# *The MSB Journal*

*by ship modelers for ship modelers*

***October 2023***

# The MSB Journal

ISSN 1913-6943

October 2023



Published by
www.modelshipbuilder.com

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## Table of Contents

# Editorial

I'll keep things real short this month as I am way behind schedule and want to get this issue to you as soon as possible. As usual we have some great articles in this issue that we hope you enjoy.

The next issue of the MSB Journal will be available in January. At that time we have decided to go to a quarterly publication (Winter, Spring, Summer, Fall … I know I've heard that in a song somewhere :-) ).

Okay, that's it! Happy Reading!

*Until next time*

*May your ANCHOR be tight,*
*your CORK be loose,*
*your RUM be spiced,*
*and your COMPASS be true.*

*Winston Scoville*

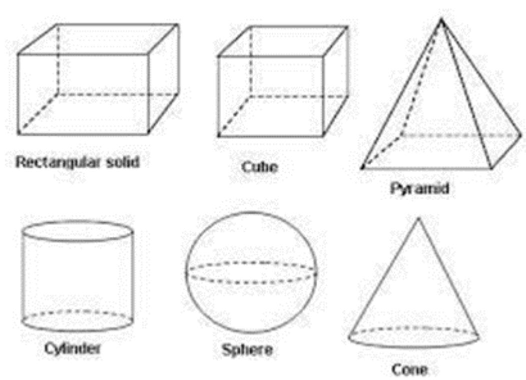
# Makerspace

By Mike Shanks

As scale modelers we create 3-dimensional (3D) artwork depicting objects of typically larger size in a lifelike fashion. Our models are made from a variety of materials using many methods. Unlike the art created via drawing and painting, scale model building uses components in 3D. These component parts can be defined by having length, width, and height (x,y,z). They also have mass and density. 3D parts and the term "3D" itself is common in the model builder vocabulary. But what is a 3D part really? How do we design one? How is a 3D part represented in a 2D drawing? What are some of the ways 3D parts may be made from scratch? Let's explore some of these questions and overview a few ways 3D parts are made.

For the draftsman and scratch builder, while the term 3D is used quite synonously they are actually very different. People often talk about drawing in 3D and the instructional advantages of 3D drawings versus 2D drawings. However, a 2D drawing expressed as a 3D artwork is only an illusion. For model building we need to see the hidden parts, be able to walk around the object or rotate it along multiple axis. Model building involves constructing physical objects in the real world of 3D where length, width, height, mass and volume can never be ignored.

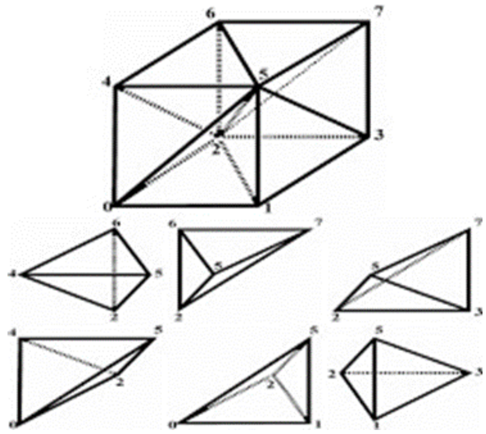
Some examples of a 3D object that can be drawn include cube, sphere, cone, cylinder, and pyramids. For these drawings to be useful for modeling each of their attributes must be defined with a real-world value on all sides of the object.




**Elevation Views**

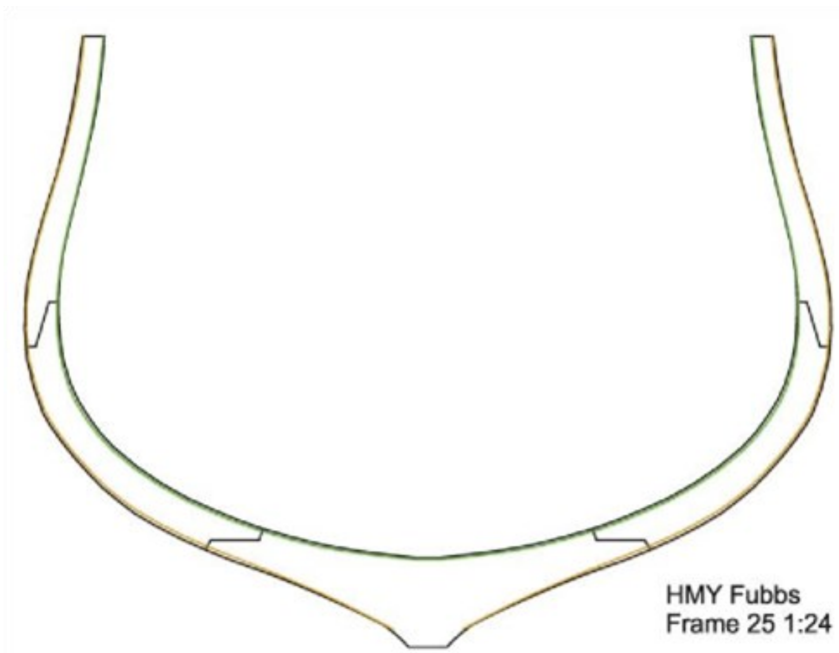
Drawings provide an overall vision of a part much quicker than prototyping. Isometric drawings give an illusion of 3D and help our brains visualize how the part will look in the real world as expressed on a paper 2D environment.

Technical attributes of a part (properties) included in drawings gives the modeler the information needed to fabricate parts while understanding the relationship of all sides of the part. Parts are not always symmetrical on all sides and can have different dimensions on opposing faces.  3D drawings can be very helpful in this regard so our brains can have a better understanding of the shape.



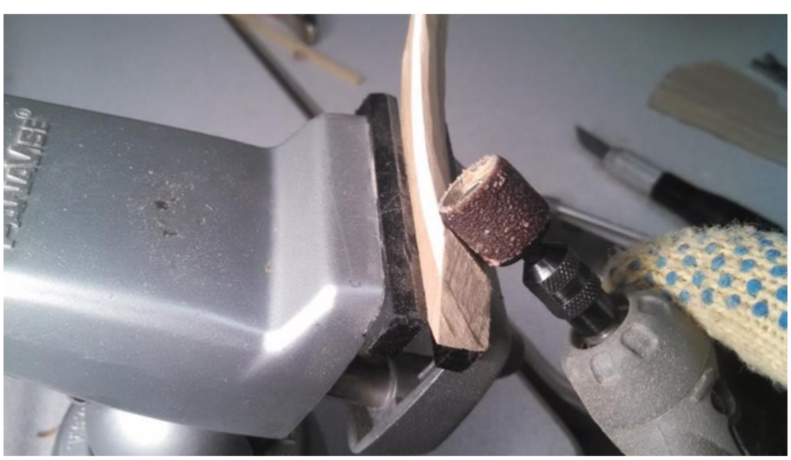

**Unequal Tetrahedrons**

2D drawings are better for: speed, ease of learning, machine tool dependencies, and depicting tolerances.  3D drawing using isometric projection is a method for representing the 3D world inside 2D technical and engineering drawings.  It is an inclined view where the 3 axes are foreshortened and the angle between either is 120 degrees.  Some people call this drawing "in perspective".  Hidden surface lines may or may not be depicted and technical properties are either annotated or provided in an attached table.

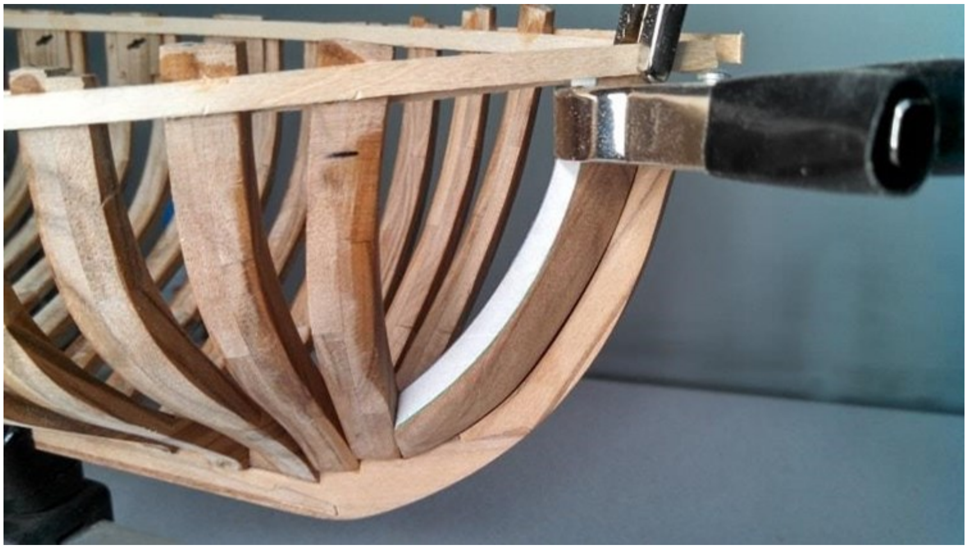



Plank on Frame ship modeling is a good example where we use a 2D drawing to define a 3D shape.  The gold and green lines seen below show us the inside and outside bevels or lofting for the frame.

Using dimensional wood of a specific thickness to define our z-axis we can use the lofting lines to manually shape the wood into a compound 3D part.

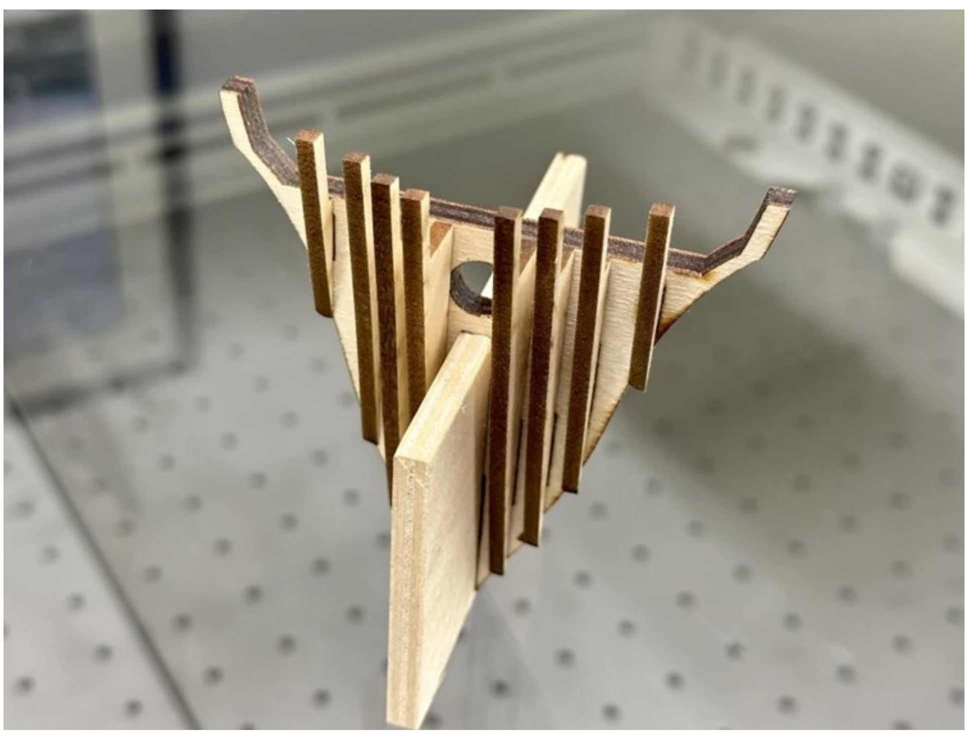


Although a flat 2D drawing was originally used, we ultimately produced a fully shaped 3D part.



Common with scratch builders, there is no limits to parts that can be made by using isometric 2D drawings as templates to produce 3D parts. However, it is very slow allowing only one part to be made at a time where every part is a prototype and difficult to replicate with consistency.

Another method is to layer dimensional wood together to build up a skeleton structure. Then either use tools for final shaping or cover the structure with thin materials to obtain the final shape. This allows for the creation of more complex shapes and asymmetrical parts.



**Layered 3D construction**

The most artistically inclined modelers are able to hand carve 3D parts from a single block of material using sharp blades, chisels, and sanding tools. Materials can be wood, clay, plaster, fillers, or even CA glue and resins. This is a very classical/traditional method of modeling where the entire 3D part is created from the solid material – all sides at once. Like previous examples, this is very manual, requires a high degree of artistic and physical skills and is slow. It is also difficult to replicate many duplicate parts of the same attributes

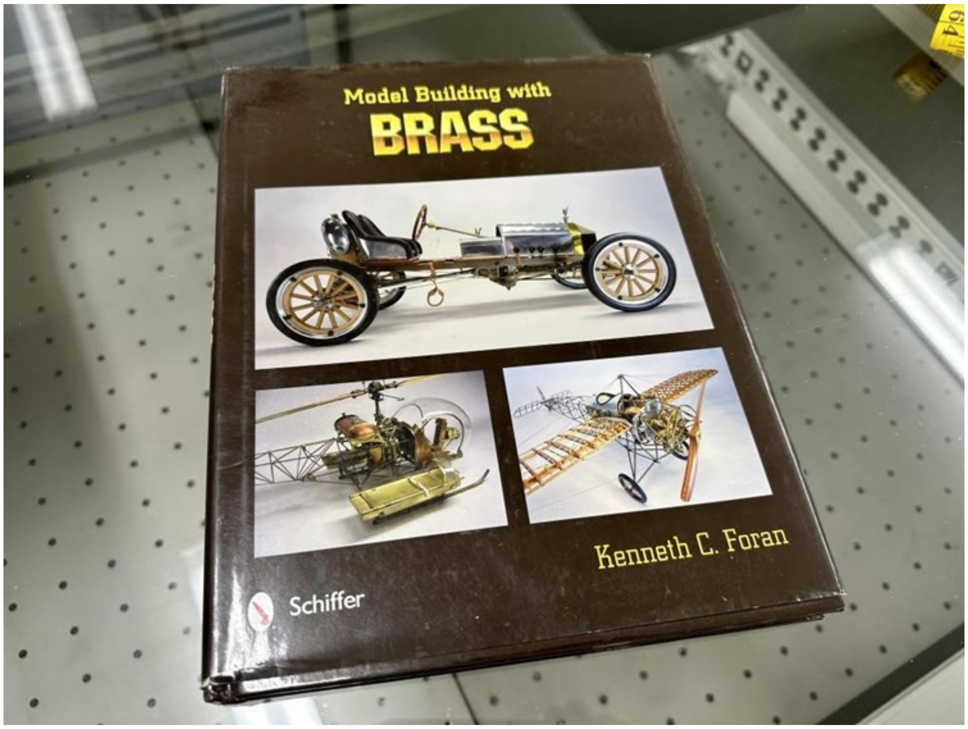
3D parts can also be made by molding. Either injection, slide, cast out of many materials to include plastics, resins, clays and polymers. To do this a master part (prototype) must first be created then a reverse mold that liquids can be poured into. While good for replication the resolution is not very high and duplication results can be inconsistent – unless extremely expensive commercial fabrication tools are used.

We have discussed 3D printing in previous articles. It is high tech, expensive, and requires training.

However, 3D printing can produce very high-quality results in a very repeatable fashion. It is somewhat slow but not nearly as slow as any of the manual methods. It is also great for prototyping new designs.

**3D printed parts**

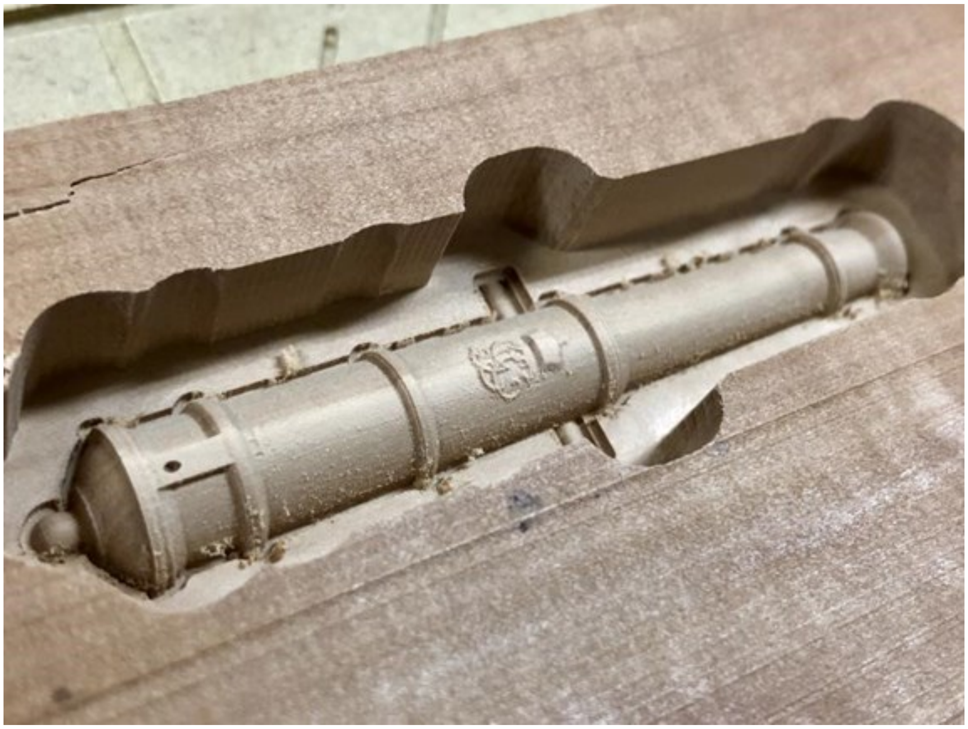
Metals can be used to create 3D parts. Annealing soft metals such as brass and then bending them using small hand tools or brakes is another common method for making 3D structural parts. The metal parts can be formed, soldered or glued together and then painted or blackened to create some very realistic model parts. Kenneth Foran's book "Model Building with Brass" is an excellent overview on the subject.



Believe it or not simple paper or cardstock can be used to make very realistic 3D models. Paper craft modeling is quite popular in the model railroading world. Heavy paper is printed, cut, folded, and glued to create a variety of modeling subject. Great for background scenery, signage, etc.

**3D model made from printed and folded paper**

2-sided CNC machining can be used to achieve a 3D part using a 3-axis milling machine. Registration between the two sides is maintained using dowel pins. The top side of the part is machined as shown in the photo below, then the material flipped over, and the bottom side is machined in full registration leaving little if any visible seam.



**Cannon made with 2-sided CNC machining**

3D assembly is an alternative to 2-sided machining where the part is split part down middle within the CAD software. The pieces are then machined as two halves and assembled together. This method works best with symmetrical parts and does not require the material flip, dowel pins, top/bottom registration so it is a somewhat faster and easier process.

**CNC parts for 3D assembly**

Advanced painting techniques such as dark washes and dry brushing can create an enhanced illusion of depth in small parts thereby increasing their 3D appearance.

**Painting for enhanced 3D effect**

When 3D parts are assembled, they become a defacto physical model. Understanding the orientation, fitment, tolerances and expected visual outcomes of individual parts is something model builders have an eye for.

Other considerations to think about when designing and making model parts: Are the parts for static display only? Are they positional? Are they operable? These questions will factor in not only the way a part is designed and made but what materials it is made of and the physical dimensions of stress bearing areas of the parts. Parts that rub against each other will wear due to friction. Tolerance gap is needed between parts that move or slide. Thin parts in full life size when reduced down to scale sizes may not have the strength to hold their shape or be practical to work with. This is where the density and mass of the modeling material comes into play. Sometimes, the material must be scaled larger than real life in certain areas for added strength.

It is now possible to make nearly any scale model part in a home shop. There are nearly an unlimited number of drawing and CAD software packages from free to expensive available. AutoCAD, TinkerCAD, Vectric Aspire, Fusion 360, SolidWorks, Blender, Paint3D just to name a few. For the creation of miniature figures there are online fantasy sites to create models such as Hero Forge and Titan Craft. Services such as Shapeways offer the means to print 3D models that you have created on your computer even if you don't have a 3D printer.

Scale model building has evolved far beyond putting a blade to wood. Modelers are now leveraging technology to not just improve the quality of their work but to also reduce the time required to produce results. The hobbyist can now create their own designs and produce realistic scale parts in 3D via repeatable methods. Design once, create many - you can make 50 of the same part, share your parts with friends, or perhaps go into business selling parts.

