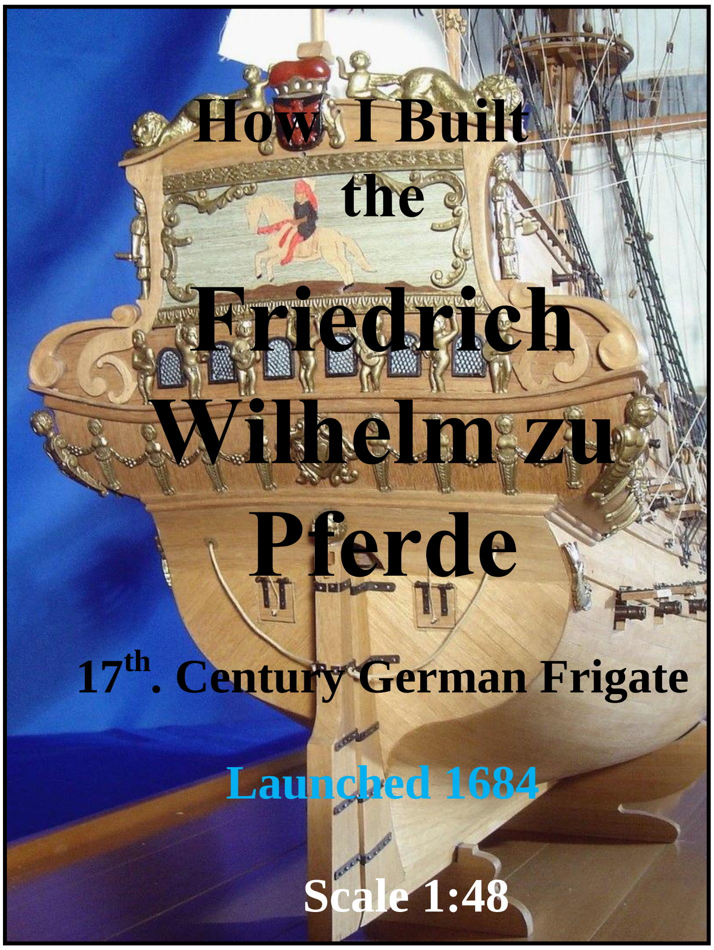


Manual 4 of 7

Masts (version 2)

My build is an interpretation of the ship based on the supplied drawings and the kit material – this individual approach has utilised small amounts of extra material.

To Massimo

Whose untold generosity as owner of
Euromodel G.B.M. Snc
inspired me to translate his plans and instructions.

Who opened his family to my family
and maintained a long relationship via the Internet
between Adelaide, South Australia and Como, Italy.

Who also inspired me whilst building a kit model of the Friedrich Wilhelm zu Pferde
to create a documented manual of construction
for others to utilize.

To him I owe much

To All Ship Builders Who Read This Document

This documentation of my work should *not* be seen as an exact instructional manual.

It is a record of how I approached the build of this ship utilizing the provided kit … *and supplementing with additional material* which was dictated by my own personal choices.

No two ships from the same kit will – or should –ever look the same.

I simply wish to share my efforts with you !

Reference Text

The Masting and Rigging of English Ships of War 1625 – 1860 by James Lee (1984). Another indispensable book ! Without this, the masting and especially the rigging would have been difficult.

The Construction and Fitting of the English Man of War 1650-1850 by Peter Goodwin (1984)

Historic Ship Models by Wolfram zu Mondfeld (1989).

[To navigate through the contents – use 'control + click']

Contents

Illustrations

[The figures below are not hyperlinked]

RECENT CHANGES TO MANUAL

Version 1 to Version 2

- Page numbering
- Contents & illustration numbering
- Ensign Staff notes (Chp. 7)
- Completion of notes for Foremast (topgallant and flagstaff) mast
- Completion of notes for Mizzen mast
- Completion of notes for Bowsprit (jackstaff)

REFLECTIONS ON MY MAST-MAKING

(final comments placed at the beginning)

Any range of modifications can be made to the construction of the masts and the drawings certainly suggest some of these. If you choose to do some research, then more bewildering changes will become obvious. The following points cover – I hope – some of the things that I chose to do (or not do).

It is important to remember that this is a manual of what I did, not a prescription of what you should or must do!

- The wood supplied for the mast sections is easy to work with and can be left natural or stained.
- Tapering the mast sections was easy with a small lathe I have. Not everybody has a lathe, so for many this all-important work will need to be done by hand (with much patience).
- The seating of the mast foot in between the trestletrees of the various tops is achieved through a square cross-sectioned section attached to a section of rounded mast. This needs to be considered very carefully. You may well decide to omit this angled (off-set) section altogether to simplify matters – this does not alter the construction process and is by far an easier way of building the mast.
- The top portion of each mast section typically has a square tenon section fitting into the mast cap.
- It is worth noting that many *Continental* ships did not have that squared upper section to the mast but simply continued the rounded form to the top. Things like the cheeks were supported against the rounded surface by specially shaped chocks.
- The ‘fid’ and their holes as well as the sheaves for the top ropes were both an integral part of the upper masts. You could choose to ignore these as shown by a builder of this ship in Fig. 1. Your call!

In summary, this model aims to be authentic in its construction but how far you choose to follow this regime is up to you.

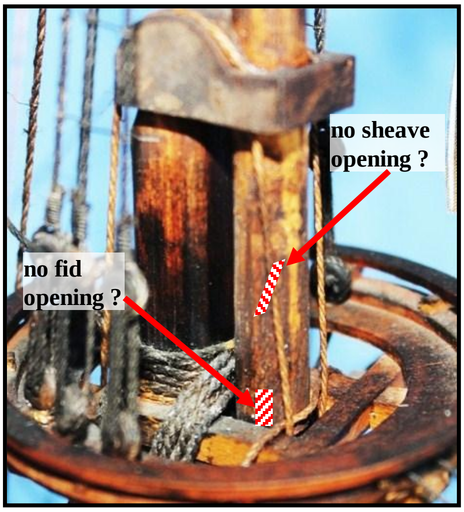


Figure 1: Deviating From the Drawing

Chapter 1: MATERIAL

The first step was to produce each mast section, each with its square tenon at the upper end (excluding the flagstaffs) which then will determine the size of the squared hole required for the applicable **mast cap** (refer to *Chapter* 2: MY INTERPRETATIONS
)

Kit Components

14 x 710mm. (1), 12 x 357mm. (1), 10 x 720 mm. (1) ; 8 x 570 mm. (1); 6 x 700 mm. (1); 6 x 580 mm. (1); 5 x 360 mm. (1); 4 x 650 mm. (1); 3 x 610mm. (1); 3 x 200mm. (1); 2 x 70mm. (1)

N.B. Euromodel have always correctly supplied the 14 mm. rod described above, but have only recently discovered a 'typo' (editing error) incorrectly showing that to be 12 mm. That is why I have shown it in a bold red colour.

Explanatory Note
Where the size is described as ' 7 – i.e. 8 mm.', this indicates that the drawing diameter is 7 mm. and that 8 mm. has been provided in the kit to allow the builder to reduce the size down to 7 mm.

A: BOWSPRIT

A1: **Bowsprit Mast** – Albero di bompresso **(14 mm.)**
A5: **Sprit Topmast -** Alberetto di parrochetto di bompressa **(5 – i.e. 6 mm.)**
A8: **Jackstaff -** Freccia di parrocchetto di bompressa **(2 mm.)**

B: FOREMAST

B1:**Fore Lower Mast** – Albero di trinchetto/ Albero maggiore di trinchetto **(12 mm.)**
B4:**Fore Topmast-** Albero di parrocchetto **(8 mm.)**
B7:**Fore Topgallant Mast** – Alberetto di pappafico di trinchetto **(4 mm.)**
B10:**Fore Royal Mast** – Freccia di pappafico di trinchetto **(3 mm.)**

C: MAIN MAST

C1:**Main Mast -** Albero maggiore di maestra **(14 mm.)**
C4:**Main Topmast** – Albero di gabbia **(10 mm.)**
C7:**Main Topgallant Mast** – Albero di pappafico di maestro / Alberetto n gran velaccio **(6 mm.)**
C10:**Main Royal Mast** – Freccia dell'a di pappafico di maestro **(3.5 – i.e. 4 mm.)**

D: MIZZEN MAST

D1:**Mizzen Lower Mast** – Albero di mezzano/ Albero maggiore di mezzana **(8 mm.)**
D4:**Mizzen Topsail Mast** – Albero di contromezzano/ Albero di belvedere **(5 mm.)**
D7: **Flagstaff** – Freccia dell'albero di belvedere / Asta per bandiera **(3 mm.)**

E: ENSIGN STAFF

E:**Ensign Staff Flag Pole** – Asta bandiera di poppa **(4 mm.)**
E1:**Supporting Mast for Staff Pole** - Maschio dell'a di bandiera **(8 mm.)**

Diameters & Lengths

- Individual mast section lengths will need to be cut from the supplied longer lengths in the kit.

- These lengths (and their diameters) are shown in the table below. The kit lengths (which allow a small excess) are indicated by the **grouped shading**. Example: Bowsprit Mast 21 and Foremast 25 have finished lengths of 295 and 385 mm. respectively and will be cut from a kit length that is 700 mm. long.

- The mast lengths (each indicated by an asterisk '*') in the table below are the correct lengths and represent a correction made to an error in the drawings. This has been remedied in Euromodel's production but in my kit, the lengths provided were shorter. Some modification may be necessary T

MASTS		Diameters								
		14	**12**	**10**	**8**	**6**	**5**	**4**	**3**	**2**
BOWSPRIT	**No.**			Lengths						
	A1	**340**								
	A5							**101.5**		
	A8									**58**
	A9					246				
	A10							111		
FOREMAST	**B1**		**350**							
	B4				**234**					
	B7							**110**		
	B10								**73**	
	B11			335					276	
	B12					213				
	B13							97		
MAIN	**C1**	**362**								
	C4			**245**						
	C7					**120**				
	C10							**85**		
	C11			375					314	
	C12					226				
	C13							108		
MIZZEN	**D1**				**331**					
	D4						**136**			
	D7								**80**	
	D8					336				
	D9						217			
	D10							109		
ENSIGN	**E**							**144**		
	E1				**36**					

* Those lengths shaded in red need to be checked carefully against the drawings in Plan Sheet 6 – both the 'stated' lengths and the 'drawn' lengths.

Chapter 2: MY INTERPRETATIONS

Euromodel presents highly accurate drawings but as shown below, some ship builders will make certain simplifications in their constructions (refer to Fig. 5 on the following page). At the end of the day, the overall visual impression will still project an authentic-looking ship so it depends on the skill of the builders as to how closely they will follow the drawings. My own construction is only an illustration and not a dogmatic step-by-step manual.

