

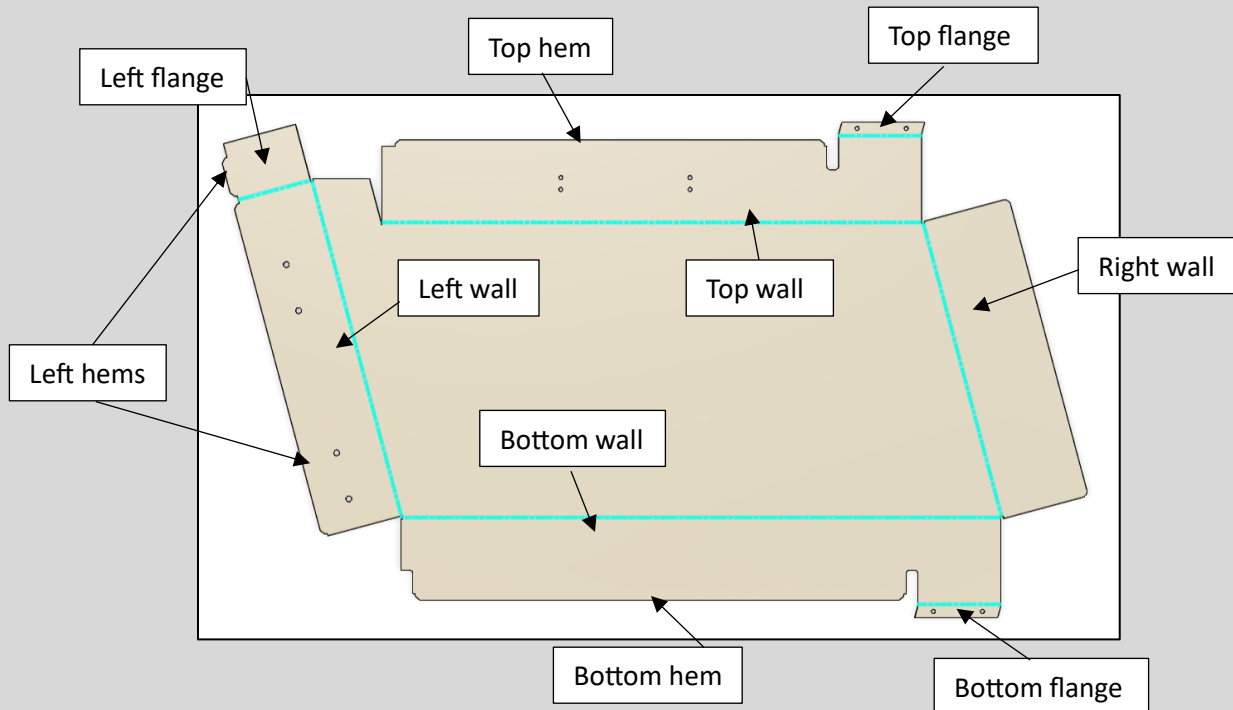
Order of Operations

Bottom Case

Workpiece: 0.04" thick Al 5052 sheet

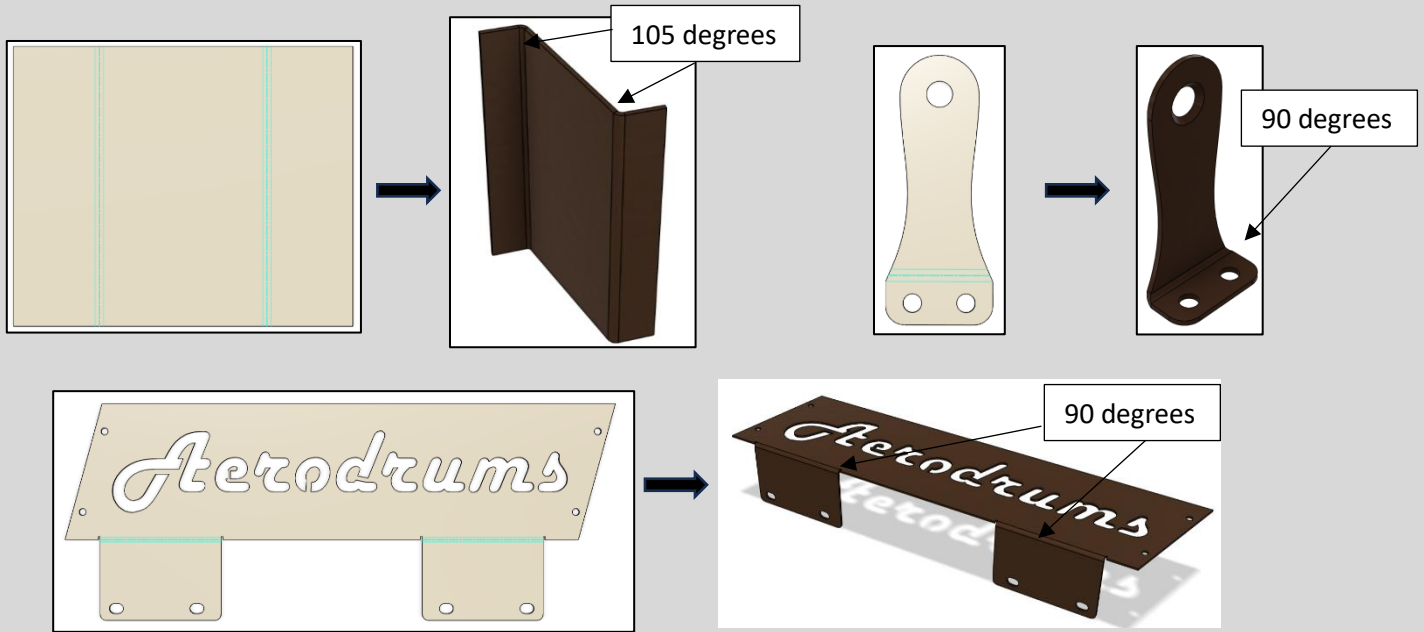
Tools/Equipment: Finger brake, digital angle gauge, TIG welder, filler rod

1. Using laser cutter, obtain all the flat pattern pieces.
2. Attach digital angle gauge to the finger brake and calibrate it.
3. Bend the bottom piece in the following sequence using finger brake. All bends are 90 degrees in angle except the hems, which are 180 