a satellite into orbit	Observe as NASA exhibit is displayed by expert invited by teacher. Read pp. 554-556	Written exercise	
Escape velocity	Listen as teacher explains escape velocity. Read pp. 556-557		
Unmanned satellites and sounding rockets	Read pp. 558-566 Compare different satellites and rockets. Construct models of various satellites and rockets. Use LAP No. 31	Evaluate structures.	
International cooperation in space	View Ariel - The First International Satellite and International Cooperation in Space Discuss how different nations have cooperated in placing man in space. View Space Navigation Construct mock-up of Apollo aircraft, Use LAP No. 31	Evaluate structures.	Films: Ariel - The First International Satellite International Cooperation in Space - NASA Film: Space Navigation - NASA
From Earth to the Moon and beyond	Simulate trip to moon and back to Earth. Read pp. 556-587		

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UNIT TITLE: Man in Space

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Three steps to the Moon	Read pp. 587 - 602 list the various steps and describe each.		
Major human problems in space	View Living in Space - Parts I, II, and III Read pp. 603 - 611 Listen as teacher explains problems of living in space and how these problems have been overcome.		Film: Living in Space - Parts I, II, and III - NASA
Predict what lies ahead	View By-Products of Space Research	Have students predict the future of space exploration. Written exam to conclude unit.	Film: By-Products of Space Research - NASA

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 31

TEACHING UNIT TITLE: F.A.A. Regulations

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. express an understanding of the F.A.A. Regulations by passing an examination related to these regulations.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II

TEACHING UNIT LENGTH: 20 hours (2 hours per day)

EVALUATION: (1) Written examination

TEACHER COMPETENCY: Knowledge of F.A.A. regulations

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrips - Private Pilot, Federal Aviation regulations and space utilization - Sanderson

Film - Flight - F.A.A.
Guide - Federal Aviation regulations: a programmed self study guide - C.A.P.

Book: - Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to help students understand the F.A.A. regulations and the necessity for enforcement.

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UNIT TITLE: F.A.A. Regulations

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

(1) express an understanding of the F.A.A. regulations by passing an examination related to these regulations.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
F.A.A. Regulations: Part 61 (1) General Definitions (2) Abbreviations and symbols. (3) Certification - Pilots and flight instructors Part 65 (4) Certification - Airmen other than flight crew members.	Read: Federal Aviation Regulations: A Programmed self - study guide. Read pp. 425 - 440 View - Private Pilot Federal Aviation Regulations and Space Utilization. Read pp. 441 - 442		Text - Aeroscience - Misenhimer. Guide - Federal Aviation Regulations: a programmed self - study guide. Filmstrips - Private Pilot Federal Aviation Regulations and Air Space Utilization (3)- Sanderson
Part 91 (1) General Operating and flight rules (2) Flight rules	Read pp. 442 - 445 View - Flight	Written examination to conclude unit.	Film - Flight - F.A.A.

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE: 13.0499

TEACHING UNIT NO. IV - 32

TEACHING UNIT TITLE: Aviation Meteorology

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. express an understanding of weather hazards.
2. read and interpret teletype reports through actual flight plan.
3. read and use weather charts.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II

TEACHING UNIT LENGTH 36 hours (2 hours per day)

EVALUATION: 1. Interpretation of sequence reports.
2. Written examination.

TEACHER COMPETENCY: A knowledge of weather and weather services related to aviation.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Advanced Meteorology - Sanderson
Meteorology from Space - NASA
Film - Space Down to Earth - NASA
Landing Weather Minimums Investigation FR878 Air Force
Key to Sequence Report - Daily weather reports.

Book: - Aeroscience - Misenhimer Aviation Weather

GENERAL COMMENT: This unit is designed to acquaint the student with aviation weather and the factors associated with weather, and give him the ability to use this knowledge effectively.

WORK COPY

UNIT TITLE: Aviation Meteorology

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. express an understanding of weather hazards.
2. read and interpret teletype reports through actual flight planning.
3. read and use weather charts.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Weather Hazards Poor visibility Fog Haze Dust Precipitation Icing Thunderstorms Turbulence Extreme weather (tornados, etc.) Density - Altitude	Read references. View teacher constructed transparencies and slides. View - Landing Weather Minimums Investigation. View - Advanced Meteorology Study key to sequence reports	Written exercise on interpretation of actual sequence reports.	Reference Aviation Weather Transparencies and slides Text - Aeroscience - Misenhimer Film - Landing Weather Minimums Investigation - FR878 - Air Force Filmstrip - Advanced Meteorology (3) - Sanderson Key to Sequence reports.
Teletype reports Sequence reports Winds aloft Terminal forecast Area forecast Severe weather forecast Radar reports Sigments Airmets Pilot reports	Read references, Interpret actual daily forecast. Man weather station. View - Space Down to Earth		Daily weather reports. Weather maps and charts. Film - Space Down to Earth - NASA

WORK COPY

UNIT TITLE: Aviation Meteorology

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Weather charts . Surface . Depiction . Radar summary . 24 hour low high level Prognosis charts . Jet stream . Constant pressure . 850 and 700 millibar . Winds aloft . Satellite	View - Meteorology From Space		Filmstrip - Meteorology From Space - NASA Film:
High Altitude Weather Arctic weather Mountain weather	Read references	Written examination to conclude unit.	Reference: Aviation Weather - Government printing office

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 33

TEACHING UNIT TITLE: Advanced Flight Computer

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. state the fuel consumption of an aircraft for a given distance at a known rate of speed and time of travel, using flight computer computations.
2. develop wind problems using the computer.
3. draw a wind triangle of an actual condition.
4. explain an off course condition using a sectional map.

RECOMMENDED PREREQUISITES: Aviation Science I and II.
Occupational Aerospace II.

TEACHING UNIT LENGTH: 10 hours (2 hours per day)

EVALUATION: (1) Pre - test, (2) Teacher observation, (3) Post unit test.

TEACHER COMPETENCY: Working knowledge of computer functions.

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Computer 2 - Sanderson
Transparency - Flight Computer - Sanderson
Book: - Aeroscience - Misenhimer
Equipment: - E6 - B type computer - Aircraft plotter

GENERAL COMMENT: The flight taken should be an integral part of the unit of instruction. The trip should follow the visit of a resource person.

WORK COPY

UNIT TITLE: Advanced Flight Computer

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. state the fuel consumption of an aircraft for a given distance at a known rate of speed and time of travel using flight computer computation.
2. develop wind problem using the computer.
3. draw a wind triangle of an actual condition.
4. explain an off course condition using a sectional map.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Review of computations - calculator side of the computer, time, speed and distance, fuel comsumption.	Observe sample problem - solve sample problem using computer.	Pre - test	E 6 - B Type Computer Aircraft plotter
Conversion - airspeed to true airspeed - calibrated altitude to true altitude - statute to nautical miles - fahrenheit to centigrade temperature.	View filmstrip Computer 2	Teacher observation	Filmstrip: Computer 2 Sanderson
Effect of wind - course heading and drift angle - wind triangle - technique in use of plotter.	Solve real problem from plans that have been filed and have contest among students for accuracy.	Observation of student in actual flight conditions	Book - Aeroscience - Misenhimer Transparency- Flight - Computer 2 Sanderson
Wind side of computer - true index - grommet a. wind triangle using E6-B computer b. enroute wind triangle using E6 - B computer	Prepare a pilot planning chart for flight and draw wind triangle. Chart an actual flight.	Post unit test	

WORK COPY

UNIT TITLE: Advanced Flight Computer

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Off course and Radius of action problems.	and follow through. Listen as resourse person discusses computer use in flight. Study transparency flight computer.		