Figures 2 & 4 well illustrates this point - the heel of a topgallant mast and the heel of a topmast shown passing through a mast cap into their respective crosstrees are ***neither*** ***square*** ***or*** ***offset*** . Both of these features are indicated in the drawing shown in Fig. 3.

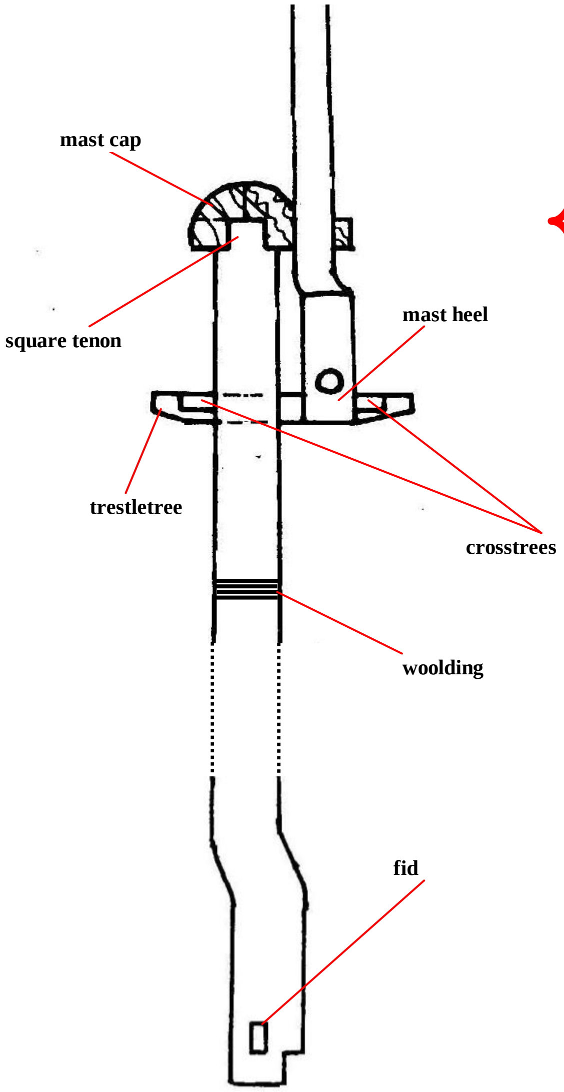


Figure 3: General Mast Configuration Shown in Drawings

Figure 2: Basic Topgallant Heel

Figure 4: Basic Topmast Heel

Since this text describes what I did, then what follows will show the mast heels square and offset !

Total Mast Overview

The following three diagrams illustrate different methods that can be utilized to create the masts. You can decide to adopt either a pure scratch, semi-scratch or basic format accepting that even the basic approach will not detract from the overall view.

<u>What is shaded in colour represents the approach I used.</u>

Most models seen have gone for using the rods alone

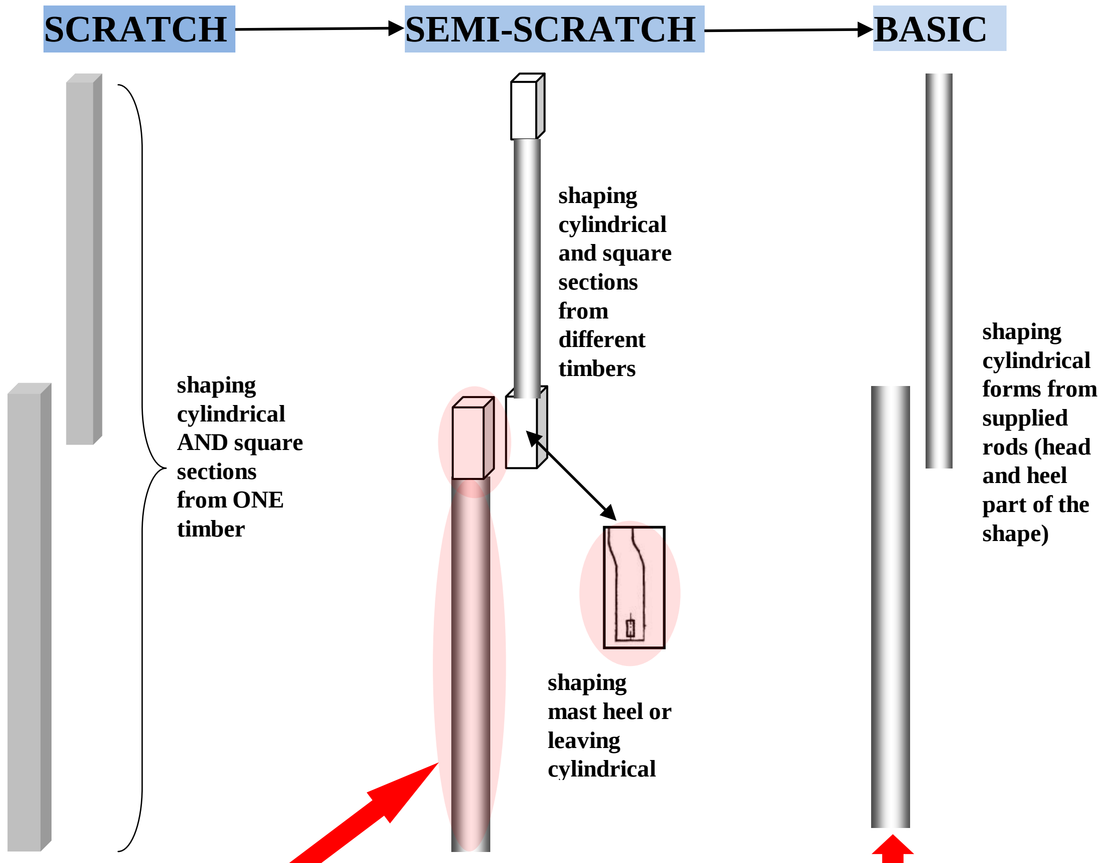


Figure 5: Construction Overview

SEMI-SCRATCH APPROACH

- **sheave simulation**
- **bolsters**
- **fid's**
- **square mast heads**
  - **can be made continuous with the rod below it but will need slightly rounded corners (i.e. cannot make the precise square dimensions), or**
  - **made from separate timber and pinned to rod below**
- **square mast heels – as above**
- **straight masts**

BASIC APPROACH = EASY CONSTRUCTION

- **no sheaves**
- **no bolsters**
- **no fid's**
- **no square mast heads**
- **no square mast heels**
- **straight masts**

MAIN MAST

1. **Double-mast sections to be painted black.**
2. **Light-coloured mast sections to be stained.**
3. **Wooldings to be applied to lower mast.**

N.B. A more basic approach would see the complete mast sections made from the supplied rods

Tops

The tops ('coffe') as shown in the drawings offer immense detail that would delight even the most demanding of scratch builders. However, this manual is directed at kit builders and so some variation on the drawings would be expected. The problems that I experienced were principally in the area of material choice (and supply) and so it was not surprising that the kit did not really contain what I needed. How you go about their construction is largely up to you.

Upper Ring – Construction Overview

The following photos give some indication as to how the top could be constructed but it is not what I did and so the techniques are left to you. In my opinion, there are a number of shortcomings that should be addressed and these are discussed in the text that follows. Even so, the techniques and materials used will still tax the ingenuity of the builder.

Not happy with this one – the upper ring is in an unusual position and cannot be made from supplied material.

Figure 6: Top Construction – upper ring above ribs

In the following figure, the upper ring is more realistic and made from a timber such as 2 x 5 mm. (as an example size) but following the actual drawings, I chose to use a smaller size.

Happier with this one – the upper ring is in a more probable position and can be made from supplied material. The timber will require considerable bending to form a ring !

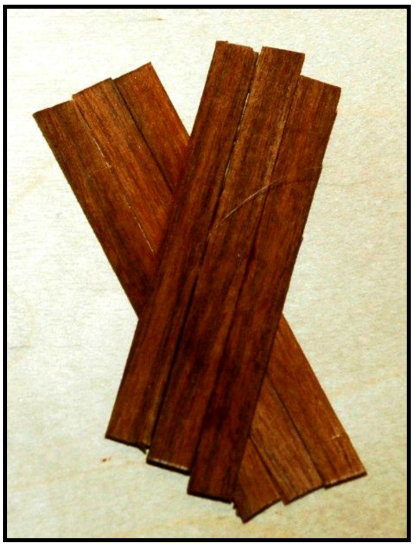
Figure 7: Top Construction - upper ring on side of ribs

Top *Lower Ring*

Having cut out the platform disc from the supplied plywood, the kit builder is faced with the problem of building the lower ring. For a minimalist, basic approach my suggestion here would be to *ignore the bottom ring altogether*. Adding planking off-cuts left over from the hull second planking to the top and bottom surface of the plywood will produce a thickness equivalent to that created if the ring *had* been built.

Lower Ring- Construction Overview

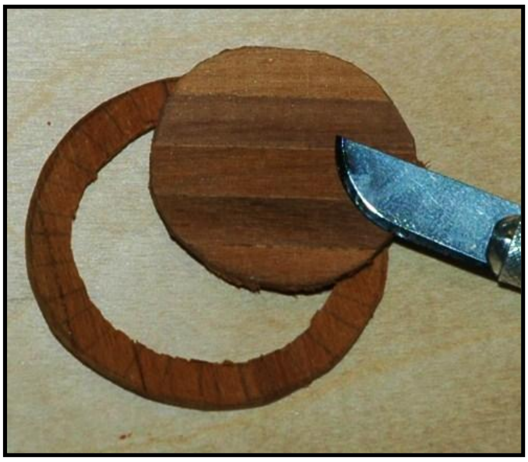
This ring is flat but even if I wished to make this from the plywood supplied, there was insufficient material available. Ideally, I would have cut this from some solid timber but ***kept to the type of material in the kit***. I must admit that I probably used more than was in the kit !



My method :

- a double-layer 'mat' was created from some scrap 1 x 5 mm. planking material – a fairly extravagant method of construction but short of a single piece of solid timber being used, I felt this was a best approach,

- after drying, a disc slightly larger than the deck was formed,



- a small curved cutting blade was used to cut out (slowly and painfully) an inner disc leaving a ring approx. 5 mm. in width (a few splits happened but these were easily glued together),

- a Dremel tool was used to smooth out the inner edge – not a simple task,

- the ring was then glued to the deck (camera angle distorts the alignment of the trestletrees with the deck !)

