

# **A Report on *The Rifle*: Documenting an Iron-Hull Steamship**

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## Abstract

This report describes the process employed to document an iron-hulled screw steamer known as *The Rifle*. The vessel is in storage at the Scottish Maritime Museum (SMM) in Irvine, Scotland. Field measurements and notes were recorded 25-28 June, 2001.

The project was undertaken as part of a project to determine the approximate lines of the SS *Xantho*, a paddle steamer built in Dumbarton in 1848 and converted to screw in Glasgow in 1870-71, and wrecked off the coast of Western Australia in 1872. No photographs or drawings of the *Xantho* hull are known to exist, *The Rifle* was selected as a starting point on the theory that, both vessels being early steamships and having been built in the same region within two decades of each other, the lines and proportions of *The Rifle* might provide a good starting point.

## Introduction

The Rifle was a small, steam-powered vessel, the remains of which are in the Scottish Maritime Museum. The history of *The Rifle* is sketchy. The place and date of construction are unknown to the museum, as well as the builder and original owner.

According to SMM<sup>1</sup>, the vessel was acquired in the 1860's by the Lochiel estate for use on Loch Arkaig, an inland lake. The vessel must have been hauled overland because the nearest saltwater is some 10 miles away at Fort William at the head of Loch Linnhe, an inlet on the west coast of Scotland. While in service at the Lochiel estate it was known as *The Rifle*, but it is not known whether the vessel went by another name before its acquisition by the estate.

*The Rifle* is believed to have been in general service on the loch, ferrying goods, passengers and possibly mail between isolated dwellings around the lake and linking them with the only town of any size, Clunes. The vessel also carried hunting parties as guests of the estate, and is believed to have carried Queen Victoria on an outing. There was some level of logging activity in the vicinity of the lake, so the vessel was also probably engaged to tow log booms.

The vessel continued in this mixed service until 1938 or 1939. At the time, she was to be broken up. The engine was removed, but before breaking could continue the vessel sank, and was not recovered.

In the mid-1980's the surviving portion of the hull was located and in 1989-1990 acquired by the SMM. Two theories obtain as to the loss of the bow. One theory is that the vessel was nearly buried in silt, preserving most of it. The bow section, exposed to water, eventually disintegrated after 50 years' immersion. The other theory holds that a causeway was under construction when the hull was located, and before recovery could commence, the bow was embedded in poured concrete for the causeway foundation.

The stern tube, containing the drive shaft where it exits the hull, does not run through the center of the stern, but instead is offset to the port side of the deadwood. The SMM curator theorizes that the ship was originally built as a sailing vessel, and the engine and stern tube, etc., were added at a later date.

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<sup>1</sup> The entire history discussion was provided by Veronica Hartwich, curator at the Scottish Maritime Museum, in a telephone conversation with the author on 2 October, 2001.

The screw might be the best clue as to the ship's age, or, if in fact the engine was added later, the age of the machinery. The distinctive, two-bladed "bow-tie" design is known as a "Smith's" screw, patented in 1836 by its inventor, Francis P. Smith. As early as 1843, the British Admiralty was experimenting with a number of screw configurations. Smith's screw emerged as the preferred design for the Admiralty's screw-steamers.<sup>2</sup>

Another clue will be found inside the stern tube itself, in the form of the shaft bushing material. Prior to about 1858, a variety of materials, such as brass, were tried and found wanting as bushings for the drive shaft where it emerges from the inside of the hull into the water. In that year, Smith, assisted by John Penn, found that lignum vitae, a hard, oily wood, proved satisfactory as both a bearing surface and as a watertight seal; shipbuilders and owners were quick to convert to this material.<sup>3</sup>

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<sup>2</sup> Edgar C. Smith, 1938, *A Short History of Naval and Marine Engineering*, London: Cambridge University Press, pp. 64-76.

<sup>3</sup> *Ibid.*, pp. 77-81.

## Current Condition

The vessel is shown in Figure 1, a photograph taken on-site 25 June 2001.



Figure 1. Stern-end view of *The Rifle* (Joel Gilman).

The hull sits on blocks in a storage yard. The vessel is missing the forward 20-25'<sup>4</sup> of the hull, all decking, deckhouses, fittings, engines, machinery, etc. All that remains is approximately 36' of the hull from the rudder forward.

The hull fabric along the bulwarks is in poor condition, badly deteriorated, with much of the material gone. The plating below the bulwarks is largely intact, with a number of holes scattered about ranging in size from less than ½ inch to over 8 inches across.

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<sup>4</sup> In this report, all dimensions are given in imperial measurements.



Figure 2. Bow-end view of *The Rifle* (Joel Gilman).

The ribs are deteriorating such that most are missing at least some material. In places the plating has pulled away from the ribs, due to insufficient support of the hull. In particular, the plating on the port side at the half bulkhead, some 20 feet forward of the sternpost, has pulled away from the ribs by as much as 3 inches, as shown in Figure 2.

The exterior surface of the plating itself is covered with one or more coats of a preservative material. The preservative material is coated thickly enough so that rivet heads are not clearly discernable. Lap joints in the plating can be detected, however. The interior surface of the hull does not appear to have any coatings and is badly rusted.

The drive shaft and stern tube are intact, though badly corroded; the shaft does not turn. A two-bladed screw approximately 5 feet in diameter is affixed to the shaft. A tiller is affixed to the top of the rudder stock; the rudder gudgeons permit a small amount of motion.

### **Construction Details**

The keel is of 1" x 3" iron laying on the narrow edge. Floors are triangular gussets of 3/8" iron rising to 4" above the keel. The ship's ribs are composed of 1 3/4" x 1 3/4" angle iron 3/8" thick. Ribs are spaced 17 1/2" between centers.

The hull fabric consists of four rows of iron strakes. The strakes vary in width from 23" to 26". Strakes are composed of individual plates butted together and riveted to reinforcing plates over the butt joint. Rivet heads are 1" in diameter. Rivets at the butt



joints and along the strake overlaps are used at 2" intervals. Where the strake overlays a rib the rivets are spaced 9" or 10" apart.

Two strakes are clinkered from the keel upwards, a third strake forms the shear strake, and the fourth strake overlaps both the shear strake and the 2<sup>nd</sup> strake from the keel, as shown in Figure 3.



Figure 3. Strake overlap detail (Don Alexander).

## Hull Lines

The primary paper documentation for a ship is a “lines drawing” of the hull. This is a set of engineering drawings showing the hull contours as seen from the side of the ship, known as a “shear plan;” a view from the end of the ship, showing the contour of the hull at regular intervals or sections, called a “body plan” or “section plan”; and a view looking straight down on the hull, known as a waterline plan or level-line plan. This view is also known as a half-breadth plan because typically only one half the hull is shown, as with the body or section plan, because both sides of the ship are assumed to be identical.<sup>5</sup>

A typical lines drawing is shown in Figure 4.

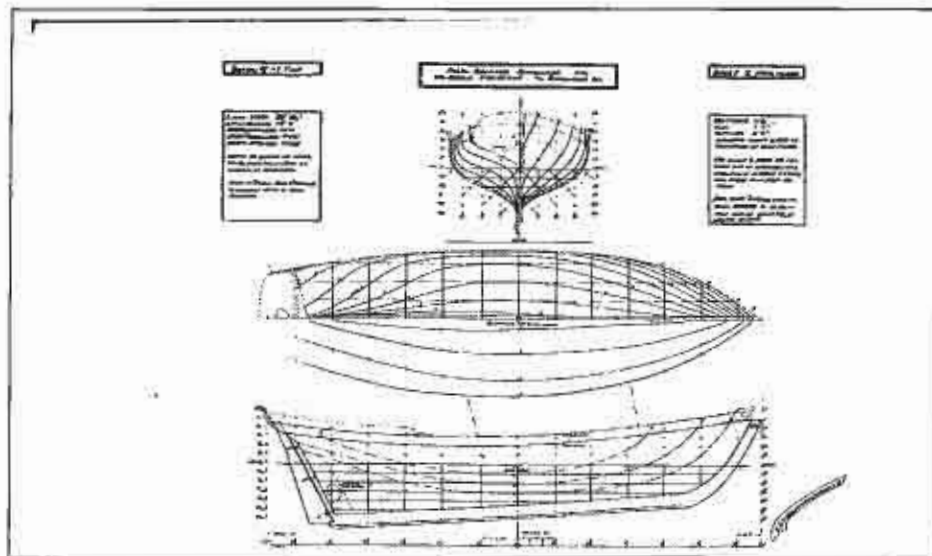


Figure 4. Example of a lines drawing.<sup>6</sup>

Creating the compound curves of a ship's hull from a set of 2-dimensional drawings is called “lofting” and is in many ways simpler than the reverse process of rendering a set of 2-dimensional drawings from an existing hull. There are a number of approaches for this reverse process, known as “taking off lines” or “picking lines.” The process employed for taking lines from *The Rifle* was as generally described by Dillon.<sup>7</sup>

<sup>5</sup> J. Richard Steffy, 1994, *Wooden Ship Building and the Interpretation of Shipwrecks*, College Station, Texas: Texas A&M University Press, and London: Chatham Publishing., p. 15.

<sup>6</sup> R. D. Culler, 1974, *Skiffs and Schooners*, Camden, Maine: International Marine Publishing Co.

<sup>7</sup> D. W. Dillon, 1983, “Taking Off—The Measuring Process,” in Paul Lipke, Peter Spectre, Benjamin A.G. Fuller, eds., 1983, *Boats: A Manual for Their Documentation*, Nashville, Tennessee: American Association for Local History; and Mystic, Connecticut: Museum Small Craft Association.

On first examining *The Rifle* it was found to be in poor condition overall. However, the lines were intact and the hull more or less true to its original lines (subject to the deterioration noted above) to offer an acceptable set of compound curves from which to derive a suitable lines drawing.