There was a time when modelers would search for kits or kit accessories of things they wanted to build models of. In today's world, those limits no longer exist as it is possible to create a model of anything a person can imagine.

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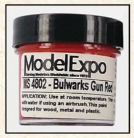


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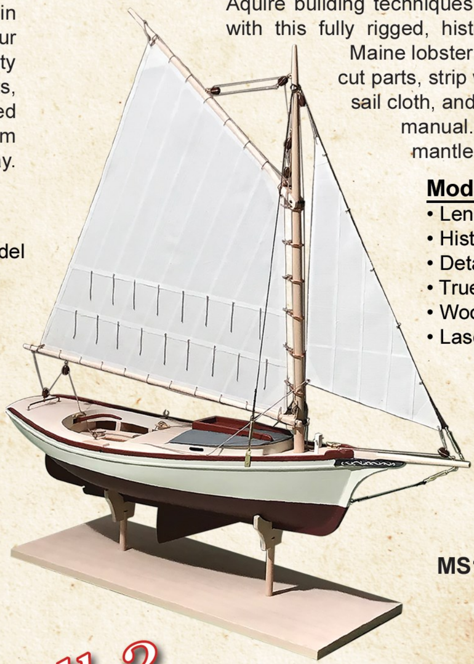

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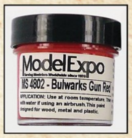


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# HMCSS Victoria – Broadside Guns

By Pat Majewski

This is the final article in the series relating to the armament carried by HMCSS *Victoria*. This article will concentrate on the Broadside guns fitted in the vessel but will be of broader interest as they were widely used in the RN at the time. Hopefully, this series of articles has added a little more to the pool of information about British ordnance of this era (mid-19$^{th}$ century).

## General

The Specification for the *Victoria,* and confirmed in related correspondence from the build Superintendent, called for the broadside guns to be Smooth Bore Muzzle Loading (SBML) 32- pounder 25-cwt guns. Two of these guns were fitted for her delivery voyage to Victoria, but her broadside armament was increased later.

F.A. Griffiths in his 'The Artillerist Manual', (1868) shows that the only 32-pounder 25cwt guns used by the RN in this period were the Dundas guns as listed in an extract from his book shown below. More detail in support of this assumption is provided later.

List of Service Guns, and Ammunition—*continued.* 60

Smooth-bore Guns—*continued.*

Cast-iron.

| | 32-Pounder. | | | | | | | | | | | 24-Pounder. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight . . . cwt. | 63°[c] | 58[b] | 56[d] | 56[e] A | 48 or 50° | 45[e] B | 42[e] C | 40[f] | 39[f] | 32[f] | 25[b] | 50[d] | 48[d] | 20[f] or 22 | .. |
| Length . . . ft. in. | 9 7 | 9 6 | 9 6 | 9 0 | 8 0 | 8 6 | 8 0 | 7 6 | 7 6 | 6 6 | 6 0 | 9 6 | 9 0 | 6 0 | .. |
| Calibre . . . in. | 6·41 | 6·375 | 6·41 | 6·375 | 6·41 | 6·35 | 6·35 | 6·35 | 6·35 | 6·3 | 6·3 | 5·823 | 5·823 | 5·823 | .. |
| Charge: Battering . . . lb. oz. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Charge: Service . . . ,, | 10[h] | 10[h] | 10[h] | 8 | 8 | 7 | 6 | 6 | 6 | 5 | 4 0 | 8[i] | 8[i] | 2 8 | .. |
| Charge: Saluting or Exercising ,, | 6 | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 2 8 | 5 | 5 | 2 8 | .. |
| Shot: Solid . . . lb. oz. | .. | .. | .. | .. | .. | 31 6 | .. | .. | .. | .. | | .. | 23 8 | .. | .. |
| Shot: Steel . . . ,, | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | .. |
| Shot: Grape . . . ,, | .. | .. | .. | .. | .. | 37 8¼ | .. | .. | .. | .. | .. | .. | 26 3 | .. | .. |
| Shot: Case . . . ,, | .. | .. | .. | .. | O.P. / N.P. | 34 11 / 36 12 | .. | .. | .. | .. | .. | .. | 24 2 | .. | .. |
| Shell: Common, empty . ,, | .. | .. | .. | .. | .. | 22 5 | .. | .. | .. | .. | .. | .. | 16 12 | .. | .. |
| Shell: Naval . . . ,, | .. | .. | .. | .. | .. | 22 6 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Shell: Shrapnel . . . ,, | .. | .. | .. | .. | .. | 28 3¼ | .. | .. | .. | .. | .. | .. | 21 5 | .. | .. |
| Carcasses . . . ,, | .. | .. | .. | .. | .. | 28 8 | .. | .. | .. | .. | .. | .. | 18 0 | .. | .. |
| Bursting charge: Common / Naval . . . ,, | .. | .. | .. | .. | .. | 1 5 | .. | .. | .. | .. | .. | .. | 1 | .. | .. |
| Bursting charge: Shrapnel . . . drs. | .. | .. | .. | .. | .. | 50 | .. | .. | .. | .. | .. | .. | 40 | .. | .. |
| | | | | | N[a] | C | | | | | | | | | |
| Fuzes: Percussion Pettman's L.S. | .. | .. | .. | .. | .. | 18 | .. | .. | .. | .. | .. | 18 | 18 | 15 | 16 |
| Fuzes: Percussion Pettman's S.S.[k] | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Fuzes: Time, Boxer, Wood: Common | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | 1 | 1 | 1 | .. |
| Fuzes: Time, Boxer, Wood: Diaph. Shrapnel | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | 1 | 1 | 1 | .. |

[a] N, Naval. C, Common. [b] Dundas's. [c] Millar's. [d] Blomefield's. [e] Monk's A, B, C. [f] Bored-up.
[g] If the shell plugs have a cross on them, not otherwise. [h] Charges for hot shot for : 2-Prs. 63 to 56 cwt., 7 lbs. 8 ozs.
[i] Charges for hot shot for 24-Prs. of 50 and 48 cwt., 6 lbs.
[k] Pettman's S.S. fuzes, and the 20" and 7¼" metal time fuze, will be superseded by Pettman's general service and 20" and 9" M. L. wood time fuzes, as soon as a sufficient store has been made.
N.B.—*Those natures marked with ° are only retained in the service until the few pieces still existing are used up or replaced.*

List of Service Guns, and Ammunition. [Part III.

**Figure 1 – List of 32-pounder Service Guns**

From 'The Artillerist Manual', FA Griffiths (1868), page 60.

An order for additional defensive guns for the Colony was made in April 1859, and this included four 32-pounder 25-cwt guns for *Victoria*. Her full broadside armament, when finally fitted in 1860, comprised six Dundas Pattern 32-pounder 25-cwt guns mounted on rear-chock carriages.

## Barrel Pattern

The SBML 32- pounder 25-cwt guns pictured aboard HMCSS *Victoria* are of the 'medium' calibre 6-foot Dundas pattern. This determination is confirmed with comparison of the detail against the drawings for the gun made by Captain Boxer, RN, in his 'Diagrams of Guns' (1853). The photograph at Figure 2 is a crop of a photograph taken by Davies & Co *c*.1865/6 titled 'H.M.V.S. *Victoria* with crew assembled on deck'.

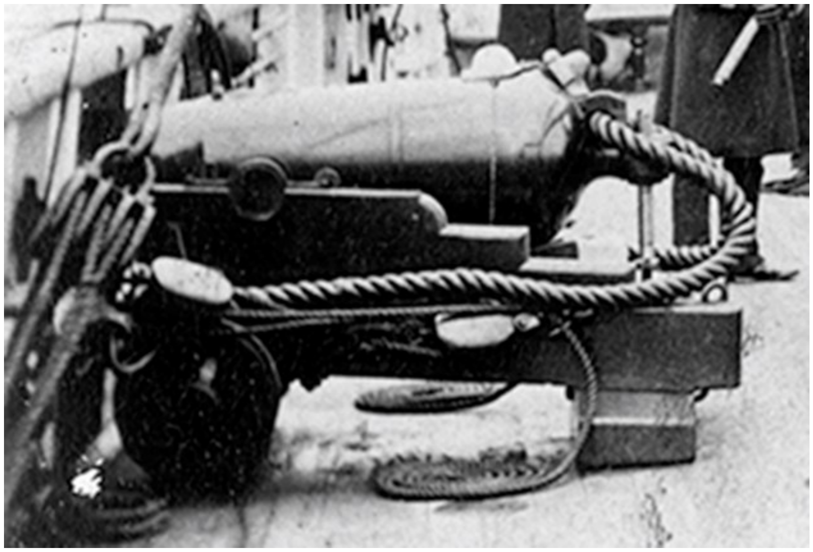

**Figure 2 – 32-pdr Dundas 25-cwt Medium Gun fitted in HMCSS *Victoria***

Crop of Image a14945 – State Library of Victoria – Accession Number H41413.

The following information, provided by Keith Quinton, an Australian Army History Unit (AAHU) Researcher, at Fort Queenscliff, assisted in identifying the gun pattern. Keith based his opinion on information found in pages 64/65 of David McConnell's 1988 Paper 'British Smooth Bore Artillery: 'A Technological Study to Support Identification'. Keith was able to identify the guns by their distinctive upper cascable loop, the addition of the lateral loop for the vertical elevating screw adjustment, and the positioning of the two re-enforcement loops in the comparative drawing of British short gun cascabels as shown in Figure 3.

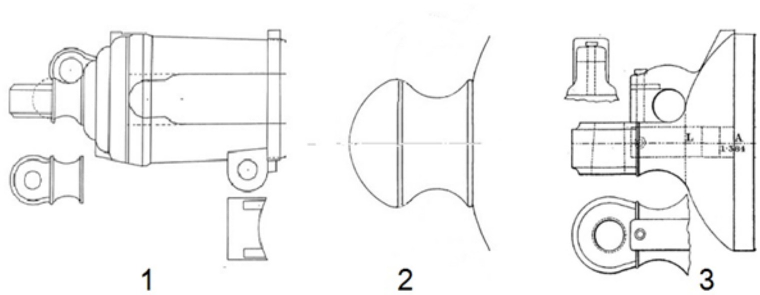


**Figure 3 – 32-pdr Gun Modifications**

Illustration by Keith Quinton after McConnell (1988) and Boxer (1853)

Figure 3 legend:

1. Carron carronade cascabel for short pivot mounted gun with rod screw elevation.
2. Standard Naval cascabel without loop.
3. Dundas 32-pounder modifications with rod screw elevation for trunnion guns.

Lt.-Colonel William Dundas redesigned the 32-pounder 25-cwt cannon in 1846. Of particular interest, he introduced the screw elevating device which is clearly evident in the photograph shown earlier.

The cumulative weight of evidence makes it almost certain that the gun shown in the photograph (Figure 2) is a Dundas 6-foot medium gun of 25-cwt as listed in the 32-pounder Service Gun list published by Griffiths (Figure 1).

The imagery also shows conclusively that the broadside guns were fitted with both a dispart and a rear sight, and a gunlock. This conclusion is formed by the presence of the aprons (lead covers) in the appropriate location on the broadside gun. These items were the subject of more detailed discussion in an earlier article.

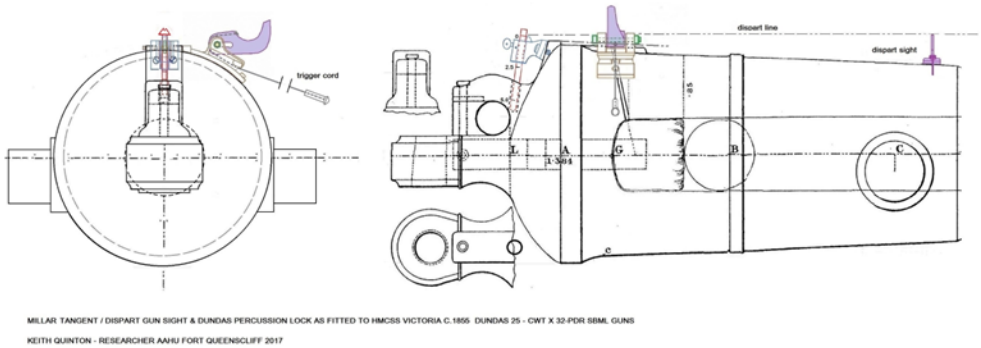


**Figure 4 – Dundas Pattern 32-pdr, 56 cwt Gun**

After 'Diagrams of Guns', Captain Boxer, 1853 – Plate VII, modified by Keith Quinton ©.

## Gun Carriages

The gun carriage, as depicted in the photograph at Figure 2, appears to be a typical rear chock carriage of the period. J.D. Moody in his article 'Old Gun Carriages', published in the Mariner's Mirror, Volume 38 (4) of 1952, page 307, explains that these carriages came into vogue in the 1840s with the introduction of guns of the Blomefield pattern. He also writes:

> *Illustrations of the early nineteenth-century carriages are not always as accurate as might be desired. The carriage was by this time over familiar, and under a heavy fire of criticism by inventors. Pictures intended to show the fitting of some suggested device or modification, or the run of tackles and breeching, are not scrupulously accurate in other details less immediate to their main purpose.*

Accordingly, any contemporary drawings must be viewed with some caution before accepting the types of fittings portrayed, especially the ironwork. Moody, in his article, illustrates a typical rear chock carriage which is shown below. Note that this drawing, except for the omission of the elevating screw, exactly reflects the carriage visible in the photograph.

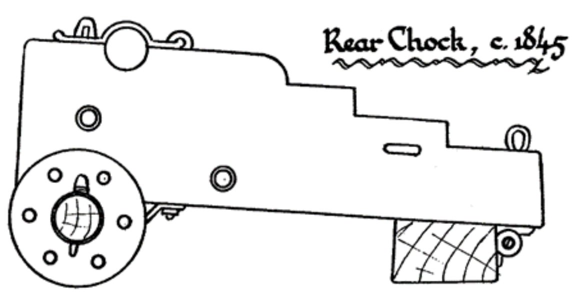


**Figure 4 – Rear Chock Gun Carriage c1845**

'Old Gun Carriages', J.D. Moody, Mariner's Mirror Volume 38 (4), 1952, page 308.

The carriage drawings developed by the author are based on drawings for a 64-pounder gun rear chock carriage dated 5 October 1854, held in the NMM Collections (ZAZ7000) and adapted to follow Moody's comments. When scaled appropriately, the NMM carriage conforms very closely to the carriage shown at Figure 2. Noting the photo shows the carriage at a slight oblique top down view some allowance for perspective must be made when comparing the two.

The obvious difference to a common naval carriage is the rear chock. Frederick Robertson, pages 158/159, writes:

> *As the power of guns and the energy requiring to be absorbed on recoil increased, the rear trucks disappeared and gave place, … to flat chocks which by the friction of their broad surfaces against the deck helped more than trucks to deaden the motion of the carriage.*

A less obvious difference is the size of the front trucks which are 16-inch diameter rather than the 18-inch trucks typically used in common carriages. This change may have been necessary to maintain the size ratio between the front trucks and the rear chock. Using a 16" truck also produces the correct height to place the bore axis (centre of metal) at the centre of the port opening.

The Dundas version of the rear chock carriage included a screw elevating mechanism that is very similar, if not the same, as those used in contemporaneous carronades. The screw elevating device negated the need for a bed and stool to support a quoin.

Moody, page 308, also explains that:

> *Tackle loops were placed vertically on the last step of the brackets, being the upper end of the rearmost hind-axletree bolts. Later these 'end loops' replaced the older side loops, but on models of about 1827 both kinds are to be seen in use together. They probably indicate a greater use of tackles in the training of the gun. …*
>
> *… That in the rear axletree [chock] was for the train tackle which held the gun inboard while it was loaded.*

According to 'A Treatise on Military Carriages', by W. Kemmis, 1874, page 175, the 32-pounder 25-cwt carriage weighed 4¾ tons, with the carriage made from elm, the axletrees from oak or African Sabiau, and had fighting blocks fitted under the front axletree for the carriage to stand on if the trucks were damaged.

**DIMENSIONS**

According to Karl H. Marquardt in his book 'The Global Schooner' (2003), as a rule of thumb, the carriage length was approximately the length of the gun from the muzzle to the centre of the trunnion plus half of the fore truck's diameter. The overall height was the height of the lower gun-port cill plus two-fifths of the gun-port height. Bracket thickness varied according to calibre between 3" and 6", being apart from each other by the gun barrel's diameter plus ½".

According to 'The Merchant's and Mechanic's Assistant' by Ridler Butts, (1856), page 61, the thickness of the brackets and axletrees should be the diameter of the shot (ball), which for a 32-pounder is 6.106-inches. By this rule the *Victoria's* carriage (for a 32-pdr) would be 6-inches. Bolt diameter is given as one-fifth of the ball diameter.

(continued next page)

However, in developing a drawing for the carriage, the author placed greater reliance on scaling the NMM drawing (ZAZ7000) cited earlier. This resulted in a carriage 5-foot 3-inches long, by 19¼-inches high at the head/front, and 5.6" thick. The space between the brackets would be 19½-inches, measured at the trunnions, 16-inches at the breech reinforce just forward of the trunnions, and 13-inches at the muzzle flare (all measurements rounded and include ½-inch room either side of the barrel). The brackets were slightly angled, being closer together at the front, and flaring outward aft.

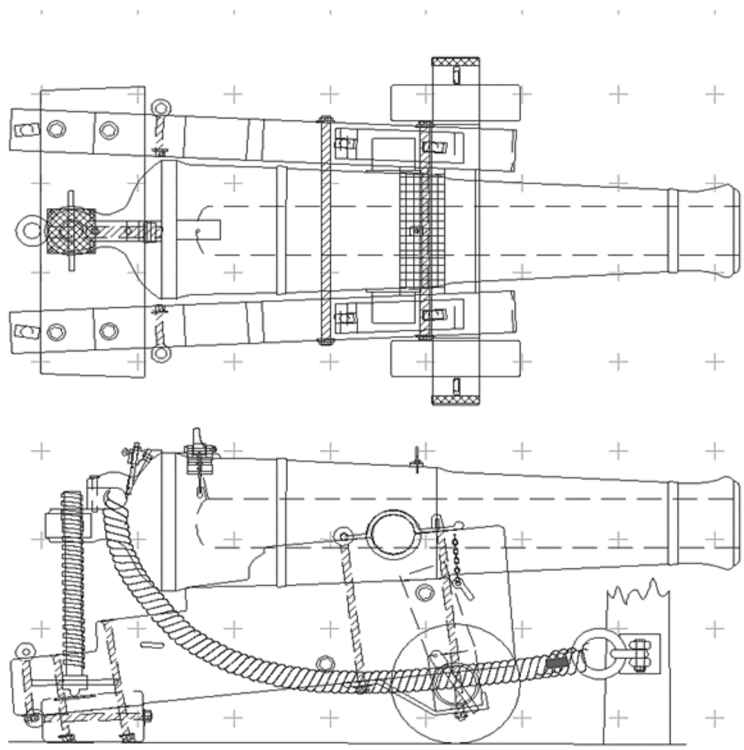

**Figure 5 – Probable Configuration of the Dundas 32-pdr, 25 cwt Gun Carriage**

Author's Drawing (©2023)

## Carriage Furniture

The furniture fitted to *Victoria's* broadside gun carriages is clearly evident in the photograph of the crew assembled on the after upper deck (Figure 2). The following discussion is not intended to be a definitive statement of the carriage furniture nor is it fully inclusive of all the fittings. The position of the various through bolts, eyebolts etc. can be determined from the drawings of the carriage.

### Elevating Screw

The gun shown in the photograph (Figure 2) clearly shows the elevating mechanism discussed briefly earlier. The screw shaft was probably made of gunmetal, or possibly bronze. The upper end of the screw shaft was wound through a wormed thread cut in the large horizontal lug (lateral loop) at the after end of the breech as shown as item 3 in Figure 3 earlier.

The screw shaft had a rounded or "ball" tail which turned on a flat plate inset into the middle of the upper side of the rear chock; it was not captured in a hollow or housing. This simple arrangement allowed the bottom of the screw shaft to move in accordance with the changing vertical alignment of the shaft induced as the gun bore axis was elevated or lowered.

Close examination of the base of the screw shaft shows, that rather than the typical cruciform handle, a simple through-rod type turning handle as shown in the mechanisms fitted to the carronades in HMS *Trincomalee* (Figure 6).

