

Half Hull Modeling



A BRIEF BACKGROUND & A MODELING APPROACH

(PICTURED ABOVE IS A BUILDER'S MODEL OF THE "WILLIAM BOWEN" CIRCA 1850'S)

Admiralty Models

Naval Board / Dockyard / Admiralty Model: Ship models built for the Admiralty Board's of major European countries during the period of 1650 to 1780, e.g., England, Holland, France, Spain, etc. These are thought to be the finest models ever made, and are mostly unrigged. These models tend to have exposed hull and deck framing to allow the inspection of the vessel's naval architecture in a three dimensional format, as well as having elaborate decorative carving work. The English 'Georgian' models, which entered this genre c.1740, were more complete in their presentation and included rigging, copper sheathing, painted hulls, complete armament, and extensive decorative elements.

British Builders Model

British Builders Model: Late 19th to early 20th century scale models constructed to a very high detail to scale of 1/8" (1:96) or 1/4" (1:48) to the foot were either full hull or half hull presentations. The latter style was typically mounted on mirrored backboards within a framed wood case to create the illusion of a full model. These were usually built by the shipyard joiners or professional model makers that constructed the actual vessel and were either kept by the shipyard as display pieces to document their yard's work or were alternatively obtained by the ship owner to display in their steamship company office. As many of these models depicted ordinary steam ships such as freighters and coasting vessels they were most often presented in a stylized fashion using high gloss paint and the fittings were of gold or nickel-silver plate.

Builders Models

Builders Model: Scale models that were built prior to, during, or just after the construction of the actual vessel. They are generally considered the primary depictions of the real vessel. Most often these were built by naval architects or shipwrights where the actual vessel was constructed. Early American half hulls of [commercial vessels] or yachts are typical of this type of model, from which lines were taken off and increased to full scale patterns for subsequent construction.

[Circa 1800's]

Half Hulls

American Half Hulls are Builder's Models!

So how were they utilized?

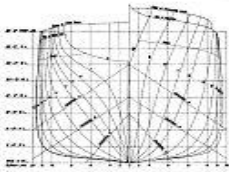
- Accurately scaled and carved *at some point in the build cycle*
- Carved to the inside of the ship planking i.e. the frames
- Scales were the builder's choice but most likely a minimum of 1:48
- Marked with build indicators (stations, plating patterns etc)
- Configured in a separable "Lift" fashion
- May have been carved as a whole hull separable along the keel for a Waterline and Buttocks depiction

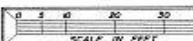
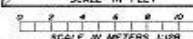
Plans of 1935 era: Lines taken off an existing vessel

LINES

NOTES

- These drawings show the hull contours or "lines" of BALCLUTHA as measured in 1935. These lines define the inner surface of the hull, and the top surface of the main deck plating. Only the starboard side of the hull was measured. H&ER assumed: a) the keel was not hogged; b) the keel had no sweep in plan; c) the ship was not raked; d) both sides of the hull were symmetrical.
- The drawings on this sheet are 75% photographic reproductions of the original line drawings drawn at 318" = 1'-0". See sheet 7 for the body plan and table of hull measurements, sheets 8 - 12 for the sheer and half-breadth plans at the original scale.
- Data for plotting BALCLUTHA's lines were "fitted" from the inside while the ship was afloat. Measurements were taken at 17 field stations chosen at frames along the ship's starboard side at intervals of 4'-0" at the bow and stern and up to 14'-0" amidships. Profiles of the keel and stem are based on information taken from BALCLUTHA's original machine-section dated May 19, 1888, and the drawing "STAR OF ALASKA," traced from an original rigging plan by Captain C. A. Hakverson 1898 - F. W. Shaw - August 1944.
- In order to work around the large ballast crabs that run most of the length of the lower hold, H&ER used a method of measurement in which interpolations were made to the hull and internal structure from multiple targets suspended from chains. All sections were plotted on site to verify measurements. A table of hull measurements is presented on sheet 7.

