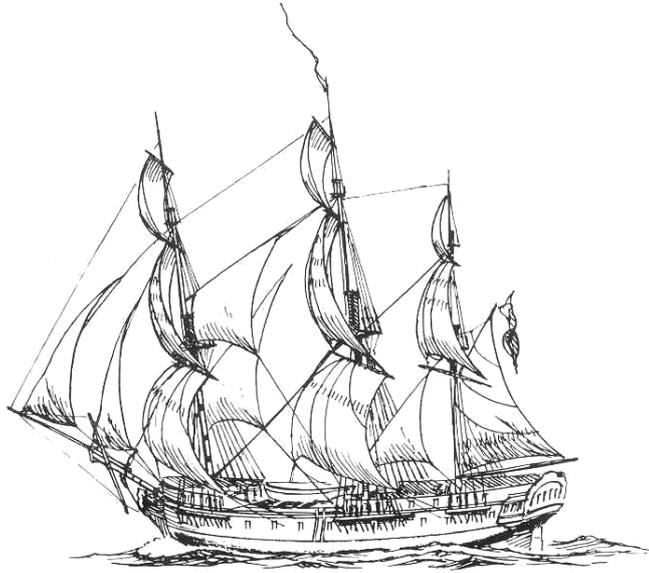


# MAKING AND FORMING SAILS FOR YOUR MODEL



This article is presented in a format that points the reader to previously tried and tested methods and techniques rather than repeating the information ad-nauseam as this subject has sufficient material to write a small book. Where appropriate, we have tried to précis or summarise the intent of the relevant authors.

Colin Riches, in his book *Ship Models from Kits*, provides an excellent introduction into model ship sails. “The decision whether to fit sails to a model is yours. Some models look very attractive with a full ‘suit’, others not so! Some may look far better with the sails ‘furled’ ...; others are better with no sails at all. One view is “if it’s in a sea, put sails on it, if not, - don’t!”

## SAILS

Before undertaking any of the various sail making techniques it may be advisable to review the types, construction and elements of the various types of sails. This information is of some benefit to the modeller in understanding the types of sails fitted, and how they may have been employed in the ship being modelled.

Some kits and better sets of ship’s plans include a “sail plan”. According to Wikipedia, <http://en.wikipedia.org/wiki/Sail-plan>, a sail plan can be described as a formal set of drawings, usually prepared by a naval architect. It normally shows the various combinations of sail proposed for a particular sailing ship. The combinations shown in a sail-plan may include:

