NAUTICAL RESEARCH JOURNAL

MODEL SHIP WORLD

US $15.00

SPRING 2020 VOL. 65, NO. 1

- Royal Canadian Navy Corvettes
- Building a Decked Canoe
- *La Galera* Don Juan de Austria's flagship
- Painting Waterlines

A Publication of the NAUTICAL RESEARCH GUILD

"Advancing Ship Modeling Through Research"

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NAUTICAL RESEARCH JOURNAL

VOL. 65, NO. 1 SPRING 2020

"ADVANCING SHIP MODELING THROUGH RESEARCH"

SUBSCRIPTIONS
One year is $50.00 US, $62.00 for all other countries. Contributions are welcomed, but contact the editor before submitting anything. Books are accepted for review. The editor and the Nautical Research Guild assume no responsibility for safe return of items sent. The Nautical Research Journal (ISSN 0738-7245) is published quarterly by the Nautical Reseach Guild Inc., 237 South Lincoln Street, Westmont, IL 60559-1917. Periodicals postage paid at Westmont, IL, and at additional mailing offices. POSTMASTER: Please send address changes to Nautical Research Journal, 237 South Lincoln Street, Westmont, IL 60559-1017.
The Nautical Research Journal is available on microfilm from Bell and Howell Information and Learning, Ann Arbor, Michigan.

ON THE COVER: The late Steve Wheeler's 1:12-scale model of a 16x30 decked canoe from 1895. Builder's photograph.

Cross-fertilization

A recent survey for model manufacturers, primarily of kits but also including ready-assembled radio-controlled and static models, to determine customers' areas of interest produced some very intriguing results. The largest groups of customers were involved in model railroading (20 percent), radio-controlled model aircraft (19 percent), and radio-controlled model cars (16 percent). Together, these groups account for 55 percent of the manufacturers' base. Scale ship and boat modelers (of static wooden or plastic kits and scale radio-controlled vessels) combined together made up 4 percent of their customers, only beating out customers interested in Lego or Meccano/Erector sets.

We are indeed engaged in a niche pursuit. There is a tendency for those with niche interests to look inward to their group members for inspiration, new ideas, and, artisanally, methods and techniques. Materials, tools, practices, all can tend to depend on the group's consensus for acceptance. This is not necessarily something to deplore but it also can limit adoption of practices from outside.

In general, ship modelers are open to new ideas from outside their own community. Nevertheless, the inertia of a niche group can make this a slow process at times. Photo-etching, for example, became an important feature of model railroading in the early 1960s, first with the arrival of stunning HO (1:87) scale brass locomotives and rolling stock produced in Japan using the technology and soon afterwards with the availability of details for scratch builders and those wishing to enhance their kits. Plastic kit ship modelers did not see similar products until 1985, when Loren Perry, after his superb demonstration of the possibilities of photo-etching at the Model Engineer Exhibition in London that year, started to produce sets commercially for them. It probably was another ten years before manufacturers started to make photo-etched details available for modelers working with traditional wooden materials or scratch builders began to explore using the technology.

Along with most other aspects of our modern society, the pace of technologically change in the modeling world has been accelerating very rapidly, and many of the costs have fallen almost equally quickly. In particular, scanning technologies allied with computer aided design (CAD) is changing the process of manufacturing models; one major manufacturer essentially only produces new kits if there is a full-size prototype accessible that its technicians can scan and scale down for production. On a more mundane level, the availability of cheap sophisticated scanning systems and powerful CAD programs combined with inexpensive and quite efficient computer-controlled milling machines, photo-etching equipment, and three-dimensional printers is making high-level options available to model makers in general on an individual basis.

The spread of the fruits of these technologies is uneven. Use of some is more prevalent among builders of static scale aircraft models or railroaders than among ship modelers. Not everyone may be interested in these applications, or have much use for them, but, photogrammetrically scanning a particular capstan and using the data to create CAD drawings, for example, does not preclude making its model by traditional methods. It behooves us to look outside our own niche pursuit and explore these possibilities.

— Paul E. Fontenoy

The Flowers of Canada: The Royal Canadian Navy's corvettes in World War II

By Bruce LeCren

Introduction

The Flower-class corvette was singularly responsible for the rise of the Royal Canadian Navy (RCN) from a small fleet of six destroyers and a handful of auxiliary

Figure 1 (1941): *Chicoutimi* shortly after commissioning, at Sydney, Nova Scotia, appears untidy and is painted builder's grey overall. It has the mainmast, and minesweeping equipment will be on the quarterdeck. There may not be any secondary armament. The inadequate size of the original bridge is apparent. All photographs are from the collection of the Naval Museum of Alberta in Calgary, Alberta, used with permission.

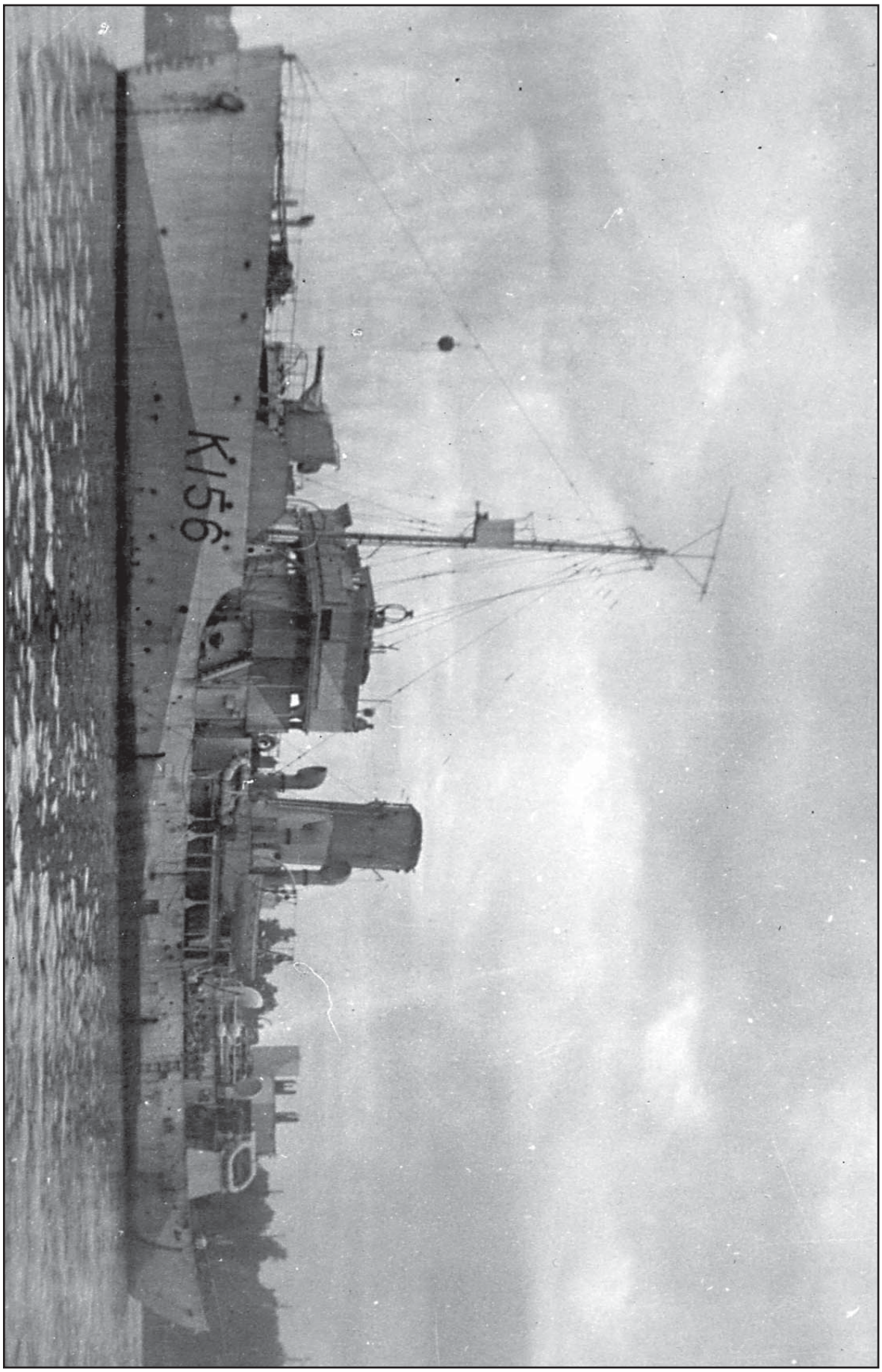

Figure 2 (early 1942): *Chicoutimi*'s mainmast and minesweeping gear has been removed and the ship is painted in the Western Approaches pastel camouflage. There are machine guns in the after anti-aircraft gun tub, no visible weapons on the bridge, and only two depth charge throwers. The foremast is still forward of the bridge, which has not been expanded. The antenna atop the mast is the Canadian SW radar.

craft in 1939 to the third largest fleet on the planet by 1945, with over 400 ships in commission. The RCN's 123 corvettes were the largest class of ships in Canadian service, the largest class of warships ever built at 270 hulls, and the largest class ever built in Canada; 121 Flowers coming down the ways between 1940 and 1944. Corvettes served in more navies than any other class of warships, nineteen fleets including the United States Navy (USN) and even the Kriegsmarine, which took over four French corvettes in 1940.

