# Building the Wee Lassie Cance

Michigan Woodworkers Guild Presentation by Bob Mills

# So you want to build a boat, eh?

### Ok, how about this for starters?



# Carved by Livio De Marchi, Woodcarver Extraordinaire







### Sit Back, Relax and Enjoy the Show

# **Building Technique Decision**

- Which technique?
  - Traditional Carvel
  - Traditional Lapstrake
  - Glued Plywood
    Lapstrake
  - Wood Strips & Epoxy
  - Etc....

#### BUILDING SMALL BOATS



by Greg Rössel

# **Design Decisions for a Canoe**

#### • Which Design?

- Intended Use fast moving water, backwaters, etc
- Capacity single or double (or more)
- Stability Initial, Dynamic
- Performance river, lakes, sea
- Plans availability need lofting?



# More Decisions

- Build from a Kit, all materials and instructions supplied
- Build from raw wood, layout and cut all pieces, buy materials independently
- Build from a combination of premilled pieces and self cut pieces
- Build for Beauty or for Function, or both....



# The Wee Lassie Canoe

- Solo canoe for calm waters
- Small, relatively low cost
- Can be built in a crowded garage shop
- Complete building guide available
- No lofting required
- Well known design with lots already built
- Materials readily available, many sources

A WoodenBoat Book by "Mac" McCarthy

# Wee Lassie Forms Layout



#### Stem Forms Patterns for the Wee Lassie Canoe



# Mold #1



# Wee Lassie Forms

(Not to scale)

22/16 Shurt 14 <sup>1</sup>/<sub>4</sub>" 14" · exact 14" 3/16" 13" -13" 12" 6 1/8" 9 11/16" 12" -3/4" 11" . -10 15/16" 11" -8 11/16" 10" 10" -11 11/16 CENTERLINE OF MOLD CENTERLINE OF MOLD 9"-9 3/8" 9" 12" 9 11/16" 8"-12 1/4" 8"-7"-9 7/8". 7"-12 3/8" 6"-9 15/16" 12 7/16" 6". 5"-10" 5"-12 1/2" Sheer 4" 10 1/16" 4" - Sheer 3". 3"-25 wide at 201/2 2"-4 7/16" 2"-3 3/4" (0)1"-1"-**BUILDING BOARD BUILDING BOARD** Mold #2 Mold #3 (Not to scale) (Not to scale)

## Wee Lassie Forms



### Wee Lassie Forms







# **Building the Strongback**



# Setting up the forms





# Laminating the Stern Inner Stem



# **Mounted Inner Stem**



# Number of Strips for a Canoe

- Need about 60 strips for the Wee Lassie hull
- About half need to be the full 12 ft length
- There is a significant amount of trial and error doing the routing of the edges so an extra 3 or 4 strips are needed
- Strips do get spoiled (frail edges) and matching color and grain is always an issue, add in another 4 or 5
- Total is about 70 strips

# Calculation of Lumber Requirements

- Use thin kerf saw blade (about 0.05")
- Finished strip is 0.25"
- Additional thickness for planing to a consistent thickness is .04" to .06"
- Total rough cut strip thickness is 0.25"+0.05"+0.05" = 0.35" (generous)
- For a 5 <sup>1</sup>/<sub>2</sub>" board expect to get 15 strips
- End result: Need 4 to 5 boards 12' L x <sup>3</sup>/<sub>4</sub>" T x 5 <sup>1</sup>/<sub>2</sub>" W

# One More Condition on the Lumber



EDGE-GRAIN BOARD RIPS INTO FLAT-GRAIN

### Need flat sawn boards

# Now Its Time to Mill the Strips

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## Label the Strips

- Label the strips so that color and grain pattern matching can be done more easily.
- Make sure to keep track of which side is the outside of the hull because it has the grain pattern that is very evident.
- Keeping the strips in an ordered manner is no small task. Have patience..... Labeling minimizes handling the strips with inevitable splinters on the cove side.