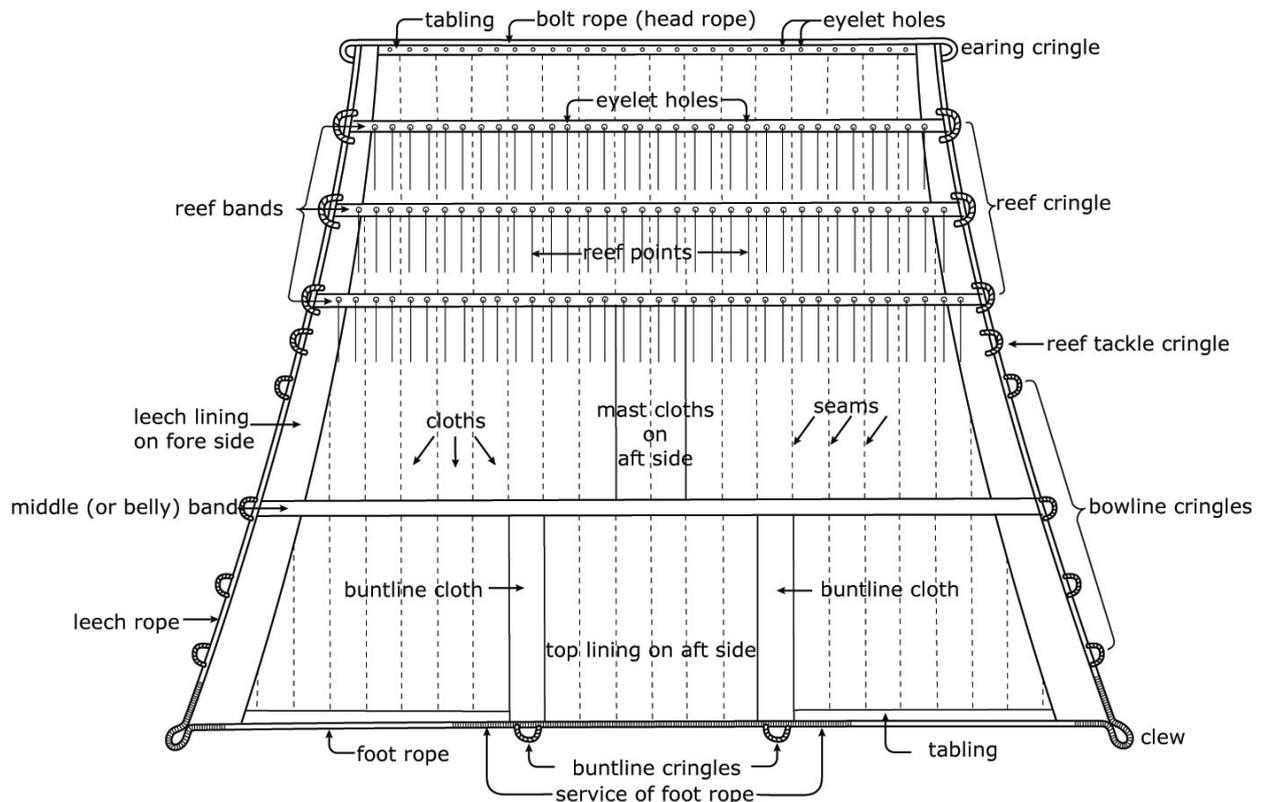
- A *light air* sail plan. Over most of the Earth, most of the time, the wind force is Force 1 or less. Thus an effective sail plan should include a set of huge, lightweight sails that will keep the ship underway in light breezes.
- A *working* sail plan. This is the set of sails that are changed rapidly in variable conditions. They are much stronger than the light air sails, but still lightweight. This sail set will include several sets of reefing ties, so the area of the sail can be reduced in a stronger wind.
- A *storm* sail plan.

One of the original and more comprehensive discussions on sail making can be found in David Steel's *"The Elements and Practice of Rigging And Seamanship, 1794"*; an on-line version is available from HNSA at: <http://www.hnsa.org/doc/steel/part4.htm>.

Another useful site for rig descriptions can be found at: <http://sailtraining.org/sailrigs.htm>

Wolfram zu Mondfeld, in his book *Historic Ship Models*, provides a useful summary of these subjects; this is also available on-line at: <http://www.all-model.com/wolfram/PAGE33.html>

The following diagram shows the various elements / construction of a sail which may assist the reader in the following discussions.



Sail diagram redrawn from *"Modelling the Brig-of-War Irene"*, E W Petrujus

## SAIL MAKING MATERIALS

Sails were originally constructed from hides and heavy cloth, then canvas; later cotton became more common, and today boaters use dacron, cotton, or polytarp.

In his book *Ship Modeling from Stem to Stern*, Milton Roth recommends the use of silk handkerchiefs or even rice paper as materials to consider for sails. The following sites offer some useful insights into the types of materials that may be used.

<http://www.kiyoinc.com/sail3.html>

<http://www.kiyoinc.com/sail2.html>

For a completely different approach, you could try the following technique? With a view to creating lighter, more true to scale sails, Langton Miniature ship models make sails made from photo etched brass. "Using this medium, sails are a mere 8 thou thick and the detail on both sides of the sail is maintained." More detail can be found at:

<http://www.rodlangton.com/>

## MAKING SAILS

One technique for modelling sails can be found in an article available on the 'Ship Modelers Association' forum at <http://www.ship-modelers-assn.org/tps0103.htm>.

