

# ASSEMBLE ALUMINUM TOOLBOX

## INTRODUCTION

In this lesson, you will assemble an aluminum sheet metal toolbox using rivets. You will start with a kit that includes pre-cut and pre-formed aluminum toolbox panels. This kit also includes the handle, latch, hinge, and a variety of rivets. Finished toolbox measures 16"L X 6"W X 4"H.

In this lesson you will experience:

- Filing.
- Hack saw.
- Deburring edges and holes
- Drilling holes.
- Dimpling holes.
- Cleco clamps.
- Variety of rivet types, including solid
- Rivet installation, including squeezing, pulling, and bucking.
- Removing Rivets.

In addition to the specific skills mentioned above, the mentor will impart his experience and knowledge of recognizing problems to avoid, safety considerations, the feel for using various tools, how to recognize quality work, disciplines, and other big picture considerations.



The completed toolbox.

☐ Completed - Introduction

## Preparation



- Determine any required Personal Protection Equipment.
- Inspect tools to ensure working condition.

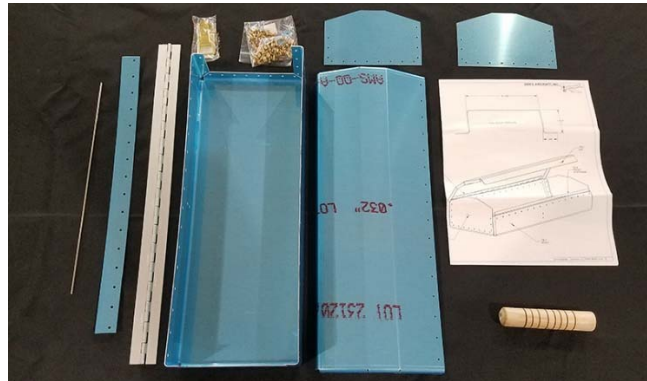
### REQUIRED ITEMS

- ☐ PPE: Safety glasses and gloves.
- ☐ Drill: Cordless or air.
- ☐ Drill bits: #30, #40, 12-inch #30
- ☐ Clecos: #30 and #40
- ☐ Hole deburring tool.
- ☐ Blue fine-tip Sharpie
- ☐ Hacksaw
- ☐ Files for edge-deburring.
- ☐ R-Flex 120-grit spindle mounted point
- ☐ Rivet Squeezer (Borrow Rod Beckwith Main Squeeze)
- ☐ Pull-rivet tool.
- ☐ Edge rolling tool.
- ☐ One-piece rivet test gauge.
- ☐ Masking tape

## ● Preparation and Review

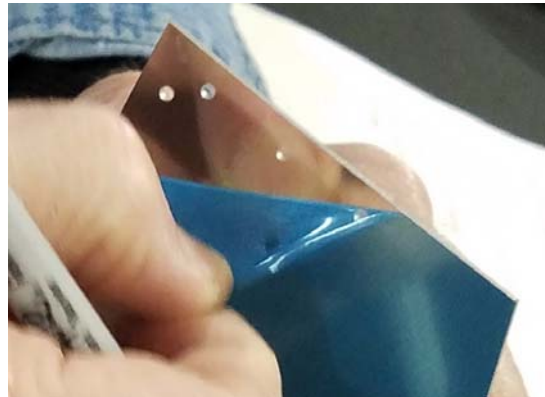
Unpack the kit, identify parts, and review intended assembly instructions.

- Notice writing on aluminum.
- Notice the ends have more holes one side than the other. Why?
- These holes are *starter holes*.
- Review the various rivets.
- Potential mistakes and pitfalls.
- Hinge operations. This project will flip the hinge pieces in nonstandard way.



This starting kit.

- Remove blue plastic coating.



Remove the plastic.

