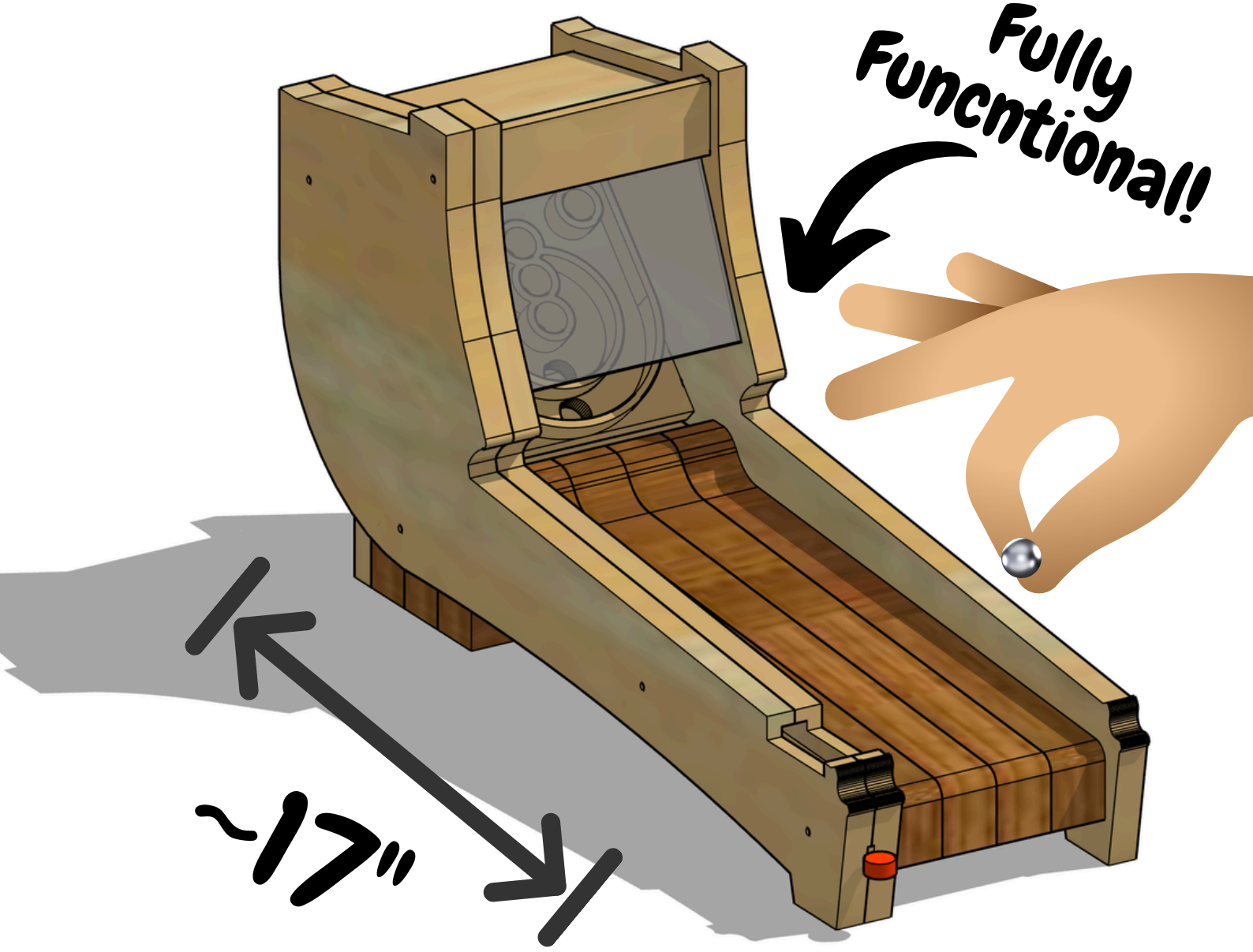
AQUA VITAE WOODWORKS
BELCHERTOWN, MA
Est. 2021

Table Top SKEE-BALL



Desktop CNC Build Manual

Material Prep - Toolpath Guide
Assembly Instructions - .SVG Files

***Invented, Designed, and Produced by* AQUA VITAE WOODWORKS**

Read this manual in its entirety before building.

These files are a product of extensive effort, involving not only the creation of Instruction Manuals, but also the invention, design, and prototyping of physical products. My intention is to enable you to profit from the items you build. You are permitted to sell the physical products resulting from your work, but ***distribution or sale of the included files and manual themselves is prohibited.***

About this MINI SKEE BALL

Introducing a fantastic DIY project: a mini skee ball game meticulously crafted with a desktop CNC machine. Each lane and ramp is expertly carved, ensuring smooth rolls and authentic arcade fun. With real ball bearings inside, it delivers the satisfying clatter of the arcade. Whether it's the centerpiece of a game room or a unique gift, this CNC creation promises hours of entertainment for everyone to enjoy.

TABLE OF CONTENTS

ABOUT THESE PLANS

*These comprehensive build plans, complete with downloadable SVG files, are tailor-made for **Desktop CNC Router Machines**. This package provides not only a list of required materials and cut lists, but step-by-step instructions on toolpath assignment, and clear assembly guidelines.*

For a more in-depth understanding of the building process, and to see other projects I've designed, I encourage you to visit my YouTube Channel. There, you'll find a collection of tutorial build videos covering most of the CNC projects for which I offer plans. Even if this specific project isn't listed, these videos utilize the same techniques, ensuring a smooth and successful build.
Happy Building!

Aqua Vitae Woodworks

INCLUDED SVG FILES:

1. *Goal Platform - .75 Inch Stock - 6 x 6*
2. *Launch Ramp - 1 Inch Stock - 25 x 9*
3. *Side Panel Number 1 - .5 Inch Stock - 18 x 10.5*
4. *Side Panel Number 2 - .5 Inch Stock - 24 x 11*
5. *Roof and Name Plate - .25 Inch Stock - 14.5 x 5.5*

Please note that the provided SVG files should be opened using your CNC CAD program of choice. I often get questions about this.

OPEN USING CAD PROGRAM, NOT WEB BROWSER.

For affiliate links to the precise tools and materials featured in this project, please refer to the description section of the corresponding YouTube video.

REQUIRED MATERIALS

Below, you'll find a list of all the parts and materials you'll need to bring this project to life. Additionally, please keep in mind that certain standard workshop essentials, such as sandpaper, double-sided tape, glue, and your choice of varnish, are often required for my projects, but not explicitly listed. ***These plans also assume you have a set of common woodworking tools readily available****, including a planer, router, and saws. These will be necessary while you embark on building most, but not all, of my projects.*

CNC ROUTER BITS:

- ***1/8" Downcut Bit:*** *Ideal for semi-fine details, drilling, and tight corners, providing precision for intricate designs.*
    - *This project requires either an extra long reach cutting bit (at least 1") or a 1/8" bit with an 1/8" shaft so it can carve all the way through 1" Stock*
- ***1/4" Downcut Bit:*** *Perfect for larger cuts, contours, an pockets.*
- ***90 Degree V Bit:*** *Ideal for engraving, chamfering edges, and achieving intricate detailing in woodworking and engraving projects.*

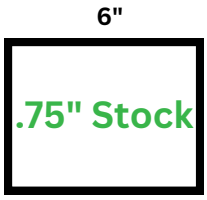
PARTS AND HARDWARE:

- x9 *11mm Ball Bearings*
- x5 *#6 Screws - 1 1/2" Length*
- x5 *#6 Screws - 1" Length*
- *1/8" Diameter Nail*
- *CA Glue*
- *Wood Glue*
- *Oramask*

MATERIAL PREP

*Let's get down to business and cut that wood to the exact dimensions I've laid out for you. Remember, the **diagrams provided are not drawn to scale**, so be sure to pay attention to the measurements.*

CNC CARVED COMPONENTS:



GOAL PLATFORM

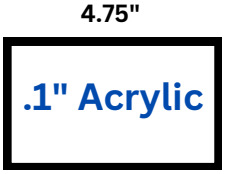
LAUNCH RAMP

SIDE PANEL NUMBER 1

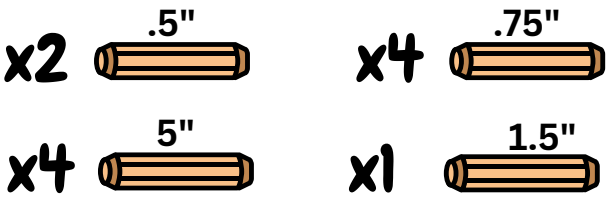
SIDE PANEL NUMBER 2

ROOF AND NAME PLATE

NON- CNC COMPONENTS:



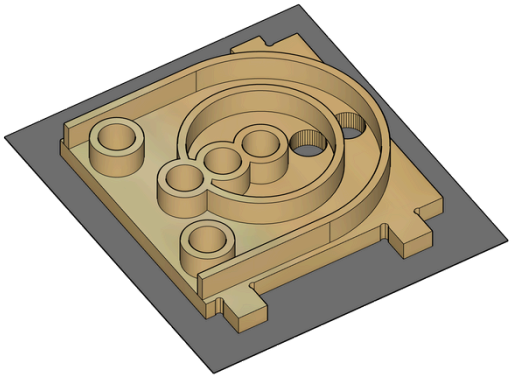
ACRYLIC COVER



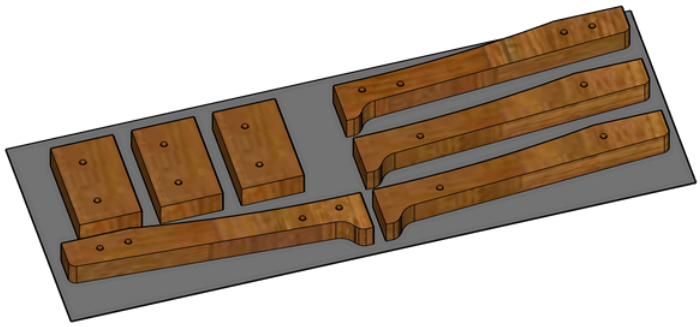
1/4" WOOD DOWELS

COMPONENTS

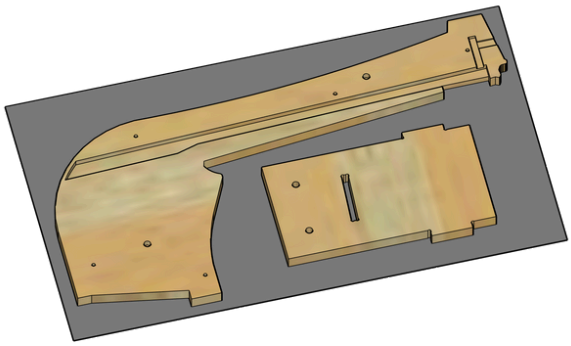
This page offers a concise visual guide for your project components. Detailed images, names, and quantities (if more than one) streamline assembly, aiding easy identification and placement for a smoother process.



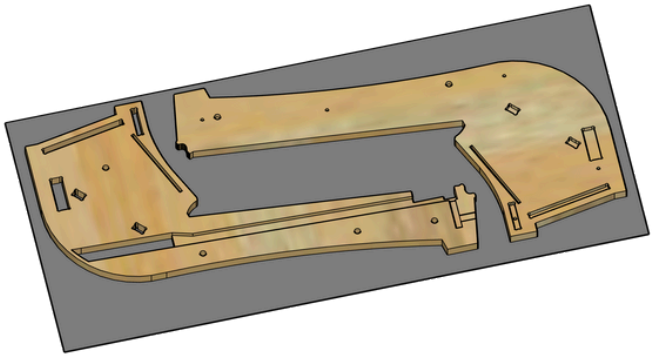
GOAL PLATFORM



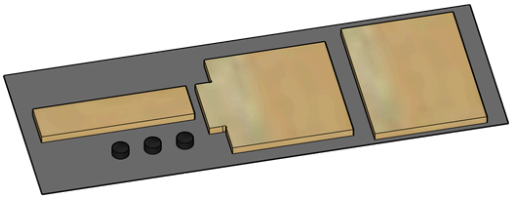
LAUNCH RAMP



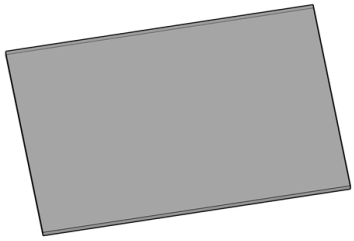
SIDE PANEL NUMBER 1



SIDE PANEL NUMBER 2



ROOF AND NAME PLATE



ACRYLIC COVER

Non-CNC

ASSIGNING G-CODE

Welcome to the tool path assignment section of your project instructions. To get started, you'll need your CAD program of choice, as well as the .svg files included with your purchase. These files are designed to be compatible with a wide range of CNC design programs, making it easy for you to use your preferred software. While I use a basic program, Carbide Create, you can seamlessly adapt these instructions to any program you normally work with.