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 34

TEACHING UNIT TITLE: Radio Aids and Communications

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. list current communication aids used by light aircraft.
2. demonstrate a working knowledge of light aircraft facilities by using those necessary for actual flight, from a controlled airport.

RECOMMENDED PREREQUISITES: Aviation Science I and II
Occupational Aerospace II

TEACHING UNIT LENGTH: 20 hours (2 hours per day)

EVALUATION: Instructor Evaluation.
Weekly written exercise.
Written unit test.

TEACHER COMPETENCY: A working knowledge of aviation communications and devices.

INSTRUCTIONAL MATERIALS:

Visuals: - 16mm Film #HQA - 174 The Vital Link N.A.S.A.
16mm Film #FAC - 122 Using The Airspace F.A.A.
16mm Film #TE6132 - Avionic Maintenance Safety U.S.A.F.

Book: - Aeroscience, Aviation/Aerospace Fundamentals

GENERAL COMMENT: Relate communication equipment studied to those used in actual flight by students.

WORK COPY

UNIT TITLE: Radio Aids and Communication

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. list current communication aids used by light aircraft.
2. demonstrate a working knowledge of light aircraft communication facilities by using those necessary for actual flight, from a controlled airport.
3. identify coded letters by sound or sight.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Radio aids . V.O.R. Stations. . A.D.F. Stations.	Visit facility related to subject. Listen to F.A.A. resource person. Read references.	Oral evaluation by class members.	Text Aeroscience Aviation/ Aerospace Fundamentals
. Distance measuring equipment.	Study diagrams and references. View transparencies.	Written exercise.	Manufacturer's manuals.
. Instrument landing system.	View 16mm film Avionic Maintenance Safety View slides. Study references. Construct mock-up.	Written test including diagrams.	16mm film Avionic Maintenance Safety U.S.A.F. Above and Beyond.

WORK COPY

UNIT TITLE: Radio Aids and Communication

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Transponders.	Read references Aviation/Aerospace	Written identification test.	Airman's Information Manual
	Read references. Aviation/Aerospace Fundamentals		Aeroscience Aviation/ Aerospace Fundamentals.
	Construct Avionic display using manufacturing picture.		
Collision Avoidance systems.	Report to group on developments and products for avoidance systems.		Manufacturer's description of avoidance systems.
Space Communications.	Listen to resource person View film The Vital Link	Class discussion.	NASA film #HQA -174 The Vital Link
		Written unit examination.	

WORK COPY

UNIT TITLE: Radio Aids and Communications

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Radios . Types . Operation . Interference . Rules	Identify aircraft radios from photographs or units. View film - Using the Airspace. Read references supplied by instructor.	 Written test.	Pictures of radio units or actual units FAA Film #FAC - 122 Using the Airspace
Radar controlled approaches	View diagrams. Listen to FAA safety talk.	Class discussion.	
Radio procedure . Ground . Air	Demonstrate proper procedure during actual flight.	Record messages play to class.	Tapes or cassettes.
Morse code Aural . Visual	Study examples. Listen to recordings of Morse code. Identify light signals	 Using key send letters for identification.	 Recordings of Morse code.
Frequences	Study list supplied by teacher.		

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 35

TEACHING UNIT TITLE: Pre-Flight

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. pre-flight an aircraft by using a check list.

RECOMMENDED PREREQUISITES: Aviation Science I and II
Occupational Aerospace II

TEACHING UNIT LENGTH: 10 hours (2 hours per day)

EVALUATION: (1) Pre-flight different aircraft.

TEACHER COMPETENCY: A knowledge of pre-flight techniques.

INSTRUCTIONAL MATERIALS:

Visual: Film - Pre-flight and Visual Inspections - SA16 Air Force FTA 174A - B

Book: - APR. Inc. Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to enable students to perform pre-flight checks.

WORK COPY

UNIT TITLE: Pre-Flight

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

(1) Pre-flight an aircraft by using a checklist.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Exterior checks: Controls Landing gear Propeller Fuel → Lights → For signs of damage	Read pp. 408 - 410 View Pre-flight and Visual Inspections PT. 1 Observe as teacher goes over the pre-flight exterior checks.		Text: APR, Inc. Aeroscience - Misenhimer Films: Pre-flight and Visual Inspections - Air Force FTA 174A - B
Interior checks: Instruments Required certification Check list	View Pre-flight and Visual Inspections PT. 2 Observe as teacher goes over the pre-flight interior checks. Review check list for various aircraft.	Visit airport and have students pre-flight as many aircraft as possible. Written examination to conclude unit.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 36

TEACHING UNIT TITLE: Airports and Airways

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. list and describe the various types of airports.
2. plan an airport for his area.
3. describe victor airways by referring to a sectional chart.

RECOMMENDED PREREQUISITES: Aviation Science I, II and Occupational Aerospace II

TEACHING UNIT LENGTH: 20 hours (2 hours per day)

EVALUATION: (1) Plan an airport, (2) Student-teacher evaluation, (3) Written examination.

TEACHER COMPETENCY: A working knowledge of and resource materials for teaching airports and airways.

INSTRUCTIONAL MATERIALS:

Visuals: Films - A Place to Land; It Pays to Stay Open: Dulles International Airport, Port of the Future: Airports in Perspective: Best Investment We Ever Made - FAA

Filmstrip - Airports, Airways and Electronics - C.A.P.

Book: - APR. Inc.
Aeroscience - Misenhimer

GENERAL COMMENT: This unit is designed to teach students the operations of airports and the necessity of airways.

WORK COPY

UNIT TITLE: Airports and Airways

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. list and describe the various types of airports.
2. plan an airport for his area.
3. describe victor airways by referring to a sectional chart.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Airports: Types Functions Facilities Management Financing Planning Future needs Benefits.	List and describe the various types of airports. View: The Best Investment We Ever Made Listen as an invited fixed base operator explains the behind-the-scenes activities on an airport. View: Airports in Perspective		Film: The Best Investment We Ever Made - FAA Airports in Perspective - FAA
	Visit an airport and observe the activities. View: It Pays to Stay Open		It Pays to Stay Open - FAA
	Plan an airport for your area. Discuss airports with an Airport manager invited by the teacher. Use LAP No. 36 View: A Place to Land Justify your airport by listing the future needs and benefits to the community. View: Dulles International Airport - Port of the Future	Evaluate plans.	A Place to Land - FAA Dulles International Airport - Port of the Future - FAA

WORK COPY

UNIT TITLE: Airports and Airways

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Airways	Listen as an invited speaker describes Victor Airways. Read Airman's Information Manual - Part 1 on airways View: Airports, Airways, and Electronics. Study sectional chart showing airways.		Airman's Information Manual - Part 1 Airports, Airways, and Electronics - CAP Sectional chart Federal Aviation Regulations - Part 71
Airman's Information Manual. Part 1 Part 2 Part 3 Part 4	Study assigned references.	Written examination to conclude unit.	Enroute low and high altitude charts.

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 37

TEACHING UNIT TITLE: Flight Planning

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. complete a flight plan.
2. use flight plan as instrument of safety.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II

TEACHING UNIT LENGTH: 10 hours (2 hours per day)

EVALUATION: (1) Completing a flight plan.