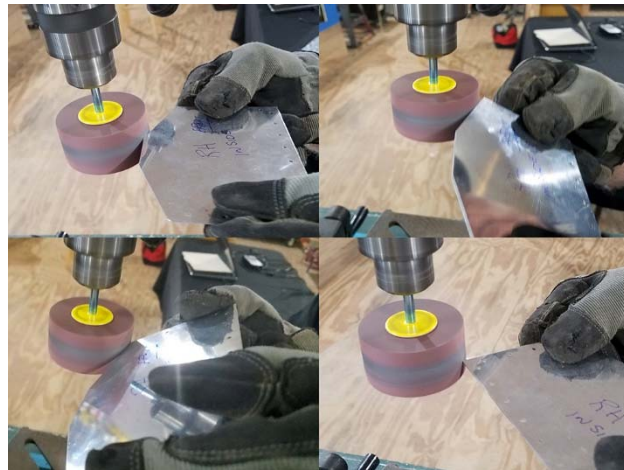
- Mark the ends to protect from mistakes.
  - Do not use black markers. Black contains carbon that can harm the aluminum. Use blue.
  - NOTICE: There are extra holes on one edge. The edge with four holes is considered the back of the toolbox.



Help protect from making a mistake by clearly labeling orientation of the end pieces. Use blue Sharpie. (Not black.)

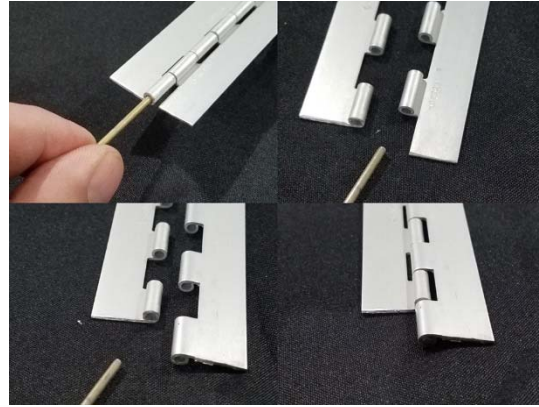
□ Completed – Preparation and Review

- Debur edges and round the corners.
  - Use two different methods...
  - Flat File
    - Wear a glove on your non-dominate hand.
    - Make sure the file teeth are perpendicular to movement in order to cut.
    - Use a flat file along all edges in at three angles
      - Square to the edge surface.
      - 45-degree to the top edge;
      - 45-degree to the bottom edge.
  - Deburring Spindle
    - Mount the 120-grit spindle into the drill press.
    - Moving from left to right (into the rotation of the spindle) deburr all edges at three angles.
      - Parallel to the edge surface.
      - 45-degree to the top edge;
      - 45-degree to the bottom edge.
    - Ovoid creating grooves in the spindle by constantly moving up and down as you move the edge across the spindle.
    - Some tight corners and limited access areas can only be deburred with a small file.



□ Completed – Debur edges and round each corners.

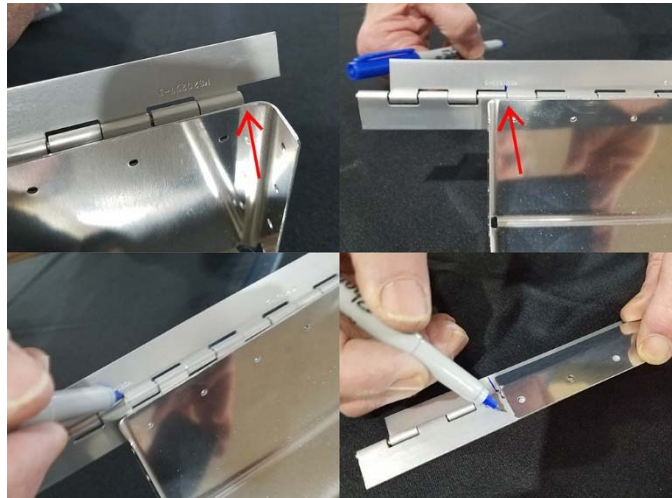
- Reverse the hinge pieces.
  - Remove the hinge pin.
  - Flip one side.
  - Insert the hinge pin.
  - Round the end of one end of the hinge to assist in insertion.



Reverse the halves of the hinge pieces.

□ Completed – Reverse the hinge pieces.

