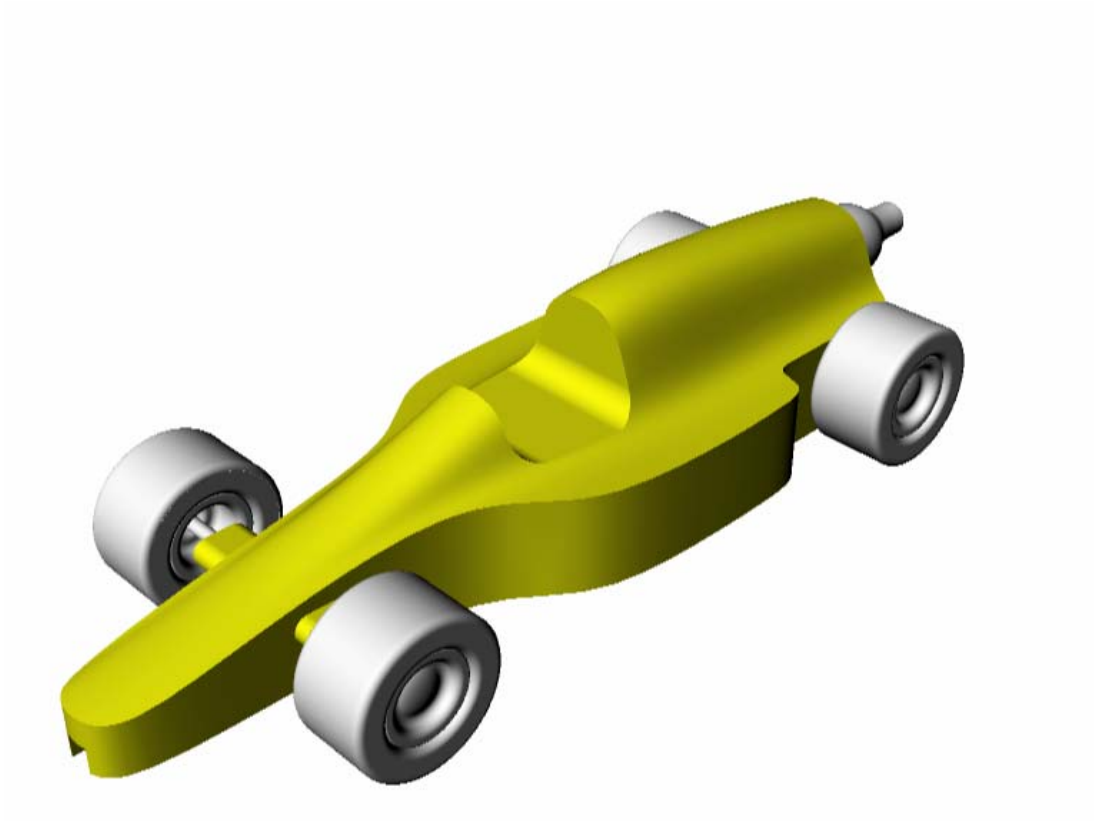


Machining a Racecar on the Roland MDX 40



Tool Paths... Modela Player 4

Racecar machined on... Roland MDX-40

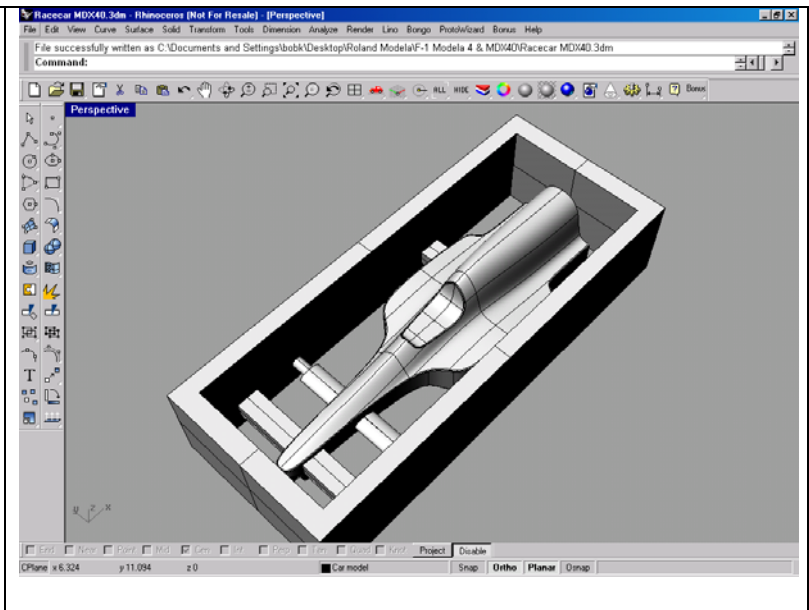
F-1 Racecar model... Rhinoceros

Machining the Racecar with Modela Player 4 on the Roland MDX-40

Rhino to Modela 4:

In Rhino, open the model:
Racecar mdx40.3dm

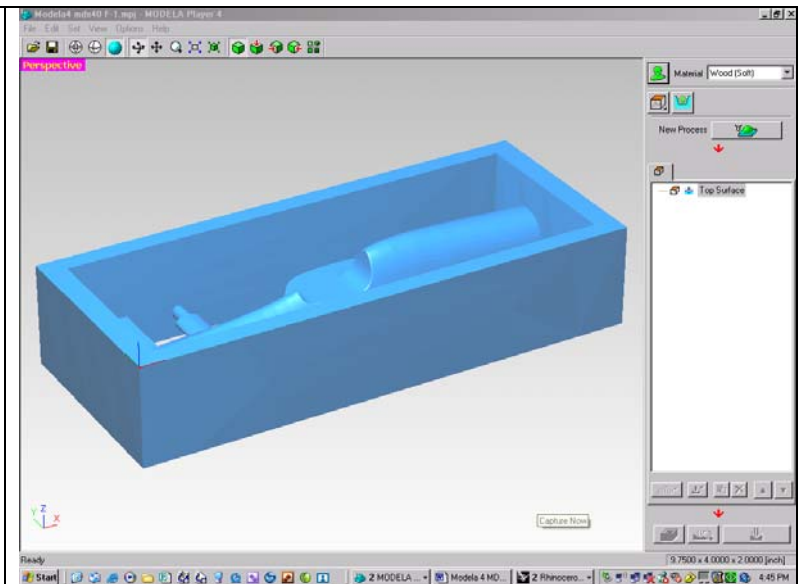
- 1 Select the model.
- 2 Export as an stl file type. 'Save as type:' stereolithography (.stl).
- 3 Name the file: Bottom-mdx40.stl









Modela Player 4


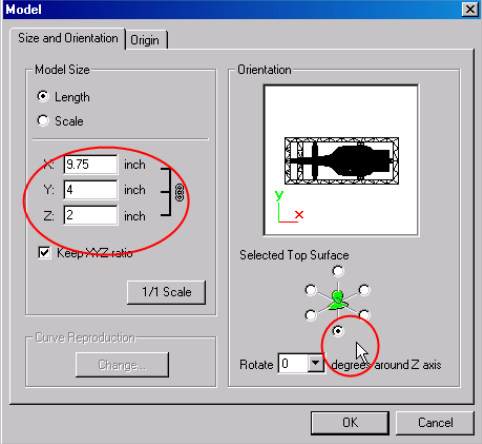
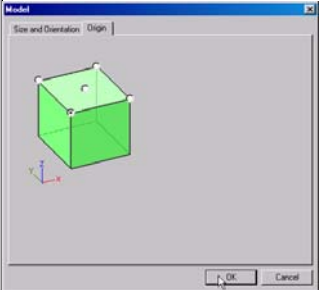



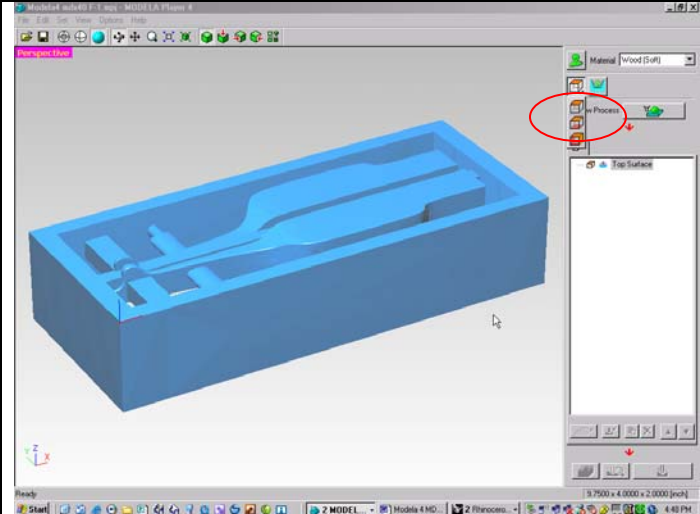
- 1 Open the model Bottom-mdx40.stl (File of type: stl files)
- 2 Save the model Bottom-mdx40.mpj
- 3 As you add the tool path processes to the model, remember to save. Save often.
- 4 There are different ways to approach the machining of this model. This is created as two different models; the bottom and the top.
- 5 Drilling for the axles and the CO2 cartridge can be done before or after machining. However, since it is easier to secure a 'square' block, it is probably better to do this machining before machining the car on the MDX 40.



