

# Experimenting with Technology in Model building

A late adopter 's experience

# What You May Get Out of The Presentation

*CNC machining is a viable option to build models*

*You may be able to reproduce elements of superior fidelity and quality*

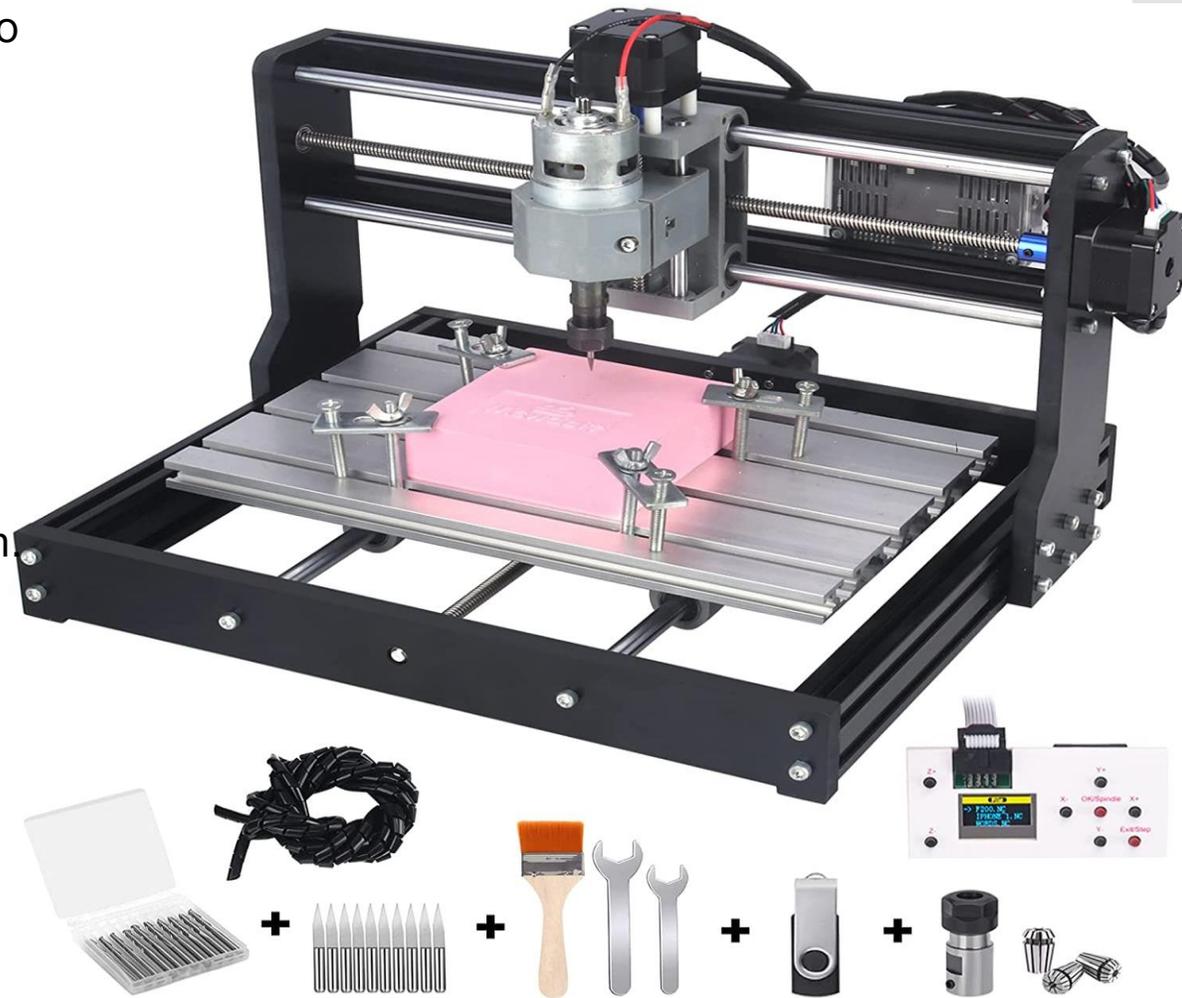
*See Syren figurehead and new block products*

*There is an up front investment in tools. Both software (learning) and hardware use*