- Cut hinge to length.
  - Mark the hinge to cut.
    - Hold hinge in position to where the right side of the hinge will be attached to the toolbox.
    - At the left side of the toolbox place a tick mark to where the hinge will be cut.
    - Place the hinge on a table. Using a straight edge, extend the tick mark to a full line.
    - At the opposite end, mark the longer hinge part flush with the shorter half.
  - Cut hinge
    - Disassembly the hinge by removing the hinge pin.
    - Do not cut the hinge pin, yet.
    - With a hack saw, cut the hinges halves at the marks.
    - At one end, you will need to cut one of the two hinge halves so they are the same length.



□ Completed – Cut hinge to length.



- Edge roll the ends.
  - Use glove on the hand that is holding the part.
  - This adds a slight bevel to the edge.
  - Only the top edge of each end.
  - Roll inward towards the inside of the toolbox.
  - The purpose is to allow these edges to tuck underneath the lid without interference.



□ Completed – Edge roll the ends.

- Clamp the end panels to the main body by using Clecos.
  - Use Size-3 Clecos. (Silver)
  - Insert into every-other hole.
  - Avoid center four holes at bottom edge.
  - Place piece of masking tape over the bottom four holes to remind us not to drill those holes yet.



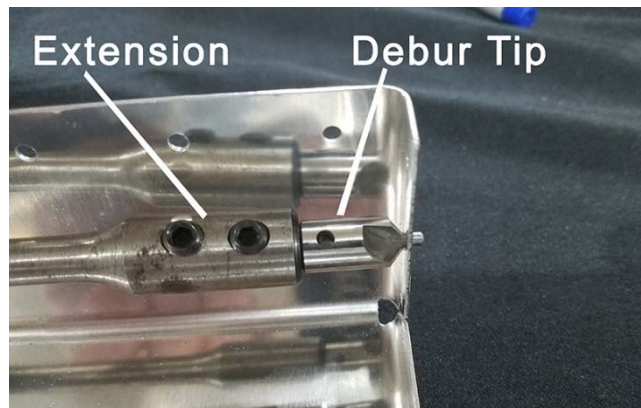
□ Completed – Clamp end panels

- Match-drill the end panels.
  - #30 for flush rivets
  - You may need to move a few Clecos to access any particular hole when match drilling.
  - Remove tape
  - #40 for four pull rivets for center four holes along bottom edge.



□ Completed – Match drill end panels.

- Debur holes
  - Detach the end panels by removing the Clecos
  - Debur each hole on both sides of the end panels AND both sides of the main body.
  - The dogleg hole-deburring tool will not work for inside the toolbox body because the handle and dogleg hit the side of the toolbox body. You will need remove the deburring tip and use your fingers to turn it in the hole. HINT: You can get better leverage on the deburring tip if you mount the deburring tip onto an extension rod and turn it by hand.
  - For the center four holes, you will need to replace the 3/32 tip with a 1/8 tip.



□ Completed – Debur holes.



- Dimple holes
  - Use size-3 dimple set.
  - Calibrate the squeezer by testing in one hole until the rivet is very slightly below the surface of the aluminum. The rivet will expand upwards very slightly when it is squeezed.
  - Do not dimple the bottom four holes where the pull rivets will go.
  - **WARNING** - The dimple must deform the aluminum towards the inside of the toolbox so that the rivet sits flush on the outside. Make sure you do dimple in the correct direction!
  - It is important that the rivet squeezer is very square to the surface while squeezing. Concentrate on not wiggling or moving the angle of the squeezer while closing the handles.
  - **HINT:** This is best done with two people when you are new to operating the squeezer. The second person can help determine if you are square to the surface or to assist in positioning the squeezer.
  - **HINT:** Make sure you have a clear line of vision with both eyes to the squeezer.
  - **HINT:** Move your head to a second position to help determine if the squeezer is square.



□ Completed – Dimple holes

- Flush rivet the ends
  - Clamp the end panels to the main body by using Clecocos. (Silver and Copper)
  - Change the die-set in the squeezer to a flush die-set.
  - Insert a #3 flush rivet into a hole. Remove and move adjacent Clecocos as needed.
  - **WARNING** – Make sure the two aluminum pieces are pressed against each other without a gap.
  - Calibrate the squeezer on one rivet by intentionally under-squeezing and incrementally adjusting the squeezer until the rivet is correctly squeezed.
  - **HINT** – Make sure you have positive pushing pressure on the head of the rivet. This force will insure the rivet is tightly seated and tends to push the two aluminum pieces together.
  - Use the one-piece rivet gauge to test your rivet.
  - **NOTE:** The proper length flush rivet has been selected for this kit. In other circumstances, you may need to purchase the correct length or trim longer flush rivets shorter to the size you need.
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□ Completed – Flush rivet the ends.