For each component of this project, you'll find a set of step-by-step instructions. These instructions will specify the CNC bit to use, the type of tool path to assign, and the depth at which to carve. ***It's important to note that these instructions will not provide specific feed rates and router speeds.*** *The choice of these settings depends on factors such as the type of wood you're using and your personal preferences. As you embark on this journey, feel free to customize these settings to achieve the best results for your project. With your creativity and basic CNC skills, you're well on your way to crafting something truly exceptional. Let's Get To It!*

HELPFUL TIPS:

- ***Zoom In for Clarity:*** *To enhance your understanding of which vector lines are selected, consider zooming in while reading this guide. This will help you precisely identify the chosen paths and avoid any errors in your machining process.*

- ***Sequentially Assign Toolpaths:*** *It is crucial to assign toolpaths in the given order for each component. This ensures efficient tool changes throughout the process.*

- ***Implement Tabs for Contours:*** *Remember to incorporate tabs when assigning contour toolpaths that carve all the way to the stock bottom. This prevents the piece from detaching prematurely.*

ZOOM IN ON A .PDF DOCUMENT

To zoom in on a PDF document for a closer view, use your preferred PDF reader's zoom features. This is especially helpful when trying to see which vector lines are selected for a specific toolpath. You can typically do this by pressing the "Ctrl" key (or "Cmd" key on Mac) and scrolling up with your mouse wheel or trackpad, or by clicking the zoom-in icon within the PDF reader's toolbar. Enlarging the content will provide a clearer and more detailed view of the selected lines and enhance your understanding of the toolpath.

UNDERSTANDING TOOLPATHS

Used in this Project

POCKET TOOLPATHS:

Pocket toolpaths are used to create recessed or pocketed areas within a material. This involves removing excess material from specific regions, resulting in cavities or depressions.

INSIDE CONTOUR TOOLPATHS:

Inside contour toolpaths involve cutting along the inner edges or contours of a shape or component. This is used to define the internal features of a part, ensuring it fits and functions as intended.

OUTSIDE CONTOUR TOOLPATHS:

Outside contour toolpaths, on the other hand, are used to cut along the outer edges or contours of a component. This shapes the external profile of the project, giving it its final shape and dimensions.

NO OFFSET CONTOUR TOOLPATHS:

Contour toolpaths with no offset involve cutting precisely along the original outlines of a shape or component without any inward or outward deviation. This method is useful for projects requiring exact replication of the design's contours, ensuring accuracy and consistency in the final product's shape.

DRILLING TOOLPATHS:

Drilling toolpaths are employed to create holes or perforations at specific points within the material. This process is crucial for various applications, such as adding fasteners or creating openings for other components in the project.

REST MACHINING POCKET TOOLPATHS: *

Rest Machining toolpaths are employed to remove remaining material after initial, larger bit machining processes. They ensure precision by focusing on areas that were not adequately addressed in previous toolpaths, resulting in a more accurate and refined final product. This is particularly useful for intricate designs and complex components.

KEYHOLE TOOLPATHS:

In addition to the above, keyhole toolpaths are employed to create specialized openings, resembling keyholes, in the material. This particular toolpath is valuable for accommodating fasteners or mounting elements, enhancing the versatility of your project.

V-CARVE TOOLPATHS:

V-carve toolpaths are utilized to create decorative or intricate designs by cutting with a V-shaped bit at varying depths. This technique is commonly employed for engraving text, logos, or artistic patterns onto the surface of the material. By adjusting the cutting depth and angle, v-carve toolpaths can achieve stunning visual effects, adding depth and dimension to your project.

**Can be substituted with Inside Contour. It will accomplish the same task, but take longer.*

GOAL PLATFORM

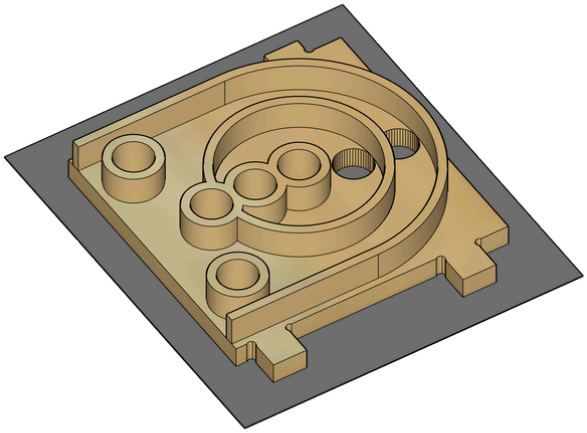
Import
Goal Platform - .75 Inch Stock - 6 x 6
Into CAD Program

CNC Bits Used:

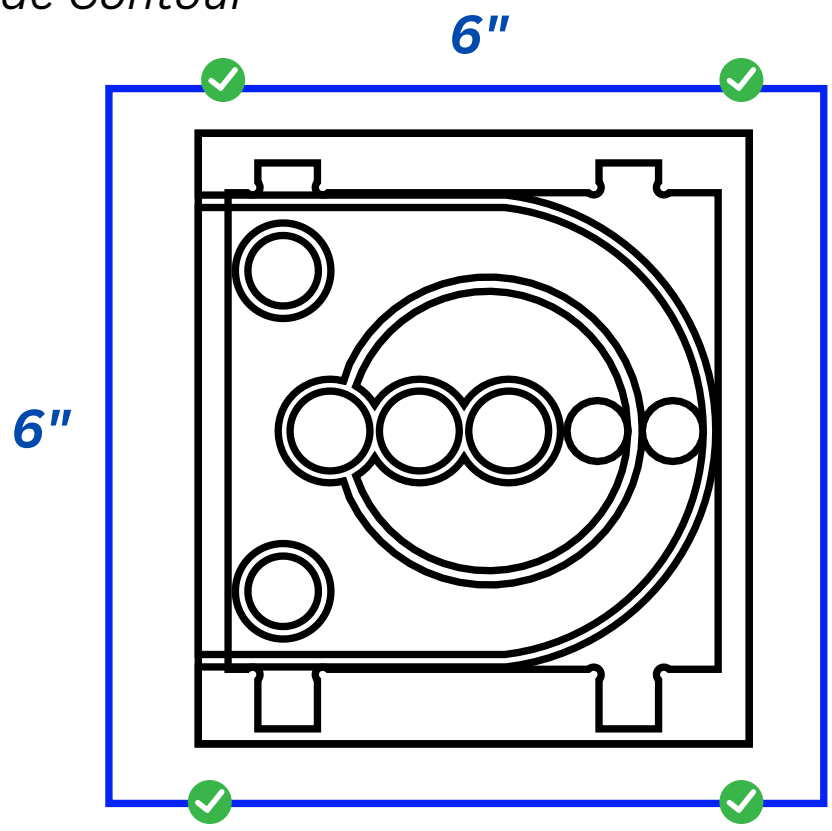
- *90 Degree V-Bit*
- *1/4" Downcut*
- *1/8" Downcut*

Toolpaths Used:

- *No Offset Contour*
- *Pocket*
- *Outside Contour*

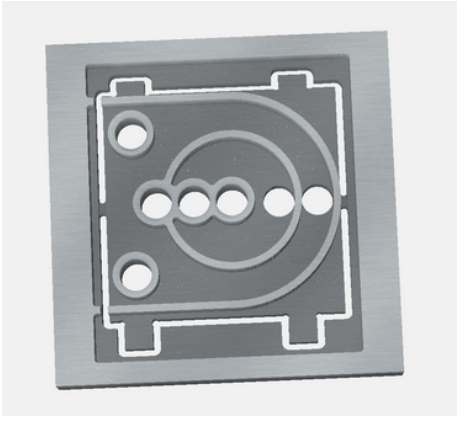


.75 Inch Stock



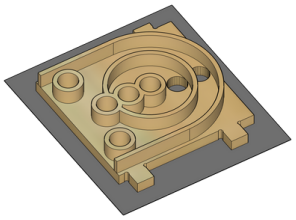
Blue Perimeter Line
Represents the Overall Stock Dimension.
If scale is off, adjust accordingly.

Clamp Locations



3D CAD Rendering
(Carbide Create)

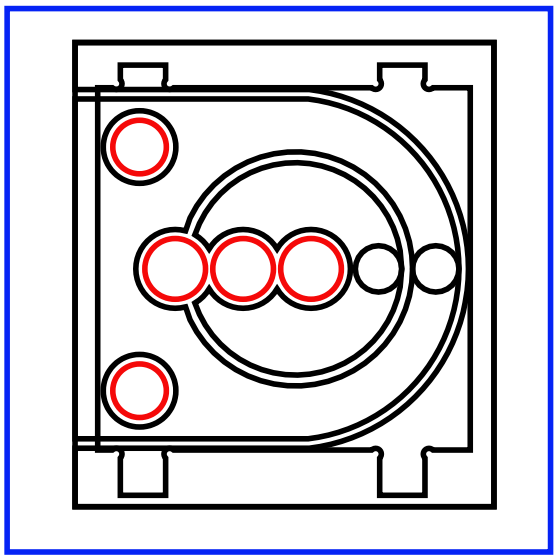
GOAL PLATFORM



SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

1.



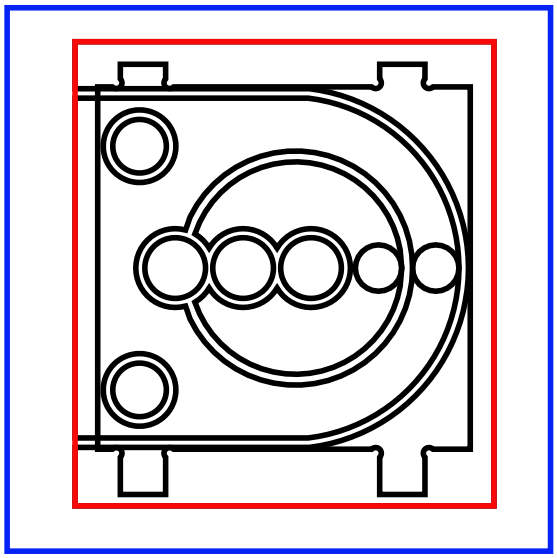
***No Offset* Contour**

90 Degree V-Bit

.1625" Depth

TOOL CHANGE!

2.

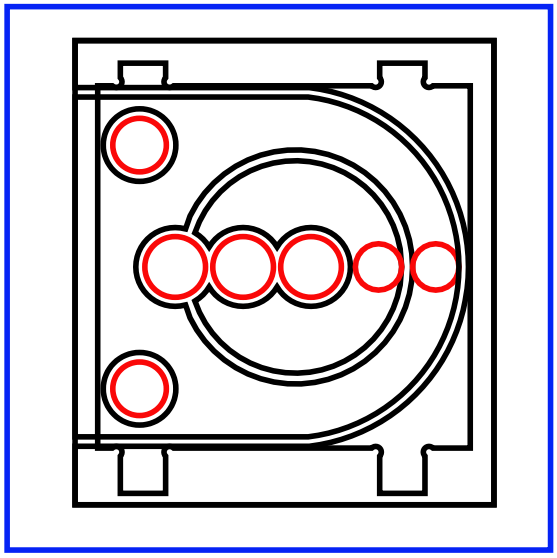


Pocket

1/4" Downcut

.1" Depth

3.



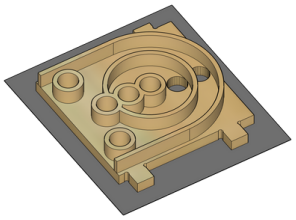
Pocket

1/4" Downcut

.1" Start Depth

Stock Bottom

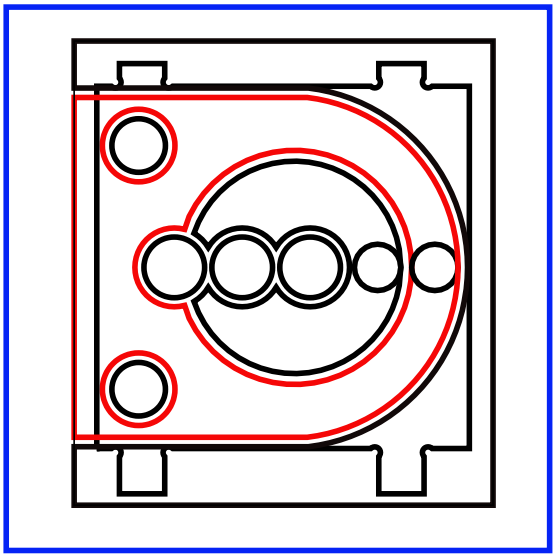
GOAL PLATFORM



SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

4.



