S10

With plank S9 recently finished, I'll stay on the same side of the boat and work on S10. The following summarizes what was done for S10 and its corresponding inner plank.

Day 1:

- Started to remove the old S11 to make room for S10 and its inner plank. I did some experimenting with removing a section of S10 w/o damaging the inner plank. My conclusion is that it can be done although tedious.

Day 2:

- Because of my experimentation mentioned above, I was not able to remove all of S11 in one day. So today I finished the job. Note that the middle section of S11 was previously replaced. A red rubbery sealant was used, but the bonding was hit or miss.
- With S11 out of the way, I cleaned up the frames.
    - Pulled the ring nails that held the inner plank to the frame. I also removed a few broken screws (7/16 Unscrew-um; high RPM to generate some heat, a few taps with a drift, and it eventually backs right out).
    - Wiped down the frame faces with alcohol. Ones aft were pretty dirty.
    - Drilled out the old fastener holes to .24", made mahogany plugs (6mm) for the holes (about 160).
    - I coated the inside of the holes with 106/205 West epoxy using a pipe cleaner, coated the plugs with G/flex, and taped the plugs into place.

Day 3:

- Trimmed all the plugs flush with the frame. This can normally be done with a chisel, but in some cases I had to saw them with a flush cut saw. The plugs are cylindrical about 1" long with a small square cap. If the hole is deeper than 1" the cap gets glued to the frame, making it much harder to remove. I either have to do away with the cap (makes gluing messier), or make sure the cylinder is longer than the hole is deep.
- Sanded the face of the frames by hand. Power sanded the bronze straps.
- Vacuumed and tacked.
- Painted with Primocon (2 coats)

Day 4:

- Using dividers (and a decimal scale), I marked the faces of the frames where the top edge of the inner plank will lie (approximately). I used the previously calculated D=width of S10 + ½ width of S11. Actually the width of S10 was inflated some to account for the problems with the top edge of S9.
- Disassembled the previous spiling batten.
- Made templates for the two hood ends. I didn't fuss with these to get a close fit. I'll just spile to get the correct dimensions.
- Clamped the templates and batten sections to the boat and trimmed the ends to get all the butts to lie between frames.
- Made on new section to fill the gap.
- Sanded the ends of the batten sections and painted the faces (white latex).
- I also checked the curvature of the frames where the inner plank will lie.

    - Frames 18-24: some curvature but not enough to warrant scrubbing (about 1/16”). One template (old) fit all these frames.
    - Frames 4-17: some curvature as well but not enough for scrubbing. One template fit these frames.
    - Frames 25-39: flat
- I used the templates to estimate the bevel angles. Frames 18-24 (91 deg. Bevel); Frames 4-17 (92 deg); Frames 25-39 (90 deg)
- Trimmed the bungs in P9.

Day 5:

- Clamped the spiling batten on the boat and glued on the butt blocks.

Day 6:

- Spiled for both the top and bottom edges of S10. Missed one measurement at the aft hood end, but I think I can work around it. I’d hate to have to maneuver that batten back on the boat.
- Removed batten and tried to layout the plank using my available (resawn and off cuts) stock. This plank is very long with a lot of curvature and my stock is only 8” wide, so I’m having to scarf several pieces together to make things work. In particular ...
    - Cut a 17’ piece of 8” stock at about the 4’ mark. Then scarfed the two pieces together at an angle to compensate for the curvature near the center of the plank.
    - Plank from forward hood end to frame 14 can be cut from an off cut (about 5” wide).
    - Cut out about 2’ in the center of a 17’ board to remove a defect and scarfed it back together (straight). This will cover to the hood end aft (with several feet to spare). I plan to scarf the last piece to the center section to make one long piece of stock. I’ll fit this long section and the shorter forward section independently and then glue them together after they fit. This way I can fit both hood ends independently. I’ve had second thoughts ... The advantage to lengthening the stock by scarfing is that
        - You save on planing stock (reduces number of 3-frame overlaps)
        - Reduces the number of tedious alignments

      The disadvantages are
        - Difficult to handle long sections (planing bench not long enough)
        - Springback of spiling batten more likely?

      So in this case, I’m leaning towards having 3 sections, that I will fit independently and then scarf the sections together (on or off the boat).
    - I reverse spiled the forward section, so it’s ready to be cut and fitted.
    - I have one more scarf to cut and glue before I can reverse spile the long aft section.
- Finished trimming the bungs in S9. One of them came out and another badly chipped. I’ll replace these two when I bung S10.