TEACHER COMPETENCY: A knowledge of flight planning.

INSTRUCTIONAL MATERIALS:

Visual:	Film	- The Flight Service Station - F.A.A.
Book:		- APR, Inc. Aeroscience - Misenhimer
Equipment:		- Plotter Computer watch
Consumables:		- Flight log forms - Flight plan forms

GENERAL COMMENT: This unit is designed to teach the student to complete a flight plan.

WORK COPY

UNIT TITLE: Flight Planning

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Ojbective) Upon completion of this unit, the student will be able to:

1. complete a flight plan.
2. use flight plan as instrument of safety.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Information: Weather Pre-flight planning or log Aircraft inspection Clearances Flight plan Activate On route reports Close	Read pp. 407 - 411 Consult local flight service station for weather information. View: The Flight Service Station. Fill out a flight plan. Use LAP No. 37 Visit a flight service station. Take an actual trip from your flight plan.	Have students fill out a flight plan as a post test.	Text - APR, Inc. Aeroscience - Misenhimer Film - The Flight Service Station - F.A.A. Navigation Log - maps - plotter - computer - watch - flight plan forms.

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace OE CODE 13.0499

TEACHING UNIT NO. IV - 38

TEACHING UNIT TITLE: Flight Maneuvers

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. describe in writing execution of basic flight maneuvers.
2. execute, with flight instructor's supervision, all basic airplane maneuvers.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II.

TEACHING UNIT LENGTH: 20 hours (2 hours per day)

EVALUATION: (1) Student - teacher evaluation, (2) teacher evaluation, (3) flight instructor's evaluation, (4) post test.

TEACHER COMPETENCY: Private pilot

INSTRUCTIONAL MATERIALS:

Visuals: Filmstrip - Private Pilot's Airplane Course - Sanderson Maneuvers

Book: - Private Pilot's Handbook to Aeronautical Knowledge FAA

GENERAL COMMENT: This unit provides for actual flight experience with flight instructors supervision, in which all basic flight maneuvers are covered.

WORK COPY

UNIT TITLE: Flight Maneuvers

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. describe in writing with 90% efficiency the execution of all basic airplane maneuvers.
2. while in control of aircraft under flight instructor's supervision, execute all basic airplane flight maneuvers, to the satisfaction of the flight instructor.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Preflight Taxi Take off Climb out Straight and level Traffic pattern	Observe filmstrip covering the preliminary flight maneuvers. Answer questions orally. Make a flight with certified flight instructor. Execute maneuvers. In class have a critique concerning the individual flights.	Teacher evaluation of questions. Flight instructor's evaluation.	Private Pilot Airplane Maneuvers Course - Sanderson
Medium turns Climbing turns Descents and Girding turns	Read reference - observe filmstrip - participate in class discussion concerning maneuvers covered in filmstrip.		Private Pilot's Handbook of Aeronautical Knowledge - FAA Private Pilot Airplane Maneuvers Course
Stalls Slow flight approach and Landing	Make flight - execute maneuvers. Have critique of flight experience.	Student - teacher evaluation.	

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UNIT TITLE: Flight Maneuvers

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Speed changes in level flight	Observe filmstrip		Private Pilot Airplane Maneuver Course - Sanderson
Ground reference maneuvers.	Take flight and execute maneuvers.		
Coordination exercises turns to headings.	Have critique on flight maneuver execution.		Private Pilot Airplane Maneuver course
Crosswind take offs and landings.	Observe filmstrip		
Use of LAPs	Read reference. Answer written questions.	Teacher evaluation.	Private Pilot's Handbook to Aeronautical Knowledge FAA
Emergency go-arounds. Forced landings.	Take flight - execute maneuvers. Have critique of flight maneuvers.	Flight instructor's evaluation.	
	In flight review all maneuvers previously executed.	Student - teacher evaluation.	
	Review filmstrips Visit EAA fly in - observe maneuvers.	Post test	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE: 13.0499

TEACHING UNIT NO. IV - 39

TEACHING UNIT TITLE: Applied Navigation

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. realize importance of navigation and communication to modern air travel.
2. utilize maps, charts, tools as used in modern navigation.
3. understand the principles and rules of cross-country flying.
4. know flight planning procedure.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II.

TEACHING UNIT LENGTH: 40 hours (2 hours per day)

EVALUATION: 1. Teacher evaluation of student's use of navigational tools -charts - maps.

2. Post test.

TEACHER COMPETENCY: Rated or private pilot or basic ground instructor.

INSTRUCTIONAL MATERIALS:

Visuals: - AF SFP 1728 The Story of Navigation/Transparencies on Navigation
TF1-3460 Aerial Navigation - Map Reading/Jeppesen & Co. Company, Denver Colorado
TF1-4990 Primary Pilot Navigation
TF1-5206 series Wind and the Navigator - Sanderson, Denver, Colorado
FAA FAC122 Using the Airspace, Navigation and Communication

Books: - APR, Inc. Aeroscience/ C.N. Van Deventer General Aeronautics Sanderson Aviation/Aerospace Fundamentals/ Civil Air Patrol Navigation

Equipment: - Ruler, plotter, computer, radio, navigation instruments, sextant, clock, air Almanac and the Weather.

Consumables: - Maps (Sectional and WAC) printed flight plan forms. Printed flight log forms celestial charts.

GENERAL COMMENT: This unit imparts knowledge to student on use of navigational tools and ability to work navigational problems.

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UNIT TITLE: Applied Navigation

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. realize importance of navigation and communication to modern air travel.
2. utilize maps, charts, tools as used in modern navigation.
3. understand the principles and rules of cross-country flying.
4. know flight planning procedure.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTION MATERIALS
Applied use of all forms of aerial navigation. Pilotage Visual landmark Dead reckoning. Maps and charts Symbols Scales Variation Computer Plotter Wind triangle Radio LF radio navigation	Refer to text. Plan simulated flight between three airports at least 100 miles apart, plan course in a triangular pattern. Draw course on sectional map. With given air speed and weather conditions, plot each leg of trip, using compass correction chart as found in C.N. Van Deventer General Aeronautics pp. 302, Fig. 10 correct for deviation. Use variation as found on map given fuel consumption and cost of fuel. View films: The Story of Navigation Using the Airspace Navigation and Communications Aerial - Navigation Map Reading Primary Pilot Navigation Wind and the Navigator Series 4 parts	Complete simulated problem.	Ruler Plotter Computer Maps, sectional and WAC Printed flight log forms Printed flight plan forms Radio (workable) instruments: 1. Compass 2. Glide slope 3. DME 4. ADF Films: AF-SFP 1728, 26 min., color The Story of Navigation FAA FAC22 Using the Airspace-Navigation and Communication 1966 AO and PA AFTF1-3460 Aerial Navigation - Map Reading TF1-4990 Primary Pilot Navigation 1955, color, 27 minutes. TF1-5206 series Wind and the Navigator 4 parts Transparencies on navigation-Jeppesen and Company, Denver, Colo., Sanderson, Denver, Colo. Sextant, celestial charts, Air Almanacs, timer or clock.

