

Fabricating Masts, Bowsprits, Booms and Yards

Using a Lathe or Reasonable Facsimile *and* Hand Tools

Fabricating Masts, Bowsprits, Booms and Yards

I am not an expert. My knowledge is experiential.
Share your experiences to add to this treatment.
Please ask questions.

This will be posted on our web site as a Shop Note!

Fabricating Masts, Bowsprits, Booms and Yards

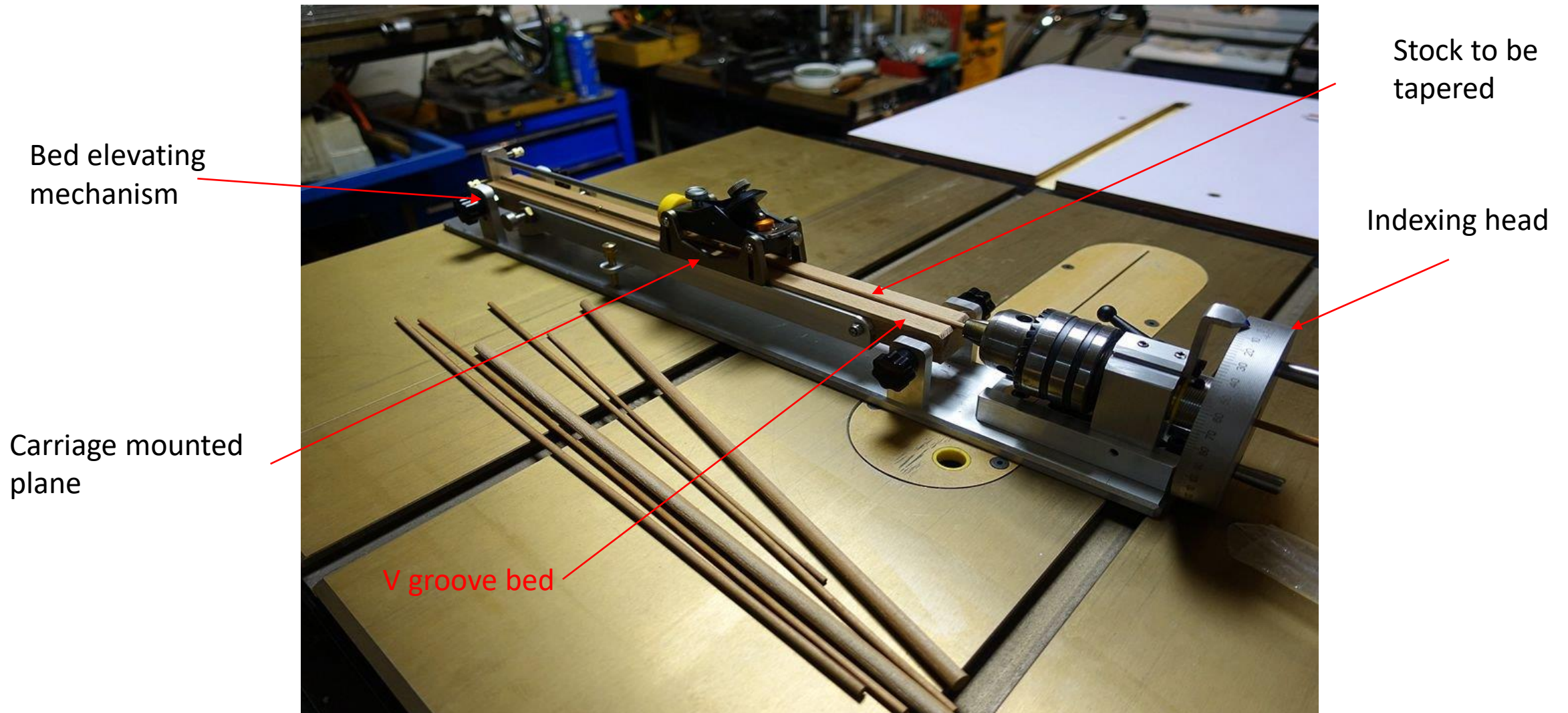
A Word About Common Practice

The conventional method of fabricating tapered model ship elements is by manually tapering stock with a plane, spoke shave or even a chisel. By shaving each corner of square stock successively one can achieve a fairly true taper which only requires progressive sanding to obtain the desired part dimension and form. ***It takes practice!***

This treatment does not cover this approach per se', but rather offers a machine oriented technique that is supplemented by this common fabrication methodology.

Fabricating Masts, Spars, Bowsprits

Extreme Tapering Jig



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Scope:

- Essential Tools/ Accessories
 - Planning Ahead
- Proper Use of Preferred Tools
- An Integrated Methodology

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Basic Tool Suggestions

Digital or Analog Caliper (*digital preferred*)

