

Project Tutorial

Compatible with the Current Version of

VCarve DESKTOP

Project: Euro Style Universal Clamping Jig By <u>David White</u>

The first issue right out of the box for a new CNC machine is creating a spoil board and clamping system for work pieces. This is generally when most operators have the least experience with their new machine and software.

This is a good early project because it's easy, it is in-expensive, and exceedingly useful with those with those of any experience level.



This type of jig offers:

- Fast repeated parts
- Can hold just about any shape
- Massive lateral clamping force
- Very hard for a tool to hit
- Can be used directly on T-Track
- Doesn't cover the surface of the part so you can "surface plane" in place

My inspiration for this was many projects using irregular stock and spending too much time thinking about how and where to clamp a project work piece. Since we are using MDF as a spoil board one doesn't want to impart any force other than compression in the soft material if doing precision machining.

By using oval nuts and hurricane bolts, we can use the metal t-track that has great rigidity. By using the hurricane bolts, we also don't have any protrusions above the height of the cams as in using toggle bolts and knobs. Hurricane bolts are also designed not to come lose with vibration. If you don't want metal anywhere close you can use nylon bolts.

Using the cam levers on the on the deep part of the table reduces the likelihood of crashing the tool if you home to the front. The stationary cam plates only rise .365 inches above the spoil board. You can also use this system right on the bed itself if a spoil board is not needed.



Brass inserts, oval nuts, oval head bolts, and hurricane bolts. Digging out thread inserts out of old spoil boards is no fun. Some like to use threaded inserts in MDF. That can be very expensive and time consuming as they are hard to reuse. Also, since mounted in the weak MDF, it can induce error in critical tolerances when tightened.

Make several spoil boards in your down time and the only thing that becomes a waste item is the spoil board itself. One can also have a spoil board set up to a specific project to drop right back on the table. Hence the title, universal clamping jig.



Design Goals:

- Very low vertical profile so thinner stock and attachments like the laser can still be used
- Should scale to different size tables
- Reasonable cost
- Easily adaptable for production use
- Little tooling is needed, just a ¼" upcut bit and a 1" spoil board cutter
- Use off the shelve cut 12" x 12" x 3/8" plywood stock for levers and cam plates



Cutting the original prototype plates using the maximum cutting area of the Piranha.



The original prototype levers and plates. Notice that they are not mirrored with right and left pivot points. In these production CAM files they are and will add more versatility.



Cam levers are two pieces glued together. I used the bolts and oval nuts to clamp while drying. The levers keep the cam plates firmly to the spoil board.



Completed parts.



Spoil board prototype. This final project has the thru holes on $\frac{3}{4}$ " spacing to match the t-track spacing. This one had 1" on the Y. Tighter spacing is better.

Parts List:

- Hurricane bolts 1/4x20 (~20) assorted lengths in ¼" increments
- Oval nuts 1/4x20 (20)
- 3/8" Baltic birch 12" x12" plywood (2)
- 12" x 12" 3/8" MDF or working bed size.

Step by Step In V-Carve 9.5

This tutorial highlights the process we took in creating the CAD and G-Code files for this project. Different sized tables can be easily adapted using the same techniques.

This project really includes three separate projects. The <u>spoil board</u>, <u>cam levers</u>, and <u>cam plates and the fixed plates</u>.

Remember to set your speeds, feeds, and cutting depth for your specific router, CNC machine, and material thickness.

Also, if you are reading this as a PDF, remember that holding the control key down as you move the mouse scroll wheel will let you zoom in for more detail.

Spoil Board Project



Of course, the first thing to do is create a new file.

Then set up the size. This one is for a Piranha and is 12" x 12".

On the Piranha, the T-Track is spaced .75" for three tracks and then a 1.5" gap before the pattern continues.



Remember to change the project to match your T-Track spacing. This shows the new <u>HD5 spacing</u> which is 10mm.