Canadian corvettes escorted thousands of ships from the Aleutians to the Mediterranean; from the Caribbean to the Arctic. Along the way they sank fourteen submarines and shot down one aircraft. Ten were lost, representing forty percent of RCN casualties during the war. Corvettes rescued hundreds of torpedoed survivors and preserved the lives of thousands of merchant sailors, along with their valuable ships and cargoes, by their very presence around the convoys.

By war's end, the North Atlantic was the only theater of war commanded by a Canadian, and the RCN had primary responsibility for escorting Atlantic convoys. Much of these achievements was due to the first eighty corvettes built in Canada in 1940 and 1941, memorialized by First Sea Lord Admiral Sir Dudley Pound, when he said "The Canadian corvettes solved the problem of the Atlantic convoys."

The first Canadian corvettes

As war clouds gathered in 1938, Canada's National Research Council sent a delegation to Britain that returned with plans for an auxiliary vessel called a 'Patrol Vessel of Whaler Type'. Designed by Smith's Dock of Middlesbrough and based on their steam whaler, *Southern Pride,* Patrol Vessels would have good sea-keeping ability and could be built in small yards using well known construction methods. They used simple and reliable machinery that was easy to build and maintain, consisting of an open-crankshaft style four-cylinder triple-expansion steam engine fed by two oil-fired Scotch boilers. Planned armament was a 4-inch gun, Asdic, and depth charges. (Developed in Britain during the 1920s, Asdic was the first shipborne active sonar system, named for the Anti-Submarine Division Investigation Committee). Patrol vessels did not, however, conform to the RCN's idea of a 'proper' navy; the Naval Staff desiring a fleet of Tribal-class destroyers and Halcyon-class minesweepers instead.

Circumstance overtook the RCN's vision when war was declared in September 1939. The Navy discovered that Canadian yards did not have the expertise to build ships to naval standards, nor could they be ordered from Britain because they were already overwhelmed with Royal Navy (RN) orders. The Canadians suggested a barter program where Canada would build Patrol Vessels to trade for British Tribal-class destroyers. Orders were placed with Canadian yards for sixty-four ships, with the expectation of trading about half for Tribals while the rest would replace requisitioned civilian vessels in Canada. Early in 1940 the barter arrangement collapsed. Ten Patrol Vessels already under construction in Canada for the RN were transferred to them, and the remaining fifty-four were assigned to the RCN. These ships became the first Canadian corvette program.

Despite being built from the same plans, the RN and RCN developed very different ships. Due to a chronic shortage of escort vessels, British corvettes quickly assumed the convoy escort and anti-submarine roles while the Canadian corvettes were built for inshore auxiliary duties. All except the ten being built for the RN were outfitted with Oropesa minesweeping equipment. This required removal of the galley from the aft end of the engine room casing, shortening the casing by four frames (over seven feet) to make space on the quarterdeck for the large steam-powered sweep winch. The galley moved forward over #1 boiler, creating a rise in the casing to clear the boiler itself. The stern was squared off, allowing room for the minesweeping equipment, sweep wire fairleads, and the depth charges.

Another difference was the location of the anti-aircraft gun tub. British corvettes placed theirs amidships on the casing forward of the main mast, which meant the gun could not fire directly astern. The Canadian

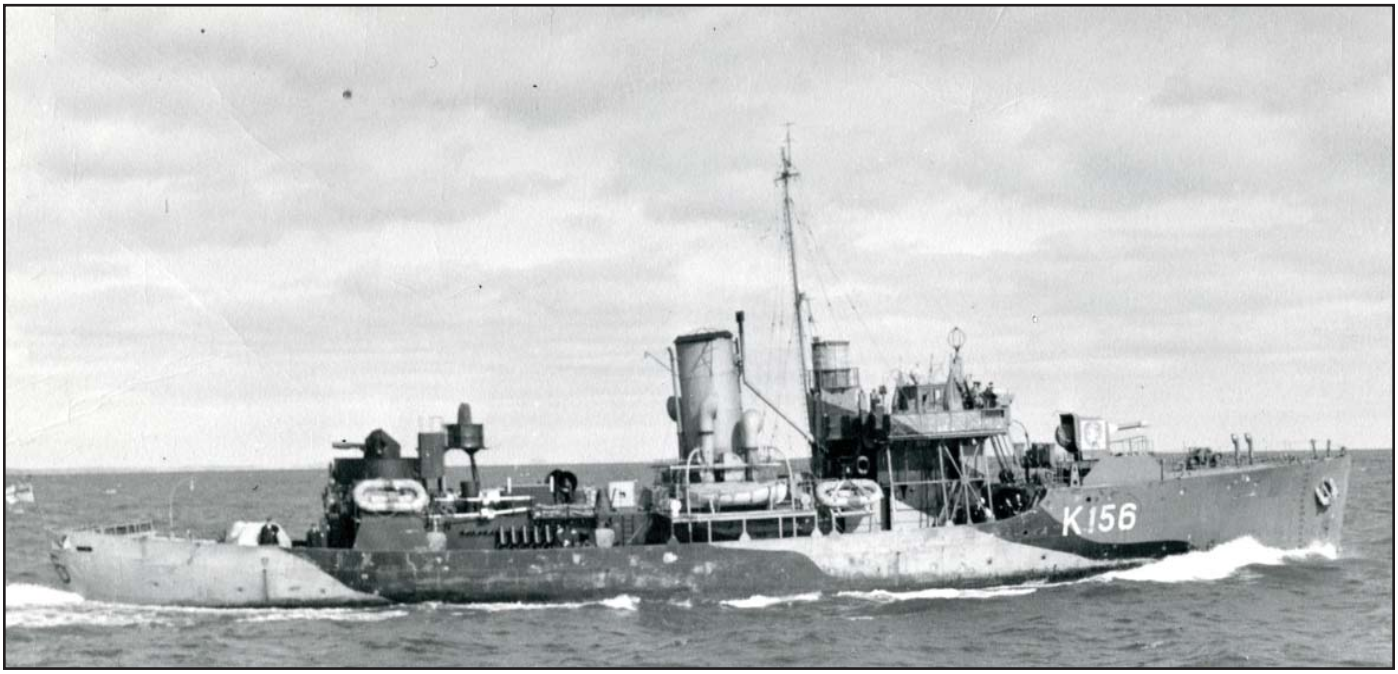

Figure 3 (April 1942): After refitting at Liverpool, Nova Scotia, *Chicoutimi*'s foremast has been moved aft and the bridge expanded. There are 20-millimeter cannons on the bridge and a 2-pounder in the aft tub. A 20-inch searchlight has been mounted forward of the gun tub. There are now four depth charge throwers. The galley stack now rises up the funnel instead of the aft side of the bridge. The structure between the mast and bridge is the British Type 271 radar. The SW radar was retained but its older Yagi antenna has been replaced at the masthead by four dipoles configured in an 'X'. Gun shield art has been added: Bugs Bunny chewing on a U-boat superimposed on an Indian head, saying "What's Up Doc?". The camouflage is an RN pattern.

solution was to place the gun tub at the after end of the casing and move the mainmast forward. Canada did not have a supply of 2-pounder anti-aircraft guns for which the tub was designed, so two dual 0.50-inch machine gun mounts were installed there. Lighter 0.30-inch Lewis guns were mounted on the bridge where the British had placed their heavier machine gun armament.

One other major difference between British and Canadian corvettes was to have severe ramifications on the Canadian ships' effectiveness. British ships were equipped with gyro compasses, electronically controlled and stabilized devices that gave a true reading of the ship's course in any sea condition, and which came with repeaters fitted throughout the ship: on the bridge, in the wheelhouse, and in the Asdic house. Canada lacked enough gyro compasses to equip the first program corvette fleet, so they were all commissioned with a single magnetic compass mounted in a binnacle inside the Asdic house on the bridge. Magnetic compasses were not stabilized and were not up to the modern navigation standards demanded by World War II. Their needles moved with every movement of the ship, so courses had to be guessed from the needle's mean position. They were graduated in 32 'points' rather than 360 degrees. These factors greatly complicated station keeping, U-boat hunting, and working in company with RN ships. It was not possible for a Canadian corvette captain to conn his ship from the open bridge and be inside the Asdic house watching the compass at the same time. Steering commands had to be passed from the bridge to the wheelhouse via voice pipe; the coxswain at the wheel had no second compass. No gyros meant the ships were not built with the low-power system necessary to operate them, so the first corvettes were also fitted with the Type 123A Asdic, an older system already considered obsolete in the RN.

Other than these differences, the Canadian corvettes were much like their British sisters, having an overall length of 205 feet, breadth of 33 feet 1 inch, draft aft of 15 feet 6 inches, and displacing 950 tons. The engine produced 2,750 horsepower at 185

revolutions per minute. Pressure in the fire-tube boilers was 225 pounds per square inch. While slow at getting up steam due to their large volume of water, the boiler had a large steam reserve that gave quick acceleration. Corvettes carried 230 tons of fuel oil in bunkers abreast each boiler room, giving a range of 3500 nautical miles at an economical cruising speed of 12 knots. Maximum speed was 16 knots, however at sea state 6 their maximum speed was reduced to 6 knots and the Asdic became ineffective. Their whale catcher design made them very agile ships that could easily outmaneuver a U-boat whether surfaced or submerged, although a U-boat was marginally faster on the surface.

