

National Aviation Consortium

Aerospace Manufacturing Assembly Mechanic Technician Certificate Program



Version 4.0

Released March, 2013

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1.0 Credits

- 18.5 credits
- 4 weeks online
- 4 weeks in lab

2.0 Course Titles

1. Assembly Mechanic Orientation
2. Power Island Equipment
3. Basic Drilling & Riveting
4. Advanced Fasteners
5. Countersinking & Flush Riveting
6. 90 Degree Drilling
7. Wing Structure Project
8. Fuselage Skin Assembly
9. Drilling Titanium
10. Drilling Composite Material
11. Sealant Applicant Processes – Mechanical
12. Electrical Bond and Ground
13. Composite Manufacturing



3.0 Program Outcomes

- Demonstrate an understanding of the opportunities, principles and culture of being an aerospace assembly mechanic.
- Demonstrate practical knowledge of power island equipment and associated safety practices.
- Identify various aerospace tools used in the installation of aerospace fasteners including rivet guns, squeeze rivet guns, lockwire pliers and nut runner pullers.
- Demonstrate practical knowledge of safety and quality control in drilling, installing fasteners and inspecting installations in aerospace assembly.
- Identify advanced fasteners used in the aerospace industry including as nut plates, lockwire and blind rivets.
- Demonstrate practical knowledge of countersinking and flush riveting in aerospace assembly.
- Exhibit the knowledge necessary to perform 90 degree drilling and reaming operations for fastener installation.
- Demonstrate practical knowledge and skills to prepare and assemble wing structures.
- Demonstrate practical knowledge and skills to prepare and assemble fuselage skin assemblies.
- Exhibit technical knowledge and skills necessary to safely and correctly drill holes in titanium based materials.
- Exhibit technical knowledge and skills necessary to safely and correctly drill holes in composite materials.
- Demonstrate the skills necessary to safely and properly prepare and apply different types of sealants to aircraft structures.
- Demonstrate practical knowledge and skills to prepare electrical bonding and grounding locations with the proper tools and procedures.
- Demonstrate practical knowledge and skill to prepare and lay-up 4 ply, carbon 8 ply and fiberglass 6 ply wet composite materials.



4.0 Course Descriptions

4.1 Assembly Mechanic Orientation

COURSE DESCRIPTION: This course provides an overview of the Assembly Mechanic program providing an overview of the expectations of the program, potential safety hazards, traits employers value, various roles and responsibilities within advanced manufacturing teams and what elements are necessary to make a manufacturing company successful.

Chapter 1 – The Assembly Mechanic Program

- Describe what this program means for you
- List the expectations of all students of the program
- Explain the potential safety hazards

Chapter 2 – Program Expectations and Polices

- Describe the expectations of the students in this program
- List all of the potential safety hazards
- State the process of acquiring tools
- Explain why foreign object damage is a serious problem

Chapter 3 – It's All About You

- Explain the top traits employers value in an employee
- Describe the attributes of each trait
- Explain how to apply these traits in the workplace

Chapter 4 – Teamwork in Manufacturing

- Identify teams that work together in the advanced manufacturing world.
- Articulate the overall mission of a team.
- Describe various roles and responsibilities within advanced manufacturing teams.
- Describe how teams and individuals work together to manufacture quality products.
- List the teams that are present in a manufacturing environment

Chapter 5 – Winning in Manufacturing

- List the main elements that can help a manufacturing company "win"
- Understand how costs—including target cost and cost of production—help determine an advanced manufacturing company's success
- Use math to determine the efficiency and productivity of a manufacturing cycle or equipment
- Explain how customer satisfaction creates several wins for the manufacturing company



4.2 Power Island

COURSE DESCRIPTION: This course provides an overview of the common equipment in power island. The student will learn the components, proper use and safety precautions required for using a disc sander, belt sander, drill press and band saw.

