

CHOOSE
AEROSPACE

An Overview of the Aviation Maintenance Curriculum

12.11.22



About

Choose Aerospace is a partnership of aerospace stakeholders, joined together to address one of the biggest threats to continued industry growth: the availability of a diverse, qualified technical workforce.

The charitable organization is managed by the Aviation Technician Education Council, a non-profit trade association that represents aviation technical education, including nearly 75% of all FAA-certificated aviation maintenance technician schools in the U.S.

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Aircraft Maintenance Technicians Association

Aircraft Mechanics Fraternal Association

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Aviation Institute of Maintenance

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Liberty University

Marshall University

Mentoring Mission

National Transportation Safety Board (former board member)

Oklahoma Department of Career and Technical Education

Pathways to Aviation

Piedmont Airlines

Portland Community College

Professional Aviation Maintenance Association

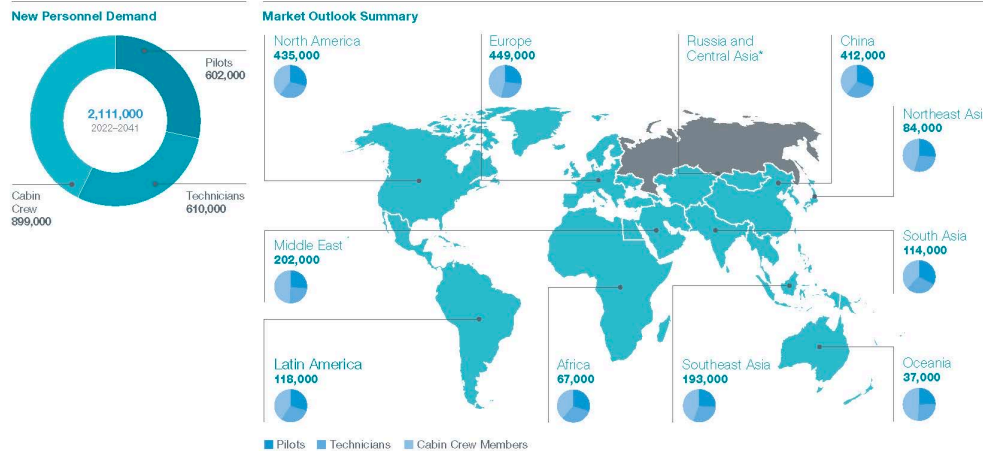
ROTORDOC LLC

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Demand



- The forecasted demand for maintenance technicians continues its multi-year climb despite pandemic impacts.
- Boeing’s 2022-2041 Pilot Technician Outlook projects that the North American market will need **134,000 new technicians** to support fleet operators and providers of maintenance, repair, and overhaul services.
- Forecasted demand for commercial aviation technicians in North America has eclipsed pre-pandemic levels by 10%.
- “The combination of fleet growth, attrition, and replacement will continue to drive high demand for the foreseeable future.”



Pilot and Technician Outlook 2022-2041

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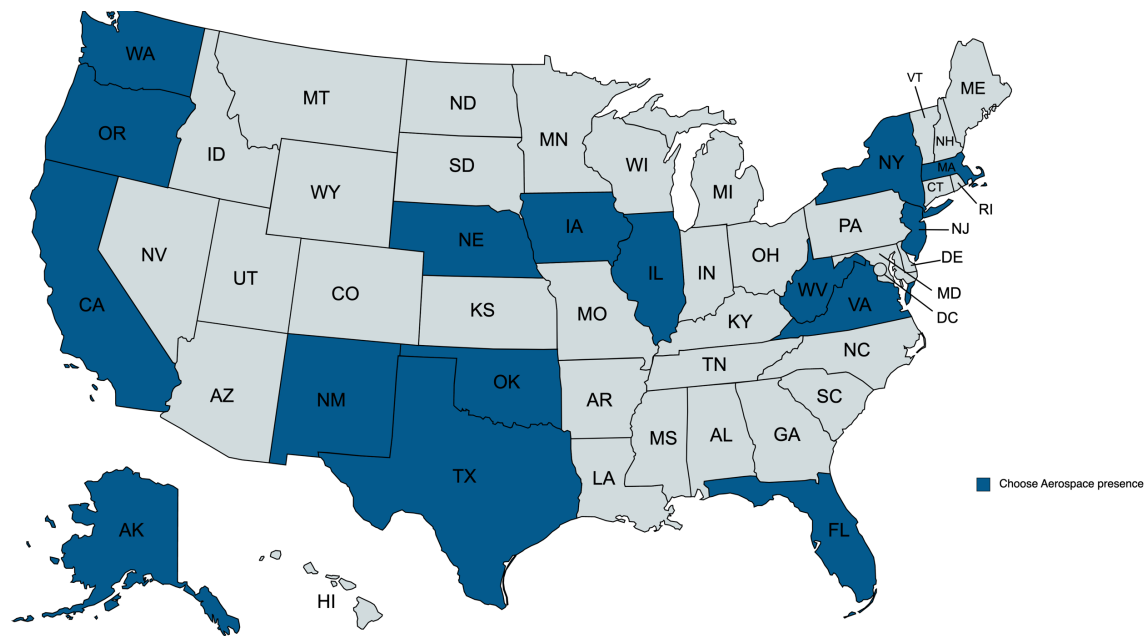
Aviation Maintenance Curriculum

- Developed by Clemson University Center for Workforce Development and ARCS Aviation, with guidance from Choose Aerospace leadership, ATEC, and advisory committee.
- Approximately 500 hours of content
- Covers the general subject areas in the FAA [Mechanic Airman Certification Standards](#) (same as required by part 147)
- Intended for deployment in community-based programs and high schools to create awareness in aviation careers, and to provide matriculation opportunities into A&P schools
- Limited equipment, materials, and teacher qualifications required, supplemental hands-on elements available
- License fees \$200 per student, per year

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Participating High Schools



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Hands-On Elements

- Optional labs are deployable in a tabletop environment
- Recommended tool and equipment list available
- Enhanced opportunities available for high schools that have part 147 partners



Credentialing

- Choose Aerospace is engaging with the FAA to provide students that complete the curriculum the opportunity to take the FAA general written knowledge test. More to come...
- In the meantime, an industry-recognized credential will:
 - provide an often-necessary credential for high school technical programs
 - encourage matriculation agreements into secondary education
 - provide third-party validation of knowledge for employers



Matriculation

- Students that come away with the ATEC credential have demonstrated knowledge of the general subject areas in the FAA mechanic airman certification standards
- FAA certificated programs transfer in credit for previous instruction
- Choose Aerospace students receive credit for the general subject areas, go right into airframe and powerplant