- Pull-rivet the bottom four holes
  - Use #4 (1/8-inch) pull rivets.
  - NOTE: The proper size pull rivet has been selected for this kit. In other circumstances, you may need to purchase the correct size pull-rivet. Pull rivets cannot be trimmed shorter.
  - Pull on the squeezer handle. The stem of the pull rivet may not snap in one pull of the handle. You may need to get another bit on the stem and squeeze again. Be carefully not to change your angle while taking a new bite or pulling the handles.



□ Completed – Pull-rivet the ends

- Clamp hinge to body
  - Use C-clamps to *gently* secure one half of the hinge to the backside of the toolbox body.
  - Set the clamps to a loose tightness so that the hinge can be nudged easily.
  - Position the hinge in its approximate position as follows.
    - Loops facing up.
    - Top edge of loop flush with top edge of toolbox body.
    - Centered left-and-right so there is roughly equal space on the ends.
  - Using a ruler, measure the gap at both ends of the hinge. Nudge the hinge until the hinge is centered the best you can.
  - Verify that the top of all hinge loops are flush with the top edge of the body. Nudge if needed.
  - Tighten the C-clamps.
  - Add additional clamps to the hinge, such as Cleco jaw clamps. Looking ahead to a future step, you should leave every-other gap unclamped so we can rivet into the unclamped holes.
  - Big Picture: Look again. Verify that the hinge did not move while you tightened and added clamps.



Loosely clamp the hinge in its approximate position.



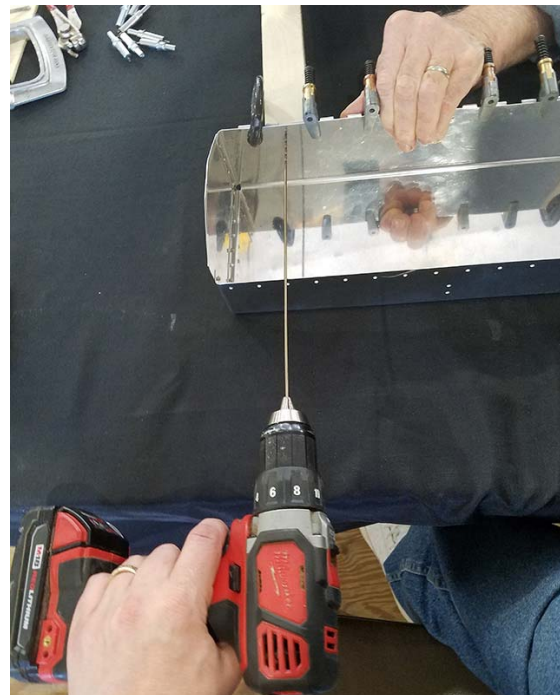
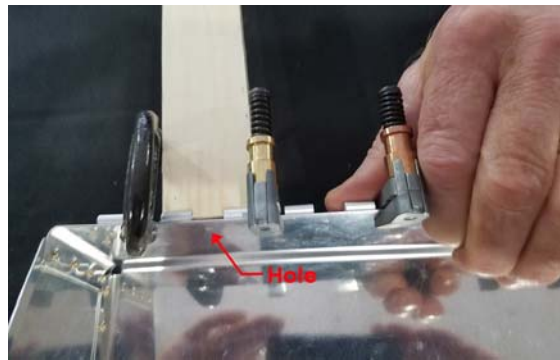
Use a ruler to accurately center the hinge.