Adjustable mechanical calipers are not accurate enough

Jig to locate center on stock ends

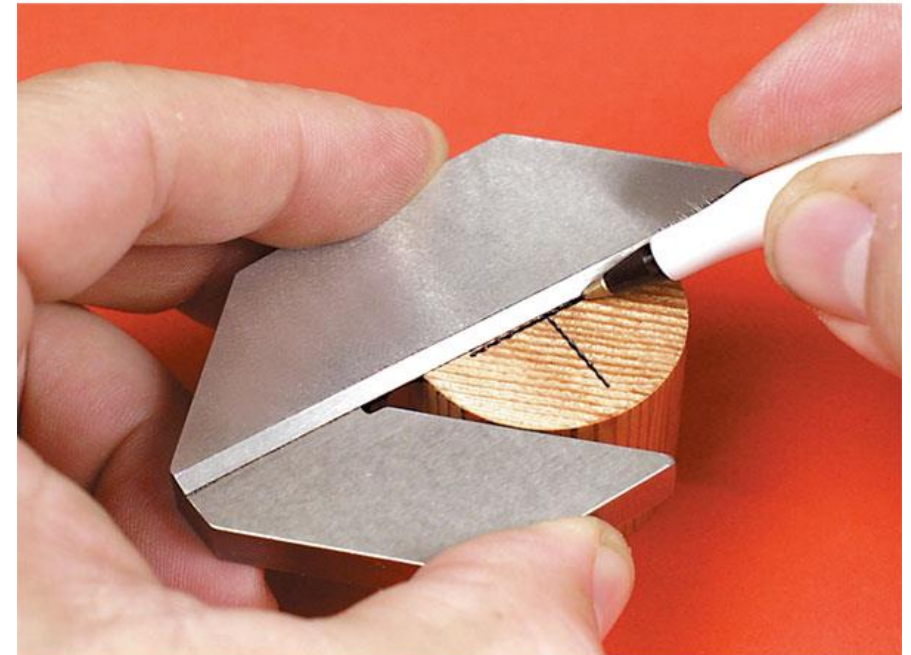
Punch (*spring loaded preferred*)

Amazon



Works with
round or
square stock

Micro Mark



Probably the best, given element size!

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Basic Tool Suggestions (See *pen turning* sites for more info)

Lathe Choices come in a range of prices and sizes. Here is one of two types comparable in bed length and capability.

Sherline is a wood and metal turning lathe



Sherline 17" Lathe

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Basic Tool Suggestions (See *pen turning* sites for more info)

Lathe Choices come in a range of prices and sizes. This is the other type comparable in bed length and capability.

Rikon MIDI Lathe and others are wood turning only

Drive end
pass through



Variable Speed
recommended

**This may be the best tool for the job!
Bed extensions, model specific chuck
accessories need to be identified.**

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Another option?
More of a curiosity than a choice?
Cheaper yet, but buyer beware!

With modification can increase bed to accommodate longer stock. You Tube video demonstrates a “how to”. See <https://www.youtube.com/watch?v=B9hNEaYiwK8>. Caution: stock length limited with Jacobs chuck (no pass through capability)

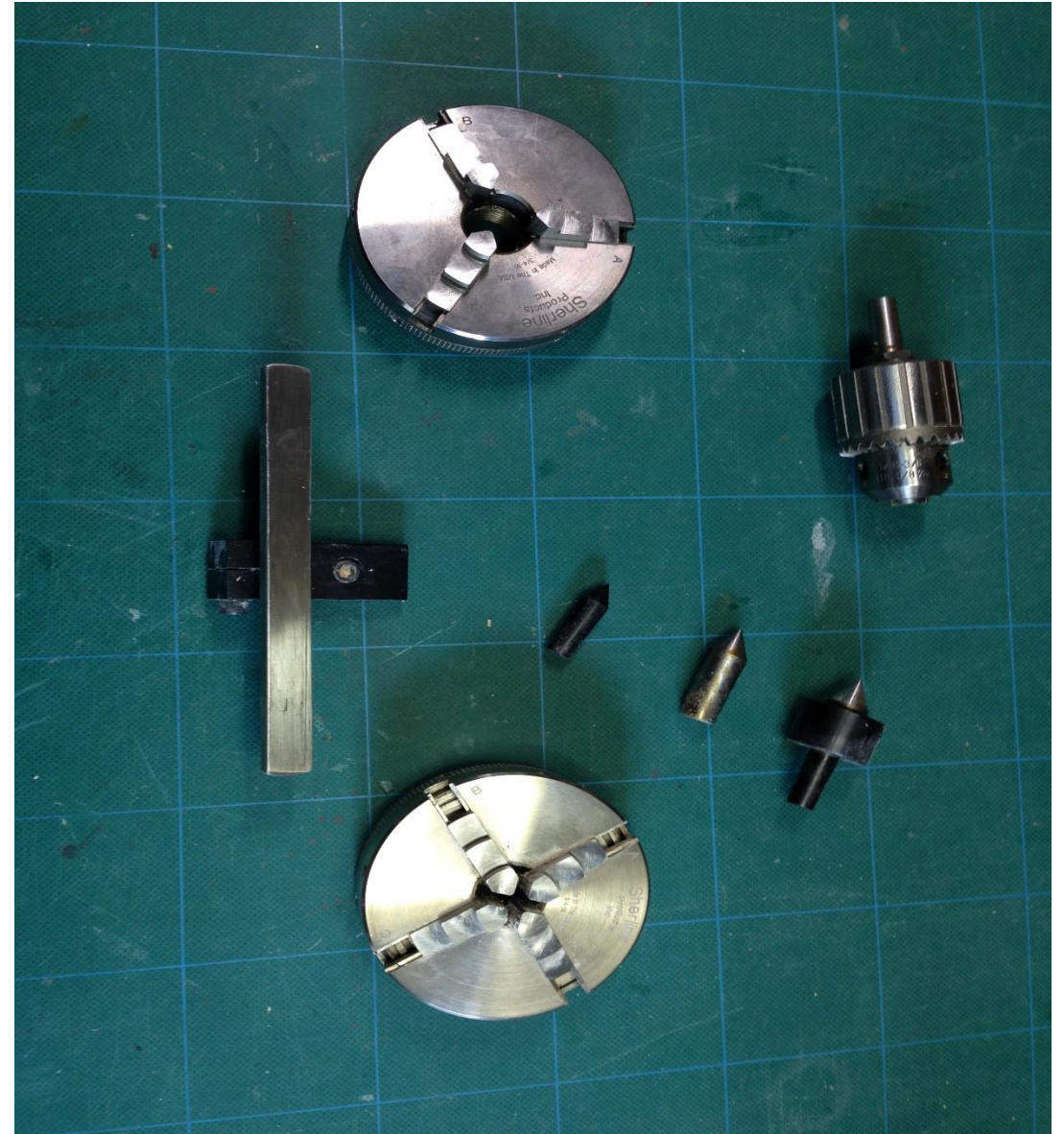
And if you want to spend almost no money at all see: <https://www.youtube.com/watch?v=gUIK4eB2II8>