Pull <u>guides</u> to ³/₄" on both sides of the working piece and then top and bottom or matching the T-Track spacing.

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Until there are four guides.

Select the <u>Draw Circle</u> vector tool.



Create the four bolt head pocket circles $\frac{3}{4}$ " in from each corner.

Draw Circle					
Center Point					
⊙ X: .75 Y: .75					
O Radius					
D: 0.80 inches					
To edit an existing shape hold shift while selecting					
Create Close					

Then create the thru holes for the bolt shaft.

Draw Circle
Center Point
• X: 0.75 Y: .75
🗟 🔿 Radius 💿 Diameter
D: 0.28 inches
To edit an existing shape hold shift while selecting
Create Close

It should look like this.



Select the bolt head circles and move them to a new layer.



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Add New Layer	
Layer Name	BoltHeadHoles
Drawing Color	—
New Layer is Visi New Layer is Act	ble 🗹 ive 🗆 🕞
ОК	Cancel

Create a new circle for the through holes in the spoil board. Place it $\frac{3}{4}$ " from the edge and above the lower left bolt head pocket.

Draw Circle
Center Point
• X: .75 Y: 1.5
Radius
D: 0.28 inches
To edit an existing shape hold shift while selecting
Create Close
l



With it selected, click on the array copy tool.



Array Copy
Selected Objects Size
X: 0.28 Y: 0.28
Rows (Y) 13 Columns (X) 15
Spacing Gap Gap X: Y: T
Symmetry
Row/Column Displacement
X: 0.0 Y: 0.0
Group Copies
Copy

Copy and paste a part of a row between the corner bolt head holes.



Copy and paste.



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Select every third row and delete those holes with no T-Track slot beneath them.



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\bigcirc	0	0	0	0	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0	0	0	0
O	0	0	0	0	0	0	0	0	0	0	\bigcirc
0	0	0	0	0	0	0	0	0	0	0	O
Ó	0	0	0	0	0	0	$^{\circ}$	0	0	0	\bigcirc
O	0	0	0	0	0	0	0	0	0	0	O
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
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PoltHoles ▼

 Image: BoltHoles
 Image: BoltHoles

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Click the light bulb next to the BoltHeadHoles to show just the thru holes that we will be drilling.

Select all the thru holes and move them to a layer of their own by renaming the default layer or by moving to a new layer.



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φ	0	0	Ó	Ó	0	Ō	Ó	0	Ó	Ó	φ
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With all the thru holes selected, open the toolpaths tab and select the drill toolpath.



In that dialog select the Tool to use and set according.

Tool Database		
Tool List		
Imperial Took	Tool Info	
End Mills	Name End Mill Upcut(0.25 inch	1)
End Mill (0, 125 inch)		-
- End Mill Upcut(0.25 inch)	Tool Type End Mill	\sim
- End Mill Downcut (0.25 inch)	Notes	
End Mill (0.5 inch)		
Ball Nose		
		100
	Geometry	
Ball Nose (0.25 inch)	Diameter (D) 0.25	inches 🗸
Ball Nose (0.5 inch)		
		SUR.
V-Bit (60 deg 0.25)		1919
V-Bit (90 deg 0.3)	Cutting Parameters	Cab
Form Tools	Pass Depth 0.125	inches ←D→
Opee - 1/4" Rads 1 1/4" Dia 1		
Roundover - 3/8" Rad 1" Dia	Stepover 0.125	inches 50.0 🐺 %
Engraving		
📕 Engrave (20' 0.02" Tip Dia)		
	Feeds and Speeds	
Diamond Drag (90 deg 0.020		
⊡ ··] ↓ Drills	Spindle Speed 15000	r.p.m
- Drill (0.250")	Feed Rate 40.0	inches/min 🗸
- Metric Tools	Plunce Pate 10.0	inches/min
End Mills	Flange Nate	indicajinin
< >>	Tool Number	Apply
New Copy Delete		
New Group Import Export		6
new ordap		OK Cancel