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UNIT TITLE: Applied Navigation

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Radio (continued) Omni range Radar Ground controlled Electronic equipment Homer beacons - ADF and DME Doppler Radar (transponder, GCA)	View Transparencies on Navigation Refer to text and reference materials.		Text: APR, Inc. Aeroscience C.N. Van Deventer General Aeronautics Sanderson Aviation/Aerospace Fundamentals Civil Air Patrol Navigation and the Weather
Celestial Navigational stars Sextant Celestial charts	Write reports on different types of Study references	Written unit test.	
Inertial			

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 40

TEACHING UNIT TITLE: Basic Air Frame and Power Plant Maintenance and Inspection

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. perform pre-flight inspection of complete aircraft to level of licensed pilot.
2. demonstrate basic skill in air frame maintenance by participating in shop restoration project.
3. read and interpret inspection manuals, FAA's and Advisory circulars.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II.

TEACHING UNIT LENGTH: 34 hours (2 hours per day)

EVALUATION: (1) Teacher evaluation, (2) Student team "A" perform work, team "B" repeat inspection and evaluate team "A" write-up.

TEACHER COMPETENCY: General knowledge of aircraft maintenance procedures.

INSTRUCTIONAL MATERIALS:

Visuals: -Men of Maintenance - Southeast Asia - SFP 1571 Air Force
The Case of the Million Dollar Pliers - SFP 1263 USAF

Books: -FAA Advisory Circular 20 - 9 Inspection of Aircraft, and Advisory Circulars 43, 13-1, 43.13-2

Equipment: -Aircraft fuselage, wings, empennage, and/or other air frame components.
Shop tools and equipment.

Comsumables: -Cleaning materials, masking tape, paint thinner.

GENERAL COMMENT: -This unit is designed to provide students with a basic knowledge of air frame and power plant maintenance and inspection.

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UNIT TITLE: Basic Air Frame and Power Plant Maintenance Inspection

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Corrosion Protection	Clean and refinish section of tubular fuselage.		
Identification, testing and inspection of materials Identification of metal Testing of metals Non-destructive testing Identification of fabrics and plastics	Listen to resource speaker.		
Aircraft Equipment: Landing gear Miscellaneous	Construct mock-up aircraft landing gear. Draw diagram of assigned electrical systems. Prepare written report on inspection and overhaul of propellers.	Evaluate project. Evaluate diagrams. Evaluate reports.	Mechanics manuals Fixed base operators
Engines and Fuel Systems: Engines Fuel Exhaust	Observe annual inspection if possible.		
Instruments: Maintenance Inspection	Assemble and inspect engine of flight instrument.	Teacher observation. Post unit test.	Manufacturers manuals

WORK COPY

UNIT TITLE: Basic Air Frame and Power Plant Maintenance Inspection

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. perform pre-flight inspection of complete aircraft to level of licensed pilot.
2. demonstrate basic skill in air frame maintenance by participating in shop restoration project.
3. read and interpret inspection manuals, FFA's, and advisory circulars.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Aircraft Wood Structures: Materials and practices Finishing wood structures	Inspect damaged aircraft structures	Teacher observation.	F.A.A. Advisory Circular 4314-1 and 4313-2 throughout unit.
Aircraft Metal Structures References Welding Metal repair procedure Repair of laminated structures	Dismantle metal aircraft part. View Men of Maintenance		Film: Men of Maintenance - USAF
Fabric Covering Practices and preventions Doping Repairs to fabric covering Fabric testing	Test two separate aircraft fabrics. Write report. Read references. View The Case of the Million Dollar Pliers	Evaluate student reports.	Film: The Case of the Million Dollar Pliers - USAF
Control Cables: Inspection and repair Safety methods	Remove and replace aircraft cables in unflyable aircraft or mock-up	Teacher evaluation of shop work.	
Aircraft Hardware and Use Identification and use	Study references and diagrams.	Written test on fasteners.	

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PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE 13.0499

TEACHING UNIT NO. IV - 41

TEACHING UNIT TITLE: Optional Flight Training

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. summarize experiences of actual flight.
2. operate aircraft under supervision of flight instructor.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II.

TEACHING UNIT LENGTH: 40 hours (2 hours per day)

EVALUATION: Flight instructor will evaluate

TEACHER COMPETENCY: Certified flight instructor

INSTRUCTIONAL MATERIALS:

Visuals: Films - Path to Safety - FAA
The Flight Decision - National Association of State Aviation Officials

Book: - FAA Private Pilot's Handbook

GENERAL COMMENT: This unit is designed to orient the students with the sensation of flight.

WORK COPY

UNIT TITLE: Optional Flight Training

STUDENT BEHAVIORAL OBJECTIVE: (Training Unit Objective) Upon completion of this unit, the student will be able to:

1. summarize experiences of actual flight.
2. operate aircraft under supervision of flight instructor.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Dual flight instruction Lesson I Preflight Checklist Start and warming Radio Taxi Run-up Take-off Climb out Straight and level Turns Glides Lesson II Review Lesson I Radio Take-off Turns Approach to stalls Stalls - power off Air speed, climb, cruise, glide Slow flight Pattern	Listen to flight instructor. View Path to Safety View The Flight Decision	Have students relate experiences of dual flight instruction.	Film: Path to Safety - FAA The Flight Decision - National Association of State Aviation Officials Book: FAA Private Pilot's Handbook

WORK COPY

UNIT TITLE: Optional Flight Training

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Lesson III Review I and II Stalls - power on Stalls - departure Pattern Airspeed Lesson IV Review Lesson III Stalls - departure S - turns Instruments Lesson V Review Lesson IV 8's around pylons and 720's about a point Instruments Lesson IV Review Lesson V Touch-and-go's Lesson VII High air work Touch-and-go's		Evaluation by flight instructor.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Aerospace Occupations III OE CODE 13.0499

TEACHING UNIT No. IV - 42

TEACHING UNIT TITLE: The Social, Political, Economic and Cultural Impact of Aerospace

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. discuss in writing the economic, social, political and cultural impact of aerospace, including 75% of all covered in class.
2. cite in writing, examples found in newspapers and periodicals concerning the effect aviation is having on the environment.
3. name orally ten or more practical benefits that are a result of aerospace research.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Aerospace Occupations II.

TEACHING UNIT LENGTH: 40 hours (2 hours per day)

EVALUATION: (1) Teacher - student evaluation, (2) teacher evaluation, (3) post test.

TEACHER COMPETENCY: Basic knowledge of social studies and basic knowledge of effect of aviation on society.

INSTRUCTIONAL MATERIALS:

Visuals: Films - Air Cargo - A Modern Marketing Tool
Return From Space
Aero-Medical Research
Benefits From Space
Spin-off Into Space
International Skies
Our Shrinking World - Jet Pilot
Earth Resources - Mission 73
Space in the 70's
Can We Have a Little Quiet, Please

Books: - General Aeronautics and Aviation/Aerospace Fundamentals

Equipment: - Timetable from International Airlines Globe

GENERAL COMMENT: The aerospace industry in its lifetime has totally revolutionized our way of life. Students contemplating an aerospace career must realize the importance of this field and the profound effect it has on people's lives.