□ Completed – Process Steps

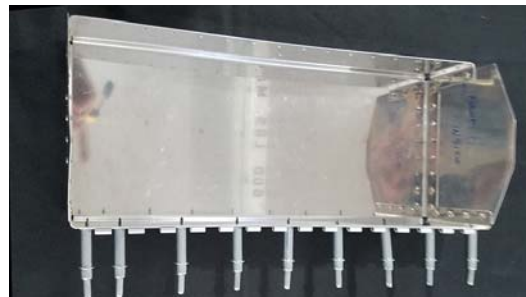


- Drill holes in body for hinge.
  - To help brace the back side of the body from flexing while drilling have a second person hold a piece of wood behind the hole that is being drilled.
  - Select the 12-inch long #40 drill and load it into the cordless drill. The long drill is required because the cordless drill interferes with the front side of the tool box thus preventing you from drilling a straight hole. The long drill allows the cordless drill to be outside of the toolbox.
  - Drill the first hole into the hinge. You can stop when wood chips are visible.
  - Note: The long drill bit flexes very easily. Do not push too hard. If flexing does occur, then use your fingers to brace the drill bit at the mid-point of the drill bit shank to help keep it from flexing.
  - Note: Remember, a proper drilling speed and forward press results in long curly chips. You can best accomplish this by running the drill at a medium or slow speed with moderate forward pressure. No need to
  - Place a Cleco into each whole after it is drilled.
  - Move the wood brace and the drill bit to the next gap to drill the next hole. Repeat until all the gaps are drilled and have a Cleco.
  - One at a time, remove a clamp and drill the hole. Insert Cleco after drilling.





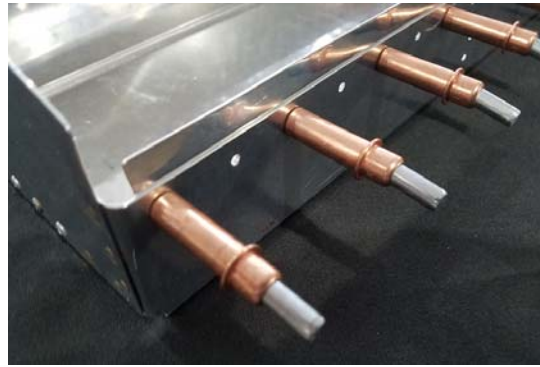
- Dimple the body hinge
  - Remove the hinge by removing all the Clecos.
  - Deburr all the holes in the hinge and the back wall of the toolbox.
  - Dimple the hinge.
  - Dimple the back wall of the toolbox.
  - Attach the hinge onto the box with Clecos in every-other whole.



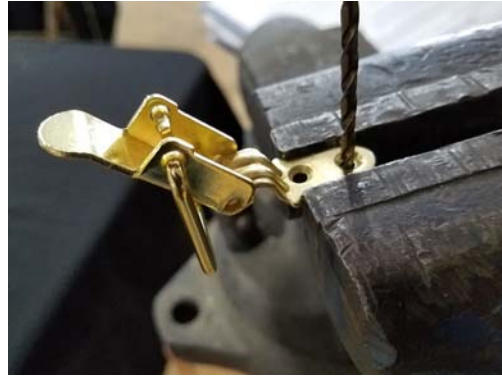
- Rivet the body hinge.
  - Using 3/32" flat head rivets, squeeze a rivet into each hole in the hinge. Start with every-other whole that have no Cleco clamps. Then one at a time, remove a Cleco and squeeze a rivet into that hole.
  - Remember to validate each rivet with the rivet gauge.



- Attach stiffener to front inner of box body.
  - Cleco the stiffener to the inner side of the box body. Every other hole.
  - Load a #30 jobber drill bit into the cordless drill.
  - Drill the hole.
  - Place Cleco into new hole.
  - Repeat for all open holes.
  - One at a time, remove the Clecos from the undrilled holes and drill them.
  - Remove stiffener.
  - Debur stiffener.
  - Reattached the stiffener to inner side of the box body.
  - Squeeze 1/8 round-head rivets.



- Rivet Latch to body
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#### ***Step 4 – Performance Standards Review***

- ☐ Student applied all required safety precautions.
- ☐ Student correctly identified all tools listed in the introduction.
- ☐ Student correctly explained and demonstrated the application of each tool.
- ☐ Student cleaned the work area and properly stored all tools and equipment.

**Additional Comments:**

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#### ***Step 5 – Sign-Off***

**Student:** \_\_\_\_\_

**Mentor:** \_\_\_\_\_

**Date:** \_\_\_\_\_