Another method can be found in the following link; in particular, note the method of drawing stained threads through the material to simulate the stitching. Try: <http://www.arsenal-modelist.com/index.php?page=accessories&part=37> ; just click on the left hand side thumbnails to sequence through the instructions.

There is also a good French language site at: <http://www.chez.com/rimbr/voile01.htm>. You may need to use a web-page translator such as babelfish (<http://babelfish.altavista.com/>) to understand the text; however, the pictures alone are quite informative.

Please note; when sewing sails, even the smallest stiches will probably be out of scale with the stitch size used by the sail makers. If working sails are to be displayed, think on the age and condition of the ship being modelled. Many working sails would be dirty and possibly patched after several uses.

## SAIL SHAPE AND SET

Everyone who writes about sail rigs seems to have a favoured sail geometry or 'set'. Do a little research yourself to determine how the sails would look in the prevailing wind conditions and ship manoeuvre you have chosen. The lighter the winds the less the degree and number of sails filled; whereas, in a strong breeze all sails would probably be filled.

Remember, the yards and running rigging will need to be adjusted to reflect the set of the sails, and should be consistent with the weather and working condition selected.

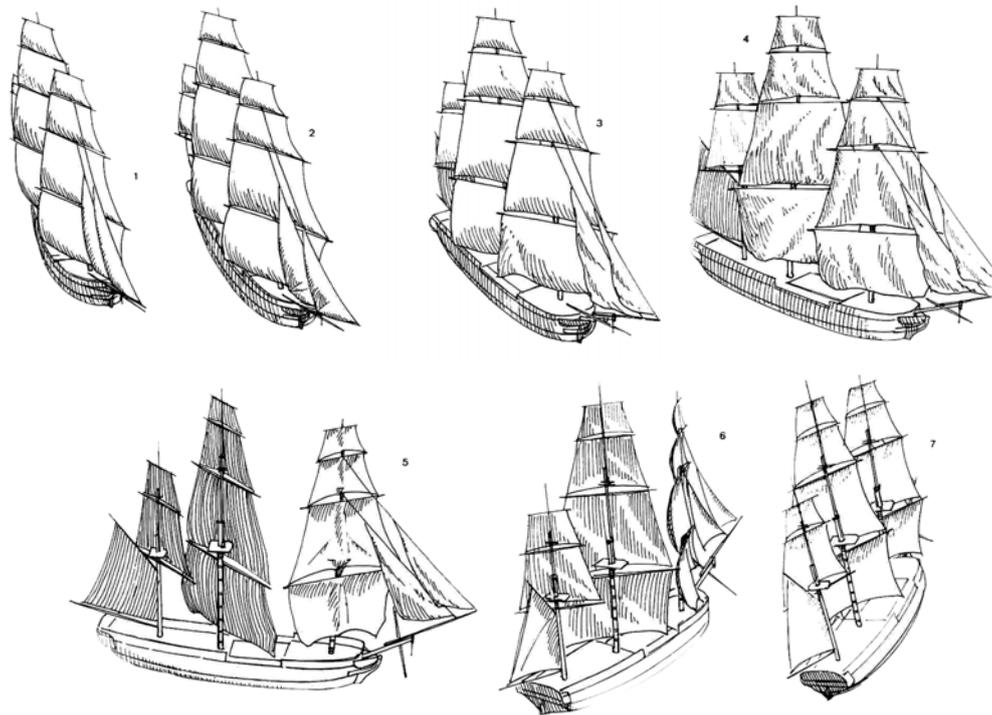
*Opinion:* Full sails are sometimes a little too perfect as real sails aren't nearly as perfect and uniform. However, full sails are what a skipper would have been trying to achieve! Maybe not every sail would be at full billow in slight/shifting winds, but in steady stronger winds, they will all have been full.

The following pictures of an actual vessel (the Batavia replica) under sail give some indication of the actual set of square sails in light wind conditions. The photos are used with the permission of Bataviawerf, Lelystad NL (<http://www.bataviawerf.nl>).