**Figure 6 – Screw Elevating Mechanism Fitted to a Carronade**
Photograph of a Carronade fitted in HMS Trincomalee taken by Clare Hunt,
and used with the permission of the National Museum Royal Navy, Hartlepool.

### Trunnion Caps

The trunnion caps were of the standard British fit as can be seen in all imagery of contemporary guns, and on the many physical examples of the 32-pounder 25-cwt guns on display throughout Victoria, Australia. A sketch showing the detail of the trunnion cap is provided at Figure 7.

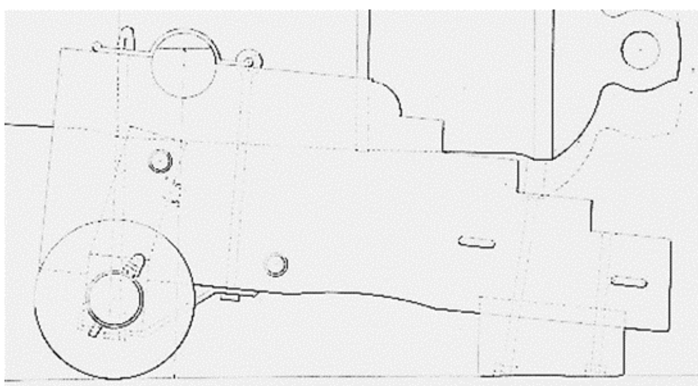

**Figure 7 – Trunnion Cap Detail of a Rear Chock Carriage c1854**
Crop of Sketch – NMM Collections ZAZ7000

### Axletree Straps

The front axletree was reinforced with two bent iron straps bolted to the underside of the front axletree, and to the underside of the carriage brackets, using the same bolts that capture the trunnion caps as shown at Figure 7 above. There is insufficient detail shown for the forward end of these straps to allow a positive determination for their shape. The straps probably wrapped under and up the fore side of the axletree and the upper ends secured with heavy screws. Alternatively, they may simply may have been terminated under the axletree and secured with the through bolts alone.

### Bolts

Two large bolts, fitted horizontally to connect the brackets, are evident from the imagery and NMM sketches. The upper, most forward of these bolts is also used to locate and secure the upper end of the transom. It has been assumed the bottom of the transom rested on, and was probably bolted to, the top of the front axletree.

The other through-bolt is located at the bottom of the brackets just aft of the trunnion cap after bolt. As no bed and stool is required, it is assumed that this bolt is used to balance the upper through-bolt in holding the brackets together (prevent them spreading under the weight of the gun).

### Truck and Chock

The photograph of the gun shows that the carriage was fitted with fore trucks and a rear chock. The 16-inch trucks (discussed earlier) are fitted in the normal method using a forelock driven through on the outer ends of each axle to keep the trucks in place against the squared side of the axletree.

The rear chock is secured to the carriage with four bolts, two through each bracket as shown at Figure 7. The tops of these bolts are recessed to sit under, or near flush, to the top of the respective bracket steps. The bolts are secured with nuts and washers on the underside of the chock which are also recessed so as not to damage the deck.

Some carriages also show a metal fitting with a forged recess, located centrally and aligned with the top of the chock. When fitted, this was used to accept a traversing lever. However, due to the location of the train tackle eyebolt shown in this position in the photograph, it is assumed such a fitting was not provided in Victoria's carriages. If fitted, it may have been in the form of a combined eye and recessed receiver forged into a single fitting, and located centrally under the eye.

### Tackle Fittings

Analysis of the carriage fittings shown in the photograph at Figure 2, establishes that the carriage had five eyebolts fitted to accept hooks for the gun, traversing and train tackles.

Two eyebolts for the gun tackles are fitted to the outer sides of the brackets aligned with the leading edge of the rear chock, as shown in the drawing at Figure 5. These were secured with a nut and square washer on the inside of the brackets. The standing block of the gun tackle was hooked to an eyebolt fitted in the roughtree timbers on either side of the gunport; the running blocks were hooked to the carriage eyebolts.

Two eyebolts were fitted to the top outer ends of the rear chock, inclined outwards at about 45°, for use with the traversing tackles. These eyebolts were formed on the upper end of the through-bolts which served to secure the rear chock. The nut and washer of these bolts were recessed into the underside of the chock with a to prevent them damaging the deck. The traversing tackles were rigged between the eyebolts and purpose fitted eyebolts or padeyes in the deck, with the running block hooked on at the bracket ends.

The train tackle running block was rigged between an eyebolt in the middle of the after side of the rear chock and the standing block eyebolt/padeye fitted in the deck directly behind (inboard) of the gun. The eyebolt was located centrally fore-and-aft through the rear chock, with the eye opening aligned facing aft. The other end of the bolt was secured with a square nut and washer on the inner side of the chock.

**Breeching Rope Fittings**

The breeching and preventer ropes for the broadside guns were set-up to ringbolts in the major roughtree timbers, at the level of the cill, to either side of each gun port. Many contemporary sketches and plans show a second ringbolt level with, but further forward/aft of these for fitting a preventer rope or for emergency use.

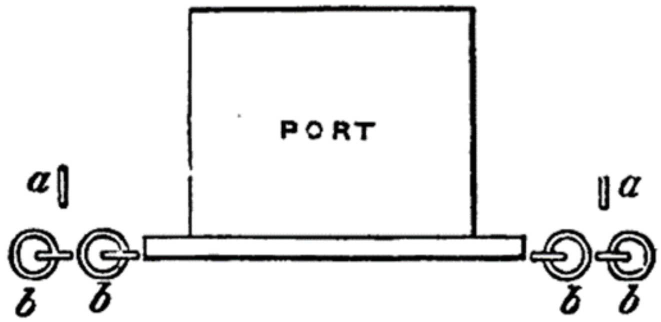


**Figure 8 – Gunport with Breeching and Preventer Ringbolts**
Crop of image from 'Rudiments of Naval Architecture' by James Peake, 1867, Chapter XXVI, page 283.

The roughtree timber arrangement in Victoria did not allow for these redundant pairs. Close examination of the breeching rope ringbolt pairs fitted in HMS Harrier shows that in some places the redundant ring could not be fitted. This provides some confidence in fitting only a single ring either side of the port in Victoria.

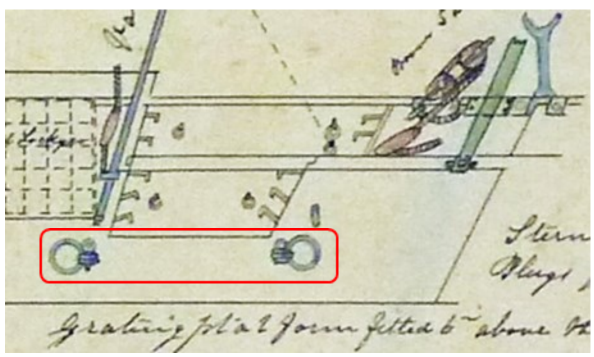

**Figure 9 – Inboard Profile of HMS *Harrier* c1860**
Crop of Drawing in NMM Collections – MFQ369 Part 2 End.

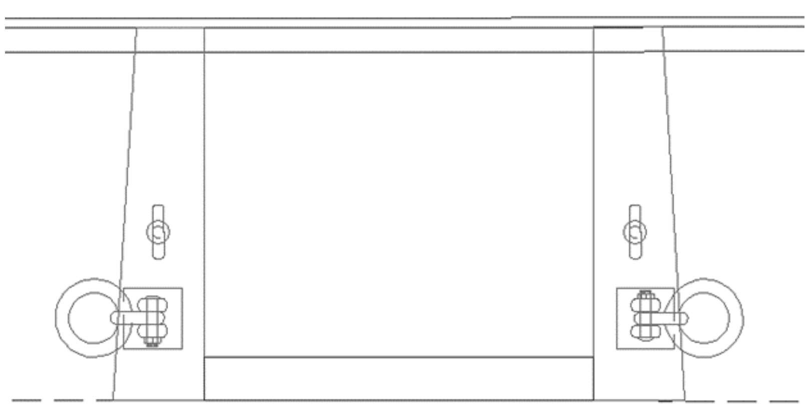

Figure **10 – Gunport Fittings HMCSS *Victoria***
Author's Drawing (©2020).

James Peake (1867), page 282, informs that the ringbolts to which the breeching ropes were secured, were the forming of a ring in the eye of a bolt, the latter (eye) being 2½ times, and the ring, in the clear, being five times the diameter of the bolt. These ringbolts were about 1¼-inch bolt diameter giving an eye clearance of 2⅜-inches, and 6¼-inch ring clearance. It has been assumed that the diameter of the ring iron was the same as that of the bolt.

The cill height, as fitted in *Victoria's* gunports, did not allow the ringbolts to align with them as was the usual practice. Accordingly, they were fitted as close to the cill as was practical, but this resulted in them being slightly above the cill level.

**Breeching Ropes**

Moody, page 307 explains that:

> *The run of the breeching was changed between 1830 and 1834, and no longer passed through the ringbolts which were therefore omitted from later carriages. In the older system the breeching passed from the cascabel down through the carriage ringbolts, and thence to the ringbolts at the port sides. This caused a reaction on recoil that tended to lift the fore-trucks from the deck, and led to frequent criticism. No change was made, however, until guns of Blomefield's pattern, with their cast breeching loops at the cascabel, had replaced the older styles which relied on a strapped-on thimble to hold the breeching to the gun.*

Analysis of the photograph showing one of the broadside guns on the after deck, shows that the breechings were set-up as described by Moody. A table in 'The Sea Gunner's Vade Mecum' (1812), page 179, provides guidance for the diameter and lengths of the breeching (preventer) ropes, and gun tackles etc., which will have remained applicable to *Victoria's* pivot guns.

The circumference and length of the breeching rope can be determined by a rule of thumb which suggests that it was about one-third the gun bore/shot diameter in circumference and three times the bore length in length. Given the 32-pounder ball was 6.106-inches, and bore length 72-inches, this would result in *Victoria's* broadside gun breeching ropes being 2.04-inches (diameter) by 18-foot long.

Captain Boxer, cited earlier, shows two methods by which the breeching ropes were bent to the rings.

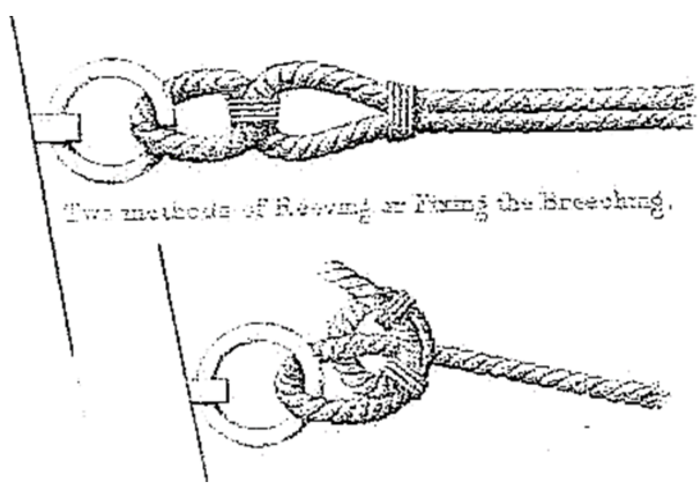


**Figure 11 – Two method of Reeving the Breeching Rope**

'Diagrams of Guns', Captain Boxer,1853, Figure 4

**Gun Tackles**

The gun tackles were fitted in a standard configuration with the standing end hooked to an eyebolt in the after part of the carriage brackets, and the running end hooked to the eyebolts in the roughtree timbers just above the breeching rope ringbolts. A gun tackle purchase is formed by a rope rove through two single blocks each fitted with a hook, which provides a mechanical advantage (power gained) of two to three times as shown at Figure 12.

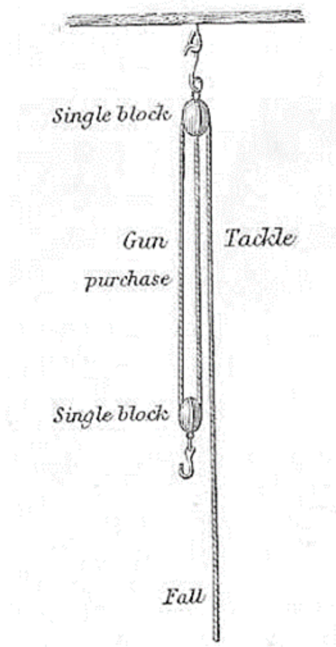


**Figure 12 – Gun Tackle Purchase**

'The Art of Rigging', G. Biddlecomb, 1848, Part II, Plate 7, page 60

Unfortunately, the Rigging Warrant does not list the gun, traversing or train tackles, so their sizes have been estimated from the photograph. The 'Sea Gunners Vade-mecum', R Simmons, 1812, page 179, Table AA2 is also silent on gun tackle rope dimensions for a 32-pounder 25 cwt gun.

This table shows the gun tackle used with a 24-pounder is formed from rope dimensioned the same as for a 32-pounder 56-cwt. This infers that the same size gun tackles would probably have been used with a 32-pouinder 25-cwt gun: namely 10 fathoms (60 feet) of 2½" hemp rope. The size of the associated blocks can then be determined from these dimensions.

Gunports

The vessel designer's (Oliver Lang) Sheer Drawing, and the profile photograph of the ship, clearly show the positions and sizes of the broadside gunports. By measurement from Lang's Drawing, the gunport openings were 34 -inches by 25½-inches.

According to 'The Merchant's and Mechanic's Assistant' (1856), page 61, the gunports were: fore-and-aft 6½ ball diameters, up-and-down six diameters; and the cill 3½ diameters above deck level. Given the 32-pounder ball was 6.106-inches, these equate to gunports 39.67-inches across by 39.64-inches high with the bottom of the cill 21-inches above deck level.

Both of these sources are primary evidence; however, greater credibility has been placed in Lang's drawing as the Rules-of-Thumb provided in the document are much more generalised. Additionally, merchant ships were not armed the same as Naval vessels, and as *Victoria* was pierced and armed by the Woolwich Arsenal, naval rules would seem more relevant.

*Victoria's* gunports were not fitted with lids as the guns were carried on the weather deck. These ports were always open when guns were fitted; however, they appear to have been planked in, or had bucklers fitted when the guns were not carried. The barrels will also have been fitted with tampions when not in use to prevent the ingress of any water.

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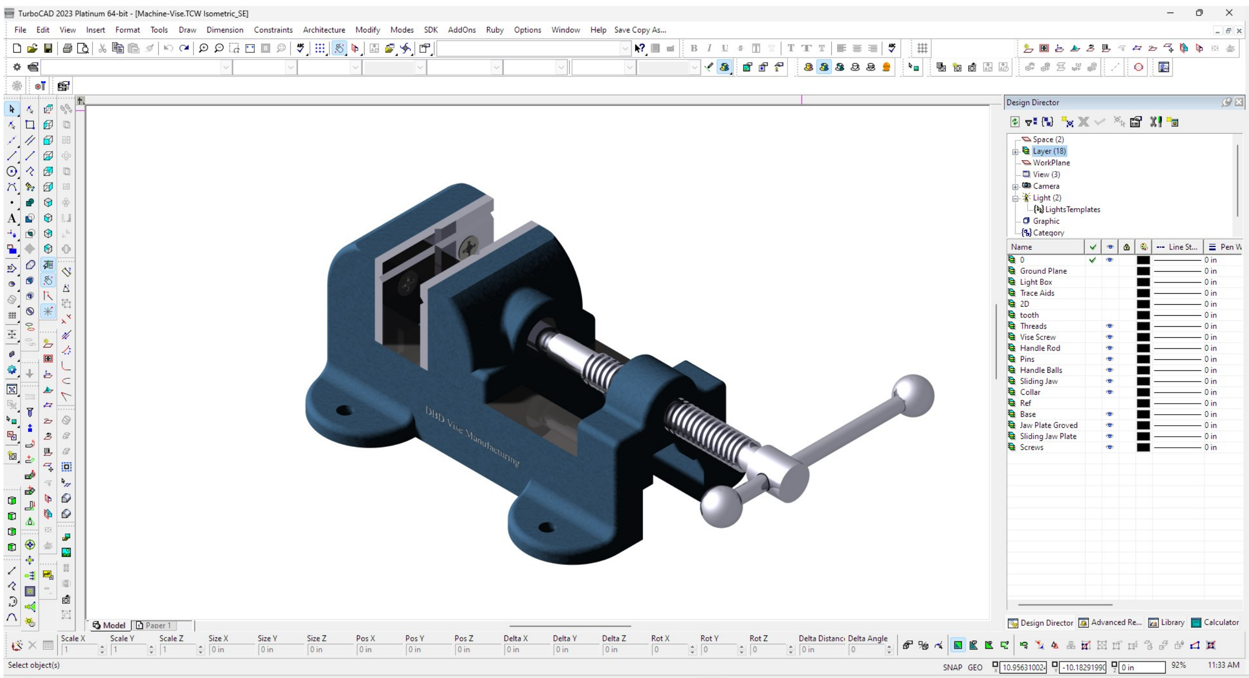
# The Ship Builders
# Machines - CAD Software

A practical Guide

*By Donald B. Driskell*




*This is a screen shot of the program I use called TurboCAD (Platinum) from IMSI Design.*

So, this article is  probably geared more towards those that love to design and play around with CAD and making their own CAD drawings, whether it be of course ships, or as far as that goes , anything you can dream up !

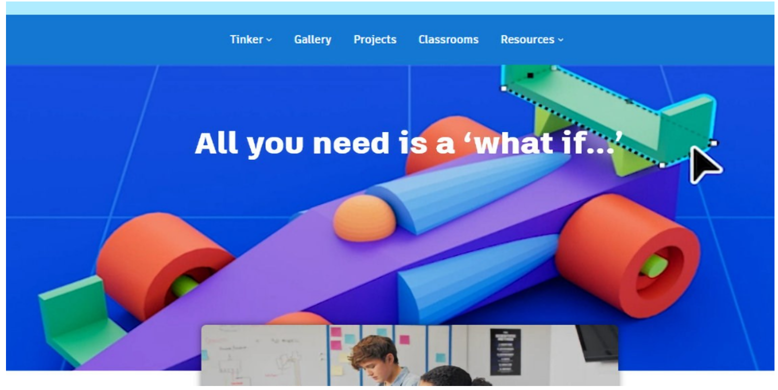
This article is simply put; to get you the information so that you can decide.  As you will see, there are tons of CAD programs from totally free, to pay, and also subscription based.  I am sure that there are many that I did not include, as I am thinking about it, such as Sketchup , sculteo, Shapr3D , ZWCAD , MicroStation and many others you can find just by a google search.

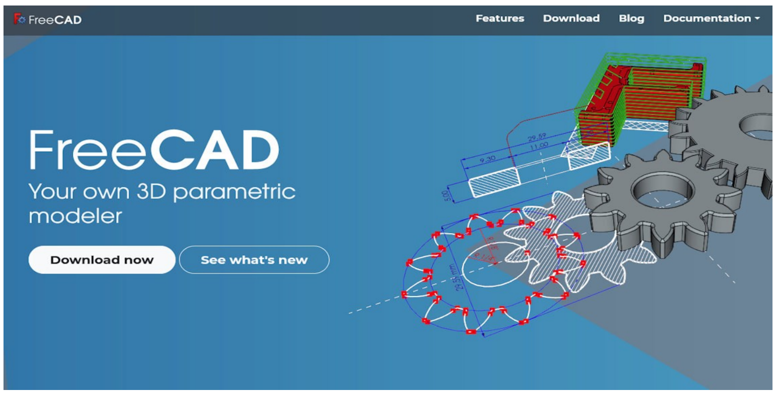
Some are lets say less expensive to really costly, really, as far as CAD goes, it depends on what you want to use it for.  Some of these programs have an easy learning curve while some for professionals has a rather huge learning curve that requires on-going training.  I am sure that most all of you only want the basics with a simple learning curve, however, I just thought I would include as many programs here just for grins.

So, lets get to it.  I have to say that this is just a sample, there are many other programs out there if you have enough time to search for them. But bear in mind, this is just a sample from beginner to expert. Free to quite expensive !