Chapter 1 – Introduction to Power Island Equipment

- Define power island
- Identify the common equipment in the power island
- Explain general safety precautions to use with power island equipment

Chapter 2 – Disco and Belt Sander

- Define disc sander
- Define belt sander
- Identify the common components of the disc sander and belt sander
- Explain general safety precautions used with the disc and belt sanders
- Understand how to properly use the sanders

Chapter 3 – Drill Press

- Define drill press
- Identify the common components of the drill press
- Explain general safety precautions used with the drill press
- Understand how to properly use the drill press

Chapter 4 – Band Saw

- Define band saw
- Identify the common components of the band saw
- Explain general safety precautions used with the band saw
- Understand how to properly use the band saw



4.3 Basic Drilling and Riveting

COURSE DESCRIPTION: This course provides specific technical knowledge of the tools and accessories required to drill a quality hole and drive a rivet in an aircraft assembly or structure. The student will learn how to mark fastener locations, set up a drill motor, drill pilot holes, enlarge holes, deburr holes, inspect holes and properly install rivets.

Chapter 1 – Basic Drilling

- Recognize the different types of drills used in aviation manufacturing
- Recognize the tools and accessories you need to drill a quality hole
- Understand the proper way to hold a drill
- Recognize common hole defects

Chapter 2 – Marking Fastener Locations

- Recognize fastener location and identification information on an engineering drawing
- Explain where to find the tools, fastener, and other supplies needed to create an assembly
- Prepare the surface of an assembly for mark up
- Properly measure and mark corner fastener locations
- Calculate fastener locations using information given on the engineering drawing
- Mark fastener locations using the calculated fastener location information

Chapter 3 – Setting Up the Drill Motor

- Properly stack and align the pieces used in this assembly
- Install a pilot bit in a drill motor

Chapter 4 – Drilling Pilot Holes and Enlarging Holes

- Create a drill start with a drill motor and pilot bit
- Drill a pilot hole
- Exchange a pilot bit for a larger drill bit
- Set a drill stop
- Enlarge a hole to size
- Inspect a full size hole using a Go/NoGo pin gauge

Chapter 5 – The Installation Plan

- Use an open countersink to deburr holes
- Use a flat file to deburr holes

Chapter 6 – Rivets

- List the parts of a rivet
- Describe how rivets work
- Describe the rivet installation process



Chapter 7 – Driving Protruding Head Rivets

- Install a cup die into a rivet gun
- Use a rivet gun and bucking bar to install protruding head rivets
- Visually inspect the manufactured heads of rivets
- Inspect the manufactured heads of driven rivets using a gap inspections shim
- Inspect the driven heads of rivets using a spoon gauge
- Inspect the driven heads of rivets using an H-gauge



4.4 Advanced Fasteners

COURSE DESCRIPTION: This course provides technical knowledge and skills required to install advanced fasteners including nut plates, bolts, blind rivets and lockwire. The student will learn about the different types of fasteners and the various tools used to install these fasteners.

Chapter 1 – Assembly Preparation

- Recognize fastener location and identification information on an engineering drawing
- Explain where to find the tools, fasteners, and other supplies needed to create an assembly
- Mark fastener locations on the assembly
- Drill pilot holes in an assembly
- Enlarge holes to size
- Take the assembly apart
- Deburr holes in the assembly

Chapter 2 – Nut Plates and Blind Rivets

- List the different types of nut plates
- Understand the function of a nut plate
- List the tools needed to install a nut plate
- List the parts of a blind rivet
- Recognize the tools used to install a blind rivet

Chapter 3 – Installing Nut Plates

- Choose appropriate material for a scrap assembly
- Operate a Winslow drill
- Adjust a Winslow drill
- Install nut plates

Chapter 4 – Squeeze Riveting Tools

- Understand how a compression riveter works
- Choose and install rivet dies for compression riveters
- Install a rivet using a compression riveter