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A word about holding mechanisms for turning stock

- ✓ There are a number of devices but they can be lathe and application specific
- ✓ Types:
 - 3 and 4 jaw chucks found mostly on metal turning lathes. **These are most versatile**
 - Jacobs chucks; **usually limited in opening diameter to 3/8 max (on small lathes) and no pass through ability**
 - Face plates (not shown) enable various mounting methods
 - Home made “jam” chucks; shaping the end of stock with a matching morse taper for lathe drive end
 - *Spur device; a unit with protruding sharp blades to bite into the wood; **not practical for small diameter stock***



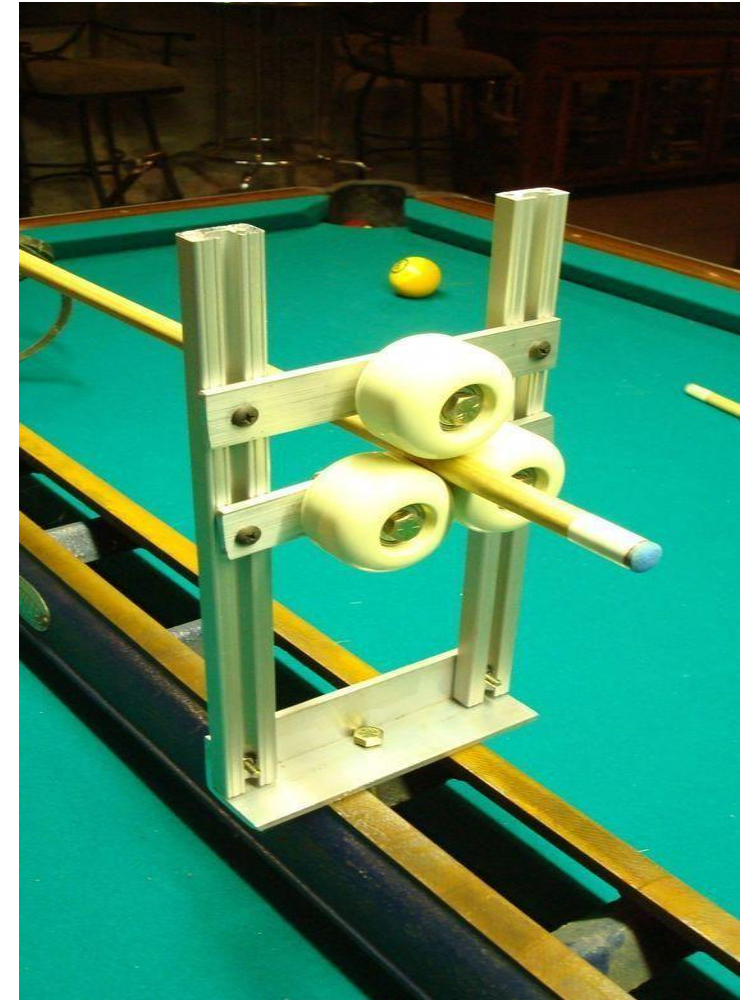
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Accessories useful for long stock



Micro Mark Steady Rest, may require modification for your bed

The rollers need to be adjustable



DIY Steady Rest for any lathe bed
Made from easy to acquire and fabricate materials

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Yes your hand is useful too for steadying stock!

Looks like a
parting tool
being used



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And yet another DIY accessory useful for steadying long stock. Very easy to make too!



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The skew chisel

- ✓ $\frac{1}{4}$ " to $\frac{1}{2}$ " HSS Easiest to sharpen (keep it sharp)
- ✓ Double bevel enables up/down hill turning
- ✓ Versatile tool (edge defining, beading etc.)
- ✓ Surface finish best



\$16

<https://www.ramelson.com/product/3-8-skew-mini-wood-turning-lathe-tool/>

Sorby turning tool options:

- ✓ Blunt nose scraper (roughing)
- ✓ Round nose scraper (roughing)
- ✓ Spindle roughing gouge
- ✓ Modular handle advisable



See this site for a more tools of the Sorby collection about the same price:

https://www.ebay.com/i/281834991312?ul_noapp=true

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- Sharpening is essential
 - ✓ HSS; easiest to sharpen (but must be kept sharp)
 - ✓ Several good sources for sharpening equipment.
 - ✓ My go to outfit is Lee Valley.
 - ✓ Most comprehensive array of product.