degrees. Bend until 95 degrees to account for spring back. Use appropriate fingers as required to just pinch the bend edge. After each bend, un-bend the curved region of sheet by hand which was supposed to stay flat.

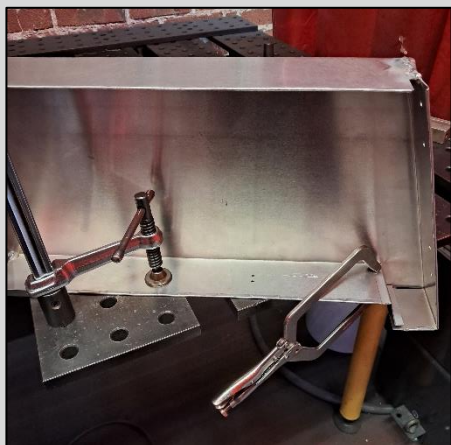
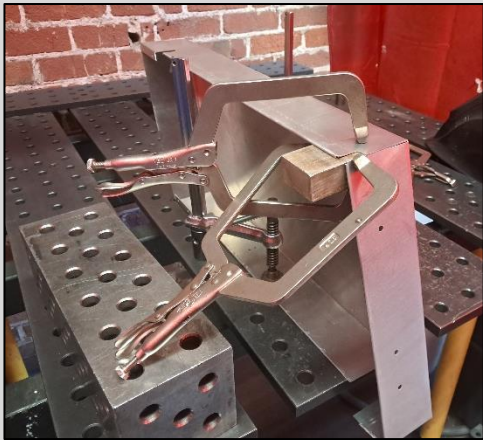


- a. Bend the top and bottom hems
- b. Bend the top and bottom flanges
- c. Bend the top and bottom walls
- d. Bend the left hems
- e. Bend the left flange
- f. Bend the left wall
- g. Bend the right wall