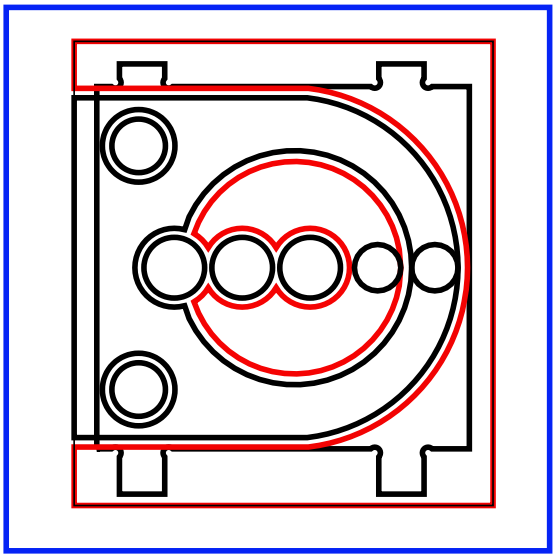
Pocket

1/4" Downcut

.1" Start Depth

.433" Depth

5.



Pocket

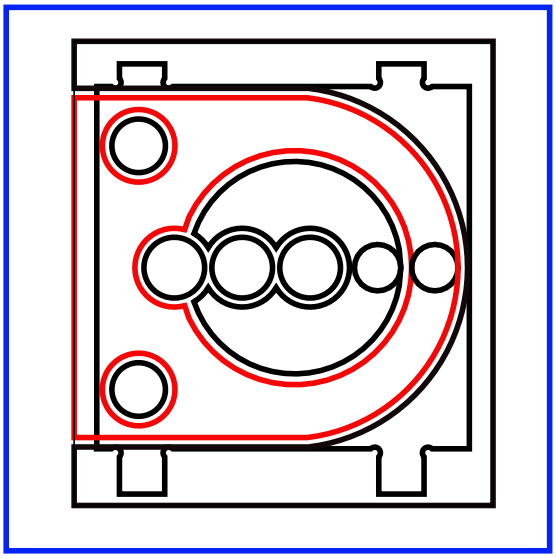
1/4" Downcut

.1" Start Depth

.433" Depth

TOOL CHANGE!

6.



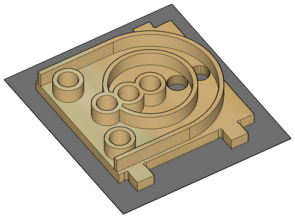
<u>Rest Machining</u> Pocket

1/8" Downcut

.1" Start Depth

.433" Depth

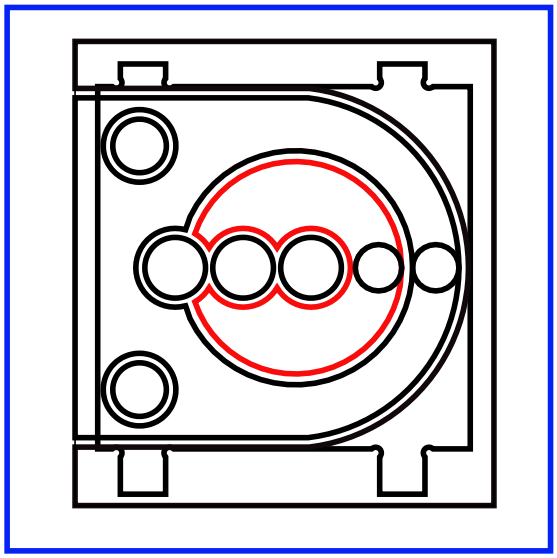
GOAL PLATFORM



SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

7.



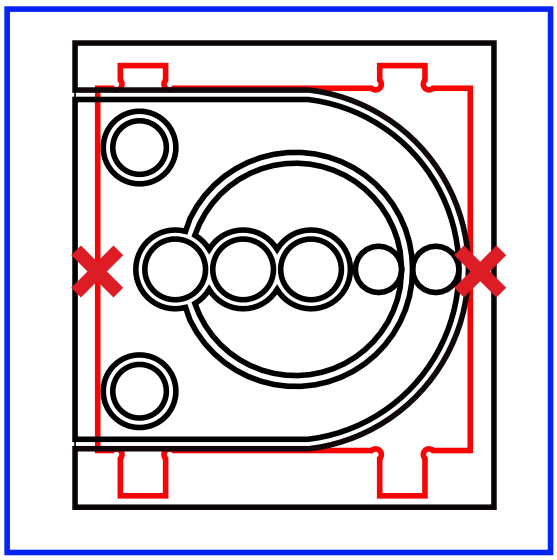
***Rest Machining* Pocket**

1/8" Downcut

.1" Start Depth

.433" Depth

8.



***Outside* Contour**

1/8" Downcut

.1" Start Depth

Stock Bottom

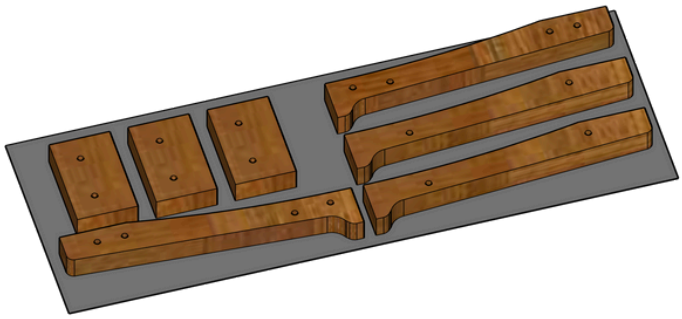
✖ = Tabs

LAUNCH RAMP

Import
Launch Ramp - 1 Inch Stock - 25 x 9
Into CAD Program

CNC Bits Used:

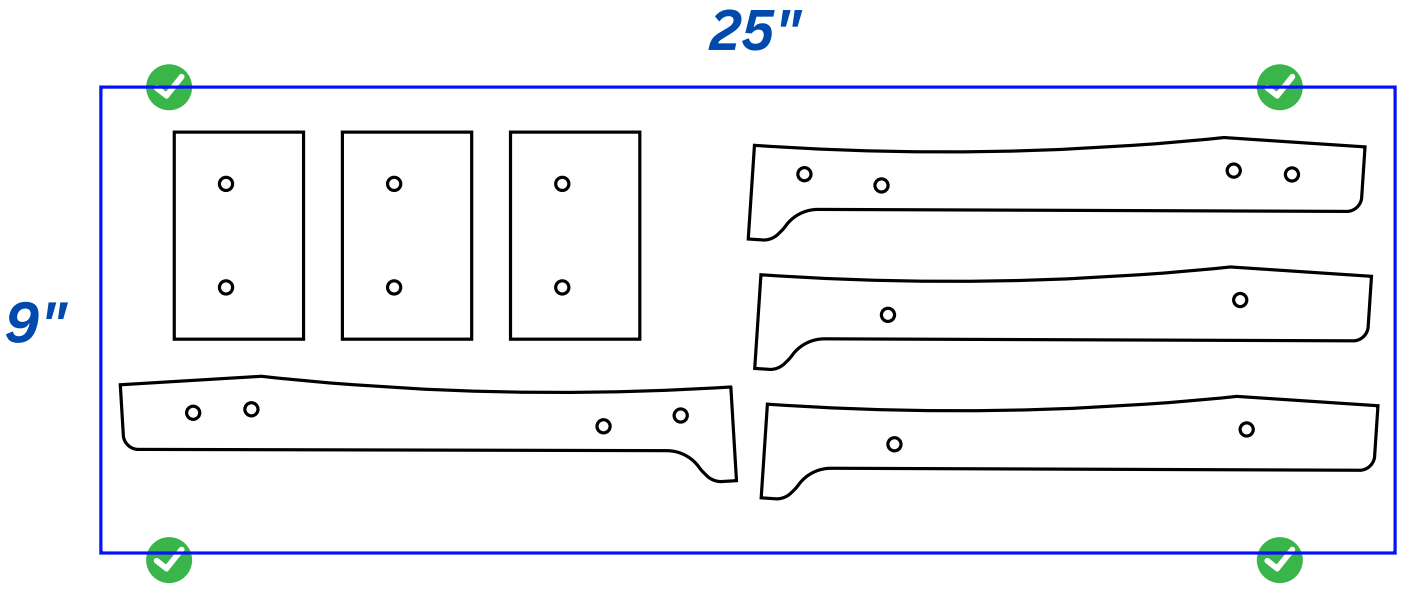
- *1/4" Downcut*
- *1/8" Downcut*
  - *1/8" Shaft Required, or extra length cutting surface to reach 1" Depth.*



Toolpaths Used:

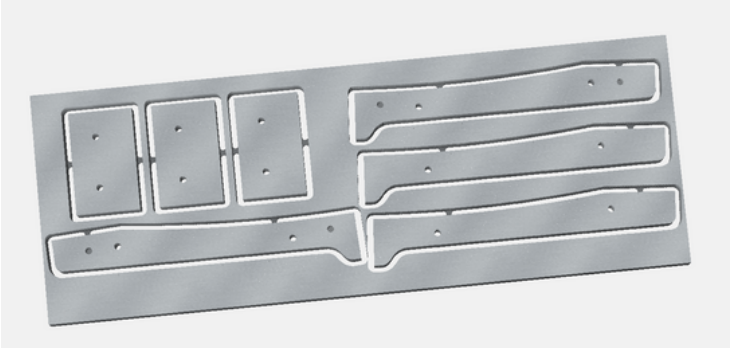
- *Pocket*
- *Outside Contour*

1 Inch Stock



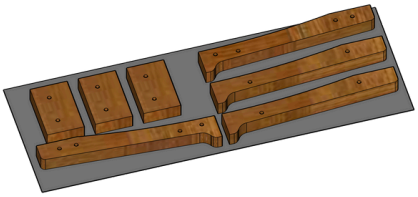
Blue Perimeter Line
Represents the Overall Stock Dimension.
If scale is off, adjust accordingly.

Clamp Locations



3D CAD Rendering
(Carbide Create)

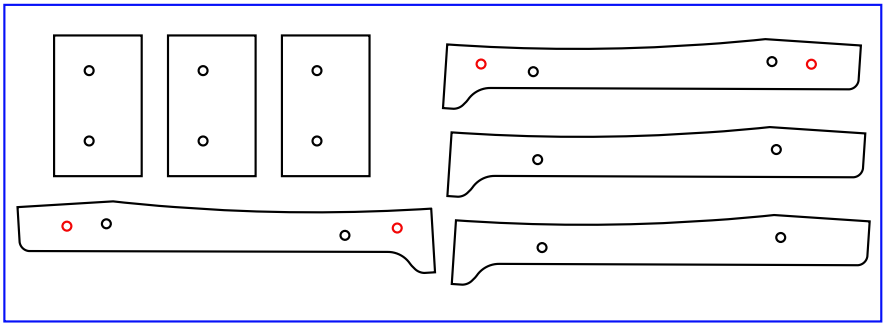
LAUNCH RAMP



SELECTED VECTORS

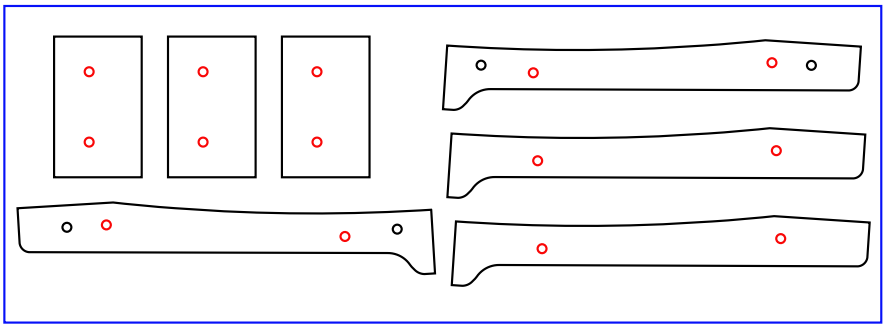
TOOLPATHS/BIT/DEPTHS

1.



Pocket
1/8" Downcut
.5" Depth

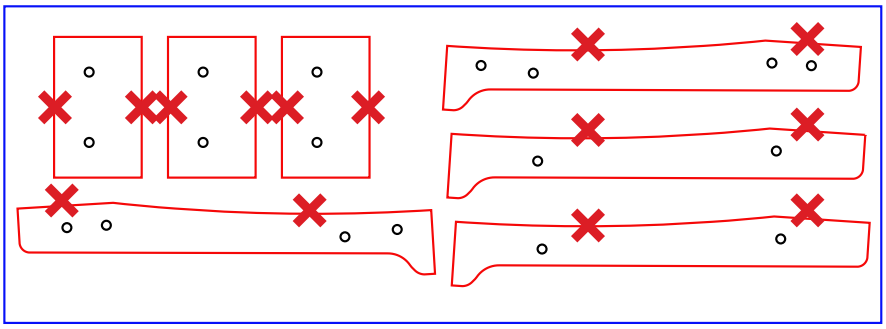
2.