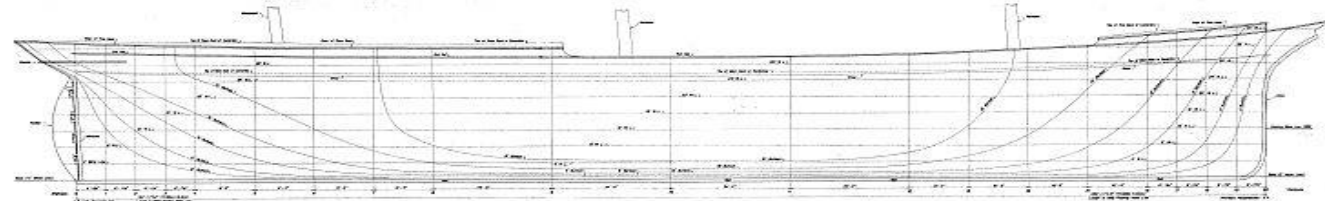


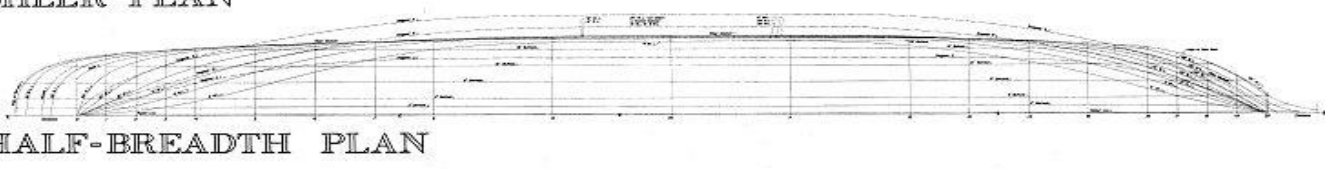
BODY PLAN

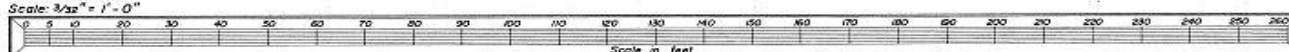
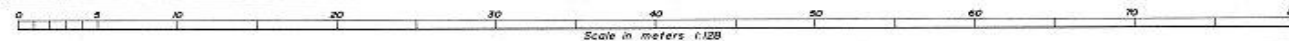
- Points plotted along a section taken at Frame 8 (between Stations 2 and 3) do not fall between the 4' water line and the 16' water line. Field data was rechecked. But the results were the same. It is possible that the hull was damaged in this area.
- In 1935 BALCLUTHA's length at the Floating Water Line was 244'-11". The initial station spacing of 24'-6" was produced by dividing 244'-11" by 10 and rounding up. Stations were added at half and quarter intervals to better define the hull at the bow and stern of the ship and labeled sequentially with whole numbers.
- Water lines and buttocks were produced by "sailing in" points between these sections which lay in planes parallel to the base plane or to the vertical centerline plane of the ship.
- The base line (plane) used in this drawing was set at the ship's rabbet line which is straight for most of the length of the vessel.
- A "sheer line" is defined in this drawing as the intersection of the external hull surface and the main deck surface.
- Details such as scuppers, chain-plats, deckhouses and other features have been omitted for clarity.
- Accuracy: while the accuracy of most field measurements is estimated to be $\pm 1/8"$, plots inevitably introduce larger errors due to the smaller scale of the drawings and the fading of lines. Estimated accuracy of drawing (in scale inches): $\pm 3/4"$ in beam and depth; $\pm 2"$ for length; $\pm 2"$ for keen intersections of lines (less than 15 degrees).