Curriculum Overview

Nov 18, 2022

Rachel Turner
Curriculum Coordinator
Lead Instructional Designer

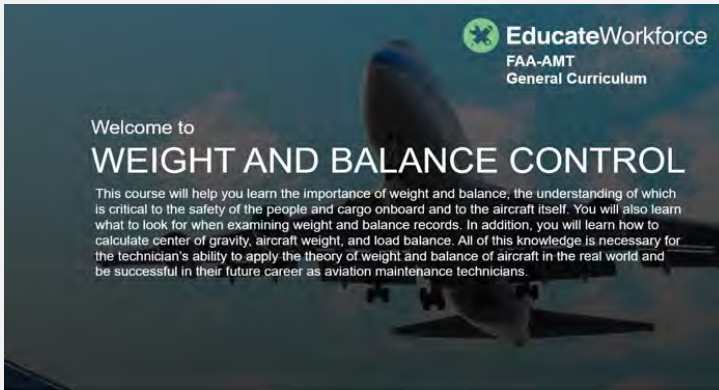



20
22





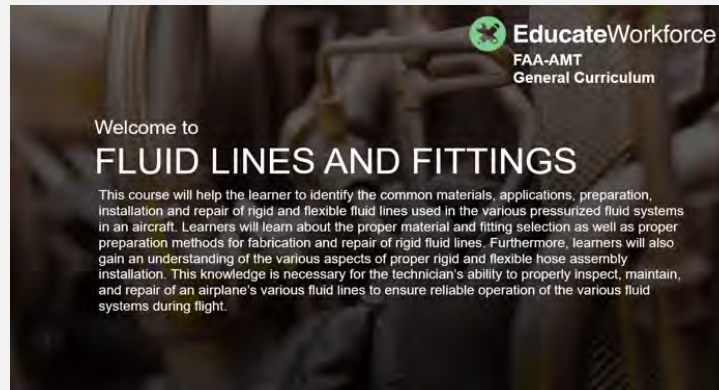
FAA General Courses




 **EducateWorkforce**
FAA-AMT
General Curriculum

Welcome to
WEIGHT AND BALANCE CONTROL

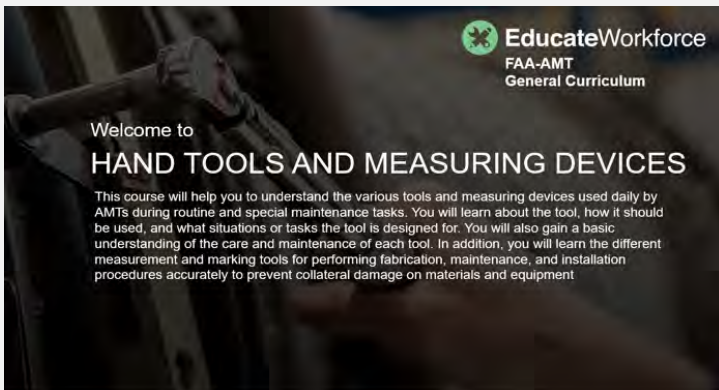
This course will help you learn the importance of weight and balance, the understanding of which is critical to the safety of the people and cargo onboard and to the aircraft itself. You will also learn what to look for when examining weight and balance records. In addition, you will learn how to calculate center of gravity, aircraft weight, and load balance. All of this knowledge is necessary for the technician's ability to apply the theory of weight and balance of aircraft in the real world and be successful in their future career as aviation maintenance technicians.




 **EducateWorkforce**
FAA-AMT
General Curriculum

Welcome to
FLUID LINES AND FITTINGS

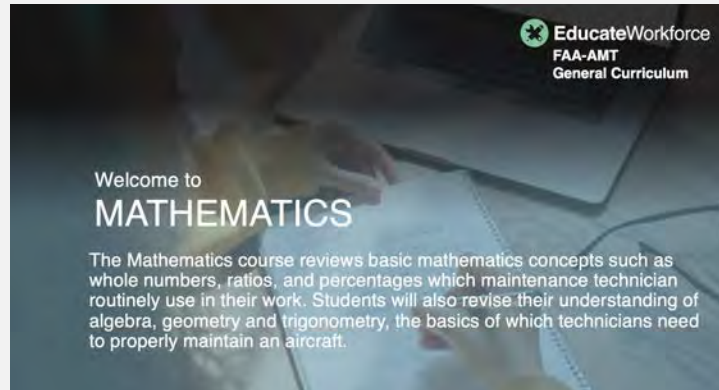
This course will help the learner to identify the common materials, applications, preparation, installation and repair of rigid and flexible fluid lines used in the various pressurized fluid systems in an aircraft. Learners will learn about the proper material and fitting selection as well as proper preparation methods for fabrication and repair of rigid fluid lines. Furthermore, learners will also gain an understanding of the various aspects of proper rigid and flexible hose assembly installation. This knowledge is necessary for the technician's ability to properly inspect, maintain, and repair of an airplane's various fluid lines to ensure reliable operation of the various fluid systems during flight.




 **EducateWorkforce**
FAA-AMT
General Curriculum

Welcome to
HAND TOOLS AND MEASURING DEVICES

This course will help you to understand the various tools and measuring devices used daily by AMTs during routine and special maintenance tasks. You will learn about the tool, how it should be used, and what situations or tasks the tool is designed for. You will also gain a basic understanding of the care and maintenance of each tool. In addition, you will learn the different measurement and marking tools for performing fabrication, maintenance, and installation procedures accurately to prevent collateral damage on materials and equipment.



 **EducateWorkforce**
FAA-AMT
General Curriculum

Welcome to
MATHEMATICS

The Mathematics course reviews basic mathematics concepts such as whole numbers, ratios, and percentages which maintenance technician routinely use in their work. Students will also revise their understanding of algebra, geometry and trigonometry, the basics of which technicians need to properly maintain an aircraft.





FAA Course Updates

- Adjusted list to 12 Courses
- Currently revising the Fundamental of Electricity Course and splitting it into two courses:
 - AC Electricity
 - DC Electricity



Sequence of Courses

This modular content facilitates a flexible approach to meet a wide-range of schedule and program needs. For example, the approximately 500 hours of content can be delivered in a full-time, 12-week program for adult learners, or as an elective in the 11th and 12th grade year of high school.

The following courses make up the entire suite of aviation maintenance curriculum. We have provided a suggested order for completion below.

01	FAA-ACS-AM-IF-GOS	Safety, Ground Operation, and Servicing
02	FAA-ACS-AM-IK-HTM	Hand Tools and Measuring Devices
03	FAA-ACS-AM-IC-WAB	Weight and Balance
04	FAA-ACS-AM-IH-MAT	Mathematics
05	FAA-ACS-AM-IJ-PFA	Physics for Aviation
06	FAA-ACS-AM-II-MIR	Maintenance and Inspection Regulations
07	FAA-ACS-AM-IB-ACD	Aircraft Drawing
08	FAA-ACS-AM-IA-FEE	Fundamentals of AC Electricity
09	FAA-ACS-AM-IA-FEE	Fundamentals of DC Electricity
10	FAA-ACS-AM-ID-FLF	Fluid Lines and Fittings
11	FAA-ACS-AM-IE-MHP	Materials, Hardware, and Processes
12	FAA-ACS-AM-IG-CCC	Cleaning and Corrosion Control



FAA Course Updates

- Adjusted list to 12 Courses
- Currently revising the Fundamental of Electricity Course and splitting it into two courses:
 - AC Electricity
 - DC Electricity
- Revised the Mathematics and Physics courses.
 - Aligned objectives with ACS
 - Added new material to EW platform and revised the lecture slides.
 - Recorded new video lectures

Course Objectives

Knowledge: Students demonstrate an understanding of:

- Areas of various geometrical shapes.
- Volumes of various geometrical shapes.
- Definitions, descriptions and use of geometrical terms, including but not limited to any of the following: polygon, pi, diameter, radius, and hypotenuse.
- Ratio problems, including examples of where or how they may be used in relation to aircraft maintenance or system(s) operation.
- Proportion and percentage problems, including examples of where or how they may be used in relation to aircraft maintenance or system(s) operation.
- Algebraic operations, including examples of where or how they may be used in relation to aircraft maintenance.
- Conditions or areas in which metric conversion may be necessary.
- Scientific (exponential) notation, decimal notation, fractional notation, binary notation, and conversion between these various forms of numeric notation.
- Rounding numbers.
- Powers and special powers.
- Measurement systems.
- Use of positive and negative integers in mathematical operations.
- Basic mathematic functions (addition, subtraction, multiplication, division).