Day 7:

- Cut bottom edge of forward section and planed to the line (two step cutting deemed unnecessary since stock was so narrow). Top edge left about ½” above spiling marks. When to mark and cut the top edge?

    - Once marked it needs to be cut before thickness planing.
    - Not best to mark before sections are fitted since the process of fitting can alter the fairness of the mark at the section transitions. Fairness a frame or two from the ends should be ok before fitting because of the overlap.
    - Marking a fair curve after fitting is possible but probably not by spiling. Probably need to take marks from frames.
    - Steps:
        - Reverse spile top edge at the same time as you reverse spile for bottom edge.
        - Cut top edge to within ½" of marks (run ½" batten through points) when you cut bottom edge to line.
        - Fit plank sections
        - Check spiling points against marks on frames (use dividers to capture distance from top of IS2 to mark on frame); make any adjustments.
        - Draw cut line for top edge; cut
        - Plane to line except for last 3 frames
        - After sections have been scarfed, layout curve at overlap and plane to line.
- Fit plank section to boat. Bottom seam to less than .022" in two iterations.
- Cut top edge and planed to line (forgot to leave last three frames full).
- So this section is done except for planing to finished thickness.

Day 8:

- Reverse spiled for middle section (every other frame since first cut is just a rough cut).
- Generated fair curve ½" outside data points both top and bottom edges – to stress relieve stock. I don't think this is necessary for the AYC (I don't see any tendency for the saw to bind), but it can't hurt.
- Cut to the line, then reverse spiled again (every frame), and generated fair curve (bottom edge only).
- Cut close to the line (bottom edge) and then planed to the line.
- After 3 fitting iterations, bottom seam less than .022". Note that on the first trial fit, the seam at frame 29 was over .1", but after one iteration, this end was flush and the largest gap (at about mid-plank) was about .048". The plane was taking a healthy .005" shaving, so I was more conservative in the number of passes that I made on each iteration.

Day 9:

- Checked top edge data points against frame marks. Very little difference. This is probably only necessary if a lot of wood was removed from the bottom edge during fitting.
- Planed the top edge to the line expect at frames 11-13.
- Matched up forward section with middle section at the overlap. The bottom edge of the two sections are basically identical between frames 12 and 13. They diverge slightly further away. So I will probably make the scarf between frames 12 and 13.

- The top edge of the forward section was planed to the line but the top edge of the middle section was just the result of the saw cut. The line for the middle section is almost exactly congruent with the forward section between frames 12 and 13. After scarfing, I'll just plane the top edge to the line. No additional fairing should be necessary. I'll wait until I make the aft section to cut the scarf.
- I reverse spiled the aft section and cut ½" outside the marks.
- Recall that I neglected to spile for the apex at the hood end, so I decided to spile it now. I cut the batten at a convenient butt block (to make the batten more manageable; I don't need the rest of the batten since I've made the other sections). I mounted the batten using the reference marks that I'd made and spiled at the apex. I should have also marked where the template meets the rabbet at the feather end, but I didn't. I will just estimate it.
- Then I returned the spiling batten to the rough plank using reference marks that I made to accurately reposition the batten. Reverse spiling should very little difference after rough cutting the plank (very little stress relief).
- Using a fairing batten, I constructed a line through the data points and cut the bottom edge. The top edge will be cut after fitting.

Day 10:

- Planed bottom edge to line.
- Fit plank to boat. Initial fit had maximum gap of 1/16" new the mid point. After 2 iterations max. gap <.022"
- Check top edge data points against frame marks. Very little difference.
- Generated fair curve thorough data points and cut top edge. Planed to line except for the last 3 frames.
- Matched aft section to middle section. Very good fit. I seems that the top edge lines for the two sections line up well. Final fairing will be done after glue up.
- Transferred reference marks to edges in anticipation of planing to thickness.

Day 11:

- Planed all three sections to uniform thickness (about .365" – just shy of the 3/8" target)
- Laid out the forward and middle sections on the bench lining up the reference marks. With an overlap of 3+ frames, accurate alignment is fairly easy. I then laid out the location of the scarf joint. Once the scarfs are cut, alignment becomes much less accurate, so I made marks on the distance ends to insure proper alignment during scarfing. I then cut the sections to length, planed the scarfs, clamped the middle section to the bench, applied resorcinol, and clamped the forward section to the bench, and clamped the scarf.