SHEER PLAN



HALF-BREADTH PLAN

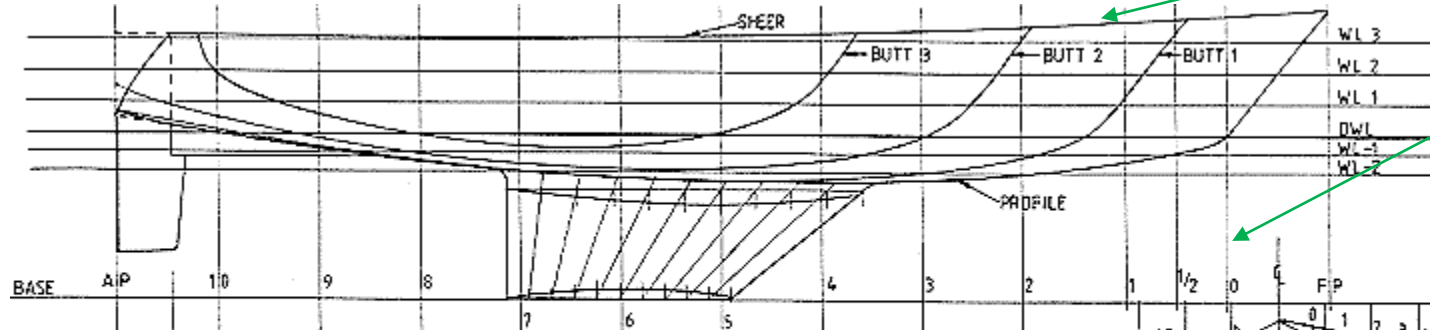


Half Hulls

Modern plan structure

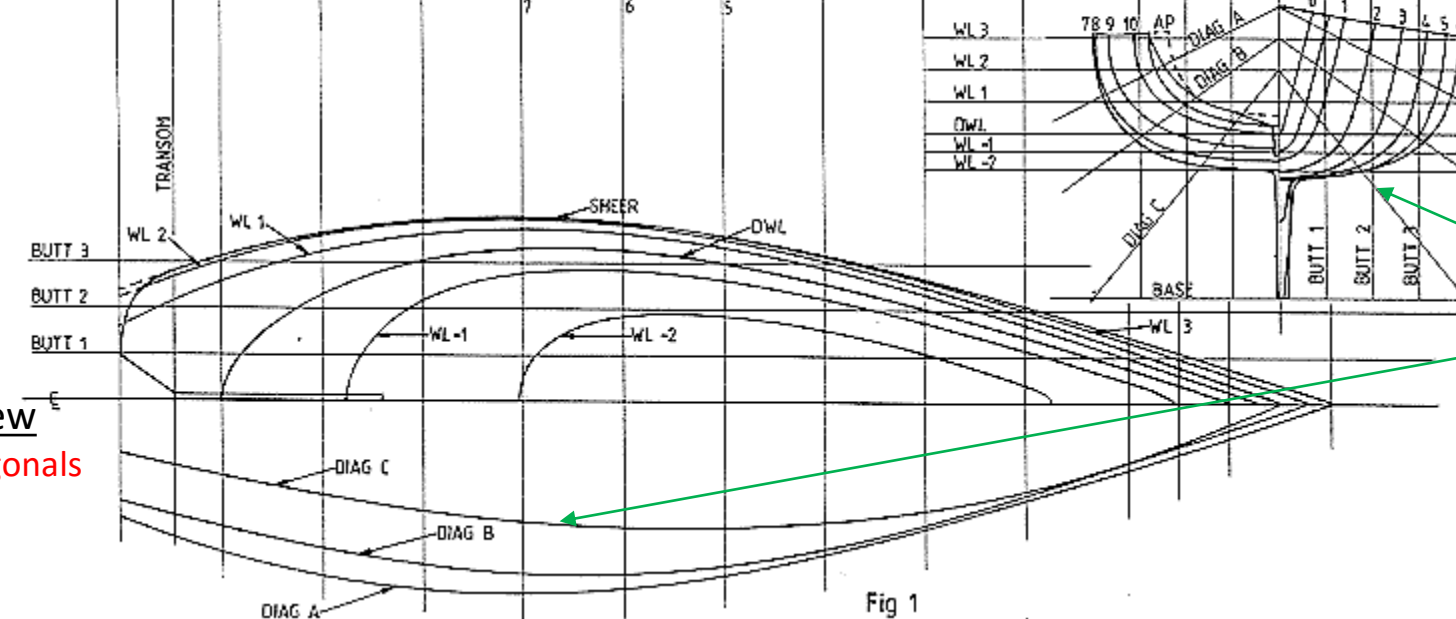
The Profile (Sheer)View
Depicting the waterlines