*The software tools are applicable to laser and 3D printing as well*

# Wanted to probe CNC Machining

- ✓ Bought Sainsmart 3018 Pro CNC system
- ✓ Includes Candle S/W application
- ✓ Not expensive
- ✓ Work area 11.8 X 7 X .27? in
- ✓ Thought minimally I could machine bulkheads while learning



# First Foray Didn't Turn Out Well

- ✓ Poor support material
- ✓ Primitive S/W
- ✓ Unable to run test files: Y axis direction error
- ✓ Help Center tried to help
- ✓ Set aside, fixed it later



# The Tools You Need Have Arrived

*Computer Aided Design (CAD/CAM) **tools** capability has evolved since 1960s to enable home use*

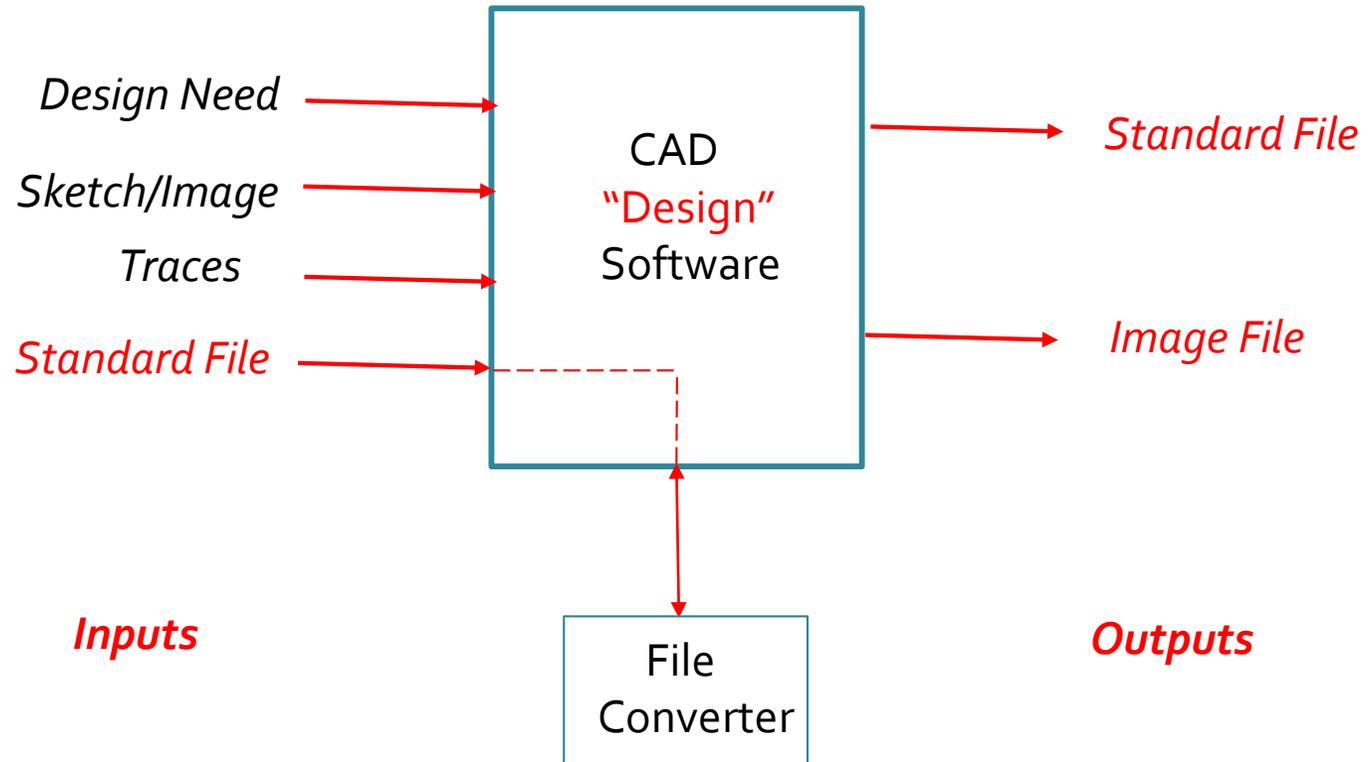
*Maturation of software applications including 2D to 3D rendering*