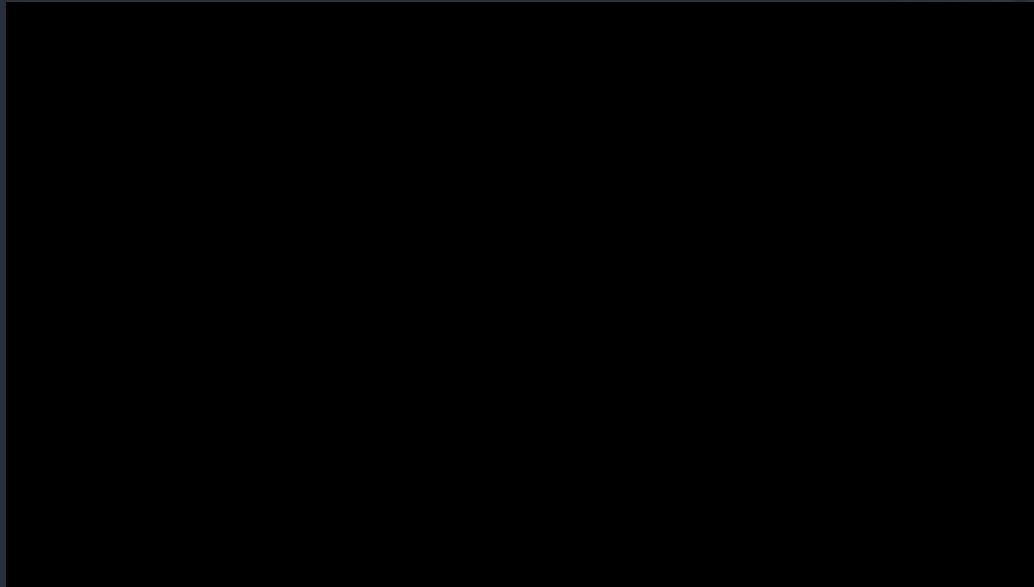
Risk Management: Students demonstrate the ability to identify, assess, and mitigate risks associated with:

- Precedence of operations when solving an algebraic equation.
- Use of both positive and negative integers in mathematical operations.
- Rounding off calculations.

Skills: The applicant demonstrates the ability to:

- Determine the square root of given numbers.
- Compute the volume of a cylinder.
- Compute the area of a wing.
- Calculate the volume of a shape, such as a baggage compartment or fuel tank.
- Convert between fractional and decimal numbers.
- Compare two numerical values using ratios.
- Compute compression ratio.
- Compute the torque value when converting from inch-pounds to foot-pounds or from foot-pounds to inch-pounds.

Video Lecture and Annotations



Powers
NEGATIVE POWERS

If a number has a negative power, it is equal to the reciprocal of the number with the same power made positive.

Always put parentheses around a negative number before raising it to a power when using a calculator.

$$2^2 = 4$$
$$3^{(-2)} = \frac{1}{3^2}$$
$$\frac{1}{3^2} = \left(\frac{1}{9}\right)$$


Interactive Lessons and Activities

The screenshot shows a web browser window with the URL courses.educateworkforce.com/courses/course-v1:CUCWD+FAA-ACS-AM-ID-FLF+DEVELOPMENT/courseware/bebd7b06958f495b8d2c39722fd.... The page title is "Tube Cutting" and it is part of a course "Module 1: Rigid Fluid Lines > Lesson 3: Fabricating Rigid Fluid Lines > Tube Cutting".

Tube Cutting

The free end lengths of tubing-work should be cut about 10% longer than that calculated to allow for any slight variations in manufacture.

Cutting is carried out using a fine-toothed (32 Teeth Per Inch [TPI]) hacksaw or a tube cutter machine (a roller cutter similar to that used by plumbers, which is attached to the tube and rotated so that it's cutting wheel cuts through the tube). The cutter can be used with any soft metal tubing, such as copper, aluminum, or aluminum alloy.

Locate the point where the cut is to be made and place the cutting wheel over that point of the tube. As excessive pressure may damage the tubing, apply slight pressure on the cutting wheel and rotate it around the tubing.

The interactivity given below consists of the procedural steps to be followed for tube cutting. Follow the step-by-step instructions to cut the tube.

Select the appropriate tool for proceeding with copper tube cutting.

Activity 2 - Types of Screwdrivers

1 point possible (graded)

Keyboard Help

PROBLEM

Reed & Prince Phillips Offset Flat blade Reed & Prince Phillips

The activity displays a grid of six empty boxes for tool identification. Above the grid are six buttons labeled with screwdriver types: Reed & Prince, Phillips, Offset, Flat blade, Reed & Prince, and Phillips. The grid contains the following items:

- Top-left: Empty box
- Top-middle: Phillips screwdriver tip
- Top-right: Flat blade screwdriver tip
- Middle-left: Offset screwdriver
- Middle-right: Reed & Prince screwdriver
- Bottom-left: Empty box
- Bottom-middle: Flat blade screwdriver tip
- Bottom-right: Phillips screwdriver tip

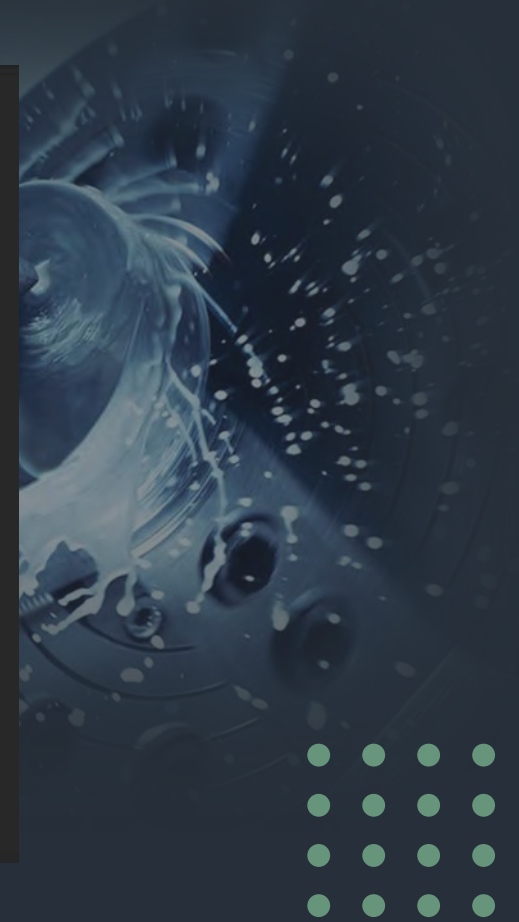
FEEDBACK

Drag each screwdriver identifier to the appropriate image below.



Storyline Interactives

☰ Determine Density Altitude



Instructor Course Guide

CHOOSE AEROSPACE

SAFETY, GROUND OPERATIONS, AND SERVICING

Course Guide for Instructors

FAA General

EducateWorkforce

Objectives

Course

Instructor Dashboard

What's inside?

01 Getting Started: Instructor Dashboard Overview

02 Suggested Course Sequence and ACS Standards Alignment

03 Overview of each course, module, and lesson

04 Course, module, and lesson objectives

05 Lesson plans, hands-on projects, and lesson activities

06 Student and instructor handouts for extended learning

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About Choose Aerospace

The Choose Aerospace aviation maintenance curriculum puts students on a pathway to FAA mechanic certification. The curriculum is intended for use in a high school setting but deployable in current part 147 schools and community-based workforce development programs.

With this hybrid approach to learning, it combines traditional delivery methods (classroom, textbooks, and in-person exercises) using a nationally deployable e-learning platform. It is intended to be used in the classroom, but many of the elements can be taught online, or student-paced. Minimal equipment and materials are required.

In partnership with Clemson University Center for Workforce Development (CUCWD), ARCS Aviation, the Aviation Technical Education Council (ATEC), labor organizations, industry employers, and education partners, the Choose Aerospace curriculum builds pipeline programs directly into higher education and aviation careers.

Through ATEC's network of Federal Aviation Administration (FAA)-certified aviation maintenance schools, students that take the curriculum will have the opportunity to transfer credit to technical schools across the U.S. given the demand for qualified aviation technicians, direct-to-employment opportunities are also available.