The starboard side was chosen for taking measurements because the plating on the port side had more significant distortions and irregularities in its lines than the starboard side. It should also be noted that the cobblestone surface was not completely flat, and appeared to have a very slight rise from the stern forward. This slope was not deemed significant and so has not been compensated for in the lines taking or in the subsequent calculations and drawings.

The centerline below the keel was found using a ruler and plumb line. A reference line was marked out in chalk parallel to this line, six feet to the starboard side. As the hull was too fragile and the inner keel was too covered with debris to permit accurately laying a straightedge down the length of the hull, a reference line parallel to the centerline was marked out 6' to starboard from the centerline. Starting at the stern post, 15 section lines were marked along the keel in chalk at 2 foot intervals using a square and a straightedge. These section marks were then transferred to the reference line.

A measuring scaffold was erected, being a vertical straight-edge, marked off in 1 foot increments from the bottom of the keel (which itself was approx. 10" off the cobblestones, resting on timbers). To provide finer resolution of the curves measured near the keel and bulwarks, additional 6" interval marks were added between the keel mark and the 1' mark, and also between the 5' and 6' marks and between the 6' and 7' marks. The vertical straightedge was affixed with C-clamps to a portable steel welder's bench, which was heavy enough to rigidly support the straightedge but light enough to permit moving from section line to section line.

At each section line, the welder's bench was positioned so that the straightedge stood squarely on the section line with its upper end just touching the bulwark, and the face of the straightedge on a line perpendicular to the keel. A second straightedge with a spirit level taped on was then clamped to the vertical straightedge at the keel mark, such that the second straightedge was horizontal as measure by the spirit level and the end was just touching the hull plate. A steel tape was then used to measure the distance from where the horizontal straightedge touched the hull to where it intersected the vertical straightedge. Measurements were made to the nearest 1/8<sup>th</sup> inch. The horizontal straightedge was then moved up to the next mark on the vertical straightedge, leveled and set against the hull, clamped, and the distance measured and recorded. This process was repeated at each mark on the vertical straightedge. The distance, or "offset," from the straightedge back to the reference line was also recorded.

This entire process was repeated at each section mark, from the stern post forward to the 28' section mark. Owing to obstructions presented by timbers and other material supporting the hull, measurements were not taken at the section lines at the 16' and 26' marks.

To record the slope of the shear line, an additional measurement was taken at each station, that being the vertical distance from the shear above or below the 7' mark on the vertical straightedge.

The scaffold was also used to measure the outer counter of the rudder. Additional measurements were made of the stern-frame, rudder profile, rib dimensions, rivet size and rivet-spacing, etc. The scaffold is shown in Figure 5, positioned to measure the profile of the rudder and counter at the centerline.



Figure 5. Scaffolding for taking lines (Joel Gilman).

## Offset Tables

The raw data collected onsite is shown in Table 4-1. 'Datum' is the sum of the distance from the keel to the straightedge and the distance from the straightedge to the reference line. This was included to indicate variation in the straightness of the keel, which as shown in the table varies by as much as  $-1\frac{1}{4}$ " to  $+1\frac{1}{2}$ ". 'WL' is two measurements made of the height of the apparent waterline above the keel, taken at the 10' and 30' sections. The 'apparent' waterline is identified by a distinctly visible line of corrosion along the side of the hull.

The data in Table 1 reflect the hull's  $2\frac{1}{2}$  degree tilt to starboard. The measurements from the keel to the 5' 6" mark at the sternpost decrease by approximately  $\frac{1}{2}$ " per vertical foot. In fact, this part of the hull is the stern frame surrounding the screw, and should remain flat. To correct this tilt across all of the data, a slope was calculated, and the amount of correction needed at each elevation derived from the slope formula. Table 2 reflects the addition of the correction at each level across all sections. Variations in the sternpost measurements reflect deformities in the fabric of the hull.

A similar approach was used to correct kinks in the hull, as reflected in the wide variation of 'Datum' values. These corrections were applied in Table 3.

The final step was to subtract each measurement from the datum value and add 1", which resulted in a figure representing the distance from the centerline of the hull (assuming a 2"- wide keel) to the molded surface of the hull. Offsets at the 16' and 26' sections were not obtainable, due to hull supports in the way of the measurement scaffold; the missing measurements were interpolated from the adjacent values, and the waterline figures also interpolated using a slope formula. The slope of the waterline, incidentally, reflects either the sagging of the hull and ribs, or that the hull as designed had a sloping keel. Finally, all figures were rounded to the nearest  $\frac{1}{4}$ " it being decided that the  $\frac{1}{8}$ " resolution of the field measurements was too fine to be accurate, given the condition of the material, errors in measurement, etc. These adjusted figures are shown in Table 4.

A draft body plan drawn from these figures suggested that the 2' section resolution was much closer than necessary, and that the 6" intervals were not necessary either. The 2', 6', 10', 14', 18', 22', and 26' sections were discarded, as were the 6" vertical intervals in the remaining columns. While drafting the final body and shear plans, minor adjustments were made to the offsets at the 20' and 24' section lines to errors that became obvious in the buttock lines. The results of these final adjustments appear in Table 5.

These figures were then used to produce the complete lines drawing in Figure 6.

## Conclusions

The approach followed for lines-taking proved adequate for the circumstances. In retrospect, however, more detail could have been collected regarding the specific condition and placement of each rib, strake, etc., given that the vessel is small and there aren't that many such details to record.

As this project was undertaken primarily to acquire a set of lines on which to base an impression of an entirely different vessel, compiling the additional detail wasn't deemed necessary at the time. Similarly, the information collected in this report covers only the rear-most 30 feet of the vessel, when in fact the segment at the SMM is over 40 feet long. The forward end was not measured because it is in extremely poor condition and not deemed useful for the *Xantho* project.

However, a complete and proper documentation project would include the entire length of the remaining hull, paying particular attention to it's actual condition, dents, holes, etc. For example, the final drawing contained here was intended as a starting point for further modifications reflecting *Xantho*'s overall dimensions. As such, the drawing reflects adjustments made to the field measurements to correct for a distinct kink in the keel, as well as a significant dent in the starboard side of the hull approximately 14' forward of the stern post. Thus, the final drawing cannot be said to truly 'document' *The Rifle*. However, the raw data in Table 1 does reflect such deformities over the length of the hull actually measured and would serve as a good starting point for completion of a full survey and documentation project.

Further, inversion of data to obtain measurements from the centerline (Table 5) should have been the first data manipulation performed, so as to make the various intervening sets of measurements usable; as it is, the inversions will have to be re-calculated for the data in each of Tables 1 through 4 before those dimensions are useable.

## Bibliography

- R. D. Culler, 1974, *Skiffs and Schooners*, Camden, Maine: International Marine Publishing Co.
- D. W. Dillon, 1983, "Taking Off – The Measuring Process" in Paul Lipke, Peter Spectre, Benjamin A.G. Fuller, eds., 1983, *Boats: A Manual for Their Documentation*, Nashville, Tennessee: American Association for Local History; and Mystic, Connecticut: Museum Small Craft Association.
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## Tables of Offsets

**Table 1**  
**Raw Measurement Data Collected 25-28 June 2001**

**Table 2**  
**Raw Data Compensated for Starboard Tilt**

**Table 3**  
**Data Adjusted to Straighten Keel**

**Table 4**  
**Offsets from Centerline, Rounded to Nearest  $\frac{1}{4}$ "**

**Table 5**  
**Final Adjusted Offsets for *The Rifle***



Table 1. Raw Measurement Data Collected 25-28 June 2001

	Stern Pftl.	Stern Post	2 ft.	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Shear V	10 3/4"	5 7/8"	4 3/8"	3 1/2"	2"	1 1/2"	0"	(-3/4")	(1 3/8")	-	(2 1/2")	(3")
7 ft.	11 7/8"	1"	1 1/2"	1 5/8"	1 1/2"	1 1/2"	1 3/8"	-	-	-	-	-
6 ft. 6 in.	28 1/8"	10 7/8"	4"	3"	2 3/4"	2 3/8"	1 7/8"	1 7/8"	1 7/8"	-	1 7/8"	2 1/8"
6 ft.	39"	42 3/8"	20 1/4"	7 3/8"	5 1/2"	4 3/8"	3 3/8"	3"	3"	-	2 7/8"	2 3/4"
5 ft. 6 in.		47"	38 1/4"	21 5/8"	10 1/4"	7 1/2"	5 1/4"	4 1/4"	4 1/8"	-	3 1/2"	3 3/8"
5 ft.		47 1/8"	48 7/8"	35 1/2"	19 7/8"	11 3/4"	8 3/8"	6 1/8"	5 3/8"	-	4 1/2"	4 1/4"
4 ft.		47 1/2"	open	48 3/4"	41 1/4"	28 3/4"	20 1/4"	14"	10 1/2"	-	7 1/2"	6 7/8"
3 ft.		48"	open	52"	50 1/8"	44 3/4"	38 1/8"	30"	22 1/2"	-	15 1/8"	13"
2 ft.		48 3/8"	open	52 3/4"	53 1/2"	51 7/8"	49 1/4"	45 1/2"	38 1/2"	-	32"	29 1/8"
1 ft.	44 1/2"	48 7/8"	open	53"	55"	55 3/8"	55 1/8"	54 1/4"	52 3/8"	-	51"	50 7/8"
6"	45"	49 1/8"	open	53 1/8"	55 3/8"	56 1/8"	56 1/4"	56"	56"	-	57 3/8"	59 1/8"
Keel	45 1/4"	49 1/2"	52 3/8"	53 1/4"	55 1/2"	56 1/4"	56 3/4"	57"	57 3/8"	-	60"	61 1/2"
Offset		23"	18 1/2"	17 1/2"	15 1/2"	14 3/4"	14 1/4"	14"	14"	-	12"	10 1/2"
Datum		72 1/2"	70 7/8"	70 3/4"	71"	71"	71"	71"	71 3/8"		72"	72"
WL							59"					

(blkhnd)