Pocket
1/8" Downcut
Stock Bottom

TOOL CHANGE!

3.



<u>Outside</u> Contour
1/4" Downcut
Stock Bottom

✖ = Tabs

SIDE PANEL NUMBER 1

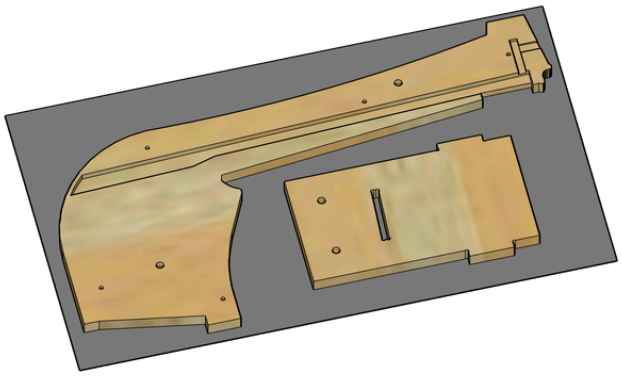
Import
Side Panel Number 1 - .5 Inch Stock - 18 x 10.5
Into CAD Program

CNC Bits Used:

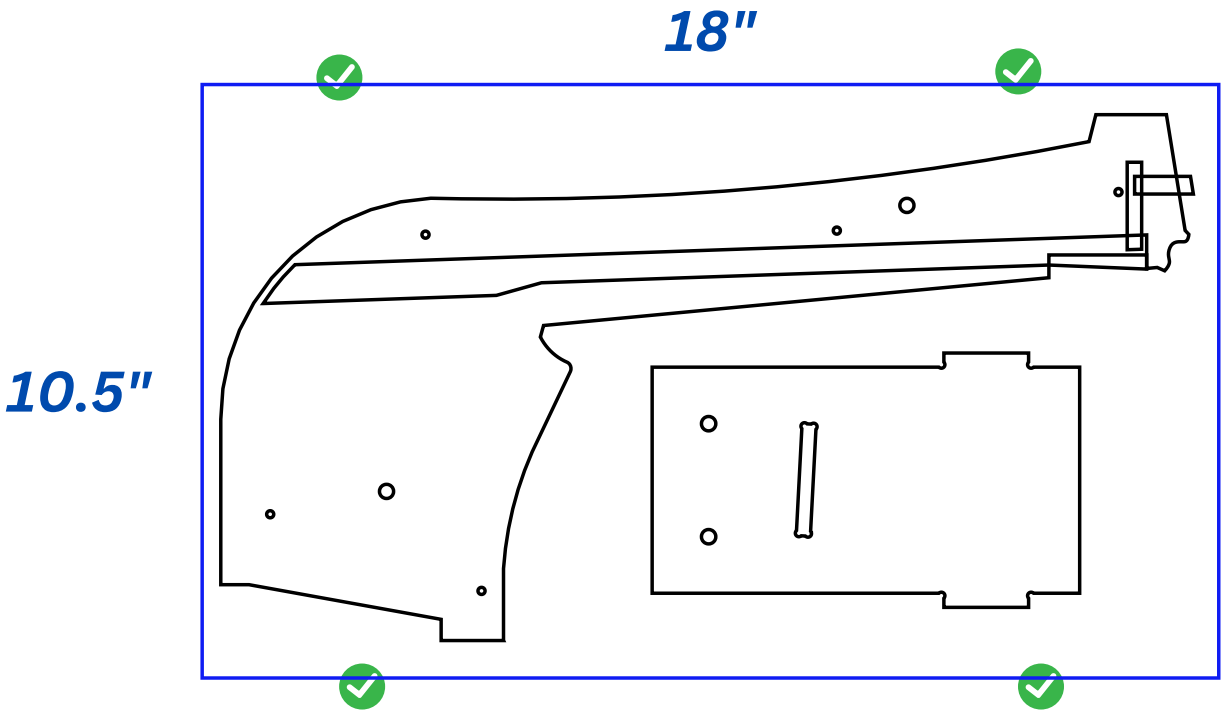
- *1/8" Downcut*

Toolpaths Used:

- *Drill*
- *Pocket*
- *Outside Contour*

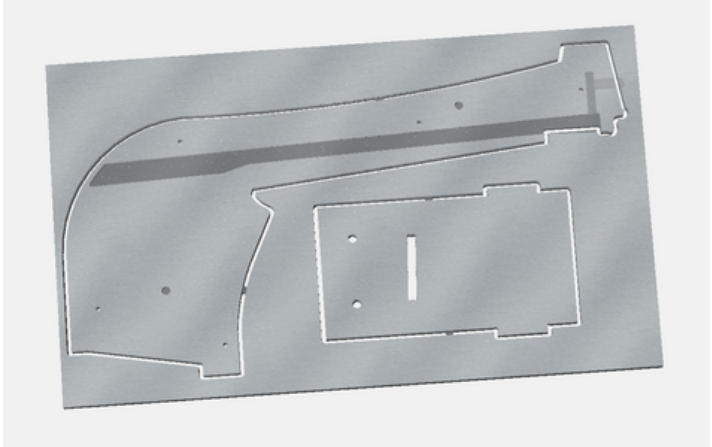


.5 Inch Stock



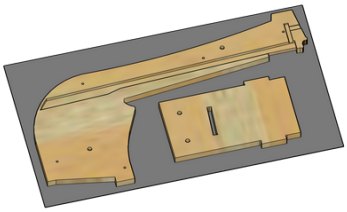
Blue Perimeter Line
Represents the Overall Stock Dimension.
If scale is off, adjust accordingly.

Clamp Locations



3D CAD Rendering
(Carbide Create)

SIDE PANEL NUMBER 1

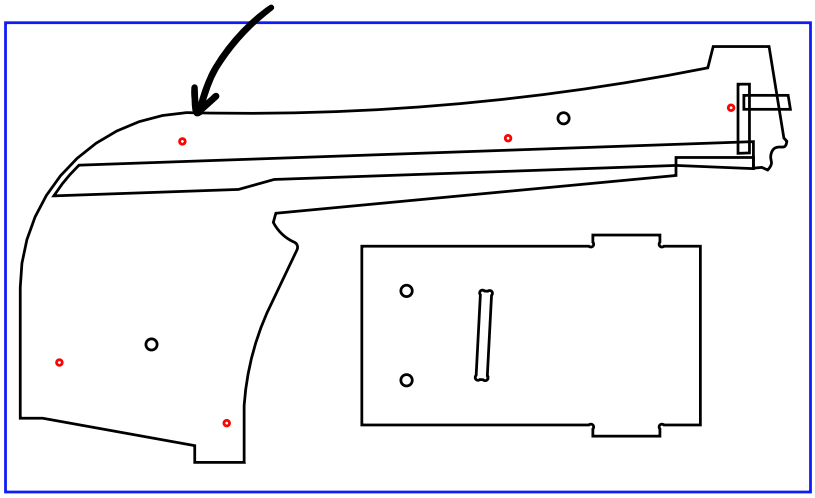


SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

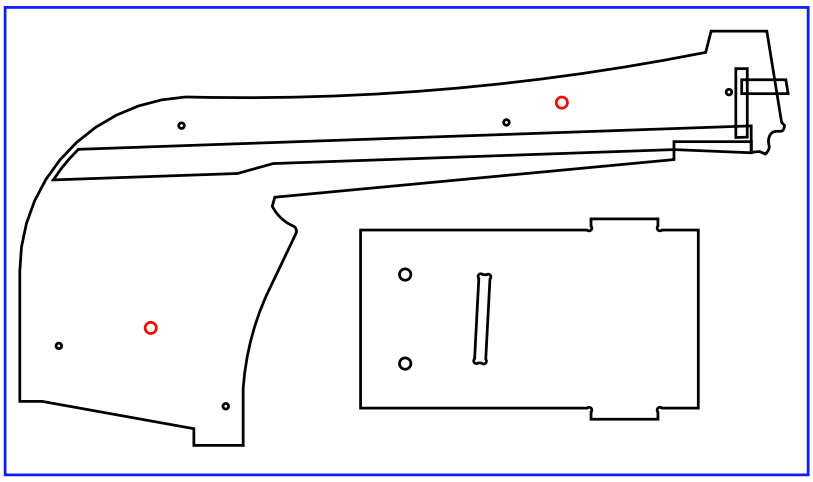
x5 Small Holes

1.



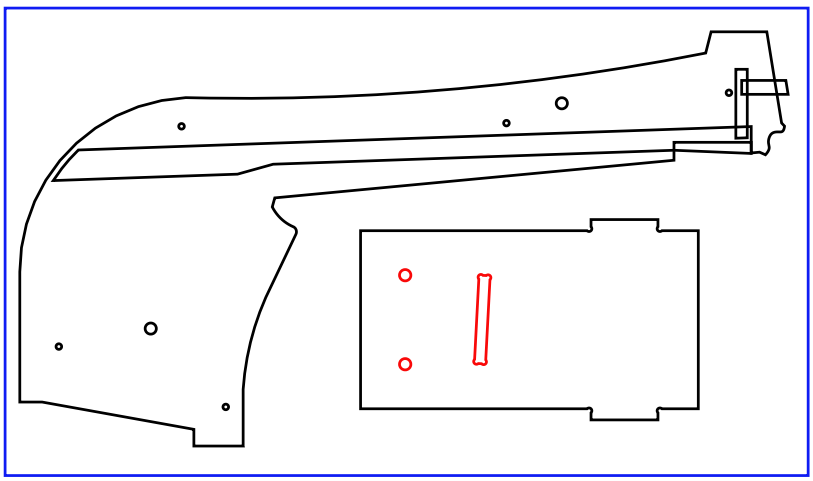
Drill
1/8" Downcut
Stock Bottom

2.



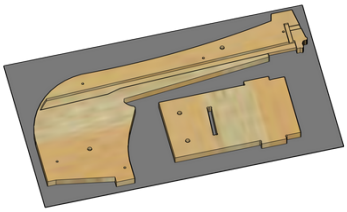
Pocket
1/8" Downcut
.25" Depth

3.



Pocket
1/8" Downcut
Stock Bottom

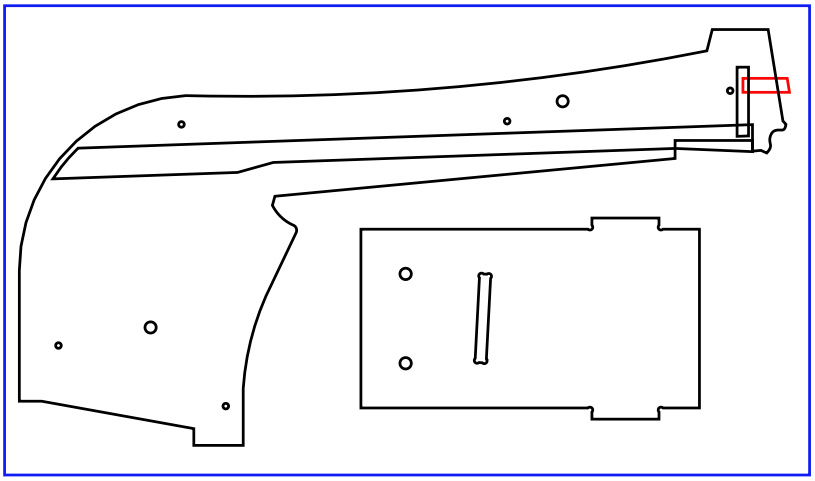
SIDE PANEL NUMBER 1



SELECTED VECTORS

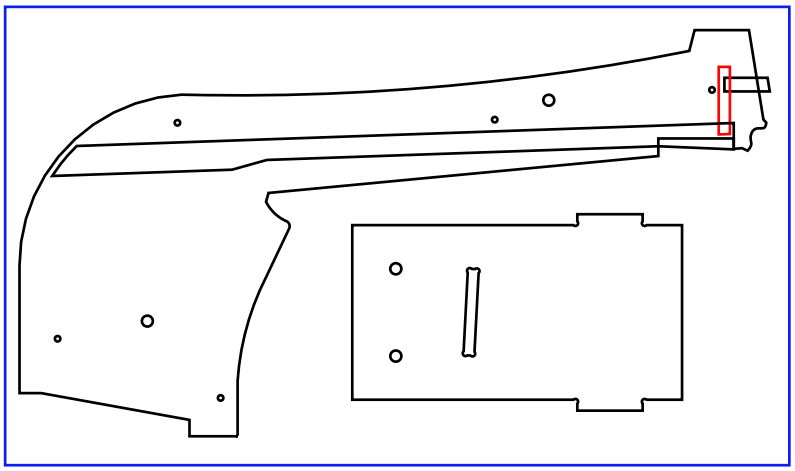
TOOLPATHS/BIT/DEPTHS

4.