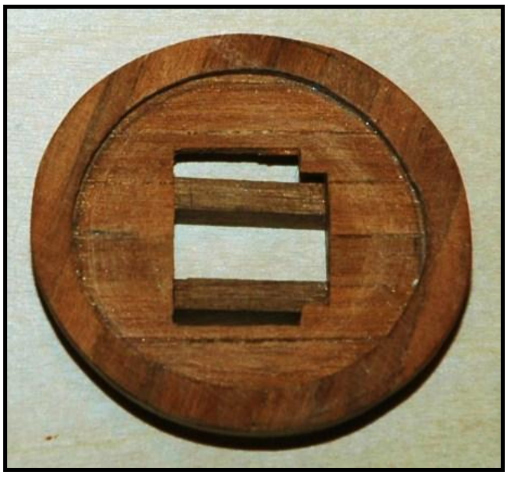


Figure 8: Creating the Lower Ring

Mast Caps

You need to check these pieces against the drawings and, if you wish, make certain modifications to length and width. This is discussed in detail in each mast section.

The diameter of the topmast passing downwards ***through the mast cap*** (red arrow in Fig. 9) will determine the diameter of the round hole.

'… the finished width of the square tenon passing ***into*** the mast cap (blue arrow) will determine the size of the square hole…'. However, since the square tenon/square hole will not be at all visible, I chose to make both round!

The small, vertical holes and grooves in the cap are designed to guide the halyards (halliards) – ropes or tackle designed to lift or lower yards.

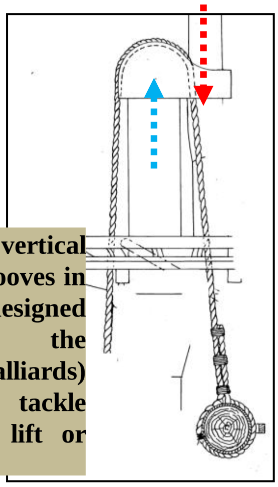


Figure 9: Halyard Tackle

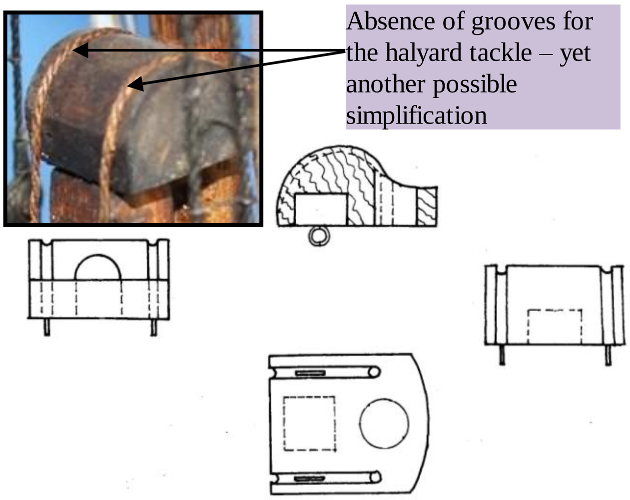


Figure 10: Mast Cap Configuration

Some modification to the mast cap pieces supplied was necessary. In making the two mast holes in the blank pieces, it was essential to take measurements from the drawings, particularly Plan Sheet 6 to keep the ***correct separation between the two holes***. This was achieved by measuring the distance between the centre lines of the two masts.

Until 1820, the corners of the mast caps were slightly rounded. I chose to make this small change to the mast cap.

Bibs

These were the lower crosstree assembly supports (shown in Fig. 12) and if they were fixed to *rounded* masts, they would be supported with chocks. An alternative method is simply gluing and nailing to the mast without the chocks. This is shown in Fig. 11 but is a bib shape to be found on English ships. This contrasts markedly with the Continental bib shape in Fig. 12. If you choose to follow the more difficult pathway of constructing square mast heads, then the chocks will not be needed.

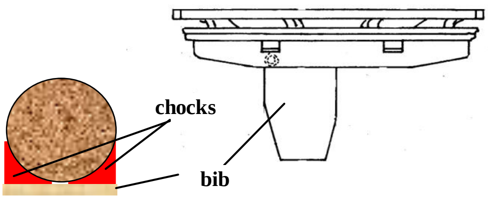


Figure 12: Mast Bib Attachment

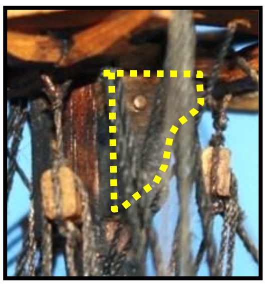


Figure 11: Alternative Bib Attchment

fid Hole

At various stages the **<u>'fid' hole</u>** needs to be created in the masts. A fid (wooden or metal peg) is fitted into this hole and its projections from the hole rest on the trestletrees to stop the topmast from sliding through. That is used for this ship although another common approach was to match up two similar holes in the two adjacent masts and then slide the fid through both.

Wooldings

- According to the authoritative text by James Lee (1984), the rope woolding width on all masts was 12 inches which on this scaled model equates to 6.35 mm. However, Mondfeld (1989) suggests that the woolding width was the same as the mast diameter. Another reference I found suggested '**half the mast diameter**'. ***This latter comment strongly confirms Lee's guidance***. The drawing in Plan Sheet 1 indicates the four wooldings on both the Main Mast and the Foremast to be 9 mm. which equates back to approx. 16.1 inches – greater than both half and even the diameter itself. On the balance of things I erred on the former measurement of approx. 6.35 mm.

- Mondfeld suggests that the rope used was 1 inch diameter (i.e. 0.53 mm. on this scale). The drawings in this kit state 1 mm. rope (e.g. 'legature con cavo 1 mm.'). **<u>I used 0.8 mm. black rope</u>** – sizes are variable out there in the market so your choice could be different. This comment and the previous one highlight how research can be useful, distracting and confusing. On the basis of all these comments, approx. eight turns would seem appropriate to produce a theoretical width of 6.4 mm – close to the above figure of 6.35 mm.

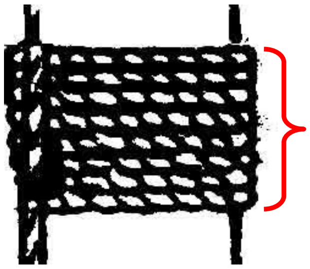


Figure 13: Woolding Interpretation

- The wooldings were evenly spaced along the mast length.

- When serving the woolding on an actual ship, the beginning of the rope was attached to the mast with three nails with a leather button under each. For this kit build, I used the following method …

  One end of the rope is bent into an extended loop and then served over as shown in Fig. 14.

Figure 14: Beginning Woolding Serving

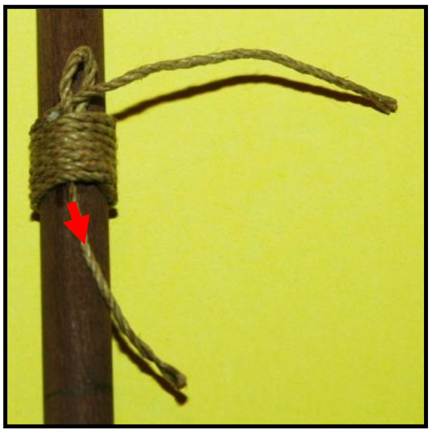


Figure 15: Finishing Woolding Serving

After creating the correct number of turns, the end is inserted through the loop and pulled tightly underneath the top few turns (Fig. 15). Any conspicuous bulge is then gently tapped down with a hammer. The ends are then cut off.

- The number of wooldings on the Foremast is one less (five) than on the Main Mast (six).
- Wooden hoops (1.5 inches equating to approx. 0.5 mm. on this model) were nailed above and below each rope woolding. This is something extra that ***could*** be incorporated.

Partners

The masts were held in position by a circular series of mast wedges or partners (sometimes collectively referred to as the ***mast heel***) between the decking and the mast itself and frequently covered by a canvas fairing called the ***mast coat***.

Figure 16: Typical Crosstree

Crosstrees

- The main crosstrees were two horizontal pieces spreading the upper shrouds to support the mast.
- Topmast crosstrees were similar but consisted of three pieces to support the topgallant and royal shrouds.
- At the head of lower masts, crosstrees were used to support platforms (i.e. tops)

Top Openings

In this time period, platforms known as tops were fitted on the lower masts and were generally painted black. The central opening – termed the '*lubber's hole*' – allows for both rigging and masting to pass through the top. Whilst shown in the drawings for the Mizzen Mast, is not at all well defined for the Foremast or the Main Mast – the way I was reading this plan sheet suggested very little detail on how the opening should be constructed. Every historical drawing for a circular top that I could find for this era illustrated a square/ rectangular opening and indeed this is the case for the Mizzen mast drawing (Fig. 17):

shaded red = mast square sections
yellow = trestletrees
pale blue = open spaces available for rigging

The Mizzen mast opening in the drawings confirms my research and it seems natural **to extend that concept to the Foremast and Main mast** top construction.

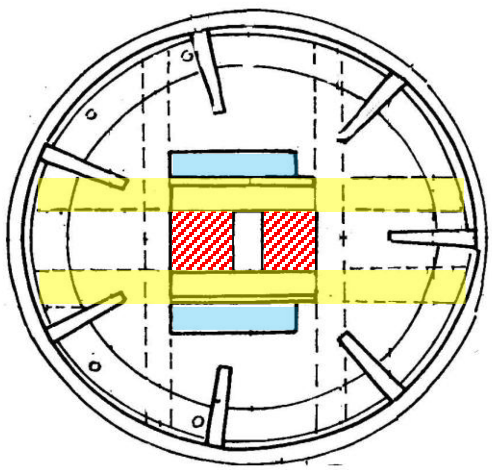


Figure 17: Mizzen Top Detail From Plan Sheet 6

Construction of the tops is very interpretive in both materials used and the structure created. The following photograph shows what I made.

Figure 18: Main, Mizzen and Fore Tops (L. to R.)

As an example of material use, the use of short lengths of 2 x 2 mm. walnut for the ribs as described a few pages back will come from the kit; the use of ribs as shown above will require the use of, for example, 2 x 5 mm. timber that is not in the kit.

Trucks

The 'truck' is a protective covering in the shape of a rounded wooden disc that protects the mast end grain from weathering. These can easily be fashioned out of scrap timber or purchased commercially.

Raking

According to Goodwin (1987) …

- the Foremast and Main Mast were generally set at an ***angle of 90^o to the keel*** although they sometimes inclined aft at an angle of 1^0.
- the Mizzen Mast was **inclined aft somewhere between 4 - 5^0**.

In reality, the situation was a little more complicated with the ship's master adjusting the rakes to his own wishes in order to gain a small advantage in speed and manoeuvrability.

Using the very bottom edge ruled margin on the plan sheet (10) as a guide to the line of the keel, the Foremast and Main Mast were determined as above (i.e. 90^o, no inclination). T The Mizzen Mast was inclined aft at 2.5^0 – by my determination !