Table 1. Continued				
22 ft.	24 ft.	26 ft.	28 ft.	30 ft.
(3 5/8")	(4")	-	(4 1/2")	-
-	-	-	-	-
2 1/4"	1 1/2"	-	4"	-
2 7/8"	2 7/8"	-	4"	-
3 1/2"	3 3/4"	-	5 1/8"	-
4 3/8"	4 5/8"	-	6 1/4"	-
6 5/8"	6 5/8"	-	8 1/8"	-
11 5/8"	11 1/4"	-	12 7/8"	-
27"	25 1/4"	-	28 7/8"	-
51"	50 3/4"	-	53 3/8"	-
60"	60 3/4"	-	63 1/4"	-
62 3/4"	63 3/4"	-	65 5/8"	-
9 3/8"	8 1/8"	-	6 3/4"	-
72 1/8"	71 7/8"	-	72 1/4"	-
				48 1/2"

Table 2. Raw Data Compensated for Starboard Tilt

	Stern Pftl.	Stern Post	2 ft.	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Shear V	10 3/4"	5 7/8"	4 3/8"	3 1/2"	2"	1"	0"	(-3/4")	(1 3/8")	-	(2 1/2")	(3")
7 ft.	11 7/8"	4 1/2"	5"	5 1/8"	5"	5"	4 7/8"	-	-	-	-	-
6 ft. 6 in.	26 1/8"	14 1/8"	7 1/4"	6 1/4"	6"	5 5/8"	5 1/8"	5 1/8"	5 1/8"	-	5 1/8"	5 3/8"
6 ft.	39"	45 3/8"	23 1/4"	10 3/8"	8 1/2"	7 3/8"	6 3/8"	6"	6"	-	5 7/8"	5 3/4"
5 ft. 6 in.		49 3/4"	41"	24 3/8"	13"	10 1/4"	8"	7"	6 7/8"	-	6 1/4"	6 1/8"
5 ft.		49 5/8"	51 3/8"	38"	22 3/8"	14 1/4"	10 7/8"	8 5/8"	7 7/8"	-	7"	6 3/4"
4 ft.		49 1/2"	open	50 3/4"	43 1/4"	30 3/4"	22 1/4"	16"	12 1/2"	-	9 1/2"	8 7/8"
3 ft.		49 1/2"	open	53 1/2"	51 5/8"	46 1/4"	39 5/8"	31 1/2"	24"	-	16 5/8"	14 1/2"
2 ft.		49 3/8"	open	53 3/4"	54 1/2"	52 7/8"	50 1/4"	46 1/2"	39 1/2"	-	33"	30 1/8"
1 ft.	44 1/2"	49 3/8"	open	53 1/2"	55 1/2"	55 7/8"	55 5/8"	54 3/4"	52 7/8"	-	51 1/2"	51 3/8"
6"	45"	49 3/8"	open	53 3/8"	55 5/8"	56 3/8"	56 1/2"	56 1/4"	56 1/4"	-	57 5/8"	59 3/8"
Keel	45 1/4"	49 1/2"	52 3/8"	53 1/4"	55 1/2"	56 1/4"	56 3/4"	57"	57 3/8"	-	60"	61 1/2"
Offset		23"	18 1/2"	17 1/2"	15 1/2"	14 3/4"	14 1/4"	14"	14"	-	12"	10 1/2"
Datum		72 1/2"	70 7/8"	70 3/4"	71"	71"	71"	71"	71 3/8"		72"	72"
WL							59"					(blkhd)

Table 2. Continued				
22 ft.	24 ft.	26 ft.	28 ft.	30 ft.
(3 5/8")	(4")	-	(4 1/2")	-
-	-	-	-	-
5 1/2"	4 3/4"	-	7 1/4"	-
5 7/8"	5 7/8"	-	7"	-
6 1/4"	6 1/2"	-	7 7/8"	-
6 7/8"	7 1/8"	-	8 3/4"	-
8 5/8"	8 5/8"	-	10 1/8"	-
13 1/8"	12 3/4"	-	14 3/8"	-
28"	26 1/4"	-	29 7/8"	-
51 3/8"	51 1/4"	-	53 7/8"	-
60 1/4"	61"	-	63 1/2"	-
62 3/4"	63 3/4"	-	65 5/8"	-
9 3/8"	8 1/8"	-	6 3/4"	-
72 1/8"	71 7/8"	-	72 1/4"	-
				48 1/2"





Table 3. Data Adjusted to Straighten Keel

	Stern Pnl.	Stern Post	2 ft.	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Shear V	10 3/4"	5 7/8"	4 3/8"	3 1/2"	2"	1"	0"	(-3/4")	(1 3/8")	-	(2 1/2")	(3")
7 ft.	11 7/8"	4 1/2"	5"	5 1/8"	5"	5"	4 7/8"	-	-	-	-	-
6 ft. 6 in.	28 1/8"	14 1/8"	7 1/4"	6 1/4"	6"	5 5/8"	5 1/8"	5 1/8"	5 1/8"	-	5 1/8"	5 3/8"
6 ft.	39"	45 3/8"	23 1/4"	10 3/8"	8 1/2"	7 3/8"	6 3/8"	6"	6"	-	5 7/8"	5 3/4"
5 ft. 6 in.		49"	41"	24 3/8"	13"	10 1/4"	8"	7"	6 7/8"	-	6 1/4"	6 1/8"
5 ft.		49"	51 3/8"	38"	22 3/8"	14 1/4"	10 7/8"	8 5/8"	7 7/8"	-	7"	6 3/4"
4 ft.		49"	open	50 3/4"	43 1/4"	30 3/4"	22 1/4"	16"	12 1/2"	-	9 1/2"	8 7/8"
3 ft.		49"	open	54 1/2"	51 5/8"	46 1/4"	39 5/8"	31 1/2"	24"	-	16 5/8"	14 1/2"
2 ft.		49"	open	54 1/2"	54 1/2"	52 7/8"	50 1/4"	46 1/2"	39 1/2"	-	33"	30 1/8"
1 ft.	44 1/2"	49"	open	54 1/2"	56 1/2"	55 7/8"	55 5/8"	54 3/4"	52 7/8"	-	51 1/2"	51 3/8"
6"	45"	49"	open	54 1/2"	56 1/2"	57 1/4"	57 3/4"	56 1/4"	56 1/4"	-	57 5/8"	59 3/8"
Keel	45 1/4"	49"	53 1/2"	54 1/2"	56 1/2"	57 1/4"	57 3/4"	58"	58"	-	60"	61 1/2"
Offset		23"	18 1/2"	17 1/2"	15 1/2"	14 3/4"	14 1/4"	14"	14"	-	12"	10 1/2"
Datum		72"	72"	72"	72"	72"	72"	72"	72"		72"	72"
WL							59"					(blkhd)

Table 3. Continued

22 ft.	24 ft.	26 ft.	28 ft.	30 ft.
(3 5/8")	(4")	-	(4 1/2")	-
-	-	-	-	-
5 1/2"	4 3/4"	-	7 1/4"	-
5 7/8"	5 7/8"	-	7"	-
6 1/4"	6 1/2"	-	7 7/8"	-
6 7/8"	7 1/8"	-	8 3/4"	-
8 5/8"	8 5/8"	-	10 1/8"	-
13 1/8"	12 3/4"	-	14 3/8"	-
28"	26 1/4"	-	29 7/8"	-
51 3/8"	51 1/4"	-	53 7/8"	-
60 1/4"	61"	-	63 1/2"	-
62 5/8"	63 7/8"	-	65 1/4"	-
9 3/8"	8 1/8"	-	6 3/4"	-
72"	72"	-	72"	-
				48 1/2"

Table 5. Measurements from Centerline, Rounded to Nearest 1/4"

	Stern Ptrl.	Stem Post	2 ft.	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Shear V	10 3/4"	6"	4 1/2"	3 1/2"	2"	1"	0"	(3/4")	(1 1/2")	(2")	(2 1/2")	(3")
7 ft.	12"	45 1/2"	49 1/2"	50 1/4"	52 1/2"	53 1/4"	53 3/4"	-	-	-	-	-
6 ft. 6 in.	28 1/4"	35 3/4"	47 1/4"	49 1/4"	51 1/2"	52 1/2"	53 1/2"	53 3/4"	53 3/4"	54 3/4"	55 3/4"	57"
6 ft.	39"	4 1/2"	31 1/4"	45"	49"	50 3/4"	52 1/4"	53"	53"	54"	55"	56 3/4"
5 ft. 6 in.	39 1/2"	1"	13 1/2"	31"	44 1/2"	48"	50 3/4"	52"	52"	53 1/4"	54 3/4"	56 1/4"
5 ft.	40"	1"	3"	17 1/2"	35"	44"	47 3/4"	50 1/4"	51"	52 1/2"	54"	55 3/4"
4 ft.	41"	1"	open	4 3/4"	14 1/4"	27 1/2"	36 1/2"	43"	46 1/2"	49"	51 1/2"	53 1/2"
3 ft.	42"	1"	open	1"	5 3/4"	12"	19"	27 1/2"	35"	39 1/2"	44 1/4"	48"
2 ft.	43"	1"	open	1"	3"	5 1/4"	8 1/2"	12 1/2"	19 1/2"	23 3/4"	28"	32 1/4"
1 ft.	44"	1"	open	1"	1"	2 1/4"	3"	4 1/4"	6"	7 3/4"	9 1/2"	11"
6"	44 1/2"	1"	open	1"	1"	1"	1"	2 3/4"	2 3/4"	3"	3 1/4"	3"
Keel	45"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
WL V							59"	58"	57"	56"	55"	54"
										Interpolated		(blkhd)