Welcome



What's inside?

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Instructor Dashboard
Overview

02

Suggested Course
Sequence and ACS
Standards Alignment

03

Overview of each course,
module, and lesson

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Course, module, and
lesson objectives

05

Lesson plans, hands-
on projects, and lesson
activities

06

Student and instructor
handouts for extended
learning

Instructor Notes:

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Inst

Getting Started

Instructor Dashboard Overview

Instructor Dashboard

The online instructor dashboard provides instructors with a variety of tools to find the information and resources they need. Below you will find a description of each tab and an image of how this information will appear in the instructor dashboard in your course.

Course Info

Allows you to view student enrollment count and basic course information.

Instructor Dashboard

Course Info Resources Membership Courses Student Admin Data Download Analytics Certificates Open-Requests

Course Info

Enrollment Information

Number of Enrollments (admin, staff, and students) by track

Verified	4
Admin	0
Professional	0
Total	4

Basic Course Information

- Course Name: **Demo: Fluid Lines and Filings**
- Course Term: **2022 Fall**
- Course Number: **FAA-ACS-AM-IB-FLF**
- Organization: **OWCWO**
- Course Start Date: **Sep 9, 2021 20:00 EDT**
- Course End Date: **Sep 9, 2022 20:00 EDT**
- Has the course started? **Yes**
- Has the course ended? **No**
- Number of sections: **4**
- Grade Goal's Pass: **0.2**

Pending Tasks

See table currently awaiting.

Resources

Download the course guide, lesson plans, student and teacher handouts, answer keys, and other instructional resources.

Resources

Handouts

This area contains additional resources for the course. The links below are downloadable PDFs for instructor use.

Instructor Materials

- Handout - Course Guide
- Answer Key - Pre/Post Course Evaluation
- Answer Key - Module 1: General Purpose Hand Tools
- Answer Key - Module 2: Manual Cutting Tools
- Answer Key - Module 2: Layout and Measuring Tools
- Answer Key - Final Exam FAA Questions

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Course Pacing Guide

General Resources (All Lessons)

- Choose Aerospace Online Course: [Fluid Lines and Fittings](#)
- eBook: [FAA-H-8083-3A General Handbook \(Chapter 1\)](#)
- Audiobook: [FAA-H-8083-3A Ch. 1](#)
- Airman Certification Standards

Interactive PDF:
Click on the Lesson
Objective buttons and
ACS Code buttons for
more information.

MODULE 1: SHOP AND FLIGHT LINE SAFETY

Days	Lesson	Lesson Objectives <small>Click the buttons below to view the full list of objectives.</small>	ACS Codes <small>Click the buttons to view the full list.</small>	Materials/Resources
DAYS 1-4 (3 hrs.)	Lesson 1: Shop Safety	Lesson 1 Objectives	AM.I.F.K12 AM.I.F.K13 AM.I.F.K14 AM.I.F.K15 AM.I.F.K16 AM.I.F.S1	Lesson 1 <ul style="list-style-type: none"> • Video Lecture: Lesson 1-Shop Safety • Materials: <ul style="list-style-type: none"> ○ Colored markers, colored pencils, poster drawing paper, poster paper w/alphabet (for each group), sticky notes • Teacher Handouts: <ul style="list-style-type: none"> ○ Course Introduction Activity ○ Safety Sign Activity ○ Risk Diamond Activity • Student Handouts: <ul style="list-style-type: none"> ○ Guided Notes ○ Risk Diamond Activity ○ Lab Safety Poster Activity • Video Resources: <ul style="list-style-type: none"> ○ Wing Safety: https://youtu.be/DxScVx1ag ○ PPE: https://youtu.be/h-6BwAisIe8 ○ FOD Walk: https://youtu.be/TY0UDy9t08A ○ Hazard Diamond Song: https://youtu.be/GEVlkekbtR8
DAY 5 (45 min)	Lesson 2 Fire Protection	Lesson 2 Objectives	AM.I.F.K6 AM.I.F.S10	Lesson 2 <ul style="list-style-type: none"> • Video Lecture: Lesson 2-Fire Protection • Flash Photography Image • Teacher Handout: <ul style="list-style-type: none"> ○ Checkpoint Activity • Student Handouts: <ul style="list-style-type: none"> ○ Guided Notes ○ Checkpoint Activity • Video Resource: <ul style="list-style-type: none"> ○ Magnesium Reaction: https://youtu.be/KY9n-UQoLo
DAY 6 (45 min)	Lesson 3: Select Aircraft Operation	Lesson 3 Objectives	AM.I.F.S12	Lesson 3 <ul style="list-style-type: none"> • Video Lecture: Lesson 3-Select Aircraft Operation • Teacher Handout: <ul style="list-style-type: none"> ○ Aviation Terms Activity • Student Handouts: <ul style="list-style-type: none"> ○ Guided Notes ○ Aviation Terms Activity ○ Safety Skit Activity ○ Module 1 Quiz Study Guide • Video Resources: <ul style="list-style-type: none"> ○ Aircraft Engine Fire https://youtu.be/OdDMa8mME_c ○ Engine Fire Protection https://youtu.be/-nY0IYaWL-I

TOTAL MODULE 1 TIME: 6 Days | 6 hrs.

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Course Pacing Guide

Interactive PDF: Click on the Lesson Objective buttons and ACS Code buttons for more information.

MODULE 1: SHOP AND FLIGHT LINE SAFETY

Days	Lesson	Lesson Objectives	ACS Codes	Materials/Resources
DAYS 1-4 (3 hrs.)	<ol style="list-style-type: none"> Identify safety precautions and policies for shop safety: electrical, gases, hazardous materials, and machine tools. Demonstrate proper procedures for shop safety in each of the four areas. Explain the importance of tool and hardware accountability and organization. Explain safety measures and protections on the flight line for hearing, foreign object damage, aircraft propellers, and fire safety. 	<p>Lesson 1 Objectives</p>	<p>AM.I.F.K12 AM.I.F.K13 AM.I.F.K14 AM.I.F.K15 AM.I.F.K16 AM.I.F.S1</p>	<p>Lesson 1</p> <ul style="list-style-type: none"> AM.I.F.K12 Tool and hardware use and accountability AM.I.F.K13 Material handling AM.I.F.K14 Parts protection AM.I.F.K15 Hazardous materials, Safety Data Sheets (SDS), and PPE AM.I.F.K16 Foreign object damage effects AM.I.F.S1 Perform a foreign object damage control procedure. <p> <ul style="list-style-type: none"> PPE: https://youtu.be/b-6PwA1Ue8 FOD Walk: https://youtu.be/TY0UDy9to8A Hazard Diamond Song: https://youtu.be/GEVlkekpt8 </p>
DAY 5 (45 min)	Lesson 2 Fire Protection	Lesson 2 Objectives	<p>AM.I.F.K8 AM.I.F.S10</p>	<p>Lesson 2</p> <ul style="list-style-type: none"> Video Lecture: Lesson 2-Fire Protection Flash Photography Image Teacher Handout: <ul style="list-style-type: none"> Checkpoint Activity Student Handouts: <ul style="list-style-type: none"> Guided Notes Checkpoint Activity Video Resource: <ul style="list-style-type: none"> Magnesium Reaction: https://youtu.be/KV9ri-U0o0o
DAY 6 (45 min)	Lesson 3: Select Aircraft Operation	Lesson 3 Objectives	<p>AM.I.F.S12</p>	<p>Lesson 3</p> <ul style="list-style-type: none"> Video Lecture: Lesson 3-Select Aircraft Operation Teacher Handout: <ul style="list-style-type: none"> Aviation Terms Activity Student Handouts: <ul style="list-style-type: none"> Guided Notes Aviation Terms Activity Safety Skit Activity Module 1 Quiz Study Guide Video Resources: <ul style="list-style-type: none"> Aircraft Engine Fire https://youtu.be/0dDMa8mME_e Engine Fire Protection https://youtu.be/nY0IYaWLJ

TOTAL MODULE 1 TIME: 6 Days | 6 hrs.