*Movement of **Fee ware** to **Freeware***

*Evolution of computing platforms*

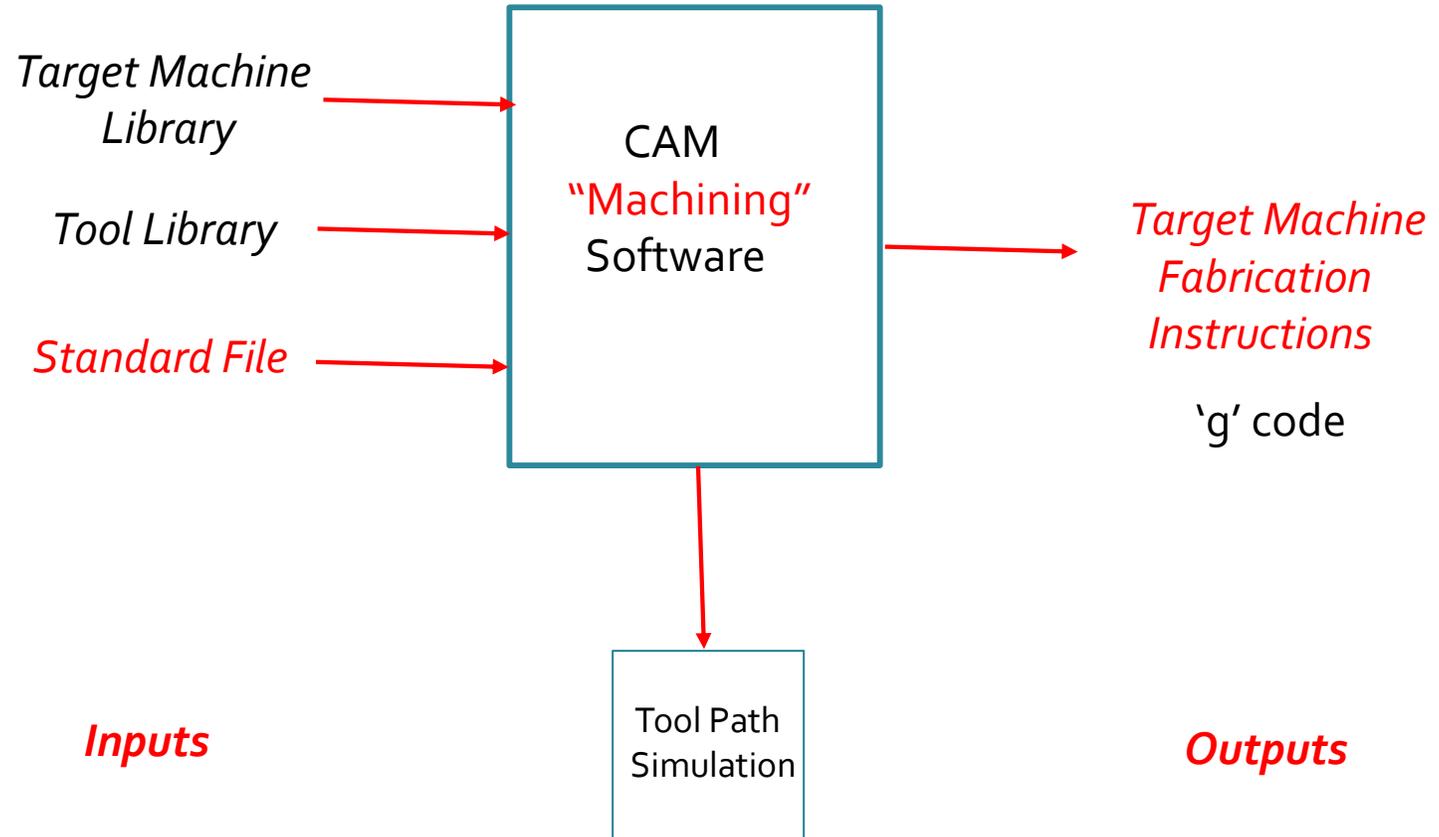
***Standardization of file formats for interchange***

# CAD Tools at 10,000 feet



Note: *Standard file examples= DXF, STL*  
*Image file = 2D image*

# CAM Tools at 10,000 feet



'g' Code = position & other information for machining

# Questions



If you wish to learn more access the Aspire Home Page. There is a great tutorial on CAD/CAM design and development.

## So What Was It I Was Trying To Do?

I had a design that was already complete.