Tinkercad is Autodesk's 100% free online 3D design application for beginners. Currently available in 16 languages, the software is based on a block construction, allowing you to develop models from a set of basic shapes – cylinders, triangles, circles, cones, etc

https://www.tinkercad.com/



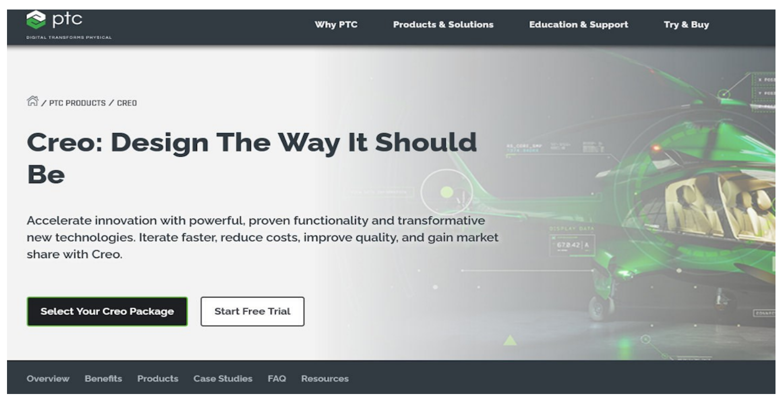

FreeCAD is a completely free parametric 3D modeling tool that is open-source and enables you to design real-life objects of any size. The parametric component makes editing easier. You can go to your model's history and change the parameters to get a different model.

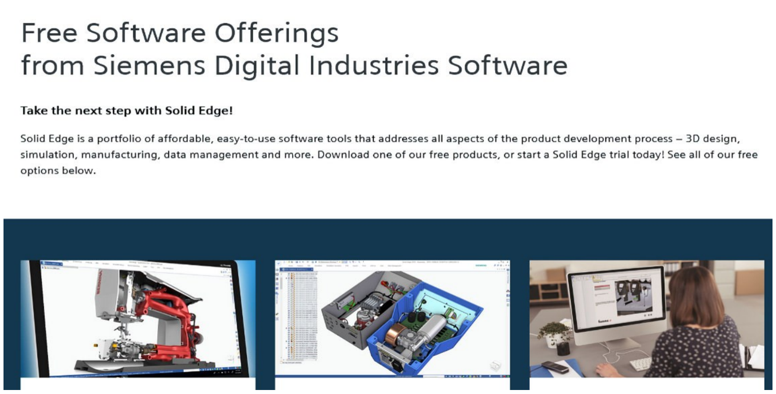
https://www.freecad.org/

**CAD for Intermediate Users:**

Creo is a 3D CAD solution that focuses on rapid product innovation, which is supposed to allow better products to be realized faster. The CAD software is considered easy to learn and guides users from initial design to final product manufacture and beyond.

https://www.ptc.com/en/products/creo




Solid Edge is a CAD software that is easy to learn and has even simpler features, making it suitable for beginners as well as professionals

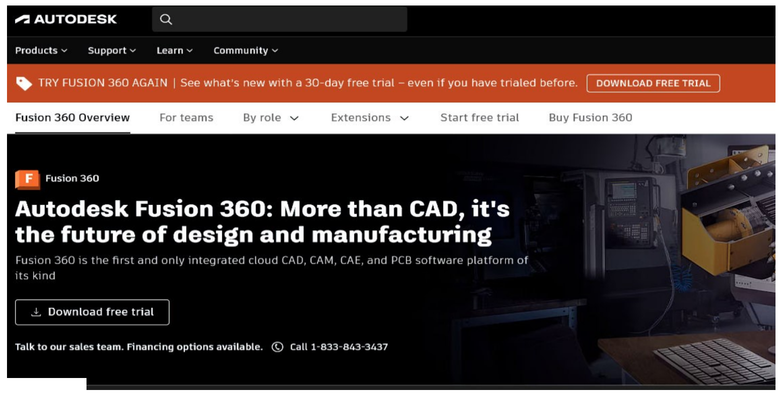
https://solidedge.siemens.com/en/free-software/overview/

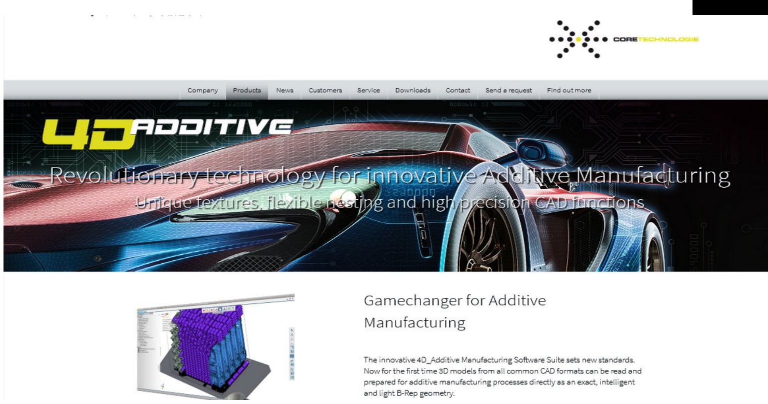

TurboCAD comes in several flavors from Deluxe (economical version) up to the Platinum Version. This platform is good for both beginners and advanced users.

https://www.turbocad.com

Developed by Autodesk, the Fusion 360 program consists of a cloud-based software platform. It is primarily used for product design and 3D modeling, CAD, CAM and PCB.

https://www.autodesk.com/products/fusion-360/overview?term=1-YEAR&tab=subscription

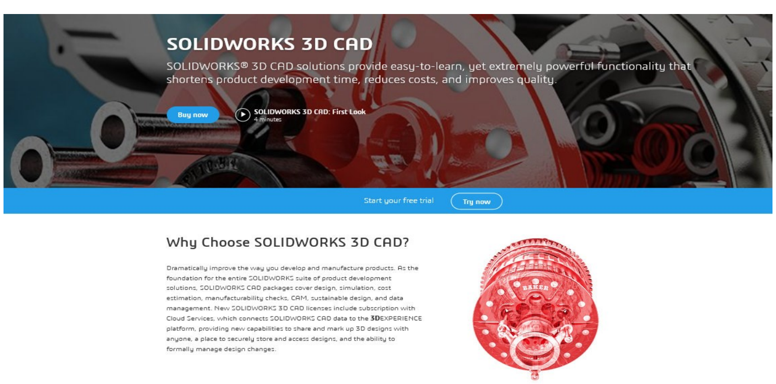



Developed by the French-German co. CoreTechnologie, 4D_Additive is a software that offers its users the possibility of repairing all types of models and enables modelling in exact geometry.

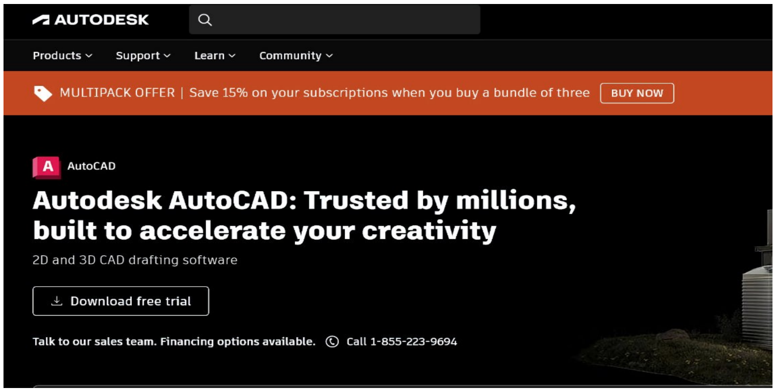
https://www.coretechnologie.com/products/4d-additive.html

## CAD Software for Professionals




SolidWorks Published by Dassault Systèmes, it is often used by professional 3D designers. It is a parametric featured-based model. The software includes a wide range of features such as design validation tools, or reverse engineering.

https://www.solidworks.com/

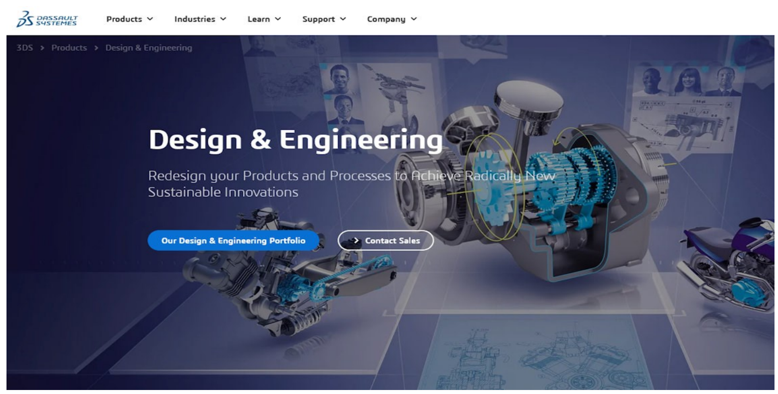


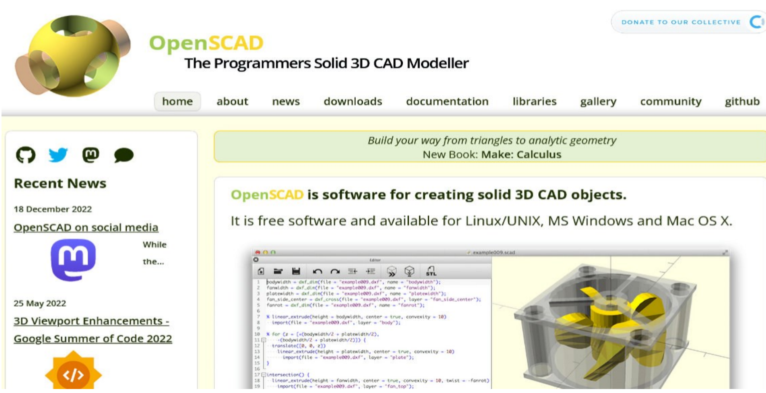

AutoCAD software from Autodesk was one of the first CAD software to be released on the market in 1982, making it a very established CAD software across industries.

https://www.autodesk.com/

CATIA is one of the world's leading product design and experience solutions, used by the most prominent companies across industries to create the products we see and use every day

https://www.3ds.com/products-services/catia/



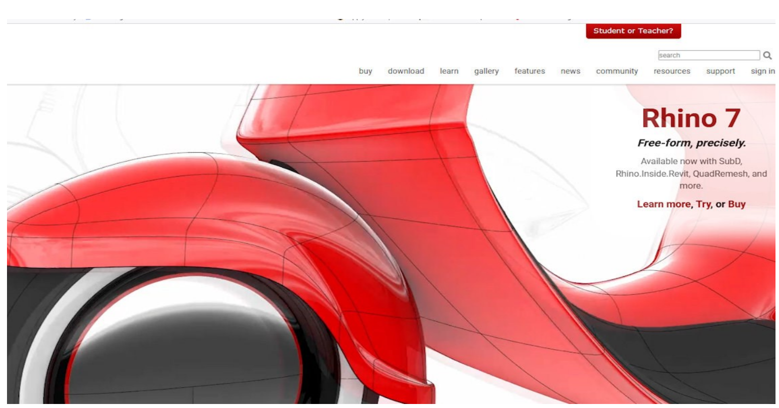



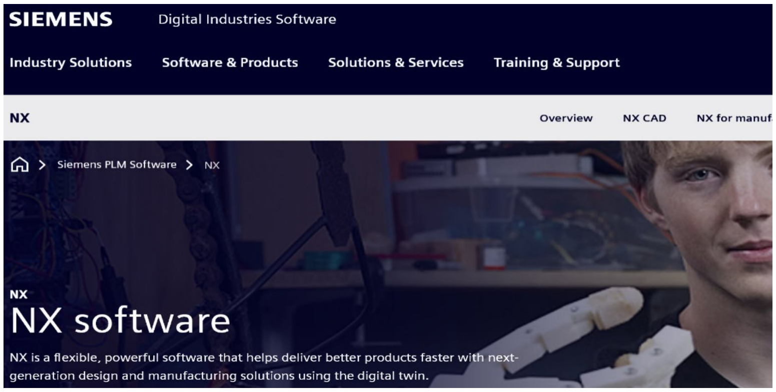

OpenSCAD is a software that is used for creating solid 3D CAD models. It is completely free and open source, and is available for GNU/Linux, Microsoft Windows and Mac OS.

https://openscad.org/

Rhino is known for being an incredibly versatile 3D modeler. The commercial 3D computer graphics and CAD software uses a precise and mathematical model known as NURB, which allows users to manipulate points, curves, meshes, surfaces, solids, and much more.

https://www.rhino3d.com/



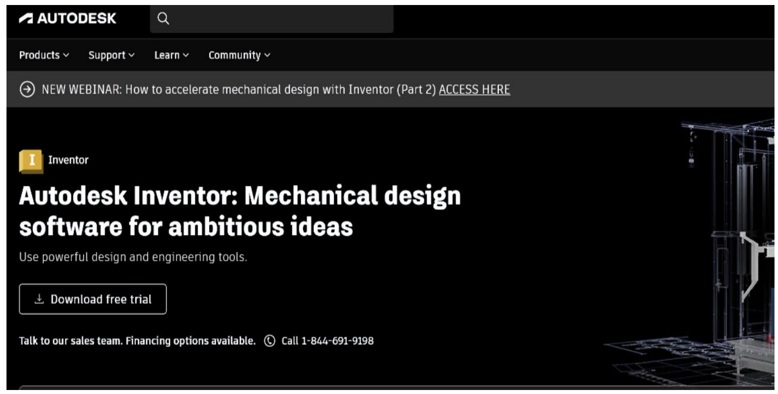



Siemens (NX). Siemens is not just a multinational conglomerate corporation and one of the largest industrial manufacturing companies in the world, it is also well-known in the field of additive manufacturing.

https://plm.sw.siemens.com/en-US/nx/

Inventor by AutoDesk CAD software, provided by Autodesk, is a particularly powerful software made for mechanical design and is, therefore, a professional tool for 3D design, documentation as well as product simulation.

https://www.autodesk.com/products/inventor/overview?term=1-YEAR&tab=subscription



# Considerations for Framing a Plank on Frame Model

# Part I

by Robert Hunt

Considerations for framing a plank on frame model (POF) are very important. One must consider his or her own experience in plank on frame construction, the scale of the model, the type of wood being used for the frames, the type of jig being used, and the type of wood being used for the keel, stem, sternpost, and keelson. These individual items are what I call “variables” and any one or several of these variables will help you to decide what approach you will take when framing your model.

First let’s consider the scale of the model. The typical scale Hahn used in his models was either 1/4” scale, 1/8” scale, or 3/16” scale. You might wonder why scale is something you need to consider when you are framing a model ship. Let me give you an example of why scale matters.

Years ago I built a Hahn style model of the 74 gun British warship called the HMS Alfred. I used Hahn’s plans for this ship, however, his model was built in 1/8” scale. In 1/8” scale, the model was about 2’ in length from stem to stern, but in 1/4” scale, the model was twice that length - 4’ long.

Because the model was so much larger, it meant that it was also heavier. The frames were thicker, so their thickness affected the framing jig in that Hahn used 1/4” plywood on his 1/8” scale model, but at 1/4” scale, the framing jig needed to be upscaled as well. The framing jig base needed to be 1/2” plywood instead. The larger jig required additional support underneath it to keep the heavier base from warping. The stem supports needed to be heavier and thicker because the longer, thicker keel was more prone to warping as well. Therefore, additional side to side supports of the keel were needed to prevent any warpage in the keel during the framing process.

To prevent the keel from warping, I had to make what I call fake frames that I installed at intervals from stem to sternpost to hold the keel straight. These fake frames were made to be the same thickness as the frames themselves. They were shaped like an upside down “T” so that the width of the top of the “T” would fit into a specific frame slot thus preventing the keel from moving side to side. The stem of the “T” was the same height as the actual frame that would eventually end up in that fake frame slot. It had a notch in the end of it that would fit into the notch in the keel.

This fake frame and others like it extended across the central area of the framing jig at intervals of about 10 frames. They were not glued into the jig but provided support for the keel to ensure that it remained on the center line, at the correct height, and thus prevented the keel from warping. When I reached one of these fake frames, I simply removed it from the jig and glued the real frame in its place using 5 minute epoxy.

Had I known what I know today, considering the scale of the model and its overall size, I would have opted for an upright building jig rather than an upside down jig. The upright jig, based on my own designs, has special pieces on each side of the keel that keep the keel centered on the centerline of the jig and ensure that the keel won’t warp. Photo 1 shows a typical upright jig I designed for a model of an Armed Virginia Sloop. This model was in 3/8” scale.

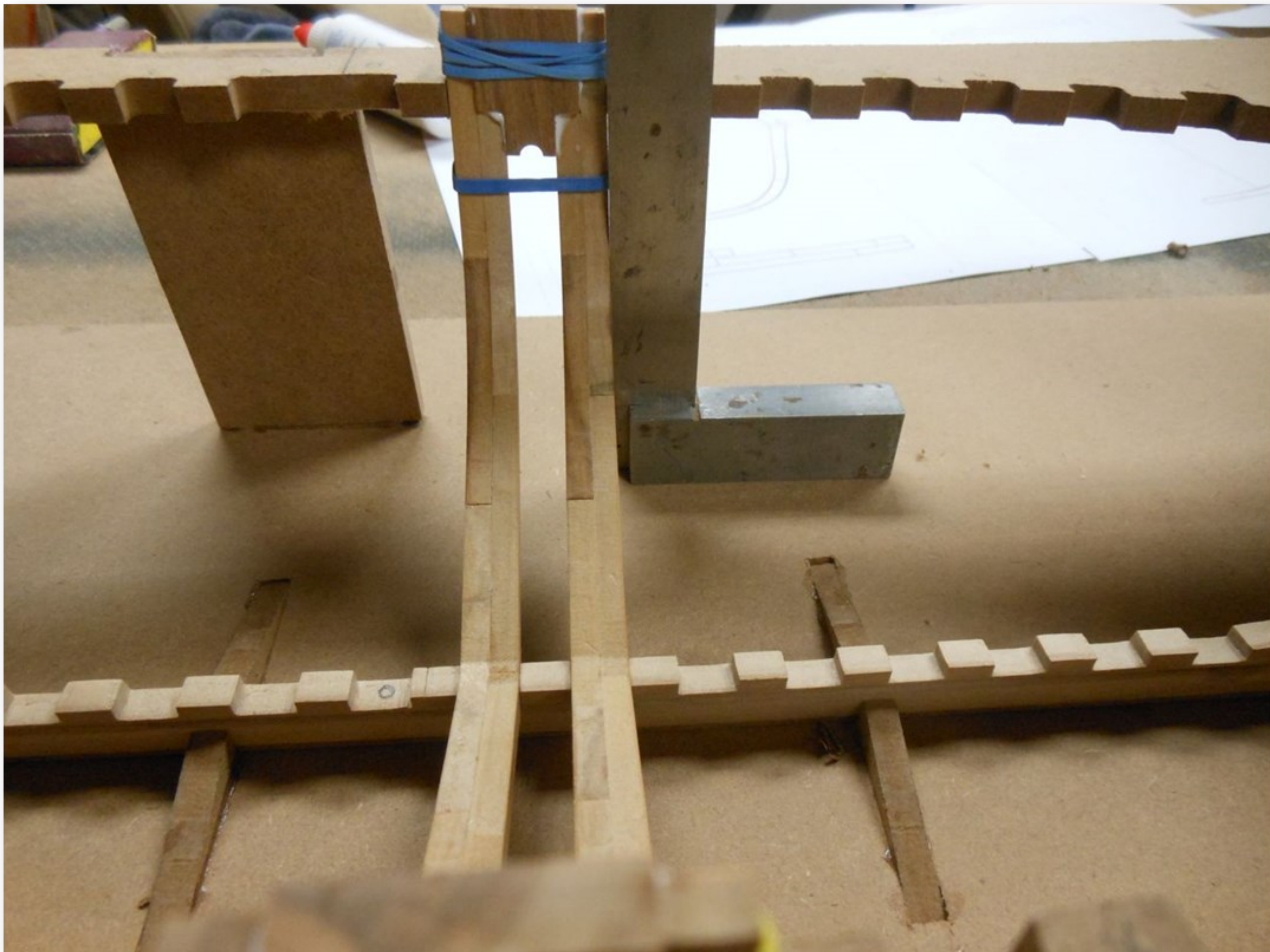


**Photo 1**

Now, had I built this particular model in 1/8" scale, these fake frames would not have been needed. However, here is another scenario where the scale of the model must be taken into consideration when framing it.

