Classroom Setup

Classroom and Work Area

In addition to a standard classroom setup, this course requires the following:

- VCR and monitor
- Shadow box of tools (See Tool Inventory List)
- Air supply for power tools
- Workroom

Materials

The course requires the following materials:

1 per class:
1. *Hole Prep in Aluminum* video (optional)
2. Roster
3. *Torquing Techniques, part 3 Power Tools* video (optional)

1 per Instructor:
1. *Introduction to Hand Held Power Tools Instructor Guide*
2. *Assembler Installer Manual*
3. Shop Skills Practice Project
4. Course Test Answer Key

1 per student:
1. Name Tent Card
2. *Introduction to Hand Held Power Tools Student Guide*
3. *Assembler Installer Manual*
4. Shop Skills Practice Project
5. Course Test
6. Course Evaluation Form
## Tool Inventory List

<table>
<thead>
<tr>
<th>Tool</th>
<th>Qty (for Class of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill gage</td>
<td>5</td>
</tr>
<tr>
<td>Rivet gage – 5/32 and 3/16</td>
<td>5 of each</td>
</tr>
<tr>
<td>GPL gage</td>
<td>5</td>
</tr>
<tr>
<td>Lightweight Lockbolt Gage – HG113-(6)</td>
<td>2</td>
</tr>
<tr>
<td>Lightweight Lockbolt Gage – HG110-(6)</td>
<td>2</td>
</tr>
<tr>
<td>HiLok Protrusion Gage</td>
<td>1 set</td>
</tr>
<tr>
<td>HiLite Protrusion Gage</td>
<td>1 set</td>
</tr>
<tr>
<td>Micrometer Caliper</td>
<td>2</td>
</tr>
<tr>
<td>Pistol Grip Drill Motor (6000 rpm)</td>
<td>10</td>
</tr>
<tr>
<td>#30 drills</td>
<td>10</td>
</tr>
<tr>
<td>.1875 drills</td>
<td>10</td>
</tr>
<tr>
<td>.194 drills</td>
<td>10</td>
</tr>
<tr>
<td>Drill Stop</td>
<td>5</td>
</tr>
<tr>
<td>Drill Guide</td>
<td>5</td>
</tr>
<tr>
<td>Drill Block</td>
<td>5</td>
</tr>
<tr>
<td>Rivet gun – 300 E4</td>
<td>5</td>
</tr>
<tr>
<td>Rivet gun – 400 E5 or 5X</td>
<td>2</td>
</tr>
<tr>
<td>Hi-lok Ratchet – HLA2002A or HLA1016 or HLA 2016A</td>
<td>3</td>
</tr>
<tr>
<td>Bolt NAS6603H2</td>
<td>50</td>
</tr>
<tr>
<td>Washer NAS1149D0332J</td>
<td>100</td>
</tr>
<tr>
<td>Lockwire Pliers</td>
<td>10</td>
</tr>
<tr>
<td>Nut Runner 35 inch pounds</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tool</th>
<th>Qty (for Class of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock-bolt Puller -- 225</td>
<td>1</td>
</tr>
<tr>
<td>Bucking Bar –</td>
<td>5 of each</td>
</tr>
<tr>
<td>Universal rivet Die 3/16&quot;</td>
<td>5</td>
</tr>
<tr>
<td>Skin (bell) Pellethane Ring</td>
<td>5</td>
</tr>
<tr>
<td>Bell Die</td>
<td>5</td>
</tr>
<tr>
<td>Reduced head “Bries” Rivet Die 3/16”</td>
<td>5</td>
</tr>
<tr>
<td>Rivet</td>
<td>60</td>
</tr>
<tr>
<td>Rivet</td>
<td>60</td>
</tr>
<tr>
<td>Rivet</td>
<td>60</td>
</tr>
<tr>
<td>Bolt</td>
<td>60</td>
</tr>
<tr>
<td>Bolt</td>
<td>60</td>
</tr>
<tr>
<td>Collar</td>
<td>120</td>
</tr>
<tr>
<td>9x6x1/16 aluminum sheet</td>
<td>10</td>
</tr>
<tr>
<td>5.5x6x1/16 aluminum sheet</td>
<td>10</td>
</tr>
<tr>
<td>Marking pencils – Berol E1 &amp; Berol E0</td>
<td>10 of each</td>
</tr>
<tr>
<td>Nut</td>
<td>50</td>
</tr>
<tr>
<td>Lockwire MS20995NC32</td>
<td>10ft</td>
</tr>
<tr>
<td>Diagonal Cutters</td>
<td>10</td>
</tr>
<tr>
<td>Torque Wrench 35DR1200I 0 – 200 inch pounds ¼ inch drive</td>
<td>5</td>
</tr>
</tbody>
</table>
Introduction to Hand Held Power Tools