Great guide:

<https://www.leevalley.com/en-us/discover/sharpen-net/how-to-sharpen>

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Just a word about stock

- ✓ Straight and straight grain along the axis
- ✓ Common close grain wood: boxwood, pear, maple and cherry
- ✓ Avoid sap wood

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Using the versatile skew

The **lower 1/3** of blade is used

With the proper attack angle it slices the fibers

The double bevel enables uphill and downhill

turning. **However with tapered stock downhill is mostly preferred.**

Note: **Roughing scrapers** work too but give a rougher finish. **Spindle roughing gouges** give a decent finish.



Turning Masts, Bow Sprits, Booms and Yards

Using the versatile skew

Note the oblique attack angle of the skew to the work piece. The cutting surface lies parallel to the stock.

Note: Not all lathes have a tool rest as the one shown. For example the Sherline is a simple flat rest. A DIY block atop the X/Y carriage would enable use of the skew but you would be turning across the top. Not the side as shown.



Turning Masts, Bow Sprits, Booms and Yards

Alternately, the spindle roughing gouge

As stated, the skew does not lend itself to lathes with an X/Y carriage as it tends to be in the way. *(See previous slide)*

The **spindle or roughing gouge** works better with a lathe tool carriage.

Note the approach and angled attitude of the gouge.



Turning Masts, Bow Sprints, Booms and Yards

Before you begin turning you need to think about any unique fabrication needs that may be easier to address on blank stock rather than on the finished work piece

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- **Planning ahead** (with uniform square or round stock)!
 - Is the element stock too long for the lathe bed?
 - ✓ Divide into logical sections (in this case joint hidden under breast plate)
 - ✓ The joint end needs a hole for a connecting dowel or tenon

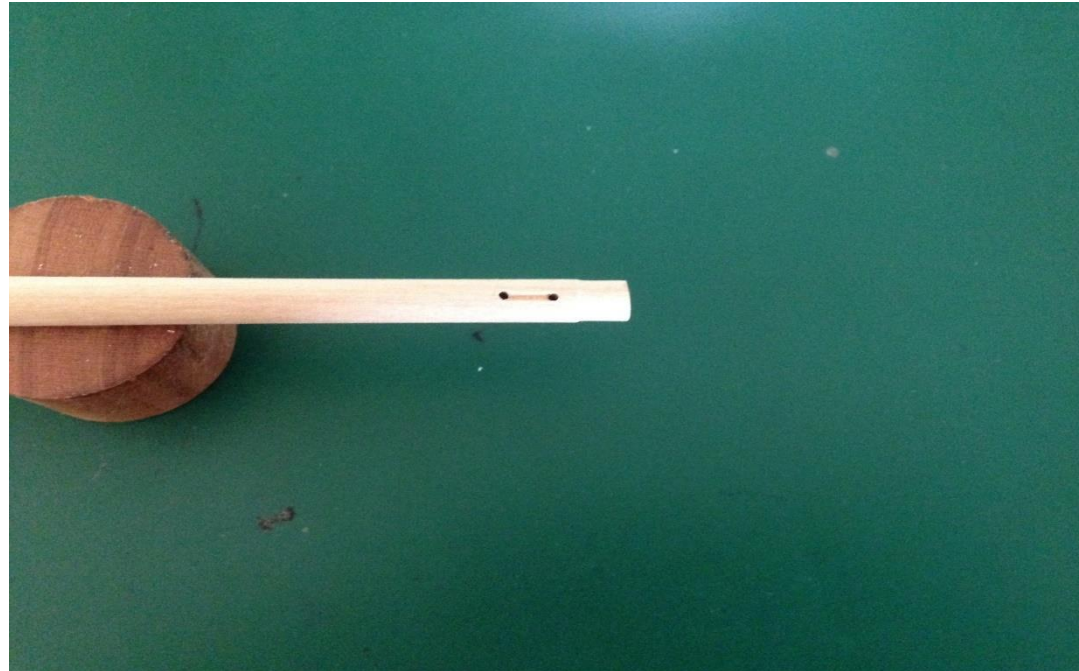
Bow sprit in this case was 18 ½" long. Didn't fit on lathe. And its diameter didn't permit "chucking it up". Turned in 2 separate elements. Joined with a 3/16 brass pin.



Fabricating Masts, Bow Sprits, Booms and Yards

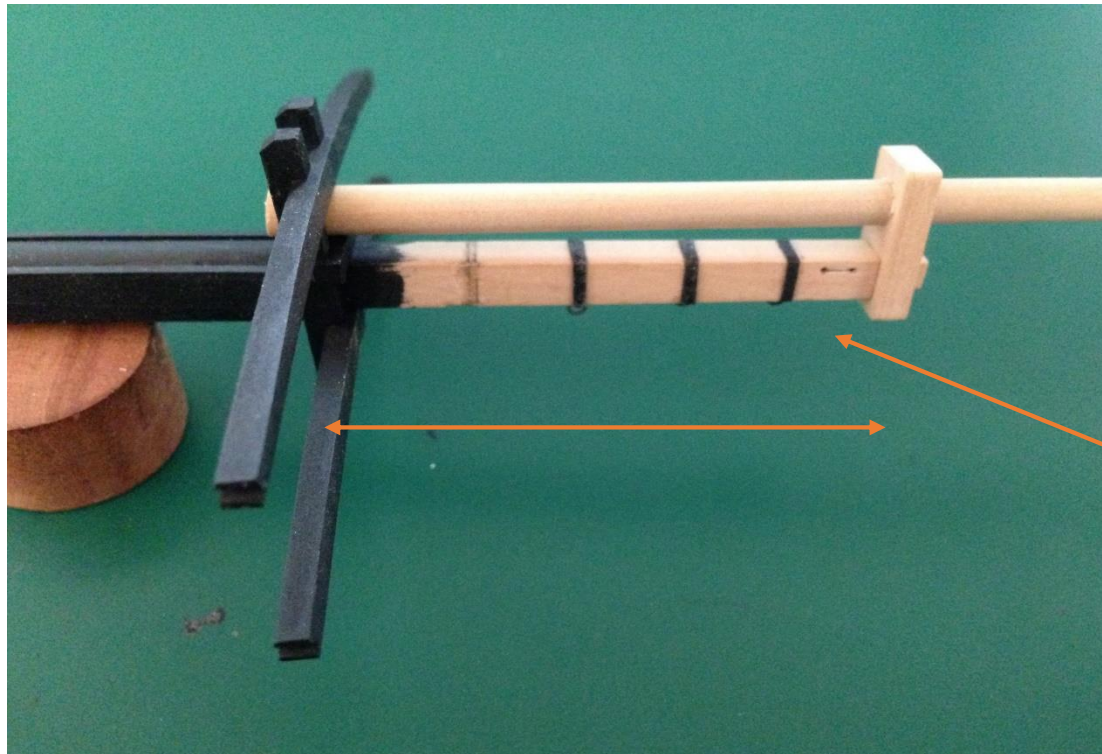
○ Planning ahead (with uniform stock)!