Processes:	Details:
Model Button → 	>Set finished size. Set the Origin.
Cutting Surfaces Button → 	>Select number of surfaces to machine.
Modeling Form Button → 	>Set the depth and the cutting area
New Process Button → 	>Create tool paths: One Roughing & One Finishing
Preview Button → 	>Create a tool path simulation & cutting time est.
Cut Button → 	>Sends the file to the MDX40 and begins cutting.

Machining the Racecar Bottom... 2 tool paths; Roughing & Finishing

<p>Model Button:</p>  <p>Model Size: 9.75x4x2</p> <p>Orientation: Select the Bottom. (See red circle at the right)</p> <p>Origin: Set as shown: see Origin dialogue box at right.</p>		
---	---	--

<p>Cutting Surfaces Button:</p>  <p>Select One side machining. Bottom will be machined first.</p>	
---	--

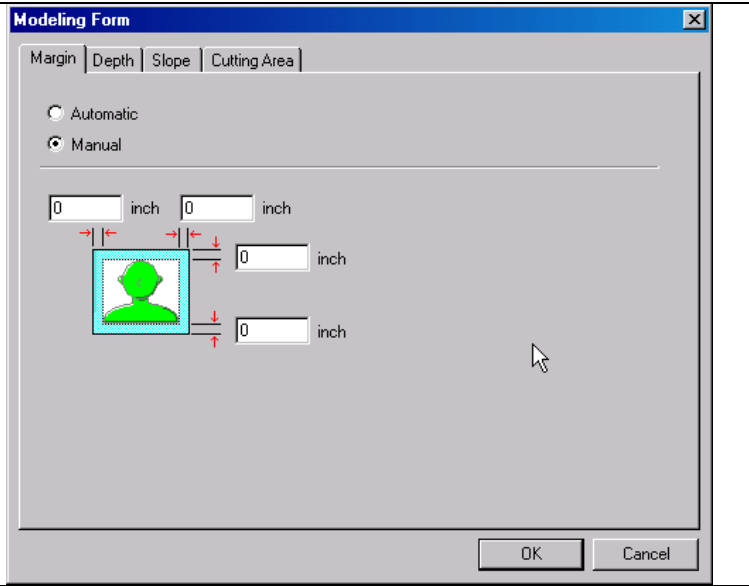
Modeling Form Button:



Margin is set to Zero.

Set the Depth. (see below)

Select the Cutting Area. (see below)



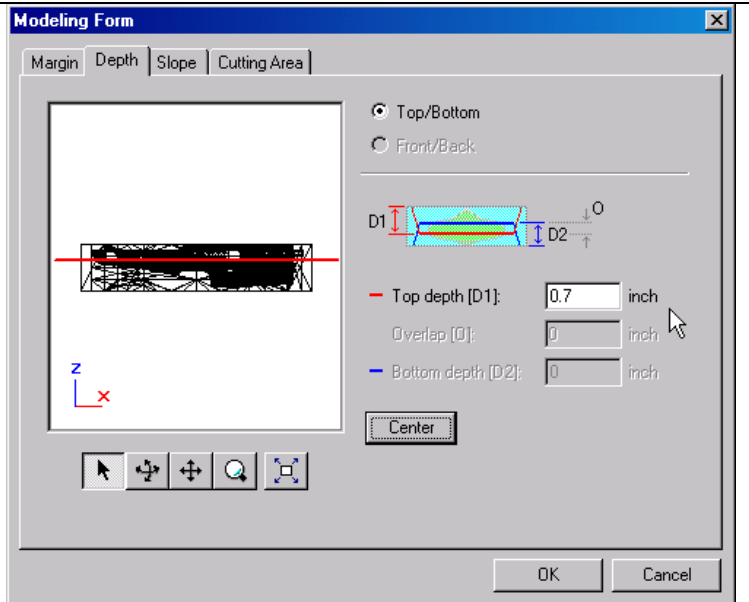
Depth:

Set depth to .7 inch

Open up the original Rhino model and look at the front view (Racecar MDX40.3dm). Turn on the 'depth dimension' layer and you will see the numbers .51 (bottom) and 1.49 (top). Add the tool radius (.125) and then put in another .1 to ensure the tool will cut through and past the 'top side' tool path.

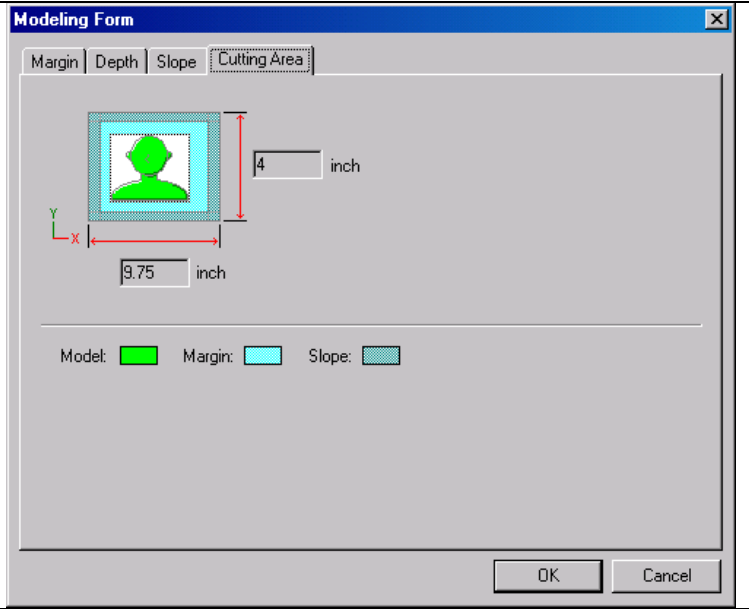
Summary:

$.51 + .125 = .635$. $.635$ will probably work, but we chose $.7$ to make sure it will cut deep enough. Creative math eh?



Cutting area:

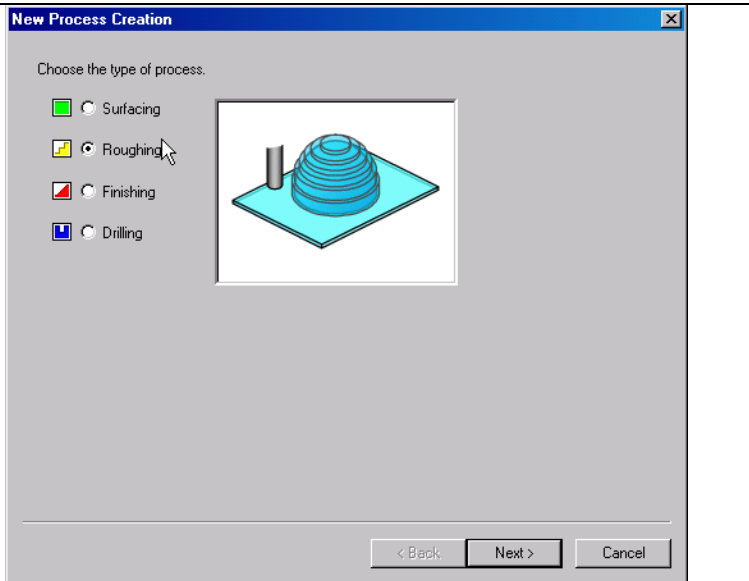
9.75 x 4 will be displayed here. If it is not, go back to the Model button and set the size correctly.



New Process Button:



Select Roughing
Select Next



Select Next

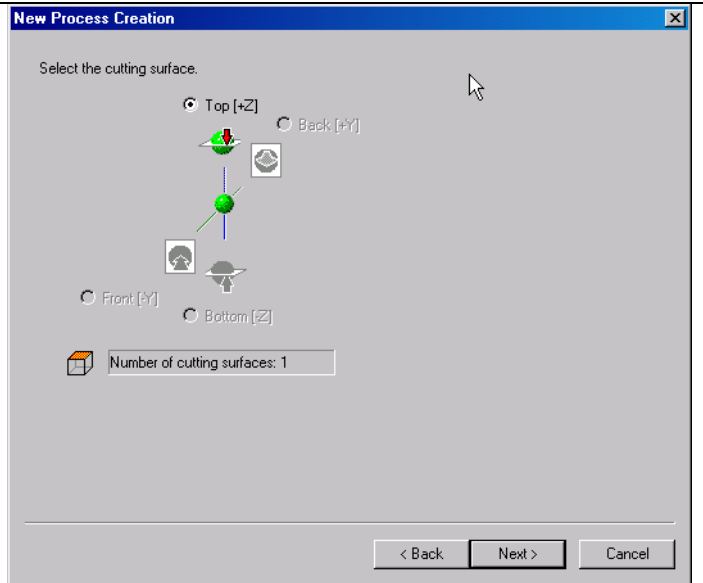
Notice that Top is selected as the cutting surface. This will always be the cutting surface when one cutting surface is selected.