General Resources (All lessons)

- Choose Aerospace Online Course: Fluid Lines and Fittings
- eBook: FAA-H-8083-3A General Handbook (Chapter 1)
- Audiobook: FAA-H-8083-3A Ch. 1
- Airman Certification Standards

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Course Introduction

Course Completion Time

This course will be completed online through EducateWorkforce.com. Instructors are also provided with accompanying lesson plans, student activities, and hands-on projects/labs as optional resources for their instruction.

- Safety, Ground Operations, and Servicing Online Course.....5.5 Hours (online coursework only)
- Lesson Plans (w/activities and labs).....12.5 hours (online course + lesson plans/labs)

Suggested Readings

The companion eBook, [Aviation Maintenance Technician Handbook-General](#), aligns with the video lectures, activities, and other module materials. The eBook may be viewed by clicking on the eBook icon found within each module or the eBook link.



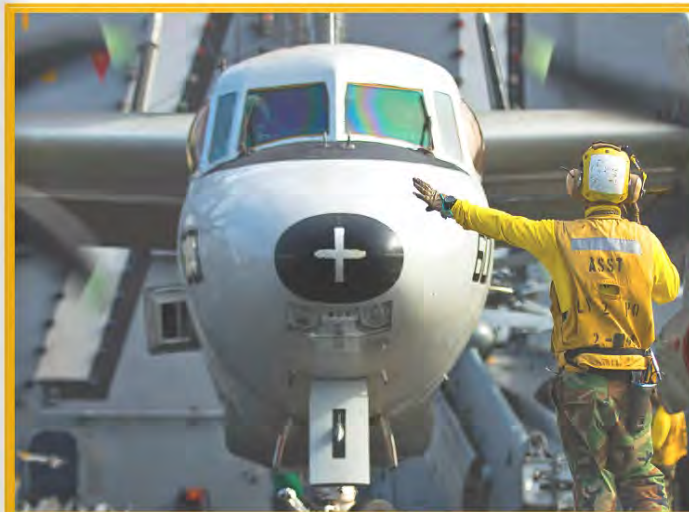
Course Format

- Self Led
- eBooks
- Mini-Video Lectures
- Activities and Assessments

For more information on how to navigate the course or for technical support, please visit the online course.



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About the Course

This course will provide learners with important safety policies and procedures for ground operations of and servicing of aircraft. Students will learn safety procedures in the areas of the shop, flight line, and fire protection. You will also learn proper tiedown procedures for multiple types of aircraft. Ground movement of aircraft, such as engine starting and towing/ taxiing, is also reviewed. Finally, you will learn about servicing the various systems in an aircraft such as air, oil, fluids, and fuel.

It is noted that information in this course is a general guide for safety, ground operations, and servicing. All manuals for specific aircraft, equipment, and machine tools should be reviewed and understood prior to any operations.

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Objectives & Standards

Course Objectives

The following objectives represent the major course expectations.

- ▶ Objective 1: Identify and describe common procedures and practices for shop and flight line safety including fire safety.
- ▶ Objective 2: Identify and describe the practices for safe ramp operations including towing and tiedown procedures, and engine start up and shutdown.
- ▶ Objective 3: Identify the precautions and procedures for servicing an aircraft in the areas of fluids, ground power units, and oxygen.
- ▶ Objective 4: Describe the precautions and procedures to fuel and defuel an aircraft.

ACS Codes

The following knowledge, risk management, and skill elements are required for ground operations and servicing as set forth in the [FAA Airman Certification Standards](#). Each module and lesson provides a detailed alignment of each standard.

- ▶ AM.I.F.K1 - K16
- ▶ AM.I.F.R1 - R10
- ▶ AM.I.F.S1 - S12



Course Outline

View more details by clicking on each section below.

OVERVIEW

MODULE 1

MODULE 2

MODULE 3

REVIEW

Course Goal

The goal of this course is to impart the skill and knowledge set forth in the Federal Aviation Administration mechanic airman certification standards with regards to safety, ground operations, and servicing.

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- ▶ AM.I.F.K1 - K16
- ▶ AM.I.F.R1 - R10
- ▶ AM.I.F.S1 - S12



New Feature: Interactive Outline

Course Outline

View more details by clicking on each section below.

OVERVIEW

OVERVIEW

- Course Pre-Test
- Course Introduction

MODULE 1

Lesson 1

LESSON 1: SHOP SAFETY

- Lesson Objectives
- Video Lecture: Shop and Flight Line Safety
- General Safety Precautions
- Personal Safety Precautions
- Fire-Precautions
- Fuel Spillage
- Working In Fuel Tanks
- Working at Height
- Working with Electricity
- Working with Compressed Gases
- Virtual Lab: Foreign Object Debris
- Charging
- Oxygen
- Toxic Gases
- Working with Oils, Chemicals, and Compounds
- Warning
- Workplace Notices
- Working on Aircraft/Engines
- Engine Running
- Working on Hazardous Materials
- Summary and Key Terms

MODULE 2

MODULE 3

REVIEW

Course Goal

The goal of this course is to impart the skill and knowledge set forth in the Federal Aviation Administration mechanic airman certification standards with regards to safety, ground operations, and servicing.

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Factor Notes:

LESSON PLAN

Lesson 1 Servicing an Aircraft



This lesson explores the various aircraft service procedures.

Lesson Duration: Two 45-minute class periods
This lesson plan is to be used with Module 3 Lesson 1 of the Safety, Ground Operations, and Servicing Online Course.

ACS Codes

The following ACS Codes will be covered in this lesson. Click on ACS Codes below to see the full list of the standards

- AM.I.F.K7
- AM.I.F.K8
- AM.I.F.R2
- AM.I.F.R5
- AM.I.F.S2

- AM.I.F.K7 Aircraft oil, hydraulic and pneumatic, and deicing servicing procedures.
- AM.I.F.K8 Oxygen system servicing procedures.
- AM.I.F.R2 Connecting external power equipment to an aircraft.
- AM.I.F.R5 Oxygen system servicing.
- AM.I.F.S2 Connect external power to an aircraft...

Materials / Equipment

- Video Lecture: Lesson Servicing Aircraft
- Student Handouts:
 - o Guided Notes
 - o Car Service video
 - o Aircraft Engine Systems video
 - o Hydraulic Systems video
 - o De-icing video
 - o Fluid Basics Website

Lesson Objectives:

After completing this course:

- Identify the different components of an aircraft that need regular service (oils, fluids, air systems).
- Describe the proper procedures for servicing aircraft fluids.
- Explain the different types of ground power units and how each are used.
- Identify the precautions and procedures for servicing oxygen systems in an aircraft.
- Describe the procedure for deicing an aircraft.

Key Terms:

The following key terms will be covered in this lesson. Click on **Glossary** to view each definition.

- Aviator's Oxygen
- Fuel Grade
- Ground Power Unit (GPU)
- Jet Fuel

Summary of Tasks/Actions:

DAY 1

Before class, have students read the Chapter 1 ebook pages 1-24 to 1-25.

5 min – Introduction Discussion Activity

In small groups, have the students list as many routine car services that they know of. Have each group share their lists and write them on the board. As each new service is added to the list, ask students if they know how often it should be performed and if anyone knows how to perform the service. If they don't know how often or how to service, ask student if they know where they could find that information. Once the list is completed, ask students what happens if a car is not serviced regularly. Then, for the whole class, play the following **Car Service video** <https://youtu.be/BGSYTWR-kic> explaining the importance of servicing your car regularly.

Lesson Plan

Lesson 1 Servicing an Aircraft



Summary of Tasks/Actions: (cont'd.)