Chapter 3: BOWSPRIT

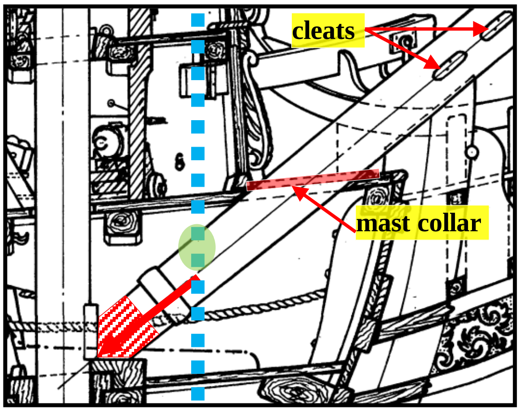


Figure 19: Bowsprit Seating

Bowsprit Mast [A1]

The bowsprit extends through a mast collar on the deck surface and continues down to touch the Foremast as shown in the following figure. However, the actual length from the mast collar will depend on your construction; in my case the final length was 345 mm. The measurement from ***Plan Sheet 10*** also indicated a longer length than that shown in Plan Sheet 6 (of 330 mm.).

Frame 2 (broken blue line) shown in Fig. 19 needs to have the underside surface of its top beam chamfered (shaded green area) to allow the bowsprit to pass underneath (Fig. 22 on the next page shows more detail).

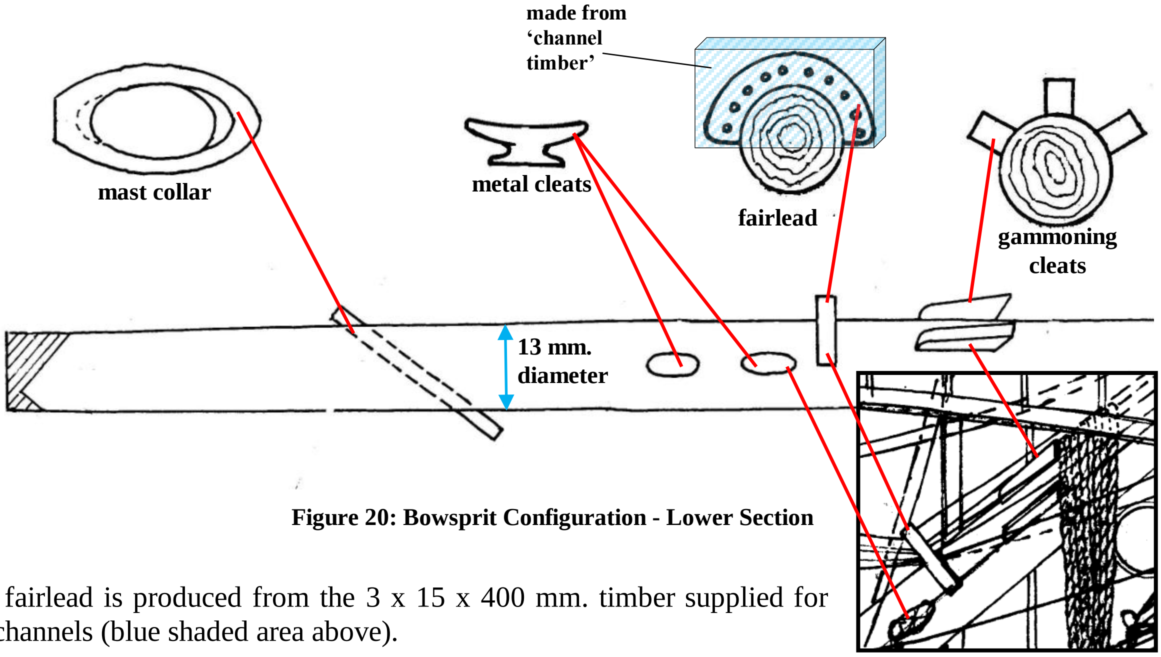


Figure 20: Bowsprit Configuration - Lower Section

The fairlead is produced from the 3 x 15 x 400 mm. timber supplied for the channels (blue shaded area above).


Figure 21: Example of Bowsprit Mast Collar

Figure 21 illustrates an interpretation of the bowsprit 'collar' on another build for this ship. Timber is not supplied in the kit and so must be made from scrap. I was not surprised at this as production of an inetgral thin collar would have been difficult.

Adjustments

In order to fit the Bowsprit mast in position, three adjustments are required:

- forming a ***concave channel*** in the sloping top edge of the false keel lying beneath the Bowsprit,
- creating a ***curved opening*** into Frame 2 that will then allow the Bowsprit to pass through, and
- forming a ***concave surface*** at the end of the Bowsprit that will allow it to fit against and partially around the Foremast.

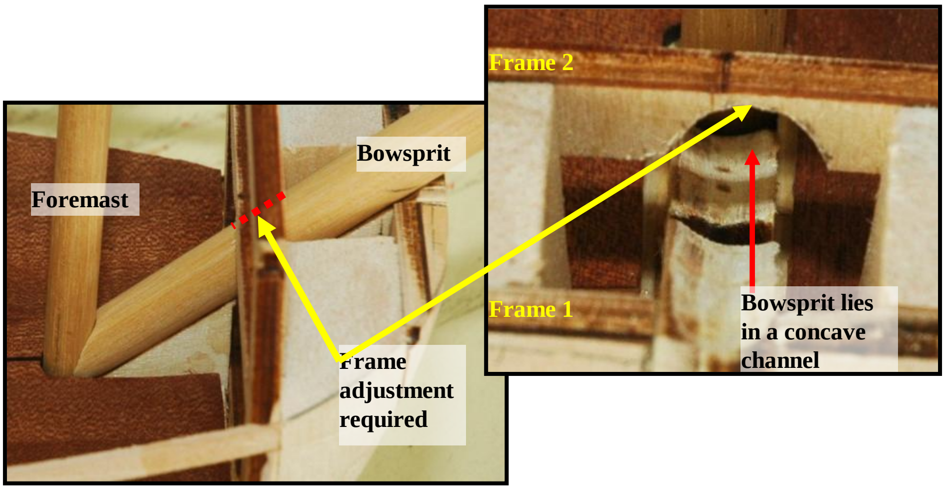


Figure 22: Adjustments Required to Fit Bowsprit

Sprit Topmast Knee [A2]

[Lees, 1984] states that the width of the knee is half that of the bowsprit. So … the **lower curved section** made from 6 mm. scrap walnut conforms closely to that figure. The under surface of the knee was made concave to fit the bowsprit. The **vertical upright section** was made from 6 x 6 mm. timber.

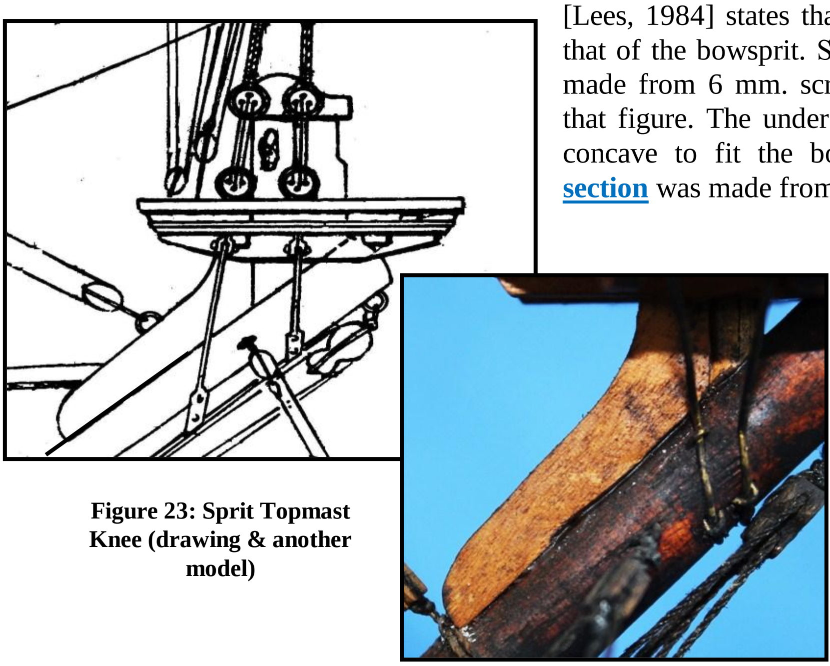


Figure 23: Sprit Topmast Knee (drawing & another model)

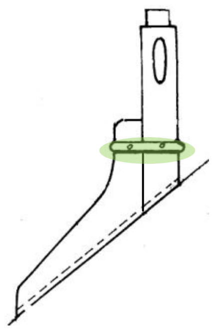


Figure 24: Complete Spritmast Knee With Metal Supporting Band (shaded green)

Refer to Fig. 30

Topmast [A5]

A number of decisions/ choices needed to be made in this construction :

- the knee was made from a scrap piece of walnut,
- the topmast was made from the 4 mm. diameter limewood supplied, but ....
- the 6 x 6 mm. square heel was produced from scrap walnut (but refer to Fig. 26 below),
- the topmast was tapered upwards. A 4 mm. hole was drilled into the heel and topmast glued into it. The drawings show that the top portion is 3 mm. square and so I created a square section from scrap limewood rod and pinned & glued that onto the rounded section (Fig. 27 below). (I have seen a number of models built only using the rounded mast),
- what I consider is a serious omission – most models I have seen do not have a sheave built into the topmast.

  Refer to Fig. 34 for an '*alternative*' method.

  Because of this omission , many will then avoid doing that bit ? I feel that it should be there because it IS part of the drawings and IS used for the halyard tackle (Fig. 25 opposite). The sheave opening I estimated to be only 3.0 x 0.7 mm. so the easiest way of simulating the sheave was to drill two holes – one top and one bottom and cut out a small sliver between them on each side.

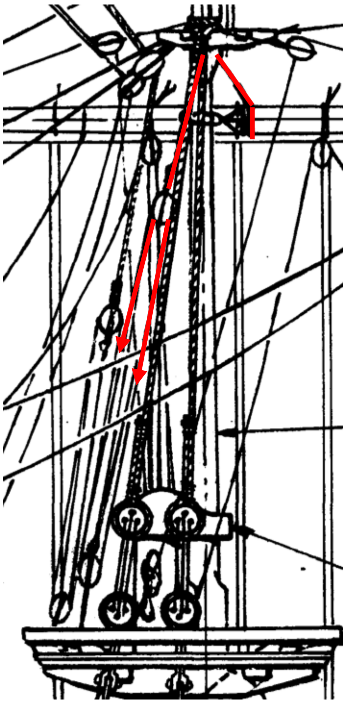


Figure 25: Halyard Tackle for Topmast

- all of the above creates a mixture of timber colours so wood staining was essential to give some degree of uniformity in timber colour. If I had been building a scratch model, then I would have chosen uniformity in wood colour (e.g. everything in walnut).