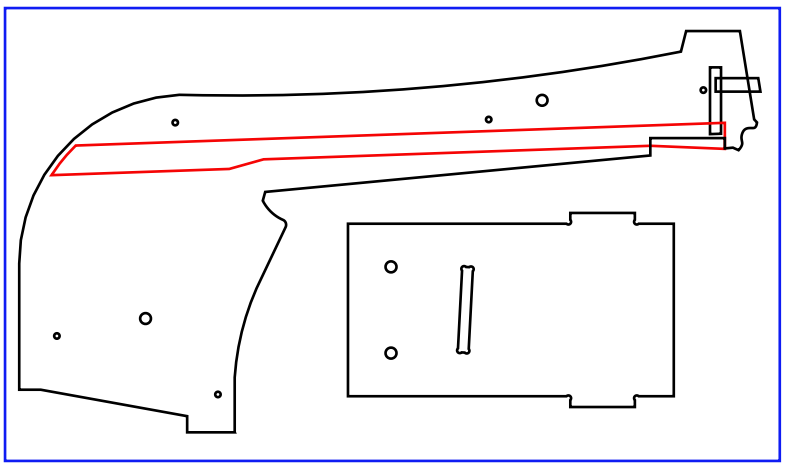
Pocket
1/8" Downcut
.065" Depth

5.



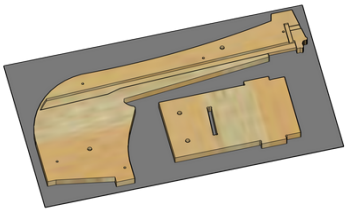
Pocket
1/8" Downcut
.127" Depth

6.



Pocket
1/8" Downcut
.236" Depth

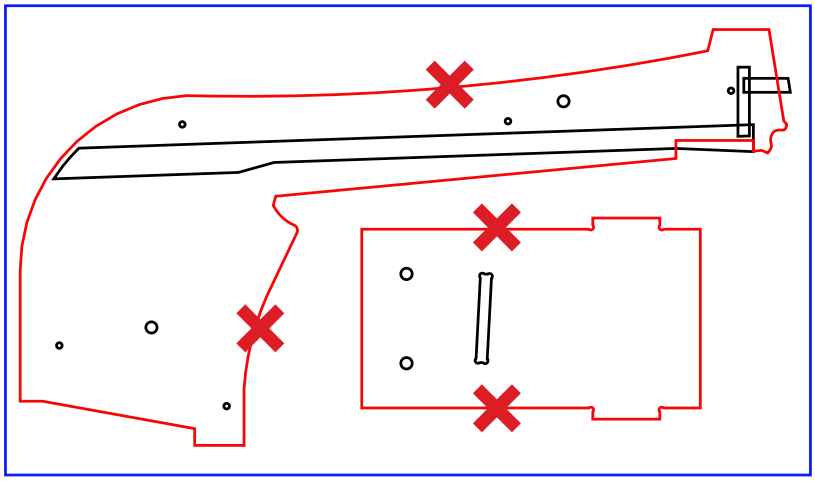
SIDE PANEL NUMBER 1



SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

7.



Outside Contour

1/8" Downcut

Stock Bottom

✖ = Tabs

SIDE PANEL NUMBER 2

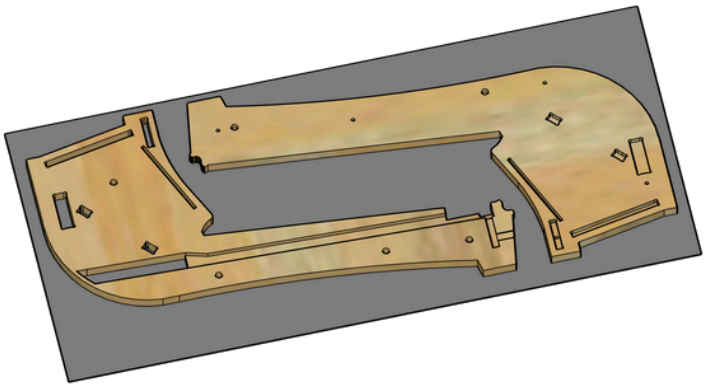
Import
Side Panel Number 2 - .5 Inch Stock - 24 x 11
Into CAD Program

CNC Bits Used:

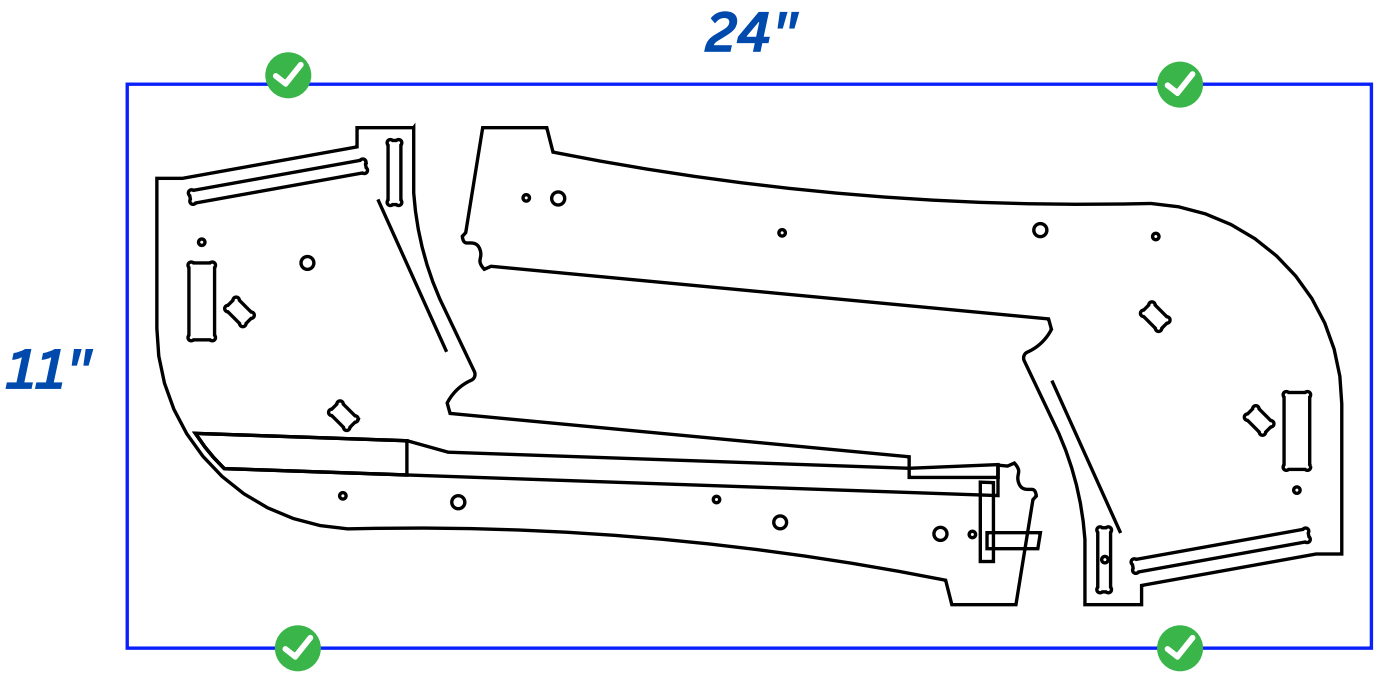
- *1/8" Downcut*

Toolpaths Used:

- *Drill*
- *Pocket*
- *No Offset Contour*
- *Outside Contour*

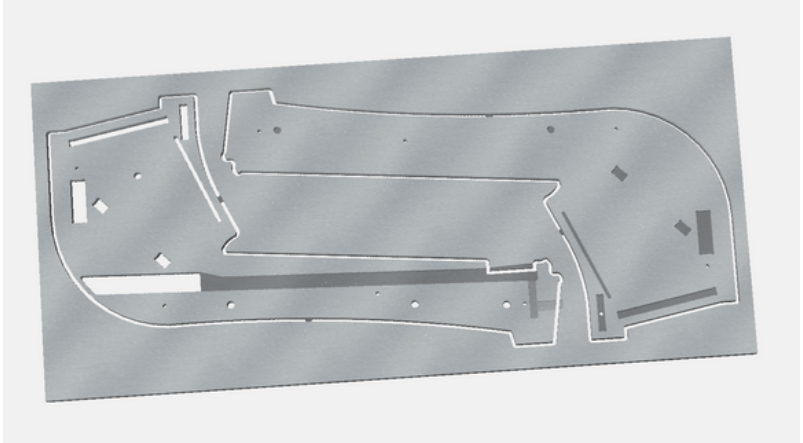


.5 Inch Stock



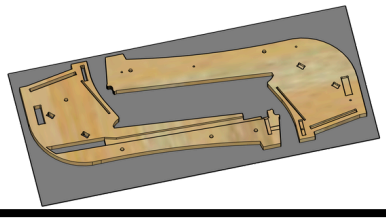
Blue Perimeter Line
Represents the Overall Stock Dimension.
If scale is off, adjust accordingly.

Clamp Locations



3D CAD Rendering
(Carbide Create)

SIDE PANEL NUMBER 2

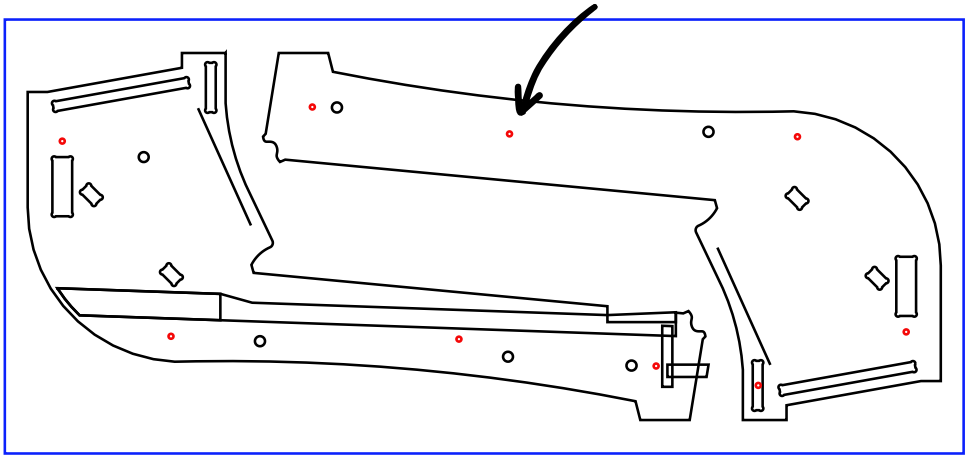


SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

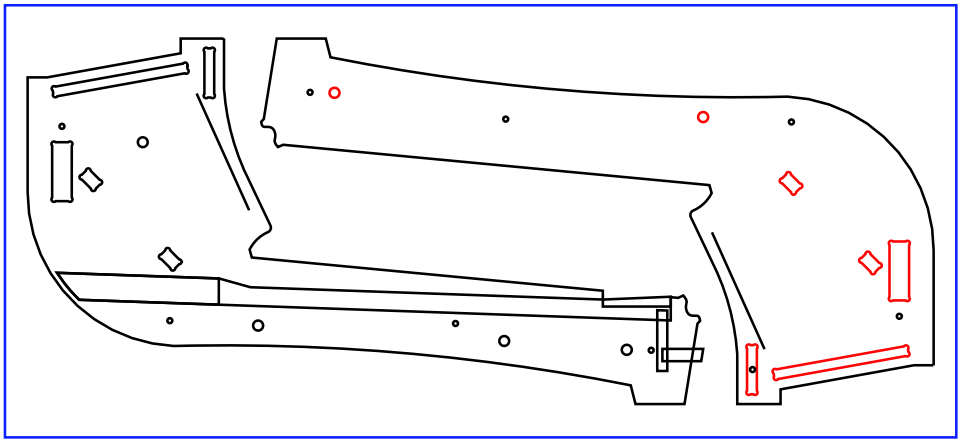
x9 Small Holes

1.



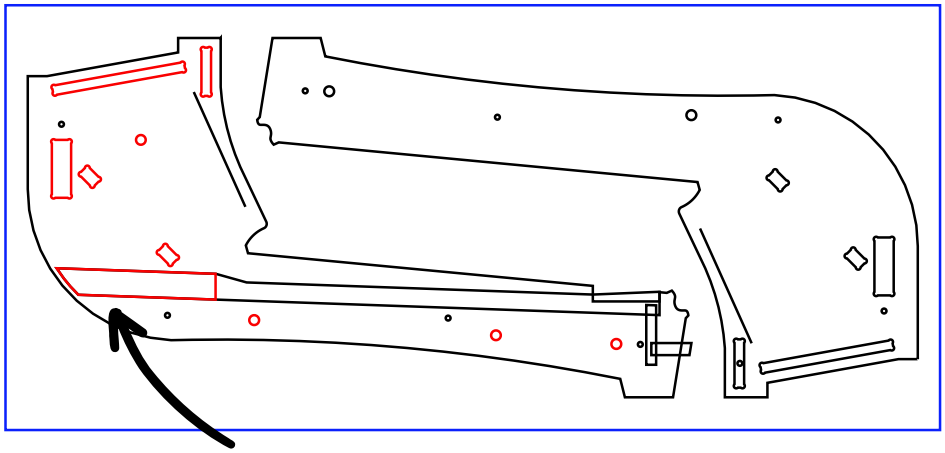
Drill
1/8" Downcut
Stock Bottom

2.