Do not be confused.

1 We selected the bottom of our car as the single surface that will be machined.



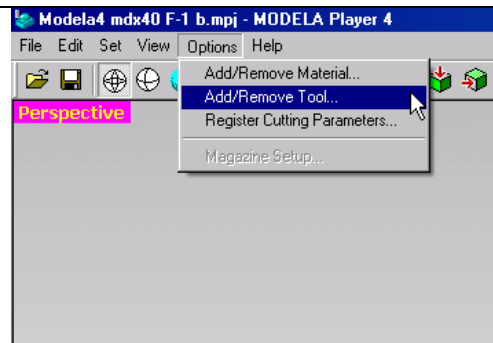
2 Even though the image at the right indicates the 'Top', it is really the bottom of our car model.



Create a New tool:

We will use a .25" diameter Ball End Mill. You will need to add this tool to the Modela 4 tool list.

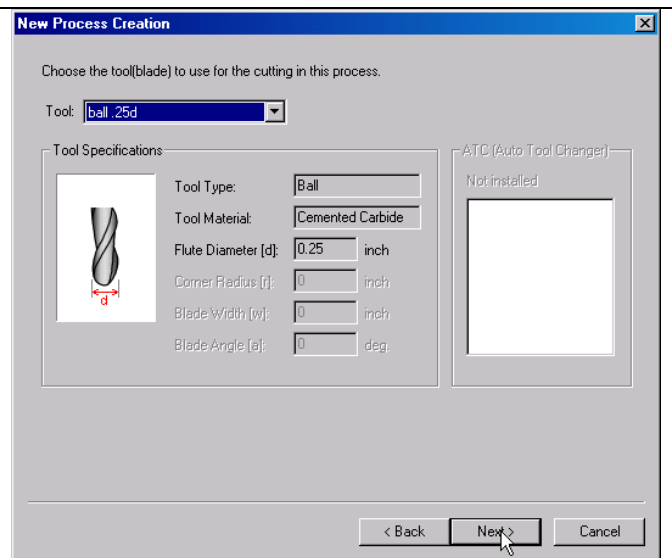
The 'Add/Remove Tool' dialogue box will walk you through the process.



Select the tool:

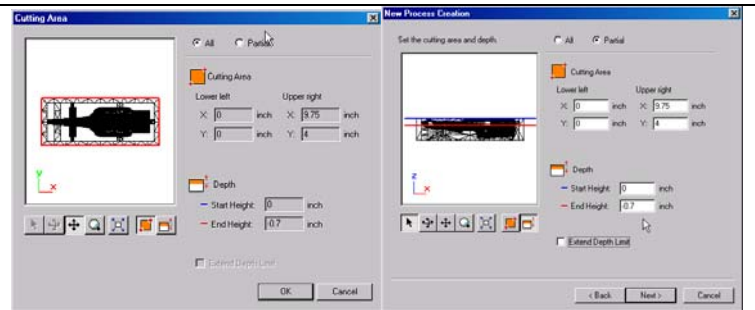
If you have successfully added the tool to the list, it will now be available to you.

Select the .25 diameter ball tool.
Select Next



Cutting area and Depth:

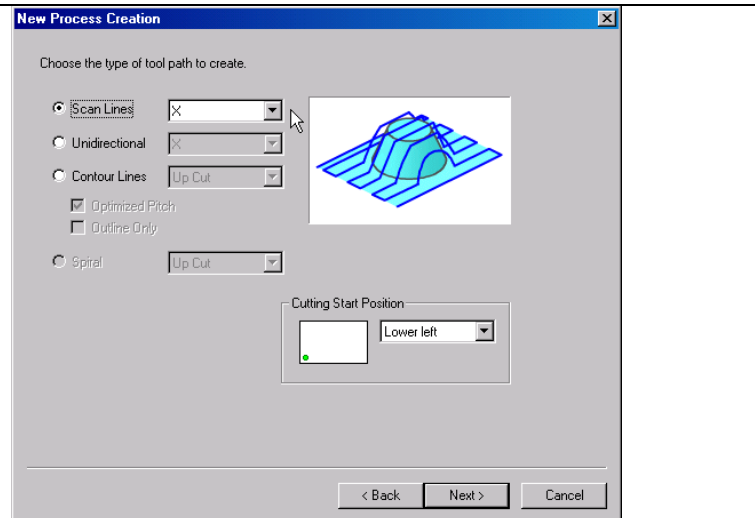
Select All
Select Partial
Start height 0
End height -0.7 (depth)
Select Next



Tool Path creation:

Select Scan Lines X
Select Next

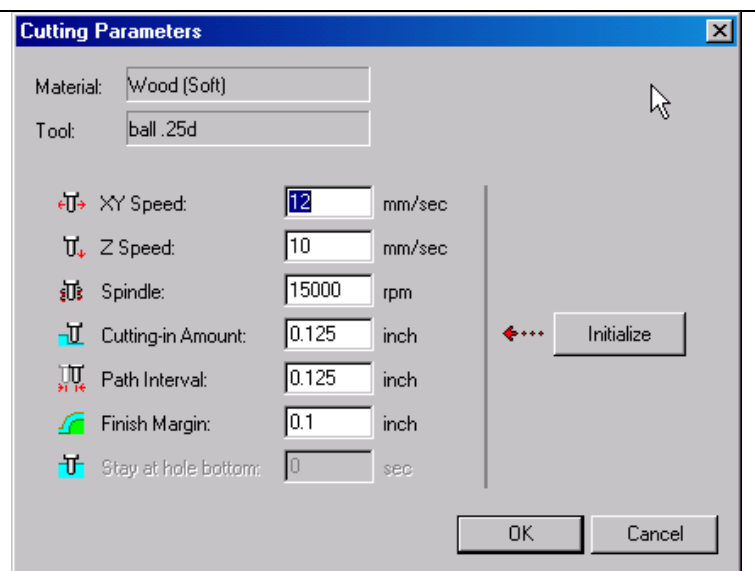
There are other types of tool paths that can be used. Experiment with different tool path methods at another time.



Cutting Parameters:

Set the parameters: as you see them listed at the right.
Select Next

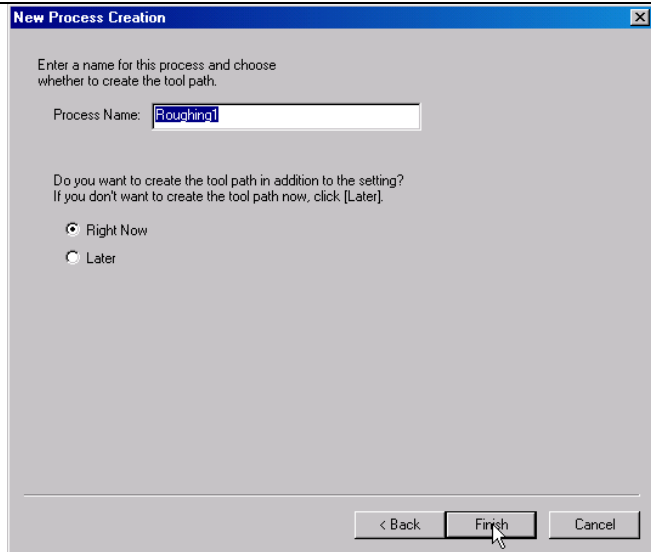
These settings work well in balsa with the .25 ball mill. Before changing settings, see how these work for you. Then consider editing the feed rates and the cutting speeds.



Process Name:

Select Right Now.
Select Next

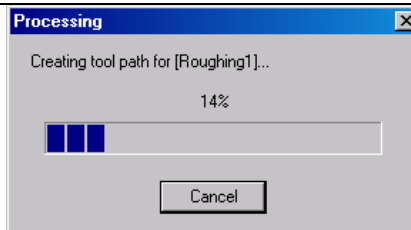
Some tool paths take time to generate.
If time is an issue, select later and create
the tool paths when time allows.



Create Tool Path Button:

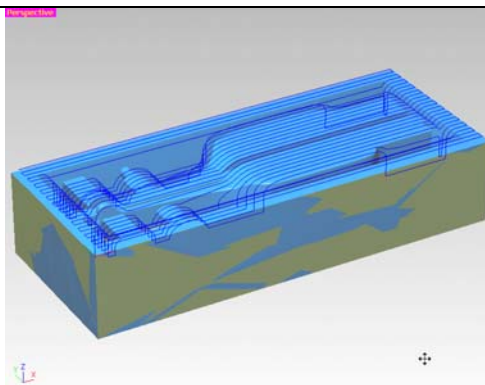


When changes are made to any of the
parameters, new tool paths must be
generated.



Screen capture of model:

Tool path scanlines will display after the
tool path is generated.