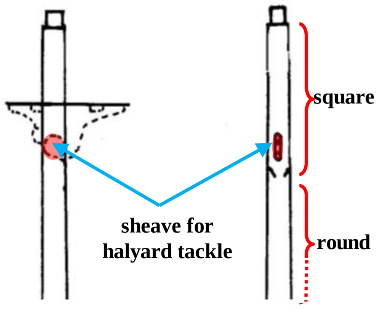


Figure 27 : Sheave Position in Topmast

The topmast cap was reduced slightly in length and width. After measuring the distance between the centres of the square tenon and the the tapered topmast, two holes were formed in the cap – the square hole forming a recess and the round hole passing through the cap. There are no halyard rope grooves on its upper surface due to the sheave in the upper part of the topmast.

The cap was left free until the bowsprit top was built and attached... nor at this stage was the topmast glued to the knee.

Figure 26 : Spritmast and Knee

Mast Top [A3]

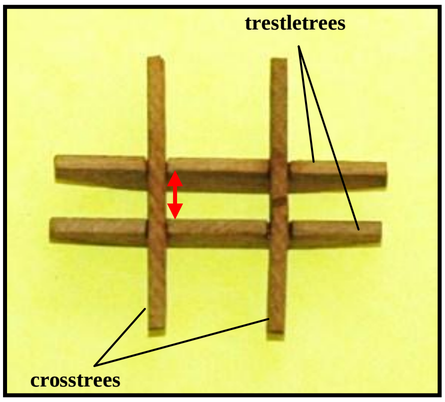


Figure 28: Top Crosstree

Crosstree

In the late 17C and early 18C, tops were fitted to just the lower masts as well as the bowsprit. The tops were supported by a crosstree (Fig. 28). The crosstrees supporting the top (and the trestletrees underneath that support the crosstrees) were constructed and pieced together taking care that the distance between the trestletrees is the same as the width of the square base of the topmast.

There are four timbers:

trestletrees – two pieces 2.0 x 4.0 x 35 mm., and
crosstrees - two pieces 2.0 x 2.0 x 35 mm.

Deck Opening

Generally, the construction of the tops remained unchanged through the centuries. In the case of the sprit top, there was only a small opening in the deck of the top just large enough for the bowsprit knee and the topmast heel to fit. The drawing shown in Plan Sheet 6 does not show the opening but in view of the previous comment, I was guided by the rectangular space between the crosstrees and trestletrees (yellow space in Fig. 29).

N.B. In the drawing, the trestletrees appear to be above the crosstrees ?

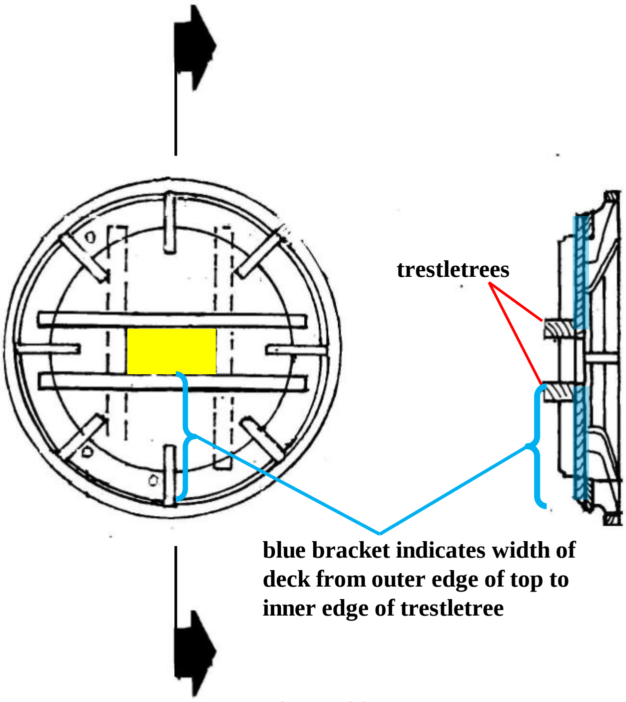


Figure 29 : Spritmast Top

Crosstree Problem

After I had constructed the crosstree as per the drawing dimensions, I quickly came to the realisation that the opening was not long enough to accomodate both the bowsprit knee and the topmast heel. The fine point here is that the two crosstrees actually would have passed through the knee and heel. My advice would be to construct the crosstree as per the drawing and modify it later. I put this problem to one side until I started constructing the actual platform and lower ring.(*Crosstree Opening Dilemma* Explained)

Decking Material

Historically, the top decking was assembled from two layers of timbers (athwartships and fore and aft) but this is getting a little complex and so as a starting point, a base of thin plywood is supplied averaging 0.6 mm thickness. An alternative is to cut the decking from one piece of timber and then scoring the joints with a knife.

Given that the decking averaged between 3 – 4 inches in thickness, at this scale of 1:48 the model deck thickness would be somewhere between 1.6 – 2.1 mm. This parameter allowed me to plank over the plywood with some scrap 1.0 mm. planking strips.

Crosstree Opening Dilemma Explained

As commented previously, the timbers shown with a total width of 18.9 mm. will not fit into the space created in the crosstree.

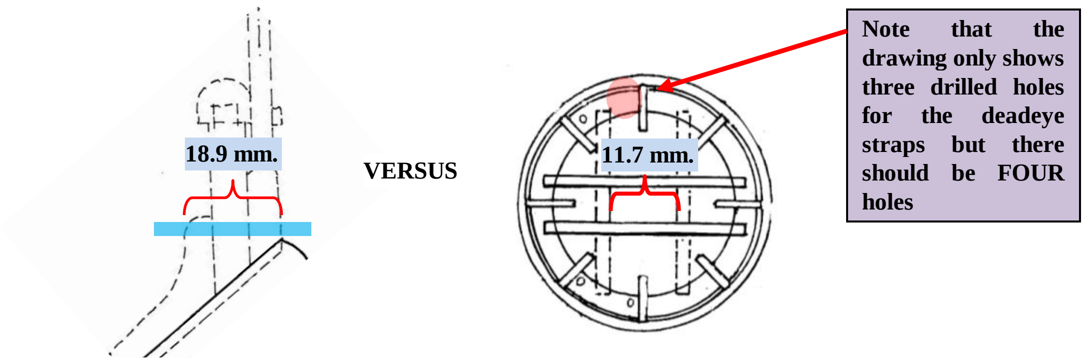


Figure 30: Bowsprit Deck Opening Dilemma

Crosstree Opening Dilemma Resolved

The two crosstree timbers were cut out and the length increased to the required 18.9 mm. The following images portray what both a scratch builder and I as a kit builder did.

Figure 31: A Scratch Builder's Solution

Evident here is the rectangular opening surrounding the bowsprit timbers. The heel of the topmast is round rather than the square section shown in the drawings. Also visible is the upper ring fixed over the ribs rather than against the outer rib ends. Further examples of choices that can be made.

Ribs and top ring were yet to be fixed to the top. ***The top has not been fixed in position*** **– needs to be levelled.**

Figure 32: My Solution

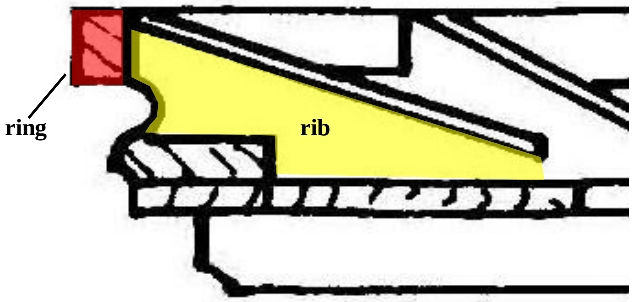


Figure 33: Historical Placement of Top Upper Ring

Ribs

Eight ribs were distributed radially at even spacings around the top to support the upper ring. I must confess to altering the rib size a little due to the thickness of the lower ring. I made the ribs from 1.0 x 5.0 x 8.0 mm. (except for two which were only 9.0 mm. long). An easier, basic approach would have been to use short sections of 2 x 2 mm. timber as shown back in Fig. 6.

Upper Ring Dilemma

I value the text written by Mondfeld (1989) and the drawings created by Euromodel with both indicating that the upper ring is attached to the ***end*** of the supporting ribs (refer to Fig. 34). The dilemma I faced was that the photographs I had access to either showed a flat ring (similar to the lower one) fixed on to the ***upper surface of the ribs*** (Fig. 6) or a flat strip fixed onto the ***ends of the ribs*** (Fig. 7). I ignored altogether the former approach.

Figure 34: Completed Bowsprit Top

This upper ring could be made by carefully bending a thin strip. Whilst not indicated in the current Component List, the original list did show that the eight strips of 2 x 5 x 760 mm. were to be used to construct this upper circle as well as being used for the wales, cap and pin rails. I was not sure about the ease of bending such a thick strip of wood.

My solution was to utilise a 2 x 2 mm. strip on the ends of the ribs. This material could have been made by carefully bending strips of walnut (could have been cut from the original 2 x 5 x 760 mm.) soaked in ammonia/water with the application of heat. I went to the expense of using 'very flexible beech' soaked in water for 10 minutes. Using heat from a bending tool, a complete curve was easily produced with such ***ridiculous ease***. With this timber it was best to produce a circle that was too small with the length overlapping. That way, it was then easily opened out and held tightly against the eight ribs without requiring any special clamping whilst gluing.

Sprit Topmast Crosstree [A6]

[CONSTRUCT B8 FROM DRAWING OF D5 AND NOT THIS DRAWING]

Framework timbers: **trestletrees** – two pieces 2 x 2 x 16.5 mm., and
crosstrees - two pieces 1.0 x 2 x 23.5 mm.

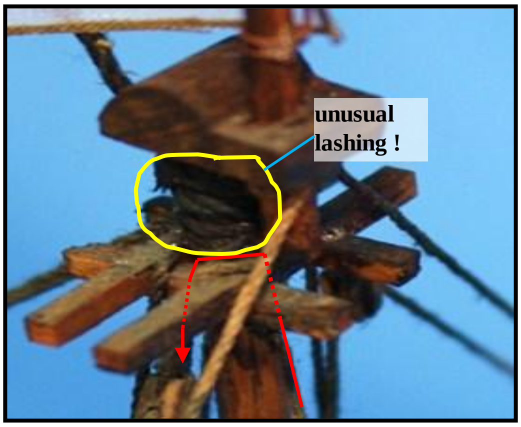


Figure 35: Bowsprit Topmast Crosstree

Because of their small size, the crosstrees at this point were difficult to cut – it proved easier if I worked from a much greater length and then trimmed to final shape and length after the joints were formed. Crosstrees often had a slight curve aftwards and the drawings perhaps suggest a very slight curve. I chose not to create a curve!