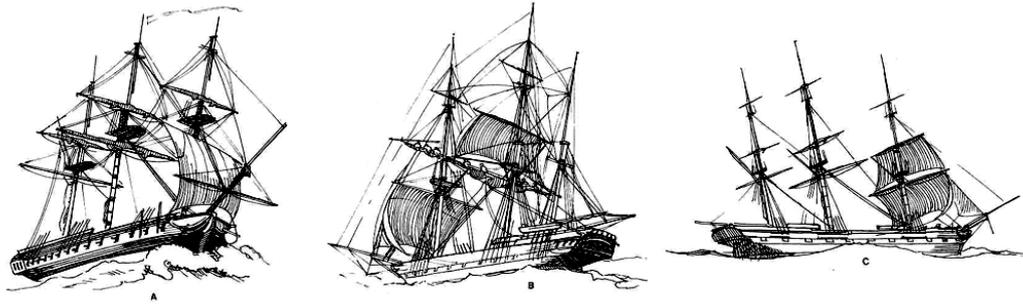
The most important consideration when using scale sails on a model is to determine the set of the sails and their associated yards and rigging, in relation to the presentation of the model. If the ship is underway, running with the wind, then the ship would carry as much sail as she could carry; however, if the ship had her gun ports open with her guns run out, she should be shown with only her fighting sail set. Alternately, if the ship is in port, her sails may be furled or even struck and stowed. The point being that the selected presentation of the model will govern the set of the sails.

The following series of illustrations, taken from *Seamanship in the Age of Sail* by John Harland, show some sail geometry (set) in various conditions of wind, sea and manoeuvre. This book is highly recommended for any enthusiast's library.



### ***Ship Tacking***

- 1 - Ship kept full for stays on port tack; "Ready about!"
- 2 - "Ease down the helm!"; jib sheets eased, spanker boom hauled amidships
- 3 - "Helm's a-lee!"; jib sheets flown
- 4 - Sails lifting; "Raise tack and sheets!"
- 5 - Ship nearly head to wind, "Mainsail haul!"
- 6 - Ship paying off to port
- 7 - "Let go and haul!"; head yards braced round, sails trimmed and ship gathers way on starboard tack.

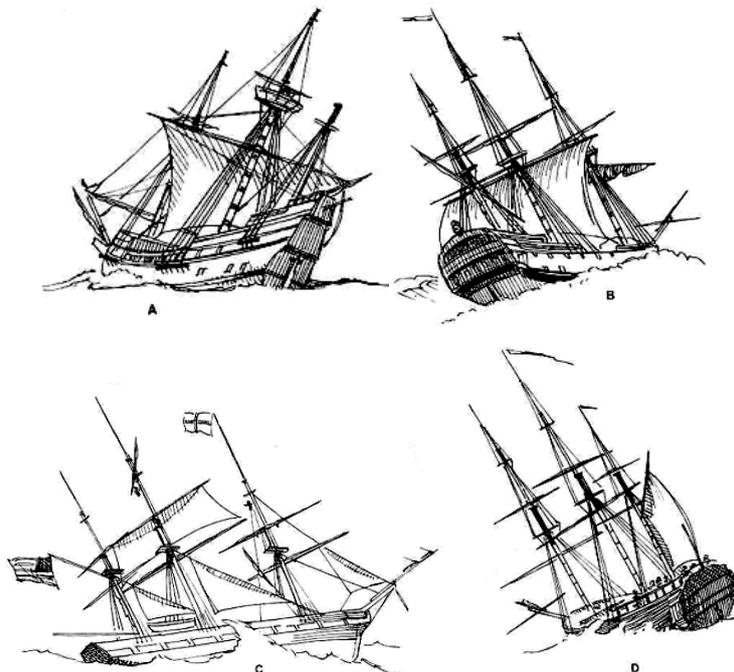


***Ship Scudding:***

A - Under foresail alone (after T J Serres, 1805)