WORK COPY

UNIT TITLE: Social, Political, Economic, and Cultural Impact of Aerospace

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. discuss in writing the economic impact of aerospace on our lives, including 75% of the topics covered in class.
2. show by use of timetables and results from personal interviews how the aerospace age has caused a social, political, economic, and cultural interdependence throughout the world.
3. cite in writing examples found in newspapers and periodicals of the effect aviation is having on the environment, particularly the ecology.
4. name orally ten or more practical benefits available to us as individuals as a result of aerospace research.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Economic Impact Growth in aviation jobs Training for unskilled and skilled workers. Changes in production and distribution of goods due to increased air cargo: Less warehousing Smaller inventory Wider distribution Lower crate costs Less theft, spoilage, loss	Discuss with class various aviation careers and training required for each. See film: Air Cargo Go to local stores; make list of all goods flown in. Using available references have panel discussion on "Aviation Contributions to Modern Living"	Teacher-student evaluation of panel.	Film: Air Cargo - A Modern Marketing Tool - U.A. Corp. References used throughout unit - Above and Beyond - New Horizons Encyclopedia of Science and Technology - McGraw-Hill Aerospace Yearbook - Spartan Aviation and Space in the Modern World - Dutton
Increase in commercial and business flying Expanded role of airlines Expansion of general aviation Increased use of helicopters and planes for special	Have commercial pilot discuss the opportunities in business and commercial flying. Have representative from GAMA speak in class. List businesses that could benefit economically from owning an aircraft.	Write paper on expansion of airlines, general aviation or	Aviation/Aerospace Fundamentals - Sanderson General Aeronautics-- American Technical Society, Periodicals, General references, FAA's Historical Fact Book, CAB Publications

WORK COPY

UNIT TITLE: Social, Political, Economic, and Cultural Impact of Aerospace

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
jobs such as: special construction, traffic control, agriculture, and health services.		business flying.	
Medical developments as result of aerospace research. Artificial heart Study of emphysema Sight switch Miniscope, etc.	See film: Aero-Medical Research		Aero-Medical Research - USAF
Aerospace manufacturing: Includes research, development, fabrication, assembly, sales and operation of aviation related materials. Manufacturing spin-offs airport growth and development. Cost of aviation growth.	Using references, give oral report to class on any aspect of aerospace manufacturing. See film: Spin-Off into Space Have NASA or other suitable representative discuss manufacturing spin-offs. Listen to airport official discuss airport and ground facility development. Ask about cost of development.		References given at beginning of unit. Spin-Off into Space - NASA
Economic benefits from aviation growth to a given area.	With the class, list any economic benefits your community has received as a result of aviation.		

WORK COPY

UNIT TITLE: Social, Political, Economic, and Cultural Impact of Aerospace

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Miniturization.	Write report on how miniturization has revolutionized manufacturing.	Teacher evaluation.	General references.
Social impact: Interdependence of people due to "closeness" through travel.	See film: Our Shrinking World Study international airline timetables to see time required to reach distant cities of the world.		Our Shrinking World - Jet Pilot - Encyclopedia Britannica
Redistribution of population. Increased development of communities with adequate aviation facilities. Increased use of leisure time. Possibilities of relief or evacuation in emergencies. Changes in daily life due to speed over distance, and availability of products.	Listen to realtor discuss trends in population movement and population trends around large aviation facilities. List ways people use aircraft for personal use. Listen to Red Cross person discuss relief and evacuation procedures. Interview several senior citizens. Write a comparison of their daily life as a youth and your daily life. Make reference to changes wrought by aviation.	Teacher evaluation - oral reports.	

WORK COPY

UNIT TITLE: The Social, Political, Economic and Cultural Impact of Aerospace

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Necessity for more education. Safety of air travel.	Compare safety records of automobiles, trains, and aircraft.		Statistics on safety records
Political impact. National and international problems created by aviation's bringing together various: Customs and conditions Languages Climatic conditions Geographical relationship Religious Idealogies	Use newspaper and periodicals to cite problems resulting from bringing together of the various differences listed. Report on these to class.	Teacher evaluation - oral reports.	Newspapers
Threat of supremacy of one nation. Need for greater military defense.	Discuss with class how the balance of power affects our government's workings.		
Creation of NASA and related agencies.	Observe program by NASA space mobile.		
Increase in international activities and agreements.	See film: Return from Space and Benefits from Space		Return from Space - NASA Benefits from Space - NASA
Cultural impact. Greater "mixing" of cultures. Cooperation and exchange of ideas, customs, and cultural differences	Using references, write paper on recent cultural changes. See film: International Skies	Teacher evaluation of written reports.	References given earlier International Skies - FAA

WORK COPY

UNIT TITLE: Social, Political, Economic, and Cultural Impact of Aerospace

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Stimulation of development of more primative ideas.	Listen to person who has lived in more primitive countries discuss aviation's role in the country's development. Invite a parent, a person from another country, one from a different region of the nation, a senior citizen, a college student and a high school student to discuss, as a panel, personal values and reasons for these values. Write paper on how your values have changed as you get older, and how exposure to new ideas aided in this change.	Teacher evaluation of written reports.	
Environmental impact. Pollution vs pollution control: Noise pollution Air pollution	See films: Earth Resources Mission 73 and Can We Have a Little Quiet, Please Using references, current periodicals, and newspapers, do research on problems and solutions of aviation related to pollution. Report findings to class.		Earth Resources - Mission 73 NASA Can We Have a Little Quiet, Please - FAA References given earlier.

WORK COPY

UNIT TITLE: Social, Political, Economic, and Cultural Impact of Aerospace

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Destruction of ecology in expanding and constructing ground facilities.	Listen to an expert speak on ecology as it related to aviation and its ground facilities.	Teacher - student evaluation.	
Preservation of ecology when expanding and constructing ground facilities.			
	See film: Space in the 70's		Space in the 70's - NASA
		Post test.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE: 13.0499

TEACHING UNIT NO. IV - 43

TEACHING UNIT TITLE: Career counseling

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. list skills and type of training required for aerospace.
2. state possible places of employment for specific occupation.
3. describe methods he would employ in pursuing a given career.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II.

TEACHING UNIT LENGTH: 20 hours (2 hours per day)

EVALUATION: (1) Student-self evaluation, (2) teacher observation, (3) post unit test.

TEACHER COMPETENCY: Knowledge of resources related to career counseling

INSTRUCTIONAL MATERIALS

Visuals: Filmstrip - FSP-1 FAA Aviation - Where Career Opportunities Are Bright
Code #0494 Sanderson Careers in Aviation/Aerospace

Film - FA-06-70 FAA How to Succeed Without Really Flying

Books: - Aviation/Aerospace Fundamentals
Aeroscience - APR, Inc.

Consumables: - "Flying" magazine

GENERAL COMMENT: This unit is designed to aid students in determining if they should pursue a career in aviation.

WORK COPY

UNIT TITLE: Career Counseling

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. list aviation related jobs, with skills needed and type of training required.
2. state possible places of employment for specific occupations
3. describe method he would use if following a given career.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Occupations available in North Carolina: domestic scheduled airlines, local service lines, aircraft builders.	. . Make survey of occupations available in North Carolina. One day a week, work on the job training if possible. Report the results of one day on the job training to the class.	Student - self evaluation	
Types of jobs available in Airline operation, aircraft manufacturing, aircraft maintenance, airport operation, maintenance, etc.	. Develop a career notebook. Study film and filmstrips: Careers in Aviation/Aerospace	Post unit test.	Film: FSP-1 FAA Code - 0499 Sanderson Film: FA-06-70 FAA References : Superintendent of Documents Aviation manufacture job description list.
Where to obtain knowledge and skills required - technical schools, four year colleges, military careers, on-job training.	Obtain job listing from airlines and manufacturers. Invite counselors from industry, services, airlines, and the military to discuss requirement and careers. Listen to and talk with counselors from technical schools and colleges.		Current magazines

WORK COPY

UNIT TITLE: Career counseling

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
	Plan a career listing course of study type of institution and possible job placement.		Military recruiting service.
Job interview.	Listen to resource person from Employment Commission or industry.		
		Written unit test.	