Chapter 5 – Squeeze Riveting

- Use a compression riveter to install rivets in the assembly

Chapter 6 – Lockwiring & Tools

- Define torque
- Identify the different types of torque tools
- Understand how torque is measured
- Convert between the different units used to measure torque



Chapter 7 – Installing Bolts

- Install bolts with a pneumatic torque tool

Chapter 8 – Lockwiring and Tools

- Understand why bolts are secured
- Describe the ways bolts are secured
- Recognize a pair of lockwire pliers
- Recognize castellated nuts and cotter pins
- Understand how to use a cotter pin with a castellated nut

Chapter 9 – Securing Bolts with Lockwire

- Install lockwire using lockwire pliers

4.5 Countersinking & Flush Riveting

COURSE DESCRIPTION: This course provides the technical knowledge and skills to properly countersink a hole in an aircraft assembly. The student will learn the different types of countersink cutters, the major components of a countersink tool, the proper technic for countersinking a hole and the proper way to inspect a countersink hole.

Chapter 1 – Countersinking Basics

- List the common reasons for countersinking a hole
- Identify the different types of countersink cutters
- Understand how countersinks are identified
- Describe the purpose of a microstop countersink tool
- Describe the proper technique for countersinking a hole
- Understand the proper way to use a countersink gauge

Chapter 2 – Marking Fastener Locations

- Recognize fastener identification information on an engineering drawing
- Explain where to find the tools, fasteners, and other supplies needed to create an assembly
- Determine fastener locations using information given on the engineering drawing
- Mark all fastener locations on the part

Chapter 3 – Setting Up the Assembly and Drill

- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor

Chapter 4 – Drilling, Enlarging, and Deburring Holes

- Drill a pilot hole
- Exchange a pilot bit for a larger drill bit
- Set a drill stop
- Enlarge a hole to size
- Inspect a full size hole with a Go/NoGo pin gauge
- Use an open countersink to deburr holes

Chapter 5 – Setting the Countersink Tool

- Choose an appropriate piece of scrap material
- Determine hole locations on a scrap part
- Countersink a hole
- Use a Federal gauge to inspect a countersink
- Install a flush head rivet
- Use a Federal gauge to inspect a flush head rivet
- Adjust the depth of a countersink cutter



Chapter 6 – Countersinking

- Countersink holes of various sizes
- Measure countersinks with a Federal gauge

Chapter 7 – Flush Riveting

- Install flush head rivets
- Visually inspect the manufactured head of a flush head rivet
- Use a Federal gauge to inspect the manufactured head of a flush head rivet
- Use a spoon gauge to inspect the clinch diameter of a flush head rivet
- Use a spoon gauge to inspect the clinch thickness of a flush head rivet



4.6 90 Degree Drilling

COURSE DESCRIPTION: This course provides technical knowledge of aviation fasteners including rivets, lockbolts and Hi-Loks. The student will learn different the preparation, tools and proper procedures to install fasteners used in aerospace assemblies. Also included is the tools, preparation and proper procedures of how to remove fasteners from an assembly.

Chapter 1 – Fasteners and Fits

- Define the term fit in relation to fasteners and parts of an assembly
- List the different types of fits
- Understand the relationships between fasteners and their mating parts
- Understand how fastener fits are selected

Chapter 2 – Lockbolts

- Explain the benefits of a lockbolt fastener
- Identify and explain the major components of a lockbolt
- Explain the process of selecting the proper lockbolt
- Install a lockbolt fastener

Chapter 3 – Inspecting Lockbolts

- Define all of the inspection requirements for a lockbolt installation
- Identify and explain all of the precision instruments used to inspect lockbolt installations
- Perform all of the inspection processes

Chapter 4 – Hi-Lok Fasteners

- Name the types of Hi-Loks used in aviation
- List the parts of a Hi-Lok
- Describe how these fasteners work
- Describe the Hi-Lok installation process

Chapter 5 – Inspecting Hi-Lok Fasteners

- Define all of the inspection requirements for a Hi-Lok installation
- Identify and explain all of the precision instruments used to inspect Hi-Lok installations
- Perform all of the inspection processes