### Plane Strips to Uniform 1/4"

- I planed both sides to get rid of any roughness due to saw marks and to help with color matching.
- Watch for thin spots (thickness < 0.25")</li>
- All the nice labels from the ripping step will get planed away so you re-label them.



# **Bead and Cove Strips**



# **Bead and Cove Router Bits**



# Routing the Edges

- Use feather boards to hold strips in a consistent manner with constant force against the table top and the table fence.
- Set bit height to accurately get the bead or the cove exactly in the center of the strip edge. Not achieving centering will require lots more sanding on the hull later.

# Routing the Bead

- Do the bead routing first (avoids breaking the frail edges of the cove during the 2<sup>nd</sup> pass).
- Set the fence so that there are no ridges at the point where the bead ends on the strip.

# Routing the Cove

- Rout the cove side with a feather board against the bead side.
- Center the cove in the exact middle of the strip edge.
- The depth of the cut for the cove should be such that the edges are about 0.01" thick, (between 1/128" and 1/64").
### **Rolling Bevel at the Stem**

#### **Beveling the Stems**

- Called a rolling bevel because it changes along the length of the stem (from shear strip to keel strips)
- Cut the bevel with a very small low angle block plane, or a microplane (best)
- Use short strip mounted along previous strip to get a good guide to follow





# "Just in Time" Beveling





#### Bungees Replace Staples for Clamping

Bungee clamps at yellow arrows

U clamps at red arrows



#### Bungee Clamps

Make up lots of these clamps. You will use 20 to 30 on each strip. Gluing two strips at a time means at least 40 of the bungee clamps and 15 of the "U" clamps are used. •

# Spring Clamp Use



#### Clamping at the Stems

Easy to clamp at the stem for the first 8 or so strips because the strips want to lie flat against the stem.



#### **Rube Clamping at the Stems**

Whatever works, including rubber bands



#### The Process of Preparing Strips

– Bevel the stems

 Get the next matched pair of strips (one for each side) and put an alignment mark in the middle of each strip near Form #4 and on the previous strip.

#### **Strip Preparation**

- Trim the end of the left side strip to fit inside the right side strip at the bow.
- Dry fit it to a temporary strip to verify that the correct angle has been cut. Use sanding block to adjust, and refit.
- Clamp the left side strip in place to use as a guide for the right side strip.

#### **Strip Preparation**

 Trim the right side strip and dry fit it to verify the correct angle was cut.

 Adjust with sanding block and refit if necessary



#### **Clamp Preparation**

Distribute bungee clamps and U clamps along each side of the strongback with the adjustments pre-set for the right amount of SQUEEZE...



#### **Strip Glue Board**

Place 8' 2x4 with ¼" slot on your workbench to hold the strip while the glue is being applied to the cove side of the strip.



#### Laying on of the Strips

- Place the strip to be glued in the glue board slot.
- Put glue into the cove of the first strip.
- Spread the glue with a glue brush and wipe excess off with a wet rag.
- Walk the strip, cove side up to the strongback and place the glued cove edge to the bead edge of the previous strip starting at the alignment mark.
- Hold it in place with a U clamp on Form #4.

#### Laying on of the Strips

- Go to the stem which has this strip on the inside and fit the strip tightly against a temporary strip.
- Clamp it in place with a U clamp at the closest form (either #1 or #7).
- Then work back towards the middle putting U clamps on each form and adjusting the cove to fit on the bead nicely in between the forms.
- Place bungee clamps between each pair of forms prior to clamping the U clamp down hard. Etc.....

#### **Strips Clamped in Place**





# Making a Feature Pattern for the Canoe Sides

- Design the feature on paper and decide where it will be put on the canoe.
- Draw full size pattern pieces on poster board.
- Cut the strips to make the design
- Bench fit the pieces, verifying that the design works.
- Make the full length strips and glue them in position



#### Building the Design on the Mold





#### Strips at the Turn of the Bilge

Getting the strips to lay down properly in the area of the bilge is challenging, since the strips are being forced in directions which they do not want to go.