The Sheer Line

The Stations; Note the '0' station

The Plan (Half Breadth)View
Depicting the Buttocks & Diagonals



The Frames (Body)View
Note Buttocks, Waterlines
and Diagonals

The Diagonals

Half Hull w/Design Markings

Station



Lift

Half Hulls

Moving From Half Hull to Actual Size Plans and Lofting

- Half Hull lifts were separated and measurements at each station were recorded
- Diagonals helped verify measurements especially in areas of extreme curvature
- The measurements were scaled up to full size
- Frame patterns were created, on the loft floor, of the boat construction building
- Frames had to be “faired” given likely error creep
- At some point, especially if the vessel was to be reproduced, an Offset Table may have been introduced.

Half Hulls

A Table of Off Sets

- Measurements at each station off a datum
- Measurements in ft/in/(1/8 in) increments
- If a + or – sign exists past last number indicates an adjustment of 1/16 inch

--- OFFSETS. ---														READ '2-7-3' AS 2'-7 ³ / ₈ '.			
STA.	0	1	2	3	4	5	6	7	8	9	10	11	T	HEIGHTS ABOVE & BELOW W.L. 1.			
SHEER	3-4-6	3-2-1	2-11-5	2-9-2	2-7-0	2-5-1	2-3-4	2-2-1	2-1-2	2-0-5	2-0-5	2-0-7	2-1-4				
CHINE		1-1-6	0-9-3	0-5-6	0-2-6	0-0-3	-0-1-2	-0-2-2	-0-3-0	-0-3-5	-0-4-0	-0-4-2	-0-4-3				
B-1		1-9-4	0-0-4	0-5-6	0-8-0	0-9-0	0-9-1	0-8-7	0-8-4	0-7-7	0-7-3	0-6-7	0-6-4				
B-2			1-8-0	0-2-4	0-2-6	0-4-7	0-5-7	0-6-2	0-6-3	0-6-2	0-5-7	0-5-6	0-5-5				
C.L.		0-0-7	0-8-4	0-10-4	0-11-3	0-11-6	0-11-4	0-10-7	0-10-1	0-9-3	0-8-3	0-7-7	0-7-3				
SHEER	0-0-3	1-6-7	2-5-7	3-0-2	3-4-1	3-6-3	3-7-2	3-7-1	3-6-3	3-5-0	3-3-0	3-0-0	2-8-5	HALF BREADTHS.			
CHINE		0-8-3	1-7-3	2-3-5	2-9-3	3-0-7	3-2-5	3-3-1	3-2-7	3-1-2	3-1-1	3-0-1	2-11-3				
W.L. 1		0-0-7	0-11-3	1-8-7	2-6-1	2-11-7	3-2-7	3-3-3	3-3-2	3-2-5	3-1-3	3-0-4	2-11-2				
W.L. 2		0-6-0	1-7-0	2-5-0	2-11-0	3-2-5	3-4-2	3-4-5	3-4-2	3-3-4	3-2-0	3-0-5	2-10-7				
W.L. 3		0-10-3	1-11-1	2-8-0	3-1-1	3-4-2	3-5-6	3-6-0	3-5-4	3-4-3	3-2-5	3-0-4	2-9-7				
W.L. 4		1-2-3	2-2-5	2-10-5	3-3-2	3-5-7											