One of Hahn's models was the Pelican. He designed this model for 1/8" scale as well. When I decided to build this model, I decided to reduce the scale to 1/16". This made the framed hull about 7" long - a very small model indeed. I simply wanted to build the basic framework and deck framing because I had some cedar wood left over from another project and loved the look of the pinkish part of the wood. If you are familiar with cedar, such as that used in furniture, then you will know that it has swirls of color in the wood from a very pale yellow color to a deep red or slightly purple color. Cedar is not ideal for model ship building because of these color variations. But at a small scale such as 1/16" on a model ship that is small to begin with, you can easily cut pieces that are all one color.

After scaling down the plans I began work on the model. I cut out several small billets of wood and made several sistered frames in the typical Hahn style. I made the keel, stem and sternpost as well as the stern deadwood. The building jig was made out of what is typically called birch aircraft plywood 1/16" thick. When it was time to frame the model, I discovered that the soft cedar did not work well when installing the notch of the frame into the notch in the keel. The sides of the notch, which come to a point, would break off very easily because the wood was so soft. Also, slightly bending the small frames to put them into the jig when the keel was clamped into position would sometimes cause a frame to snap in two because you have to slightly compress the frame to fit the tops of it into the jig at the same time.

Had I taken into consideration the scale of the model, I would have chosen a different framing jig, such as an upright design, and a different type of wood, such as boxwood which is harder and less likely to break at the notch of the frame where it fits onto the keel. Again, my experience was limited to Hahn style models at the time so it never occurred to me that I could design my own upright jig. At that time, I had no knowledge of how to use a CAD computer program, so designing an upright jig would have been a challenge even if I had thought to do so.

Yes, scale of the model is a consideration when framing a plank on frame model ship. The type of wood you will use is also a consideration, and the amount of experience you have in building plank on frame models is another one. Framing the model is more than just inserting frames you made into a framing jig, even if the model is being framed in the Hahn style.

For a beginner, that is, a modeler who has never built a plank on frame model ship before, I would recommend starting with a Hahn style model such as his Hannah model, and using the Hahn style upside down jig. This particular ship and method of framing is perfect for a new scratch building modeler. The jig ensures success in framing the model, and the experience teaches the modeler a few things about plank on frame construction. You will learn about such things as cant frames which are not applicable to kit construction. You will learn about deck beams, carlings, and ledges and about the keelson, stern deadwood, and stem deadwood, which are not applicable in kit construction. All of these items are common in plank on frame construction regardless of the subject model.

Photo 2 shows the Hannah model being framed using a Hahn style framing jig.

As you can see, my experience at the time I built this particular plank on frame model had taught me that the keel needed to be centered over the framing jig and supported at the correct height to allow the frames to be installed and glued to it. I had also learned from previous models I built in the Hahn style that clamps helped ensure that the frames were properly seated into the notches in the keel and were pressed tightly against the side notches in the framing jig. I wrote a practicum on how to build this model which covers such details (Senior Course of my College of Model Shipbuilding courses).

As I've already mentioned, the type of wood is a consideration when framing a model ship. You must consider not only the type of wood you are going to use but also the cost of that wood and how much you will need. Most scratch builders prefer to use boxwood for frames, keel, stem, stern deadwood and sternpost. It's a nice hard wood, it holds an edge well, it doesn't dull tools too quickly, it doesn't have much visible grain so it looks good in almost any scale. However, consider the 74 gun ship HMS Alfred I built in 1/4" scale.

The Alfred had a lot of frames in it, and at 1/4" scale, they required a lot of wood. At the time I built that model in the late 1990's, I had not yet thought of using an upright framing jig. Instead, I was still framing my scratch built models in the typical Hahn style - upside down with a lot of extra, wasted wood in the upper area of the frames which got cut and thrown away when the model was removed from the jig. I decided to use poplar instead of boxwood for the frames, keel and such because it was readily available at my local Lowes store, and it cost a heck of a lot less than boxwood did.

Had I known what I know today about framing a model ship, I would have done things differently. I would have considered the amount of wasted wood that that results from framing a Hahn style model in the Hahn style - upside down. I didn't even know there were other ways to build a plank on frame model ship at that particular time in my model ship building career.

The type of wood is definitely a consideration when framing a model, and it works hand in hand with the scale of the model and your experience as a plank on frame model builder. Earlier, I mentioned considering the type of wood you use for the stem, keel, sternpost, and deadwoods. You might be wondering why that is an important consideration. I have seen modelers get really excited about using all kinds of hardwoods to build a plank on frame model ship from scratch. I did myself when I built the Confederacy Frigate in 3/16" scale. I bought some cocobolo that I wanted to use for the stern and stem deadwood because I knew it was a real hard wood and had some nice color contrast to it. I had never worked with that wood before, so I was not aware that it was an oily type wood (as is ebony) and did not take glue well. I was using 5-minute epoxy at the time as my preferred choice of glue. (I had built a plank on frame model of the Rattlesnake previously using only basswood, which is a terrible wood to use for a plank on frame model ship due to its softness).

To make a long story short, the epoxy did not hold well when gluing cocobolo together. I ended up making a giant mess of the model and had to remake a lot of parts using the same wood I used for framing instead (poplar). If I had known about the characteristics of cocobolo, I might have tried gluing it with a good wood glue, but my lack of experience with that wood type caused me to waste time, money, and wood trying to fix the problem. (As a side note, I chose epoxy because I learned somewhere that it can be unglued by applying heat from a hair dryer to it which causes the epoxy to melt).

On the next page Photo 3 shows my Confederacy model under construction where I used swiss pear, bloodwood, ebony, and holly to construct the officers' quarters on the deck beneath the main gun deck. This proved to be a waste of time and money as well because after adding the gun deck and poop deck, you couldn't see any of those details!

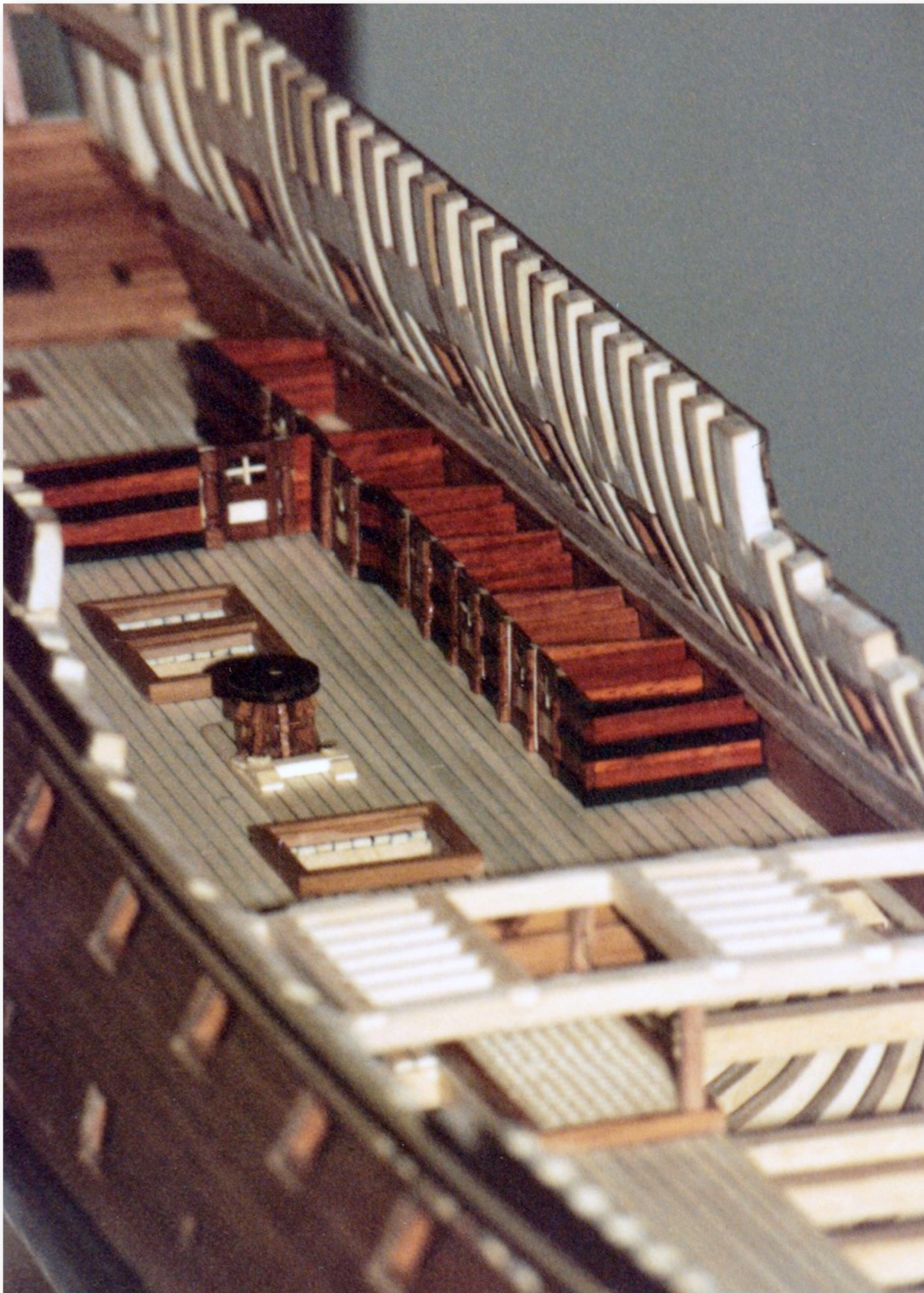


**Photo 3**

**Hahn Style Framing**

Hahn style framing is probably the easiest and best method for framing a plank on frame model ship if you have never built one before. There are several reasons why I say this. First, in all of my years of building model ships both from kits as well as from scratch, I have never built a plank on frame model using Hahn's method where the framework was not successful. Hahn's method almost guarantees good results in framing the model.

I have built nearly every model ship which Hahn designed plans for - *Hannah, Halifax, Confederacy, Oliver Cromwell, Pelican, HMS Roebuck, HMS Alfred, Rattlesnake*. In every instance, I simply followed his method of construction which meant using his frame drawings, his jig drawings, his keel, stem and sternpost drawings and so forth. Hahn's framing jigs provide a reference point by which you can take measurements from the plans and easily transfer them to the model. That reference point is the surface of the framing jig, which is shown on each of his plans.

This reference point is very important because after the model is framed, you will need to locate the wales at various points across the hull. As a bare minimum, the wales are important parts to install because they serve to hold the framework together once the model is cut from the jig. The top surface of the framing jig makes it easy to measure and mark the location of the wales using the plans and a waterline marker like the one shown in Photo 4.

**Photo 4**

The Hahn framing jig can also be used to transfer points inside the hull such as the location of deck beam shelfs. In this case, the measurements are taken from the underside surface of the jig. Such a marker can be easily made using a couple of pieces of wood and some double sided carpet tape. Photo 5 shows a very simple waterline marker. By putting the tape on the vertical piece of wood, you can easily adjust the height of the pencil. By making the base wide enough to stretch across the opening in the Hahn style framing jig, you can suspend the marker from the underside of the jig while inverting the jig so that you can mark the location of beam shelfs on the insides of the frames.

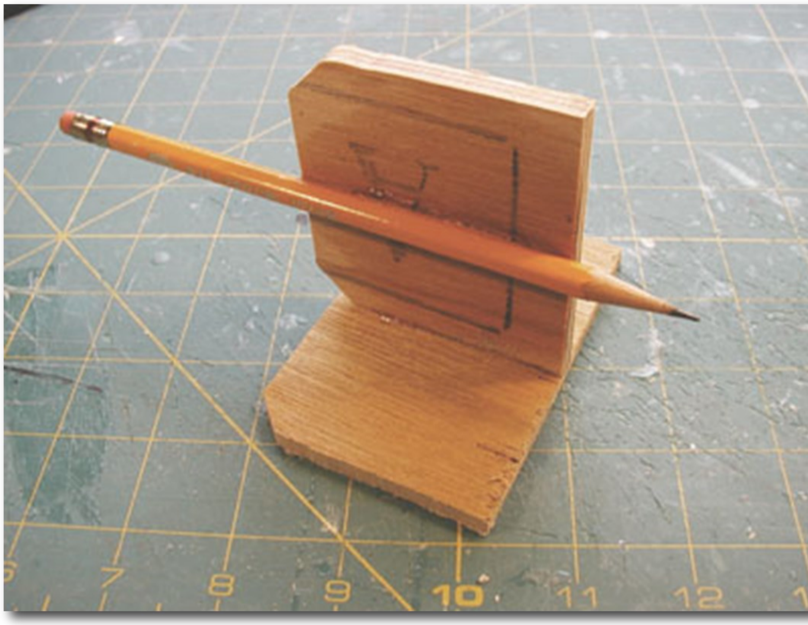


**Photo 5**

The Hahn style jig also provides a stable method for framing the stern transom, which is one of the more difficult areas to construct when building a model ship from scratch. Hahn always designed. his jigs in such a manner that the stern transom frames could be located on the surface of the jig and glued to it as you framed the counter and stern transom windows. From experience, I modified the surface of the jig by adding a curved piece of wood at the point where the transom frames met the jig. This provided a kind of back stop for the frames ensuring that they did not move as horizontal framing parts were added to the transom.

Photo 6 shows an example of this in use on my Hannah model.

**Photo 6**

Here you can also see the cross piece that frames the top of the counter and thus the bottom of the stern transom after it was installed. The transom frames are glued into notches in the wing transom at their bottom and wedges of wood were glued underneath them at their tops to ensure that they were snug and would not move as I added additional pieces to the transom framework.

My Fair American kit uses a similar part, but it was simply clamped to the jig. By clamping it to the jig rather than gluing it, I was able to remove it later when I cut the ship out of the jig. The top end of the transom frames were actually sitting on the surface of the jig but not glued so a special piece of wood could be installed that kept the frames properly space for CNC milled windows to be installed after the model was removed from the jig. Photo 7 shows the clamped piece of wood that held the transom frames in place. Photo 8 shows the model removed from the jig and the special spacer installed and glued to the tops of the transom frames.

**Photo 7**

**Photo 8**

The Hahn style jig also provides slots for the cant frames. This is important in the framing of the ship because the cant frames sit at an angle to the keel. They are actually half frames so they do not have a notch that fits over the keel. Instead, the sides of the cant frames are glued directly to the deadwood. Photo 9 shows the forward cant frames of my Fair American kit. You can see how they are angled yet glued into slots in the framing jig (red arrow). The base of each cant frame is glued to the side surface of the stem deadwood (blue arrow).

**Photo 9**

Framing a model in the Hahn style is not difficult, but there are some procedures I recommend that you follow to make the process a bit easier. The first is to make a keel clamping device so that the keel is held in the proper position over the base of the framing jig and at the correct height. Hahn never used such a device. He describes his method of framing the model in his book on the Colonial Navy. He would first install and glue a frame into the jig. Then he would install the keel with the frame fitted into the proper notch on the keel. After the glue had set where the frame had been glued to the jig, he would remove the keel and add another frame. He repeated this process of installing and removing the keel for each and every full frame in the model. When the last frame was installed into the jig, he would then glue the keel to all of the installed full frames.

Picture that process in your mind. I don't know how he did it. I tried this method the first time I tried to frame a model in the Hahn style. I made such a mess of the frames that I ended up throwing the entire model in the trash.

The frames are very fragile at the point where the notch is at the foot of the frame. The repeated installing and removing of the keel caused most of these points to break off. That ruined the look of the frame and weakened the entire structure. After that first attempt failed, I came up with the keel support piece.

The keel support piece has a notch in it that the keel will fit into. It has a shelf in that notched area that holds the top of the keel at the bowsprit area so the keel is at the correct height. The stern support is similar, but its shelf is at the height of the sternpost. By letting the keel assembly sit in these notches and on these shelves, the keel is not only held at the correct height but is also held along the centerline. This enables you to install the frames into the jig from the sides and glue it to the keel as well as into the notches in the jig.

The important step in this method is to start framing the ship at the bow and the stern at the same time. In other words, the first two frames installed are the very first full frame and the very last full frame. You install them first so that they keep the keel in the centerline and at the right height for all of the remaining frames. Photo 10 shows the Hannah and Photo 11 shows my Fair American kits being framed this way. In Photo VI-10, you can see how I made the keel support pieces so that they could be screwed to the surface of the framing jig.

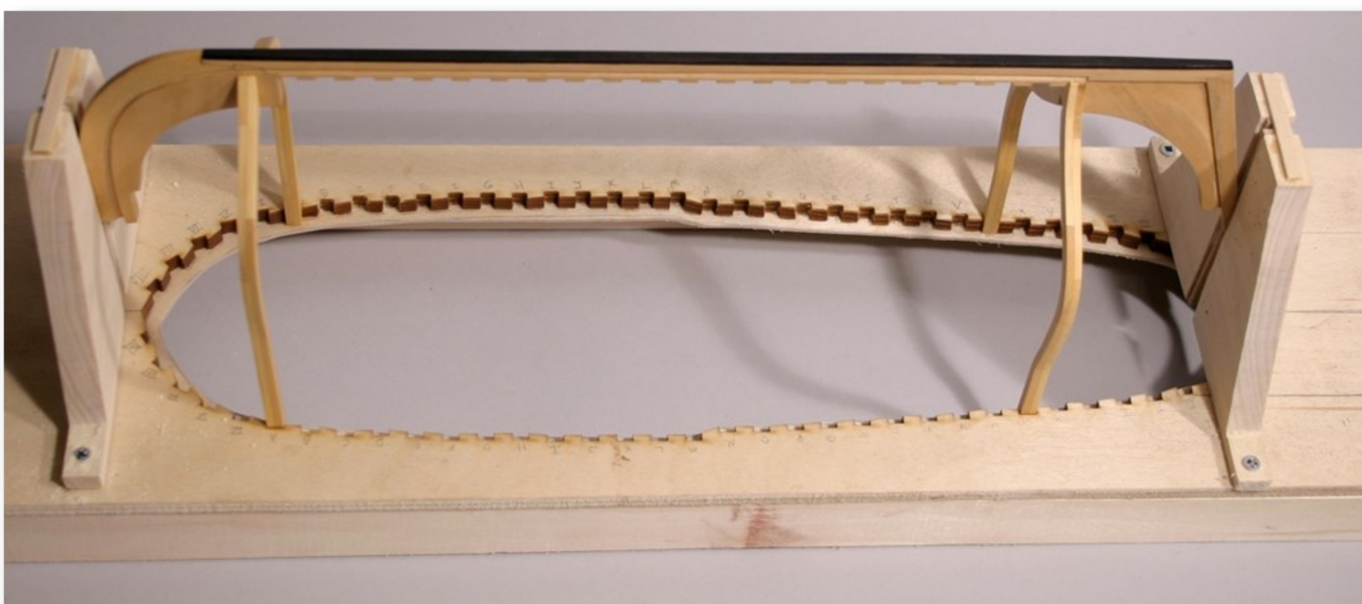


**Photo 10**

In Photo 11 on the next page, you can see that the keel support pieces are a bit different. They have tabs on their ends and are glued into slots in the top surface of the framing jig. The slot in the fore support stops at a point where it forms a shelf so the keel can be slipped in from above with the bowsprit area resting on the shelf at the bottom of the slot. The aft support has no such slot. Instead, it has two pieces, one on each side of the keel. The top of the keel is aligned with the top of the support and clamped with an office clip. The last full frame also helps to support the keel at the correct height. Once the ship is frames, the aft support pieces are lifted out of their slots. The frames are cut off, and the entire assembly is pivoted upwards and backwards, thus allowing it to swing up and away from the jig because the forward support was open at the top. All of these things must be considered when designing these support pieces.