15 min – Video Lecture

(Whole class or individually) Have students view the online video lecture for Lesson 1 Servicing Aircraft. While watching the video lecture, have students fill in the **3.1 Student Handout – Guided Notes**. Be sure to review today's key terms from video lecture with students.

20 min – Reading Activity

Have students go to Lesson 1 in the online course to complete the following: 1) Read the **Ground Service Connections** page. 2) Read the **Pneumatic Ground Supplies** page and watch the video. 3) Read the **Electrical Ground Supplies**. 4) Complete the **Virtual Lab: Connecting External Power** simulation activity. 5) Read the **Hydraulic Ground Supplies**. 6) Read the **Precautions**. Have students add any additional information they missed from the video into their guided notes.

5 min – Summarizing Activity

To summarize and close class, review the lesson **Summary and Key Terms** and have students complete **Lesson 1 Activity 1 and 2** in the online course. (Optional: Assign the following **Take Home Task** to extend student learning. (Optional): Assign the following **Take Home Task** to extend student learning.

Take Home Task:

Have students watch the Aircraft Engine Systems video <https://youtu.be/S6vX2p-pnW8> to see an aircraft being serviced. Ask students to write down 3-5 take-away points from the video.

DAY 2

Before class, please have students read the Chapter 1 ebook pages 1-22 to 1-26.

5 min – Introduction

Play the following **Hydraulic Systems video** <https://youtu.be/MIUddxRAjbc> for the entire class to give them a basic overview of what a hydraulic system is. After the video, have students work in pairs or small groups to sketch a diagram (labeling the parts) of how a basic hydraulic system works.

20 min – Reading Activity

Have students continue to complete the following reading activities in Lesson 1 of the online course: 1. Read the **Aircraft Oil, Hydraulic and Pneumatic, and Deicing Servicing** pag. 2) Read the **Oxygen System Servicing** page. 3) Read the **Servicing Procedures** page and watch the video. 4) Read the **Temperature** page. 5) Read the **Precautions** page. Let students know to add any additional information into their guided notes.

15 min – Practice Activity

Have students watch the following **De-icing video** https://youtu.be/C7z_FB_z-bs followed by reading the **Fluid Basics webpage** https://aircrafticing.grc.nasa.gov/2_3_1_1.html about deicing aircraft. Have students begin on the linked page (should be the beginning of module 3) and continue until the end of the module by clicking next section to move to the next page. At the end of the module are 3 questions for students to answer online.

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Author Notes:

Lesson 1 Servicing an Aircraft



This lesson explores the various aircraft service procedures.

Lesson Duration: Two 45-minute class periods
This lesson plan is to be used with Module 3 Lesson 1 of the Safety, Ground Operations, and Servicing Online Course.

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The following ACS Codes will be covered in this lesson. Click on ACS Codes below to see the full list of the standards

- AM.I.F.K7
- AM.I.F.K8
- AM.I.F.R2
- AM.I.F.R5
- AM.I.F.S2

- AM.I.F.K7 Aircraft oil, hydraulic and pneumatic, and deicing servicing procedures.
- AM.I.F.K8 Oxygen system servicing procedures.
- AM.I.F.R2 Connecting external power equipment to an aircraft.
- AM.I.F.R5 Oxygen system servicing.
- AM.I.F.S2 Connect external power to an aircraft...

Materials / Equipment

- Video Lecture: Lesson Servicing Aircraft
- Student Handouts:
 - o Guided Notes
 - o Car Service video
 - o Aircraft Engine Systems video
 - o Hydraulic Systems video
 - o De-icing video
 - o Fluid Basics Website

Lesson Objectives:

After completing this course:

- Identify the different components of an aircraft that need regular service (tools, fluids, air systems).
- Describe the proper procedures for servicing aircraft fluids.
- Explain the different types of ground power units and how each are used.
- Identify the precautions and procedures for servicing oxygen systems in an aircraft.
- Describe the procedure for deicing an aircraft.

Key Terms:

The following key terms will be covered in this lesson. Click on **Glossary** to view each definition.

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- Fuel Grade
- Ground Power Unit (GPU)
- Jet Fuel

Summary of Tasks/Actions:

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In small groups, have the students list as many routine car services that they know of. Have each group share their lists and write them on the board. As each new service is added to the list, ask students if they know how often it should be performed and if anyone knows how to perform the service. If they don't know how often or how to service, ask student if they know where they could find that information. Once the list is completed, ask students what happens if a car is not serviced regularly. Then, for the whole class, play the following **Car Service video** <https://youtu.be/BGSYTWR-kjc> explaining the importance of servicing your car regularly.

New Feature: Interactive Glossary

GLOSSARY

MODULE 1: SHOP AND FLIGHT SAFETY AND FIRE PROTECTION

SHOP SAFETY

LESSON 1

Compressed Gases

A substance that is a gas at normal room temperature and pressure, and is contained under pressure, usually in a cylinder.

Foreign Object Damage (FOD)

Any damage caused by any loose object to aircraft, personnel, or equipment. Examples: broken runway concrete, shop towels, safety wire.

Material Safety Data Sheet (MSDS)

MSDS contain detailed information of chemical safety issues of hazardous materials. Required by the US Department of Labor Occupational Safety and Health Administration (OSHA).

No-Leak Condition

all connections should be in "no-leak" condition.

Risk Diamond

Risk diamonds are a visual representation of the chemical safety issues of hazardous materials. Required by the US Department of Labor Occupational Safety and Health Administration (OSHA).

RPM

A measure of rotational speed. One rpm is one revolution made in one minute.

FIRE PROTECTION

LESSON 2

Class A Fire

A class of fire that occurs in ordinary combustible materials, such as wood, cloth, paper, upholstery materials, and so forth.

Class B Fire

A class of fire that occurs in flammable petroleum products of other flammable or combustible liquids, greases, solvents, paints, and so forth.

Class C Fire

A class of fire that involves energized electrical wiring and equipment.

Class D Fire

A class of fire that occurs in flammable metal. Class D fires are caused by Class A, B, or C fires. They usually involve magnesium in the shop or in aircraft wheels and brakes or are the result of improper or poorly conducted welding operations.

Halon 1001

Methyl Bromide, chemical formula CH3Br, toxicity rating of 2.

Halon 1011

Chlorobromomethane, chemical formula CH2ClBr, toxicity rating of 3.

Halon 104

Carbon Tetrachloride, chemical formula CCl4, toxicity rating of 3.

(see next page for more Lesson 2 terms)



Name: _____

Date: _____

As you watch the Lesson 1 Servicing an Aircraft video lecture, fill in the organizer with important information.

Servicing Overview:

- ▶ _____ aircraft systems is an important _____ function. This is only a general guide for servicing aircrafts.
- ▶ Check the _____ to determine the proper servicing procedures.
- ▶ If any aircraft fluids are spilled on clothing or skin, _____ as soon as possible due to _____.
- ▶ If you are servicing tires or struts, _____.

Aircraft Fluids:

Oil

- ▶ Oil is checked using a _____ or _____
 - Reciprocating engines: check _____
 - Turbine engines: checked _____
- ▶ Use caution if _____.
- ▶ Never _____ oil tank.
- ▶ Always use the correct type of _____ for the _____ being serviced.

Hydraulic

- ▶ Bleed pressurized reservoirs _____ to service.
- ▶ Take extra effort not to _____ the system during service.
- ▶ When changing _____ filters, make sure _____.
- ▶ After servicing, _____.

Electric Ground Power Units:

- ▶ Electric ground power can be _____.
- ▶ Each vary in _____.
- ▶ When in use, _____.
- ▶ NEVER _____ while the cables are attached to an aircraft.