Drilling Toolpath						
Cutting Depths						
Start Depth (D) 0.0 inches						
Cut Depth (C) 0.38 inches						
Tool: End Mill Upcut(0.25 inch)						
Select Edit						
Use Peck Drilling						
Retract above the cutting start depth						
Retract above the height of the previous pass						
Retract Gap (R) 0.1 inches						
Peck Depth (P) 0.125 inches						
Note: Peck depth is controlled by the 'Pass Depth' for the tool						
Dwell at the bottom of each drill pass						
Use Vector Selection Order						
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50						
Project toolpath onto 3D model						
Vector Selection: Manual Selector						
Name: DrillBoltHoles						
Calculate						

Click the Calculate button.

In the Layers section, click the light bulbs so just the "BoltHeadHoles" are now visible.



With all the bolt head pockets selected, open the toolpaths tab and select the pocket toolpath.



Set the tool to the same as the one in the drilling toolpath.

Pocket Toolpath
Cutting Depths 0.0 inches Start Depth (D) 0.0 inches Cut Depth (C) 0.25 inches Show advanced toolpath options
Tool: End Mill Upcut(0.25 inch) Select Edit
Clear Pocket Offset Raster Cut Direction Climb Cut Direction
Raster Angle 0.0 degrees Profile Pass Last
Ramp Plunge Moves Distance 1.0
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50
Name: BoltHead Calculate Close

Click the Calculate button.

We need to now add a rectangle slightly larger than the spoil board. This is necessary to get the spoil board corners cut to the same level as the rest of the board. The software will not cut outside the bounds of the materials size without us making a larger target.

Make a rectangle slightly smaller than the project size. Move the rectangle to a new layer and turn off the visibility of all other objects. Select the rectangle and size it to fit half an inch over all the sides of the work piece.



Draw Rectangle
Anchor Point O
X: 6.0 Y: 6.0
Corner Type
Square
O Radiused External
Radiused Internal
Radius 0.0 inches
Size
Width (X) 12.5 inches
Height (Y) 12.5 inches
To edit an existing shape hold shift while selecting
Apply Close



We are ready to make a new toolpath for the spoil board cut. This will depend on what cutter you purchase. I am using the <u>WhiteSide 6210</u> which is available around the mid \$35 level or better.



With the rectangle around the project piece selected we are going to create a new pocket toolpath.



I call it the mowing the grass toolpath. Adjust the cut depth as necessary. Running this file multiple times is preferable to taking big swings to level the spoillboard.



Now its time to create the G-Code for the three different toolpaths. Since two of them use the same tool, they can be combined.

Select the two toolpaths, DrillBoltHoles and BoltHead and get ready to export the G-Code files.



Toolpaths	Р
Save Toolpaths	
Output all visible toolpaths to one file Output Tiled Toolpaths Add side to toolpath name	
Toolpaths to be saved DrillBoltHoles [1] End Mill Upcut(0.25 inch) BoltHead [1] End Mill Upcut(0.25 inch)	<
Post Processor	-
CNCPiranha-Arcs (inch) (*.tap)	~
Output direct to machine Driver: Save Toolpath(s)	
Close	
Toolpaths	Ļ
DrillBoltHoles DrillBoltHoles DrillBoltHead SpoilBoardPass	

Remember to select the Post Processor for your machine.

Deselect the "DrillBoltHoles" and "BoltHead" toolpaths and export the G-Code file for spoil board pass.