Manned initially by four officers and forty-eight ratings, by war's end their complement had increased to between eighty-five and one hundred and five personnel due to more weapons, increasingly complex systems, and longer oceanic voyages. Crew spaces were steam heated, and Canadian corvettes had refrigeration, something the British ships lacked. Officers berthed aft per RN tradition but, as the size of crew grew, they moved to accommodations amidships and the after spaces were reconfigured for Chiefs and Petty Officers (some ships berthed the engineering crew aft). Seamen, stokers, and other trades berthed in two fo'c's'le mess decks. There was direct access from the upper mess to the main deck through an open well aft of the fo'c's'le. In time seamen also took over the original Chiefs' and Petty Officers' space aft of the lower mess deck. Eventually there was double the crew for which the forward messes were designed, and sailors ate and slept wherever they could find room. The lucky ones slung hammocks from the overhead beams while the rest slept on lockers, benches, or the deck. The crowding was exacerbated whenever the corvette picked up survivors, crews making space wherever they could squeeze them in. Corvettes were not equipped to care for survivors and did not have a sick berth or medical staff.

By the end of 1940 four RCN corvettes were in commission, fifty were still building and another sixteen had been ordered to meet the crisis as the Atlantic war developed. Six of this second procurement were ordered with the original short fo'c's'le. The remaining ten were revised based on British experience, with an extended fo'c's'le and greater sheer and flare to the bows for improved seakeeping, making them three feet longer than their short fo'c's'le sisters. The long fo'c's'le extended aft of the funnel, increasing the accommodations and enclosing the commanding officer's cabin and galley.

All sixteen corvettes of the second procurement were ordered with extended bridge wings and water-tube boilers. These smaller and lighter boilers could not deliver the rapid acceleration of the earlier Scotch boilers, but their steam delivery was more reliable, and their higher pressures could be sustained without causing failure of the boiler. None of these sixteen ships were fitted for minesweeping.

At the end of 1941 all but one of the original corvettes and six of the second procurement were in commission, the ten for the RN having sailed to Britain partially finished and manned by skeleton Canadian crews. They went unarmed since they were to be fitted out in the United Kingdom, at least one making the crossing with a wooden 4-inch gun. The RN was reluctant to accept these ships because they, too, lacked gyro compasses, and eventually they were commissioned into the RCN, becoming the only Canadian corvettes with British pattern hulls and Flower names.

The first eighty corvettes each took about ten months to construct at a cost of around $600,000, a remarkable feat of shipbuilding for the time. Except for three built by St. John Shipbuilding and Drydock in New Brunswick, all Canadian corvettes were built in shipyards along the St. Lawrence River, the Great Lakes, or on the west coast. Canadian corvettes were named after towns across the country, and for a brief period were classed as Town-class corvettes until that name was taken for the fifty American World War I-era destroyers given to Britain under lend-lease. Each community sponsored its name ship, and service clubs provided warm clothing, food parcels and other niceties to the crews. Often the mayor's wife christened the ship, and captains were encouraged to visit and thank the communities, if possible.

Manning the Ships

During World War II Canada had three navies: the professional Royal Canadian Navy (RCN), whose officers joined as teenage cadets and apprenticed in the RN; the RCN Reserve (RCNR), professional merchant mariners who were called up on the outbreak of war, many from retirement; and finally the RCN Volunteer Reserve (RCNVR), thousands of young men who signed up 'for the duration'. In time the RCNVR became the professionals of the RCN and many of its ranks rose to command, but in 1940 most had never even seen the ocean, much less sailed upon it. Hal Lawrence, in his biography *A Bloody War*, said "…the RCNR are sailors trying to be gentlemen, the RCNVR are gentlemen trying to be sailors, and the RCN are neither trying to be both!"

As the war progressed, Canada's navy grew from less than 2,000 to over 100,000 personnel. The RCN eventually became as good as any navy in the world through skill and sacrifice inherited from centuries of traditions of supremacy and leadership at sea. However, during the early years most of the professionals were employed aboard Canada's destroyer flotilla which sailed to Britain in 1940, or in training establishments and the Naval Staff ashore. There were not enough left to fill the key positions in the eighty new corvettes that flooded down the St. Lawrence, so they were manned largely by RCNVR sailors with no more than a few weeks of basic training, who learned their new jobs as they went along.

The first corvette captains were RCNR, and often they were the only officers aboard who had been to sea and who could use a sextant to navigate the ship. There might be less than half a dozen professional engineers and seamen on board. The few taught the many how to tend boilers, operate machinery, make and read flag and blinker signals, lower, row, and hoist boats, swing the lead, steer the ship, handle guns and ammunition, load and fire depth charges, and all the other minutiae required to man and fight a ship of war. During the winter of 1940 to 1941 they learned their business while conducting patrols off Halifax and Sydney, and while escorting convoys about 400 miles east to where the ocean escort of an old battleship or armed merchant cruiser took over as protection against the mid Atlantic threat from surface raiders.

Reports dated 1941 indicate that corvettes demonstrated "seamanlike handling" and could withstand "without material damage the heaviest gale in the North Atlantic". During these voyages the men discovered their ships were also wet and uncomfortable. Too short to span the Atlantic swells, they rose up one side of a wave and buried their bows in the trough of the next, green seas flooding the well aft of the fo'c's'le and soaking the mess decks. Corvettes also rolled with abandon. Many sailors were seasick for the duration of their voyages. Some never found their sea legs and had to be invalided ashore. At Action Stations, hatches were opened and a hoist rigged to pass ammunition from the magazine to the 4-inch gun, giving the sea access to the lower decks. Hot food, when it could be prepared, had to be carried from the galley forward along the main deck, often arriving cold and 'salty'. The heads discharged directly overboard, so concluding one's business became a matter of careful timing. The sailors and their possessions were often wet through for most of a two or three week voyage, and the inability to bathe soon gave the mess decks a fug of vomit, unwashed bodies and wet woolen clothing that could not be eradicated until the ship came into the lee of the land.

Early Operations

In May 1941 the RCN was asked to establish the Newfoundland Escort Force (NEF) based at St. Johns, so anti-submarine escort could be provided all the way across the Atlantic. By the end of that year nearly sixty of Canada's eighty corvettes, including the ten built for the RN, plus the RCN's destroyers, were committed to the mid-ocean convoy system instead of the inshore duties originally planned, and in an area known for freezing gales and persistent fog. The NEF was organized into escort groups consisting of four or five corvettes and two destroyers, aided by the British ability to route convoys away from known wolf pack locations. By the fall of 1941 the USN also

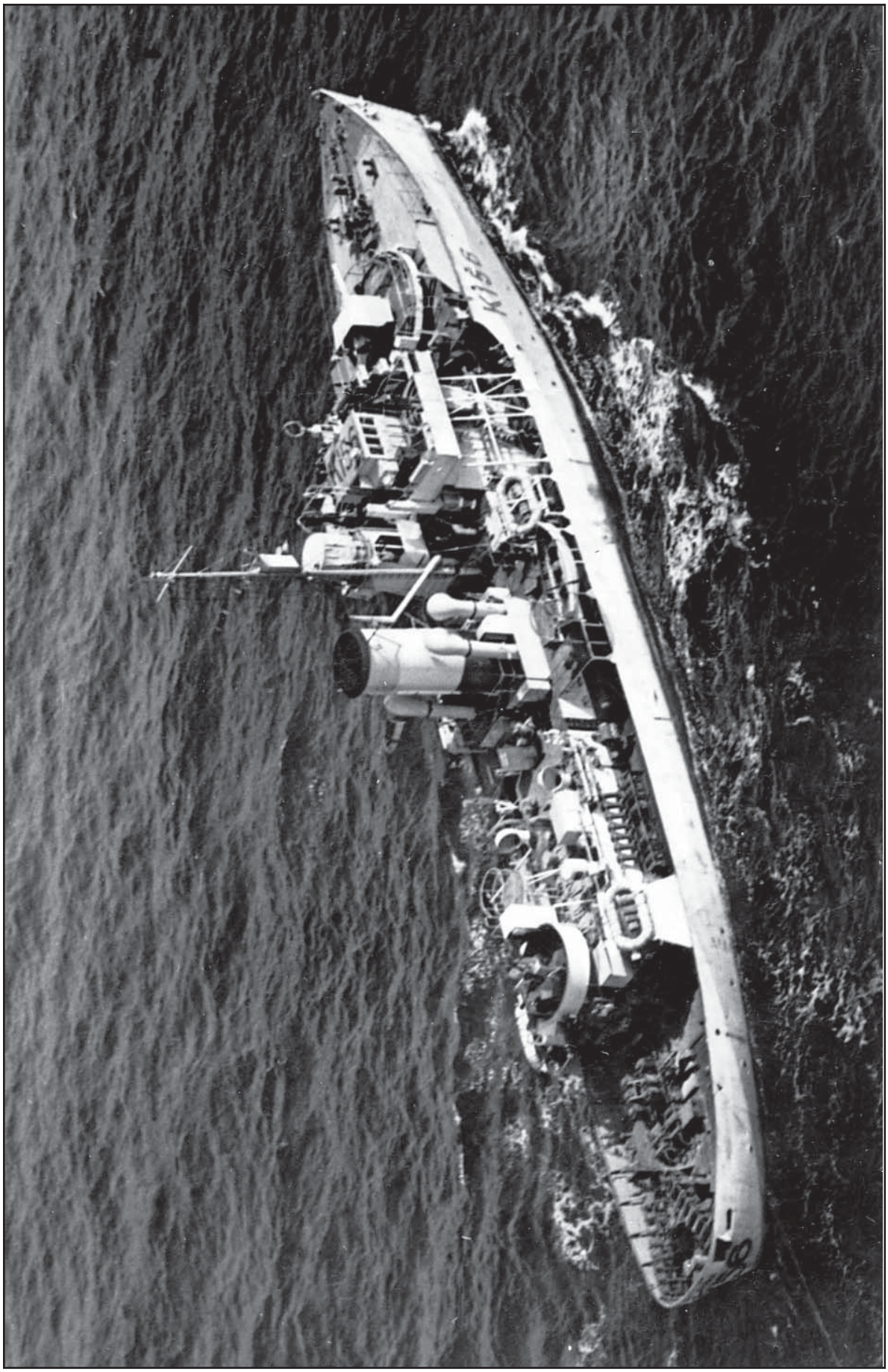

Figure 4 (October 1943): *Chicoutimi*'s silhouette has not changed, but the 20-inch searchlight has been removed for some reason, and the Western Approaches camouflage restored.