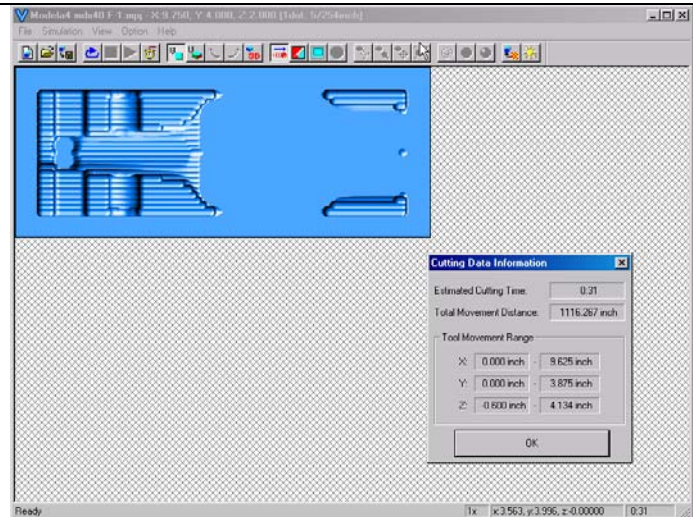


Preview Cutting button:



Creates a 2d or 3d simulation of the tool path.

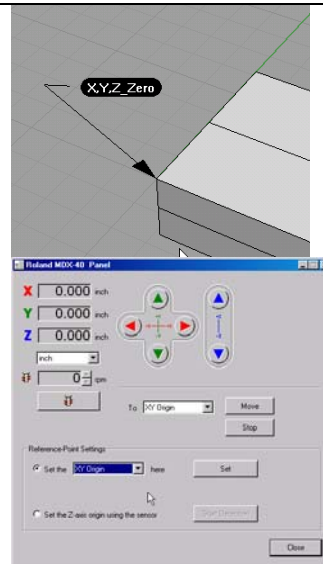
Estimates the time of cutting based on the parameters chosen.




MDX40 control panel:

Set the X,Y origin so it is at the left hand corner of the model. Set the Z origin at the top surface of the model.

- 1 Touch off at the top of the block. This is Z zero. Set the Z origin here. This is Z zero on our block.
- 2 Touch off at the front edge of the block. Set the Y zero origin here. The counter will read Y 0.000. Using the green arrow keys, move Y so it reads .125". Set the Y Origin here. This is Y origin on our block.
- 3 Touch off at the left edge of the block. Set the X zero origin here. The counter will read X 0.000. Using the red arrow keys, move X so it reads .125". Set the X Origin here. This is the X origin on our block.



Cut Button:

Highlight the Roughing toolpath and select the Cut/NoCut button  so this tool path file will be sent to the MDX40. This is button that controls which tool path is or is not sent to the machine.

- 1 Block ready to be cut.
- 2 The completed Roughing cut.



Ready to cut.

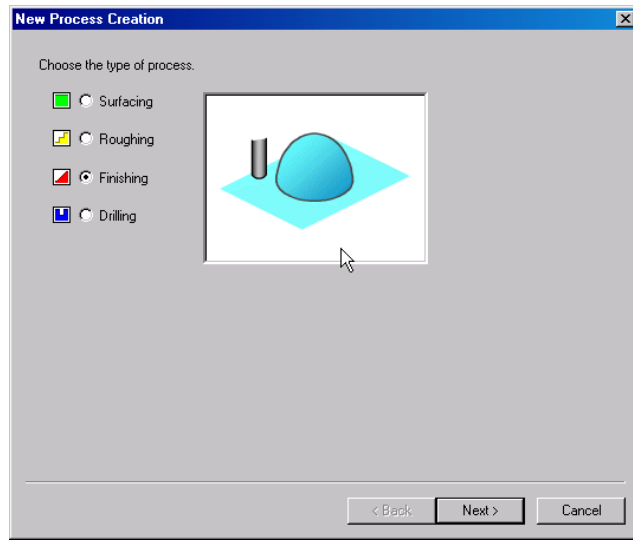


Completed Roughing

New Process Button:



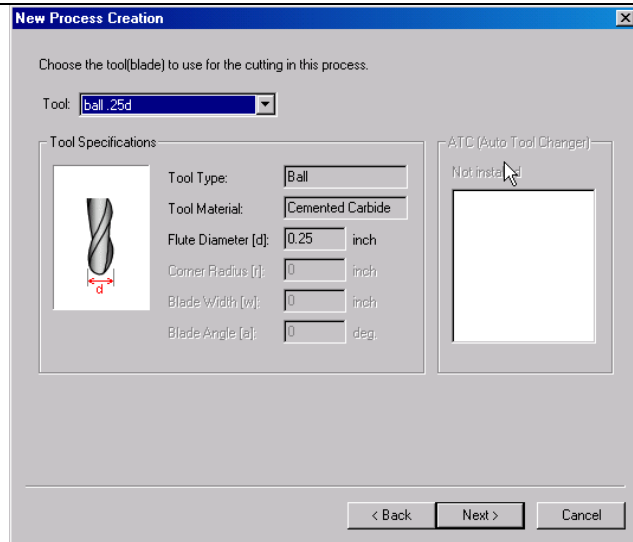
Select Finishing
Select Next



Select the tool:

Use the same tool. .25 dia ball mill.

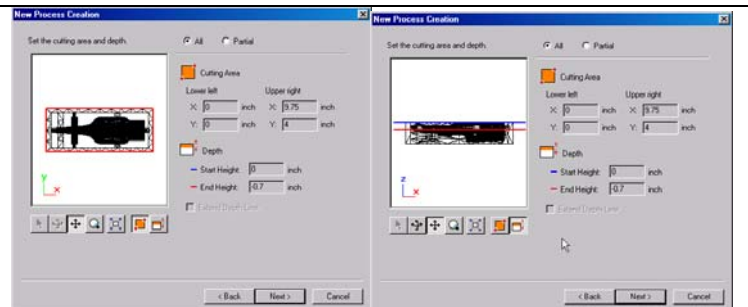
Select Next



Cutting area and Depth:

Same settings as roughing.

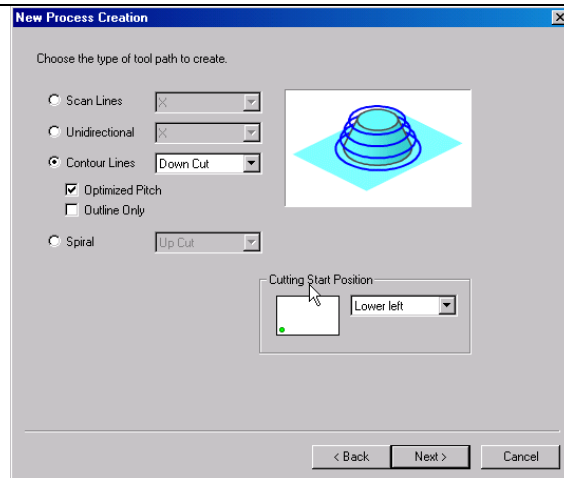
Select next



Tool Path creation:

Select Contour Lines: Down Cut
Select Next

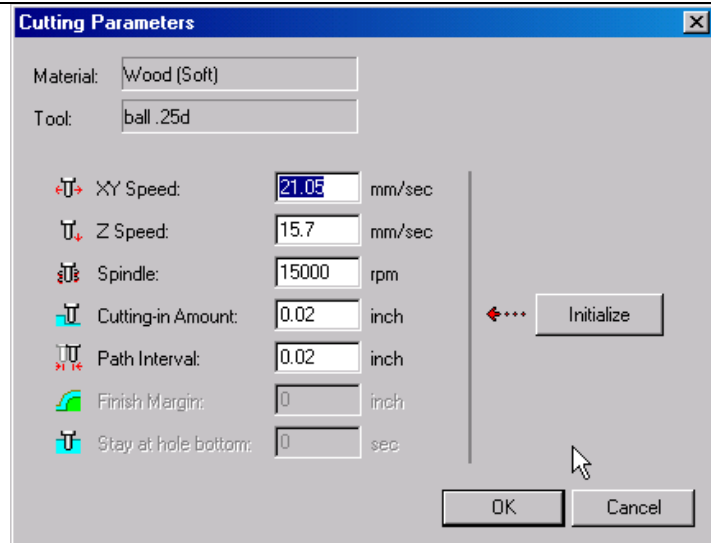
There are other types of tool paths that can be used. Experiment with different methods at another time.



Cutting Parameters:

Set the parameters: as you see them listed at the right.
Select Next

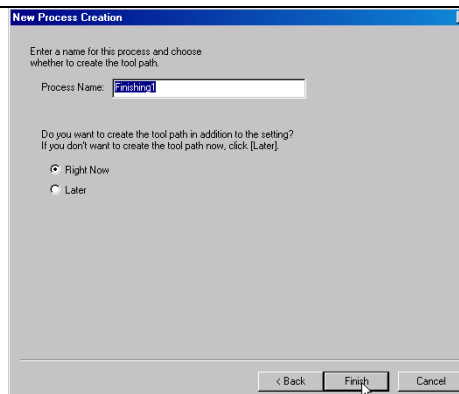
These settings selected work well in balsa with the .25 ball mill.