Save Toolpaths
Output all visible toolpaths to one file Output Tiled Toolpaths Add side to toolpath name
Toolpaths to be saved SpoilBoardPass [2] SpoilBoard (1 inch)
V Post Processor
CNCPiranha-Arcs (inch) (*.tap) \lor
Output direct to machine Driver:
Save Toolpath(s)
Close
Toolpaths
·····

Cam Levers Project

Create a new project with the thickness of your plywood. Its good to take an average of the board on all sides and use that as the thickness.

dol 🤿	Setup
Job Type	Single Sided
171	O Double Sided
	ORotary
Job Size	
I	Z vidth (X): 12.0 inches
//×	Height (Y): 12.0 inches
/~T	hickness (Z): 0.3625 inches
Units (inches Omm
XY Datum	Position
, –	• Y: 0.0
Modeling Ver	Resolution v High (7 x Slower)
4 m	illion points
M N	DF v
	5olid Color:
ОК	Cancel

The first step is to create circles of the size 1.5" diameter.



Then we need to more circles on the same center point of .28 (a little larger than the bolt shaft) and one a little larger .78 than the bolt head.

Draw Circle
Center Point
• X: 3.2039 Y: 6.7647
🖸 🔿 Radius 💿 Diameter
D: .28 inches
To edit an existing shape hold shift while selecting
Create

Draw Circle
Center Point
() X: 3.2039 Y: 6.7647
💿 🔿 Radius 💿 Diameter
D: 0.79 inches
To edit an existing shape hold shift while selecting
Create Close

To where we have something that starts to resemble a bullseye.



Select the inner two circles. This will be the bolt head pocket and the bolt shaft thru hole.



Using the keyboard arrow keys move it halfway to the edge.



That will give us the eccentricity for the cam and give approximately half and inch of travel.

We need to have the bolt thru hole the same on the top and bottom of the cam head, so we want to copy and paste this now. Delete the bolt head circle from one.





Zoom in to the handle and make sure all vectors are closed.

Select the handle and move over the cam about three quarters to one side.





Time to draw the cam handle and it starts with the <u>polyline</u> tool.



Select the Trim tool.



Cut the over lapping lines away. Verify there are no open vectors.

Select the filet tool.

Star Star Star Star Star Star Star Star
Fillet - create fillets between spans
·
Offset and Layout
Create Fillets
Fillet / Tool Radius: 0.2 inches
Click on an angled corner to change corner into a circular fillet
Fillet Type
Ormal fillet
🔿 'Dog-Bone' Fillet
These fillets are used for creating clearance in internal corners to allow slotted pieces to fit together.
○ 'T-Bone' Fillet
These fillets are used for creating dearance in internal corners when the slot is the same size as the tool
🔿 'Plasma/Drag Knife' Fillet
These external fillets are used for machining past a corner when using plasma tools or drag knives
Removing Fillets
To remove a fillet, day on the fillet arc.
Close

Set the radius to half the length of the end of the handle.

Click on the inside of any of the corners you want to smooth out.

Select the cam handle and all internal circles to cut/paste them as a copy. Using the keyboard arrows move it away from the original one. Same with the lower half of the cam handle.



Using the Rotate Selected Objects transform, flip them so they appear as so.





Select the outside edges.



Move them to a new layer.



When we are done, each part will have its own layer to make it easy to select the objects for a toolpath. There will be three for this project.

Ø	ayer 1 🕶	_
<u></u>	♀ ■ Layer 1 ♀ ● OutSideCut ♀ ● ThruHole ♀ ● BoltHeadpocket	
	Add New Layer	

Select all the items and paste them repeatedly until we fill the work piece. Once you have three at the top, you can select them and paste them on the lower half of the job.



Using the lightbulb control in the layer's menu, show just the Thru Holes.





Select them all and add a Drilling Toolpath from the Toolpath menu.



Toolpaths 😽 🕈
Drilling Toolpath
Start Depth (D) 0.0 inches Cut Depth (C) 0.365 inches
Tool: End Mill Upcut(0.25 inch)
Use Peck Drilling
Retract above the cutting start depth Retract above the height of the previous pass
Retract Gap (R) 0.1 inches Peck Depth (P) 0.125 inches Note: Peck depth is controlled by the 'Pass Depth' for the tool
Dwell at the bottom of each drill pass
Use Vector Selection Order
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50 Project toolpath onto 3D model
Vector Selection: Manual Selector
Name: ThruHoles
Calculate Close

Click the Calculate button.