All dimensions rounded up to nearest 1/4 inch

	Table 5. Continued				
	22 ft.	24 ft.	26 ft.	28 ft.	30 ft.
Shear V	(3 3/4")	(4")	(4 1/4")	(4 1/2")	-
7 ft.	-	-	-	-	-
6 ft. 6 in.	58"	60"	59 1/2"	59"	-
6 ft.	57 1/2"	58 3/4"	59"	58 1/4"	-
5 ft. 6 in.	57 1/4"	58 1/4"	58 1/4"	58 1/4"	-
5 ft.	56 1/2"	57"	57 1/2"	57 1/2"	-
4 ft.	54 3/4"	56"	56"	56"	-
3 ft.	50 1/4"	52"	51 3/4"	51 3/4"	-
2 ft.	35 1/2"	38"	37 1/4"	36 1/4"	-
1 ft.	12"	13 1/2"	12 3/4"	12 1/4"	-
6"	3 1/4"	3 3/4"	3 1/4"	2 3/4"	-
Keel	1"	1"	1"	1"	-
WL	53"	52"	51"	50"	49"
			interpolated		

All dimensions rounded up to nearest 1/4 inch



Table 6. Final Adjusted Offsets for The Rifle

	Stern Profile	Stern Post	4 ft.	8 ft.	12 ft.	16 ft.*	20 ft.	24 ft.
Shear V	10 3/4"	6"	3 1/2"	1"	(3/4")	(2")	(3")	(4")
7 ft.	0"	45 1/2"	50 1/4"	53 1/4"	-	-	-	-
6 ft.	27"	4 1/2"	45"	50 3/4"	53"	55"	56 3/4"	58"
5 ft.	28"	1"	17 1/2"	44"	50 1/4"	53"	55 3/4"	57"
4 ft.	29"	1"	4 3/4"	27 1/2"	43"	49"	53"	56"
3 ft.	30"	1"	1"	12"	27 1/2"	39 1/2"	47 1/2"	52"
2 ft.	31"	1"	1"	5 1/4"	12 1/2"	23 3/4"	32 1/4"	38"
1 ft.	32"	1"	1"	2 1/4"	4 1/4"	7 3/4"	11"	13 1/2"
Keel	33"	1"	1"	1"	1"	1"	1"	1"
WL V		64"	62"	60"	58"	56"	54"	52"
							(blkhd)	

\*These values are interpolated from the values in the adjacent columns.

Table 4. Measurements from Centerline Rounded to Nearest 1/4"

	Stern Prfl.	Stern Post	2 ft.	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Shear V	10 3/4"	6"	4 1/2"	3 1/2"	2"	1"	0"	(3/4")	(1 1/2")	(2")	(2 1/2")	(3")
7 ft.	12"	45 1/2"	49 1/2"	50 1/4"	52 1/2"	53 1/4"	53 3/4"	-	-	-	-	-
6 ft. 6 in.	28 1/4"	35 3/4"	47 1/4"	49 1/4"	51 1/2"	52 1/2"	53 1/2"	53 3/4"	53 3/4"	54 3/4"	55 3/4"	57"
6 ft.	39"	4 1/2"	31 1/4"	45"	49"	50 3/4"	52 1/4"	53"	53"	54"	55"	56 3/4"
5 ft. 6 in.	39 1/2"	1"	13 1/2"	31"	44 1/2"	48"	50 3/4"	52"	52"	53 1/4"	54 3/4"	56 1/4"
5 ft.	40"	1"	3"	17 1/2"	35"	44"	47 3/4"	50 1/4"	51"	52 1/2"	54"	55 3/4"
4 ft.	41"	1"	open	4 3/4"	14 1/4"	27 1/2"	36 1/2"	43"	46 1/2"	49"	51 1/2"	53 1/2"
3 ft.	42"	1"	open	1"	5 3/4"	12"	19"	27 1/2"	35"	39 1/2"	44 1/4"	48"
2 ft.	43"	1"	open	1"	3"	5 1/4"	8 1/2"	12 1/2"	19 1/2"	23 3/4"	28"	32 1/4"
1 ft.	44"	1"	open	1"	1"	2 1/4"	3"	4 1/4"	6"	7 3/4"	9 1/2"	11"
6"	44 1/2"	1"	open	1"	1"	1"	1"	2 3/4"	2 3/4"	3"	3 1/4"	3"
Keel	45"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
WL V							59"	58"	57"	56"	55"	54"
										interpolated		(blkhd)

All dimensions rounded up to nearest 1/4 inch

Table 4. Continued					
	22 ft.	24 ft.	26 ft.	28 ft.	30 ft.
Shear V	(3 3/4")	(4")	(4 1/4")	(4 1/2")	-
7 ft.	-	-	-	-	-
6 ft. 6 in.	58"	60"	59 1/2"	59"	-
6 ft.	57 1/2"	58 3/4"	59"	58 1/4"	-
5 ft. 6 in.	57 1/4"	58 1/4"	58 1/4"	58 1/4"	-
5 ft.	56 1/2"	57"	57 1/2"	57 1/2"	-
4 ft.	54 3/4"	56"	56"	56"	-
3 ft.	50 1/4"	52"	51 3/4"	51 3/4"	-
2 ft.	35 1/2"	38"	37 1/4"	36 1/4"	-
1 ft.	12"	13 1/2"	12 3/4"	12 1/4"	-
6"	3 1/4"	3 3/4"	3 1/4"	2 3/4"	-
Keel	1"	1"	1"	1"	-
WL	53"	52"	51"	50"	49"
			Interpolated		

All dimensions rounded up to nearest 1/4 inch

Table 5. Final Adjusted Offsets for *The Rifle*

	Stern Profile	Stern Post	4 ft.	8 ft.	12 ft.	16 ft.*	20 ft.	24 ft.
Shear V	10 3/4"	6"	3 1/2"	1"	(3/4")	(2")	(3")	(4")
7 ft.	0"	45 1/2"	50 1/4"	53 1/4"	-	-	-	-
6 ft.	27"	4 1/2"	45"	50 3/4"	53"	55"	56 3/4"	58"
5 ft.	28"	1"	17 1/2"	44"	50 1/4"	53"	55 3/4"	57"
4 ft.	29"	1"	4 3/4"	27 1/2"	43"	49"	53"	56"
3 ft.	30"	1"	1"	12"	27 1/2"	39 1/2"	47 1/2"	52"
2 ft.	31"	1"	1"	5 1/4"	12 1/2"	23 3/4"	32 1/4"	38"
1 ft.	32"	1"	1"	2 1/4"	4 1/4"	7 3/4"	11"	13 1/2"
Keel	33"	1"	1"	1"	1"	1"	1"	1"
WL V		64"	62"	60"	58"	56"	54" (blkhd)	52"

\*These values are interpolated from the values in the adjacent columns.

## Project Journal

### 12 April 2001

The first task was drafting a page for the *Xantho* website. I wanted to give readers some idea of what to expect, without committing the project to specific details at this point, since I don't know what those details are yet. The salient points here are that we're building a model onsite as part of the exhibit. I felt the need to explain why models are important for research, so I borrowed some ideas from Steffy's book. I also wanted to offer a concrete example of the sort of thing we use models to research, and added a few paragraphs about the conversion from side-paddle to screw propulsion.

An issue that that comes up immediately is the historical significance of the *Xantho*'s hull conversion. Was this a common practice or was it unusual, in 1871? Another question to look into.

### 16 April 2001

I've been poring over a 1970 reprint of a 1940 facsimile reproduction of Laughlan McKay's 1839 treatise *The Practical Ship-BUILDER*. McKay [07 Sep. 01. Brother of Donald McKay, the famous American clipper builder] was a ship's carpenter to the U.S. Navy at the time.

The book includes a discussion of a design for a side-paddle steamer. Although McKay was no doubt thinking of a timber hull when he drew it, I doubt there was much difference, in those days, between a design for a timber hull and one for an iron hull. This bears looking into further.

I've had the book for several days; its significance for my project just dawned on me. *Xantho*'s builders, Denny's of Dumbarton, must have been aware of the book by 1848; whether they read it or not, or, if they did, whether they relied on it, is not so important. What's interesting is the probability that their knowledge of shipbuilding reflected the state-of-the-art, which could not have advanced so far in the decade following the publication of McKay's treatise. This also bears looking into.

### 26 April 2001

I'm still grappling with the choice of materials. The considerations I'm focusing on are, in no particular order:

- Cost
- Appearance
- Ease of working
- Visual Interest
- Time to complete

The materials under consideration are:

**Paper mache'** – The advantages of this are that it's very cheap, and very easy to work with, though creating a mold would be something of a project in itself – cutting a block, then using a spoke shave and a rasp to the shaping, and finally lots of sanding (I don't think we want sanding in the gallery). It wouldn't take that long to complete. The appearance is a matter of how carefully it's finished. The disadvantages are that it's messy to work with, so we might not want to do the actual papering in the gallery. I don't think it would have much visual interest, either, because the process would involve making a mold, laying up the shell, and doing the finishing. Mold making would take a couple of weeks, and wouldn't offer much of a show, other than a guy shaving a block of wood. The laying up would take at most a day. The finishing would take as much or little time as I want to spend on it, but wouldn't be that interesting to watch.

**Fiberglass** – Has all the disadvantages and advantages of paper mache, though it costs a little more and is very messy. Laying up would have to be done outside the gallery due to mess of epoxy, fumes, etc.

**Wood** – This is tempting. I rejected this at first because I didn't realize the hull was clinker built, and I felt a smooth surface in wood might be difficult to achieve. But with a clinker built hull, a plank-on-wood model would accurately reflect the original. It would cost more than the previous materials, but would be much more visually interesting. It would be more time-consuming, but virtually all of the time could be spent in the gallery providing an excellent "show."

**Metal** – I lean toward metal but there are some issues I haven't worked out yet. It would be the most expensive, but I don't know yet how expensive. I'm thinking of copper or aluminium strakes pop-riveted to angled brass ribs. This would be extremely interesting visually, and though time consuming, again most of the work could be done in the gallery. And it would look like a metal-hulled ship under construction the entire time. I'm a little concerned about how noisy it would be to drill rivet holes and do the pop-rivets. Periodically, I'd need to take the hull out of the gallery to a workshop so I could hammer the back of the pop rivets into an appropriate shape – this hammering would be much to annoying inside the gallery. (Or would it?)