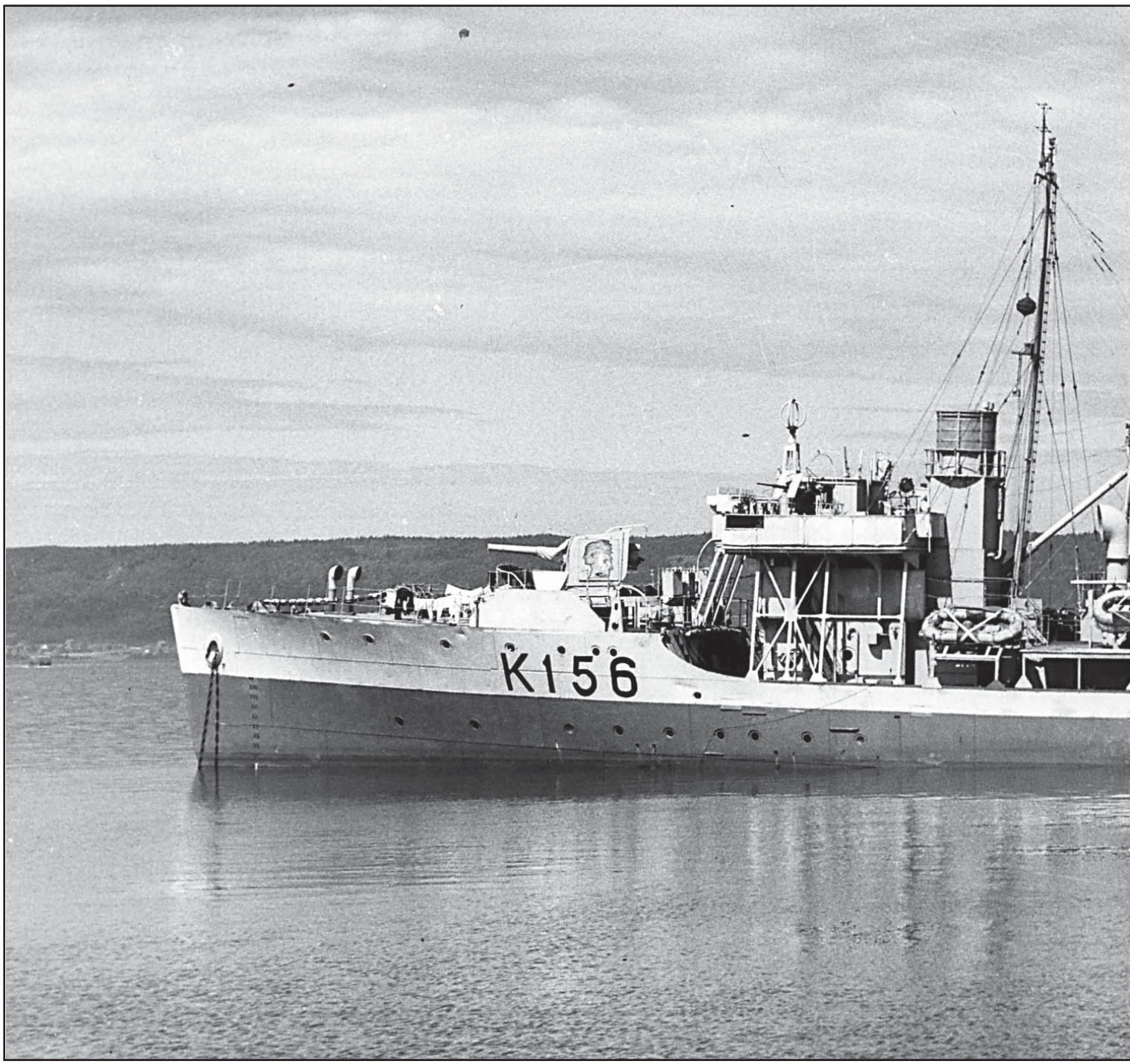

Figure 5 (1944/45): From September 1944 to March 1945 *Chicoutimi* was assigned to the training school, HMCS *Kings*, at Halifax, presumably because the ship was not modernized and crew morale was suffering. The searchlight is back. The 16-foot dinghies have been replaced with

began escorting convoys west of Iceland through what the then-neutral United States called the "non-war zone". Their escorts were faster destroyers, so they escorted the faster convoys while the Canadian groups escorted slower ships, thereby bearing the brunt of the U-boat assault.

With their inexperienced crews and obsolete Asdic, Canadian corvettes posed little threat to a skilled submariner in 1941. If a corvette was lucky enough to find a U-boat and blow it to the surface with depth charges, it was nearly impossible to hit it with the 4-inch gun due to the motion of the ship. It became standard practice to use the corvette's maneuverability

extra rafts port side and a 27-foot motor whaleboat to starboard, the new standard corvette arrangement.

to sink surfaced U-boats by ramming. The trade-off of considerable damage to the bows versus a kill was considered acceptable.

By the end of 1941 British corvettes were being equipped with an effective radar, the Type 271, and modern Asdic systems that made them effective U-boat hunters. The RCN however, had to make do with the obsolete equipment available to it. The Canadian-designed SW series radar began to be fitted late in 1941. It was suitable for navigation but did not have the resolution necessary to detect U-boats at long range or in heavy seas. Besides lacking the latest technology, the first Canadian corvettes were initially

prone to rust. The pressures of war time construction meant that the steel plate was not left outside long enough for weather to remove the mill scale left after production. After a short time in the Atlantic the wind and salt did that job, taking the paint with it.

There is no question that Canadian corvettes and their crews went to war ill-prepared during 1941, but their presence permitted the trans-Atlantic convoy system, the bedrock of the Battle of the Atlantic, to be established.

With the United States' entry into the war the focus shifted away from the North Atlantic as U-boats moved to the unprotected American seaboard. The USN's reluctance to adopt a convoy system came as a shock to those who had been fighting since 1939, and, in March 1942, the RCN began convoys from Boston to Halifax. By May losses off the east coast were so severe that the RCN also initiated Caribbean tanker convoys, which continued until late summer when the reduced loss rate finally convinced the USN to establish their own convoy system. The RCN placed six corvettes under USN operational control for those duties, and the RN lent others.

The strength of the NEF was further reduced when sixteen ships were re-assigned to inshore convoy work in the St. Lawrence and on the 'triangle run' between New York, Halifax, and St. Johns. In August an additional seventeen corvettes were withdrawn for Operation Torch, the Allied landings in North Africa. It was significant that the Canadian-built British corvettes and ten of the revised corvettes, most of the best equipped in the RCN, were on loan to other navies by the fall of 1942.

The remainder of the Canadian corvettes, most of the short fo'c's'le builds, sailed through 1942 without new equipment, refits, repairs, or proper training. The exigencies of war made this necessary, but the price of neglect was high. During the last half of 1942 eighty percent of ships lost in mid ocean were escorted by Canadian groups in slow convoys. The British blamed poor leadership and training, while the RCN argued the root causes were outdated equipment and lack of destroyers. By the end of the year merchant shipping losses were not sustainable, the RCN had reached its limit, and their forces were withdrawn from the mid-ocean escort role.

There were also corvette losses, balanced by some successes. Corvettes were not designed to withstand heavy damage, and one torpedo was enough to sink them. *Levis* had its bows blown off by a torpedo in September 1941 and sank with the loss of seventeen lives. In the same month *Chambly* squared the account by blowing *U-501* to the surface, then ramming and sinking it. In December *Windflower* was sunk in collision with a freighter it was escorting. *Spikenard* was torpedoed in February 1942 near Iceland, only eight of the crew surviving fourteen hours in the water. *Wetaskiwin* shared in the sinking of *U-558* in July, and *Charlottetown* was sunk off Gaspe in September. In August *Oakville* blew *U-94* to the surface near Haiti, rammed it twice, and boarded the boat before it sank. In the same month *Sackville* damaged two U-boats and attacked a third in one day. Had the ship possessed modern radar and heavy anti-aircraft weapons it might well have sunk all three, but the SW radar and machine guns were not enough to give a decisive edge at night and in the fog.

Modernization

The Canadians had known early in the war that the British were modifying the forward half of their corvettes to make them more suitable for the Atlantic. Canada saw different roles for these urgently needed ships so decided against modifying the first production program while they were still being built. The British had begun modernization of their ten Canadian Flowers, so that by early 1943 these were the best equipped corvettes in Canadian service. The question Canada faced in 1942 was whether or not to start modernizing seventy ships that were now considered obsolete, or to construct new types such as the Castle-class corvette and River-class frigate. The Naval Staff was unenthusiastic about modernizing the first corvettes because of the long time each ship would be out of service, the complexity of the work, lack of shipyard space, and the difficulty of obtaining equipment.