Half Hulls

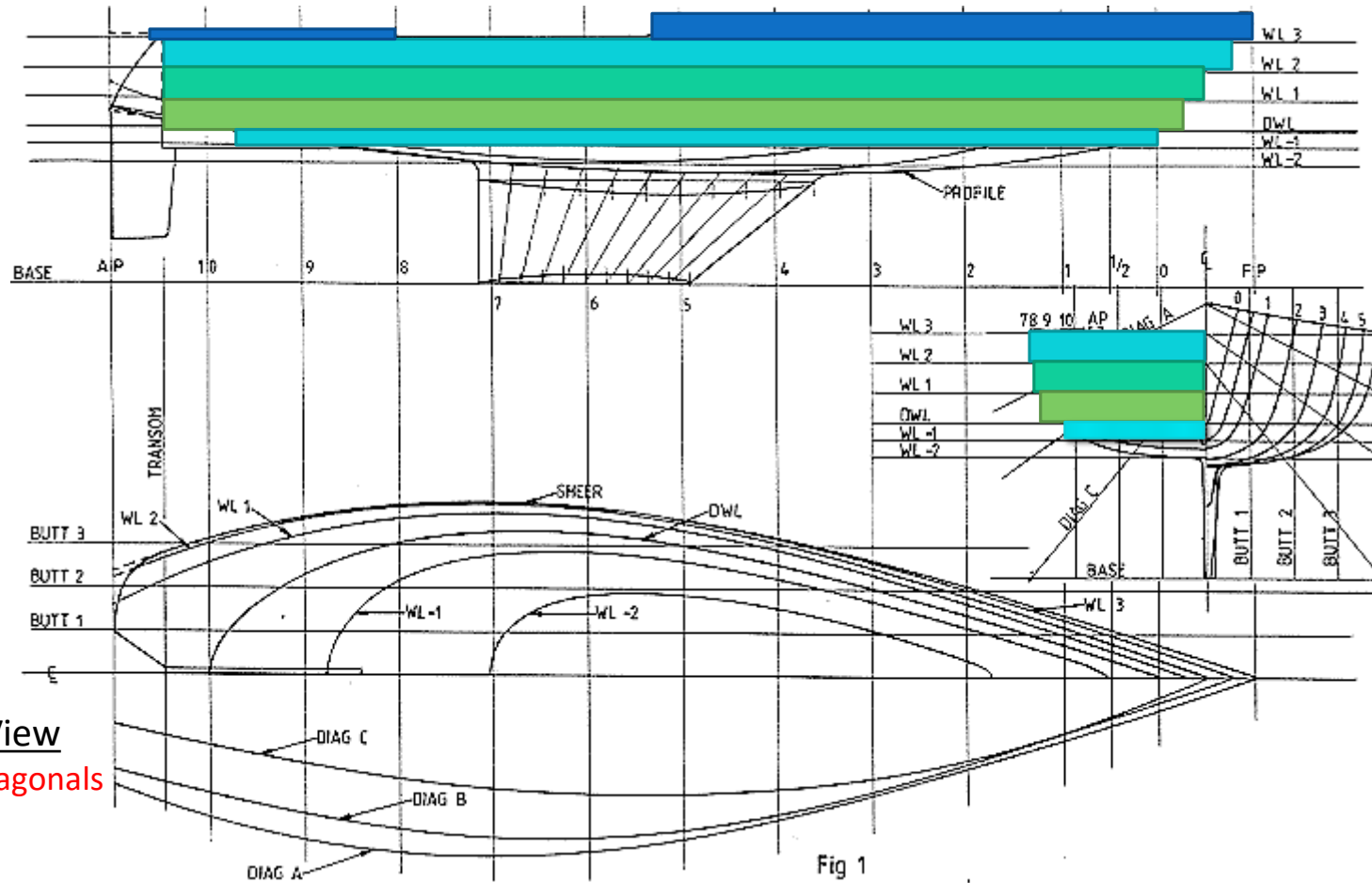
Modern Half Hulls are meant for more decorative and/or presentation purpose

- Decide what appearance/type of model is desired
 - More or Less Authentic (more lifts, measurement depiction, less detail)
 - Decorative (much more detail, choice woods, painting)
- Choose an appropriate scale
 - 1:48 would yield a 50 inch model for a 200 ft vessel
 - 1:96 might be more practical for most purposes
 - Or adjust scale to suit the need (space, material limitations etc.)
- Obtain a drawing (with Sheer and Body plans at a minimum) to matching scale
- Layout the lifts on both views as shown in next slide. Adjust lifts so waterline is a lift line
- Make templates from the Frames View for each station