- Does the element require any unique machining
 - ✓ Cheerful needed a simulated embedded block outboard on bow sprit
 - ✓ Hard to drill an accurate perpendicular hole on a tapered element
 - ✓ At least establish reference holes



Fabricating Masts, Bow Sprits, Booms and Yards

- **Planning ahead** (with uniform square stock)!
 - Does the element need a square top section?
 - ✓ While stock is still square define and rough machine that section
 - ✓ Roughing can be done on a table saw (only practical for square stock)
 - ✓ Or you can turn just the lower section and add the square section using a tenon.
This is my preferred approach.



Note this section also needed a simulated embedded block

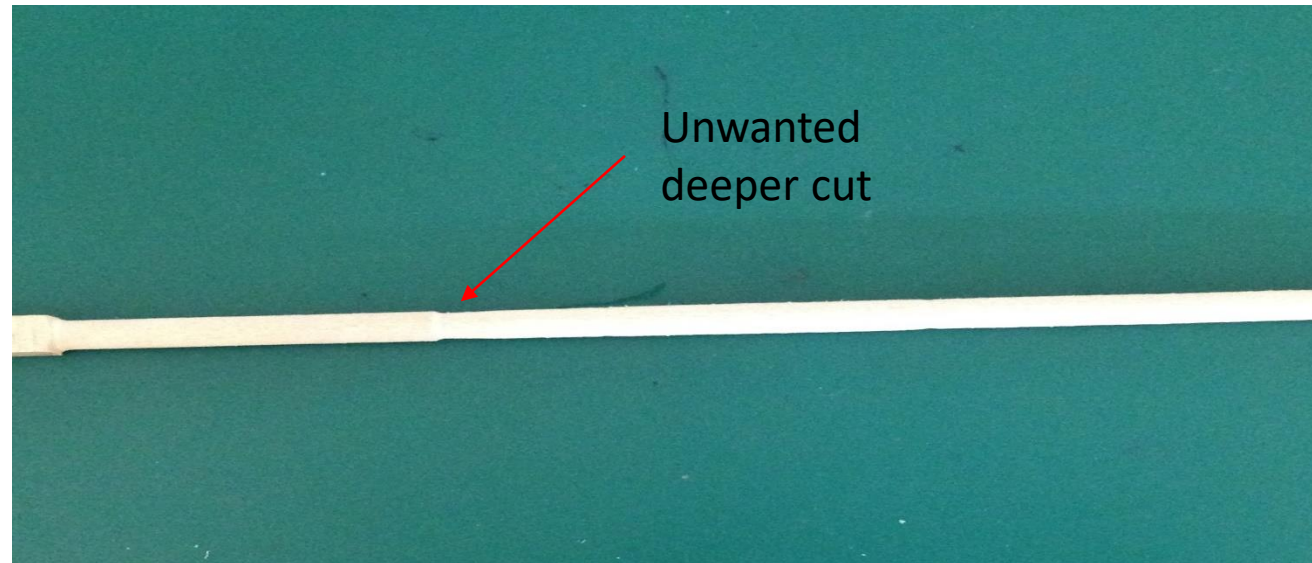
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A few words about preparing stock, especially slender stock

Turn to a consistent rough diameter by

- ✓ Taking light cuts to minimize vibration especially with unrounded stock
- ✓ Proceed with the rough rounding from the drive end to the tail stock
- ✓ Not doing so will produce disappointing results due to deflection problems

Drive end



Started rough
shaping at drive
end but continued
from tail end

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- Start with stock approximately 1/8" larger than largest diameter
- Make stock length longer than needed for holding purposes
- Establish center point of each end. The **center point is relatively critical.**
Punch the tail stock end hole very carefully!

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- Initial tapering square stock end to end can be used **but establish center points prior**
 - ✓ See MSW Tapering Jig
(<https://www.pettigrews.org.uk/lm/page030a.htm>)
 - ✓ Can reduce turning time
- Alternately just plane off the 4 corners to create a hex shape **(use a bench jig or do it right on the lathe. Hand turning of course.)**
- **The bench jig** can be as simple as a 'V' grooved block of length with end hold down capability

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- You can use the skew or gouge for the roughing operation
 - ✓ Work carefully and safely!!!!
 - ✓ Even with small work wear safety goggles/glasses.
 - ✓ Take light cuts until reaching round stock
 - ✓ Don't run at high speed (< 300rpm)
 - ✓ Don't let the top tip of skew get caught in the stock!!!!!!!!
- I use my Sherline X/Y carriage with a cutter fashioned as a round nosed scraper to rough for thinner stock.