The structural work involved lengthening the fo'c's'le and enlarging the bridge, as per the revised corvettes; this would improve accommodations, seakeeping, command and control, and provide a platform for the new Hedgehog anti-submarine mortar. The forward half of the ships needed re-wiring with the low power system necessary to operate gyro compasses, electronic plots, the latest Asdic sets, and the Hedgehog. Canada would need to acquire this high-tech equipment as well as 20-millimeter cannons for the new bridge and the 2-pounder anti-aircraft gun for the after tub. Most of this equipment and weaponry had to come from Britain or the United States, and Canada was at the far end of very long supply chains.

A complicating factor was that there were very few Canadian shipyards that could carry out the work. Once fitted out for war service, corvettes could not return to the Great Lakes yards that had built the majority because they could no longer clear the locks on the St. Lawrence River. West coast yards were too far away, and shipyards on the east coast were backed up with repair work and new construction.

By the end of 1942 corvettes had had their mainmasts and minesweeping equipment removed, and around that time the Naval Staff authorized modifications that could be carried out quickly and economically, but not a full modernization program. The authorized work included moving the foremast aft of the bridge and expanding the bridge. Oerlikon cannons were mounted on the bridge wings and a second magnetic compass binnacle on an extended front so the captain could remain on the bridge during action. The 2-pounder anti-aircraft weapons were finally procured for the after gun tub and a 20-inch searchlight was added there as well. Modern Type 271 centimetric radar sets were installed on a raised structure behind the bridge. The modifications were mostly carried out in yards on the east coast or along the St. Lawrence below Montreal.

About six months after the modifications were authorized, the Naval Staff finally approved full modernization of the corvette fleet. However the work proceeded slowly with only fourteen corvettes finding space in Canadian yards in 1943. The RN modernized the remaining eight built for them in the United States under lend-lease, but only had dockyard space for two RCN corvettes that year, while two more completed modernization in American yards. During 1944, twenty-two corvettes were modernized in Canada and another eleven in the United States or Britain. Six short fo'c's'le corvettes were sunk and the remaining five were never modernized. Those ships received the authorized improvements listed above, but went through the entire war with short fo'c's'les and obsolete Asdics, their crew morale suffering accordingly.

Even though Canadian corvettes had been withdrawn from the mid-Atlantic at the end of 1942, they remained the major escort force for convoys elsewhere. During the support for Operation Torch *Ville de Quebec* sank *U-224*, *Port Arthur* sank the Italian *Tritone*, and *Regina* sank *Avorio*. In March, while escorting Gibraltar convoys, *Shediac* shared in the sinking of *U-87*, and *Prescott* sank *U-163*. Against these successes the corvettes *Louisburg* and *Weyburn* were lost. In the fall of 1943 the RCN returned to the mid-Atlantic with three support groups providing assistance to convoys under attack, and over that winter they accounted for the sinking of three more U-boats: *Snowberry* sharing *U-536*, *Camrose* sharing *U-757*, and *Chilliwack* and *Fennel* sharing *U-744* with five other escorts after a 32-hour hunt that expended 291 depth charges.

Late War Corvettes

By 1942 the solution to convoy escort was seen as the River-class frigate, known during its design stage as the 'twin screw corvette'. By the end of the war Canada was operating seventy frigates, but in 1942 Canada ordered an additional fifteen corvettes from shipyards that would otherwise have been idled, an unthinkable prospect while the fate of the free world was being decided. These were not the obsolete ships of the earlier building programs, but the first of the Increased Endurance (IE) type of the Flower-class. Their hulls incorporated all the lessons learned during three years of fighting, including a bridge built to naval standards with an open pilotage and modern Asdic

compartment at the forward end. The gun platform was directly connected to the wheelhouse, and a deck higher than earlier designs. This also elevated the bridge, making a three-level superstructure. The gun was the 4-inch semi-automatic Mk. XIX with a high angle mount for engaging air as well as surface targets. Hedgehog was mounted beside the gun, integrated with and fired by the new Type 144 Asdic. IE corvettes had forced draught boiler rooms and dispensed with the characteristic large stokehold ventilators around the funnel. Their IE name came from enlarged bunkers that doubled their range to 7400 nautical miles at 10 knots.

Another twelve IE corvettes were ordered in 1943 as Canadian production in the smaller shipyards began switching to Algerine-class minesweepers. The British also wanted Algerines so offered in trade four more IE corvettes being built in Britain, and twelve of a completely new corvette type, the Castle-class.

The final corvette order from Canadian yards was for fifteen IE ships for the USN, commissioned as the Action-class of Patrol Gunboats (PG-86 – 100). These joined ten modified corvettes provided to the USN by the RN in 1942, known as the Temptress-class (PG-62 – 71). Only eight of the Action-class served the USN, the other seven going directly to the RN. The Americans replaced the 2-pounder anti-aircraft gun with a 3-inch 50 cal. weapon, and the Temptresses carried a second similar gun forward instead of the older model 4-inch gun. They sank no U-boats and suffered no losses.

The IE and Castle corvettes formed most of the mid ocean escort groups during the last eighteen months of the war, while the corvettes of the earlier programs moved back to the inshore duties for which they were originally designed. This was somewhat ironic because the use of Allied air power and specialized submarine hunter-killer groups had forced the U-boats into quieter zones where the older corvettes now operated.

By May 1944 the RCN was fully responsible for all trans-Atlantic convoy escort, and the mid-ocean escort force now numbered nine Canadian groups. The IE type fought no major battles and sank no submarines during their relatively brief careers. Nineteen Canadian corvettes served in Operation Neptune, the naval component of Overlord. During that time *Alberni* shot down a JU-88 but itself was sunk by *U-480* a month later. *Regina* was torpedoed by *U-667* in August, and *Trentonian* was lost to *U-1004* in February 1945.

Canada's east coast was one of the last areas where ships destined for the United Kingdom could be threatened, and several were sunk during the last few months of the war. In late November *Shawinigan* was patrolling independently after escorting the regular ferry to Port-Aux-Basques in Newfoundland. Sometime during the night the corvette was sunk by *U-1228* with the loss of all hands.

Where have all the Flowers gone?

With the European war over in May 1945 there was no further need for Atlantic escort forces, and disposal was swift. The eight survivors of the original ten Flowers built for the RN were returned to Britain by June, where four were scrapped and the others sold for conversion into whalers. The RCN corvette fleet sailed to Sorel, Quebec, where all but one were handed over to the War Assets Corporation by April 1946.

Thirty-eight Flowers went straight to the breaker's yards; the rest, including most of the IE type and the Castles, were sold for other uses. Forty-nine were converted into merchant ships, serving under more than a dozen flags. They became coastal steamers, weather ships, salvage ships, and thirteen were converted into whale catchers. Most of these vessels had gone to the breakers by the end of the 1960s, some were lost, but a few sailed on into the 1970s.

Seven mercantile corvettes returned to naval service; the former *Norsyd* and *Beauharnois* smuggled Jews into Palestine before being taken into the new Israeli Navy, and *Barrie* was converted into an Argentinian Navy survey vessel. Four of the eleven Castles that went to the Chinese were converted back to warships; *Copper Cliff*, *Orangeville*, and *Bowmanville* were taken

Figure 6 (June 1945): *Chicoutimi* decommissioning at Sydney, Nova Scotia. The 4-inch gun is gone, as are the mess deck vent cowls and one of the 20-millimeter gun shields. Shortly after, *Chicoutimi* would make its last voyage under tow to Sorel and the War Assets Corporation.

over and re-armed by the People's Republic in 1948. *Tillsonburg* served the Nationalist Chinese Navy.

Seventeen ex-RCN corvettes were sold to South American navies. Venezuela bought seven, Chile three, Uruguay one, and six went to the Dominican Republic. By 1979 only two, *Louisburg II* and *Lachute*, remained. Negotiations to have them repatriated to Canada were underway when they were both blown ashore and wrecked by Hurricane David.

By 1980 there was only one ship left of Canada's wartime fleet of 123 corvettes: *Sackville*. In 1944, shortly after being modernized in Galveston, Texas the #1 boiler failed. There was no point in undertaking the enormous task of replacing the Scotch boiler at that point in the war, so *Sackville* became a training ship and was later re-fitted as a loop layer. The #1 boiler room became the cable tank, and the 4-inch gun was replaced by the winch and other equipment necessary for the new task. In this role *Sackville*

removed the seabed cable sensor loops off Canada's east coast harbours. This post-war use meant the ship was assigned to the reserve fleet. During the cold war *Sackville* became an oceanographic survey ship, a naval auxiliary manned by civilians. To carry out this new work a laboratory was fitted over the engine room casing, the fo'c's'le extended further aft, and the bridge replaced. *Sackville* was finally retired in 1982 after forty-one years of Atlantic service.

The Government of Canada dedicated *Sackville* in May 1983 as the Canadian Naval Memorial. By 1985, the seventy-fifth anniversary of the RCN, *Sackville* had been returned to its 1944 configuration following modernization, incorporating all the improvements made to the original fifty-four Canadian corvettes during the war. The ship is open to the public during the summer months, berthed next to the Maritime Museum of the Atlantic at Halifax. Its custodians are the Canadian Naval Memorial Trust. Their website is www.http//hmcssackville.ca.