#### 26 June 2001

At the Scottish Maritime Museum, Irvine, Scotland, UK

Arrived late yesterday. Jim Tiledsley, the museum director, was still here and waiting for me. I also met Bridget, Jim's administrative assistant; Veronica, the collection manager; and Emily, the curator. They set me up in a nice B&B run by a fellow named Nick, whom I keep thinking of as Gordon from "Local Hero."

Today I met Michael, who gave me the full museum tour and helped me get started on *Rifle*. So far I've laid out a datum line parallel to the keel and 6 ft. away from it; marked off 2 ft. intervals for sections and found the point perpendicular to the stempost; rigged

up a vertical straightedge from a steel sawhorse; and started setting up a horizontal rule. This may need some tinkering tomorrow.

I'll be taking offsets at 1 ft. vertical intervals, starting from the keel, though I might add a couple of 6" intervals, one above the keel and one below the shear, to get the turn of the bilge and the line of the counter as it nears the stern.

The keel itself is not raked, but there is a distortion just ahead of the screw frame that will need an allowance. The ribs appear even smaller than *Xantho's* 2" x 3" angle-iron ribs. The strakes are thinner than I expected, probably about the same as *Xantho*.

The gross dimensions are a bit smaller than those published for *Xantho*. I may need to do a bit of scaling of the final lines. Michael also showed me the National Maritime Museum publications of Denny's Lists, showing the original specs for *Xantho*, along with several other steamers built within a few years of *Xantho*. I will photocopy these and pick one to adjust my *Rifle* lines toward. Looking at the others, though, I'd say Ian Warne's speculative drawings of *Xantho* are pretty close to the mark.

This is the most interesting museum I've seen yet. It reminds me of the Polly Woodside in the clutter and lack of polish on the working areas, though more expansive and with a much bigger collection of old vessels, including the 1864 clipper *City of Adelaide*, wood planks on iron frames, and badly wanting restoration. But picturesque as she is, just set on the slipway. The entire setting is great: the Irvine harbourside, a 300-odd year old working waterfront that is well past its prime, and the developers and Disney crowd haven't moved in yet [7 Sep. 01. I later learned from Jim T. that most of the picturesque harbourside buildings are new, built in a period style to support a waterfront precinct scheme, with the museum as the anchor point]. Lots of old boats, workshops, cobbled paving everywhere, beautiful old buildings and houses, and the museum itself housed in a 19<sup>th</sup> century glass-roofed brick-walled factory building, held up by cast iron beams. The whole thing was in Glasgow, where it was disassembled, loaded on trucks, and hauled down here. I could work here. I'd love to get in on the *City of Adelaide* restoration. It will take years and lots of shipwrights.

Other notes:

Still need to document where every bit of info comes from (which document and its date and which file # in the *Xantho* files, etc.)

**6 July 2001**

Perth, Scotland.

This is a summary of impressions gleaned from the various museums, exhibits, and historic sites I have seen this trip. I will expand on this as I remember details.

Kensington Gardens, Speke monument, Peter Pan statue, Albert memorial, Italian Fountains, & Diana's Walk (Princess Walk?), London (June 16)

**Science Museum, London (June 17 & 19)**

Whilst in London on 17 June I visited the Science museum and saw the wonderful collection of model ships and original builders' models of steam engines, including two of Penn & Sons trunk engines.

On 19 June I went back to the Science Museum and met with Peter Fitzgerald, the asst curator for the ship and engine models. Interesting guy to talk to and he volunteered any help he could provide on the engine details. He might also have something on the thrust block.

Cutty Sark, Greenwich (June 18)

**National Maritime Museum (June 18)**

On 18 June I saw the National Maritime Museum in Greenwich. Best part of NMM is the South exhibit, about Scott, Shackleton, etc. They have all the Denny's records but I didn't see the library. I might go back to London early and spend a day in the library at NMM to see what I can turn up. When I get to Dundee of course I hope to see Scott's ship the *Discovery*. NMM has an entire gallery devoted to Adm. Nelson that borders on fetishism.

V&A, London (June 19)

Leiston Airfield, Leiston Abbey ruins, Dunwich Cathedral ruins, Leiston area (June 20)

Long Shop Museum, Orford Castle, Dunwich Museum, Leiston area (June 21)

Flatford Mill & Lock, Ipswich (June 21)

Hastings Battlefield, Battle (June 21)

**Portsmouth (June 22)**

On 22 June I visited Portsmouth, which includes the Royal Navy museum and the HMS *Warrior* and the HMS *Victory* – more Adm. Nelson fetishism. *Warrior* has one of Penn's largest trunk engines. This site also has the *Mary Rose* restoration project. Here I met Charlie Barker who gave me a great backstage tour of the restoration work, as well as the lowdown on the *Mary Rose* museum (which I would guess was something of a prototype for the WAMM's Dutch Shipwrecks display areas).

**Stonehenge, Salisbury (June 23)**

Too many people. A placard indicates that the plan is to reroute the highway farther from the stones, and restore the grounds to a huge open meadow, removing the restrictions on where people may walk.

**SS Great Britain, Bristol (June 23)**

On 23 June I visited Bristol and saw the SS *Great Britain* and museum at the Great Western Dockyards. This reminded me a lot of the Polly Woodside: not that well organized, under funded, but with a lot of heart and set in a wonderfully ungentrified



harbour area. The museum is not well organized, though they do have a full-size replica of a steam dredge. The diorama shows a workmen stoking the engine, and his clothes are filthy with coal dust. Very refreshing. I like the museum because it is not well organized, the grounds are a rundown Victorian shipyard and graving dock. SS *Great Britain* is Brunel's ocean-going passenger steamer, built in 1843, 5 years before *Xantho*. The 5<sup>th</sup> strake up from the keel was laid on first, then the remaining strakes were clinkered both up and down from this strake. I measured a rivet head at 39 mm, which scales down to 6.5 mm.

**Cardiff Bay Waterfront (June 23)**

I ended the day in Cardiff Bay, Wales, a massive waterfront redevelopment that claims to have a maritime museum, though I never did find it.

Scottish Maritime Museum, Irvine, Scotland (June 25-28)

Scottish Maritime Museum, Dumbarton, Scotland (June 29)

Dumbarton Castle, Scotland (June 29)

Ferry to Orkney: Skara Brae, Stenness Stones, Circle of Brodgar (July 3)

Orkney: Highland Park Distillery, Earl's Palace, Churchill Barrier & scuttled ships, ferry back to Thurso, drive to Inverness & Loch Ness (July 4)

**Culloden battlefield (July 5)**

Culloden has minimal interpretation, but it's fun to walk the battlefield and see the markers where the various regiments stood.

**RRS Discovery & Broughty Castle (July 6)**

RRS Discovery is fun to see. The ship is in beautiful condition, though it is largely a reconstruction. It was modified quite a bit by the Hudson's Bay Co., from its original configuration as an arctic exploration ship. The museum was more of a Disney show. Lots of "interactive" things that didn't work very well, but they do let you get your hands on stuff. The dioramas have the usual, sanitized look. The shipyard scene shows an engineer (wearing a derby) talking to what we assume is a shipwright (wearing a workman's cap), with a finger extended as if directing him. The tone of the exhibit is along the lines of "Gee whiz! Look at the size of those timbers!"

**Ullswater Lake & Steamer dock (July 7)**

**Dock Museum, Merseyside Maritime Museum (July 8)**

Dock Museum has exhibits on the Vickers Shipyards, in an old graving dock. Museum has a lot of potential, given what it claims to represent, but hasn't found its focus yet. Did have an interesting exhibit on industrial model-making, including info about Bassett-Lowke, a London/Manchester model-building firm. [7 Sep 01. Have since learned more

about Bassett-Lowke, from emails with the Dock Museum and with Peter Fitzgerald at London's Science Museum.]

Merseyside has an extensive collection of models. The bookshop also offers a publication on their models collection.

**Stratford-on-Avon (July 9)**

Tourist trap. Very disappointing. I did enjoy the hand-cranked ferry across the river from the parking area to the village centre.

Cambridge, British Antarctic Survey and Scott Polar Research Institute (July 9)

Duxford Imperial War Museum (July 10)

Nelson's Column (July 11)

**19 July 2001**

Back in Perth.

Issues regarding the *Xantho* model.

If I rely on the *Rifle* lines, we are clearly looking at a hybrid impression of *Xantho*, which cannot even claim to represent *Xantho*. I have mixed feelings about this. The alternative is to use lines from a contemporaneous Denny Bros. Hull, such as the *Celt* or another referenced in the Denny's Lists publications from NMM.

Another option is to use a drawing for some other vessel entirely, such as the river steamer in McKay's book from 1839. McKay's drawing is for a timber hull, which then raises the question of how much did a wooden hull's lines differ from those of an iron hull, in the practice of the time?

As for the *Rifle*'s lines -- a quick look at the picked data indicates a few problems with *Rifle*'s hull: there is a kink in the keel, extending from the stern post forward about 10-12 ft. The sides have begun to collapse away from the ribs, which is clear from looking at the inside of the hull, and also by the sag in the waterline from the sternpost forward (assuming the waterline was originally parallel to the bottom of the keel). These can be adjusted for in the final drawing.

As for models generally, I have some references from Tom Vosmer to explore, seems to be fertile ground.

**1 August 2001**

(Transcribed from handwritten daybook)

I've decided to start keeping a hardcopy daybook/journal instead of doing it on the computer. Booting the computer and loading the file takes too long and removes spontaneity. I've printed the file to date and inserted it in the front.

Old business to think about:

- My reaction to the woman last week who wanted to point out the discrepancy between the two text panels on the Broadhurst family.
- My choice whether or not to interact with visitors.
- Thinking about and explicitly planning each week's activity "show." This week finish the drawing.
- Start an outline for thesis.
- Enhancements to my table and display area – photographs, etc.