WORK COPY

PROGRAM AREA: Transportation Occupations

CAREER CLUSTER: Occupational Aerospace III OE CODE: 13.0499

TEACHING UNIT NO. IV - 44

TEACHING UNIT TITLE: Specialized Group Instruction

TEACHING UNIT OBJECTIVES: Upon completion of this unit, the student will be able to:

1. relate to the class experiences of a student selected aviation oriented self-study to gainful knowledge or expanded skills pertaining to the industry.

RECOMMENDED PREREQUISITES: Aviation Science I and II, Occupational Aerospace II

TEACHING UNIT LENGTH: 40 hours (2 hours per day)

EVALUATION: (1) Written examination, (2) teacher evaluation of projects.

TEACHER COMPETENCY: Ability to aid students in their selected areas.

INSTRUCTIONAL MATERIALS:

Visuals: - Laps related to subject areas

Equipment: - Student selects materials and equipment coinciding with specialized study.

GENERAL COMMENT: This unit is designed to allow students to select areas in which they would like to spend more time.

WORK COPY

UNIT TITLE: Specialized Group Instruction

STUDENT BEHAVIORAL OBJECTIVE: (Teaching Unit Objective) Upon completion of this unit, the student will be able to:

1. relate to the class experiences of a student selected, aviation oriented self-study to gainful knowledge or expanded skills pertaining to the industry.

CONTENT	SUGGESTED LEARNING EXPERIENCES	SUGGESTED EVALUATION TECHNIQUES	SUGGESTED INSTRUCTIONAL MATERIALS
Suggested areas: Meteorology Navigation Communications High Speed Aerodynamics Building an Aircraft Aviation Related Shop work Airport Management Aviation Occupations Man in Space PAVE - Programmed Assistance to Vocational Education Instrument Flight Training Military Aviation General Aviation Commercial Aviation Environmental Aerospace Civil Air Patrol Squadron	Self-study. Use LAPS related to your area. Consult teacher.	Written examination. Teacher evaluation of projects.	LAPS related to student-selected areas. PAVE - Cessna Aircraft Company See references and resources Local C.A.P. Squadron or State Commander.

Instructional Resources Aerospace Sections I, II, III, IV

A. Text

1. Aeroscience, Misenhimer, Ted G., Aero Products Research, Inc., 11811 Teale Street, Culver City, Calif., 90230, 1970.

2. Aerospace Education Text Booklets, National Headquarters, Civil Air Patrol, Maxwell AFB, Alabama, 36112

3. An Introduction to General Aeronautics, Van Deventer, C.N., American Technical Society, 848 E. 58th Street, Chicago, Illinois, 60637, 1970.

4. Aviation/Aerospace Fundamentals, Sanderson Times Mirror, 8065 E. 40th Avenue, Denver, Colorado, 80207, 1971.

B. Suplementary references:

5. Above and Beyond, New Horizons Publishers, Inc., 154 E. Erie Street, Chicago, Illinois, 60611, 1968.

6. Aeronautical Science Course of Study, FAA Above

7. Airmen's Information Manual, Superintendent of Documents, U.S. Government Printing Office, Division of Public Documents, Washington, D. C.20402, 1972.

8. An Introduction to Aerospace Education, General Aviation Manufactures Association, Inc., Suite 1200-A, 1025 Connecticut Avenue, N.W., Washington, D. C., 20036, 1968.

9. Aviation Weather, Federal Aviation Administration, P. O. Box 20636, Atlanta, Georgia, 30320, 1965.

10. Biology, NASA Above

11. Classic Monoplanes, Shamburger, Page, Crown Publishers, Inc., 419 Park Avenue, South, New York, N. Y. 10016.

12. Experimental Aircraft Association Manuals, Experimental Aircraft Association, P. O. Box 229, Hales Corner, Wisconsin,53130, 1970.

13. Exploring in Aeronautics, National Aeronautics and Space Administration, Langley Research Center, Langley Station, Hampton, Virginia, 23363, 1971.

14. Exploring in Aerospace Rocketry, National Aeronautics and Space Administration, Langley Research Center, Langley Station, Hampton, Viringia, 23263, 1971.

15. Flight Instructor's Handbook, F.A.A. Above

16. Flight Training Handbook, F.A.A. Above

17. Fundamentals of Aviation and Space Technology, Applegate, L. Burnell and others, The Institute of Aviation, University of Illinois - Willard Airport, Savoy, Illinois, 61874, 1971.

18. Guide to Conceptual Approach in Aerospace Education, NASA Above

19. Instrument Flying Handbook, F.A.A. Above

20. Life Science in a Space Age Setting, NASA Above

21. Private Pilot's Handbook to Aeronautical Knowledge, Federal Aviation Administration, P. O. Box 20636, Atlanta, Georgia, 30320, 1970.

22. Space Science, NASA Above

23. Tracks Across the Sky, Shamburger, Page, J. B. Lippincott Company, East Washington Square, Philadelphia, Pennsylvania, 19105.

Other resources and suggestions:

1. Aviation Education Bibliography, National Aerospace Education Council 616 Shoreham Building, 806 15th Street, N. W., Washington, D. C. 20005.

2. Aerospace Bibliography, same as above

3. Federal Aviation Administration Film Catalog, Federal Aviation Administration, P. O. Box 20636, Atlanta, Georgia, 30320.

4. Air Force Film Library, USAF Central Audio - Visual Center, Norton AFB, California, 92409.

5. Aviation Aerospace Education Catalog, Sanderson Times, 8065 E. 40th Avenue, Denver, Colorado, 80207.

6. Navy Film Library, 6th Naval District, U. S. Naval Base, Charleston, South Carolina, 29408.

7. Aero Products Research, Inc. 11811 Terle Street, Culver City, California.

8. NASA Film List, National Aeronautics and Space Administration, Langley Research Center, Langley Station, Hampton, Virginia, 23363.

9. Modern Talking Picture Service, 1212 Avenue of the Americas, New York, New York, 10036.

10. Sterling Movies, Inc., 43 West 61st Street, New York, New York, 10023.

11. Eye Gate House, Inc., 146-01 Archer Avenue, Janraria, New York, 11435.

12. Shell Oil Company, 450 N. Meridian Street, Indianapolis, Indiana, 46204.

13. Bell Telephone and Telegraph, Contact local office.

14. Commercial Airlines:
United Airlines, School and College Department, P. O. Box 66141, Chicago, Illinois, 60666
Eastern Airlines, c/o "Sunrise at Eastern", 10 Rockefeller Plaza. New York, New York. 10020.
Delta Airlines, Film Department, Atlanta Airport, Atlanta, Georgia 30320.
Piedmont Airlines, Smith - Reynolds Airport, Winston-Salem, North Carolina 27102.

15. Cessna Air Age Education, Cessna Air Craft Company, Aviation Education Department, P. O. Box 1521, Wichita, Kansas 67201.