Overview

*Introduction to Hand Held Power Tools* consists of three 3-hour sessions. Session I presents the safe use of tools and fasteners that the student will use to perform the hands-on exercises in Sessions II and III. In addition, students will interpret a layout that provides the specifications for the hands-on exercises.

Purpose

*Introduction to Hand Held Power Tools* provides basic instructions for:

- Safely operating hand tools that are used to assemble airplane components.
- Interpreting a drawing that details the layout of a job.

Learning Objectives

Students will learn to:

- Use hand tools, including pistol grip drill motor, rivet gun, ratchet wrench, Microstop Countersink Cage, Lockbolt Puller, and Hi-Lok Ratchet Wrench, Nut Runner and Torque Wrench appropriately and safely.
- Interpret a drawing to lay out a job, including the placement of holes, and selection of appropriate tools and fasteners to perform the job.
- Use gages appropriately.
- Install Lockwire
- Complete the job, per drawing specifications, in accord with the Instructor’s performance criteria.

Continued on next page
Use the following guidelines to evaluate student performance:

- After receiving safety instructions during Session I, and one-on-one safety guidance, as needed, during Sessions II and III, students will be able to use tools safely 100% of the time.

- With minimal assistance from the Instructor, students will lay out the job, according to the drawing specification, to a minimum of 95% accuracy.

- With minimal assistance from the Instructor, students will be able to select the appropriate tools and fasteners to perform the job.

- Students will be able to correctly drill a minimum of 80% (28 of 35) of the holes.

- Students will be able to correctly fill at least 3 out of 5 holes for each of the 6 types of fasteners.

- Students will be able to Torque and lockwire 5 bolts in place.

- On the Course Test, students will be able to answer correctly at least 80% of the multiple-choice questions.
### Session I: Overview of Hand Tools, Safety, and Drawing Layout (3 hours)

<table>
<thead>
<tr>
<th>Session I at a Glance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Introduction – 15 minutes</td>
</tr>
<tr>
<td></td>
<td>• Student handouts – 5 minutes</td>
</tr>
<tr>
<td></td>
<td>• <em>Assembler Installer Manual</em> – 15 minutes</td>
</tr>
<tr>
<td></td>
<td>• Safety – 20 minutes</td>
</tr>
<tr>
<td></td>
<td>• Hand Tools Demonstration</td>
</tr>
<tr>
<td></td>
<td>• Drilling</td>
</tr>
<tr>
<td></td>
<td>Pistol Grip Drill Motor (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Drilling Preparation (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Using the Drill Motor (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Countersinking (15 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Installing Fasteners</td>
</tr>
<tr>
<td></td>
<td>Identifying Rivets (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Using the Rivet Gun (15 minutes)</td>
</tr>
<tr>
<td></td>
<td>Installing Lockbolts (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Installing Hex-Drive Fasteners (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>Lockwiring (5 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Drawing Interpretation</td>
</tr>
<tr>
<td></td>
<td>Shop Skills Practice Project – (10 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Homework</td>
</tr>
</tbody>
</table>
## Introduction of Class, Course Material and Safety Issues

### Introduction
- Introduce yourself
- Have students introduce themselves
  - Name
  - Current position
- Go over the Course Objectives
- Describe Facilities
  - Evacuation procedures
  - Restrooms
  - Telephone

### Student Handouts
- *Introduction to Hand Held Power Tools Student Guide*
- *Assembler Installer Manual*
- *Shop Skills Practice Project*

### Note:
- Briefly describe the layout of the **Shop Skills Practice Project**, including the materials (aluminum sheets) that will be used, as well as the fastener codes, and explain that students will lay out the job and will drill and fill the holes according to the drawing specifications.
- State that the tools that will be taught are those that will be used to perform the **Shop Skills Practice Project**.
- **State that the layout will be discussed in greater detail at the end of Session I.**