The only joints were in the trestletrees to a depth of 1.0 mm. Fig. 35 (not my build) shows all four timbers made from 2 x 2 mm. which goes against what the drawings suggest (see note above).

Also evident is an alternative method for reeving the halyard tackle and not using the topmast sheave. The red lines follow the halyard tackle as it passes up from the yard, over the crosstree and down to a block. In the overall picture, this would most likely not be evident to anyone but the builder.

As I continue to say …. 'your choice'

Mast Cap [A7]
The supplied piece measured 8 x 12 mm. I worked on this forming the two holes and then reduced this piece down to a size approx. 5 x 8 mm. as per the drawing.

Jackstaff [A8]
After tapering the staff from 2 to 1 mm., a small piece of 1 mm. thick walnut planking was glued on top and then shaped into a 3 mm. diameter truck. An fid was inserted into the jackstaff using a small piece of 0.9 mm. diameter brass wire.

Figure 36: Bowsprit Masting Finished Ready to be Part-Painted in Black

Chapter 4: FOREMAST

Foremast [B1]

Composition and Length

There were two ways to tackle this mast. It could have been entirely made from a tapered round rod ranging from 12 – 10 mm. (very straightforward), in which case the space between the trestletrees beneath the top may need to be reduced slightly. Using only the rod, a 10 x 10 mm. square head cannot be produced – insufficient material!

More exactly, the mast can be made from a shorter slightly tapered rod as described ***and*** a 10 mm. square section at the head (Fig. 37) which is the method I used but it did require more work and more material. I planned to paint this top, cap and associated mast sections black so different coloured timbers would not be a problem. Both approaches required an 8 x 8 mm. tenon on top.

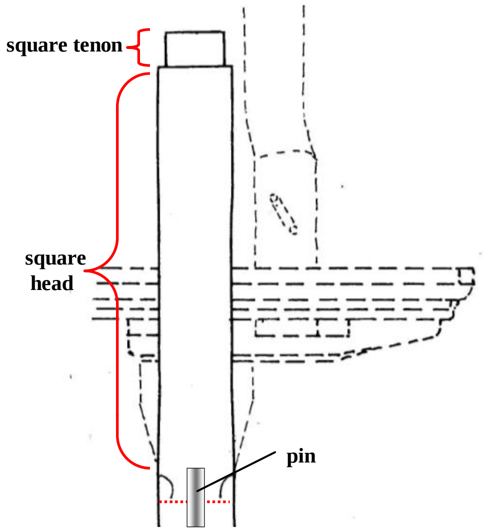


Figure 37: Foremast Head

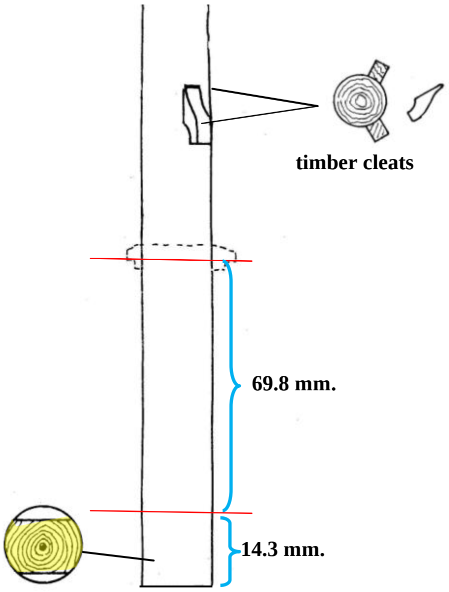


Figure 38: Foremast Heel

In either case, the completed length of this mast section will be ***longer*** than in the drawing!!! The length below the Forecastle Deck in my build was 84.1 mm. (Fig. 38). Below the Main Deck level, the mast will need to be reduced in width across one direction to fit the odd-shaped hole (shaded yellow) provided.

This resulted in an overall length of approx. **350 mm**. (below the square head, I used 274 mm. of the rounded rod). If you are using only the 12 mm. rod, then a short section of ‘something’ will need to be added to the bottom to increase the length.

Mast Cap [B3]

According to the drawings, the mast cap supplied was slightly smaller with a base size of 24.5 x 16.5 mm. when it should have been 25.5 x 19 mm. Adding on a 2 mm. thick strip on the ‘high’ end would have been sufficient to manipulate this block but even so I felt the width of 16.5 mm. was a bit restrictive so I chose to produce a cap from ***two pieces of scrap*** timber, both 6 mm. thick (refer to Fig. 39). This had the advantage of being able to create a square mortise (hole) right through the pale red block and then covering it with the shaped blue block piece. Euromodel are making the necessary changes to this piece.

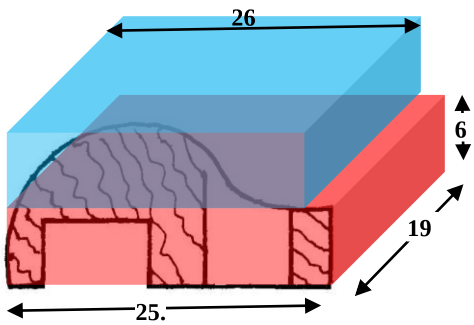


Figure 39: Producing a Cap for the Lower Foremast

N.B. Ensure that holes for the two eye pins are drilled underneath the cap before assembly.

Crosstree Support [B2]

Making up the mast top supporting framework are four timbers:

trestletrees – two pieces 5 x 6 x 62 mm., and

crosstrees - two pieces 2.5 x 4 x 60 mm.

Top [B2]

Deck Opening ('Lubber's Hole')

Generally, the construction of the tops remained unchanged through the centuries. However, looking at the drawings, I was puzzled by the fact that of the three masts (excluding the Bowsprit), the only top drawing that clearly showed a lubber's hole (red line) was the Mizzen Mast (Fig. 40) . So ***I utilised that design for the other two masts*** which conforms to the usual layout – top decking covering the crosstrees (shaded blue) but exposing the trestletrees (shaded yellow) with enough space either side for rigging to pass through.

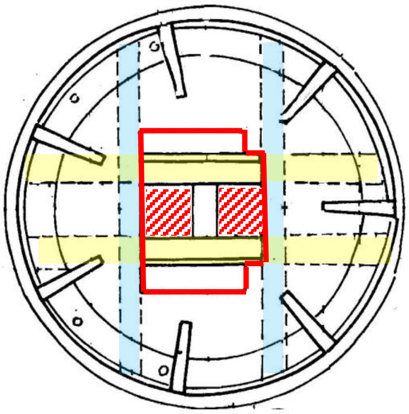


Figure 40:Mizzen Top Showing Lubber's Hole

Top Construction

The top is constructed in the same manner as for the Bowsprit top – refer to

In the following figure, the upper ring is more realistic and made from a timber such as 2 x 5 mm. (as an example size) but following the actual drawings, I chose to use a smaller size.

Top *Lower Ring*

Having cut out the platform disc from the supplied plywood, the kit builder is faced with the problem of building the lower ring. For a minimalist, basic approach my suggestion here would be to *ignore the bottom ring altogether*. Adding planking off-cuts left over from the hull second planking to the top and bottom surface of the plywood will produce a thickness equivalent to that created if the ring *had* been built.
and

Upper Ring Dilemma . However, the deck is different now showing the lubber's hole (refer to text above).

Twelve ribs were distributed radially at even spacings around the top to support the upper ring. I made the ribs from 2.0 x 6.0 x 13.0 mm. The ribs were also longitudinally tapered as shown in the drawings.

Again, I used 'very flexible beech' soaked in water for the upper ring. **Refer back to Fig. 18**

Bolsters

The bolsters on the top of the trestletrees were created from 4 x 5 mm. scrap timber and sanded to create a quasi-quadrant shape and over which the shrouds will be ultimately pulled down – position shown by yellow arrow in adjacent figure. I have seen a number of builds all of which have ignored this feature (Fig. 41). To me personally, this is disappointing but to the untrained observer the overall impression will still be satisfactory. I chose to include the bolsters.

Figure 41: Absence of Bolsters

Mast Cheeks

The cheeks were cut from the supplied 4 x 17 x 150 mm. and tapered downwards from 4 to 3 mm.

Topmast [B4]

The following illustration (Fig. 42) of the topmast construction centres around the fact that the mast heel at the bottom is an off-set square cross-section and because of its size could not be made from the 8 mm. rod supplied. There are two choices …

Figure 42: Advanced Topmast Heel

1. ***Ignore the square mast heel & head*** altogether and simply utilize the round mast at the base. This ignores a basic part of the mast structure but does make the construction much easier and appearance-wise is satisfactory.

2a. ***Create the off-set square mast heel from other timber*** and then glue + pin to the round mast. More work but I did not consider the procedure too difficult. However, I was intrigued with the ***foot dimensions of 8 x 8 mm.*** when the width between the trestletrees in B2 was 10 mm. I felt it necessary to add a thin piece of packing either side where the heel passes through the trestletrees. A 'sheave' needs to be simulated in the mast heel.

2b. ***Creating the mast head from other timber***
A quandary occurs at this point – as it does with other similar mast sections. The rounded mast below the head is finished at 6.0 mm. diameter and so the minimum finished width of the head above it must be 6.0 mm. to fit. Mathematically, it follows that this would be formed from a rod with a minimum diameter of 8.48 mm. The original rod diameter in the kit varied considerably from 7.90 – 8.17 mm. in diameter.

Solutions :
- form a smaller head size and work around that (too basic?),
- use a thicker piece of timber [refer back to Fig. 5] to start off with (too extreme ?)
- glue and pin a head made from separate scrap timber. This latter method was my choice.

DRAWING INTERPRETATION OF B4

The stated dimension for tapering shows the maximum 8.0 mm. at the bottom tapering upwards to a minimum of 6.0 mm. My measurement from the drawing determined a tapering from 7.8 mm. upwards to 6.0 mm. (these drawings were created before the digital age and CAD…. so your call).

Cheek [B5]

Refer to the notes on the Main Topmast - ***Cheeks [C5]***. The 4 mm. thickness provided can be used but I reduced this down to the stated 3 mm.

Crosstree [B5]

Making up the framework are four timbers:

trestletrees – two pieces 3 x 3.5 x 29 mm., and
crosstrees - two pieces 2 x 3 x 30 mm. **(Component List states 2 x 2 mm. - your call)**

Refer to the notes on the Main Topmast -

Crosstree [C5]

Mast Cap [B6]
The supplied piece I did not alter (length was correct and the width only 1 mm. wider) but as always the finished diameter for the topgallant mast to fit through must wait until later. For ease of construction, the square hole I made circular – far easier to drill than carve out !!!