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- Once a consistent diameter is achieved
 - ✓ Increase the drive speed up (< 500rpm)
 - ✓ *Situationally* you might start the small diameter end first. Then again maybe not.
 - ✓ Again note the angle of the skew to the work



Fabricating Masts, Bow Sprits, Booms and Yards

Used Cheerful experience to build this methodology

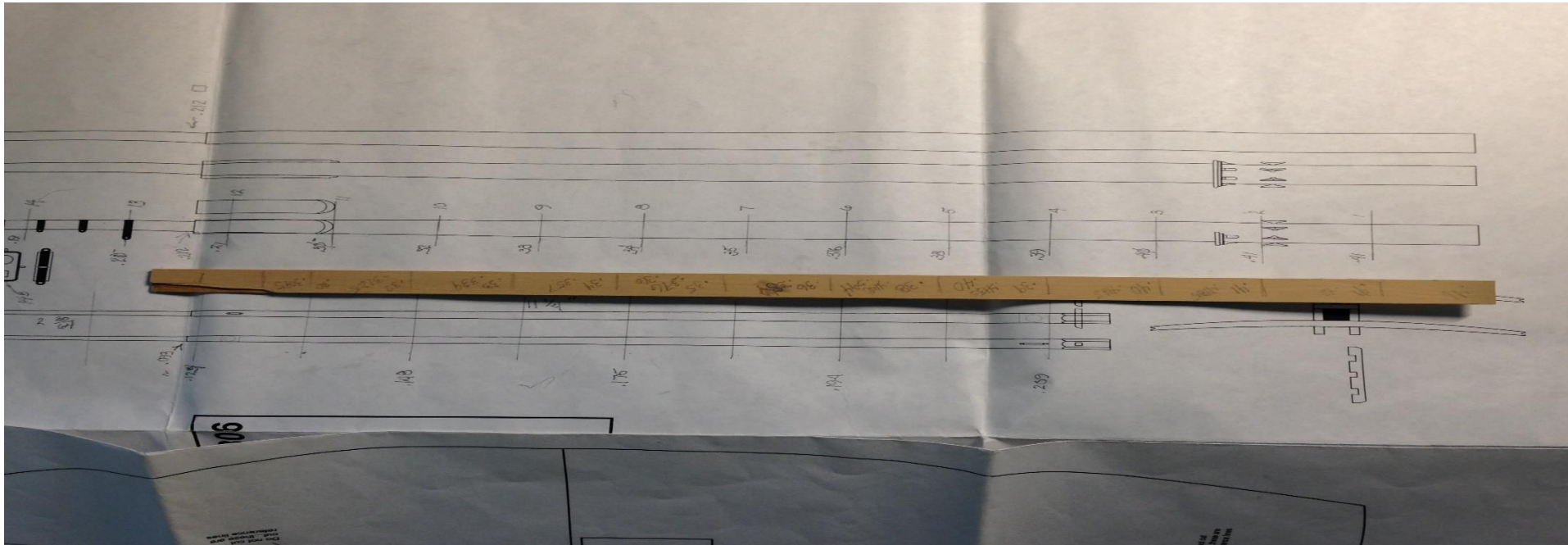
Cheerful		Section	Type	Dia Max	Dia Min	Length	Note	Method
1	Mast							
		Lower	Rnd Taper	0.41	0.27	12.375		Turned
		Above Cheeks	Square	0.21	0.19	3.75	Sim Blk	Machined
		Step	Rnd Taper	0.21	0.12	8.75		M/H Taper
		Top	Rnd Taper	0.093	0.073	2.375		Turned
2	Bowsprit			0.32	0.196	13.5		
		Inboard	Square					Sawn
		Outboard	Rnd Taper				Sim Blk	Turned
3	Boom		Irreg taper	0.3	0.073	13		M/H Taper
4	Top Yard		Tapered	0.162	0.103	11		M/H Taper
5	Lower Yard		Tapered	0.24	0.15	12.375		M/H Taper
6	Gaff		Irreg Taper	0.207	0.078	9.56		M/H Taper

M/H Taper: Segmented turning stopped when measurable deflection observed. Hand tapering with a tool then used. Element finished with hand sanding.

The stock was machined somewhat too thin. Length and an offset error on the end centering made turning full length impossible. Had to turn only ½ of element by reducing the turn area length in the drive end.