*Well sort of.*

Acquired a *laser* file (a *DXF* file, *a standard file and image file*) for an entire model skeleton (all bulkheads and false keel)

*Good Old  
American  
Know Who*

Given my Sainsmart unresolved problem(s) at the time



Enlisted a fellow woodworker's help with a commercial CNC system

# The Experiment Ready, Set, Stop!

Could not execute a test run "out of the box" of the *standard file*

Rework of design was required (*using Aspire CAD/CAM application*)

Fix laser line segment discontinuity



Fix laser nodal voids



Add stouter tabs needed for CNC machining

Add machining instruction to *cut to the line*

Segmented master file into discrete model elements to fit the plywood material sizes

## While waiting for file rework

Purchased about 15 sheets of 12" X 24," 1/4" model plywood

*Material was nominally 1/4"*

Plywood cut into 12" X 12" size for all 30 bulkheads

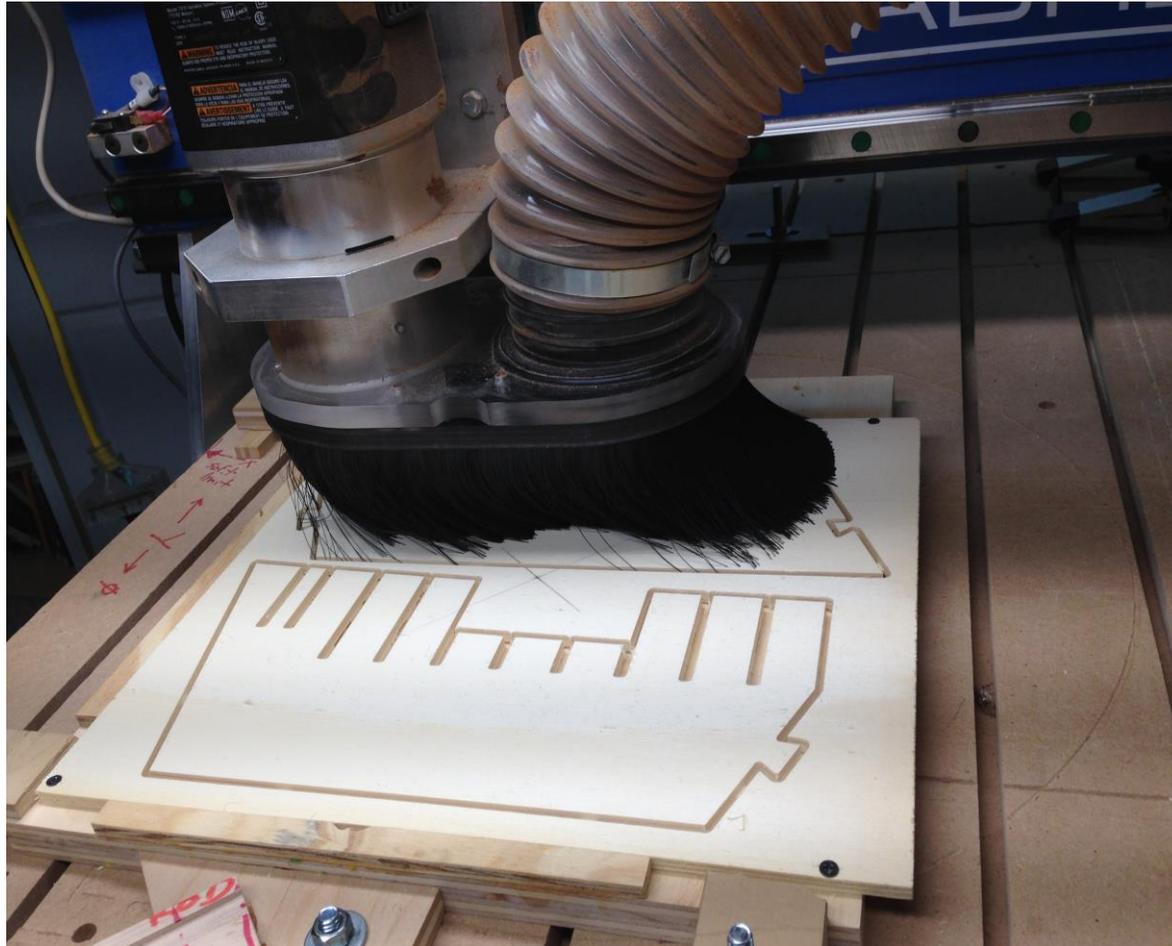
Plywood for false keel was sized as required

Holding jig was made for CNC table

*Nice thing about CNC parts they do not require mating "tricks" as with laser derived parts*