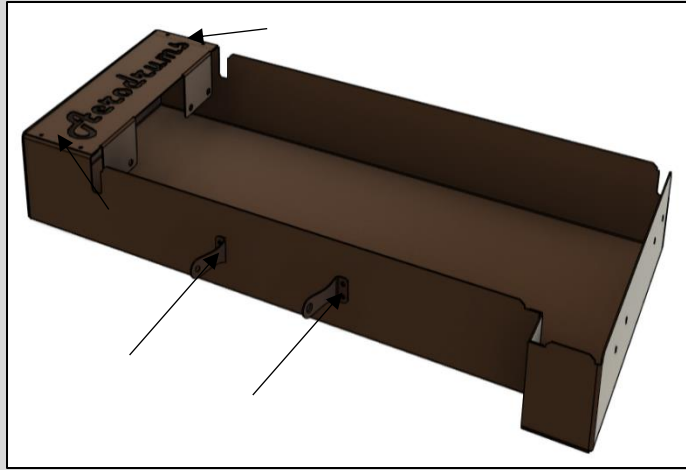
4. Bend the remaining bottom case pieces and the two handle attachment pieces in a similar manner in the following sequence.



5. Do TIG welding using filler rod at the corner and lap joints. Use an AC amperage of 55A, balance level of 7 and a postflow of 9. Use clamps and steel blocks as shown in the images to rigidly hold the piece. Grind out the welds and deburr the edges.



6. Connect the remaining bottom case piece and the two handle attachments using rivets.



Top Covers and Handle

Workpiece: 20"x8"x1" common pine lumber pieces (x2), 0.12" thick Duron sheet

Tools/ Equipment: Planar, band saw, hand plunge router, drill press, hand drill, wood lathe, 1/4" router bit, 17/64" drill bit, 1/2" Forstner drill bit

1. Using planar machine, reduce the thickness of the two 20"x8"x1" common pine lumber pieces to 10mm.
2. Draw the profile of the top covers and cut using band saw.



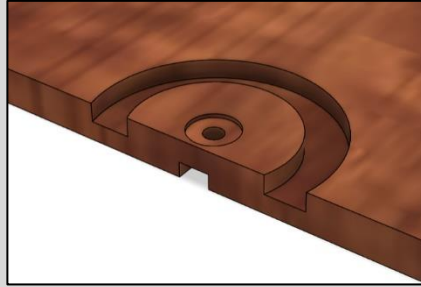
3. Using a laser cut template made from Duron sheet having the shape of grooves, mark and cut out the circular grooves in the two top covers and the bolt slot in the right top cover by using the hand plunge router and 1/4" router bit.



4. Mark side holes at required location. Using a drill bit of appropriate size as per the wood screw shank diameter and hand drill, make holes having 10mm depth.



- Using 17/64" drill bit and drill press, make a through hole at the center of circular groove in the right top cover. Make a shallow counter bore of about 1 mm using 1/2" Forstner drill bit.



- Laser cut Duron flat pieces and glue them to the wood covers.