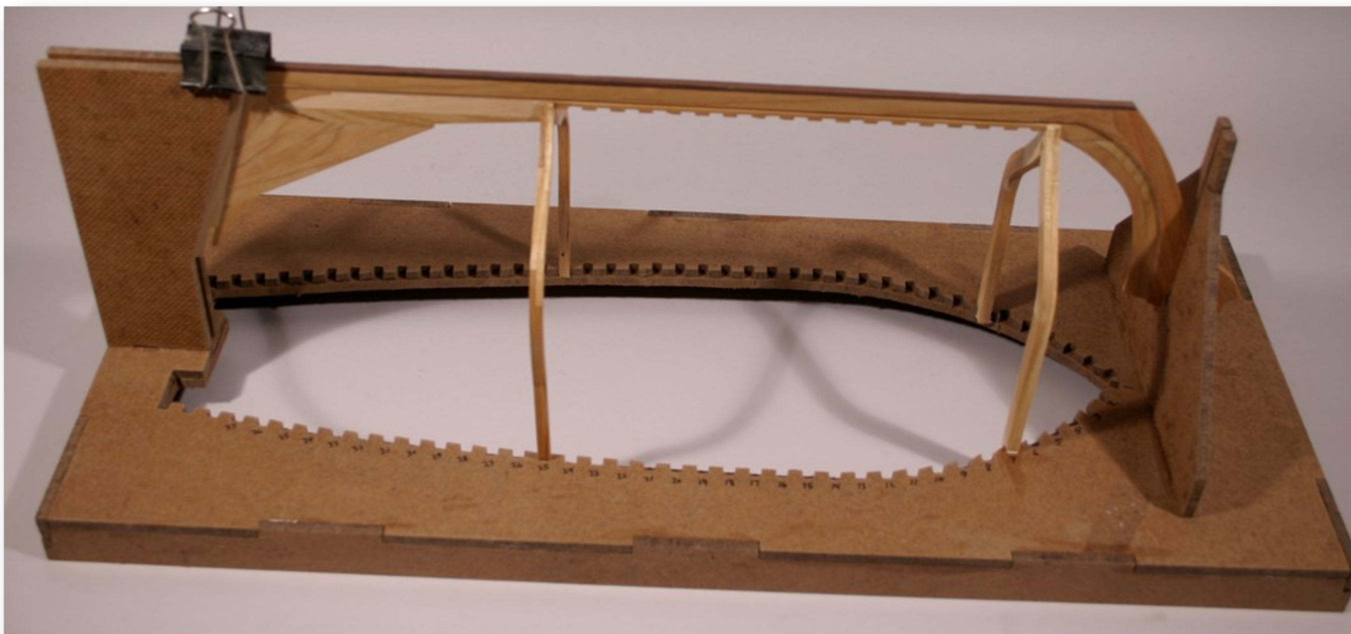


**Photo 11**

Once the first two frames are in the jig, you can proceed to install and glue the remaining frames. I like to work from both ends installing 2 frames each time - one at the fore end and one at the aft end. This makes the framing go rapidly.

The last frames to install are the cant frames. Hahn's drawing alway shows the bevel line at the foot of the frame. By beveling the frame on this line, the frame should fit against the deadwood at the correct angle, and the top should fit into the jig notch correctly. To make this bevel, first cut out a copy of the left cant frame pattern and one of the right frame pattern. Using rubber cement, glue them to the two cant frames for the first cant frame closest to the first full frame at the bow. Then using a #22 Xacto knife, cut from the bevel line shown on the frame pattern down and outward, making the bevel end at the bottom outer edge of the frame.

To get a better understanding of this process, Photo 12 (next page) shows a typical cant frame. In this photo, I have removed the frame's fore side bevel area by using a #11 Xacto to cut along the fore side bevel line. Hahn always showed the two bevel lines (fore side and aft side) as a solid line and a dotted line on his frame drawings. The bevel line for the edge of the frame that fits against the deadwood is shown by the black arrow. You can ignore the horizontal blue lines which are waterlines in this example. The red line is the inside bevel line.

In Photo 13, the frame has been beveled on this bevel line as has the outside edge.

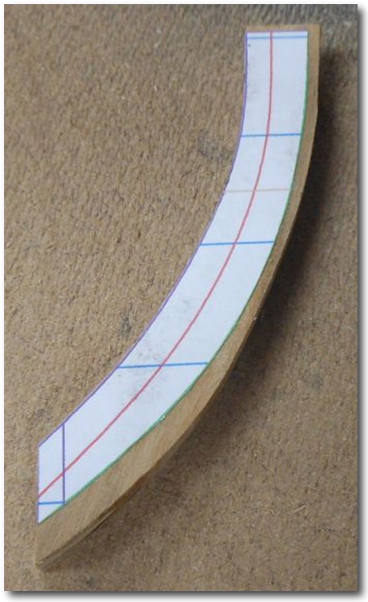


Photo 12

Photo 13

You can see how the bevel goes from the bevel line down and outward to the bottom outside edge of the frame. This particular frame is one that sits on the forward port side of the hull.

Photo 14 shows this frame after it has been beveled on the inside edge. To do the inside bevel, rubber cement another copy of the frame drawing to the back side of the frame aligning the two outside edges with the frame. Then using a #11 Xacto, cut along the inside bevel line (red line in this example). The frame is then beveled using a Dremel tool with a sanding drum or a #22 Xacto.

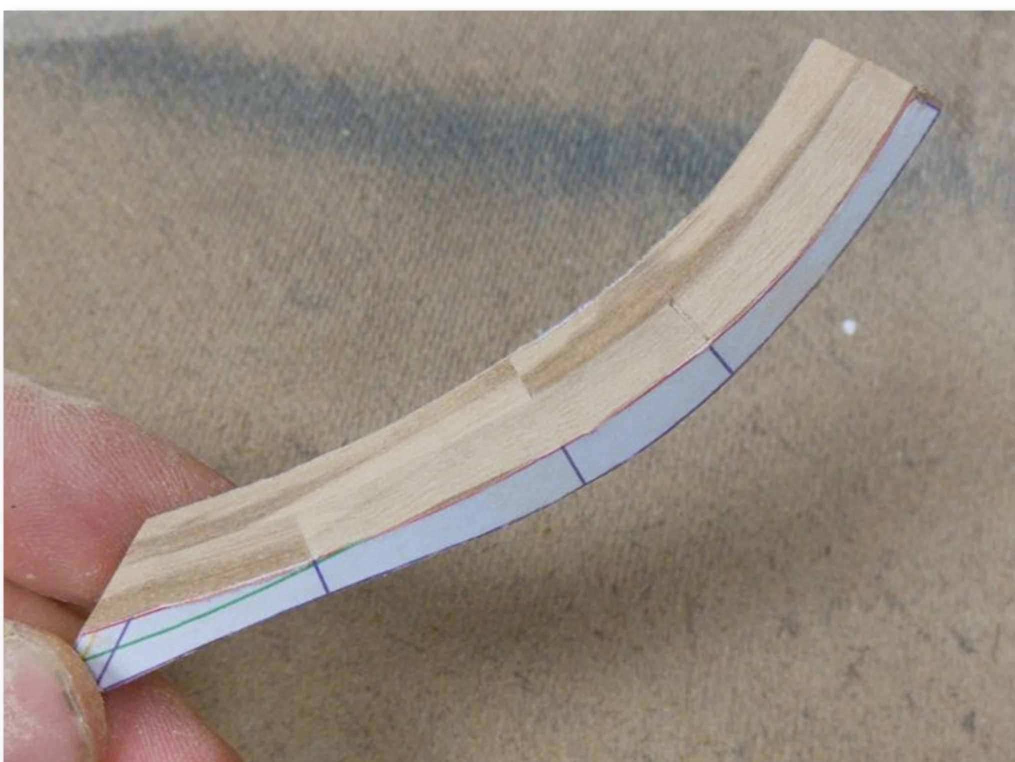


Photo 14

With all of the bevels complete, the frame can now be glued into the jig. The first cant frame on Hahn style models is installed with the aft edge pushed up against the fore edge of the first full frame of the model. I prefer to use 5 minute epoxy to attach these frames but you must watch the frame to make sure it does not move out of position before the glue sets up. (Epoxy is a rather slippery type of glue which can cause the weight of the frame to move it slightly before the epoxy sets up).

When you make these cant frames, it is important that you make one right side drawing and one left side drawing for each frame. I have seen modelers make the mistake of making two of the same side. You can avoid that mistake by making sure that on the forward cant frames, the frame drawing is first rubber cemented on the fore side of the two frames. Lay the two copies of the frame down on your work table side by side ensuring that you are looking at a right side and a left side frame. Cut out the two frame drawings and rubber cement them to the appropriate frames. Now, you are ready to cut the bevel lines at the foot of the two frame copies.

The aft cant frames are at an angle to the stern deadwood that makes them point slightly backward, which is the exact opposite of the forward cant frames which point slightly forward. On the forward cant frames of a Hahn style model, each cant frame butts against the previous one. This can be seen in Photo 15 and 16 on the next page. Initially you will probably find that the foot of the cant frames do not match up perfectly with the rabbet line. This misalignment is not unusual and is corrected after all of the cant frames have been installed and the glue has had time to set. It is all part of the fairing process - the process of sanding the hull inside and to make sure that every frame flows smoothly to the next and previous frame.

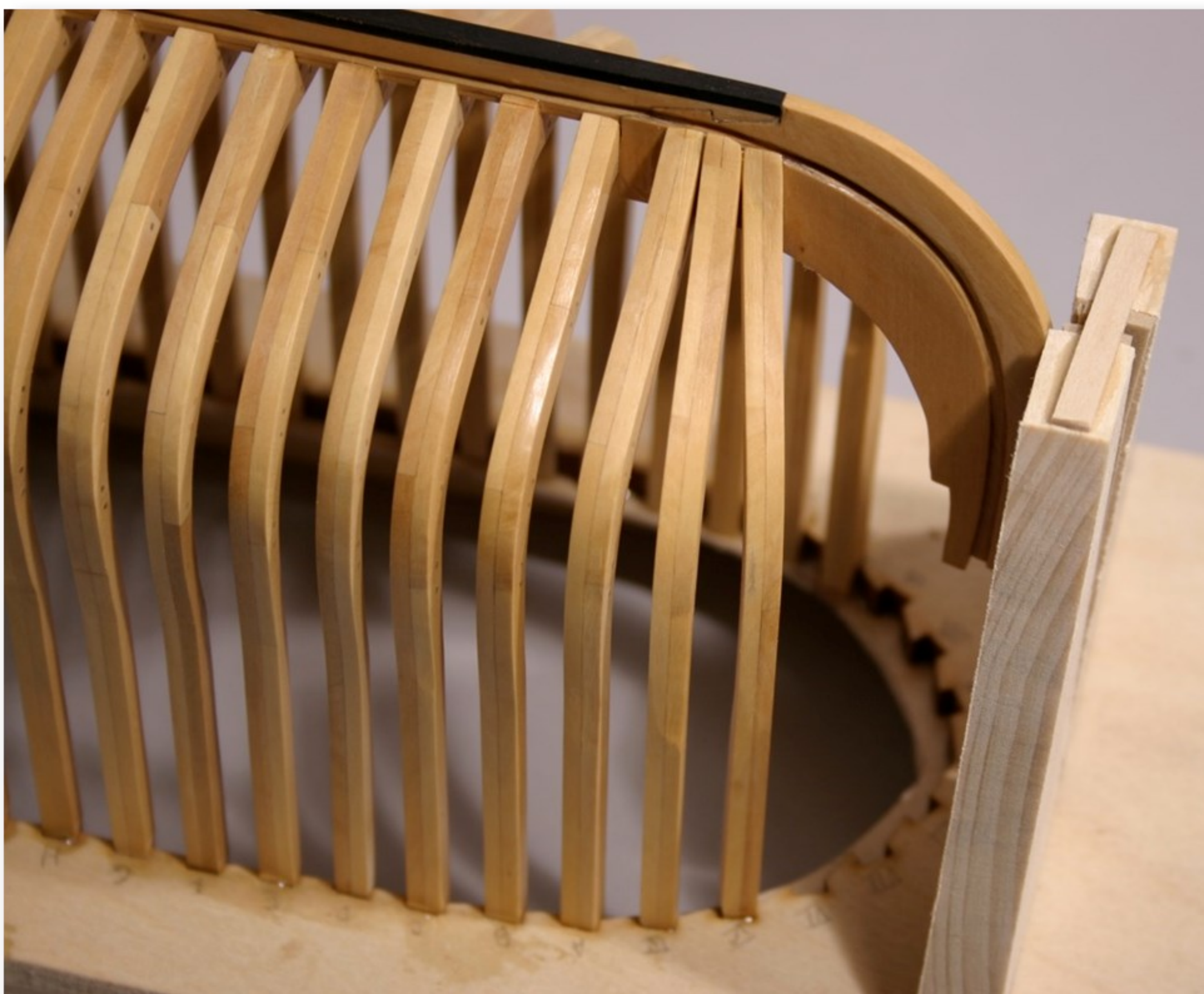


**Photo 15**

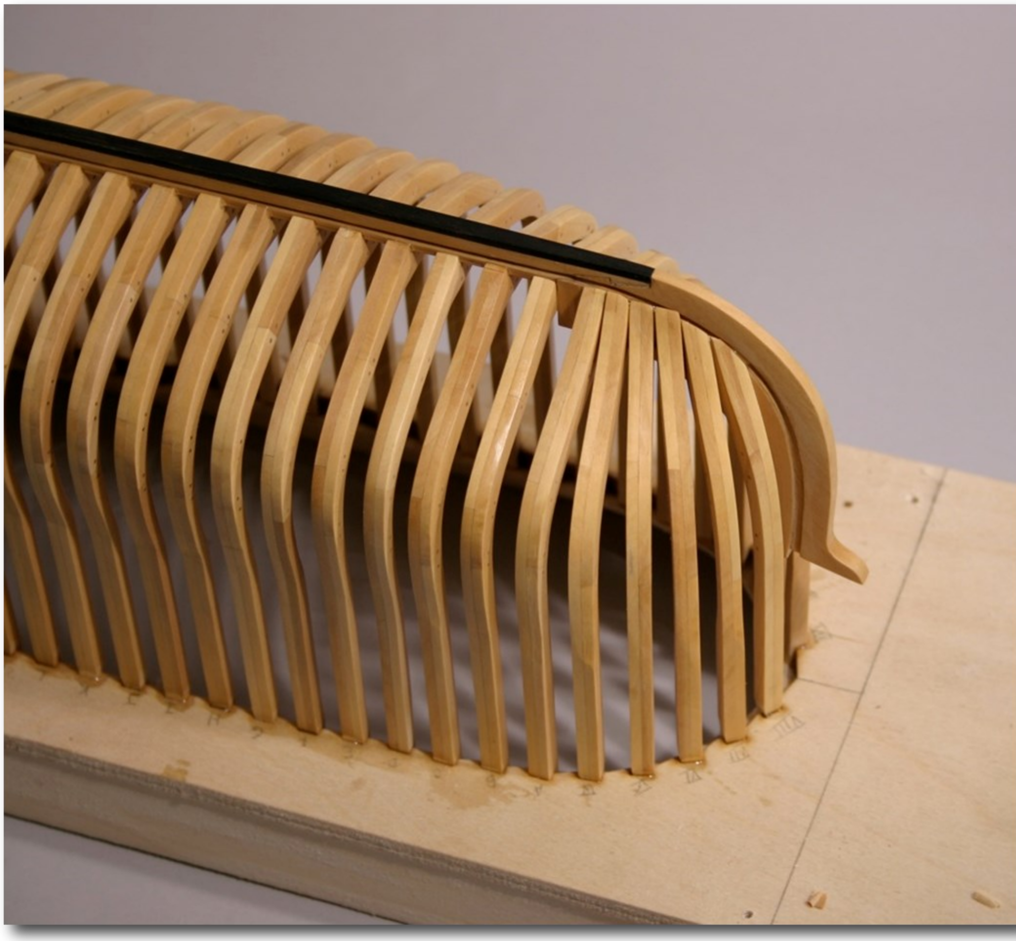


**Photo 16**

As you can see in Photo 16, the keel support had to be removed so that the cant frames could be installed. The black arrow points to the third cant frame which shows that the foot is above the rabbet joint. The fifth cant fame also sits slightly above the rabbet joint. I have found this to be a by product of hand drawn frame drawings. All of Hahn's plans were drawn by hand, so small deviations can easily creep into the drawings such as the proper shape of the cant frames. However, these anomalies are easy to clean up and correct.

In Photo 17, you can see the bow of the model after fairing and cleanup of the forward cant frames so they all end at the rabbet joint. Using a #22 Xacto to carefully trim the frames at the rabbet joint and folded sandpaper in 100 grit work well in this fairing process. Final sanding is done with 150 grit and 200 to 300 grit sandpaper.

**Photo 17**

The planking shown in Photo 17 is installed before the frames are cut and the model is removed from the jig. However, you are not ready for that final step in the framing process for a Hahn style model. The next step is to add the aft cant frames and the stern transom framing.

In my experience, the aft cant frames on a Hahn style model are not butted up against one another as they are at the fore end. However, from a historical standpoint, this is not always the case. Because the frames are not butted up against one another, their location at the stern deadwood must be identified and marked. To do this, I simply take a tracing of their location from the profile plan of the model's framework. Hahn always showed this in his plans. Photo 18 shows how I transferred these frame locations to the model.

**Photo 18**

After making these marks, attaching the frames is simple. Glue is applied to the flat, slightly beveled area at the foot of the frame and at the notch in the framing jig. Be sure to install them on the correct side. These cant frames have a slight angle beveled in the foot so that the are angled to the aft of the model. You might need to apply some clamps to the foot of the frame to ensure that it is pressed tightly against the stern deadwood. Clamping might also mean that you must glue one frame side to the deadwood at a time, allowing ample time for the glue to set up before gluing and clamping the other side.

Photo 19 shows a stern cant frame being glued in place on my Hannah model. Notice that I have clamped it at the deadwood as well as at the framing jig.

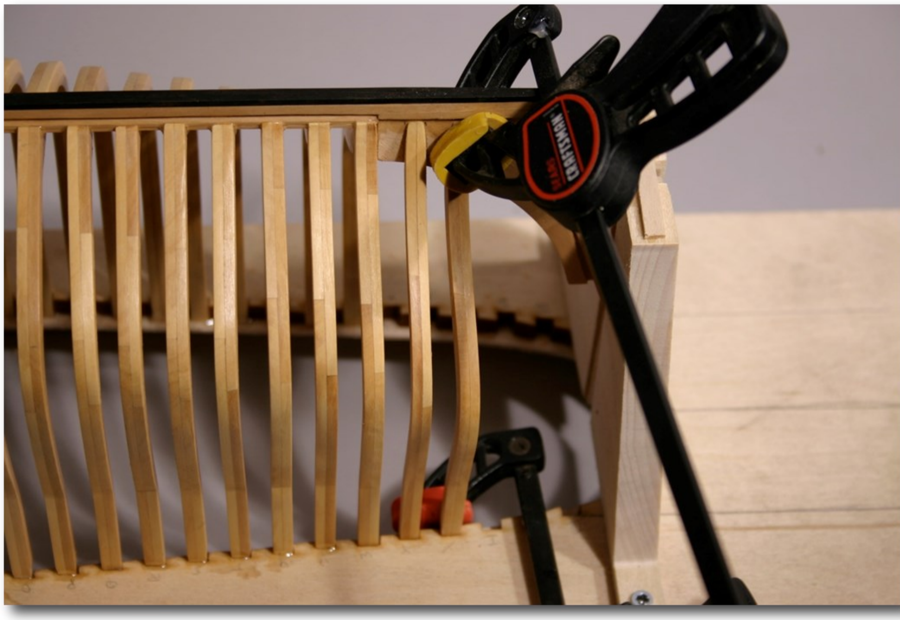


**Photo 19**

Once all of the aft cant frames have been glued in place, some trimming at the foot is required. Hahn always trimmed these frames in a sweeping curve that curved upward towards the sternpost. This represents the flow of the rabbet line. You should recall that the rabbet joint is the space between the bearding line and the rabbet line. The bearding line represents the lowest point of the planking while the rabbet line represents the lowest point of the frames. At the stern the rabbet joint opens up and becomes very wide because the planking twists at that point so that it can lie flat against the stern deadwood. The planking ends at the sternpost. You should recall that there is an inner sternpost and the actual sternpost. The planking lies across the inner sternpost and stops at the sternpost itself. The outer surface of the planks are flush with the outer surface of the sternpost.

**Photo 20**

Photo 20 shows how the aft cant frames are trimmed in an upward sweeping curve.

This photo also shows the remaining framework that must be made and attached to the stern of the ship to complete the framing of the model. This framework forms the stern transom. It also finishes the aft end of the hull where the planks flow around to the sternpost before reaching the start of the counter.

Next, I will cover each timber that makes up this area and how to install those timbers. There is a process to this framework that you should follow. This is the process I developed which should work on any Hahn style model you wish to build.