Chapter 6 – Assembly Preparation

- Recognize fastener location and identification information on an engineering drawing
- Explain where to find the tools, fasteners, and other supplies needed to create the assembly
- Mark fastener locations on the assembly
- Drill pilot holes in the assembly
- Enlarge the pilot holes to size



- Chamfer the holes in the assembly
- Take the assembly apart
- Deburr holes in the assembly

Chapter 7 – Installing 5/16 Inch Hi-Loks

- Install a Hi-Lok
- Use a pneumatic torque tool to install a Hi-Lok collar
- Inspect the manufactured head of an installed Hi-Lok with a gap inspection shim
- Inspect the collar of an installed Hi-Lok using a pin protrusion gauge

Chapter 8 – Installing 3/16 Inch Hi-Loks

- Install a Hi-Lok
- Use a hand tool to install a Hi-Lok collar
- Inspect the manufactured head of an installed Hi-Lok with a gap inspection shim
- Inspect the collar of an installed Hi-Lok using a pin protrusion gauge

Chapter 9 – Installing Protruding Head Rivets

- Use a rivet gun and bucking bar to install protruding rivets
- Inspect the manufactured and driven heads of the rivets

Chapter 10 – Removing Rivets

- Mark the manufactured head of an installed rivet with a drill bit
- Use a drill motor and drill bit to remove the manufactured head of an installed rivet
- Use a pin punch and ball peen hammer to remove the shank of an installed rivet

Chapter 11 – Removing 5/16 Inch Hi-Loks

- Use a pair of Hi-Lok pliers to grip the collar of an installed Hi-Lok
- Use a pin punch and ball peen hammer to remove the shank of an installed Hi-Lok



4.7 Wing Structure Project

COURSE DESCRIPTION: This course provides the technical knowledge and skills for how to assemble a wing assembly including preparation of the assembly, drilling, countersinking, fillet relief and installation of different fasteners. The student will learn about the required production tools used in a wing assembly including templates, fixtures, and jigs.

Chapter 1 – Tools for Wing Structure Project

- Recognize a drilling template
- Understand the difference between a fixture, jig, and template
- Understand the function of a drilling template
- Recognize a fluid-tight fastener with a counterbore and countersunk head
- Describe a counterbore and countersink drill bit
- List the parts of a rivet shaver
- Know how a rivet shaver works

Chapter 2 – Preparing the Assembly

- Recognize hole location information on an engineering drawing
- Locate the tools required to mark hole locations on the assembly
- Mark hole locations on the wing structure assembly
- Drill all the pilot holes common to the -2 parts in the assembly

Chapter 3 – Countersinking and Fillet Relief

- Countersink holes
- Counterbore and countersink holes for fluid tight fasteners

Chapter 4 – Installing Fasteners

- Install Hi-Loks
- Install lockbolts
- Install protruding head rivets
- Install fluid tight rivets
- Shave the heads of fluid tight rivets



4.8 Fuselage Skin Assembly

COURSE DESCRIPTION: This course combines technical and manufacturing skills necessary to assemble fuselage skin assemblies. The student will learn the proper procedures to prepare a fuselage skin assembly, drill skin panels, prepare the doubler, countersink, install fasteners and remove rivets.

Chapter 1 – Corrosion

- Define corrosion
- Explain the corrosion process
- Identify the conditions that must exist for corrosion to occur
- Recognize different types of corrosion
- Identify common corrosive agents
- Identify metals that are subject to corrosion
- Identify preventative measures for corrosion

Chapter 2 – Preparing the Assembly

- Know where to find the supplies you'll need to create this assembly
- Describe an assembly jig
- Understand the function of an assembly jig
- Set up the fuselage skin assembly project on the jig