Select the "OutSideCut" layer and de-select the others.

6	DutSideCut 🗸	
	♥ ● OutSideCut ♥ ● ThruHole ♥ ● BoltHeadpocket	
	Add New Layer	

Selecting the outside of the objects we want to cut out in the project we create a Profile Toolpath.



Set the tool you want to use to cut out the cams and cam spacers.

Toolpaths 📑 🕈
2D Profile Toolpath
Cutting Depths Start Depth (D) 0.0 inches Cut Depth (C) 0.365 inches
Show advanced toolpath options
Tool: End Mill Upcut(0.25 inch) Select Edit
Machine Vectors Outside / Right Inside / Left On Direction Olimb Cimb
Ramp Plunge Moves Distance 4.0
Add tabs to toolpath
Length 0.2 inches
Thickness 0.05 inches
Edit Tabs
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50
Name: OutSideCut
Calculate

Then set the tabs.

🍫 Toolpath Tabs
Add Tabs
Constant Number
O Constant distance between tabs
Distance 8.0 inches
Min. number 1
Max. number 10 🌲
First tab at machining start point Add Tabs
Interactive tab entry Add Tab - Click on a selected vector to insert a tab at the cursor position.
Delete Existing Tab - Click on it.
Move Tab - Click on it and drag it to the new position with the button pressed
Select or Deselect Vector - Press Shift key while dicking on the vector
Delete All Tabs
Close

Adjust the tabs and run a preview to make sure you have enough meat to hold them through cutting.

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$\sum_{i=1}^{n}$		



The last Toolpath to create is the bolt head pockets.

Select the layer only for the bolt hole heads and select them all. Then create a Pocket Toolpath.

Toolpaths	÷ 🛃
Material Setup Set Z 0 0.2" Home Pos: X:0.0 Y:0.0 Z:0.5 Toolpath Operations	XY Datum X: 0.0 Y: 0.0
Pocket Toolpath	
Toolpaths ThrouHoles OutSideCut	1 ↓

Pocket To	olpath			
Cutting Depths Start Depth Cut Depth	h (D) (C) d toolp a	0.0 0.225 ath op	tion	inches inches s
Tool: End Mill (0 Passes: 5	. 125 inch Select . Ec) dit Pass	E es	dit
Use Larger Are	e a Clear Ilear tool Select I Ed	ance 1 lit Pass	E E	dit
Clear Pocket Offset O Cut Cut Cut Cut Cut Cut Cut Cut Cut Cut	Raster Direction Climb Conven 0.0 Last	n tional degre	es	~
Pocket Allowance 0.0 inches				
Use Vector Selection Order				
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50 Project toolpath onto 3D model Vector Selection: Manual Selector Name: BoltHeads				
Calculate				Close

Set the options and then click the Calculate button.

Time to save the Toolpaths and export the G-Code to a file.

Toolpaths	4
Material Setup	m
Set Z 0 10.3625 X: 0.0	
Home Pos: X:0.0 Y:0.0 2:0.5 Y: 0.0	
Toolpath Operations	
Save Toolpat	:h
✓ Toolpaths	Ť
dutSideCut	
Save Toolpaths	
Output all visible toolpaths to one file	
Output Tiled Toolpaths	
Add side to toolpath name	
Toolpaths to be saved	
ThruHoles [1] End Mill Upcut(0.25 inch)	
BoltHeadPockets [1] End Mill Upcut(0.25 inch)	
OutSideCut [1] End Mill Upcut(0.25 inch)	
~	
Post Processor	
Output direct to machine	
Driver:	
Save Toolpath(s)	
Close	
✓ Toolpaths	

Since all the toolpaths use the same tool, we can run the G-Code in one file. The order is important and it's a good habit to get the stuff inside done before the cuts with the tabs. You can edit the order with the arrow tool pointed at by the big red arrow.