Guided Notes Page 1



Hydraulic Ground Power Units:

- ▶ Used to _____ aircraft hydraulic systems and _____.
- ▶ Use caution when _____ Leaks greater than _____ can cut like a sharp knife.
- ▶ ALWAYS _____.
- ▶ When not in use, _____.



Ground Support Air Units:

- ▶ Ground support air units are used to provide: _____
 - Typically used to _____ or like an APU _____ on the ground.

Oxygen Servicing:

- ▶ Servicing should be accomplished in _____.
- ▶ Servicing area must be _____.
- ▶ All maintenance actions should _____.



Oxygen Types:

- ▶ Two types of oxygen for use on aircraft: _____ and _____; one manages the _____ people are required to _____ and the other _____ in the aircraft.
- ▶ _____ during this process in case of emergency.
- ▶ Only oxygen labeled _____ should be used in aircraft systems.
 - Contains _____.
 - Gaseous oxygen, while nonflammable, _____.
 - Always use _____ when servicing oxygen systems.

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Name: _____

Date: _____

Answer the following questions, given the images below.

1. **Nacelle:**2. **Cowling:**3. **Chocks:**

If you need some help, you can review the Lesson 3 Summary and Key Terms page. You can also use the online dictionary <https://www.collinsdictionary.com/us/dictionary/english>.

4. **What do you think are the purposes of the nacelle and cowling to the aircraft?**

ANSWER KEY

Answer the following questions, given the images below.

1. **Nacelle:** a streamlined enclosure on an aircraft, especially for an engine2. **Cowling:** a removable metal covering that houses the engine and sometimes part of the fuselage or nacelle3. **Chocks:** a block of material wedged under the tires of an aircraft to prevent it from rolling

If you need some help, you can review the Lesson 3 Summary and Key Terms page or use the online dictionary <https://www.collinsdictionary.com/us/dictionary/english>.

4. **What do you think are the purposes of the nacelle and cowling to the aircraft?**

Answers will vary but may include something along the lines of cooling and streamlining the aircraft

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Name: _____
Date: _____

This module has included many concepts of shop and aircraft safety. In small groups of 2-4 students, you will choose a safety concept from this module and create a short 3-5 minute skit to perform to the class today. Be sure everyone in the group plays a role.

Example: A group demonstrates how to choose and use a fire extinguisher properly.



Safety Skit Rubric

CRITERIA	Weight	Exceptional 4	Admirable 3	Acceptable 2	Attempted 1
Understanding of Topic	40%	<input type="checkbox"/> Information is accurate <input type="checkbox"/> Clear understanding of topic	<input type="checkbox"/> Information is mostly accurate <input type="checkbox"/> Good understanding of topic	<input type="checkbox"/> Information is somewhat accurate <input type="checkbox"/> Fair understanding of topic	<input type="checkbox"/> Information is inaccurate <input type="checkbox"/> Presentation is off topic
Cooperation	30%	<input type="checkbox"/> All members contribute <input type="checkbox"/> Individually contributes and accepts ideas of others	<input type="checkbox"/> Some members contribute <input type="checkbox"/> Individually contributes and accepts most ideas	<input type="checkbox"/> Few members contribute <input type="checkbox"/> Unwilling to contribute or accept ideas from others	<input type="checkbox"/> One or two members completed all the work <input type="checkbox"/> Does not work well with group members
Presentation	30%	<input type="checkbox"/> Shows confidence <input type="checkbox"/> Informative <input type="checkbox"/> Entertaining, engages audience <input type="checkbox"/> Speaks loudly and clearly <input type="checkbox"/> Appropriate use of body language <input type="checkbox"/> Presentation time is appropriate	<input type="checkbox"/> Shows some confidence <input type="checkbox"/> Presents some information <input type="checkbox"/> Engages audience <input type="checkbox"/> Can be heard <input type="checkbox"/> Some use of body language <input type="checkbox"/> Presentation time meets minimum	<input type="checkbox"/> Unsure of responsibility <input type="checkbox"/> Somewhat informative <input type="checkbox"/> Engages audience intermittently <input type="checkbox"/> Not very clear or loud <input type="checkbox"/> Some movement <input type="checkbox"/> Presentation time is under requirement	<input type="checkbox"/> Little to no confidence <input type="checkbox"/> Not enough information <input type="checkbox"/> Not engaging <input type="checkbox"/> Does not speak loudly or clearly <input type="checkbox"/> Little to no body language <input type="checkbox"/> Presentation time is too short
Total					



Name: _____
Date: _____

To prepare for Module 1 Quiz, review each of the following using your guided notes and the ebook. Be sure to add any missing information into your guided notes.

Specific topics to review in ebook Chapter 1:

- Page 2 Electrical Safety
- Page 2 Safety Around Compressed Gases
- Page 3 Safety Around Hazardous Materials
- Page 3 Safety Around Machine Tools
- Page 4 Hearing Protection
- Page 5 Foreign Object Damage (FOD)
- Page 5 Safety Around Airplanes
- Page 5 Fire Safety
- Page 6 Classification of Fires
- Page 6 Types and Operation of Shop and Flight Line Fire Extinguishers
- Page 8 Inspection of Fire Extinguishers
- Page 8 Identifying Fire Extinguishers
- Page 9 Using Fire Extinguishers

Review at the beginning of Module 1 in EducateWorkforce:

- Introduction
- Objectives
- Orienting Questions - be sure you can answer these!!

Review at the end of Module 1 in EducateWorkforce:

- Key Concepts
- Key Terms

Review for EACH lesson in Module 1 in EducateWorkforce:

- Objectives
- Summary and Key Terms

Review Notes and any activities from Module 1

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PRACTICAL PROJECT | Safety, Ground Ops, & Servicing Skill Stations

Project Overview

In this project, students will work in small group stations, complete a FOD Walk, and answer a series of questions to demonstrate Safety, Ground Operations, and Servicing knowledge and skills. Through this, students will be able to complete Part of the 12 ACS skill requirements.

Project Duration:
Two 45-minute class periods

Pre-Requisites

FAA-ACS-001-17-001-Safety, Ground Operations, and Servicing Course

Learning Outcomes:

The students will be able to demonstrate the successful completion of several skills through application and critical thinking in areas of: stop/start and the safety, ground operations, and the servicing of aircraft, including FOD control, use of hand signals, fuel identification and application of aviation fuel, starting/shutting down a reciprocating aircraft, extinguishing an engine induction fire, and securing an aircraft.



This course project was designed as a culminating project to be completed at the end of the Safety, Ground Operations, and Servicing course.

*Note to Instructor: This project can be adapted to meet the needs of the learners. Reviewed through online project before beginning the project to ensure you have the required supplies and materials.

Supplies/Materials:

- 2 copies of FAA-8000-326 handbook
- Nylon rope - 7 per group member (length as needed to tie two objects together)
- Five marbles with 1 lb.
- Water
- Red, Green, Blue, Purple, and Yellow food coloring
- FOD Walk Location Map
- Trash bags (one every 2 students)
- Yellow/Orange vest (optional)
- Probe/Optional

Equipment

- Computer with Microsoft Flight Simulator installed (preferably 1 per every 2 students)

Attachments

- Station 1 Instruction Sheet - Aircraft Hand Signals
- Station 2 Instruction Sheet - Aircraft Knots
- Station 3 Instruction Sheet - Reciprocating Engine Start-Up/Shutdown
- Station 3 General FOD Stop/Start/Down Checklist
- Station 4 Instruction Sheet - Aircraft Induction System Fire
- Station 4 Timeline Cards
- Station 5 Instruction Sheet - Aircraft Fuel System
- Station 5 Fuel Grades Color Cards
- Station 5 Fuel Grades Matching Cards
- Station 5 Instruction Sheet - Approved Fuels
- Station 5 Aircraft Image Cards
- Station 5 Approved Fuel Types Matching Cards



ACS Codes

The following Aircraft Certification Standards will be covered in this project.