Chapter 3 – Drilling the Skin Panels

- Set up your drill motor to drill pilot holes
- Drill the holes in the skin panels
- Set up your drill motor to drill full size holes
- Enlarge the holes in the skin panels

Chapter 4 – Preparing the Double

- Drill pilot holes in the doubler
- Locate the doubler on the skin panel
- Enlarge the holes in the doubler to accommodate the fasteners

Chapter 5 – Countersinking

- Countersink holes in the fuselage skin assembly

Chapter 6 – Assembly Finish and Fastener Installation

- Drill the final holes in the assembly
- Remove the assembly from the jig
- Take the assembly apart
- Deburr the holes in the assembly
- Clean the assembly
- Rebuild the assembly and return it to the assembly jig
- Install Hi-Loks in the assembly
- Install flush head rivets in the assembly



Chapter 7 – Removing Rivets

- Mark the manufactured head of an installed rivet with a drill bit
- Use a drill motor and drill bit to remove the manufactured head of an installed rivet
- Use a pin punch and ball peen hammer to remove the shank of an installed rivet



4.9 Drilling Titanium

COURSE DESCRIPTION: This course provides specific technical knowledge and skills necessary to safely and correctly drill holes in titanium based materials in the aerospace industry as an assembly mechanic. The student will learn the qualities of titanium material and the proper procedures for drilling, chamfering and deburring a hole in a titanium assembly.

Chapter 1 – Drilling Titanium

- List some qualities of titanium material
- Understand the hazards of working with titanium materials
- Define a quality hole
- Understand how to drill a quality hole in titanium material
- Recognize some common hole defects

Chapter 2 – Marking Hole Locations

- Recognize hole location information on an engineering drawing
- Explain where to find the tools and other supplies needed to create an assembly
- Prepare the surface on an assembly for mark up
- Properly measure and mark the hole locations in the assembly

Chapter 3 – Drilling Pilot Holes

- Create the assembly
- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor
- Drill pilot holes into the assembly

Chapter 4 – Drilling and Enlarging Holes in Row JD2

- Use a 90 degree drill motor to drill the pilot holes in row JD2
- Use a 90 degree drill motor and two separate single-step drill bits to enlarge the pilot holes to size

Chapter 5 – Enlarging Row JD7

- Enlarge the holes in row JD7

Chapter 6 – Enlarging Row JD4, JD5, and JD6

- Enlarge the holes in rows JD4, JD5, and JD6

Chapter 7 – Enlarging Row JD1 and JD3

- Use two reamers to enlarge the holes in rows JD1 and JD3 to size

Chapter 8 – Enlarging Row JD8

- Enlarge the holes in row JD8



Chapter 9 – Chamfering

- Choose appropriate scrap material
- Mark hole locations and drill and chamfer holes in scrap material
- Measure the diameter of a chamfer with a countersink gauge
- Adjust a countersink cutter to create a chamfer of the correct diameter
- Chamfer holes in the final assembly

Chapter 10 – Edge Breaking and Deburring

- Edge break a hole to a specified diameter
- Inspect an edge break using a countersink gauge
- Deburr holes in a titanium assembly



4.10 Drilling Composites

COURSE DESCRIPTION: This course provides specific technical knowledge and skills necessary to safely and correctly drill holes in composite materials in the aerospace industry as an assembly mechanic. The student will learn the qualities of composite material, common hole defects that occur in composite materials and the proper procedures for drilling and enlarging holes in a composite assembly.