HMCS *Chicoutimi*

My father-in-law served for a time aboard HMCS *Chicoutimi*, so for me this was the obvious subject when I decided to model a corvette. *Chicoutimi* shows off the original corvette design built in Canada: short fo'c's'le ships that performed all the unglamorous duties of convoy escort on the North Atlantic and around the east coast. *Chicoutimi* was one of five corvettes that was never modernized so epitomizes the corvettes that went to war in 1941. With untrained crews and inadequate weapons they carried the brunt of the war during the years when no other ships were available. *Chicoutimi* was built by Canadian Vickers Ltd. in Montreal, Quebec; launched on October 16, 1940, commissioned May 12, 1941, paid off on June 16, 1945, and broken up at Hamilton, Ontario in 1946. Six photographs illustrate *Chicoutimi's* evolution during its brief career.

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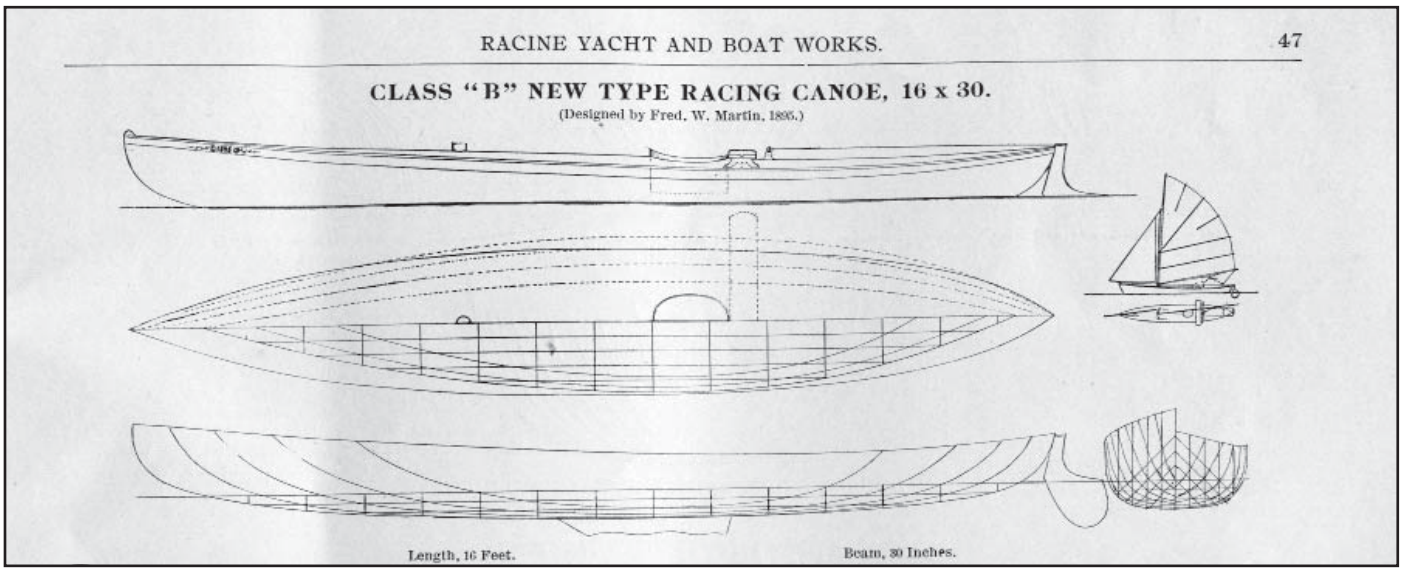
Bruce LeCren retired in 2006 after 33 years with Canada's Air Traffic Services system. His professional qualifications include Electronic Technologist and Adult Educator. Bruce has had a lifetime interest in nautical history. He has contributed articles to magazines and professional journals, including "St. Roch: Master of the North" for Ships in Scale. He has donated HMCS *Chicoutimi* to a naval museum; his next project will be a model of R.C.M.P. *St. Roch*. Bruce resides in Beaumont, Alberta with his wife Dale and their two dogs.



1. Fred Martin's drawings of the boat, from an 1895 Racine Yacht & Boat Works catalog.

A 16x30 decked canoe from 1895, Part 1

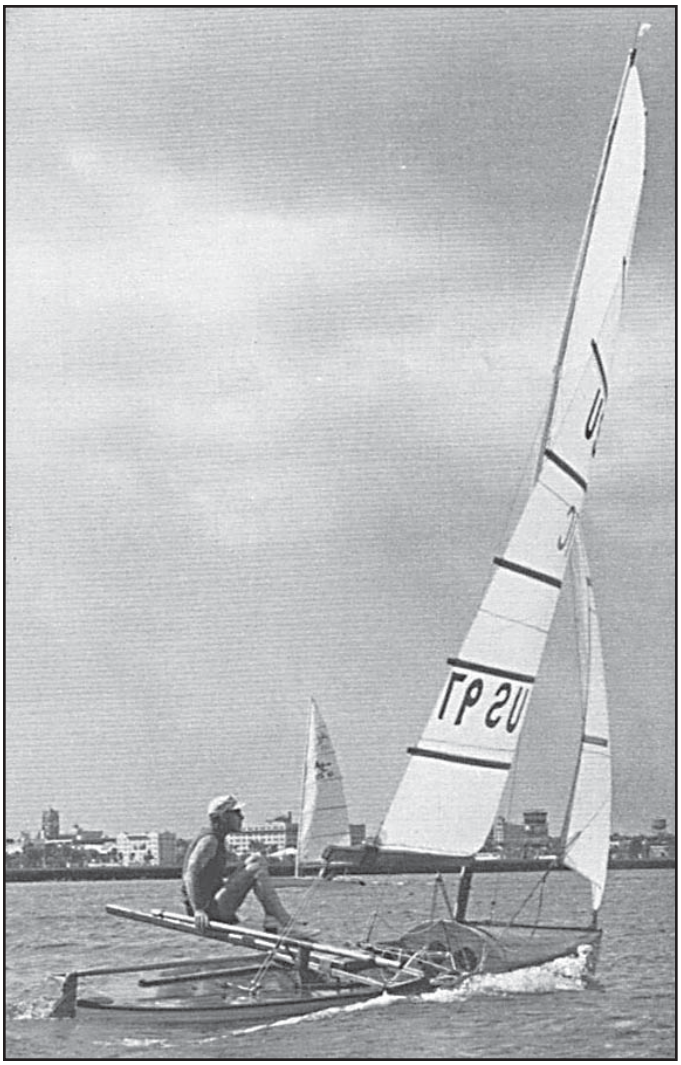
By Steve Wheeler

As readers of these pages probably know by now, I tend to model subjects that have a connection with Racine, Wisconsin, my hometown. This sailing canoe was designed there by naval architect Fred W Martin in 1895. But what, really, is a canoe? One definition is: "Any of various slender, open boats, tapering to a point at both ends, propelled by paddles, or sometimes sails", and Martin's design certainly fits that description.

Canoes have been around for perhaps thousands of years and there have been many, many forms, from early dugouts used by native peoples and Pacific Islanders for transportation, to the large bark canoes sometimes used by early voyageurs to carry goods, to more conventional types used for recreation and sport. Recreational canoes were built in almost endless variation almost everywhere in this country. The five boat companies that operated in Racine around the turn of the twentieth century, for example, produced and marketed no less than twenty-six distinct designs.

Canoes formed a major part of the early transportation network in the United States as roads tended to be poor or non-existent before the advent of the 1920s. John MacGregor, a Scotsman, is generally credited with developing the first decked sailing canoe. In the 1860s he designed a boat that he named *Rob Roy*; it had a sail and was set up so he could sleep aboard and in it he made extensive cruises on the waterways of Europe. In 1866, he published a book about his travels entitled *A Thousand Miles in the* Rob Roy *Canoe*, which popularized his design and canoeing in general as a sport both in Europe and the United States. Fred Martin's canoe (just one of several he designed) is a direct descendent of that boat. Cruising canoes like MacGregor's became extremely popular in all parts of the country and, as one would expect, when two canoeists met they often raced one another to see who was fastest. Sailing canoes specifically designed for racing were one outcome of these early contests and serious competition began with designers and full-time naval architects vying with one another to see who could come up with the fastest boats. Distinct classes evolved and the "16 x 30" type was just one.

Fred W Martin was one of the few designers in those days who actually published hull lines for his work; the accompanying drawing of his boat, (Figure1), is



2. A modern sailing canoe. Image via the author.

from Martin's *Racine Yacht & Boat Works* catalog, which he published in 1895. It is reproduced from a scan of an original owned by a friend of mine… which, unfortunately he will not sell to me. The boat, whose hull actually looks much like a kayak, conformed to the 16 x 30 class rules, of which there were only two: boats could be no longer than 16 feet and their beam had to be less than 30 inches. Everything else was completely open. The hull form, weight, sail plan (both in area and the number of sails), and construction were left to the designer's imagination. Martin came up with a round-bottom, carvel (flush) planked hull that looks to be seriously over-canvassed. To keep the boat upright it had, like many other racing canoes of the day, a sliding seat that the skipper could crawl out upon to put as much weight to windward as possible. Steering from this position created difficulty too, and Martin gave the boat a tiller bar that slid in a metal fitting attached to a yoke arrangement mounted on the deck forward of the rudder; another design detail that was, and still is, popular in boats of this type.

The oversize mainsail was called a "batwing" for obvious reasons; it added an extreme amount of area by virtue of the full-length battens that held the after part of the sail, the roach, in place. Battens on sails like this could be either enclosed in pockets or doubled and laced to either side of the sail, the latter being the version I modeled. A small jib completed the rig, but Fred Martin said in his catalog description of this boat that the sail plan he showed was only a suggestion and "any other may be fitted". I have measured about 130 square feet of sail area between the main and jib—which is a lot for a sixteen-foot hull. The rig itself was a sliding gunter, where the mainsail gaff is hoisted by a single halyard.