Day 12:

- After the resorcinol cured, I trimmed away the excess glue and prepared to layout and trim the top bevel in the vicinity of the scarf joint. As a guide for producing a fair curve, I wanted to layout the plank width at each frame using the scribe marks on the frames. Unfortunately, I neglected to transfer the frame locations to the edge of the plank before planing. So I had to clamp the plank in position on the boat and mark the location of the frames on the plank (just 3 frames on either side of the scarf). I then returned the plank to the bench, marked the plank widths at frames near the scarf, and drew a fair curve through the points and tangent to the

top edge away from the scarf. I then planed to the line. Recall that I already planed the top edge of the forward section to the line, so the trimming was only required for the middle section. The plank was just too long to clamp to the bench, so I planed the edge with the plank face down on the bench. This turned out to be very convenient. I just shimmed the plank off the surface of the bench and planed the edge with the plank riding along the top of the bench. This easily maintained a 90 degree angle while allowing be to easily see the line. This works only for the top edge, which is convex (you can't angle the plane to accommodate a concave edge).

- Added the aft section to the partial plank.

Day 13:

- Cleaned up the scarf joint.
- Update data points for top edge in the vicinity of the scarf. Drew a fair curve and planed to the line.
- Painted the inside face of the plank with 2 coats of Primcon.

Day 14:

- Sanded hood ends of plank since I forgot not to paint them!
- Clamped the plank in place for a final fit.
- Had to trim a little off of both hood ends.
- A little wedging down here and there and I got the seams to <.022".
- Primed the hood ends with 215.
- Applied 291 LOT and reclamped.
- Started nailing. Finish both hood ends and frames 3 through 14. At that point my arm started to ache so I knock off for the day.

Day 15:

- Finished nailing
- Planed and sanded the seam between the new inner plank and the one below it, thus eliminating any small step differences thickness at the seam.
- Started working on the outer plank
    - At each frame location, marked the inner plank with the location of the top edge of the outer plank. There are two ways to do this: (1) measure upward from S9 the width of the old S10; or (2) measure downward from S12 the width of the old S11. I did both giving me two slightly different marks. Some of the difference was probably due to measurement error, but some was due to the fitting problems with S9; i.e., the wood removed in fitting S9 resulted in a slightly narrow plank. Extrapolated the data points to the hood ends. Keep in mind that the data points for the top edge are just rough estimates at this point. Once the plank sections have been fitted, we will check that these data points produce a fair curve.
    - Disassembled the spiling batten and clamped the sections to the boat. Modified the forward hood end template slightly. Trimmed a few sections to have the butts fall between frames. Sanded and painted the sections.

Day 16:

- Prepared the scrubbing templates. Four templates were needed overall. Only one had to be made from scratch. The others were used previously. In general the

frames greater than 23 were flat, with some have some minor concavity that the sealant will fill.

- Measured and recorded the bevel angles on a bevel board. For those frames that were not flat, the bevels were measured from the scrubbing templates. For the others the bevel was measured directly using a small bevel gage. A scale on top of the plank edge provided more bearing surface for the gage.
- Clamped the spiling batten sections to the boat and glued the butt blocks.
- Spiled for both the top and bottom edges. At each frame there were two data points for the top edge. I spiled for midway between them.

Day 17:

- Selected stock and reverse spiled; rough cut the stock to size and planed it to final thickness (5/8 + 1/16). I spent a long time on stock selection, trying to get the most out of the available stock. Ultimately, I realized that I could not get the full plank from the one board (part of S9 already cut from it) no matter how I sectioned the plank. I could get the most out of it if I cut one section from the hood end to frame 21, but that would put the spice in the same frame bay as S9. I can't come up with a technical argument why I this is objectionable (if the scarf is stronger than the wood itself, why should it matter). I know that you stagger butt blocks (surrounding planking supports the weaker joint), so this is my (weak) justification.

  So I decided to make the plank in three sections – one covering the middle and the other two at either end. Even with careful stock selection, I wasn't happy with the planks. One plank has a knot hole through the middle of the plank about 3/8" in diameter. This I can plug with bungs set in epoxy. The middle plank has significant twist at one end. I don't see anything wild in the grain but it worries me. I'd like to cut off the end to eliminate the twist but then the plank will be short – I wouldn't be able to get a 3-frame overlap. I could just scarf the middle plank to the end plank before cutting to size, but alignment could be a problem.