B - Under foresail, main topsail and fore topmast staysail (barque *Contstance*, after T J Dutton, 1850)

C - Under foresail and fore topsail



***Ship Lying-to:***

A - Under mainsail

B - Under mainsail with foresail hauled up and backed (after Hutchinson, 1777)

C - Under main topsail and staysails (*Ship Seamew*, after R Salmon, 1835)

D - Under mizzen alone (after F Holman)

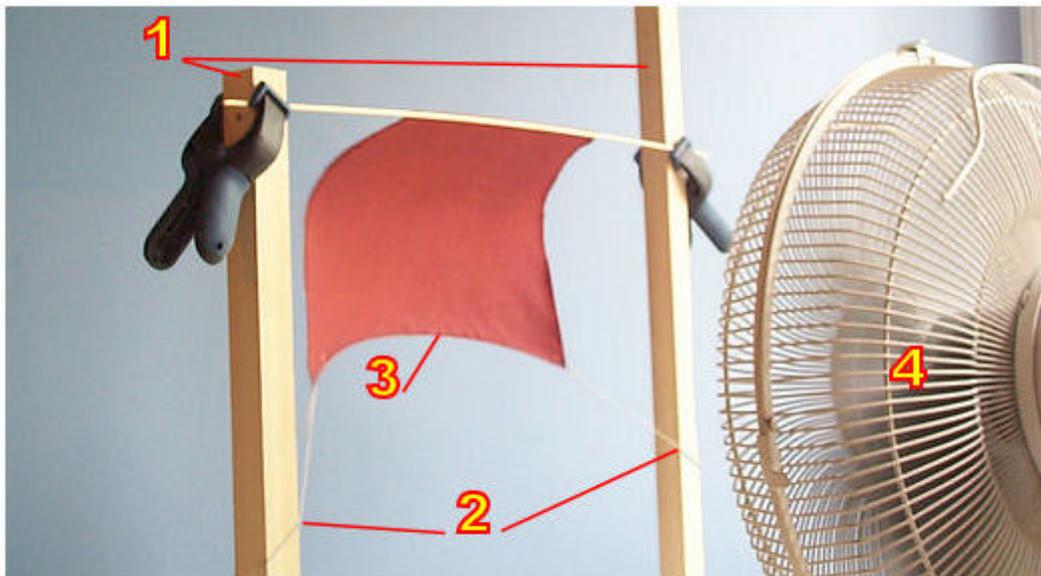
Wolfram zu Mondfeld in "*Historic Ship Models*" also provides some great advice on sails, their colouring, and set.

## SAIL FORMING TECHNIQUES

Should you choose to display scale sails on your model, the following techniques may provide you with some ideas; it will be necessary to experiment with these techniques until you find one you are comfortable working with. The subject has been discussed under *Filled Sails* and *Furled Sails*.

### *Forming Filled Sails*

Hubert Sicard provides a very good overview of a sail forming technique on his Internet site *Wooden Ship Modelling for Dummies, Chapter 43* (available to non-subscribers): <http://www.shipmodeling.ca/aa172v.html>



Hubert *shows* various adaptations of the same technique for the various sail types (square, gaff, lateen etc). His technique will require a few simple jigs and tools to use as spreaders and anchors; and a fan to form the sail shape (as shown above).

Another site to research is: <http://www.boatmodelling.com/content/view/34/31/lang,en/> - then select the 'creating sails' button. This technique is similar to Hubert's but does not use fans to billow the sails, rather these Polish builders use a sandbag to shape the sail.

Other modellers have reported that the use of stainless steel or other types of wire allow the form of a sail to be preset and held using the wire to create the 'set' and a stiffening product to hold the shape of the sail. However, other modellers do not recommend the use of wire at all as it may rust or mark the fabric in time.

Some experimentation may be needed to find a method that works best for you and the selected sail materials.