Process Name:

Select Right Now.
Select Next

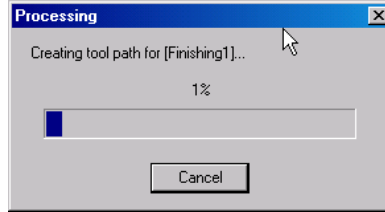
Some tool paths take time to generate. If time is an issue, select later and create the tool paths when time allows.



Create Tool Path Button:

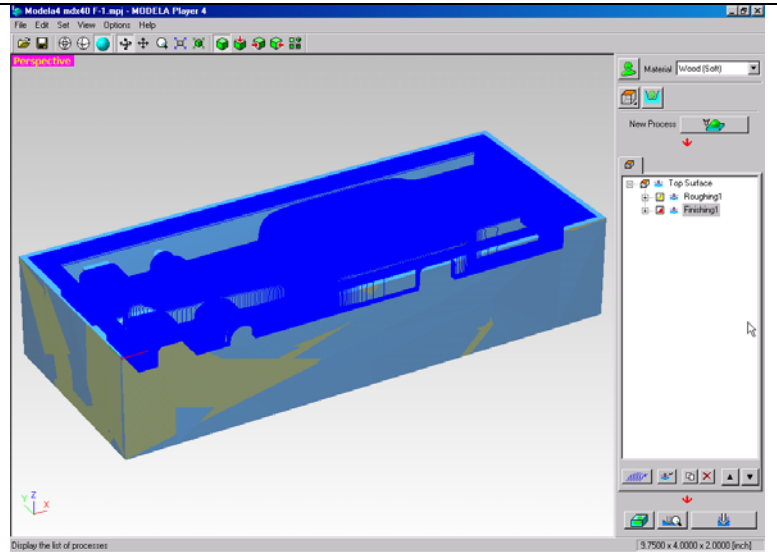


When changes are made to any of the parameters, new tool paths must be generated.



Screen capture of model:

Tool path scanlines will display after the tool path is generated.

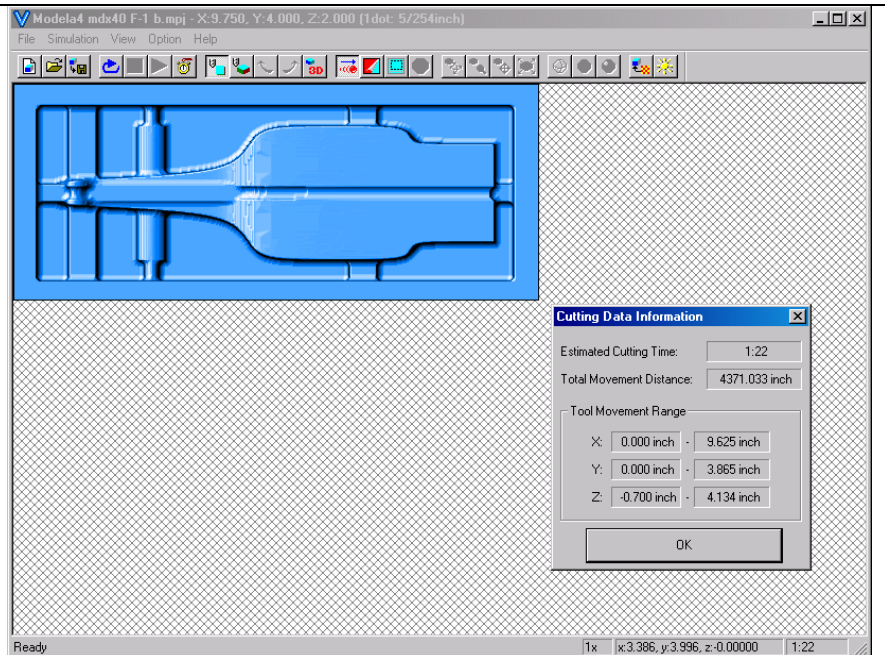


Preview Cutting button:




Creates a 2d or 3d simulation of the tool path.

Estimates the time of cutting based on the parameters chosen.

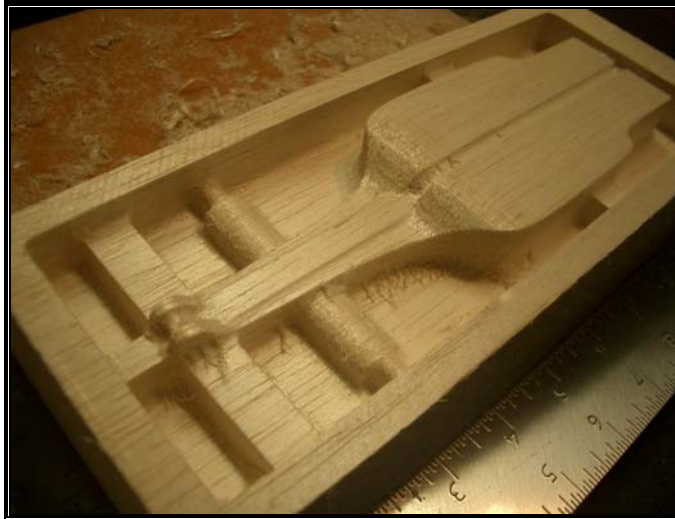
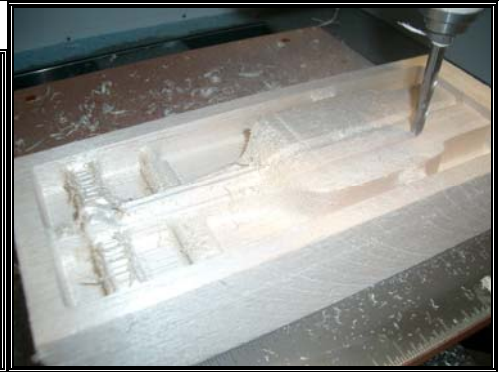
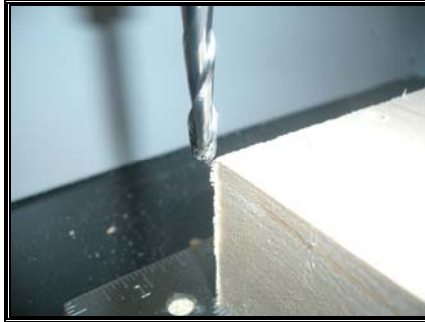


Cut Button:



Highlight the Finishing toolpath and select the Cut/NoCut button 

- 1 Location of XYZ Zero
- 2 Model being cut on the MDX40
- 3 The finished bottom of our car. Ready to turn it over and machine the top of the model.



We have completed the Machining of bottom side of our model. It is time to do the top side of the car.

Machining the Racecar Top... 2 tool paths; Roughing & Finishing

Machining the Top of the Model:

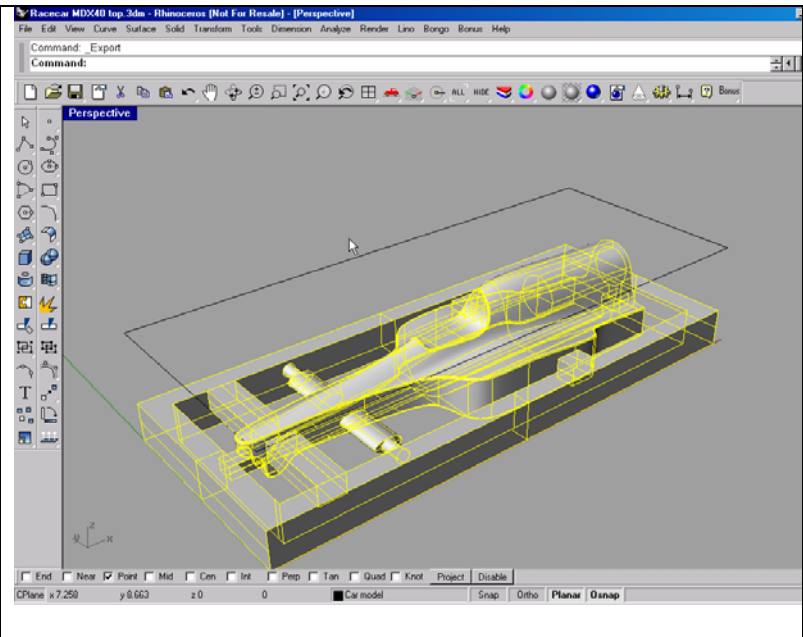
- 1 Remove the model from the MDX40.
- 2 If you used tape to hold the block to the machine, carefully remove the tape from the bottom side of the block.
- 3 Apply double-sided tape to the machined side of the block. Cover all the flat surfaces with tape.
- 4 Install the block in the MDX40 at the exact location of the previous block. Notice the installed 'corner' in which to locate the block so it is easy to re-index the model.
- 5 The MDX40 'remembers' its X,Y,Z zero locations. This makes it easy to accurately cut the top side of our racecar model.