Pocket
1/8" Downcut
.25" Depth

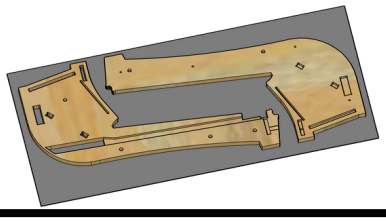
3.



Pocket
1/8" Downcut
Stock Bottom

Don't Miss This One

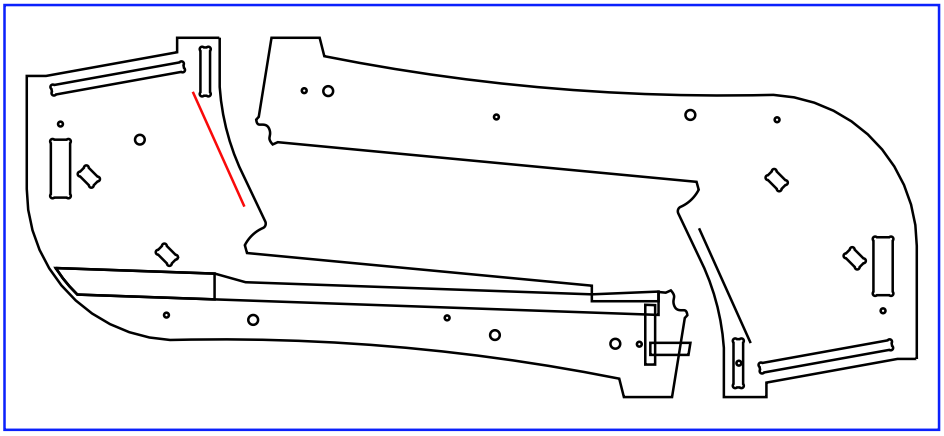
SIDE PANEL NUMBER 2



SELECTED VECTORS

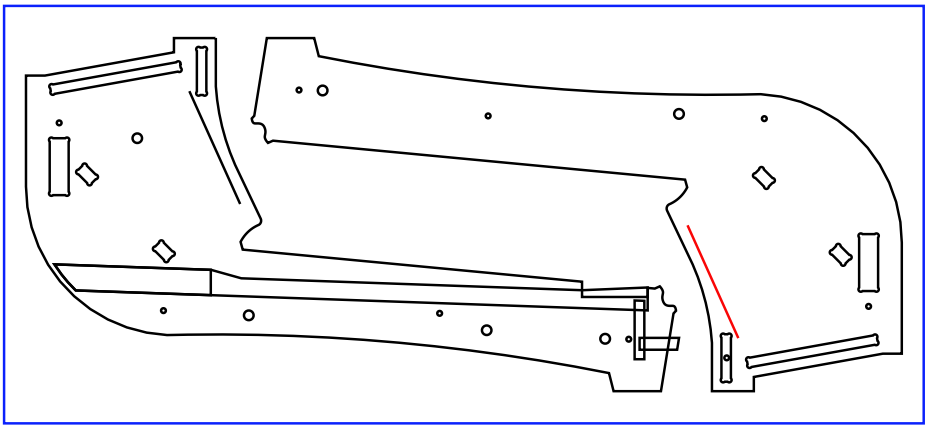
TOOLPATHS/BIT/DEPTHS

4.



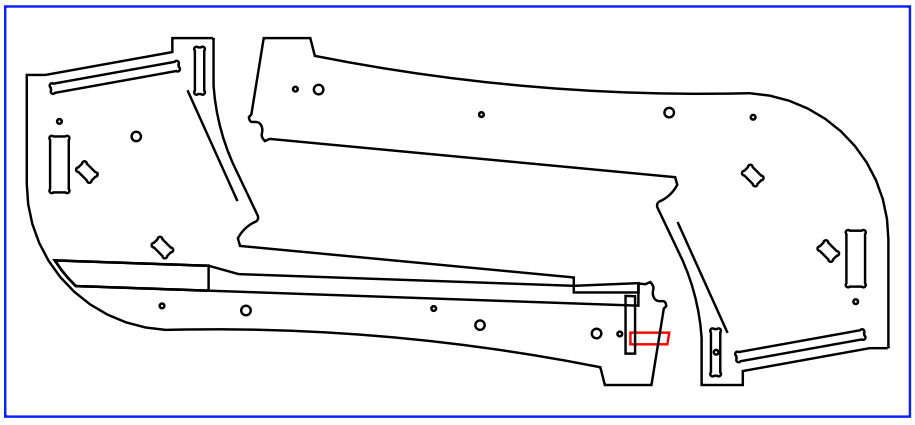
***No Offset* Contour**
1/8" Downcut
Stock Bottom

5.



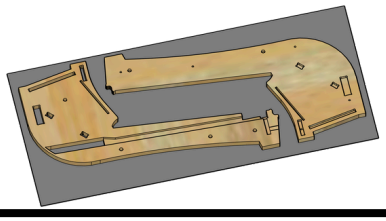
***No Offset* Contour**
1/8" Downcut
.25" Depth

6.



Pocket
1/8" Downcut
.065" Depth

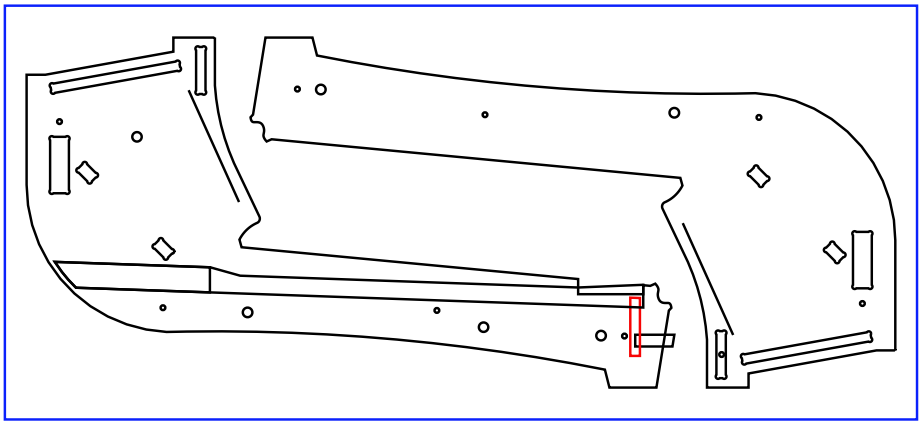
SIDE PANEL NUMBER 2



SELECTED VECTORS

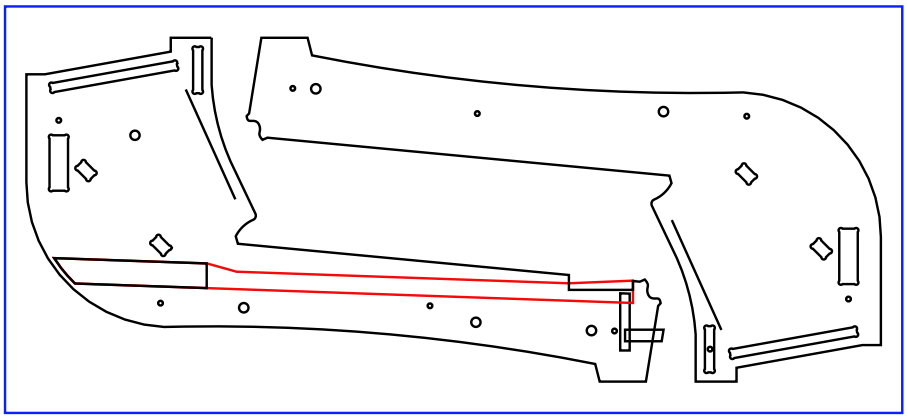
TOOLPATHS/BIT/DEPTHS

7.



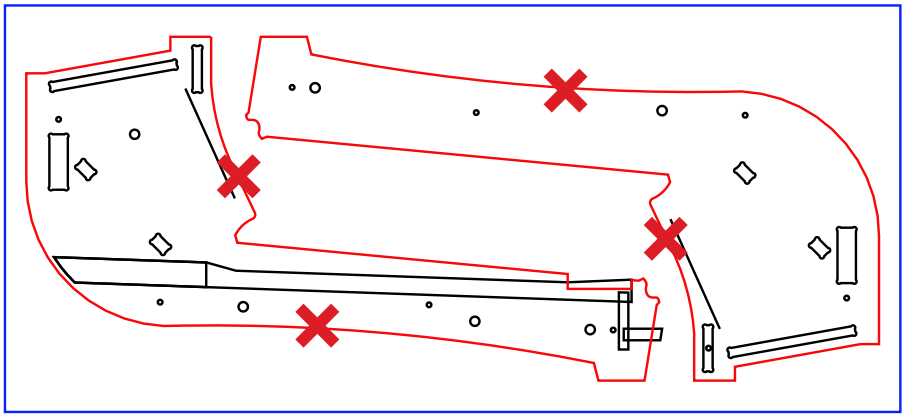
Pocket
1/8" Downcut
.127" Depth

8.



Pocket
1/8" Downcut
.236" Depth

9.



<u>Outside</u> Contour
1/8" Downcut
Stock Bottom

✖ = Tabs

ROOF AND NAME PLATE

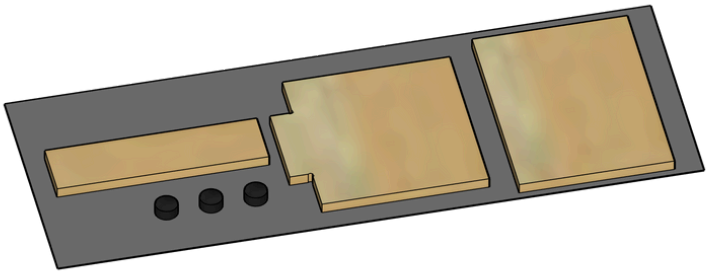
Import
Roof and Name Plate - .25 Inch Stock - 14.5 x 5.5
Into CAD Program

CNC Bits Used:

- *90 Degree V-Bit*
- *1/8" Downcut*

Toolpaths Used:

- *V-Carve*
- *Outside Contour*

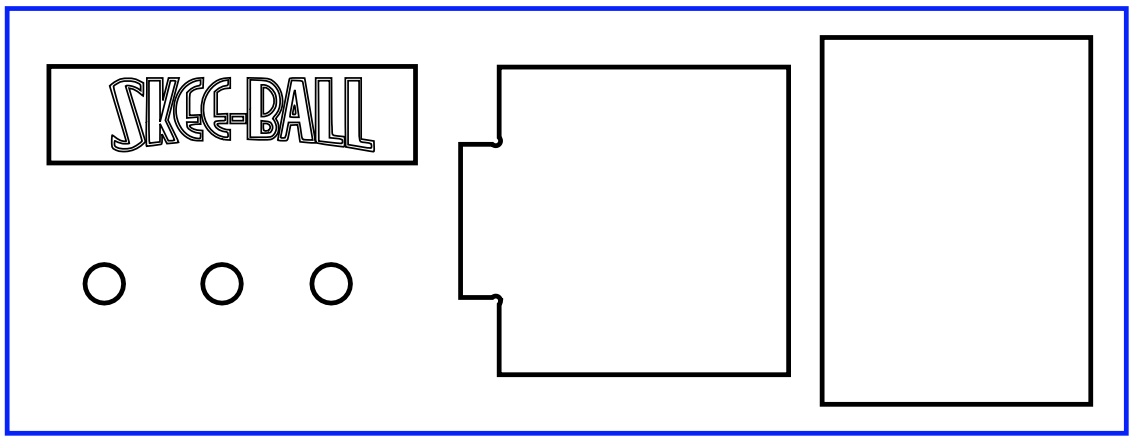


.25 Inch Stock

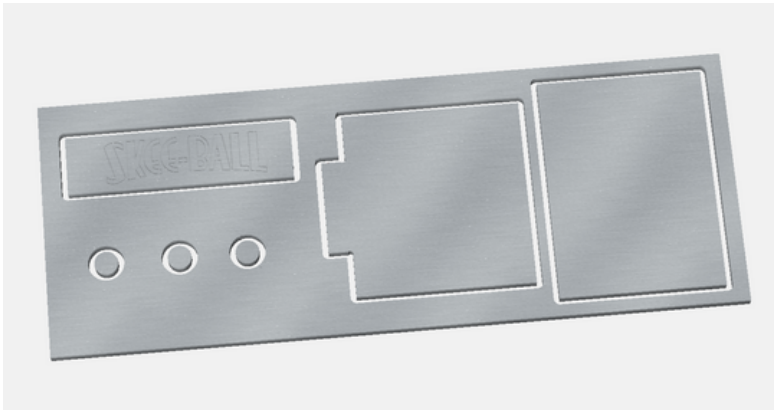
⚠ ***Secure with Double Sided Tape***

14.5"

5.5"

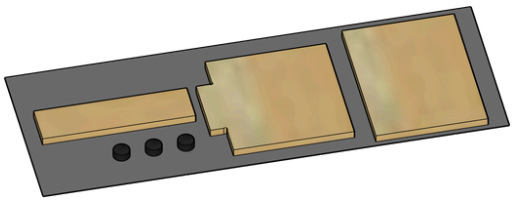


Blue Perimeter Line
Represents the Overall Stock Dimension.
If scale is off, adjust accordingly.