16. Beech Aircraft Cooperation, Aviation Education Department, Wichita, Kansas 67201.

17. Piper Aircraft Corporation, Lock Haven, Pennsylvania, 17745.

18. National Aerospace Education Council, 806-15th Street, N. W., Room 616 Washington, D. C. 20005.

19. North Carolina Aviation Specialist, Department of Transportation.

20. Superintendent of Documents, U. S. Government Printing Office, Division of Public Documents, Washington, D. C. 20402.

21. Pan American Navigation Service, Inc., 12021 Ventura Blvd. No. Hollywood, California, 91604.

22. Felsenthal Instruments Company, A V Training Division, 11940 Quay Street, Broomfield, Colorado, 80020.

23. Local Experimental Aircraft Association.

24. Fixed Base Operators.

25. Pilots Association.

26. Aero clubs.

27. Model plane clubs.

28. Civil Air Patrol Squadrons.

29. Air Force Recruiters.

30. Retired Air Service Personnel.

31. North Carolina Aviation/Aerospace Education Committee, Department of Education.

32. Army Pilot or Airplane owner.

33. Air Force Bases

34. Air National Guard

35. Air Force ROTC units

36. National Weather Services

37. General Aviation Manufactures Association, Suite 1200-A, 1025 Connecticut Avenue, N. W., Washington, D. C. 20036.

38. Aircraft owner's manuals

39. All aircraft manufactures

40. Magazines:

Air Forces, Tear Siegler, Inc., Astronics Division, 3171 South Bundy Drive, Santa Monica, Calif. 90406.
Air Progress, Petersen Publishing Co., 8490 Sunset Blvd., Los Angeles, Calif. 90069.
Flying, Ziff-Davis Publishing Co., One Park Avenue, New York, N. Y. 10016.
Plane and Pilot, Werner and Werner Corp., 631 Wilshire Boulevard, Santa Monica, Calif. 90401.
The AOPA Pilot, Aircraft Owners and Pilots Association, 7315 Wisconsin Avenue, Bethesda, Maryland 20014.
American Aircraft Modeler, Potomac Aviation Publications, Inc., 733 Fifteenth Street, N. W., Washington, D. C. 20005.

C. Audiovisual

Films	Session Number	Cost	Vendor
Aeronautical Oddities 20 min. B & W 1961	WF 0036	Free Loan	Film Library, AC-445, F.A.A. P. O. Box 25082 Oklahoma City, Oklahoma 73125
How An Airplane Flies 18 min. Color 1969	FA-703	Free Loan	F.A.A.
Basic Radio Procedures for Pilots 30 min. 1970	FA-902	Free Loan	F.A.A.
Rx for Flight 20 min. 1968	FA-606	Free Loan	F.A.A.
Medical Facts for Pilots 25 min. 1970	FA-01-70	Free Loan	F.A.A.
Charlie 22 min. 1967	FA-618	Free Loan	F.A.A.

C. Audiovisual cont'd.

Films	Session Number	Cost	Vendor
Today for Tomorrow 14 1/2 min. 1965	FA-907		F.A.A.
The Wind is Right 28 min. 1971	FAC-135		F.A.A.
Transport Crash Safety Test - Parts 1 & 2 15 min. & 26 min 1964	FA-515 FA-615		F.A.A.
Stable and Safe 20 min. 1959	FA-704		F.A.A.
Brother 13 1/2 min. 1970	FA-01-71		F.A.A.
How to Succeed Without Really Flying 28 min. 1970	FA-06-70		F.A.A.
Aviation Mechanic 17 min.	FA-315		F.A.A.
Aviation Workshop 29 min.	FAA-605		F.A.A.
The Flight Service Station 28 min. 1969	FA-901		F.A.A.
What's My Traffic 25 min. 1962	FA-201		F.A.A.
Air Navigation 25 min. 1970	FA-02-70		F.A.A.
Basic Radio Procedures for Pilots 30 min. 1970	FA-902		F.A.A.
This is Vortac 15 min. 1959	FA-104		F.A.A.
The Cold Front 15 min. 1962	FAN-103		F.A.A.
The Warm Front 20 min. 1962	FAN-104		F.A.A.

C. Audiovisual cont'd.

Films		Session Number	Cost	Vendor
Fog and Low Ceiling Clouds - Avection Fog and Ground Fog 25 min.	1962	FAN-101		F.A.A.
Fog and Low Ceiling Clouds - Upslope Fog and Frontal Fog 10 min.	1962	FAN-102		F.A.A.
Flight 28 min.		FA-117		F.A.A.
Path to Safety 20 min.	1967	FA-612		F.A.A.
Can We Have a Little Quiet, Please 14 1/2 min.	1971	FA-02-71		F.A.A.
International Skies 5 min.	1969	FA-904		F.A.A.
One Eye on the Instruments 16 min.	1962	FA-209		F.A.A.
From Kitty Hawk to Aerospace 21 min.	1965	SFP-1240	Free Loan	U. S. Air Force Audio - Film Library Norton AFB, Calif. 92409
Landing Weather Minimums Investigation 22 min.	1967	FR-878		A.F.
Avionic Maintenance Safety 16 min.	1969	TF-6132		A.F.
Pre-flight and Visual Inspection 12 1/2 min. B & W	1956	FTA-1746		A.F.
Aerial Navigation Map Reading 21 min. B & W	1945	TFI-3460		A.F.
Primary Pilot Navigation 27 min.	1955	TF-1-4990		A.F.

C. Audiovisual cont'd.

Films	Session Number	Cost	Vendor
Winds and the Navigator 15 min. 1957	TF-1-5206b		A.F.
Man of Maintenance - Southeast Asia 15 min. 1968	SFP-1571		A.F.
The Case of the Million Dollar Pliers 24 min. 1964	SFP-1263		A.F.
Aero-Medical Research 27 min. 1957	SFP-390		A.F.
Aerodynamics - Air Flow 18 min. B & W 1941	TF1-160		A.F.
Aerodynamics - Forces Acting on an Air Foil 26 min. B & W 1941	RF1-161		A.F.
High Speed Flight - Approaching the Speed of Sound 27 min. 1959	TF1-5340		A.F.
High Speed Flight - Transonic 20 min. 1959	TF1-5341		A.F.
High Speed Flight - Beyond the Speed of Sound 20 min. 1962	TF-5550		A.F.
It Takes a Man 26 min. B & W 1953	TF1-4804		A.F.
How an Airplane Flies 34 min. B & W 1953	TF1-4805		A.F.
Beyond the Stick and Rudder 14 min. B & W 1959	TF1-5300		A.F.
Helicopter Orientation 27 min. B & W 1952	TF1-5181		A.F.
AAAARK - Something About Communication			A.F.
The Aircraft Called Seventy 31 min.	SFP-1158		A.F.