### *Furling Scale Sails*

The first thing to do is get a clear understanding of what happens to the spars and rigging when the sails are furled. There's more to it than simply replacing the "set" sails with furled ones.

In the typical eighteenth-century square-rigged ship the only yards that are fixed in position vertically are the lower yards (i.e., the fore, main, and crossjack yards). All

the others slide up and down the masts - up when the sails are set, down when the sails are furled. The quickest way for a ship modeller to demonstrate a failure to understand rigging is to put bare yards, or yards with furled sails on them, in the raised positions. If the sails are furled or left off the model, the topsail yard should be resting on the lower cap (or nearly so). The topgallant yard should be resting on the topmast cap, and the royal yard on the collar of the topgallant stay. Lowering the yards in itself changes the appearance of the model significantly - and, to the eye of an experienced ship enthusiast, improves it.

The Cutty Sark has double topsails. In that rig the lower topsail yard is fixed to the front of the lower cap. When the upper topsail is furled, the upper topsail yard is lowered to a few feet above the lower topsail yard. The yards above it are lowered as they were in previous periods.

All this may be a little confusing in print, but if you look at a good diagram it's actually quite simple. An excellent source is *Seamanship in the Age of Sail* from which some illustrations have been included in this article. In addition to good verbal explanations of the various evolutions, it contains hundreds of excellent illustrations; some of which have been included in this article..

Another error lots of modellers commit is to make the "bundles" of the furled sails too big. A real furled sail is remarkably compact - usually a bit SMALLER in diameter than the yard to which it's attached. If you stand on a pier behind a ship with furled sails, you probably won't be able to tell whether the sails are there or not.

Almost any material used for scale model sail making is, by definition, too thick. With furled sails, though, it's possible to compensate for that problem by reducing the sail's depth - and thus the size of the bundle.

A favourite material for furled sails is "silksan" tissue, subjected to a special (but quite simple) treatment. Silksan can be found in the flying model airplane department of any good hobby shop - for very reasonable prices. The thinnest grade of silksan works well for larger sails. For the smaller ones, pay a visit to the local camera store and buy a package of lens-cleaning tissue. This stuff seems to be about the same material, but finer. The drawback to it is that it only comes in small sheets.

Start by taping a piece of tissue over some sort of frame (a small cardboard box works fine) and painting it with a mixture of water-soluble hobby paint, Elmer's white glue, and water. The colour should be a pale greyish beige (PolyScale makes a railroad colour called 'weathered concrete' that looks about right). The proportions of paint to glue to water aren't critical. Apply the mixture with a cheap foam brush from the hardware store. The tissue will sag a bit as it gets painted, but the cardboard box will stop it from drooping back on itself and creating a useless mess.

When the painted tissue is dry it's stiff and smooth; the fuzzy original texture of the silksan is gone. Then use a fine pencil to lay out the shape of the sail by making trapezoid shape, with the long axis identical to the scale width of the sail but the depth considerably less. Again, that ratio isn't critical, but half the scale depth would be about right. The reason for the trapezoidal shape is that (assuming you are working on an eighteenth- or early-nineteenth-century square sail) the finished bundle should be fatter in the middle than at the ends. While laying out the shape of the sail in pencil, also lay out a narrow hem on each side. Then cut the sail out and, using white glue again, glue a piece of fine rigging thread (the boltrope) around the edge, and fold and glue the hem over it. The hem isn't authentic, but it strengthens the sail and will

be barely detectable on the finished product. Then, using a small needle and thread, fasten the sail to the yard - or, if the ship dates from after about 1820, the jackstay on top of the yard. Then rig the various lines that are attached to the sail - clewlines, buntlines, leechlines, sheets, tacks, etc.

At this point the yard/sail/rigging assembly looks pretty stupid; but, now comes the trick. Touch the sail with a brush that's been dampened in water. For some reason the water softens up the white glue but doesn't affect the paint. The sail takes on the consistency of a thin sheet of rubber, which can be bundled up by hauling on the appropriate rigging lines and teased into authentic-looking wrinkles and creases. It takes a while to rig the gaskets that hold it in that condition; if the sail starts drying out before you're finished, dab on a little more water. When the water evaporates, the sail is remarkably stiff and durable.