3D CAD Rendering
(Carbide Create)

ROOF AND NAME PLATE

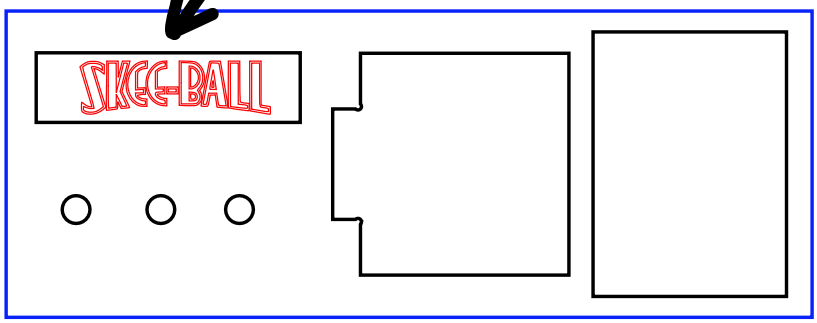


SELECTED VECTORS

TOOLPATHS/BIT/DEPTHS

*Add **Oramask** to this section before carving if you want to paint the text.*

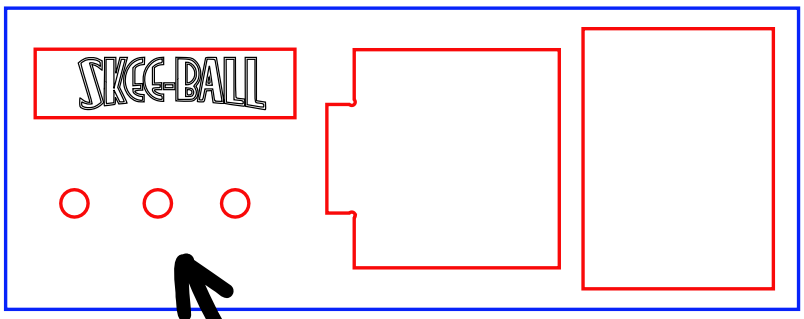
1.



V-Carve
90 Degree V-Bit
Stock Bottom

TOOL CHANGE!

2.



Outside Contour
1/8" Downcut
Stock Bottom

2 of these 3 small circles are extra incase they go flying during the carve. Fingers crossed!

⚠️ ***Secure with Double Sided Tape***

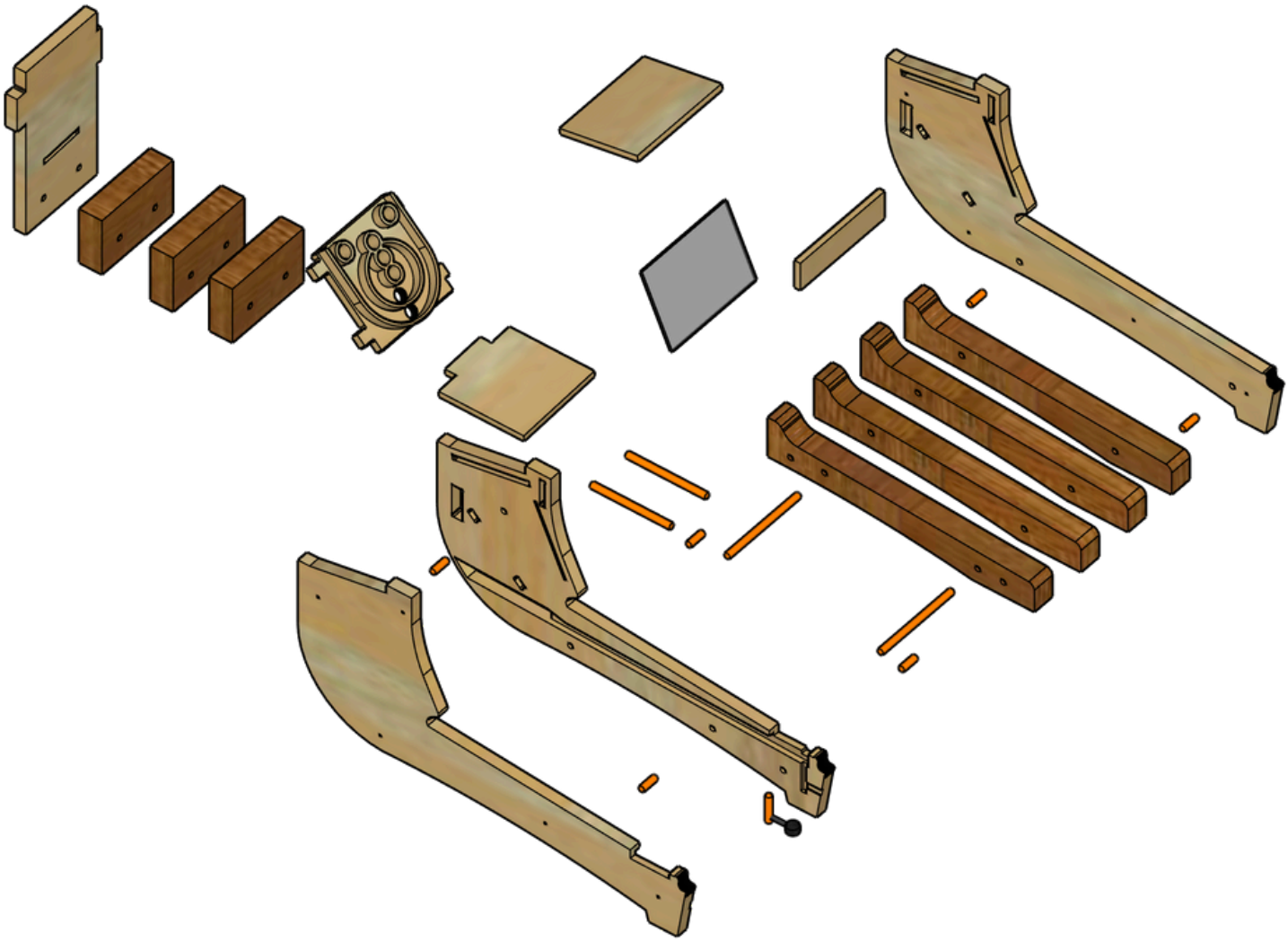
ASSEMBLY

(Page 1/5)

For more detail and visual guides on assembly, watch YouTube Tutorial.

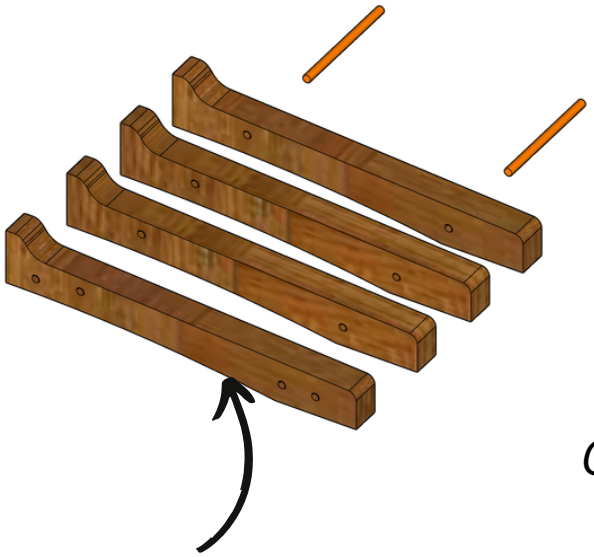
Watch Now!

Welcome to the assembly phase of your project! At this point, you've successfully carved all the components using your CNC machine, removed any tabs, and sanded them to your desired finish. In this section, I provide visual aids in the form of pictures, accompanied by brief instructions, to guide you through the assembly process. These instructions assume you have some woodworking skills and experience with basic woodworking techniques. Let's get started!



ASSEMBLY

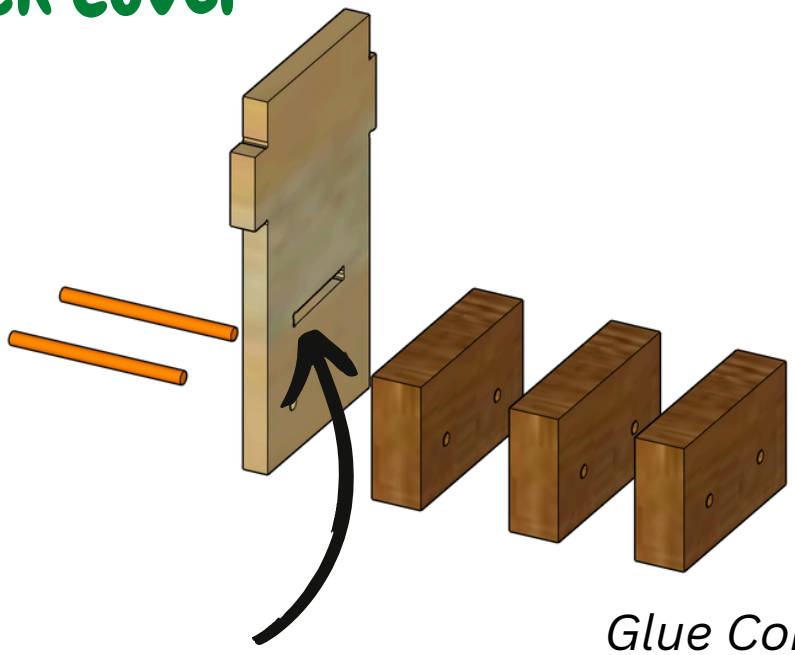
Launch Ramp



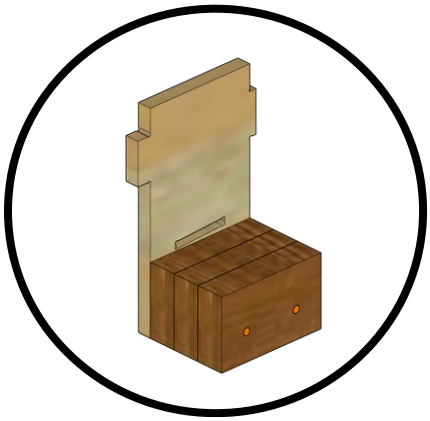
Two parts with 4 holes go on the **outside**.

Glue Component, align with 5" Dowels. Then flush cut.

Back Cover



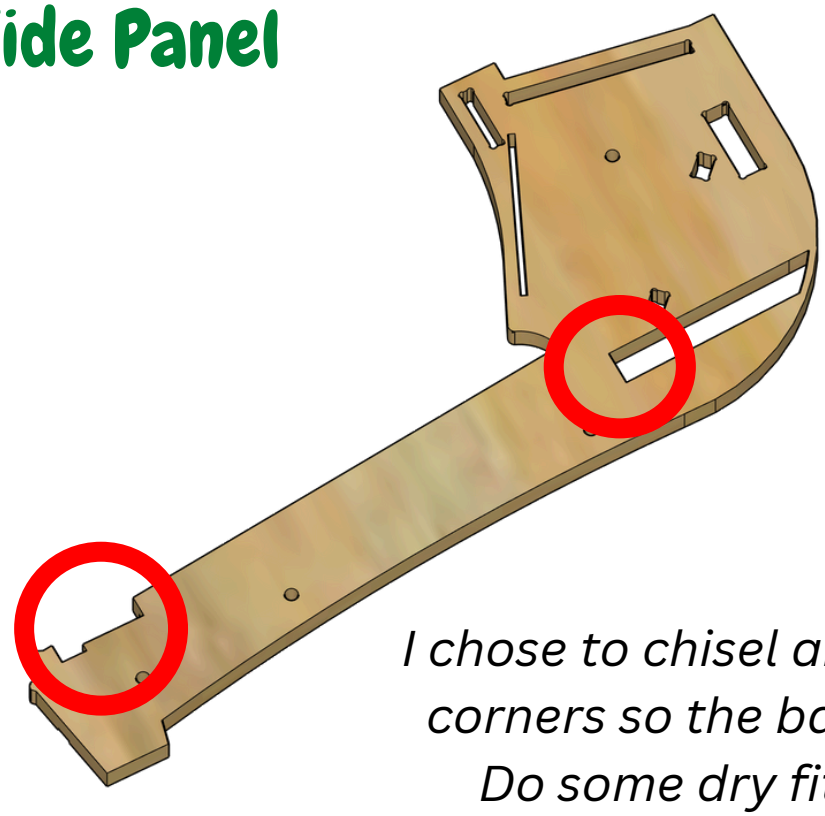
Make sure decline faces the ball return side.