Topgallant Mast [B7]

This mast could be made simply by tapering the supplied rod from 4 mm. up to 3 mm.

Having made the small off-set mast heel, I decided not to produce the mast head as a separate piece due to the following reasons …

- the diameter of the mast is much smaller compared to the other mast sections making pinning difficult,and
- there is a sheave to simulate thus leaving little room for the pin in the mast head.

I produced the mast above the heel & the mast head as one piece from some 5 mm. rod and reduced it down to the required taper. There was ample material remaining to form the squared mast head (3 x 3 mm.).

Crosstree [B8]
The drawing specifications are contained within the Mizzen Mast drawings and ***are the same as 'D5'***.

The bowsprit drawings show that B8 and A6 are the same…
…..IGNORE THIS as it is misleading with smaller dimensions.

Making up the crosstree framework are four timbers:

trestletrees - two pieces 2 x 2.5 x 18 mm., and
crosstrees - two pieces 1 x 3 x 22 mm.

Mast Cap [B9]
Supplied piece slightly different in width (8 mm.) to the drawing size (10 mm.) but not a problem. There are two eye pins, one each side.

Flagstaff [B10]

Starting with 3 mm. rod, this was tapered to 2 mm.

Chapter 5: MAIN MAST

Main Mast [C1]

Composition and Length

There were two ways to tackle this mast.

- It could have been ***entirely made from a tapered round rod*** ranging from 14 – 12 mm. (very straightforward), in which case the space between the trestletrees beneath the top may need to be reduced slightly. Using only the rod, a 12 x 12 mm. square head cannot be produced – insufficient material!

- More exactly, the mast can be made from a shorter slightly tapered rod as described ***and*** a 12 mm. square section at the head (Fig. 43) which is the method I used but it did require more work and more material. I planned to paint this top, cap and associated mast sections black so different coloured timbers would not be a problem. Both approaches require a 10 x 10 mm. tenon on top.

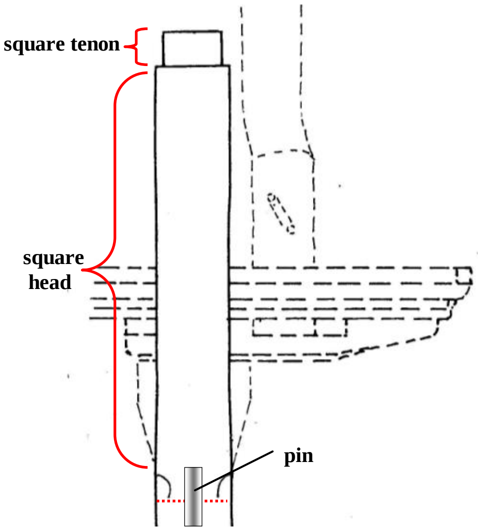


Figure 43: Main Mast Head

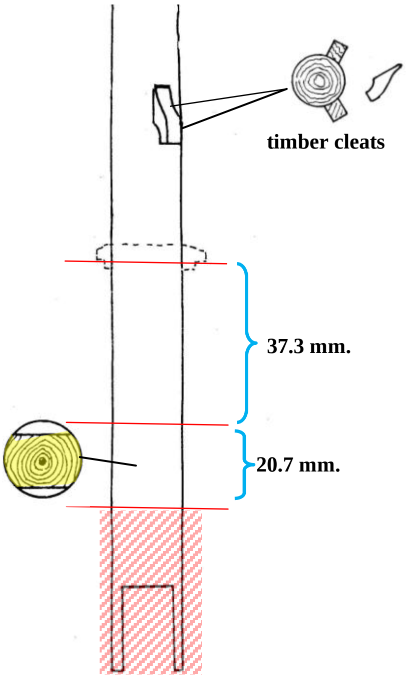


Figure 44: Main Mast Heel

In either case, the ***<u>overall length of this completed mast section will be shorter than in the drawing</u>*** which is based on a pure scratch build.

The length below the Main Deck in my build was 58.0 mm. (Fig. 44) resulting in an overall length of approx. **336 mm**. (below the square head, I used 260 mm. of the rounded rod) - the red-shaded area I did not use. Below deck level, the mast will need to be reduced in width across one direction to fit the odd-shaped hole (shaded yellow) provided in the deck (Fig. 44).

Mast Cap [C3]

The mast cap supplied was too small with a base size of only 24.5 x 16.5 mm. when it should have been 30.0 x 26.0 mm.

I chose to produce a cap from ***two pieces of scrap*** timber, one 6 mm. thick and the other 8 mm. thick (refer to Fig. 45). This had the advantage of being able to create a square mortise (hole) right through the pale red block and then covering it with the shaped blue block piece. Euromodel are making the necessary changes to this piece.

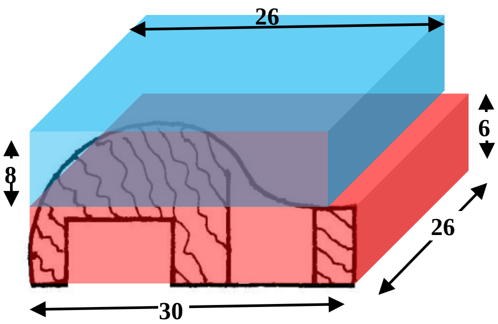


Figure 45: Producing a Cap for the Main Mast

N.B. Ensure that the holes for the two eye pins are drilled underneath the cap before assembly.

Crosstree Support [C2]

Figure 46: Main Mast Head, Crosstree & Cap

Making up the mast top supporting framework are four timbers:

trestletrees
- two pieces 6 x 7 x 64 mm., and

crosstrees
- two pieces 2 x 5 x 56 mm.

Note that the mast cap in Fig. 46 is made up from various thicknesses of timber. The mast head is yet to be pinned to the rounded mast below it. After fitting the circular top, this section will all be painted black.

Top [C2]

This top is constructed in the same manner as for the Bowsprit top – refer to

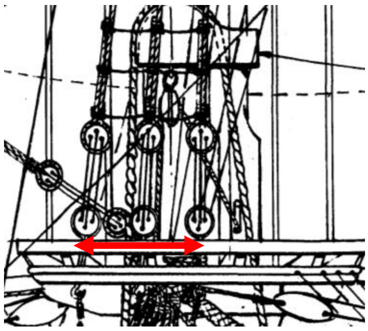


Figure 47: Deadeye Hole Positioning

In the following figure, the upper ring is more realistic and made from a timber such as 2 x 5 mm. (as an example size) but following the actual drawings, I chose to use a smaller size.

Top *Lower Ring*

Having cut out the platform disc from the supplied plywood, the kit builder is faced with the problem of building the lower ring. For a minimalist, basic approach my suggestion here would be to *ignore the bottom ring altogether*. Adding planking off-cuts left over from the hull second planking to the top and bottom surface of the plywood will produce a thickness equivalent to that created if the ring *had* been built.

and

Upper Ring Dilemma . The deck, though, shows the lubber's hole as in the Foremast Top – refer to ***Top [B2].***

- ***Twelve*** ribs were distributed radially at even spacings around the top to support the upper ring (one rib is not shown in the drawings). I made the ribs from 2.5 x 6.0 x 13.0 mm. The ribs were also longitudinally tapered as shown in the drawings.

- I used 'very flexible beech' soaked in water for the upper ring.

- Positioning of the holes needed for the deadeye straps (Fig. 47) are off-centre of the mast line.

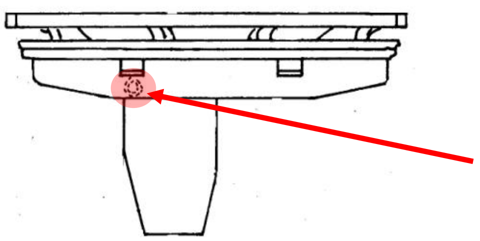


Figure 48: Main Top Eye Pin Installation

- An eye pin needs to be installed underneath one of the cross tree members midway between the two trestletrees – refer to Fig. 48. Also refer to Plan Sheet 8, 'Dettaglio C'

Bolsters

The bolsters were constructed in a similar manner to that of the Foremast. They were created from 4 x 6 mm. scrap timber. Since I was including the fid, I had to shorten the length of the bolster.

Cheeks

The kit supplies 4 x 17 x 150 mm. and the basic approach is to use that for all cheeks. Perhaps not necessary, but I formed these two cheeks from scrap so that I could taper downwards from 5 to 3 mm. as per the drawings.

Main Topmast [C4]

As mentioned in the introduction (***Total Mast***), there are a number of choices in how you go about the build of this mast. My main concern was the interpretation of the head with logic leaning towards the head being square in cross-section but most builds seem to avoid this ? Whilst the Fore Topmast drawing clearly shows the mast head being square, the Main Topmast gives no such indication. My approach was to carry that square cross-section through to this mast.

Figure 49: Main Mast Top, Cheeks, Cap & Head ; Topmast Heel

I utilized some scrap timber (by combining thinner pieces together) to create the heel of the mast as one 'curved' piece. In making the topmast I followed the drawings exactly and finished up with the **10 x 10** mm. heel sitting loosely in the **12** mm. wide separation of the trestletrees. I should have anticipated this problem before starting. It was a disappointing error in the drawings but in the end I decided to leave things as they were – not changing the drawings - and carry out a careful bit of packing when assembling.

Both masts have two important features :

- **fid** (common term but source of word seems to be unknown) to support their weight, and
- **sheave** – in the heel of the topmast. As in other parts of this ship, the 'sheave' is a simulation based on two holes joined by a narrow channel.

DRAWING INTERPRETATION OF C4

The stated dimension for tapering shows the maximum 10 mm. at the bottom tapering upwards to a minimum of 7 mm. My measurement from the drawing determined a tapering from 9.5 mm. upwards to 7.4 mm. (these drawings were created before the digital age and CAD…. so your call).

Cheeks [C5]

The cheeks are cut from the supplied 4 mm. thickness (4 x 17 x 150 mm.) and for a basic approach that is what I suggest is done. However, the drawing shows a 3 mm. thickness and that is what I used. The rope channels passing through the cheeks could have been made as two straight grooves.

Figure 50: Topmast Cheek

Cheek *rear surface*: raised central area denoted by black circle represents sheave. A channel has been cut around the sheave to allow for the rope.

Crosstree [C5]

Making up the crosstree framework are four timbers:

Figure 51: Main Topmast Crosstree (without any curvature)

trestletrees
- two pieces 3.5 x 4 x 32 mm., and

crosstrees
- two pieces 2 x 3 x 35 mm.