## 2 August 2001

Thursday in the gallery.

*Rifle* is narrower than *Xantho*, by nearly 7 feet. Depth is about the same. *Xantho*, as built, would probably have had a lower counter and very little deadwood [12 Sep. 01. This term is not defined in the oxford companion, but I've seen it used to describe, on an iron hull, what would be called "deadwood" on a wooden hull) since she did not have to accommodate a screw [7 Sep 01. On reflection, the amount of deadwood between the keel and the counter is probably a non-issue with respect to whether a ship used a screw or side-paddles, although I keep bringing it up in later paragraphs.]

My inclination is to use the lines of *Premier* with a modified stern post, or the photos of the *Loch Lomond*.

Denny Bros. Hulls of the period distinctive characteristics for paddle steamers (shallow draft, convex bows, very little deadwood) whereas their screw steamers are more like schooner or even clipper hulls (sharp concave bows, severe sheer, severe deadwood and a high, shallow counter). For example, compare the Denny List lines drawings for *Premier* vs. *Erin's Queen*, a paddle steamer and a screw steamer, respectively, both built in 1846.

Mac indicated he believes *Xantho's* hull was more along the lines of a schooner hull (are we debating schooner "rig" vs. hull shape?). [7 Sep 01. Mac's argument is that *Xantho*, although built for side paddles, was designed to carry sail, and thus had to have a sharper keel and stern than a hull powered by paddles alone, such as *Loch Lomond*]

Visitor Notes-

Last week, a woman (who identified herself as a history teacher) pointed out a discrepancy in the name of Broadhurst's eldest son between two text panels – Charles Henson Broadhurst (as in the panel titled "The Extraordinary Broadhurst Family" or Robert (as in the panel titled "Steamships and Suffragettes"). She also pointed out that the

Vlamingh gallery nowhere explains what “VOC” stands for. She later came back and said it was explained upstairs in the VOC gallery. [7 Sep. 01. Actually, VOC is defined in the first set of panels you see on entering the Vlamingh gallery from the Museum lobby. The fact that she didn’t see it may suggest that it is buried in all that text. Then again, she was consciously looking for it and still didn’t see it, so maybe it wants to be a bit more prominent. Tough call. As we used to say of user comments, back in my tech writing days, “Everyone wants everything to be on page 1.”]

Today, an Asian man poked his head into the room, scanned around, and we made eye contact. He gestured to ask whether it was OK to come in, and I enthusiastically waved him in. This raises the question why he wasn’t sure whether it was OK to come in – unclear signage, all the storage racks, my presence [wearing an ID badge and seated at a desk apparently working]? Perhaps setting up the gallery as a work-in-progress to expose “museum work” leads people to think that this is a “work area” and not a “display area.” He was the only visitor [to appear confused about it] I’ve seen so far in two days in the gallery (in which time I’ve seen probably 50-80 people pass through).

Today I’m more open to interaction than I was last week. Instead of remaining hunkered down over my drafting board, as I did last week, I tend to look up when people enter and make eye contact, though I’m reluctant to engage them unless they start. I’m more concerned about “disturbing” them. I also wonder whether, by making eye contact, I give them the impression that I’m here as a monitor, or Big Brother, keeping an eye on them.

Display goodies – I’d like to offer displays that address the specific questions I’m looking at – for example, determining the shape of the [*Xantho*] hull in the absence of drawings or photos. The composite [mosaic] site photo in Mac’s office would look good, but would need some interpretation. I’m also concerned that by the time it was produced, I’ll be working on a different issue (the dog clutch or the thrust block, for example).

Right now, I could use a panel explaining our tentative interest in *Rifle*, and what we hoped to learn from it, which turns out to be nearly useless, aside from the fact that it got me to think about the “bathtub” vs. “schooner” hull, and the manner of placing the shaft tube (inline, or offset as in *Rifle*). [7 Sep 01. OK, it was worth much more, as I spent a lot of time with a French curve getting the “S” curves of the sections worked out for the final set of lines used to produce the model molds. *Rifle*’s lines were an essential starting point, even though ultimately it won’t look much like *Rifle*.]

### 7 August 2001

The *Rifle* drawing is nearly complete. I need to lay out all three sheets and use battens to fair the buttock lines.

I’m a little concerned about the stern details. My measurements [of *Rifle*] were not as detailed as I would now like them to be. I may revise the stem and rudder after studying the photos further.

This drawing represents a number of adjustments to the raw data obtained in Irvine.

The first was the matter of correcting the 2 1/2 degree tilt to starboard. [07 Sep. 01. I noticed this in Irvine, but didn't give it much thought as it was such a small tilt. On examining the spreadsheet of raw measurements, a very clear slope was indicated that would have resulted in a very deep and narrow V-shape at the stern post.] This was simply a matter of calculating the slope [to starboard] of the deadwood at the sternpost, determining the correct offset at each waterline elevation to render the sternpost true vertical, and adding the same set of corrections at each of the other sections.

Next came straightening the keel. The horizontal offset from the keel to my base line showed about a 12 foot long kink to starboard from the sternpost forward. This did not appear to rise above the keel so I simply adjusted the offset at each section to render a straight keel.

The third adjustment was to eliminate very second section, so as to leave sections at 4' intervals instead of 2' intervals. This made for a cleaner stern-view drawing. I also removed the 6" waterlines as they added no important info.

On my first draft of plotting the section lines, I noticed that the 12' and 14' lines converge well below the shear, whereas the 16' line was twice as far from the 12'/14' lines at the shear as either the 10'-12' interval or the 16'-18' interval (verify which lines I'm talking about here). This indicated a big dent in the side of the hull. Eliminating the 10' and 14' lines, as well as adjusting the 12' line to be equidistant between the 8' and 16' lines corrected this dent. [07 Sep. 01. The spreadsheets reflect all of these adjustments].

Further adjustments.

*Rifle* at the sternpost is approximately 8' deep and at the beam is a little less than 10' wide. *Xantho* is 8.4' deep at the midpoint and 16.8' wide, according to the registration. So *Rifle* is about the right depth but much too skinny.

So, step 1 is to use a proportional divider to expand the section lines horizontally by a ration of 8:5. I suspect we will also need to raise the shear. Finally, we need to modify the rudder and screw frame, as we have a pretty good idea how *Xantho's* looked since those bits survived.

We are also looking at photos of a model of *Loch Lomond*, a Denny-built paddle steamer said to be along the same lines as *Xantho*.

Mac and I have an ongoing debate about how *Xantho's* stern was modified [by the scrap metal dealer in Glasgow in 1870]. He believes the original stern was cut off entirely, ahead of the deadwood, and a new stern built out to accommodate the stern tube, screw, and new rudder. I lean toward the theory that they simply built out the existing deadwood [to accommodate the screw, frame, relocated stern-post and rudder], since *Loch Lomond*

has a large overhang with apparently plenty of room for the screw frame under the original counter. [07 Sep. 01. Some clarification: the overhead site photographs show the remains of the stern triangle. Where the shaft penetrates the hull to the screw frame there is no deadwood; the sides of the hull at the height of the shaft come together at the same point the shaft exits the hull. The side photographs show the screw enclosed in a stern frame with a nicely curved top, the radius of which might well match the radius of the underside of *Loch Lomond's* counter.]

How to determine?

A number of ideas: [07 Sep. 01. This would be an interesting realm for experimenting with a number of throw-away models, starting with a model of *Loch Lomond's* hull, with a keel, and then try a few different approaches to modifying it to accommodate a screw frame similar to the one at the wreck site.]

- 1) We know the shape and can ascertain the radius of the curved arch on top of the screw frame. If this matches the radius of the [underside of the] counter on *Loch Lomond* [assuming we can work this out from the photos of the model], this would seem to support my theory.
- 2) How would they cut the old stern? Did they have oxy-acetylene cutting torches in 1870? If not, did they use a hacksaw? Use a steam drill to bore out the plate rivets? Without a torch, this would seem like a big job.
- 3) But they did lengthen in. [Need to verify this, and by how much.] Perhaps a false bow riveted onto the original, to convert it from a convex riverboat bow to a sharper, sea-going bow. [07 Sep. 01. Seems like this would be apparent from the remains of the bow triangle in the site photos, which doesn't seem to be the case.]

(sketch #1)

To determine any of this, I need to study the photos of the bow wreckage.

This week at the museum:

- 1) Start new drawing for *Xantho*
- 2) Set up display bench
- 3) Start cutting ribs of 8 mm plywood, ½" wide.

**9 August 01**

In the gallery

People seem reluctant to interact. I am reluctant to coerce them to. I don't want them to feel "watched" or supervised. When I visit museums, I don't want to feel supervised or coerced into [listening to] verbal interpretation.

Presentation outline for MAAWA: [09 Sep. 01. Two days prior I agreed to do a presentation on the project to the upcoming August meeting of MAAWA, on the 21<sup>st</sup>.]

- 1) Mac's original idea: raise the entire stern section and display it as the machine room of the ship.
- 2) After lifting engine, it proved impractical (so far) to raise the stern of the hull (soliciting helicopters, etc.)
- 3) Use a model/impression/mock-up
  - digression on use of models in archaeology
  - digression on use of models in museum displays
- 4) Need for a line drawing – no details of original
- 5) Start with *Rifle*, *Jenny Lind*, *Loch Lomond*, etc.
- 6) All the questions: shape of ship, 1870 modifications, shape of bow, tiller, etc.

#### Visitor interaction-

Someone asked about the wreck site & discovery, and the conservation process. [09 Sep. 01. I gave them a quick rundown on the *Xantho* story, which on reflection was pretty much covered in the video. But she seemed happy to listen to a person explaining it.]

#### 16 August 01

##### In the gallery

I've started cutting mold sections for the hull. This requires a decision on the stern shape. Mac is in Broome another week or so, I'm on my own. [07 Sep. 01. Still haven't made a decision on the shape of the stern profile, but the mold is design so that we can replace the sternpost section if the shape of the stern profile and stern frame requires more or less deadwood.]