Half Hulls

Modern plan structure

The Profile (Sheer)View
Depicting the waterlines



The Plan (Half Breadth)View
Depicting the Buttocks & Diagonals

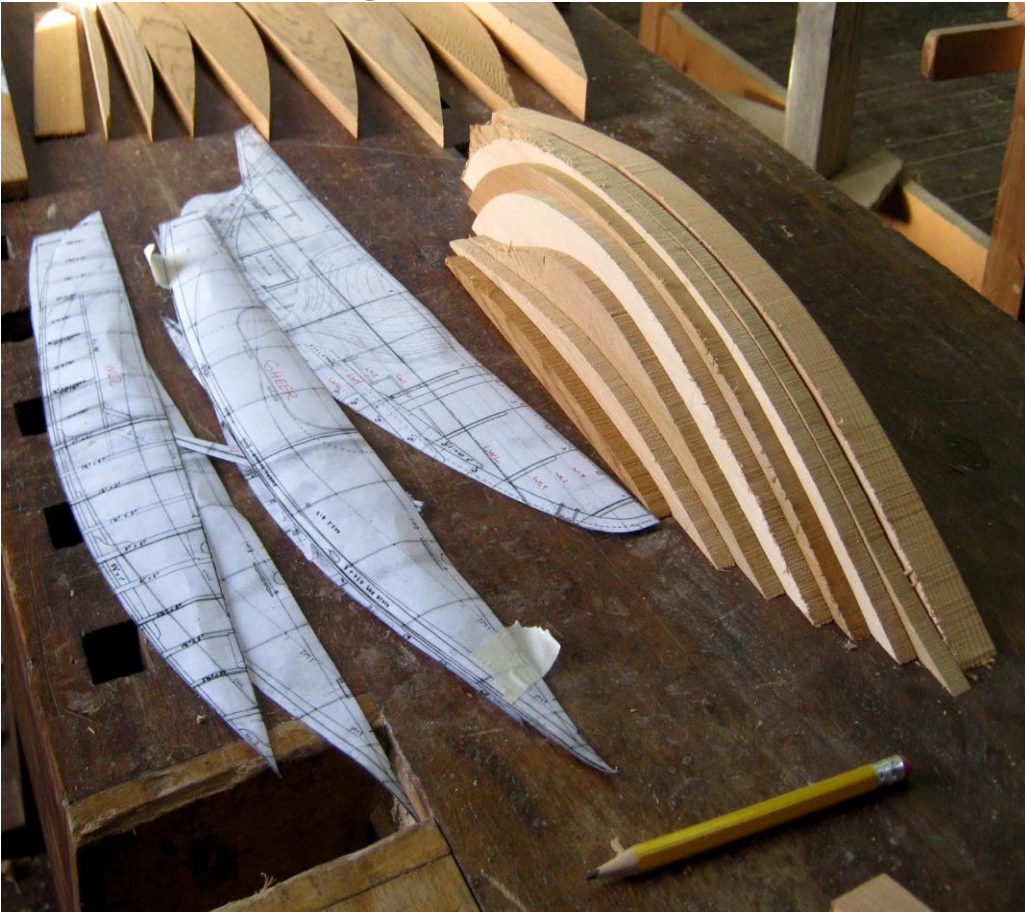
Half Hulls

Modeling the half hull continued

- Mark each lift with the measurements taken at each station with a sharp pencil (See Hint Slide)
- Fair the contour lines for each lift
- The sheer lift may have to be treated separately
 - It depends on placement of the top lift
 - It may be better to make that lift cover the entire sheer profile
 - Alternately just add partial lifts fore and aft glued to the top lift

Half Hulls

Modeling the half hull: From Lifts To Carved Hull



Half Hulls

Modeling the half hull continued

- Cut out the lifts leaving about 1/8 inch proud of the lines
- If the station lines have been lost e-establish them on the top of each lift for assembly alignment
- It is optional but may be to your advantage to predrill all lifts for locating dowels
- Glue the lifts together
- Mount the assembled lifts to an 'L' shaped wooden bracket for mounting in a vise
- Begin carving using gouges to reduce the profile carefully to near pattern lines
- At this point bring the cutout templates into play to check your contours at each station