The crosstree poses a dilemma – the drawing shows a distinct curvature in the crosstree members and historically that is correct. With the aim of simplifying things, the majority of builds that I have seen ignore this curved timber and opt for two straight pieces (Fig. 51). From a total perspective, that approach is quite acceptable.

These curves are difficult to achieve and so I opted out of 'good practice' and decided to follow the usual trend of **straight pieces** [Alternatives: very flexible beech timber is an easy approach but expensive or soaking in ammonia + water mixture and then bending using heat]. I also felt compelled to accept that this was not strictly a scratch build … 'so keep it simple, Pete' !

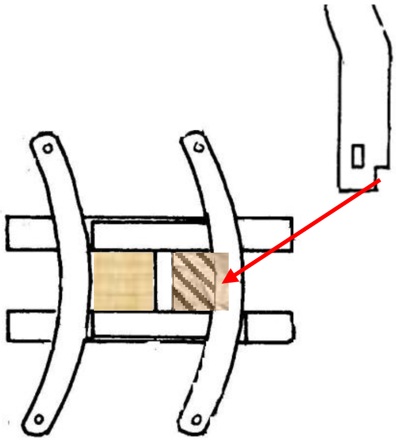


Figure 52: Main Topmast Crosstree Drawing – from Plan Sheet 6 - (showing curvature)

Measurements from C5 in Plan Sheet 6 indicate that the topmast head/topgallant heel combination will not fit in the space between the two crosstree members. However, closer examination shows the cut out in the base of the topmast heel alleviates this apparent problem – refer to Fig. 52.

HINT: It was far safer to do this cut-out after producing the fid opening. Working from the drawings, I found that some small adjustments to both the size of the cut-out and the fid hole position were necessary – refer to Fig. 53 below.

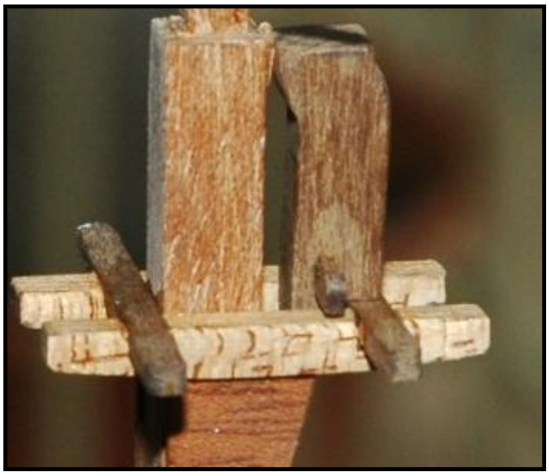


Figure 53: Topgallant Heel Seated in the Topmast Crosstree

Mast Cap [C6]

Supplied piece slightly different (21 x 13 mm.) than drawing size (18 x 15 mm.) but not a problem.

Main Topgallant Mast [C7]

This mast could be made simply by tapering the supplied rod from 7 mm. up to 5 mm.

As for the foremast topgallant mast, having made the small off-set mast heel, I decided not to produce the mast head as a separate piece due to the following reasons …

- the diameter of the mast is much smaller compared to the other mast sections making pinning difficult,and
- there is a sheave to simulate thus leaving little room for the pin in the mast head.

I produced the mast above the heel as one piece from some 8 mm. rod and reduced it down to the required taper of 6 mm. up to 5 mm. There was ample material above this to form the squared mast head (5 x 5 mm.).

Figure 54: Topgallant Crosstree - no eye pins evident

Crosstree [C8]

Making up the crosstree framework are four timbers:

trestletrees

- two pieces 3 x 3.5 x 21 mm., and

crosstrees

- two pieces 1.5 x 3 x 22.5 mm.

There are two eye pins, one each side.

Mast Cap [C9]

Supplied piece slightly different in length (16 mm.) to the drawing size (14 mm.) but not a problem. There are two eye pins, one each side.

Flagstaff [C10]

Starting with 3 mm. rod, this was tapered upwards to 2 mm.

Chapter 6: MIZZEN MAST

Mizzen Lower Mast [D1]

Composition and Length

As with the other masts, there were two ways to tackle this mast. It could have been entirely made from a tapered round rod ranging from 8 – 7 mm. (very straightforward), in which case the space between the trestletrees beneath the top may need to be reduced slightly. Using only the rod, a 7 x 7 mm. square head cannot be produced – insufficient material!

More exactly, the mast can be made from a shorter slightly tapered rod as described ***and*** a 7 mm. square section at the head (Fig. 55) which is the method I used but it did require more work and more material. I planned to paint this top, cap and associated mast sections black so different coloured timbers would not be a problem. Both approaches required a 5 x 5 mm. tenon on top.

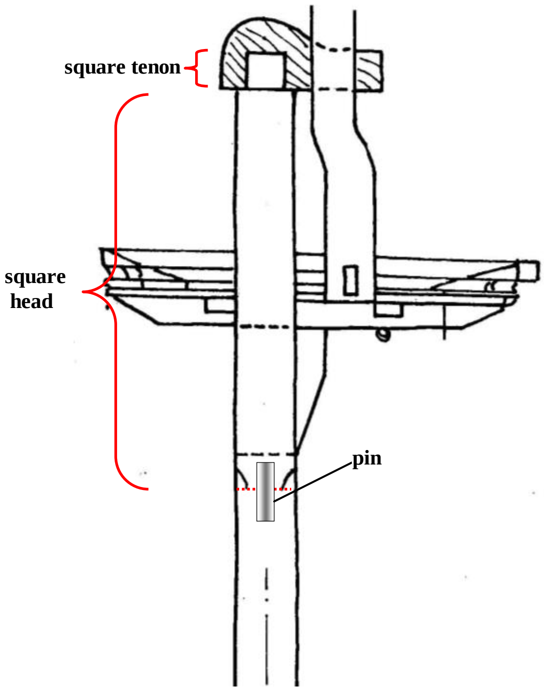


Figure 55: Main Mast Head

In either case, the completed length of this mast section will be ***<u>longer</u>*** than in the drawing!!!

The length below the Upper Quarter Deck in my build was **111 mm.** which was confirmed by measuring from Plan Sheet 10. However, Plan Sheet 6 which contains all the detailed drawings for the masts clearly shows that this measurement should be 104 mm. There was no choice but to go with 111 mm. given the fixed dimensions of the hull and its frames.

This resulted in an overall length of approx. **331 mm**. (below the square head, I used 279 mm. of the rounded rod). If you are using only the 8 mm. rod, then a short section of 'something' will need to be added to the bottom to increase the length.

Mast Cap [D3]

Plan Sheet 6 only shows a side view of this cap and so I assumed that the width of the supplied piece is suitable - the length was correct. Unlike the other two caps for the lower masts, this one does not have grooves cut in on the upper surface for the halyard rigging.

Crosstree [D2]

Making up the mast top supporting framework are four timbers:

trestletrees
- two pieces 4 x 4 x 48 mm., and

crosstrees
- two pieces 2.5 x 3 x 45 mm.

For the trestletrees, the 4 mm. thickness appears to be made from two strips. I was not sure about this but did settle on one strip made up as 4 x 4 mm. from some scrap I had.

NOTE: In the drawing for D2, the space between the two crosstrees is shown as 16 mm. Measuring off the drawing of D3 (lower mast), the spacing is 17 mm. I used the latter measurement.

Top [D2]

Deck Opening

This top is constructed in the same manner as for the Foremast Mast top. ***Top [B2]***

Top Support

Making up the mast top supporting framework are four timbers:

trestletrees – two pieces 4 x 4 x 48 mm., and
crosstrees - two pieces 3 x 2.5 x 45 mm.

Bolsters

The bolsters that are glued onto the top of the trestletrees were created from 3 x 4 mm. timber and sanded to create a quadrant shape over which the shrouds will be ultimately pulled down. The drawing suggests a flat-topped/bevelled bolster but I chose to go for the traditional quadrant shape.

Installation of Crosstree/Top

Remember to allow for the inclination of the mast. [Unfortunately, I did not so I hope it will go un-noticed!!!]

Topmast [D4]

This mast could be made simply by tapering the supplied rod from 5 mm. up to 3.5 mm.

Having made the small off-set mast heel, I decided not to produce the mast head as a separate piece due to the following reasons …

- the diameter of the mast is much smaller compared to the other mast sections making pinning difficult, and
- there is a sheave to simulate thus leaving little room for the pin in the mast head.

I produced the mast above the heel as one piece from some 5 mm. rod and reduced it down to the required taper of 3.5 mm. There was ample material above this to form the squared mast head (3.5 x 3.5 mm.).

Crosstree [D5]

Making up the mast top supporting framework are four timbers:

trestletrees
- two pieces 2 x 2.5 x 18 mm., and

crosstrees
- two pieces 1 x 3 x 22.5 mm.

Mast Cap [D6]
Dimensions slightly smaller but acceptable. Two eye pins used, one either side of the mast cap.

Flagstaff [D7]
Starting with 3 mm. rod, this was tapered upwards to 2 mm.

Chapter 7: ENSIGN STAFF

The Ensign Staff is attached to the Poop Deck but the following figures show an obvious difference in that Figure 56 has the staff seated on a flat deck but the drawing (Fig. 55) clearly indicates a curved deck. **Not my build** but just another illustration of 'your choice'.

Figure 56: Ensign Staff on a *Flat* Poop Deck

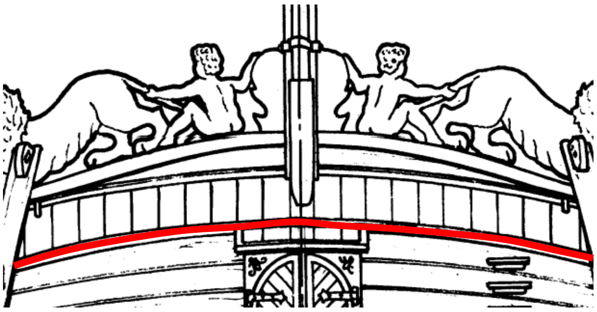


Figure 57: Curvature of Poop Deck

- There is no specific drawing for this component but Plan Sheet 1 does show most of the detail.
- The staff was set at **102°** to the Poop Deck but the final angle you achieve will depend on how you set the work up!
- The kit allows for a length of 8 mm. rod to 'vertically' support the staff pole (E1).
- In my construction, I utilised some scrap timber to make the supporting column square in cross-section.
- Dimensions:
  Supporting base beneath the staff (carved from scrap timber)
  - 24 mm. in length by approx. 18 mm. high.

  Staff pole
  - 144 mm. in length, tapering upwards from 4 to 3 mm.

  Supporting column
  - 6 x 6 x approx. 36 mm.

  Distance between tenon and hole in mast cap
  - 5.5 mm.
- Mast Cap [E2] has the same dimensions as that for Mast Cap [B6]