It is much easier to do all this off the model. One method is to clamp a piece of wood dowel in a vice on your bench and secure the yard temporarily to that. When the furled sail has dried out, transfer the yard to the model and secure the ends of all the rigging lines appropriately.

Professor John Tilley has a few examples of his work displayed in various internet forums, the links for which are provided below.

<http://www.hmsvictoryscalemodels.be/JohnTilleyHancock/index.html>

<http://www.hmsvictoryscalemodels.be/JohnTilleyPhantom/index.html>

<http://www.hmsvictoryscalemodels.be/JohnTilleyBounty/photos/photo5.html>



A few models with sails rigged using this technique more than twenty years ago, still look good as new today. The following examples of John Tilley's work are kindly reproduced from the above sites, with the "Hancock" (above) and the "Phantom" shown below:



### **SAIL STIFFENING PRODUCTS**

*Before attempting any of the following techniques, please test it on a sample piece of sail material first so that you don't ruin your model's sails with unwanted discolorations, shrinkage or other general damage.*

Apart from the solution suggested by John Tilley earlier, the following solutions have also been used successfully by various model shipwrights.

#### ***Starch and Varnish/Lacquer:***

Hubert Sicard's technique (introduced earlier) uses a combination of starch and varnish to hold the sail shape. The sail is starched on its outside and given 2 or 3 applications of a flat (matte) clear coat varnish on the inside of the sail. Hubert also recommends that spraying the varnish is a great improvement over varnish applied with a brush as brushing on a water based varnish deforms the fabric between the seams and marks/stains the sail cloth.

### ***Hair Spray:***

Try unscented hair spray, one modeller has reported using it on two or three ships and the sails are still holding their shape. However, there is also some discussion in the forums suggesting that this technique may not provide a viable “long term” solution.

### ***Sugar Solution:***

Another modeller has recommended using sugar dissolved in boiling water, until no more sugar would dissolve and starts to build up at the bottom of the pot. The consistency of the solution should be somewhat like concentrated lemonade. Dipping the sail in the solution (finger warm) and then drying the sails made it possible to form them. This method is reported to create an ‘aged-look’ in time but that remains to be verified.

This technique has also attracted some discussion in internet forums; in particular, it was suggested that the sugar may attract ants and other unwanted houseguests. This may not be a problem in cooler countries but could be in warmer climates.

### ***Stop-Fray / Fabric Stiffener:***

An alternative method worth exploring is the use of a diluted ‘arts and crafts’ fray-stop or fabric stiffening solution to try and produce the same effect as starch and varnish, the longevity of this method may be difficult to assess in the shorter term.. These products have worked well with rigging and may have some possibilities with cloth.

## **CONCLUSION**

As this article opened with a quote from Colin Riches book, so will it close.

“Remember that the sails have to be fitted to the yards **before** fitting the yards to the masts. It is virtually impossible to rig the sails neatly, and correctly, with the yards in position. An added disadvantage to fitting sails, and one that should certainly be considered, is the amount of dust that will adhere to them! Models with sails **must** be enclosed in a completely dust-free case. Another point worth remembering is, if sails are fitted, they will hide all the rigging ropes, shrouds, ratlines and delicate work, of which you will feel justifiable pride. The choice is yours!”

Sincere thanks to Mark Myers, the illustrator of “*Seamanship in the Age of Sail*” written by John Harland, for his kind permission to reproduce the line drawings used to illustrate this article, and to Rich (Cut-throat Jake of MSW) for preparing them.

As you can see from John Tilley’s work on the linked sites, when done properly, sails can provide that “wow” factor for a model.

**\*\*Written and prepared by: Pat Majewski (Banyan) & Prof. John Tilley for the exclusive use of the “Model Ship World” website.**