Chapter 1 – Drilling Composites

- List some qualities of composite material
- Understand the hazards of working with composite materials
- Define a quality hole
- Understand how to drill a quality hole in composite material
- Recognize some common hole defects that occur in composite materials

Chapter 2 – Marking Hole Locations

- Recognize hole location information on an engineering drawing
- Explain where to find the tools and other supplies needed to create an assembly
- Properly measure and mark hole locations in the assembly

Chapter 3 – Drilling Pilot Holes

- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor
- Drill pilot holes into the assembly

Chapter 4 – Drilling Row JD3

- Drill and enlarge the holes in row JD3 of the composite assembly

Chapter 5 – Drilling Row JD7

- Drill and enlarge the holes in row JD7 of the composite assembly

Chapter 6 – Enlarging Holes in Row JD1 and JD5

- Enlarge the holes in rows JD1 and JD5 of the composite assembly

Chapter 7 – Enlarging Holes in Rows JD2 and JD6

- Enlarge the holes in rows JD2 and JD6 of the composite assembly

Chapter 8 – Enlarging Holes in Row JD4

- Enlarge the holes in row JD4 of the composite assembly



4.11 Sealant Applicant Processes - Mechanical

COURSE DESCRIPTION: This course provides technical knowledge and skills necessary to safely and correctly apply different sealant on an aircraft. The student will learn where different sealants are used and the proper procedures of fay sealing, fillet sealing, injection sealing, and cap sealing.

Chapter 1 – Sealing Basics

- Define sealing and understand the purpose of sealing in airplane assembly
- Describe the types of sealants
- Understand general surface preparation when sealing
- Understand how to be safe during the sealing process
- Identify the curing phases in the sealing process

Chapter 2 – Fay and Prepack Sealing

- Define fay sealing
- Identify where fay seals are used
- Understand the process of fay sealing
- Define prepack sealing
- Identify where prepack seals are used
- Understand the process of prepack sealing

Chapter 3 – Fillet and Injection Sealing

- Define fillet sealing
- Identify where fillet seals are used
- Understand depth of fillet
- Understand the process of fillet sealing
- Define injection sealing
- Identify where injection seals are used
- Understand the process of injection sealing

Chapter 4 – Cap Sealing

- Define cap sealing
- Identify where cap seals are used
- Understand the process of cap sealing



4.12 Electrical Bond and Ground

COURSE DESCRIPTION: This course teaches the process and tools used to install a pre-installed ground stud and direct standard ground stud per specifications such that the installation meets all electrical resistance and inspection requirements. Includes preparing the surface, installation and checking resistance.

Chapter 1 – Electrical Bond and Ground Introduction

- List the steps required to install a pre-installed ground stud
- List the steps required to install a direct standard ground stud
- Explain how to use the power tools to install ground studs

Chapter 2 – Pre-installed Ground Studs

- Install a pre-installed ground stud
- Check resistance on a pre-installed ground stud

Chapter 3 – Electrical Fay Surface Bonds

- Prepare the surfaces of a fay surface bond
- Install a ground stud in two pieces of material
- Check resistance on a ground stud

Chapter 4 – Direct Ground Stud

- Install a direct ground stud
- Check resistance on a direct ground stud

Chapter 5 – Fillet Sealing a Ground Stud

- Apply a fillet seal on a direct ground stud installation

Chapter 6 –Fay Sealing a Ground Stud

- Apply a fay seal on a direct ground stud installation
- Check resistance on a direct ground stud installation with a fay seal



4.13 Composite Manufacturing

COURSE DESCRIPTION: This course teaches the lay-up process for layering composite materials when constructing a composite component. The student will learn about the tools and materials needed to perform a composite lay-up using unidirectional 4 ply, carbon 8 ply with a core and fiberglass 6 ply with resin.

Chapter 1 – Preparation for the Lay-up Process

- Identify the documentation used in laying up composite components
- Identify material orientation used in laying up composite components
- Understand the purpose of material orientation used in composite lay-up
- Identify different lay-up types

Chapter 2 – Composites Project One

- How to build a composite component using unidirectional, pre-impregnated composite materials
- How to lay-up a composite component with four plies

Chapter 3 – Composite Project Two

- How to build a composite component using pre-impregnated composite materials
- How to lay-up a composite component with eight plies and a core

Chapter 4 – Composite Project Three

- How to build a composite component using fiberglass and liquid resin
- How to lay-up a composite component with six plies



5.0 180 Skills Contact Information

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