C. Audiovisual cont'd.

Films	Session Number	Cost	Vendor
Unchained Goddess		Free Loan	Bell Telephone and Telegraph Local Offices
Do's and Don'ts		Free Loan	Teledyne Continental Motors, Suite 1200-A 1025 Connecticut Avenue N.W., Washington, D. C. 20056
Flight Without Wings 14 1/2 min. 1969		Free Loan	National Aeronautic and Space Administration, Langley Research Center, Langley Station, Hampton, Va. 23363
Research Project X-15 27 min. 1966			NASA
Space Down to Earth 27 1/2 min. 1970			NASA
The Vital Link 28 1/2 min			NASA
Returns from Space 27 min. 1966			NASA
Benefits from Space 10 min. 1969			NASA
Earth Resources - Mission 73 20 min. 1969			NASA
Space in the 70's Man in Space - The Second Decade 28 min. 1971			NASA
Spin-offs into Space			NASA
Universe-1960 28 min.			NASA
The Mastery of Space 58 min. 1962			NASA
America in Space - The First Decade 28 min. 1968			NASA
Before Saturn 14 min. 1962			NASA

C. Audiovisual cont'd.

Films	Session Number	Cost	Vendor
Friendship 7 58 min. 1962			NASA
Space Navigation 21 min. 1967			NASA
Living in Space - Parts 1 and 2 13 min. 1967 20 min. 1967			NASA
International Cooperation in Space 23 min. 1965			NASA
Ariel - The First International Satellite 13 min. 1963			NASA
By-Products of Space Research 16 1/2 min. 1967			NASA
High Speed Flight (3) 27 1/2 min. 20 min. 19 min.		Free Loan	Shell Oil Company 450 N. Meridian St. Indianapolis, Ind. 46204
ABC's of Jet Propulsion			Modern Talking Pictures Service 1212 Ave. of the Americas New York, N. Y. 10036
Engineer - Man of Destiny 30 min.		Free Loan	
The Flight Decision 15 min.		Free Loan	National Association of State Aviation Officials Suite 1002, 1000 Vermont Ave., N.W., Washington, D. C.
Air Cargo - A Modern Marketing Tool 15 min.		Free Loan	United Aircraft Corp. 400 Main Street East Hartford, Conn. 01608
Our Shrinking World - Jet Pilot 17 min.		$180.00 Rental: $6	Encyclopedia Britanica Educational Corp. 425 N. Michigan Avenue Chicago, Ill. 60611

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C. Audiovisual cont'd.

Films	Session Number	Cost	Vendor
Turboprop/turboshaft Engines 13 min. 1959	MN-8812A	Free Loan	U. S. Navy 6th. Naval District U. S. Naval Base Charleston, S. C. 29408
Crosswind Approach Landings and Takeoffs 8 min. B & W 1953	MN-7398C	Free Loan	U. S. N.
Before You Fly 13 min. B & W 1953	MN-7398A	Free Loan	U. S. N.
Holes in Our Pockets 15 min.		$15.00	Sales Training Association P. O. Box 5172 Wichita, Kansas 67218

C. Audiovisual cont'd.

Filmstrips	Vendor
Aircraft Ignition Systems	Sanderson Times Mirror 8065 E. 40th Avenue Denver, Colorado 80207
Airplane Performance	
Careers in Aviation and Aerospace	
Airports	
Airspace Utilization	
Aircraft Ground Operations	
Basic Flight Maneuvers	
Private Pilot - Federal Aviation Regulations and Space Utilization	
Advanced Meteorology	
Computer 2	
Private Pilots Airplane Maneuvers	
IFR Flight Charts	
IFR Planning and VOR Flight	
IFR Regulations and Procedures	
IFR Clearance Shorthand	
Science of Flight	
Weight and Balance - Parts A, B, and C	
Flight Control Systems and Instruments	
Flight Computer	
Radio Communications	
Air Traffic: Control and Communications	
Meteorology Series	
Reciprocating Engine and Related Systems	
Aviation History	
The Path of Least Resistance	
Airplane Systems and Instruments	

C. Audiovisual cont'd.

Filmstrips	Vendor
Communications	
Physiology of Flight	
Basic Navigation	
Basic Flight Computer	
Aviation: Where Career Opportunities are Bright	Federal Aviation Administration Film Library, AC-445 P. O. Box 25082 Oklahoma City, Oklahoma 73125
The Atmosphere	
Air Masses	
Looking Ahead	Piper Aircraft Corp. Lock Haven, Pa. 17745
Training for Perfectionists	Air France % Dept. Anin. LA. 1350 Avenue of the Americas New York, N. Y. 10019
The Dawning Space Age	Civil Air Patrol National Headquarters % Bookstore Maxwell AFB, Ala. 36112
Don't Build That Rocket Alone	National Aeronautics and Space Administration Langley Research Center Langley Station Hampton, Virginia 23365
The Airplane Changes America	Eye Gate House, Inc. 146-01 Archer Avenue Jamaica, N. Y. 11435

Transparencies	Vendor
Flight Computer	Sanderson Times Mirror 8065 E. 40th Avenue Denver, Colo. 80207
Navigation	
Radio Navigation 1. Omni 2. VOR 3. Advantages 4. ADF	
Flight Computer - Windside	

C. Audiovisual cont'd.

Transparencies	Vendor
The Four Strokes	
Propeller	
Power Source	
Weight and Balance	
Computer Side	

Slides	Vendor
Power for Aircraft	Civil Air Patrol National Headquarters % Bookstore Maxwell AFB, Ala. 36112

TOOL AND EQUIPMENT LIST

Description	Quantity	Cost	Total Cost
Work Benches			
Work Tables Build		$ 100.00	$ 100.00
Compressor	1	200.00	200.00
Spray Gun	1	40.00	40.00
Grinder	1	50.00	50.00
Jig Saw	1	100.00	100.00
Belt and Disc Sander	1	100.00	100.00
Saber Saw	1	50.00	50.00
Electric Hand Drill	1	40.00	40.00
Clamps Bar	2	5.00	10.00
Clamps (Hand Screw)	4	5.35	21.40
Clamps "C" (Small assorted)	24	1.20	25.80
Pinking Shears	1	7.50	7.50
Guages (Feeler)	2	1.82	3.64
Guages (Gapping)	2	.50	1.00
Hammers (Ball Pein)	2	1.85	3.70
Wrench Sets	2	100.00	200.00
Screwdriver Set (Standard)	2	5.00	10.00
Screwdriver Set (Phillips)	2	6.73	13.46
Aviation Snips L.H.	1	2.24	2.24
Aviation Snips R.H.	1	2.24	2.24
Aviation Snips-Straight	1	2.24	2.24
Vise Pipe	1	16.18	16.18
Vises-woodworking	2	16.21	32.42
Vise Machine	1	30.00	30.00
Wrench Torque	1	15.00	15.00
Saws-Hack	2	2.50	5.00
Saws-Crosscut (10 pts.)	2	5.50	11.00
Saws-Coping	4	.75	3.00
Saws-Buck	1	4.20	8.40
Plane Block	2	4.50	9.00
Plane Smooth	2	7.50	15.00
Square Framing	2	4.00	8.00
Square Combination	2	3.00	6.00
Riveting Tool	1	12.00	12.00
Files Flat	6	1.10	16.60
Files Round	6	2.00	12.00
Files Half Round	6	1.50	9.00
Easy Cuts	2	5.00	10.00
Drill Sets	2	28.00	56.00
Stapler	1	12.00	12.00
Mallet	2	2.20	4.40
Paint Brushes (Assorted)		20.00	20.00
Steel Brushes and Miscellancous Cleaning Equipment			25.00
Soldering Iron	2	11.25	22.50
Soldering Gun	2	8.00	16.00
Miscellaneous Measuring and Test Equipment			50.00
Rivet and Welding Equipment			200.00

AIRCRAFT

	Cost
Engines - opposed	Government Surplus
Radial	"
Engine parts and accessories	"
Engine stands	"
Engine instruments	"
Flight instruments	"
Aircraft parts	"
Aircraft unflyable	$ 500.00
Tools and equipment	1,570.82
Instructional materials	1,000.00
Expendable supplies (per year)	200.00
Total	$ 3,270.82