Rhino to Modela4:

In Rhino, open the model:
Racecar mdx40-top.3dm

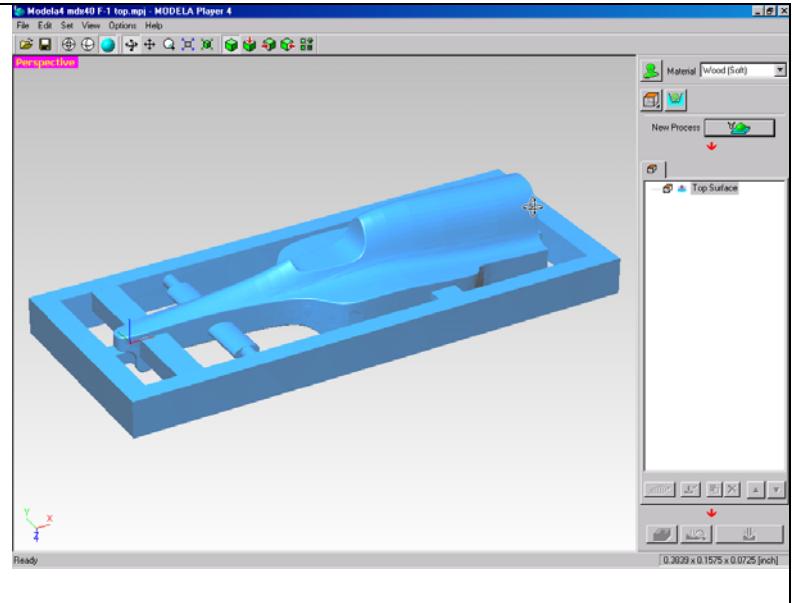
- 1 Select the all polysurfaces; the car and the box model.
- 2 Export as an stl file type. Pick the 'Save as type' stereolithography (.stl).
- 3 Name the file: Top-mdx40.stl



Modela Player 4



- 1 Open the model Top-mdx40.stl
- 2 Save the model Top-mdx40.mpj
- 3 As you add the tool path processes to the model, remember to save. Save often.
- 4 With the block securely held in the MDX40, we're ready to create the tool paths.



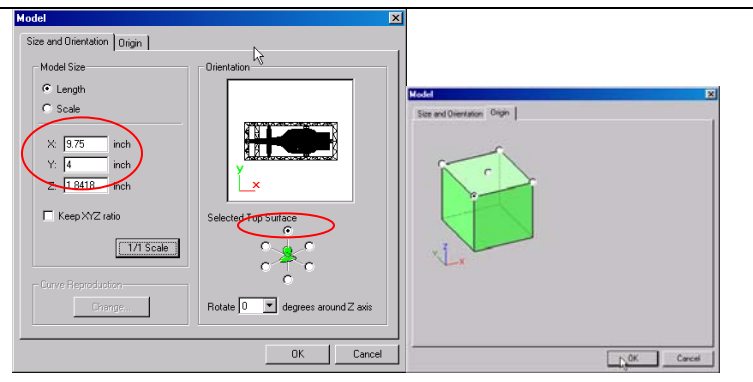
Model Button:



Model Size: 9.75 x 4

Orientation: Select the Top

Origin: Set as shown: See Origin dialogue box at right.

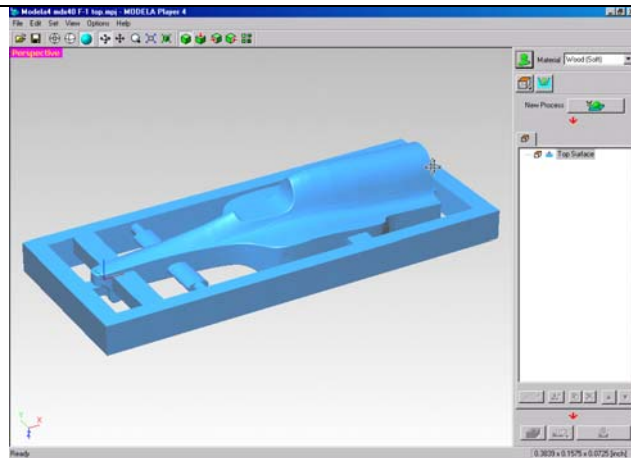


Cutting Surfaces Button:



Select One side machining.

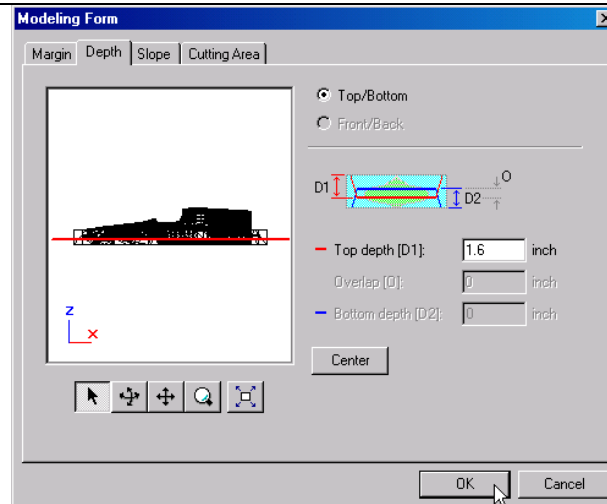
Top, as shown, will be machined. We will machine much of the original stock block as we cut out the racecar. This will alleviate excessive plunging by the cutter which puts strain on the system.



Depth:

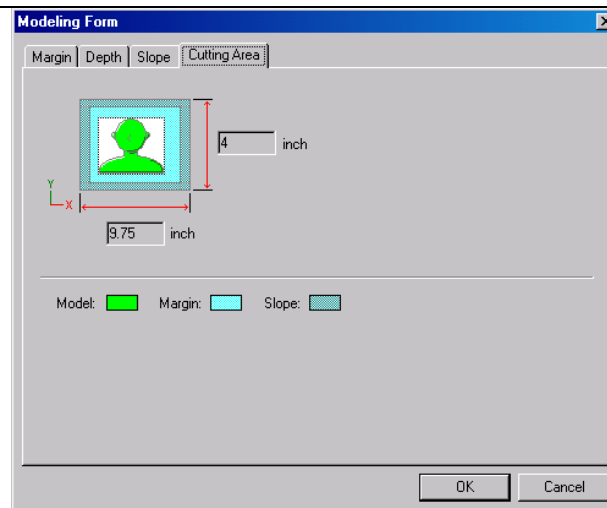
Set the Depth to 1.6 inches.

1.6 inches is sufficient depth to cut into and beyond the depth of the bottom tool path.



Cutting area:

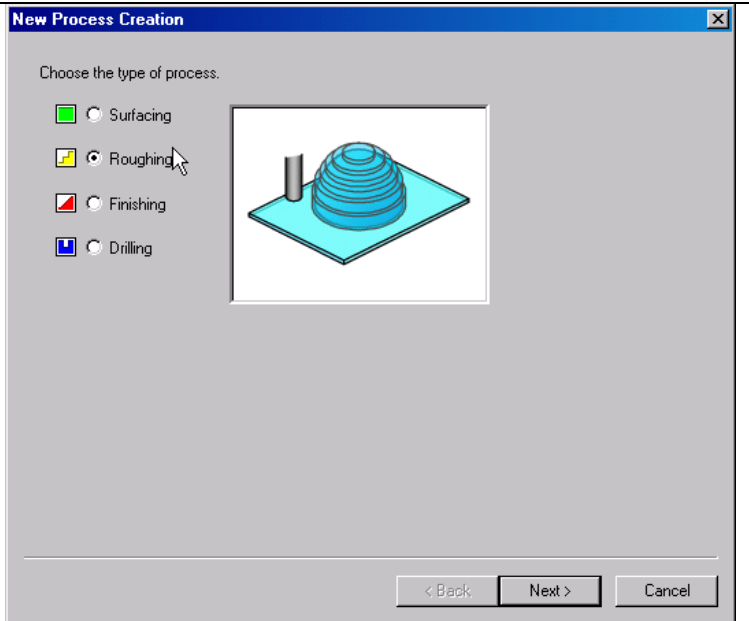
9.75 x 4 will be displayed here. If it is not, go back to the Model button and set the size correctly.