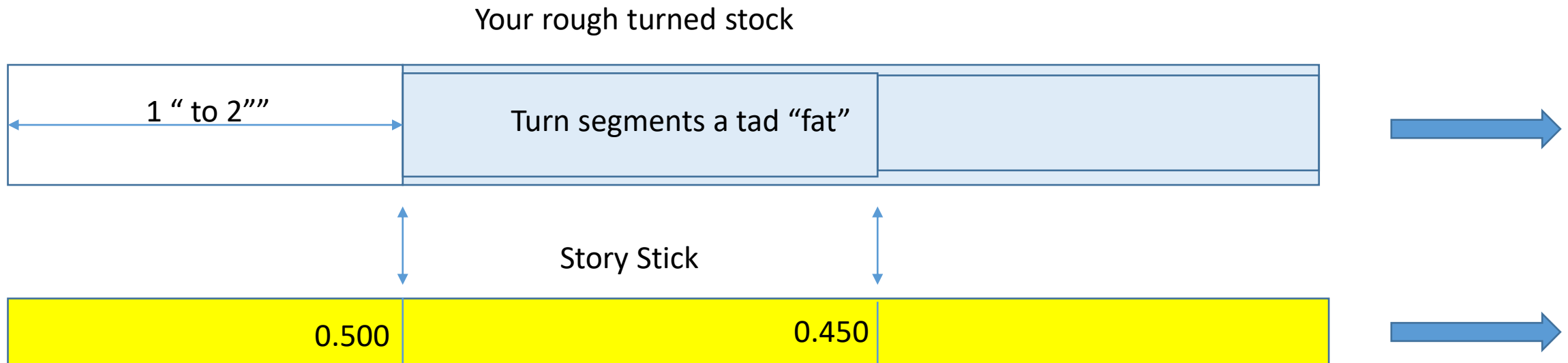
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- A *general procedure* for relatively long stock and accurate results
- On the drawing mark off 1" to 2" segments
- Measure and record the diameter at each marked station on the drawing.
- Transfer those dimensions to a 'story stick' for continued reference as you turn.



Fabricating Masts, Bow Sprits, Booms and Yards

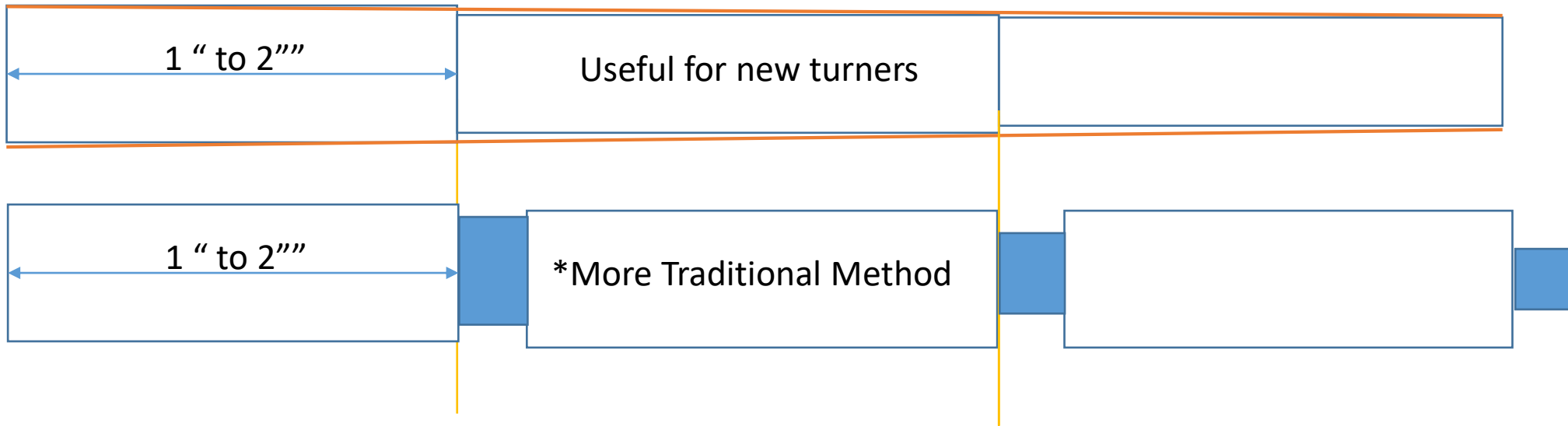
- Using the story stick mark the segments on your work piece. While stock is turning fully mark the sections on the circumference. **Careful with the incising method!**



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- Turn the stock in segments as shown below.
- Turn to a somewhat proud diameter at each location
- Continue the segment approach the entire length
- Return to the start point and carefully turn a taper (Note: it is an *elongated* taper not a taper over the one segment)
- Some form of a steady rest may be needed for long, thin stock
- Sanding to final diameter smooths any irregularities

Two Methods



These are exaggerated openings. Need only to be wide enough for calipers

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- Some hints/tips
 - Use a dial calipers for accurate measurement even in the sanding phase
 - Side force on long, thin elements is tricky as the stock will easily deflect
 - ✓ Deflection will show up in the rough turning looking almost like a spiral along the axis
 - ✓ Use the steady rest or **shorten up the length in the drive end**
 - About turning the narrowest end of stock first. Some suggest may not always be the best choice
 - ✓ Turn it last
 - ✓ Flip the stock end for end and turn closest to the drive end
 - **Once you become proficient and confident, with care, you can dispense with the segmented approach but maintain use of the story stick**



Refine the elongated taper with tools and sanding

- Use of a skew chisel turning tool; <https://www.youtube.com/watch?v=eBa2eYa5vVc>
- Turning long spindles with unique tools; <https://www.youtube.com/watch?v=qDZuZLcGdPM>
- Use of various tools to turn very thin stock; https://www.youtube.com/watch?v=ceGFI_Ic4EU

Fabricating Masts, Bow Sprits, Booms and Yards

Long yards and booms especially for smaller scale models can be problematical as the beam strength diminishes over its length from the thickest end to the thinnest end. Trying to use any turning tool that presents measurable perpendicular force to the axis just deflects the piece creating rough spiral cuts to the element. Even sanding the element too tightly may break it!!!!