Cam Plates Project

Create a new project with the thickness of your plywood. It's good to take an average of the board on all sides and use that as the thickness.

🦐 Job Setup
Job Type Single Sided
Job Size Width (X): 12.0 inches Y Height (Y): 12.0 inches Thickness (Z): 0.3625 inches Units (inches) mm
Z Zero Position Material Surface Machine Bed
XY Datum Position Use Offset X: 0.0 Y: 0.0
Modeling Resolution Very High (7 x Slower) 4 million points Appearance Image: Solid Color:
OK Cancel

We are going to be making a template for the both cam plates, the fixed and those that fit the cam lever and spacer.



It will look like a bullseye when completed.



Why you are constructing these you might want to take advantage of the hot keys for setting the size.



Also turning on Grid Snapping can make this much easier.





These are the sizes I used. Remember you can use the mouse wheel to zoom in and out to see more detail.

Copy and past a copy of the "bullseye" and place it well away of the original. Using the arrows keys to do this is something I like to do.



The inner two circles are for the bolt shaft and the bolt head. The others are the template so we can see just what the offset of the plates is in design. Move them to a new layer.



Let's move the inner two circles to a new layer of their own to assist in selection later.



I will have four layers when done. The outside profile cut, the bolt head pocket, the thru hole, and the inside cut for the plate that is used with the cam layer.

Using the polyline tool, we will create the outside dimensions of the plates.



Draw the ruff shape of the static plate, then use the node edit mode to fine tune the positions. You should have 1/4" incremental sides.



We can now delete the unused circles outside of the bolt head circle on the first bullseye.

On the second, we can select the inner circles out to the 1.5" diameter and delete them.





Use the polyline tool as before and then the node edit mode to fine tune the shape.

Edit the 1.5" circle to something slightly larger to allow it to fit over the cam spacer. 1.51" for me. We can sand a bit if its too tight.

Draw Circle		
Center Point		
• X: 2.75 Y: 5	.7787	
🖸 🔿 Radius 💿	Diameter	
D: 1.51 inches	;	
To edit an existing shape hold shift while selecting		
Apply	Close	

Delete all the unused circles outside the 1.51" hole.

Use the fillet tool to ease all the outside edges. I used .25".



Cut and paste the objects until you fill the work piece. I flipped the static cam plates and move the bolt head and bolt shaft holes to the opposite side before I copied to give more variety in spacing. The Cam plates can be always flipped so no reason to mess with those.



Select just the "OutSideCuts" layer.



Select the Profile Toolpath operation form the Tool Path tab and set the desired settings for the outside cuts.

Toolpaths		
2D Profile Toolpath		
Cutting Depths Start Depth (D) 0.0 Cut Depth (C) 0.365 Show advanced toolpath options		
Tool: End Mill Upcut(0.25 inch) Select Edit		
Passes: 3 Edit Passes		
Machine Vectors Outside / Right Inside / Left On Direction Climb Conventional Allowance offset 0.0 inches		
Do Separate Last Pass		
Allowance (A) 0.0 inches		
Add tabs to toolpath		
Length 0.2 inches		
Thickness 0.07 inches		
Git Tabs		
Ramp Leads Order Start At Corners		
Add ramps to toolpath Type Smooth Zig Zag Spiral		
Specify Ramp Ramp on Lead In		
Distance 4.0 inches		
Angle 20.0 degrees		
Distance 4.0 inches		
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50		
Vector Selection: Manual Selector		
Name: OutsideCuts		
Calculate		
Close		

Click the Edit Tabs button and add and move the tabs so they make sense and for safety.



Select just the bolt head layer, select the bolt head circles and create a pocket toolpath for those.