- APL1.F.31 Perform a foreign object damage control procedure.
- APL1.F.34 Use appropriate hand signals for the movement of aircraft.
- APL1.F.35 Identify different grades of aviation fuel.
- APL1.F.37 Select an approved fuel for an aircraft.
- APL1.F.39 Follow a checklist to start an aircraft, cover an aircraft reciprocating or turbine engine.
- APL1.F.30 Identify procedures for extinguishing fires in an engine induction system.
- APL1.F.38 Secure an aircraft.

References

- [Book FAA-8000-326, Pages 1-6](#)
- [FAA Advisory Circular 3000-2021](#)
- [FAA Association Website Page 10](#)

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Instructor Notes:

INSTRUCTOR DAY 1

- 1) Before class set up 5 stations with the Day 1 Equipment/Materials as provided in the Instructor Instruction sheet and complete the tasks for each station activities.
- 2) You will be dividing the class into 5 groups (ie. 100/20 = 5) A student. For larger classes, you can assign 3 of each station.
- 3) Each group will rotate 5 stations starting at the same station (drop their group number). You will assign each group to a starting station and have them rotate based on the activity assignment below:
 - Group 1 - Station 1 > 2 > 1
 - Group 2 - Station 2 > 3 > 4
 - Group 3 - Station 3 > 4 > 5
 - Group 4 - Station 4 > 5 > 1
 - Group 5 - Station 5 > 1 > 2

A) Plan to set a timer for 7 minutes for each group to rotate. As soon as a group finishes, check their work and verify that all group members are ready to rotate when the timer goes.

NOTE: Each day is designed in a 45-minute class time. For longer class periods, combine Day 1 and 2. If you need more time for each group, you can split Day 1 into two days and do with groups rotating 3 stations or do the remaining two stations on Day 2. The VDO with activity and exercises can then be completed on Day 2.

Plan Procedures:

DAY 1

5 minutes - Introduction

Divide the class into 5 groups (See instructor notes for more information on this activity and grouping). Provide students with verbal or written instructions detailing the following:

- a) Each group will rotate five stations.
- b) Each station has a set of instructions to be followed.
- c) They will be given approximately 7 minutes at each station.
- d) They should notify the instructor when they have completed the task so it can be verified.

30 minutes - Small Group Activity

Facilitate each group as they perform the assigned tasks at the 5 stations (See instructor notes for more information about stations and grouping). Students will be given approx. 7 minutes at each station. Once the students have completed the task(s), the instructor will need to verify that they have followed instructions and can demonstrate the skill required before moving onto the next station.

5 minutes - Wrap-up

Final check of task completion and have students complete a log on each station.

Day 1 Equipment/Materials:

- 2 copies of FAA-H-8083-30A handbook
- Copy each with Personal Flight Manual provided (see table for every 3 students)

Station 1 Aircraft Hand Signals

- Instruction Sheet - Aircraft Hand Signals

Station 2 Aircraft Knots

- Instruction Sheet - Aircraft Knots
- Rope (one 10' long group members must be able to tie knots in rope)

Station 3 Aircraft Start-Up/Shutdown

- Instruction Sheet - Aircraft Start-Up/Shutdown
- Checklist (one for 1/2 class) (1/2 class) (one for 1/2 class)

Station 4 Aircraft Fuel System Flow

- Instruction Sheet - Aircraft Fuel System Flow
- Timeline Cards

Station 5 Fuel System Approval Cards

- Fuel system flow cards
- Note
- Red, Green, Blue, Purple, and White flow marking
- Instruction Sheet - Aircraft Fuel System Flow
- Fuel System Flow Approval Cards
- Fuel System Flow Approval Cards
- Approved Fuel System Approval Cards
- Approved Fuel System Approval Cards

Procedures

Set out the following instruction sheet cards and rotate one at each station.

STATION 1

Aircraft Hand Signals:

1. Study the aircraft hand signals found in Figures 1-14 and 1-25 on pages 1-22 and 1-23 of the FAA-H-8083-30A handbook.
2. Close the book and take turns calling out a hand signal. All members of the group must demonstrate the correct hand signal in response.
3. Repeat until all group members are able to demonstrate at least 7 of 10 signals correctly.
4. When ready, have your instructor evaluate if your group can correctly demonstrate 7 out of 10 signals.

STATION 2

Aircraft Knots:

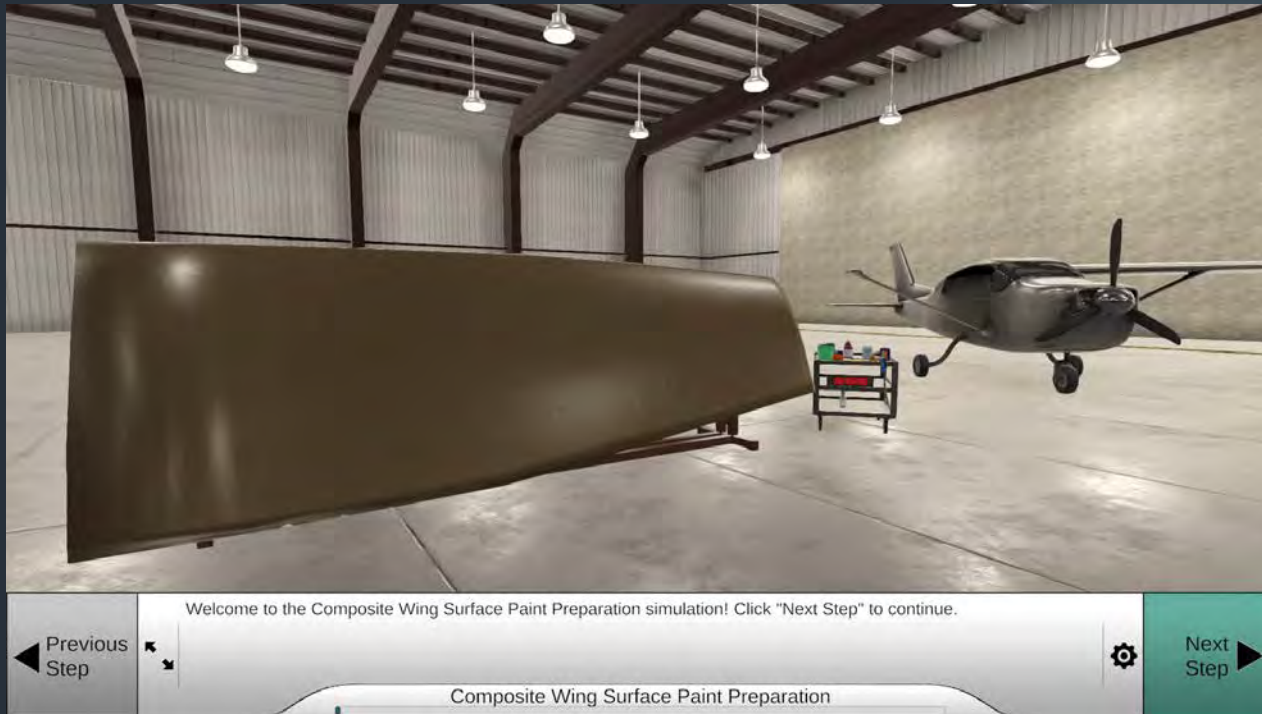
1. Study the bowline and square knot diagrams found in Figure 3-10 on page 3-10 in the FAA-H-8083-30A handbook.
2. Each group member is to provide a bowline and then a square knot by tying two objects together.
3. Once you are confident in your knot tying skills, have your instructor evaluate your knots for accuracy.

Instructor Notes:

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Ins

Sample Virtual Reality



Paint Preparation: Composite Wing

More Information

www.chooseaerospace.org/curriculum
careers@chooseaerospace.org

CHOOSE
AEROSPACE