I don't believe there is any deadwood above the stern tube, unlike *Rifle* which has a massive deadwood. Looking at the stern frame at the wreck site photos, and the overhead shots [the B&W mosaic], there does not appear to be any deadwood above the shaft. I'm inclined to go that route – the stern will look something like this:

(sketch #2)

#### Visitor Notes –

Parents with children usually admonish the kids not to touch anything, but kids touch thing anyway. They love the computer and go directly to it and start tapping keys. By instinct.

#### 23 August 01

##### In the gallery

I spent the weekend building the mold: 7 sections of MDF (reinforced with a single pine bar across the base) bolted to a frame approx. 15 ½" W x 80" L x 3 ½" H. Today I installed the mold in the gallery. [07 Sep. 01. The mold frame stands on legs approx. 20" tall, allowing it to be either set upside down, so I can work on the planking, etc., or displayed right-side up so visitors can see how it will look as a finished shell segment.]

Visitor Notes –

[12 Sep. 01. While I was bolting together the mold pieces, several visitors stopped to watch what I was doing. One woman joked “We’ll be back after lunch and I expect that to be finished.” An older man, wearing a jacket with the logo “RCMP” (for Royal Canadian Mounted Police) stopped to watch. I noticed the logo and asked him if he were a Mountie. He said he was retired. He was from the Caribbean originally, moved to Canada and worked many years in various RCMP posts throughout British Columbia (Kamloops, Prince George, etc.), then retired and moved back to the Caribbean (I forget which island). So we talked about Western Canada, a place I have visited some but not nearly enough, the area around Prince George in particular, and he asked about my studies at uni, etc. We didn’t talk much about the exhibit itself, but in a way it was a more satisfying conversation.]

An older woman with two boys in tow was looking at the work table, chuckling. I said hello and asked what she thought. She said the boys’ weren’t impressed. They liked all the museum, except this room. I joked to them that it wasn’t finished yet – which didn’t seem to impress them much.

Mac was surprised at this. And suggested we might need to rethink our concept (by this I assume he means the “exhibition to demonstrate an exhibition in progress to the visitors” concept). I think the concept is fine but nobody understands it because 1) it’s not what they expect, either by prior conditioning in other museums or by the rest of this one, and 2) we don’t explain it.

The main entrance to the gallery, near the lifts, has a large placard with lots of text, that no one reads. The entrance from the Vlammingh Plate gallery has no placard at all (this entry was not anticipated, and the door used to be closed all the time).

I propose to do an exhibition brief – very brief – for Mac to review and critique, as a way to focus his concept in a coherent statement.

[12 Sep. 01. Assuming one hasn’t been done already. I was thinking it would be a useful exercise to do after the fact.

The conflict between the formal approach embodied in an exhibition brief, vs. the practical realities of getting a meaningful exhibit put together on no budget, has a useful parallel in the software industry.

30 years ago, the standard practice when developing a new software application (we called them “programs” or “utilities” back then) was to start by writing a Requirements Statement, which laid out all the broad constraints of the application – hardware and OS it must run on, maximum memory usage, maximum CPU cycles per transaction, storage, etc. In those days, computers were hideously expensive, such that the cost of operation could be computer per CPU cycle and was a significant amount. This was followed by a functional specification, detailing each user command (entered at a keyboard) and what exactly it would accomplish. This would be followed by a Partition Spec or Module



Spec., which detailed the functionality of each section of program code, and so on. Lots of documentation would be written, reviewed, analysed, discussed, and revised, long before any actual code was written.

In the last 10 years, this “document-driven” approach proved unrealistic and terribly expensive in the competitive world of microcomputer software products, so a new approach emerged, known as “rapid prototyping.” Since CPU cycles, working memory, hard disk storage, etc. are infinitesimally cheaper than they were 30 years ago, programmers could easily afford to just sit down and tinker with code, throwing it away and starting over when they realized an approach wouldn’t work. This is still much faster and much more responsive to market demands than the old document-driven approach, and also takes advantage of the fact that as you write and discard code your understanding of the problem grows, so in essence you learn what to do in the very process of doing it.

Our approach to the *Xantho* gallery is analogous to this “rapid prototyping” model and offers some advantages, especially where, as here, resources are short, but as a work-in-progress we have the freedom to tinker with the exhibition, move the furniture around continually until the exhibition falls into place. Some would argue that without an Exhibition Brief it will never “fall into place” because the “place” was never properly defined, but I suspect that in the process of tinkering, we will find the “place.” It’s more a right-brain process than a left-brain process. This is an idea I want to develop at length in the final thesis.]

Some possible sections [of the exhibition brief]:

- 1) Historical Essay on Xantho and Broadhurst
- 2) Themes:
  - Xantho – the ship
  - Xantho – the wreck and restoration
  - Broadhurst family
- 3) Exhibition in Progress – the purpose is to share with visitors the process of creating an exhibition (worth asking the value of this).
- 4) Timing Issue – labels and panel need to stay in sync with physical changes to the gallery
- 5) [12 Sep. 01. The Rapid Prototyping Model for Exhibition Design]

[07 Sep. 01. This was the day Mac suggested I rearrange the entire gallery. Sketch #3 is the floor plan of the gallery as I found it]

(sketch #3)

Move model table next to engine area: [This was the only rearrangement idea I had at the time]

(sketch #4)

Mac suggested cutting section molds to accommodate the engine mock-up and drive shaft, etc. I balked at inserting the shaft, etc., other than the engine, as the molds are only temporary and I will need to turn it upside down to lay on skin planks (balsa wood? 1-2mm?) Inserting the engine adds visual interest. So does the drive shaft, etc. We just don't want it to be too cumbersome to invert on days I'm working on it. I need to think about this. I can also add doodads to make the display stand more stable. [07 Sep. 01. In a later conversation with Mac I suggested we just use blocks of wood glued in place to indicate the position of the engine, drive shaft, etc., as it cutting the molds at this point at best would be difficult to do neatly and besides the wooden model keeps getting broken. He still felt we should use a piece of dowel or something to indicate the shaft, which is easy enough to do. I'm looking for a burned out 30cm desk fan to use the 3-blade assembly as the screw mockup).

Next week, we'll move the furniture. Volunteer supervision adds a new dimension to museum work, as it takes paying attention. [07 Sep. 01. Polly Woodside experience will help flesh this out. Also, there was a paper presented at the Sydney conference last year on working with volunteers.]

Mac nailed the legs of the mold stand to the work table:

(sketch #5)

I hadn't thought about this. Apparently, things tend to walk away from the exhibit if they aren't nailed down [so to speak]. For next week I need to make sockets we can bolt the legs to:

(sketch #6)

[07 Sep. 01. In reality, the sockets turned out to be much simpler than those shown in sketch #6.]

Next Steps [on the mock-up]:

Floors, bulkheads, keel, deadwood, stern frame, sheer rails. 12mm plywood, 12mm x 12mm Jarrah?

**30 August 01**

In the gallery

The gallery is completely jumbled today. The air-conditioning people are working so the gallery is closed and everything has been shoved into the middle of the room.

Mac said that this is pretty much the story of his life, stuff just happens so you go with it and use it. While the Great Science of Museology relies on detailed analysis, planning, selection of themes & narratives, much of what we do here is seat-of-the-pants, no-budget

improvisation, and it more or less works. The meetings, plans, etc. are fine, but in the end the exhibition gets built one way or another, with what is available.

So today's plan is to come up with a new layout and labeling proposal.

(sketch #7) "A Blank Slate"

There are a number of difficulties in laying out the Xantho gallery, not least of which is the lack of funds. There are several aspects [or "Exhibition Themes" in Andrea's parlance] to the Xantho that all need space (the Broadhursts, the trunk engine history, the working engine model, the video, the stern impression, and the engine restoration itself). A very difficult problem is the two entrances to the room. A single linear narrative won't work because it will shortchange people who enter from the "wrong" end.

The layout idea I came up with today uses the Batavia storage racks as room dividers to create something of a labyrinth and guide people through a number of paths through 4 distinct "theme" areas, instead of a single narrative. Entering from the "front" or the corridor, you come into the "Xantho's History Area," which includes the text/art panels with Ian Warne's sketches, the Bob Burgess model, text panels on Penn and the trunk engine design, and the desk with the computer. This area will also feature the panel that explains the "exhibition in progress" concept without making too many promises.

From here, visitors can go to the left, and watch the video [the "Video Area"], away from traffic, distractions, etc. The video tells most of the exhibition story in sort of a parallel path to the rest of it.

Or they can skip the video (or come back to it later) and enter the "Archaeology Area" which is in the center of the room. This area is where the engine bed, parts, piping, etc. are displayed and where the engine reconstruction will occur. Panels in this area depict the underwater work, conservation, reconstruction, etc.

[End of transcription from daybook]

[07 Sep. 01. This area also includes the work tables where the piping is being restored, and where the hull mock-up is being built, along with panels of text/photos explaining what these projects are for.

The final area is just inside the door from the Vlamingh exhibition, and includes the large panels on the Broadhurst family.]

**1 September 2001**

email to M. McCarthy:

*Xantho* Gallery Layout

So, this turned out to be a lot of fun. I came up with a layout that I think will work nicely, it's in the 1:30 scale model of the room, sitting on the end of the hull impression table, with a note attached explaining how the different areas function.

The main goals were that I wanted a separate, somewhat isolated area for the video (some people watch, some don't, and those who do get pretty much the full story so in a sense it parallels the story told in rest of the gallery); I wanted the engine bed in the center of the room, with all roads leading to it; and I wanted a meaningful entrance inside each doorway.

The existing entry doesn't change much. It still has Bob Burgess' working model of the engine and the text panels to explain what a "trunk engine" is (the first time I visited this gallery I was stumped by this, until I found the text panels), as well as the *Xantho* history text panels with Ian's artwork, and the desk with the computer and web site.