  This raises a familiar question ... is it better to work with long or shorter sections? Here is my most recent opinion on the matter. Even if I had stock long and wide enough for full-length planks, I would still prefer working with at least two sections. Why?

  1. I would not like to have to fit both hood ends simultaneously.
  2. The longer the plank the more likely that significant edge set will occur. This could lead to large gaps to be removed during fitting, which would be time consuming and reduce the plank width.
  3. The longer plank is also more difficult to handle, too long for the planing bench.

  Since my planking stock is at most 17' long and the current planks are over 30' long, I need at least two sections, but then that puts the splice in the middle. So if you want staggered splices, you need at least 3 sections. With sections ranging from 6 to 16 feet, we can achieve staggered joints without have planks that are too long for accurate and convenient fitting or too short resulting in more than 3 sections.

The down side is that you need about a 3-frame overlap to assure proper alignment, which is a waste of stock. For sections starting at a hood end, at least one additional foot of stock is needed. For middle sections, 2-3 feet are needed.

Day 18:

- I decided to remove about 2' from the middle plank to eliminate a section having significant twist. If nothing else, having twist at the end would make cutting a scarf very difficult. When cutting a scarf, you can't clamp too close to the joint or you can't work the plane, so you count on the planks being fairly flat so that they lie flush one on top of the other.

  Removing the two feet of twist means that I can only get a 2-frame overlap between the middle and aft sections. This should be ok. In any case, I won't remove the twisted section until I have to. Maybe I can use the full length to help with alignment and then remove it prior to cutting the scarf?

  So the plan is to have a 3-frame overlap between the forward and middle section a 2-frame overlap between middle and aft. I may glue these two sections on the boat to help with alignment.

- I reverse spiled the forward section (hood end to frame 16). I spiled both top and bottom edges. The bottom edge has significant obtuse bevel angles, so I adjusted my spiling points accordingly. I then cut out the plank with a circular saw, and planed the lower edge to the line. The top edge was left rough cut.

  I then laid out and cut the bevels on the lower edge using a bevel limit line developed from the bevels on the bevel board.

  I cut the hood end to size with a Japanese saw. The bevel angles at the hood end were slightly acute, so no adjustment was needed. I'll cut a caulking bevel (1/16") at the hood end after fitting the plank to the boat.

  I then scrubbed the inside face concave to match the templates. I found that only one template really required scrubbing. The others were so close to flat (1/32" or less cord depth) that I didn't bother. I now think that scrubbing for a 5/8" plank is only necessary for cord depths of 1/16" or more. Otherwise the plank will just conform to the shape when fastened.

  After 2 fitting iterations the maximum seam gap was less than .022" for the length of the plank.

  I marked the location of the frames onto the plank and made three reference marks in the vicinity of frames 16, 15, and 14. A reference mark at frame 9 helps to align the plank when lifting the plank into place.

So the forward section is done except for plugging the knot hole, cutting the caulking bevel at the hood end, and finishing the top edge (defer until all the plank sections have been fitted).

Day 19:

- I cut the caulking bevel in the forward plank.
- I plugged the knot hole in the forward section. I drilled the hole out to 3/8" and plug the hole with three 3/8" diameter bungs set in epoxy with wood powder filler. After the epoxy set, I chiseled and planed the repair flush with the faces of the plank.
- I spiled the aft section (frames 27 to hood end) top and bottom edges, and cut out the plank with a circular saw. I then planed the bottom edge to the line.
- The bottom-edge bevel angles in this area of the boat are basically square (90 degrees); however, there was a problem at frame 38. Evidently the frame is not fair to the hull. I realized this while fitting the inner plank – it wouldn't lie nicely against the frame. The result is that the bevel angle at frame 38 is significantly obtuse whereas the bevel angle at frames 37 and 39 are close to 90 degrees. To produce a tight seam, I had to make the bottom edge of the plank a bit unfair at frame 38.
- The bevel angles at the hood end are significantly obtuse, so I made the necessary adjustment to the cut line and cut the hood end to size with a Japanese saw. I then planed the bevel.
- No scrubbing was required for this section.
- After two fitting cycles and maximum seam gap was < .022".
- I cut the caulking bevel at the hood end.
- I made two reference marks at frames 27 & 28 to provide registration with the middle plank.
- I also made a mark near frame 33 to help with alignment when lifting the plank to the boat.
- The aft plank is done except for planing the top edge.