Half Hulls

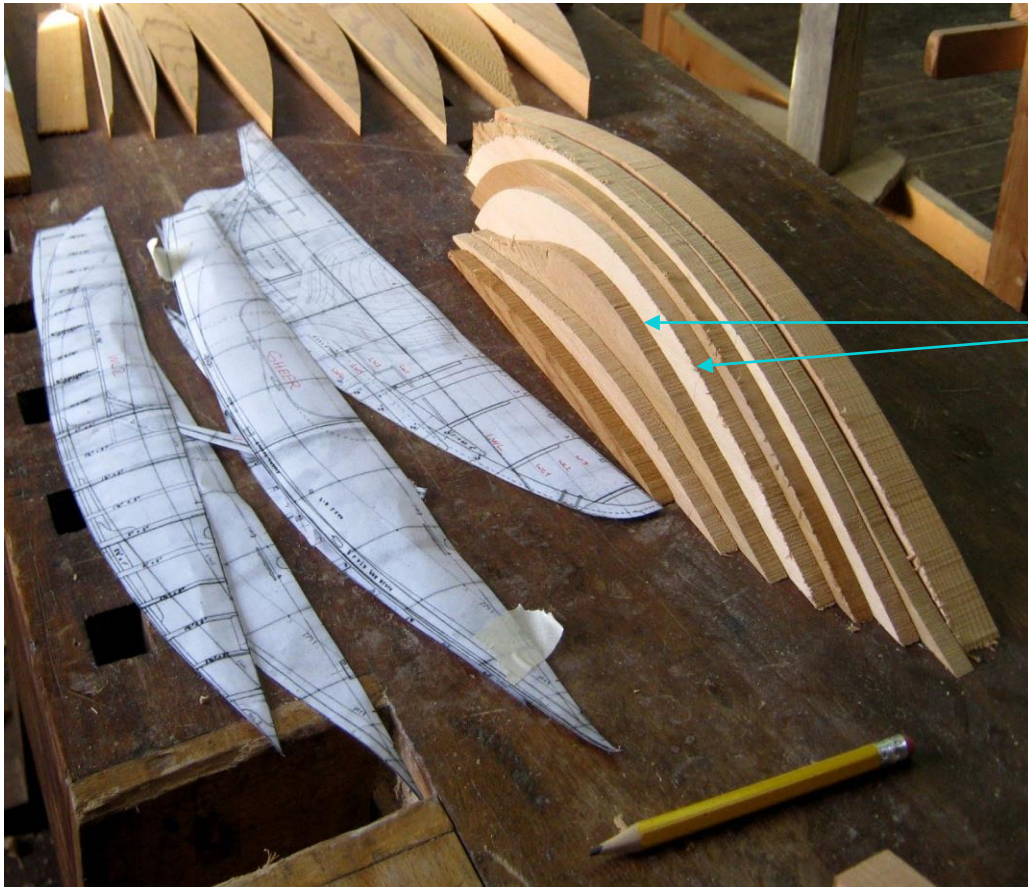
Modeling the half hull continued

- You can add detail and refinements such as stem, keel and rudder but pay attention to scale and proportions
- Watch waterlines. Thin waterlines work best especially with contrasting woods



Half Hulls

Modeling the half hull: Creating the Lifts



Hint: save some time by marking the top and bottom of the lift with the appropriate profile of the mating lift. Carve, plane or band saw some (leave it somewhat proud) of the material away prior to assembly

Hint: It is a bit wasteful but if you initially machine the lift stock all to the same width as the widest lift. Then assemble them (w/o glue) and trace the profile on the back side of the assembled lifts. Then band saw the Profile of the hull you will have a decent start to the overall profile shape. Do leave some material proud of the tracing.

Half Hulls

Basic tools for carving the half hull



Half Hulls

Suggested woods for the half hulls used in combination or alone

- Sugar Pine
- Cherry
- Walnut
- Maple
- Swiss Pear (accents)
- Box Wood (accents)
- Bass
- Mahogany
- All preferably close grain, no knots or voids

Half Hulls

Samples of the best!



Half Hulls

Samples of the best!