This area is isolated by the position of the steel racks. If you go to the left you enter the video corner, but you can also proceed directly to the archaeology area where the engine bed takes center stage, surrounded by bits of pipe and other parts, and the panels with photographs of the engine recovery and conservation. This area is also where you land as soon as you leave the video corner.

If you enter from the Vlamingh gallery, you pass through a corridor formed by another steel rack and the west wall, on which hangs the panels that talk about the Broadhurst family. Straight ahead (where the TV used to sit) is the hull impression and text panels explaining what it's for. As you approach the impression, the steel rack on your right gives way and you see the engine bed and the rest of the arch. area.

Some extras we might consider, depending on costs:

- Covering the racks with clear plastic or coarse netting to protect the Batavia timbers, etc., without hiding them.
- Covering one side of the racks, depending on where each one sits, with painted plywood, MDF, or even cardboard, to add a colour backdrop to the panels hung on them.
- Use painted cardboard, etc., behind the Broadhurst panels to add visual interest and smooth the transition from the Vlamingh gallery, which has obviously had a lot of time and money put into it's design.
- One thing I like about the steel racks that we might work with is their sheer dark bulk, like something you'd find in an Industrial Revolution machine shop or foundry, or iron ship yard. Maybe we could cover the walls with plastic or cardboard painted to look like old grimy brickwork.

I didn't spend much time thinking about the signs and labels, so I will try to come in for awhile Tuesday to review those and come up with some suggestions.

Cheers,

Joel

### **3 September 2001**

Short gallery visit

[07 Sep. 01. Labels and text panels – I want to cut up the big panel that explains the exhibition-in-progress concept, discarding the first paragraph that talks about “within the next month...” but retain the other Q&A paragraphs as individual panels to be put up at specifically relevant spots in the gallery, maybe next to a large graphic of a question mark. We need a new “Exhibition-in-progress” concept explanation that is much shorter, in larger type, that makes no promises about dates, months, etc., given the unpredictability of how soon conversation can get any more engine pieces out of the tanks. This explanation should appear at each entrance. We also need a title for the exhibition, something like “Solving Xantho’s Mysteries” or some such. I haven’t thought about other labeling, etc., but this is all stuff I’ll need to address under the various “Themes” in the exhibition brief.]

### **16 October 2001**

Telephone conversation with Mac. After several weeks of on-again/off-again discussions about whether to make room for additional marine steam engines in the Xantho Gallery, this morning it appears that they will move into the gallery. This alters the narrative, as now the exhibit includes a range of types of marine steam engines, not just the trunk engine.

### **18 October 2001 (transcribed from Daybook)**

We rearranged the gallery today.

According to Mac – During the 2-week school holiday, the education department used the gallery for various educational programs for school kids, etc. In the TV corner, they set up a display of scuba divers, using mannequins and bits of scuba equipment. This proved a big hit with the kids.

We decided to include them [the mannequins] in the re-arranged gallery, in the TV theaterette area. They seem to “welcome” visitors to come in, sit down, and enjoy the video.

The gallery has multiple uses. Mac wants the education department to feel comfortable there. It also needs to remain fairly flexible as the exhibit evolves. The steam guys might move in, so the narrative may need to include additional marine engines.

The redesign followed my plan fairly closely, except we couldn’t angle the engine bed because the crank needs to remain directly underneath and parallel to the central beam. So the bed is to the south wall, next to the crank. The pipe restoration work is on a

smaller table, between the engine and the south wall. The big table is in the northwest corner, with all of the copper and brass piping on it. The 1/6 hull is in the adjacent corner where my original design had the big work table. Otherwise, it's all as I wanted.

The signage needs a lot of work. I'll include that in my thesis under further development possibilities.

#### **20 October 2001 (transcribed from Daybook)**

Xantho dive.

[Along with MAAWA members Don Alexander and Adam King, I went to Port Gregory to dive the Xantho wreck site. We launched Adam's boat from the beach and went to the GPS coordinates Mac gave us. This put us much closer to the reef than I expected. Possibly the coordinates used the older datum, or there was a calibration error in Adam's GPS transponder or in the one that was used to obtain Mac's coordinates. In any case, we decided to visually search for the wreck, using the "shark bait" method, whereby a diver wearing a snorkel is slowly towed behind the boat over the search area, allowing the diver to study the seabed and look for the target dive site.]

Adam and Don in the boat towed me around about 2 minutes while I tried to spot the wreck. I saw a dark shape, thought about it, and waved my arm. While the boat slowed I drifted further east and saw another dark shape, the distinctive hooked stem of Xantho. I really waved my arm. They got the boat stopped, right over the boiler. I swam up to the boat – the boiler seemed high enough for me to stand on and still reach the surface.

The sand is a lot deeper at the stern than in the 1985 photos – above the drive shaft and the screw boss. The hull is broken just ahead of the stern triangle. Aft, it tilts to starboard, forward it tilts to port. I took a lot of photos of the entire drive train and the screw aperture.

The thrust block looks to me like a gearbox with two shafts – the lower one coming off the engine and the upper one going back to the clutch, and taking the thrust against a horizontal beam – large piece of metal. Like this:

<drawing of thrust block>

This is similar to a drawing in Fincham [actually, the drawing I was thinking of is in E.C. Smith, 1938, *A Short History of Marine Engineering*] that shows an early (1840's) screw thrust block. Interestingly, this one has the engine crank shaft coming in under the drive shaft. In Fincham's book [Smith's book] the engine crank shaft comes in above, allowing the thrust from the lower drive shaft to press against a post rising from the keel. I wonder if Stewart did it that way because the engine sat too low in the hull for a straight shaft or a drive-under shaft to pierce the tuck at the right height for the intended screw.

25 October 2001

In the gallery

## Notes on signage:

- 1) We need a "Welcome" from the Woodblock Floor Gallery.
- 2) The two linked photos of the engine deconcretion process, just to the right of the working model of the trunk engine display case – move these around to the west side of the adjacent rack, so it faces the engine bed. Same for the many other B&W photos of the deconcretion process in the gallery main entrance foyer. Right now there are no conservation or excavation photos in the engine-bed area, except for one photo on the "Rebuilding of the Xantho has commenced" sign.
- 3) The photo of Geoff Kempton at work on plans of the SS Xantho engine" shows the big exhaust pipe. This would be good to hang on the rack just behind the exhaust pipe reconstruction table. That is a dark spot and would need additional light.
- 4) Engine-bed needs an A4 sign explaining what's happening right now, or at least what is expected to happen next (bring in a web, piston, etc.)
- 5) In the reconstruction area, a chronology would be helpful so visitors have some sense of the time involved in conservation. For example
  - 1985 – Engine removed from seabed
  - 1986-19?? – Deconcretion and disassembly
  - 19?? – 19?? – Desalination treatment
  - 19??- 19?? Stabilisation treatment
  - 19?? – First pieces of brass and copper piping placed on display
  - 1998 – Engine bed assembled
  - March 2001 – Crankshaft placed on display
  - Feb 2002???? - <whatever we expect to have happen next, in a realistic time frame>
- 6) Hull impression area – needs a sign explaining use of schematic models to tinker with hull shape, other Steffy/Classen arguments. For example, what question are we trying to solve this week?
- 7) Patrick noticed that the sign hanging behind the piping display table is too small-print to read comfortably across the big table. He suggested a new, color panel of one of the underwater shots of the engine lift, showing lots of piping still on the engine as it came off the seabed.
- 8) A large, laminated poster of the onsite work, to replace one of the hinged B&W panels and incorporate the text on one of the smaller foam-core panels.

- 9) Place a large sheet of black or brick red cardboard behind the posters in the window grottos to set off the light posters from the light limestone walls. This would also improve the Broadhurst family portrait.
- 10) Two small text signs on foam core, sitting on sill of window grotto just inside main gallery entrance, on right. Incorporate this text into a new poster, with a colour map showing Port Gregory wreck site. Currently, a map entitled "Historic Shipwrecks of Western Australia" hangs to the left of the grotto, but it doesn't include Xantho.
- 11) "Steamships and Suffragettes" – I would cut off the bottom part – the "X" and chronologies. Use the upper part on its own stand, as part of the "Welcome" to this entrance, and remount the lower part where it is now, but with a new heading, perhaps lettered on a strip of cardstock that is glued across the top edge.
- 12) Sign outside the main gallery entrance – "Xantho Engine – a work in progress"  
This sign has a lot of useful info but it's too busy. I would cut this into 5 smaller panels, each one starting with one of the 5 large type questions. The main title can be retained as the subtitle of the exhibition under a new "Steamships and Suffragettes" title. The first of the 5 questions "What's happening beyond the glass doors?" I would discard because a) it assumes the doors are closed, and b) the first line of the answer starts, "Within a month, you'll be able..." which is already out of date. The second paragraph under this question is useful, and could be retained, perhaps glued to another panel. The second question "Why is the work taking place in the gallery" I would place by itself near the piping table. The third question "Why is the Xantho Exhibit significant" I would place near the engine bed. The last two, "What are the goals of the Xantho exhibit" and "How can you be involved" I would either discard and rewrite, or place as is on the desk next to the computer. Also, it might be nice to provide a chalkboard or some other visitor feedback medium, not to collect valid statistical data or answers to particular questions, but to invite random comments, or questions that visitors came up with but that are not answered in the exhibition.

While I was jotting notes on signs, three teenagers came in and sat down in the TV area. They had fun playing with the TV controls, running the volume way up, giggling in embarrassment, then turning it down, tweaking the colour adjustments, etc. This goes to the heart of all the museology theories about empowering visitors, inviting subversion, removing barriers, etc. You'll always have bored or restless teenagers trying to screw things up. No matter how much you try to incorporate "subversion," by definition you can't. As soon as you incorporate it or in any way validate or approve of it, it is no longer subversive, and teenagers will then find some other way to contradict your intentions. They're just doing their job as teenagers.