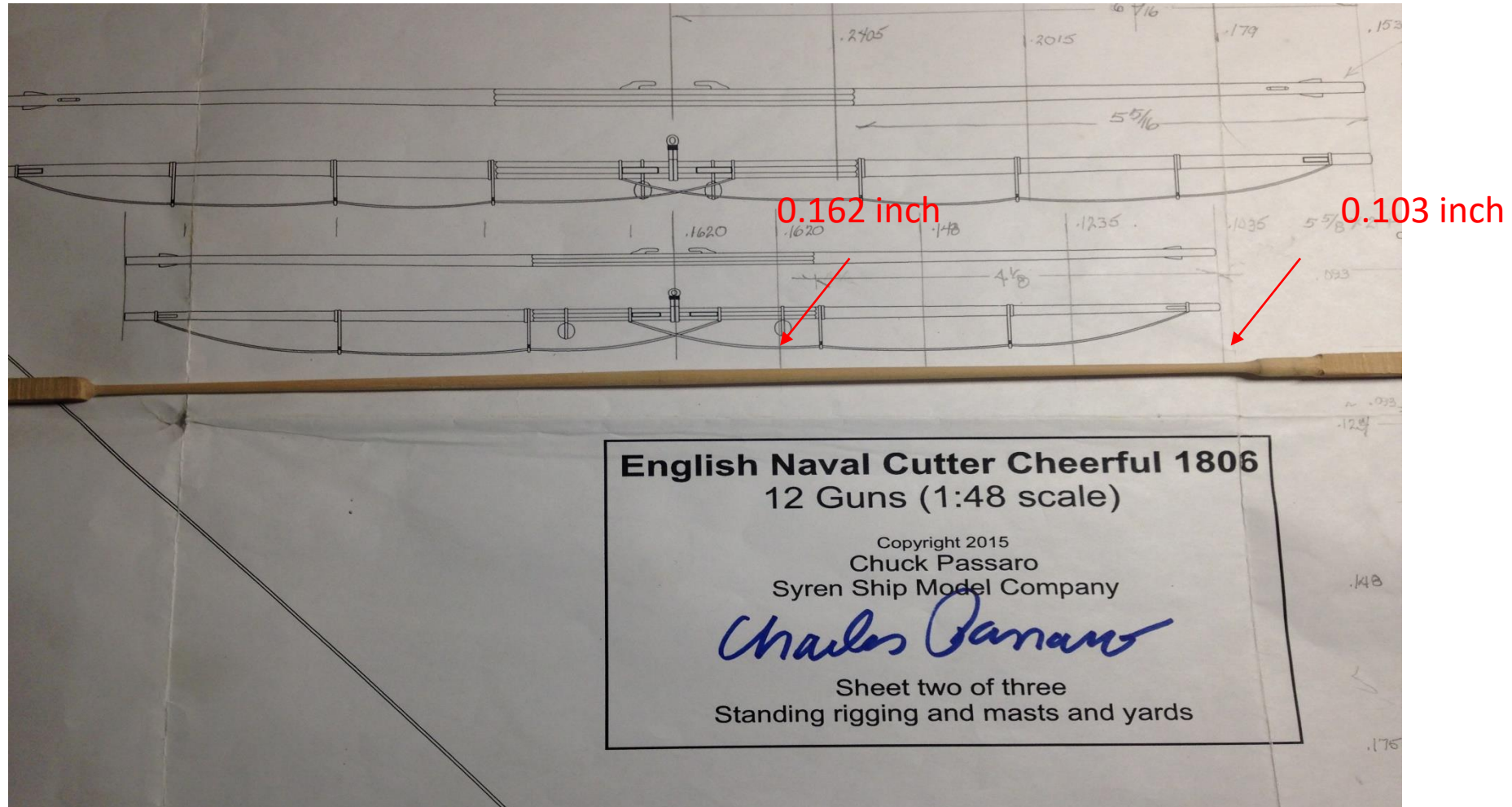
Fabricating Masts, Bow Sprits, Booms and Yards

- General rules apply for *initial* turning of **long, very thin stock**
 - ✓ Lathe turning tools will only take you so far
 - ✓ Stop using tooling when measurable deflection begins.
 - ✓ An intermediate measure; mark the mid point, ***chuck it up*** to shorten the length. Turn this portion first. Reverse the piece in the chuck and repeat. ***A word of caution; take care to turn the 2nd segment such that the turning axis is held.***
 - ✓ Again use the story stick. Tracking the differential is found to be most useful.
 - ✓ A miniature spoke shave can be useful to advance the taper.
 - ✓ Revert to sanding to refine the taper. Usually 180 then 220 grit works.
 - ✓ Don't wrap the sand paper around the stock! It will snap!



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Top yard done!!!! ETA? Don't Ask!



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That's the long and short of it!
Questions/Comments?

Need Someone To Volunteer

Group Project Candidate List

Skills Building

Rope making using a rope walk

- May have to be a demonstration

- Club could purchase a rope walk

Designing and fabricating model parts with modern technology

Planking tutorial revisited

- Can be supplemented with our Shop Notes planking tutorial

Making your own castings with resin

- Would involve turning or carving a part out of wood

- Making a mold form

- Learning more about casting materials

Creating a part using styrene sheet

- Making a form

- Vacuum forming a part

Making realistic flags

Making sails with silk span

Making a ship case

Silver Soldering

Tapering masts, bow sprits and yards

Advanced Rigging

Research techniques to upgrade kits for accuracy (aka Bashing)

Photo etching