The first step in the process is to install the wing transom and the stern transom frames. Hahn always showed the shape of the wing transom on his plans as well as the shape of the stern transom frames. Photo 21 shows these parts cut out using the drawings on Hahn's plans as templates.

**Photo 21**

The wing transom has notches cut into the top surface that the stern transom frames sit in. To create these notches I use a layering technique. I calculate the thickness of the wing transom first and subtract the depth of the notches from that amount. This gives me the thickness of the bottom layer which is what you see in the photo above. I then cut out a second layer the thickness of the notches. I cut the notches into the second layer using Hahn's drawing of the wing transom again and glue the two layers together. Photo 22 shows the two layers glued together.

You will notice that the notched second layer is slightly small in size along the aft, outer edge as well as on the ends. The reason it is smaller at the aft edge is so that there is something for the ends of the planking to attach to because the plank ends at the wing transom as it wraps around the hull. The reason the second layer is short on the ends is because this is where the outer stern transom frame is fitted.

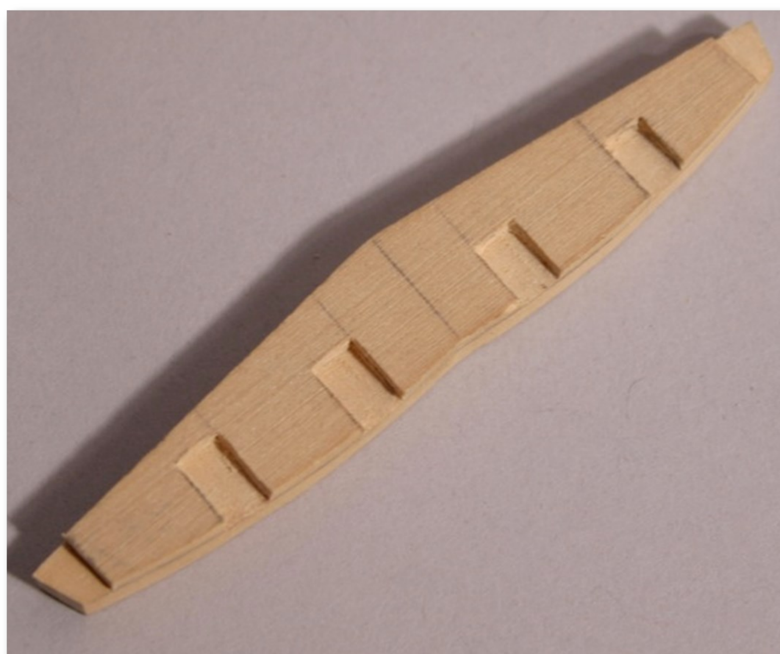


**Photo 22**

Once the wing transom has been made, it is fitted to the model. The fore edges which are angled where they meet the last cant frame. The wing transom sits on top of the inner sternpost.

Photo 23 shows the wing transom attached to the model.

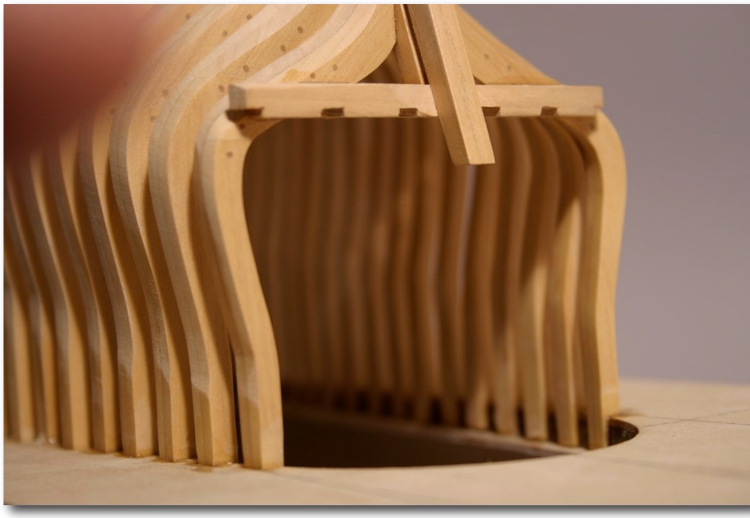


**Photo 23**

Notice the notch between the sternpost and the inner sternpost. This is the rabbet joint. The lower planking will be fitted into this notch. At the top of the notch, the planking will then flow onto the wing transom so that it's outer surface is flush with the outer aft edge of the wing transom.

It's important to be sure that the wing transom is level and at the correct position. You do not want to glue the wing transom in place until after you have adjusted it and marked it's location on the cant frame. To check this I use a small ruler to check the distance from the top of the wing transom to the surface of the framing jig and check that measurement with the same measurement on the profile drawing of Hahn's plans. You must check both sides and make adjustments until you get the same measurement on each side. At that point marks are made on the aft cant frame so you can remove the wing transom and apply glue to it.

Photo 24 shows me taking a measurement of the distance between the wing transom and the surface of the framing jig. You can see that the ruler reads exactly 2"


**Photo 24**

Beneath the wing transom are several additional parallel timbers called transoms. These timbers glue to the aft side of the last cant frame and to the inner sternpost. They are usually evenly spaced on Hahn style models. I like to use wooden spacers rather than rely on measurements to get them aligned, spaced, and parallel to the wing transom. I first place a spacer that is the correct thickness of the space between the transom frame and the wing transom directly on the lower surface of the wing transom. Then, I place the actual transom timber on top of the spacer gluing it to the inner sternpost and the aft side of the last cant frame. It's important that you do not get glue on the spacer because it has to be removed after the glue sets up on the transom frame.

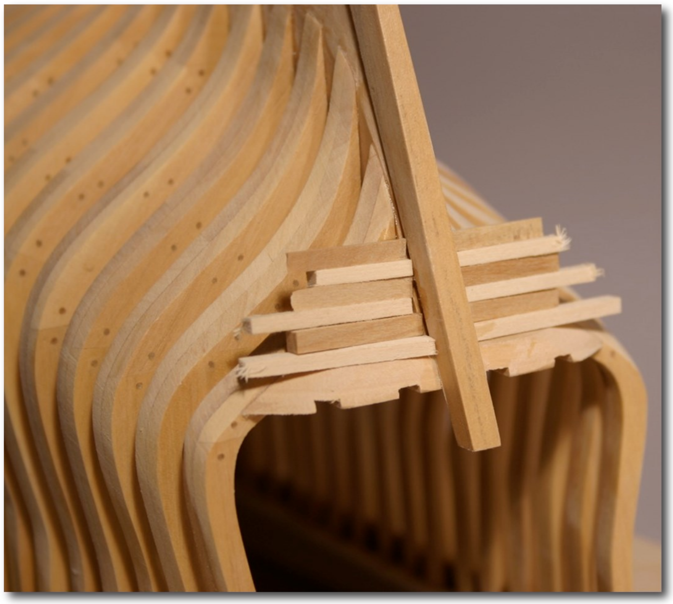
Photo 25 shows this process. The spacer is the longer of the two timbers in this photo.

**Photo 25**

As you can see, the transom frame overlaps the rabbet joint (black arrow) and it extends beyond the cant frame so that it can later be trimmed and faired out. You can also see that I have done some fairing of the frames and the wing transom prior to installing this transom frame.

There are three such transom frames on this particular model of the Hannah. The space between each of these transom frames varies, so spacers had to be cut to the correct thickness to properly space these transom frames. You will find it to be so much easier to locate and install these frame pieces if you use these spacers than if you tried to mark their location using a ruler and pencil.

Photo 26 shows all three of the transom frames installed on both sides of the hull.



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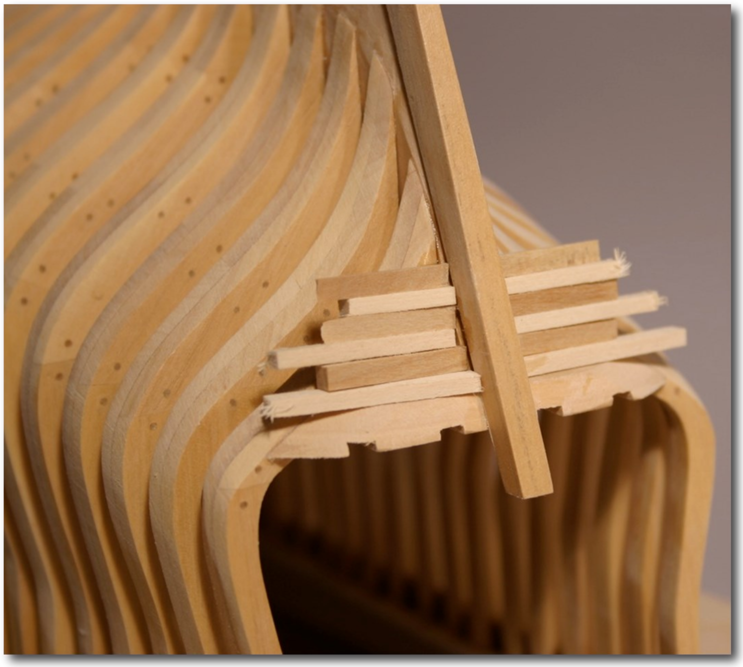

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There are three such transom frames on this particular model of the Hannah. The space between each of these transom frames varies, so spacers had to be cut to the correct thickness to properly space these transom frames. You will find it to be so much easier to locate and install these frame pieces if you use these spacers than if you tried to mark their location using a ruler and pencil.

Photo 26 shows all three of the transom frames installed on both sides of the hull.

Once the glue has set, the spacers are removed and the transom frames are trimmed and faired out. I like to use a Dremel tool with the drum sander in it to do the initial trimming at the outer ends. Then I switch to a sanding block and 80 grit sandpaper to fair and create the curved area of the frames . The frames are also beveled on their outer edges so that they meet and match the angle of the rabbet joint. A #22 Xacto works well for this process.

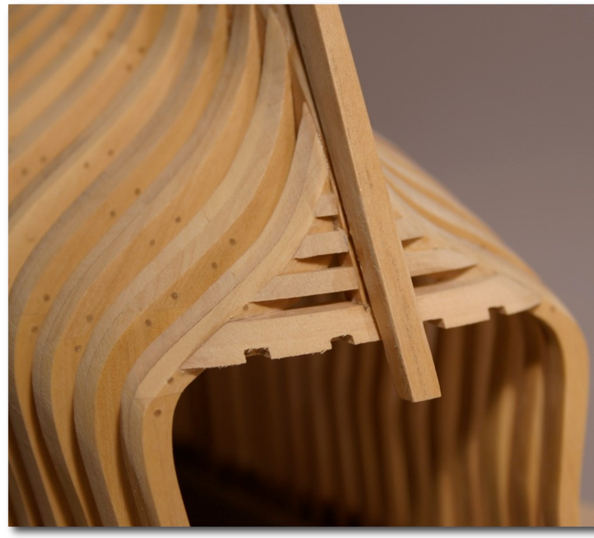


Photo 27

Photo 27 shows the completed transom frames after beveling the aft side of them (black arrows) and sanding them fair with the rest of the hull. Notice how they curve around and upward so that the planking can wrap around them and tuck into the rabbet joint at the inner sternpost. You can see how the rabbet joint flows right onto the wing transom. This is exactly what you need to achieve in your fairing of the hull frames and the transom frames.

Photo 28

Once the transom frames have been completed, it is time to install the stern transom frames. As I mentioned earlier, a piece of wood must be made and attached to the framing jig surface to help keep the stern transom frames in place.

Photo 28 shows this piece of wood in place (black arrow). You can see that the transom frames have been glued into the notches in the wing transom. I have also added the horizontal timber that is at the knuckle of the transom frames.

There is a second cross timber that must be added across the stern transom frames. Measurements are taken from the plans to locate this timber as shown in Photo 29. Notice that the surface of the jig is used as the reference point. Those members are then transferred to the model using a waterline marker. The timber is made, notches are cut into the timber, and the timber is installed onto the stern transom frames.

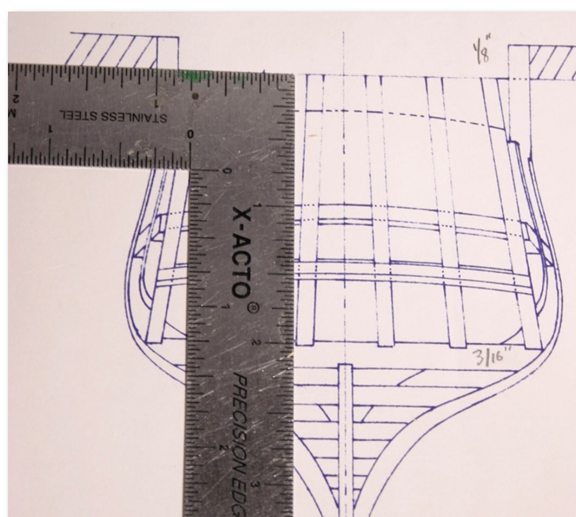



Photo 29

Photo 30shows the waterline marker used to transfer measurements.

**Photo 30**

On larger ships, there will be several of these cross timbers. They are used to create the window frame areas and on some ships a second or upper counter is framed by one of these timbers. Each one can be properly located on the model by first taking measurements from the plans and then transferring those measurements to the model using a waterline marker.

Photo 31 shows this cross timber installed after cutting notches in it at each stern transom frame location. By holding the shaped, curved part in place, the location of each stern transom frame can be marked so that the notches can be cut on it’s outer surface.

**Photo 31**

The stern transom frames must be tied into the framework of the entire model on the sides. To do this, a horizontal piece is installed on the aft side of the last cant frame. This horizontal cross piece is always shown on Hahn's plans. On larger ships, there will be 2 or more of these cross pieces. This piece will have one or more notches cut into it so that additional upper frame parts can be added to give the planking something to attach to at the stern.

Photo 32 shows this horizontal cross timber attached to the aft side of the last cant frame on one end and to the horizontal curved timber on the stern transom frames. It ties the stern transom frames to the last cant frame.

**Photo 32**

You can take measurements from Hahn's plans to get the location on the last cant frame where the piece attaches. The piece is actually wider than the cant frame at that point. A portion of it wraps around the cant frame on the inside. This piece is usually at the same location as the beam shelf so that the final deck beam can sit on top of it.

I make this piece in stages using wide wood that I can trim down as I need to. The first step is to establish the length needed and the angle of the cut where the piece meets the last cant frame. I check the distance between the last cant frame and the horizontal piece it ties to using a ruler or calipers and compare it to Hahn's plans. Hopefully, the two measurements will be the same. After test fitting it, I mark where the notch will go that allows it to wrap around the cant frame. Then I establish where the partial frame will go and mark the piece to cut a notch for that frame.

Photo 33 shows the timber installed along with the extra frame part. If you look closely, you can see that some additional wood has been added to the outer stern transom frame and sanded fair with the rest of the hull (black arrow). This is necessary on most of the Hahn models in order to tie the sides of the stern transom into the rest of the hull when deck planking is added.

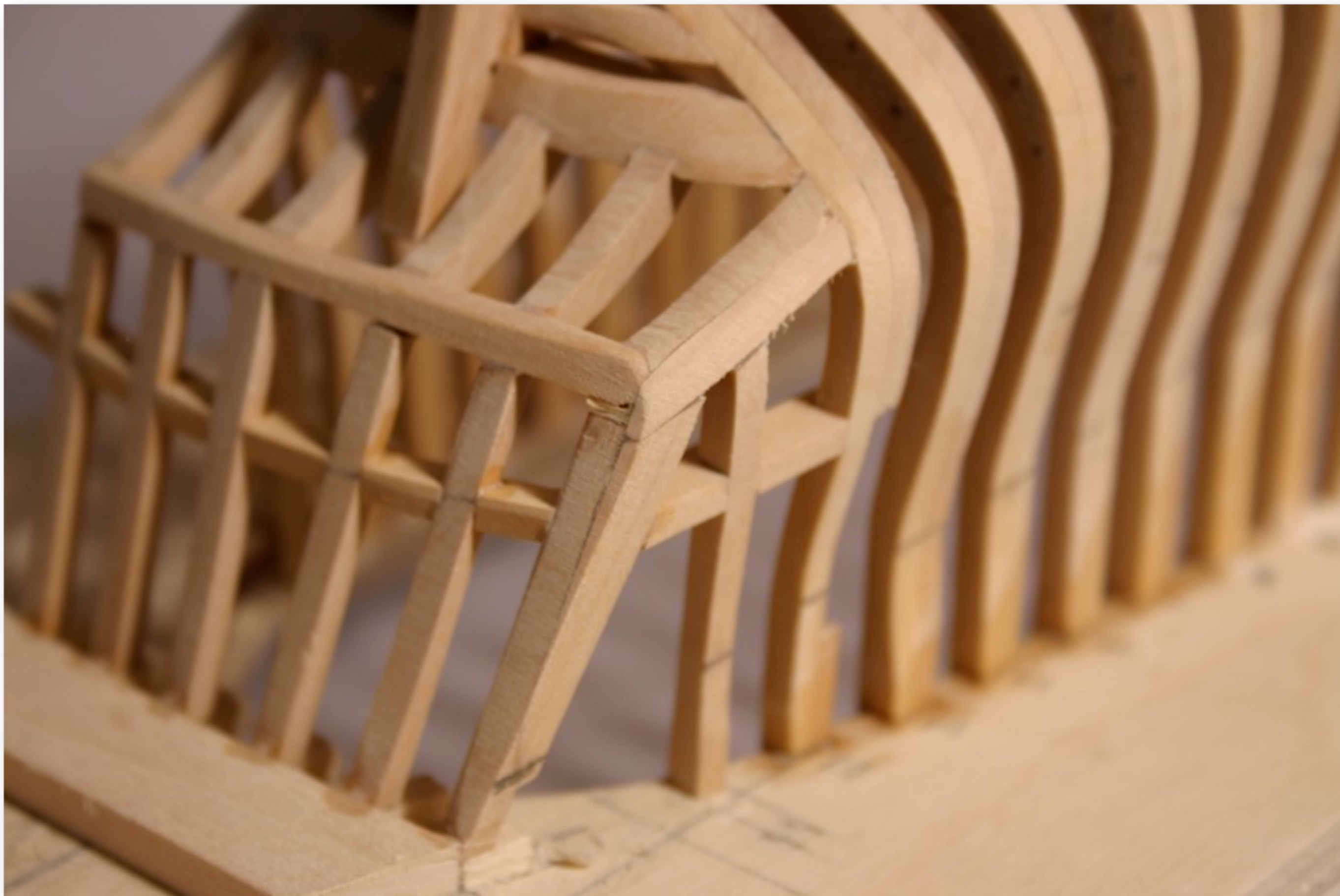


**Photo 33**

Now that the entire model has been framed, some rigorous sanding with various grits of sandpaper is necessary to fair out the hull. You can sight down the length of the hull from either end and at different angles to see how the hull looks after sanding. When each frame flows to the next and a plank can be laid flat against the hull at any point, you will know that the hull is fair.

The next step in the framing of the hull is to cut in the gunports and any oar sweep ports as shown on your plans. Typically the gunports cut across at least one frame. There is an upper sill and a lower sill. These horizontal pieces are tied into the frames on each side of the cut frame using a special joint. However, Hahn's plans did not show this joint. His plans simply showed a sill fitted into a notch in the adjacent frames.

On the Hannah model used in these photos, the gunports only had a lower sill. The upper sill was formed by the caprail that sits on top of the frames. I didn't add the lower rail until I removed the model from the framing jig. On my Fair American kit, I designed the gunports so that a cutout part formed the entire port and was fitted between two frames. Since the frames were sister framed, the inside portion of each frame was cut allowing the gunport part to be fitted between them. Photo 34 shows one of these cutout gunports being installed near the bow.

**Photo 34**

Notice that the part is much thicker then the framework. That's because the hull has to be faired out at the gunport location so that the gunport sills formed by the part are flush with the rest of the framework. I designed the model this way when I created my CAD drawings. How you handle your gunports is something you have to plan out when you are drawing up your CAD plans. If you are using Hahn's plans, then the gunport sills will already be planned and shown in the plans. In most cases, Hahn simply used a horizontal timber that was wide enough to fit into notches you would cut into the sides of two frames. After cutting the notches you would glue the horizontal sill into them thus forming the upper and lower frame of the gunport. Additional vertical pieces might be added to adjust the width of the gunport to match the plans. This was typical of Hahn's framework.