*And less we forget there is no **CHAR with CNC machining!***

# Finally Making It Happen



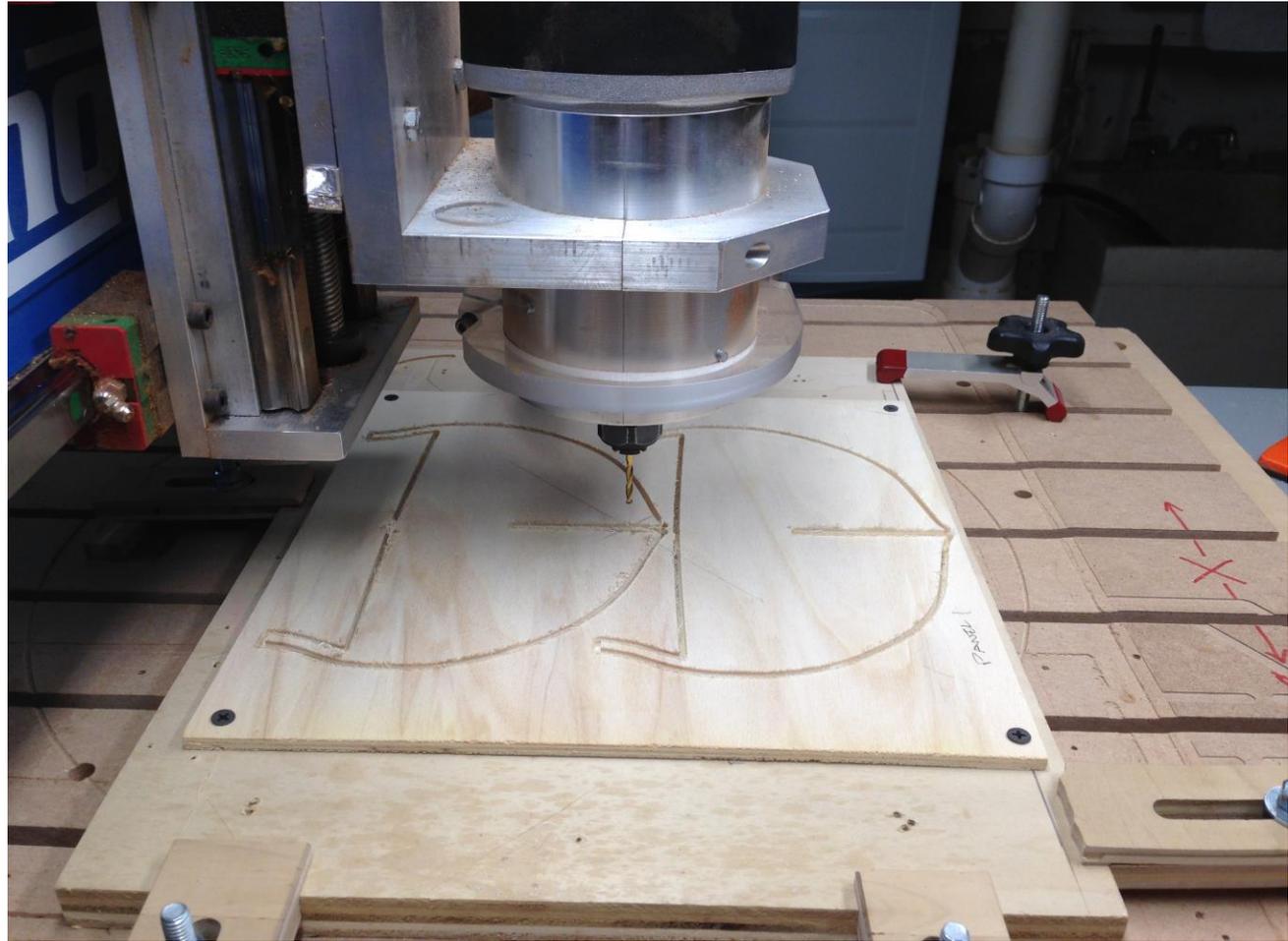
Plywood plates were screwed down to spoil board  
Established *system zero* reference

No bit run to check for hold down interference

*Not Shown:* started with one bulkhead test piece

*Shown:* machining 2 of 3 segments of false keel using  $\frac{1}{4}$ " router bit