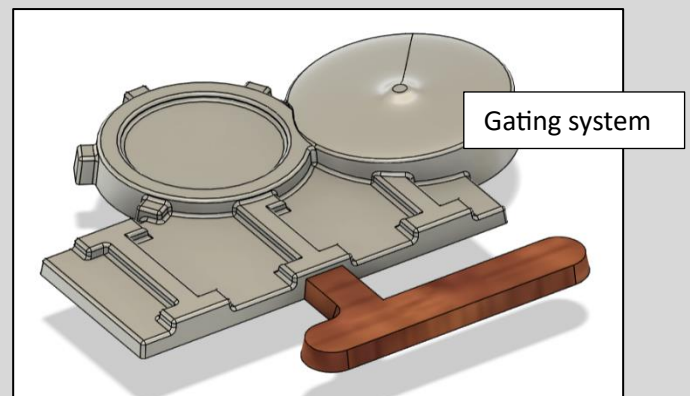
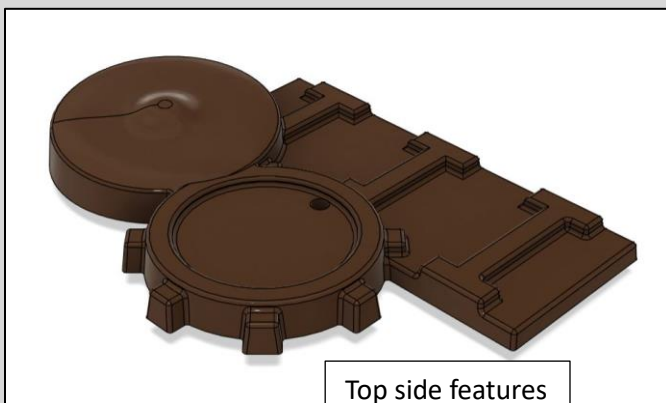
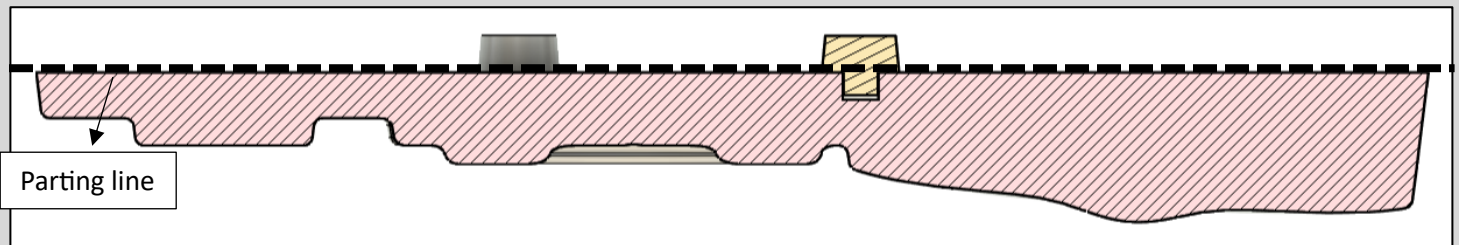


Drum lock

Workpiece: Block of cast aluminum

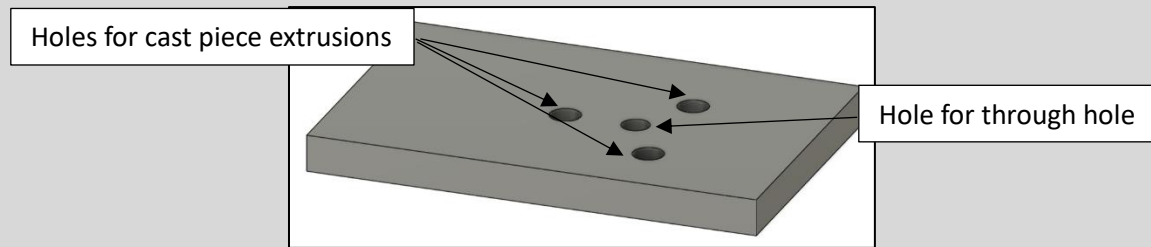
Tools/ Equipment: Appropriate sand molding equipment, hack saw, file, freedom tool, helicoil repair kit

- 3D print a loose pattern of the required cast using PLA.



radii of 1mm and a minimum wall thickness of 5mm is ensured.

3. Prepare the cope and drag mold by using the loose pattern. Use parting sand at appropriate faces and ensure the molding sand is rammed properly near fine edges.
4. Cut out the sprue and pouring cup, and make vent lines
5. After the cast is made, remove the sprue and runner using a hack saw. Remove the flash and deburr along the parting line using file.
6. Finish the cast surface using file and foredom tool.
7. 3D print a fixture for making the center through hole on a milling machine. Using the H drill bit and ¼-20 STI tap from the ¼-20 helicoil thread repair kit, make a through hole and tap it on the mill. Then insert the helicoil.



Foam Insert – manually mark out instrument outlines and carve it out on foam sheets.

Finishing Operations

Cast Drum Lock and Bottom Case – Spray paint chestnut gloss

Top covers – finish using Danish oil

Assembly

Assemble all the parts using wood screw (WS) and binding screw posts (BSP) as shown below. Insert hex head bolt into the top cover through hole from bottom and fix snap ring onto it from the top.