#### One Side to the Keel Line

It is easier to get a good straight keel line with only one side filled in. Working space is provided by the open side.



#### Sanding Block for Keel Line



#### Down to the Last Strip!





## Last Strip Stands Out??



#### Smoothing the Hull







# Preliminary Smoothing of the Hull

# Add External Stems

#### **External Stems Sanded Fair**



#### Smoothing the Hull

- Using filler is necessary in those places where a joint is not perfect.
- Applying filler was a real headache because the filler does not soak up epoxy the way the raw wood does. The cedar gets darker, the filler remains it's dried color. So...... Trial and error with lots of different fillers being tried.

#### Smoothing the Hull

- After doing any filling the hull is smoothed with a small, low angle block plane and cabinet scrapers to remove high spots.
- Then a variable speed orbital sander with 80 grit paper and a thick foam pad is used to get closer to a fair hull.
- Then the long board (fairing board) is used both across and with the grain to get any longitudinal waviness out.
- Finally the power sander with 150 grit paper is used to get out the marks left by the very coarse grit paper and hand sanding blocks are used with the grain to get a final smoothness in preparation for epoxy application.
- During all the sanding verify that there are no dangerously thin spots by using a bright light inside the hull, viewed from the outside.
#### Fiberglassing the exterior

The hull is very flexible with only strips glued to each other so it cannot be removed from the mold and worked on before a layer of fiberglass and several layers of epoxy have been applied to the outside.

- Measure and cut the glass cloth (4 oz for the Wee Lassie).
- Mix the epoxy and roll on a sealer coat.
  Spread it with a plastic spreader and tip it off with a short length and somewhat stiff brush.

## Cloth and First Layer of Epoxy



#### **Fiberglassing Continued**

- After the sealant coat is no longer tacky but not yet cured completely, put glass cloth on the hull and wet it out with epoxy.
- Put on a coat of epoxy, and use a scraper while epoxy is still green to remove drips and drools (and sand if beyond green stage).
- Add four to five coats in this manner.

#### Fiberglassing the Exterior Hull

- In between coats of epoxy, add second layers of cloth where additional strength is desired (stems and keel).
- Flare the edges of the double cloth areas with each successive application of epoxy.

# Final coat of Epoxy

#### Hull Just off the Mold



## Fiberglass Installed



#### Mill the Outwales

- Both the inner and outer rails are made from Spanish Cedar 3/8" x <sup>3</sup>/<sub>4</sub>" x 11'
- The edges are softened using a router with a round over bit.
- Inwale spacers are cut from the same sized stock to be 3 <sup>1</sup>/<sub>2</sub>" long.

#### **Outwale Installation**



#### **Build the Inwales**









## **Painter Fitting**





#### Make the Thwart

- Design thwart, draw pattern, mill the blank (fore and aft curve) and hand "carve" the shape.
- Forward edge is slanted to match angle of back support. Hand done with microplane and sanding block. Soften edge with sandpaper.
- Rear edge is rounded with sandpaper.
- Length is determined by beam measurement between station #4 and #5 specified in plans.

## Make up Bulkheads



## Stripped Faces for the Bulkheads

## Glassing the Bulkheads



## **Develop A Design for Decks**

#### **Backing Board Bow Deck**





#### Dry Fit the Deck Halves







## Deck Edge Detail







#### Trim Decks for Coaming

- Make the final sanding of the arc in the deck sandwich using oscillating sander.
- Copy the arc to pattern board.
- Use the pattern board to make a bending form for coaming piece.







## Installing the Coaming





#### The Seat Frame





## Caning the Seat






#### Making a Paddle

#### TBD



"There is nothing- absolutely nothinghalf so much worth doing as simply messing about in boats."



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### How about a Horse Drawn Carriage?



## Or Maybe A 1937 Jaguar!



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# And not only boats.....



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