*Continued on next page*
Introduction of Class, Course Material and Safety Issues, Continued

Assembler Installer Manual

- The Assembler Installer Manual is the reference for the course, and all page numbers in this guide refer to pages in the Assembler Installer Manual.
  - Chapter 3. Safety
  - Chapter 5. Measuring Tools – hole gage, drill gage, thickness gage, Micrometer Caliper
  - Chapter 10. Hand Tools – ratchet wrench
  - Chapter 12. Portable Power Tools – air tool air supply requirements, safety
  - Chapter 13. Hole Preparation – drilling, countersinking
  - Chapter 14. Riveting
  - Chapter 15. Solid Rivet Installation
  - Chapter 17. Standard and Straight Shank Pins and Collars
  - Chapter 18. Standard and Straight Shank Pins and Collars – Hex-Drive Fasteners

Safety

- Show the Hole Prep in Aluminum video. (15 Minutes)
- Go over the key safety issues in the Assembler Installer Manual.

------------------ Break – (10 Minutes) ------------------
Hand Tools Demonstration

Drilling

Pistol Grip Drill Motor
As you cover the drill motor tool, be sure to include the following topics:

- RPM range – Each motor has an RPM range that is identified on the tool; usually a color-coded or stamped washer is attached to the drill’s handle.
- Safety – Drills over 3 inches long cannot be used at speeds above 6000 rpm.
- Drill length – Should be as short as practical so that the drill will not bend or break.
- Quick-Change Chuck drill installation
- Keyed Chuck drill installation

Note: Let students practice using the chucks.

Drilling Preparation
Cover the following topics:

- Selecting the correct drill motor and drills for a particular job
  - 135 deg. drill, 6000 rpm in aluminum + .004-.006 hole
  - D.M drill, 6000 rpm in aluminum + .001-.002 hole
- Using a drill gage to confirm drill bit diameter
- Using a micrometer caliper

Note: Go over each of the safety points listed and stress the safety and quality issues.

- Use the Shop Skills Practice Project to demonstrate drilling preparation, including selecting the correct drill motor and drill bits that will be used to perform the job.
- Use the micrometer caliper to measure the thickness of the aluminum sheets that will be used in the hands-on exercises.
- Note the function of the ratchet on the micrometer caliper in ensuring consistent and uniform readings.
Drilling, Continued

Using the Drill Motor

Cover the following topics:

- Holding a drill motor correctly
- Drilling perpendicular to the surface
- Using a Drill Guide; using a Drill Block
- Using a Drill Stop
- Identifying drilling safety issues
- Drilling pilot holes

Note: Let students practice using the drill motor, drill guide or block, and drill stop.

Countersinking

Cover the following topics:

- Selecting the appropriate Microstop Countersinking Tool
- Using the Microstop Countersinking Tool

Note: Use the specifications of the Shop Skills Practice Project to demonstrate countersinking, including selecting the correct Microstop Countersinking Tool(s) that will be used to perform the job.

- Go over each of the safety points and stress the quality issues.
- Let students practice using the Microstop Countersinking Tool.

------------- Break – (10 Minutes) -------------
Installing Fasteners

Identifying Rivets

Cover the following topics:
- Modified Universal Head
- Countersunk Head
- Rivet Codes and Fasteners

Note:
- Use the specifications of the Shop Skills Practice Project to demonstrate the rivet/fastener codes.
- Have a sample of each of the rivets/fasteners that the students will use to perform the hands-on exercises.
- Encourage student participation in rivet/fastener identification, per drawing specifications.

Using the Rivet Gun

Cover the following topics:
- Identifying Rivet Guns, their parts, and their capacities
- Identifying riveting safety issues
- Identifying Rivet Dies
- Identify rivet die precautions and maintenance issues
- Selecting Bucking Bars
- Driving Rivets
- Using Rivet Gages
- Identifying rivet defects

Note:
Cover the following riveting safety precautions:
- Make sure that the air hose is disconnected.
- Make sure that the retaining spring is secure.
- Make sure that the rivet gun is pointed towards the floor.
- Examine the rivet die for cracks or other defects.
- Make sure that you do not touch the trigger.
Point out that accidentally touching the trigger of a pneumatic rivet gun is least likely to cause an injury.