Photo 35 shows my HMS Roebuck model built from Hahn's plans. In this photo I have cut the frames at the location of the gunport sill and am test fitting the upper sill. The planking you see in this photo is basswood. Because the scale of the model is 1/4" making the model over 4' long, it would have been too difficult to bend boxwood wale planking at the scale thickness. Therefore, I used a layering technique on the planking because basswood is easily bent after soaking it in water. The visible layer of boxwood was just a thin layer of planking which attached directly to the surface of the basswood planking.

**Photo 35**

The frames have a notch cut into them on the outside that the sill fits into. The sill has notches on each end that make the center part fit snugly between the two frames, thus forming the upper sill of the gunport. Another like timber is installed for the bottom sill after cutting notches in the frames at its location.

Locating these timbers is easy on a Hahn style model. I would print out the profile frame drawing of the model or make a copy of it from Hahn’s plans and then cut the print along the gunport sill line. By placing the drawing on the surface of the framing jig, and matching up the frames, you can easily mark the location of the sills. Photo 36 shows an example of this method.

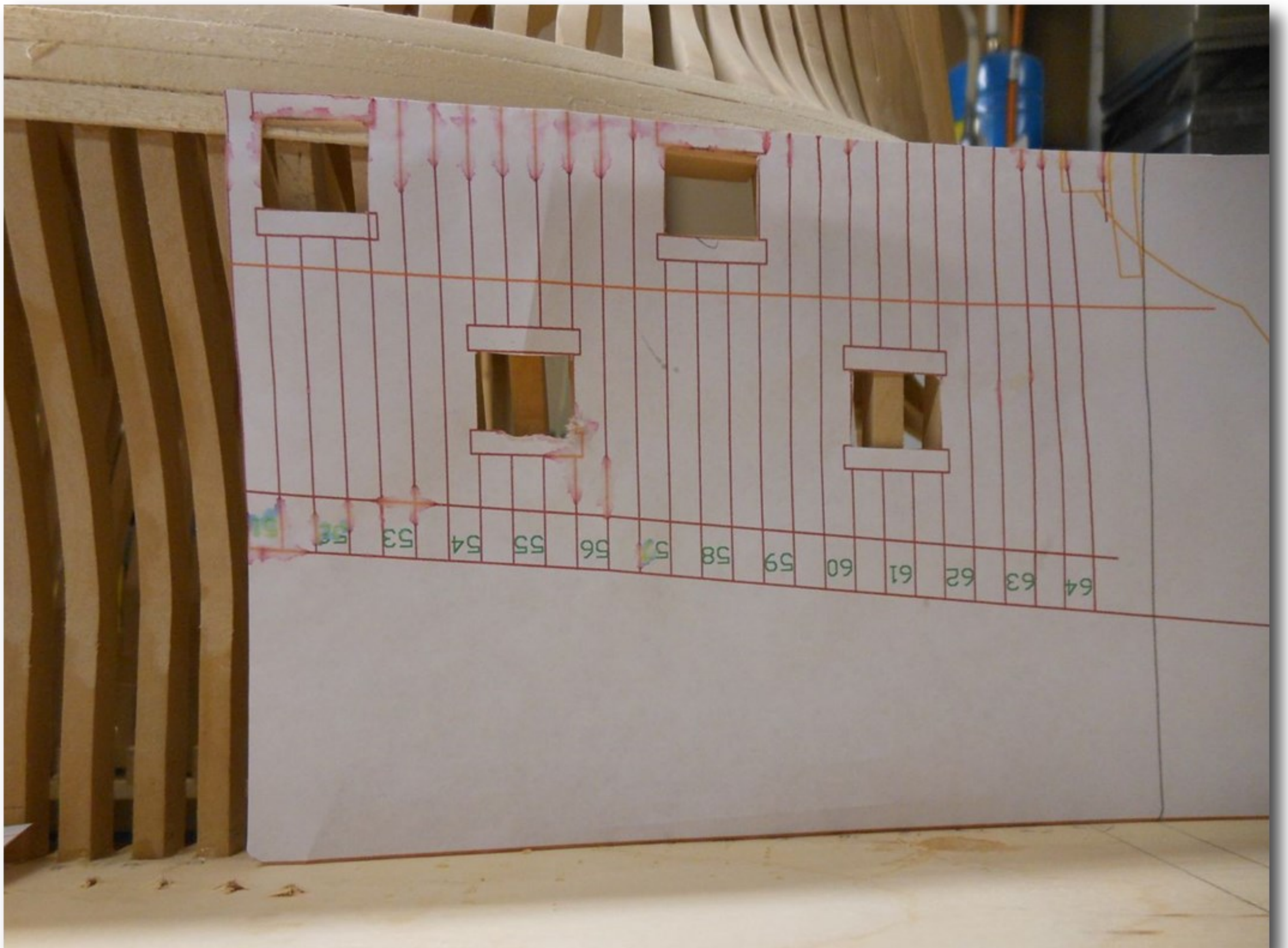


**Photo 36**

This template can also be used to mark the locations on each frame where the top of the hull ends. You can also locate different bands of the planking such as the wales, different moldings and areas where you want to use different wood types for contrast.

Photo 37 shows how I marked the entire side of the Hannah hull using such a template taken from the profile drawing on the plans. I am marking the location of the bottom of the wales which are always the first planks you want to add to the hull.

**Photo 37**

Once the wales location is marked, its a simple matter of cutting the bottom wale plank to length, soaking it in water so it will bend at the bow, and gluing it to the model. It is the planking that holds the entire framed model together when you remove it from the framing jig.

In Photo 38, you can see that all of the planking has been added. I used a combination of woods for contrast such as ebony for the wales, boxwood for the lower planking, swiss pear for the moldings, holly for more contrast, and swiss pear for the aft upper planking.

**Photo 38**

The final step in framing the Hahn style model is cutting the frames and removing the model from the jig. To remove the model from the jig, all frames musto be cut just above the top of the upper planking using a #13 Xacto blade. The #13 blade is like a miniature saw. It can be time consuming on a model with a lot of frames, but it's the only way to remove the model from the jig.

Photo 39 shows the cuts being made. Photo 40 shows the model after being removed from the jig.

**Photo 39**

Once the model is out of the jig, all that is left is to clean up the tops of the frames. You can use a Dremel tool with a drum sander in it to do the initial cleaning. Finish up with a #22 Xacto bringing the frames down even with the top of the planking. Usually the caprail is then added to cover the tops of the frames.

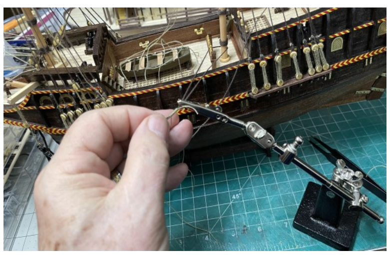
This concludes my talk on framing a Hahn style model. In the next issue, I will discuss framing a similar model (which might even be another Hahn style model) by using an upright framing jig. I will also discuss framing a Navy Board model which can be framed without using a jig at all.

# The College of Model Shipbuilding

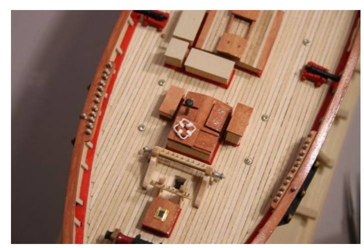
**by Robert E. Hunt @ www.lauckstreetshipyard.com**

Hello, my name is Bob Hunt. I own a small business called Lauck Street Shipyard. I specialize in providing very detailed instruction on how to build model ships from kits or from scratch. Other subjects are also covered in detail as well, which are all part of my College of Model Ship Building

The college of Model Shipbuilding has courses for all levels of experience. For beginners, we have Prep School Courses. These are based on kits that are easier to plank, such as Artesania Latina kit, Bluenose II.



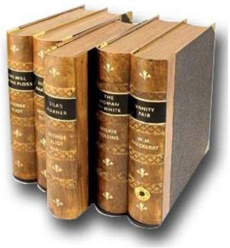
Our Freshman Courses are also a good place to start if you are a beginner. We have a number of these courses to choose from including our most recent Golden Hind, which is based on the Ocre kit. It also has an optional masting and rigging course.



Our Sophomore Courses are designed for modelers with some experience who want to advance their skills and Techniques. One of the most popular Sophomore Courses is the Pride of Baltimore which is based on the Model Shipways kit.

Our Junior Courses are for modelers with much more experience who want to start learning kit bashing and scratch building. These courses include the Mamoli kit Rattlesnake and the Panart kit HMS Victory.

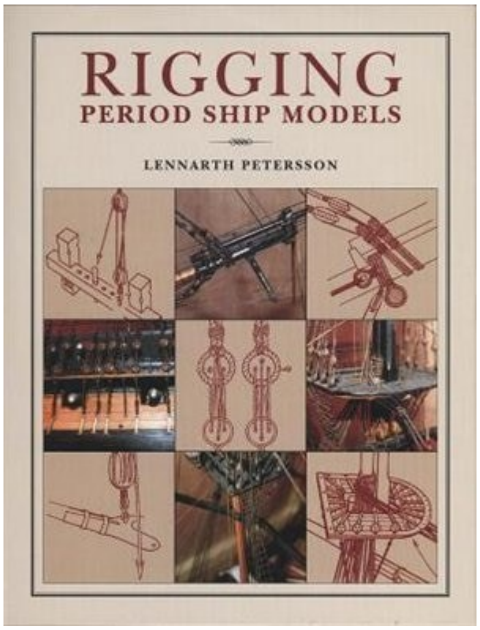
I hope you'll check out my website today to see all of the course I offer. Just go to https://www.lauckstreetshipyard.com. We also have video Practicums, and other very detailed Practicums on special subjects as learning CAD, learning different planking techniques, and how to rig a model ship. I also provide a private support forum for those who purchase one of my courses. If you have any questions please send me an email at lauckstreet@gmail.com



# The Book Nook

Books of interest for the Model Ship Builder

New & Old




## Rigging Period Ship Models: A Step-by-Step Guide to the Intricacies of the Square-Rig

**By:** Lennarth Petersson

**ISBN 10:** 1848321023
**ISBN 13:** 978-1848321021

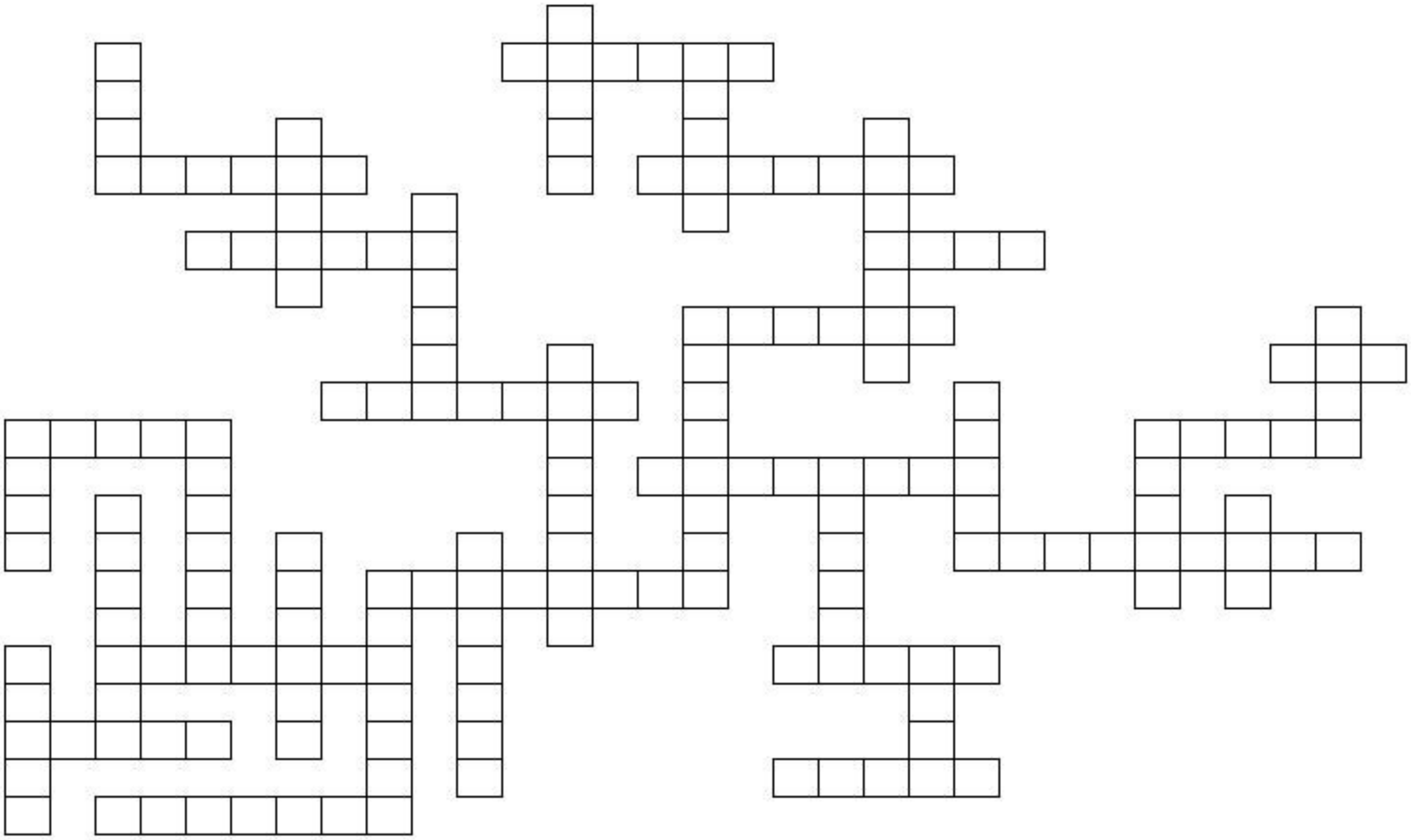
**Pages:** 128
**Publisher:** Seaforth Publishing

**Overview**

The rigging of period ship models is arguably the most complex and daunting task for the modeler. An eighteenth-century man-of-war boasted mile upon mile of rigging, over 1,000 blocks, and acres of canvas. To reduce the rigging in scale and yet retain an accurate representation is a formidable undertaking. After studying numerous eighteenth-century museum models, the author has drawn some four hundred diagrams which clearly show how each separate item of rigging is fitted to the masts, yards, and sails. Each drawing deals with only one particular aspect and is accompanied by a logical and straight forward narrative. For example, the fore deadeyes and channels are shown before the shrouds are added, and these are depicted before the ratlines are added. Whether a model maker needs to rig a whole ship or just requires information on one aspect, it is all here in this beautifully produced volume that no modeler of period ships should be without.

# *Genes Nautical Trivia*

## Types of Ships



### Fit These Words In The Grid

| 3 Letter Words | 4 Letter Words | 5 Letter Words | 6 Letter Words | 7 Letter Words | 8 Letter Words | 9 Letter Words | 10 or more LetterWords |
|---|---|---|---|---|---|---|---|
| COG | BRIG | BARGE | BARQUE | CARRACK | CHALOUPE | HYDROFOIL | |
| TUG | DORY | CANOE | BIREME | CLIPPER | CORVETTE | | |
| | JUNK | FERRY | CUTTER | CORACLE | LONGBOAT | | |
| | PRAM | FLUYT | GALLEY | DREDGER | SCHOONER | | |
| | SHIP | KETCH | LAUNCH | DRIFTER | | | |
| | | LEUDO | TENDER | FELUCCA | | | |
| | | SKIFF | WHALER | FRIGATE | | | |
| | | SLOOP | | GONDOLA | | | |
| | | SMACK | | TRAWLER | | | |
| | | XEBEC | | | | | |
| | | YACHT | | | | | |

# *Genes Nautical Trivia*

**Horatio Nelson**

Each letter in the phrase has been replaced by a number
Solve this quote by Horatio Nelson

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
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16 23 2 10 19 23 25 23 2 — 26 24 23 2 — 10 24 23 — 23 2 23 25 6 — 20 5

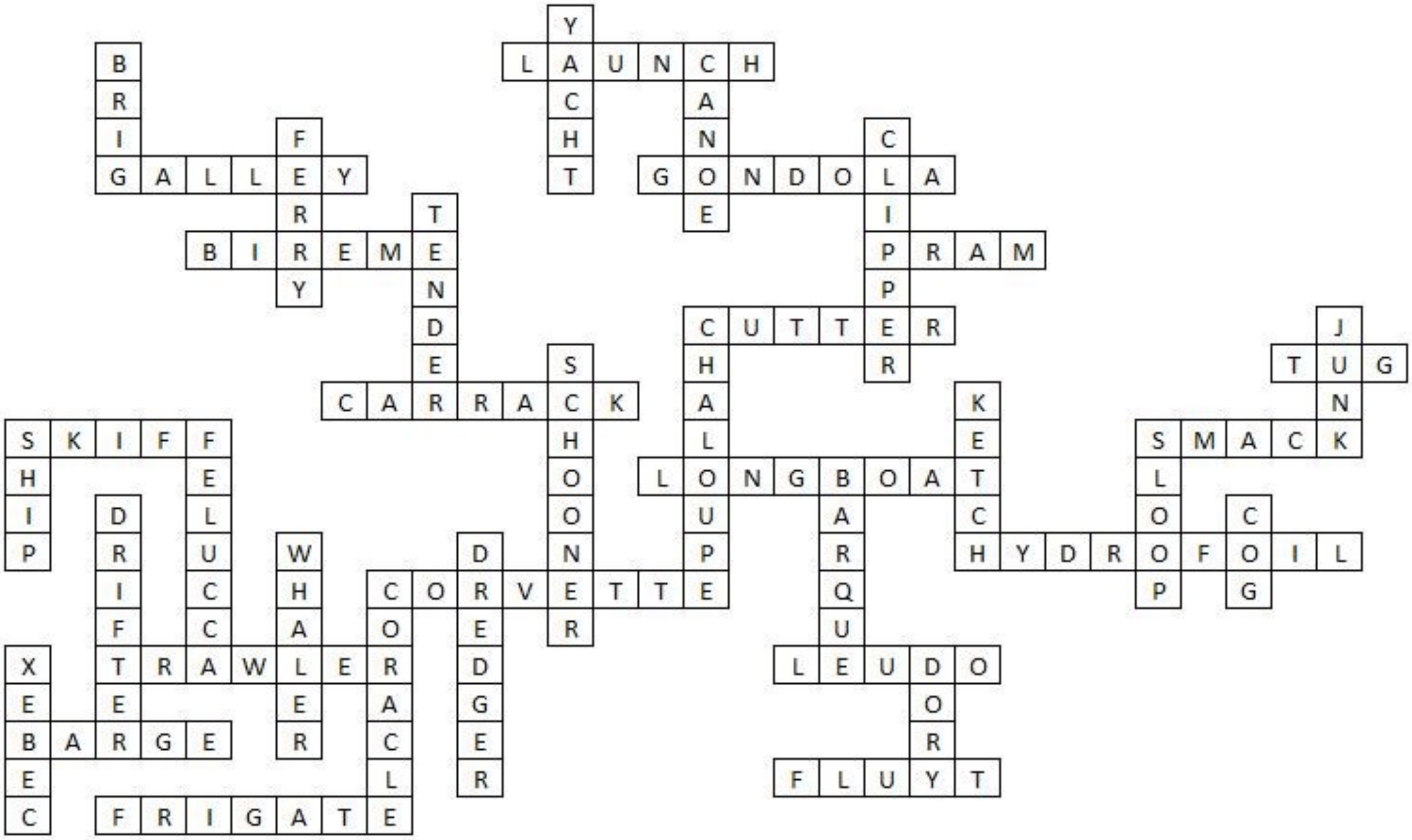
8 18 25 25 20 10 23 21 — 10 18 — 15 — 25 20 5 10 15 17 23 — 26 23 — 25 3 5 10

2 18 10 — 20 2 10 23 11 11 3 4 10 — 24 20 25 — 10 18 18 — 5 18 18 2

# *Genes Nautical Trivia*

## Answers

### Types of Ships




This is the code used to encode the quotation made by Horatio Nelson

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 12 | 8 | 21 | 23 | 22 | 16 | 24 | 20 | 9 | 17 | 19 | 25 | 2 | 18 | 4 | 14 | 11 | 5 | 10 | 3 | 13 | 26 | 7 | 6 | 1 |

**Horatio Nelson**

"Gentlemen when the enemy is committed to a mistake we must not interrupt him too soon"