# Repetitively Making It Happen



Processing all the bulkheads and miscellaneous elements  
Using 1/4" router bit

# Like Watching Paint Dry

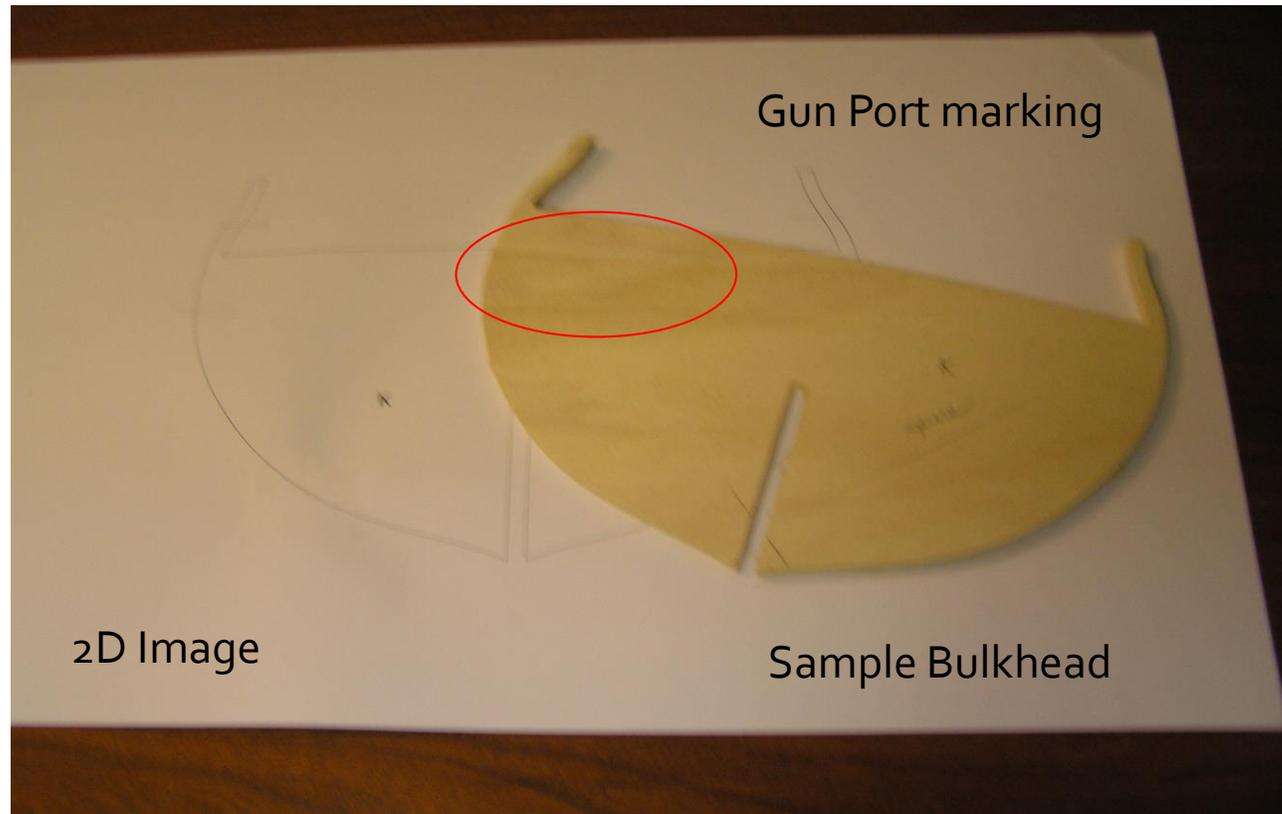


Procedure completed for all 30 bulkheads

Multiple passes to achieve through cuts and minimize tear out

Average time less than 10 minutes per "plate" including fastening, routing, removal

# Post Machining Work Needed



Cut off tabs, lightly sanded all components  
Squared off all inside router bit arcs  
Sanded the slots to fit the plywood  
Marked off gun ports by hand  
Checked all elements against drawings (*Image File*)

# What Was Learned

Material, especially wood may require some post machining processing because of *nominal* sizing characteristics.

Two bulkheads exhibited delamination at uprights. Had to patch them. Better hold down may be needed

The process is front end loaded. The machining is quick

The results are accurate (*Caveat: a few file reworks may have introduced errors*)

Had to hand mark bulkhead gun ports. An advantage of laser machining

Was it worth it?  
Indeed!  
Learned a good  
deal about  
CAD/CAM  
machining