Glue Component, align with 5" Dowels. Then flush cut.

ASSEMBLY

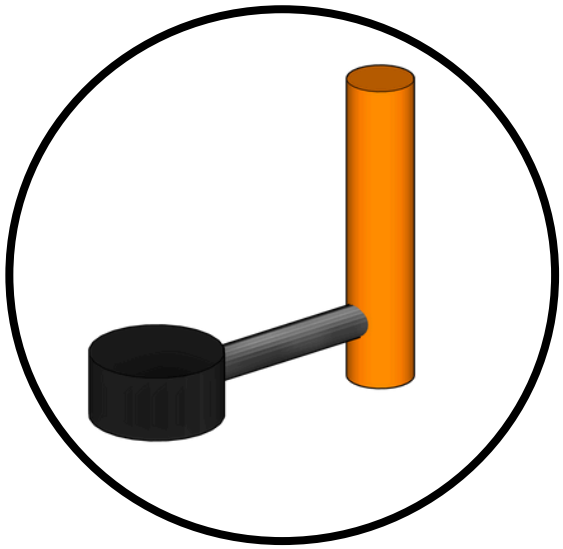
Side Panel



I chose to chisel and file down these two corners so the balls would flow easier. Do some dry fitting to test things.

Lever

Carefully fit together small circle, nail, and dowel as shown.

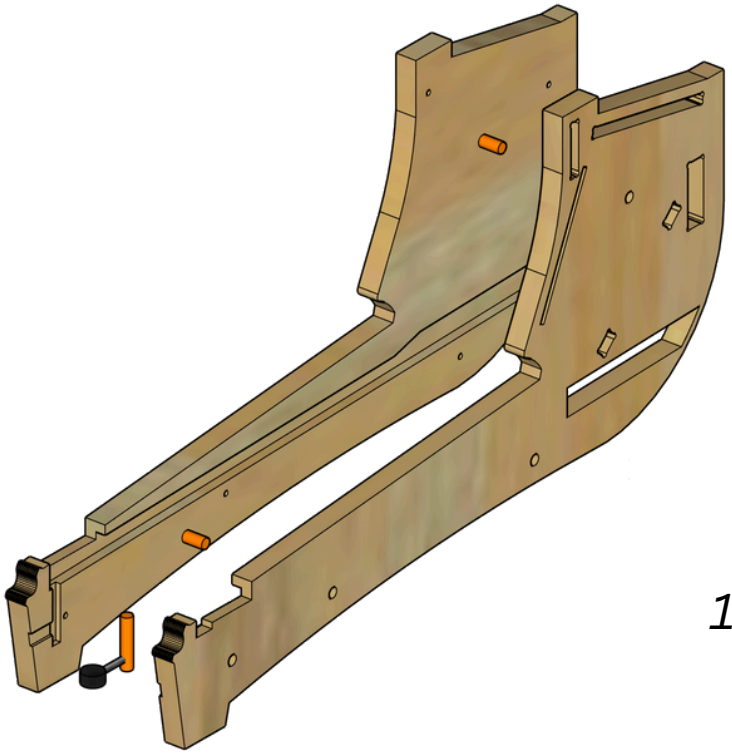


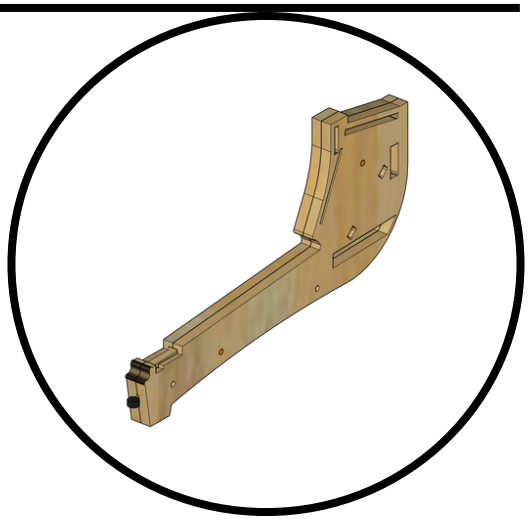
I used a 1/8" nail and CA Glue after drill holes.

⚠️ *Dry fit lever in side panel component before gluing. You will need to adjust dowel to size.*

ASSEMBLY

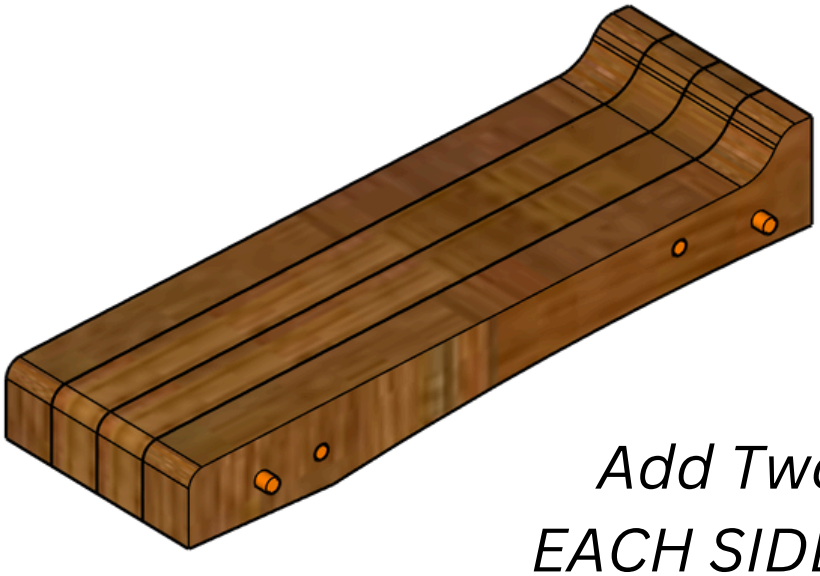
Side Panels





Align Side Panels with 1/2" Dowels. Insert Lever between them.

Launch Ramp Dowels



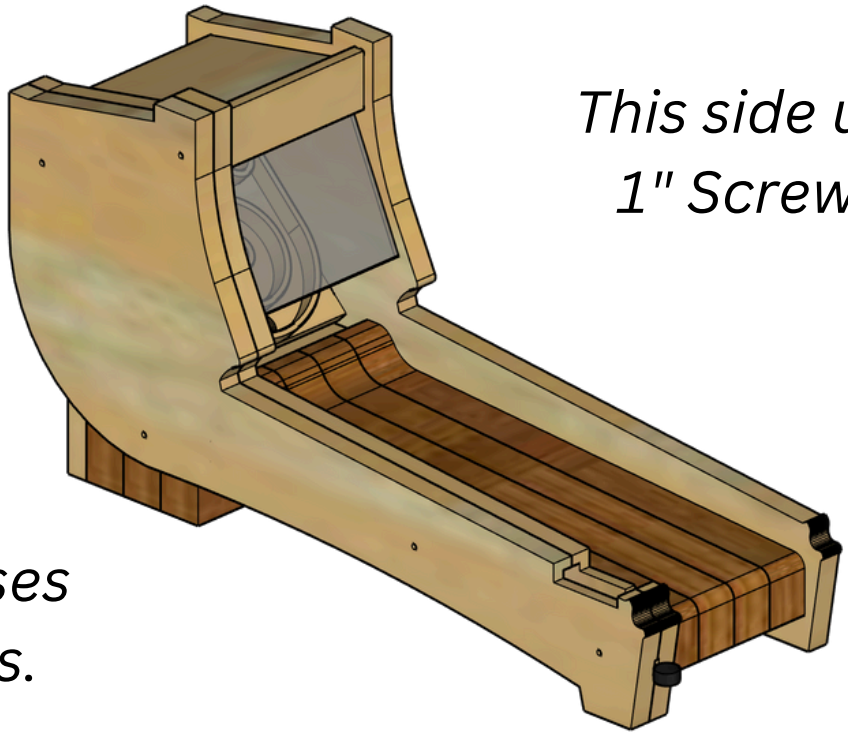
Add Two .75" Dowels to EACH SIDE of Launch Ramp

ASSEMBLY

Final Assembly

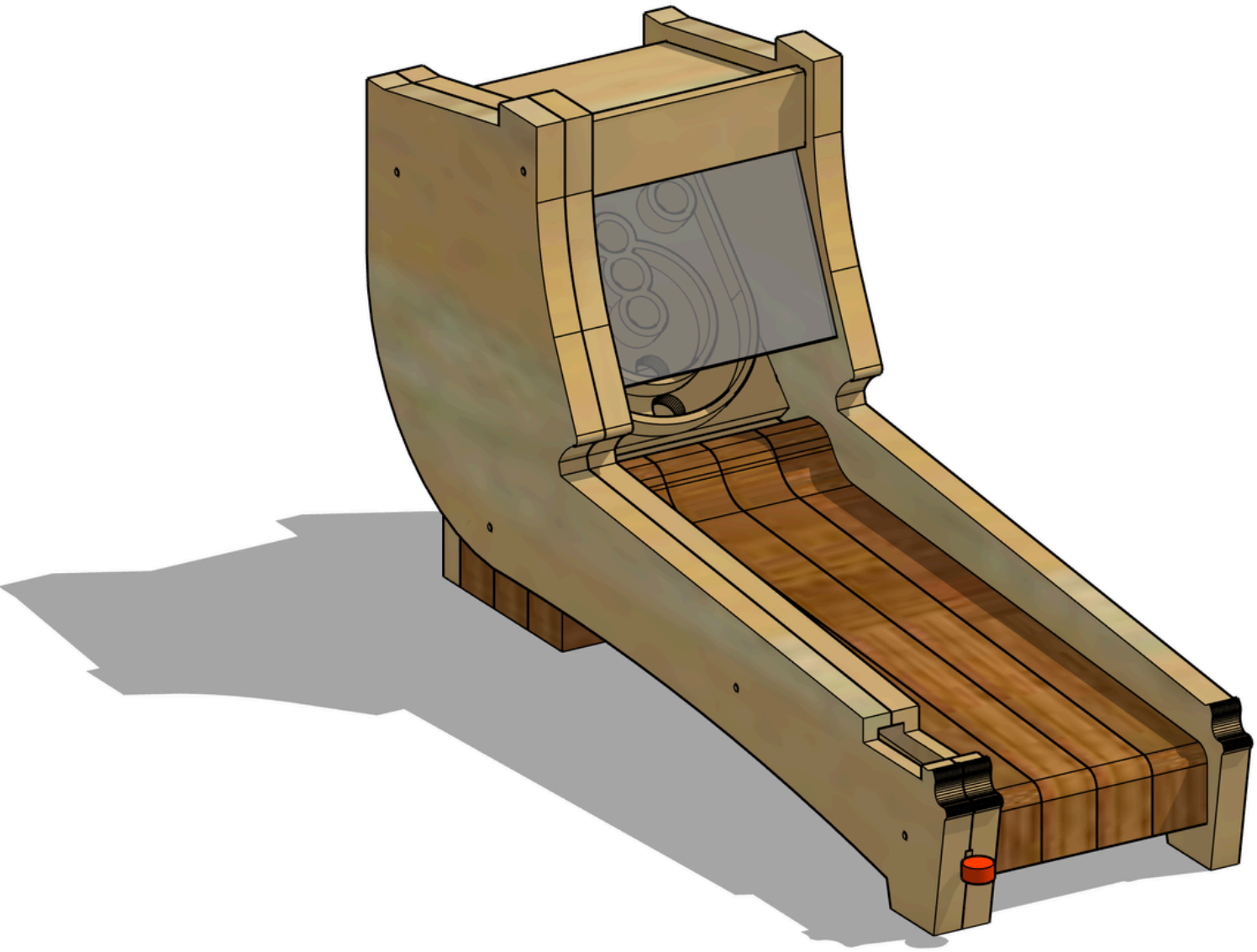
Combine all Components.
They should fit like a puzzle.

Screws



This side uses
1" Screws.

This side uses
1.5" Screws.



Thank you for choosing Aqua Vitae Woodworks!

I'd love to see your completed projects. Share your builds on social media and tag me!

Tiktok: *AquaVitaeCNC*
Instagram: *AquaVitaeWoodworks*
Facebook: *AquaVitaeWoodworks*