New Process Button:

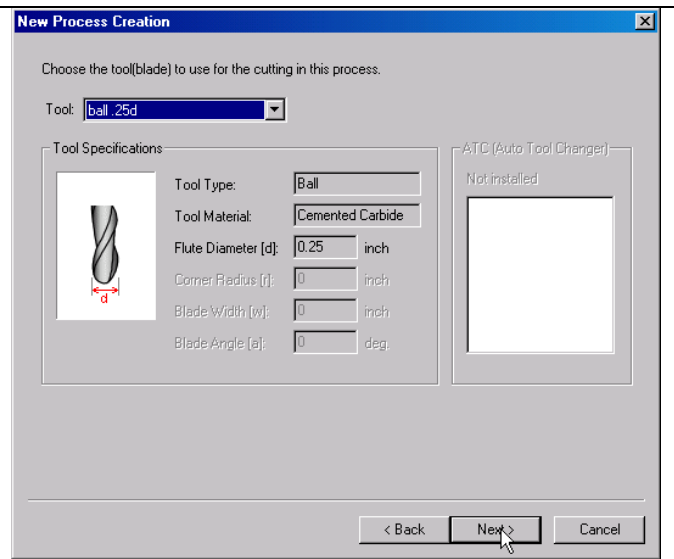


Select Roughing
Select Next



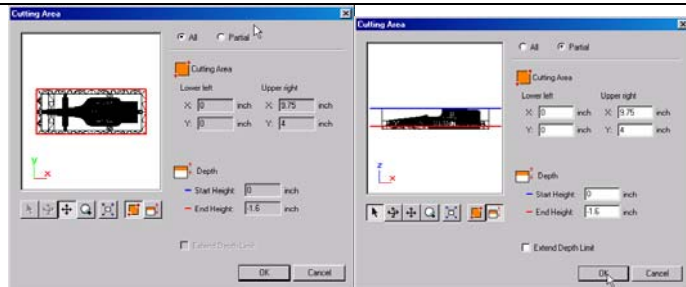
Select the tool:

Select the .25 dia ball tool.
Select Next



Cutting area and Depth:

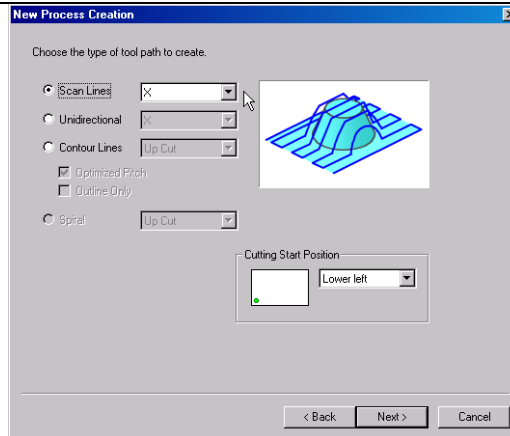
Select All
Select partial
Start height 0
End height -1.6 (depth)
Select Next



Tool Path creation:

Select Scan Lines X
Select Next

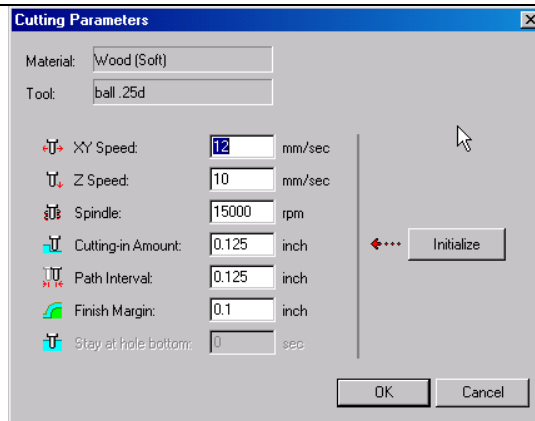
There are other types of tool paths that can be used. Experiment with different methods at another time.



Cutting Parameters:

Set the parameters: as you see them listed at the right.
Select Next

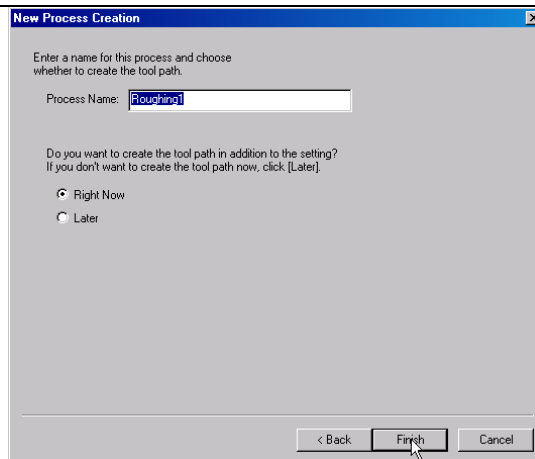
These settings selected work well in balsa with the .25 ball mill. These are not the default settings. The initialize button will reset to the defaults.



Process Name:

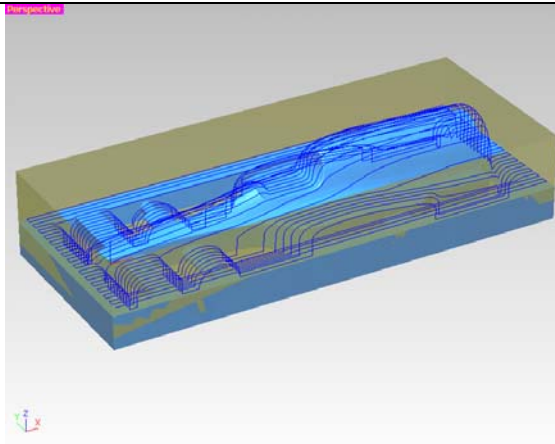
Select Right Now.
Select Next

Some tool paths take time to generate. If time is an issue, select later and create the tool paths when time allows.



Screen capture of model:

Tool path scanlines will display after the tool path is generated.

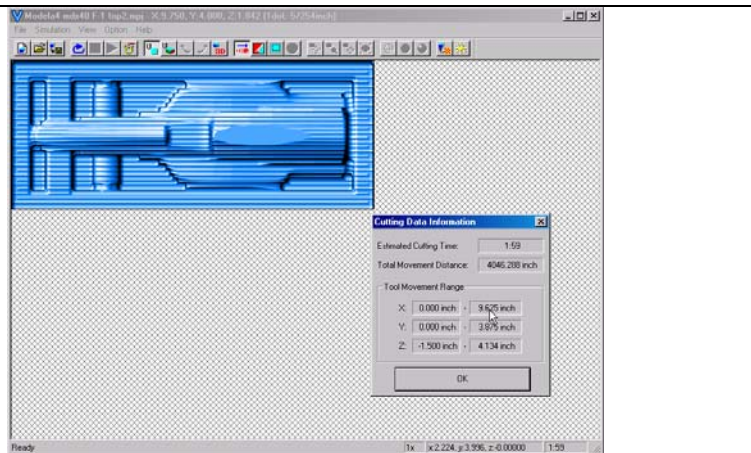


Preview Cutting button:



Creates a 2d or 3d simulation of the tool path.


Estimates the time of cutting based on the parameters chosen.



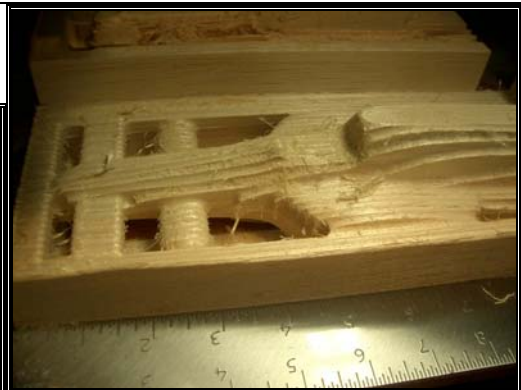
Cut

Button:

Highlight the Roughing toolpath and select the

Cut/NoCut button 

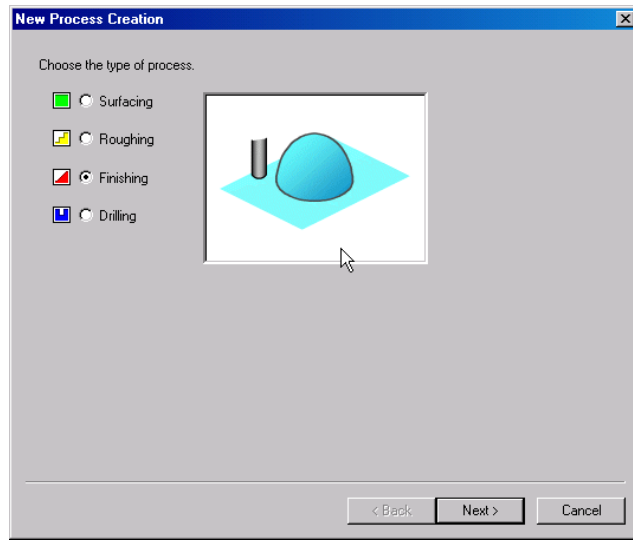
- 1 Block secured to the MDX40.
- 2 XYZ Origin is set (see above).
- 3 The completed Roughing of the model. Ready for the Finishing tool path.