Day 20:

- Reverse spiled the middle plank top and bottom edges.
- Planed bottom edge to the line.
- Trial fit – Oh, I forgot to scrub the plank. I also forgot to allow for obtuse bevel angles on the bottom edge. Fortunately, the bevels are not severe and the significant ones are limited to frames 6, 7, 8.
- I measured the gaps anyway since the plank was already on the boat. It was clear from my measurements that the seams were open on the outside due to the obtuse bevels.
- I scrubbed the inside face of the plank to fit the templates. This was limited to frames 15, 16, 17 and frame 23.
- It took we awhile to plane the edge since I had to cut the bevels as well as plane the high spots. In any case, after two fitting cycles and some minor wedging down, I reduced the maximum gap at the seam to < .022".

- I made reference marks on the plank corresponding to the marks on the inner plank.
- Note that the twist at the aft end of the plank became a non issue once the plank was clamp to the boat. I'll still need to remove it since scarfing would be difficult otherwise.
- The middle section is done except for planing the top edge.
- Ok, all three sections are done, so it's time to check the alignment, plane the top edge to the line (except at the overlap), and cut and glue the scarfs. I'll do one at a time.

Day 21:

- Checked alignment of all three sections. Everything seems ok.
- Planed the top edge of all three sections to the line, except in the vicinity of the scarfs.
- I was able to use three overlapping frames for alignment for both scarfs. I located the one scarf to avoid the plank end with the severe twist.
- Cut and glued the scarf between the middle and aft sections. I cut a 7" scarf, which for a 5/8" + 1/16" thickness, produces about a 10:1 scarf joint.
- In working on the trimming the top edge, I realized how it should be done.
    - To locate the top edge of S10, you can either measure down from S12 by the width of S11 or up from S9 by the width of S10. If you measure down, you need to mark the inner plank with the location of the top edge at each frame. If you measure up, you can omit this step. (Not really. You still need to locate the top edge, at least roughly, to establish the limits for the scrubbing templates.) We'll assume that you measure the width of S10.
    - Spiling is done only for the bottom edge. (No, you're going to need to top edge too so that you can select appropriate planking stock.)
    - After reverse spiling the bottom edge, you measure up at every third data point the width of S10 at that frame. (Just reverse spile top edge too.) Draw a fair curve ½" outside the marks.
    - Make the rough cut as usual (top and bottom edges).
    - Respile the bottom edge and cut to the line
    - Plane the bottom edge to the marks and fit the plank.
    - After fitting, layout the top edge by measuring up from the bottom edge by the width of S10. This corrects any errors resulting from trimming the bottom edge.
    - Draw a fair curve through the top edge data points. The curve will be fair except at the overlap. Cut and trim to the line except at the overlap.
    - After glue up, layout the top edge data points in the vicinity of the overlap and refair the curve and trim to the line.

Day 22:

- Cleaned up the scarf joint.
- Drew a fair curve for the top edge in the vicinity of the scarf joint.
- Planed to the line.

- Laid out the position of the middle and forward sections so that the bottom edges at the 3-frame overlap were congruent. Made marks close to and far from the location of the scarf. This allows the two sections to be accurately positioned after the sections are cut to length.
- Cut and glued the scarf joint between the middle and forward sections. On glue up, the forward section missed one of the distant marks by about 1/16". Don't know what happen, but the finished plank fit just fine.

Day 23:

- Cleaned up the scarf joint.
- Drew fair curve for the top edge at the overlap and planed to the line. Working the top edge of the full-length plank would be very difficult if I had to clamp the plank to the side of the bench (like I do for the individual sections). Fortuntely, the bevel angle for the top edge is square so I can plane the edge with the plank laying flat on the bench. I just shim the plank up a bit and run a smooth plane along the edge.
- Checked the fit of the plank – very good. Recorded the location of clamps and wedges.
- Traced the location of the top edge onto the inner plank (for primer reference).
- Sanded the faying surfaces of the inner and outer planks.
- There wasn't enough time left in the day to hang the plank, so I'll wait until tomorrow morning.

Day 24:

- Applied primer and hung the plank, using just enough fasteners to hold the plank tight against the frames. I'll finish the fastening tomorrow.
- I tried to keep the counter bore at about 3/16" and used restraint in tightening the fasteners. We'll see how the bungs do with only 3/16" depth.

Day 25:

- Finished fastening, made and installed (over 100) bungs.

All that remain now is to trim the bungs, which I will do after the paint dries. I should also back fasten the inner plank to the outer from inside the boat. Also the bronze hull straps should be fastened to the planking from the inside.