Continued on next page
Installing Fasteners, Continued

Note:

- Use the specifications of the Shop Skills Practice Project to demonstrate the usage of the Rivet Gun, selection and application of the rivet dies and bucking bars, and use of the rivet gage.
- Have a sample of each of the rivet dies, bucking bars, and rivet gages that the students will use to perform the hands-on exercises.
- Note that bell dies that have been used to seat lockbolts and hi-loks cannot be used to drive skin rivets, because the die face may be damaged.
- Discuss the types of riveting defects that can occur, and the recommended practices for avoiding them.

Let students practice using the Rivet Gun, using rivet dies, bucking bars, and rivet gages.

Installing Lockbolts

Cover the following topics:

- Identifying lockbolt pullers, their parts, and their capacities
- Identifying types of lockbolts
- Performing the installation of pull-type lockbolts
- Using gages to verify proper installation

Note:

- Use the specifications of the Shop Skills Practice Project to demonstrate the application of the Lockbolt Puller, selection and application of the lockbolts, and use of the gages that students will use to complete the project.
- Have a sample of each of the lockbolts and gages that the students will use to perform the hands-on exercises.
- Let students practice using the Lockbolt Puller, using the lockbolts and gages they will use to perform the hands-on exercises.
Installing Fasteners, Continued

Installing Hex-Drive Fasteners

Cover the following topics:
- Identifying when hex-drive fasteners should be used
- Identifying equipment to install collars on hex-drive fasteners
- Identifying types of Hex-drive fasteners
- Performing the installation of hex-drive fasteners
- Using gages to verify proper installation

Note:
- Use the specifications of the Shop Skills Practice Project to demonstrate hex-drive fastener installation, selection and application of the fasteners and collars, and use of the gages that students will use to complete the project.
- Have a sample of each of the fasteners and collars, and the gages that the students will use to perform the hands-on exercises.
- Let students practice using the Hi-lok Ratchet Wrench, using the fasteners and collars, and the gages they will use to perform the hands-on exercises.

Lockwiring

Installation of Safetying Devices

Cover the following topics:
- Installation and inspection of safetying devices.
- The three examples of safetying.
- Using the lockwire pliers.
Drawing Interpretation

Cover the following topics:
- The layout specifications on the drawing.
- The type and dimensions of the material that is to be drilled.
- The meaning of the codes.
- The types of fasteners that are required for each column of holes.
- The tools that you will use to perform the job.
- The safety and quality issues that relate to performing the tasks.

Note:
- Conduct a group discussion to reinforce the information presented in Session I and have students interpret the drawing and specify the tools they will use to complete each column of the project.
- Explain that Column 4 will be drilled, and will be available if more practice is needed in applying one or more of the types of fasteners.

Homework

Assign Homework: Have students review the information presented, using the Assembler Installer Manual.

-------- End of Session I --------
Session II: Torque Wrenches And Laying Out the Project; Drilling and Countersinking Holes (3 hours)

Ask if there are any questions regarding material presented in Session I.

Torque Wrench

Show the Torquing Techniques

Review Key Points
1. Grip tool firmly.
2. Line up tool with the fastener.
3. Do not feather the trigger.
4. Never re-trigger the tool.
5. Always check the certification.

Shop Skills Practice Project

Brief students that their tasks include the following:
- Lay out the project according to the drawing specifications.
- Select and assemble the appropriate tools to drill and countersink the holes, as specified by the drawing.
- Drill the holes according to the drawing specifications, using appropriate safety precautions.
- Countersink the holes that are specified on the drawing specification.
- Use the appropriate gages to verify your work.

Explain that you will evaluate each student’s work when completed.

---------- End of Session II ----------
Session III: Installing Fasteners (3 hours)

Review

Ask if there are any questions regarding material presented in Sessions I or II

Shop Skills

Practice Project

- Brief students that their tasks include the following.
  - Select the appropriate fasteners that are specified on the drawing.
  - Select and assemble the appropriate tools to fill the holes, per drawing specification.
  - Fill the holes according to the drawing specifications, using appropriate safety precautions.
  - Torque and Lockwire bolts in place
  - Use the appropriate gages to verify your work.

Explain that you will evaluate each student’s work when completed

Course Test

As each student completes the Session III activities, distribute the Course Test. State that a passing score is 80%.

Note: Make certain that you collect all of the Course Tests.

------------- End of Session III -------------