New Process Button:



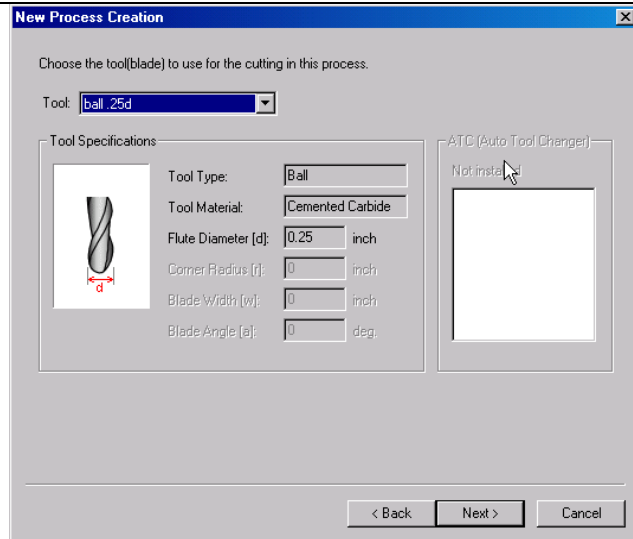
Select Finishing
Select Next



Select the tool:

We use the same tool. It will already be selected.

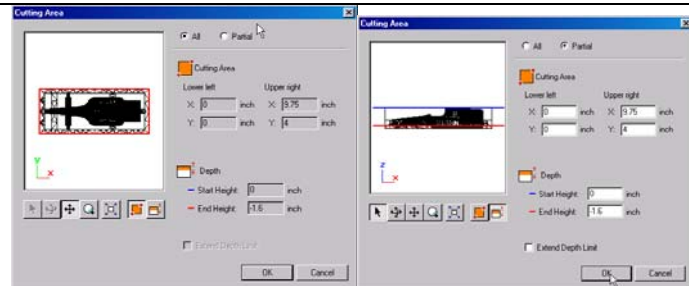
Select Next



Cutting area and Depth:

Select All
Same settings as roughing.

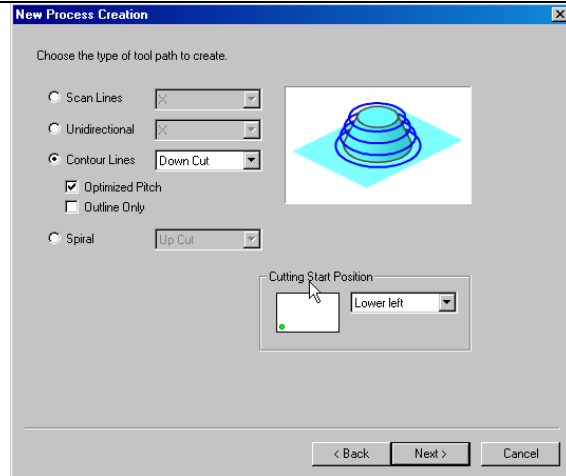
Select Next



Tool Path creation:

Select Contour Lines: Down Cut
Select Next

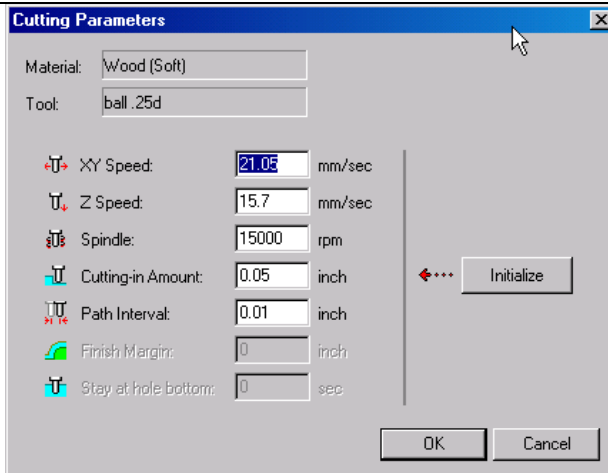
There are other types of tool paths that can be used. Experiment with different methods at another time.



Cutting Parameters:

Set the parameters: as you see them listed at the right.
Select Next

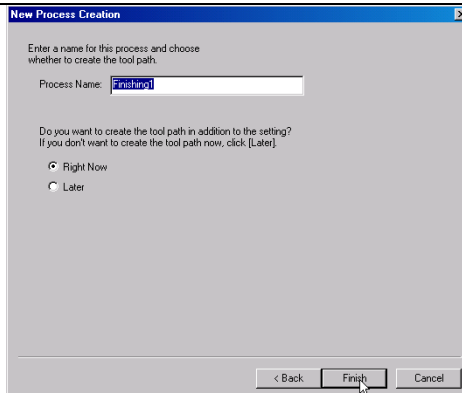
These settings selected work well in balsa with the .25 ball mill.



Process Name:

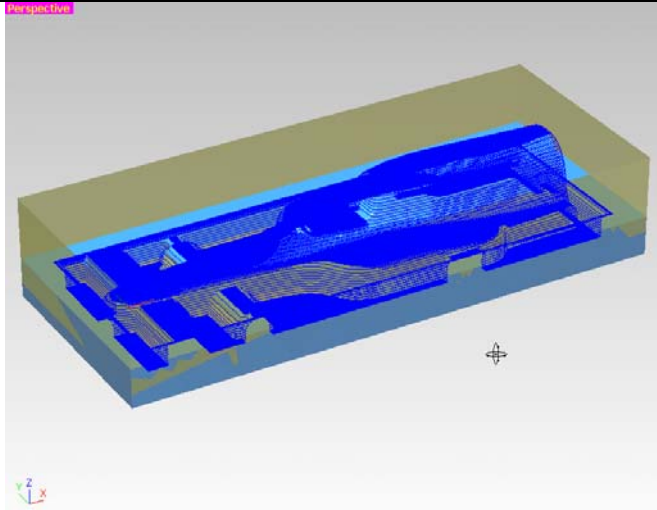
Select Right Now.
Select Next

Some tool paths take time to generate. If time is an issue, select later and create the tool paths when time allows.



Screen capture of model:

Tool path contour lines will display after the tool path is generated.

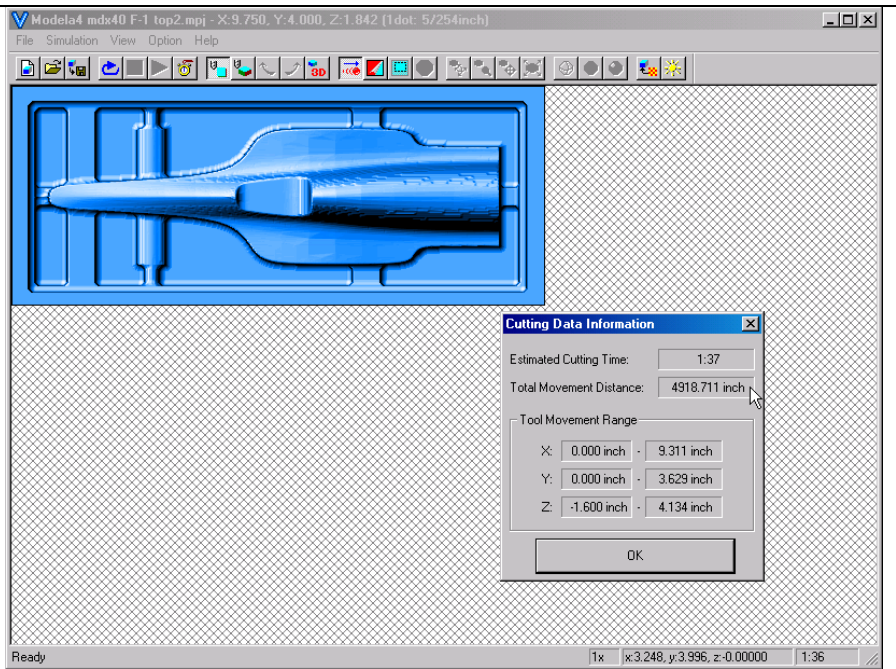


Preview Cutting button:



Creates a 2d or 3d simulation of the tool path.

Estimates the time of cutting based on the parameters chosen.



Cut Button:

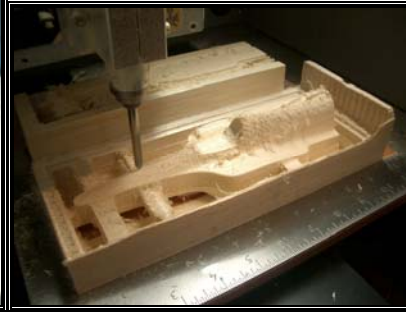


Highlight the Finishing toolpath and select the

Cut/NoCut button

- 1 XYZ Origin is set (see above).
- 2 Photo of model being cut.
- 4 The finished model.

Ready to be removed from the machine and turned over to cut the top of the model.



Finished model ready for removal from the support block

Author's Notes:

Roland Modela Player 4... tool paths.
Roland MDX-40... cnc machine with in Balsa.
F-1 racecar... modeled with Rhinoceros.
Cutter used... 1/4 inch solid carbide 2 flute end mill.

The tutorial is considered a 'work-in-progress'. It is one teacher's approach to cutting this racecar. If you have suggestions, send them along.