Fred Martin was usually picky about detailing deck details in his drawings but here he showed no provision to get inside the hull (either by omission or design) and because every wooden hull of this type leaked to some extent it was probably necessary, although not shown on the drawings, to add a pair of drain plugs in the bottom to let out water. Martin noted that the centerboard was made of brass plate but that lack of access to the inside of the hull probably meant it would have a notch that sat on a pin on which it could pivot; it could then be lifted out to be removed.

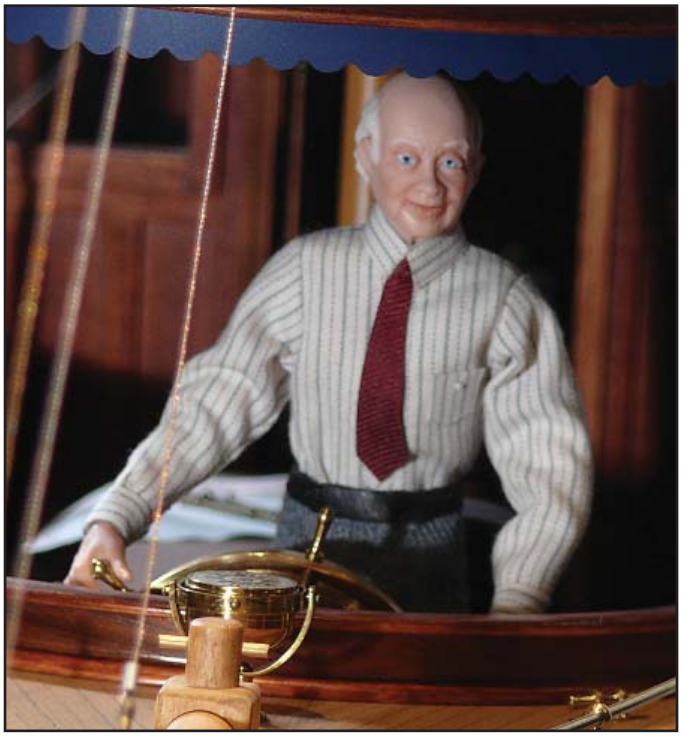
The boat had a cockpit (which, as Martin noted, was of "the bathtub" variety) that was clearly too small to do anything but hold lines and put one's feet in; cockpits on boats like this are always awash with lines and the model's cockpit is a mess with them, too. Any water that entered it drained through the centerboard slot.

Decked sailing canoes similar to this are still being built and raced, although the 16 x 30 class disappeared in the 1930s and was replaced with other, similar, classes. Modern boats look surprisingly like this 1895 design and can have many of the same features: sliding hiking seats (the forerunners of modern-day trapezes), unusual tiller arrangements, and huge sail plans. They can be exciting to sail. A sailor from a hundred or more years ago, transported to today, would instantly recognize these modern boats, one of which is shown in Figure 2.

The model

Like all my models, I scratch built it to 1:12-scale, or one inch to the foot, and so it is sixteen inches long. To show off its best characteristics, mounting it required extra care, so that needed to be determined before construction began. The major visual point of the boat is the sail plan so I decided I would have to mount it heeled over, with both the mainsail and jib set and drawing. So that this made sense, and to highlight how that sliding seat and the tiller arrangement worked, the display would need a skipper sailing the boat; he would also point up the scale of the result, showing just how big (or small) things were, and he would give an indication of how lines might be handled, too.

The problem was finding a figure that would do the model justice. There were two options: use a very well done, exact scale figure or find or make a good representation of a human. Quite a number of years ago I was able to buy three 1:12-scale (common for dollhouse miniatures) figures for a series of models I was building. They had porcelain heads, hands, and feet and were fully posable, being constructed on wire armatures. They were extremely well done, but hideously expensive, and had clothing that was glued on, not sewn, which eliminated bulky seams and gave them a much more realistic look. (Figure 3) A miniature this good would have been perfect but the lady who supplied me no longer made them. I spent a lot of time looking at miniature sites on the web but none of the figures I was able to find even came close to those I had. Some actually looked pretty cheesy and none of them would do at all.



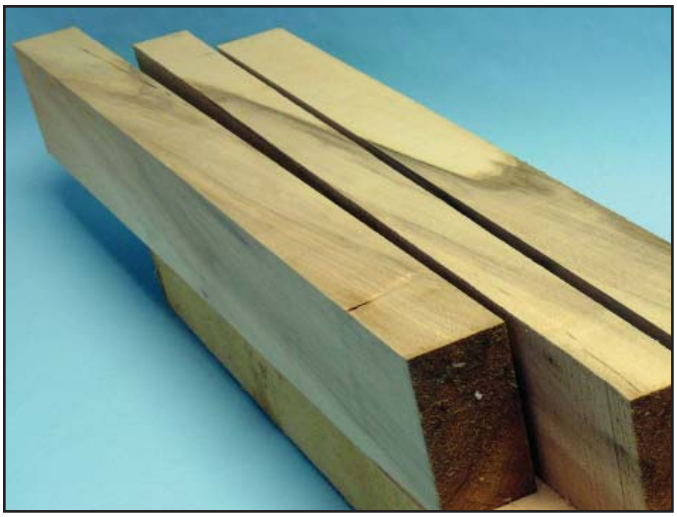
3. A 1:12-scale miniature figure I used on another model. Figures this good, unfortunately, are no longer available. All photographs by the author unless otherwise indicated.

I then looked at Plan B, a representation. My first thought was to buy (or make) a posable wire-form armature that would give the impression of a figure. I was not able to find a suitable item and making something more than just a wire stick figure seemed to be beyond my skill set. Then I thought of folding up a figure from cardboard but rejected that idea as I thought it might be too flat. What I finally chose was one of those wooden, posable mannequins that artists use. They look like humans, but clearly are not, and I thought that one could be just right for what I needed. These come in a number of sizes (the smallest I found was four inches high) and are amazingly well done. My web searches turned up a mannequin standing 5-1/2 inches tall, which equates to 5 feet 6 inches in my scale—just perfect. (Figure 4) It comprises twenty-nine individual wood parts, all finely turned and sanded hardwood, plus a number of screws and internal springs. The best thing is that it cost the princely sum of $2.58 on eBay and shipping

4. The posable artist's mannequin I used for the 16 x 30's skipper. At 5-1/2 inches tall, he would later have his joints filled and be painted.

was free! Once I posed him, filled his joints, and painted him gray he would turn into a sort of shadow figure sailing the boat.

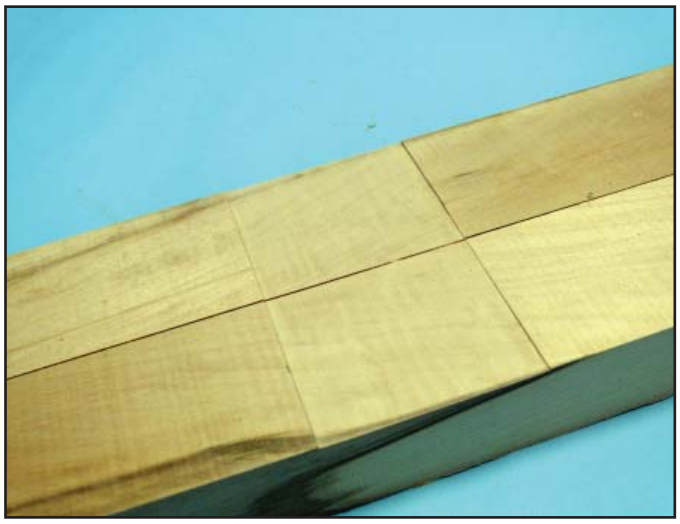
With the mounting and the skipper figured out actual building could start. I will highlight some of the tools and fixtures I used in the process. A few might be old news to some but hopefully they might help other folks. Note, too, that how I do things is clearly not the only way and builders should do what is most comfortable and works best for them.



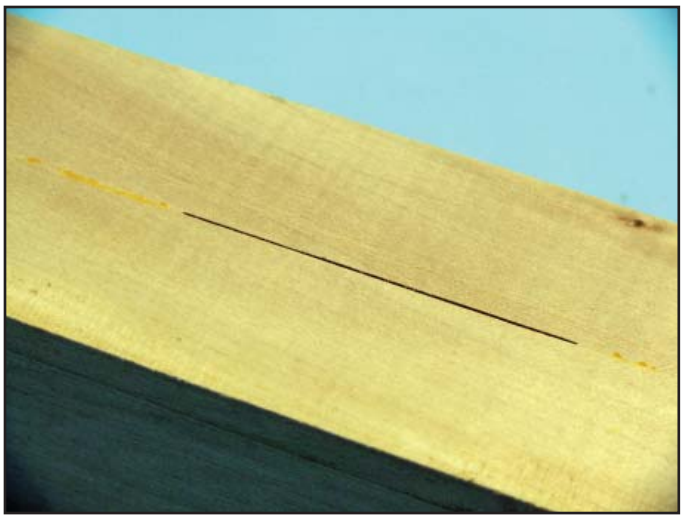
5. The basswood billet, sawed and ready.