Toolpaths 📑 🗧		
Pocket Toolpath		
Start Depth (D) 0.0 inches Cut Depth (C) 0.2 inches		
Show advanced toolpath options		
Tool: End Mill Upcut(0.25 inch) Select Edit		
Passes: 2 Edit Passes		
Use Larger Area Clearance Tool Not using area clear tool Select Edit		
Passes: 0 Edit Passes		
Offset • Raster Offset • Raster Cut Direction • Climb O Climb • Conventional Raster Angle • 0.0 degrees Profile Pass Last		
Pocket Allowance 0.0 inches		
Ramp Plunge Moves Distance 1.0		
Use Vector Selection Order		
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50		
Vector Selection: Manual Selector		
Name: BoltHeadPocket		
Calculate		

Select just the inside cuts layer and create a profile tool path for the cam plates.

Toolpaths 📑		
2D Profile Toolpath		
Cutting Depths 0.0 inches Start Depth (D) 0.0 inches Cut Depth (C) 0.365 inches Show advanced toolpath options		
Tool: End Mill Upcut(0.25 inch) Select Edit		
Machine Vectors Outside / Right Inside / Left On		
Direction Olimb Conventional		
Distance 4.0 inches		
Add tabs to toolpath		
Length 0.2 inches		
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50		
Name: InsideCuts		
Close		

The last toolpath we need is the for the bolt shaft. Select hold the bolt shaft layer and select those circles.

Create a Drilling Toolpath for them.

Toolpaths 📑 🕈		
Drilling Toolpath		
Start Depth (D) 0.0 inches Cut Depth (C) 0.365 inches		
Tool: End Mill Upcut(0.25 inch) Select Edit		
✓ Use Peck Drilling ○ Retract above the cutting start depth ○ Retract above the height of the previous pass Retract Gap (R) 0.1 Inches Peck Depth (P) 0.125 inches Note: Peck depth is controlled by the 'Pars Depth' for the trail		
Dwell at the bottom of each drill pass Dwell Time 0.05 seconds Use Vector Selection Order		
Safe Z 0.2 inches Home Position X:0.00 Y:0.00 Z:0.50 Project toolpath onto 3D model Vector Selection: Manual Selector		
Name: ThruHoles Calculate Close		

Now its time to export the G-Code to the .tab files for your machine.

Toolpaths	[🖓 Ф
Save Toolpaths	
Output all visible toolpaths to one file Output Tiled Toolpaths Add side to toolpath name	
Toolpaths to be saved ThruHoles [1] End Mill Upcut(0.25 inch) InsideCuts [1] End Mill Upcut(0.25 inch) BoltHeadPocket [1] End Mill Upcut(0.25 inch) OutsideCuts [1] End Mill Upcut(0.25 inch)	^
Post Processor	_
CNCPiranha-Laser (inch) (*.tap)	\sim
Output direct to machine Driver:	
Save Toolpath(s)	
Clos	e
✓ Toolpaths	ſ

As always select the correct post processor and select the toolpath order as all these toolpaths can be cut at the same time. I like to go from inside to outside when using tabs. About the Contributor:

David White is a weekend CNC and a computer programmer/financial technology analysist during the week. You can find him hanging out around the Woodcraft store in Clearwater Florida occasionally. The best way to contact him is through his email at:

superdavewhite@outlook.com.



Hurricane bolts are a low-profile clamp when getting started.



A piece of flat bar also can become a handy clamp on the Piranha to cut to the front of the bed.





Another quick way for a low-profile hold down while cutting a spoil board to the front of the T-Track.



A fly cutter with an inexpensive dial gauge makes a good way to tram your router for perfect cuts. When you surface the spoil board, if you have a scallop pattern, you might want to get some shim material and tune the routers mounting.



Time to clean up one I had been using with the spoil board cutter and get it flat as West Texas.



Using the cams on the far side or the deep side of the beds is better, so tools don't hit the cam levers. Oh, you live and learn.









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