The hull

To make things seem to go faster I tend to turn parts of a build into individual models. This breaks up what can sometimes seem like an endless job into manageable pieces and makes the light at the end of the tunnel at least look a little brighter. The first of those individual models was the hull, usually a good starting point. As with any scratch-built model there are always options. I have built hulls using the plank-on-bulkhead method, molded custom fiberglass, and carved from solid using separate waterline lifts. The small size and relative simplicity of this subject—everything was convex—seemed to dictate a solid hull

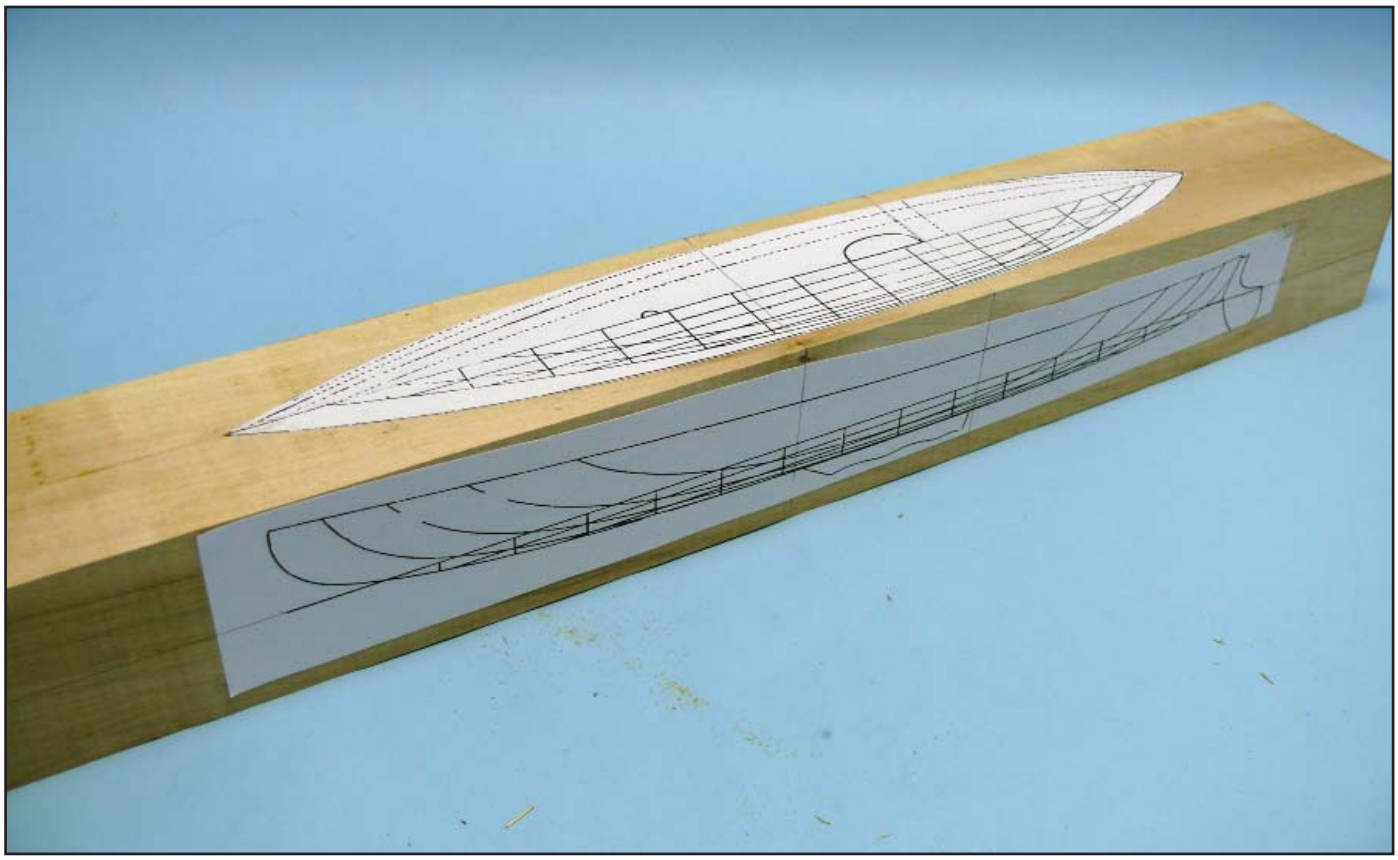


6. One half of the centerboard slot routed in each piece.

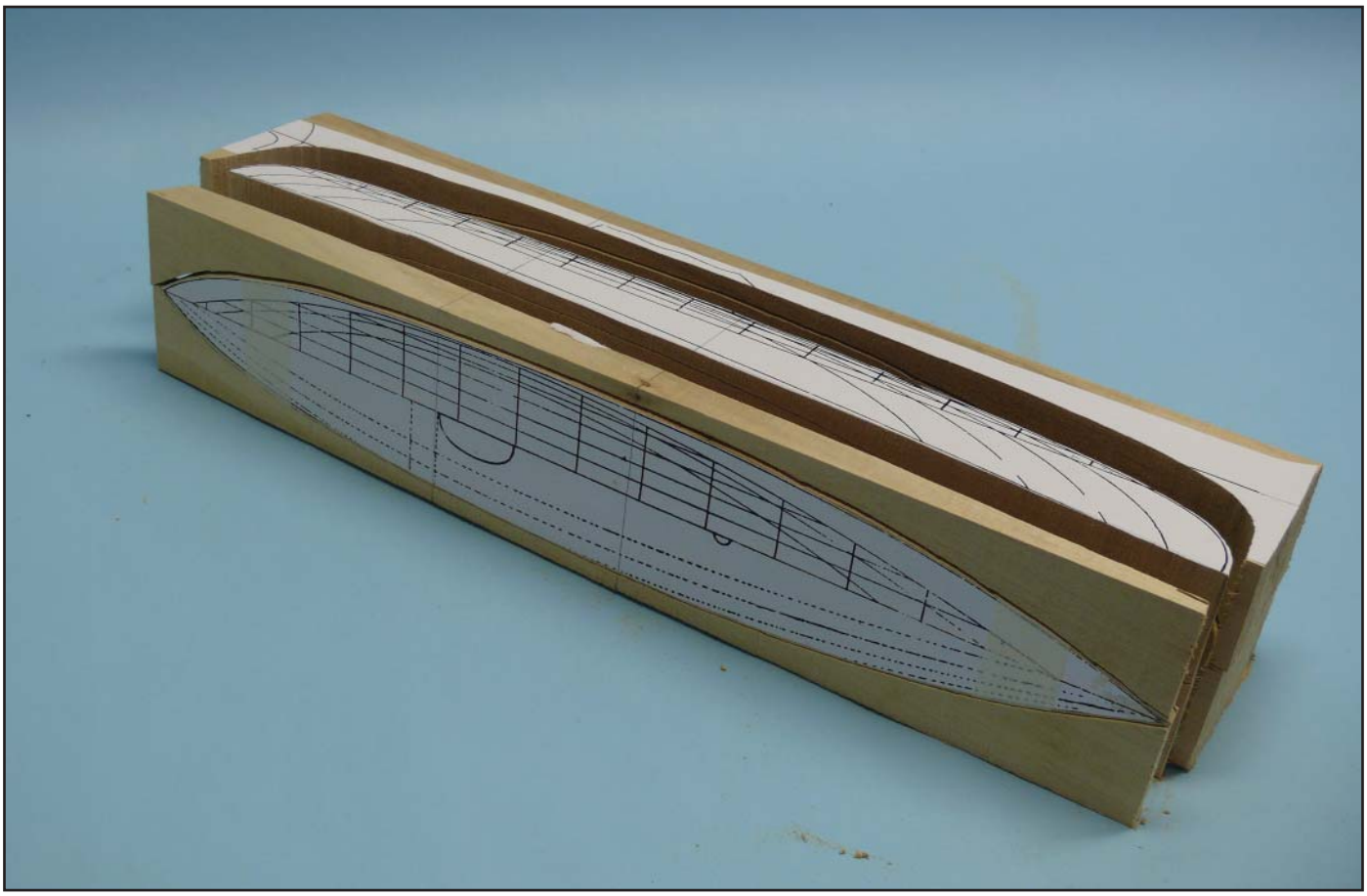


7. The hull blank as it was glued up with the resulting centerboard slot.

without the use of lifts. I had a 5-inch-square billet of basswood that was perfect. I do not like to waste wood, so I band-sawed it into four pieces. (Figure 5) The two outer upper pieces became the model and the rest went into my stockpile. Why use two pieces for the model instead of one? Being a centerboard boat, it needed a slot (detailed on Martin's plan) and the best way to make it was to rout half of it into each half of a block split down the middle. I used a Dremel rotary tool with a router base for this and routed down just a little less than 1/32-inch. (Figure 6) When the two halves were glued together, the result was the blank in Figure 7. The next step was to glue copies of the top and profile views of the hull from the plan to the blank (Figure 8) and cut out the hull. Note that Martin's sheer draft (the side view on the block in Figure 8) does not show the height of the deck at the centerline, so I added it afterwards. This was one of those things that easily could have been forgotten, and I almost did. I band-sawed the blank in two steps, first sawing out the top view and then the profile view. If you are building a hull this way, do not throw out the offcuts. After cutting out the top view, tape the offcuts back onto the blank and then saw out the profile, or vice-versa. The offcuts both stabilize the blank and replace the profile drawing, which had been cut away. (Figure 9) The offcuts, taped back on yet again, also help stabilize things when sanding right to the lines on the drawings with



8. Top and profile views glued onto the hull blank.

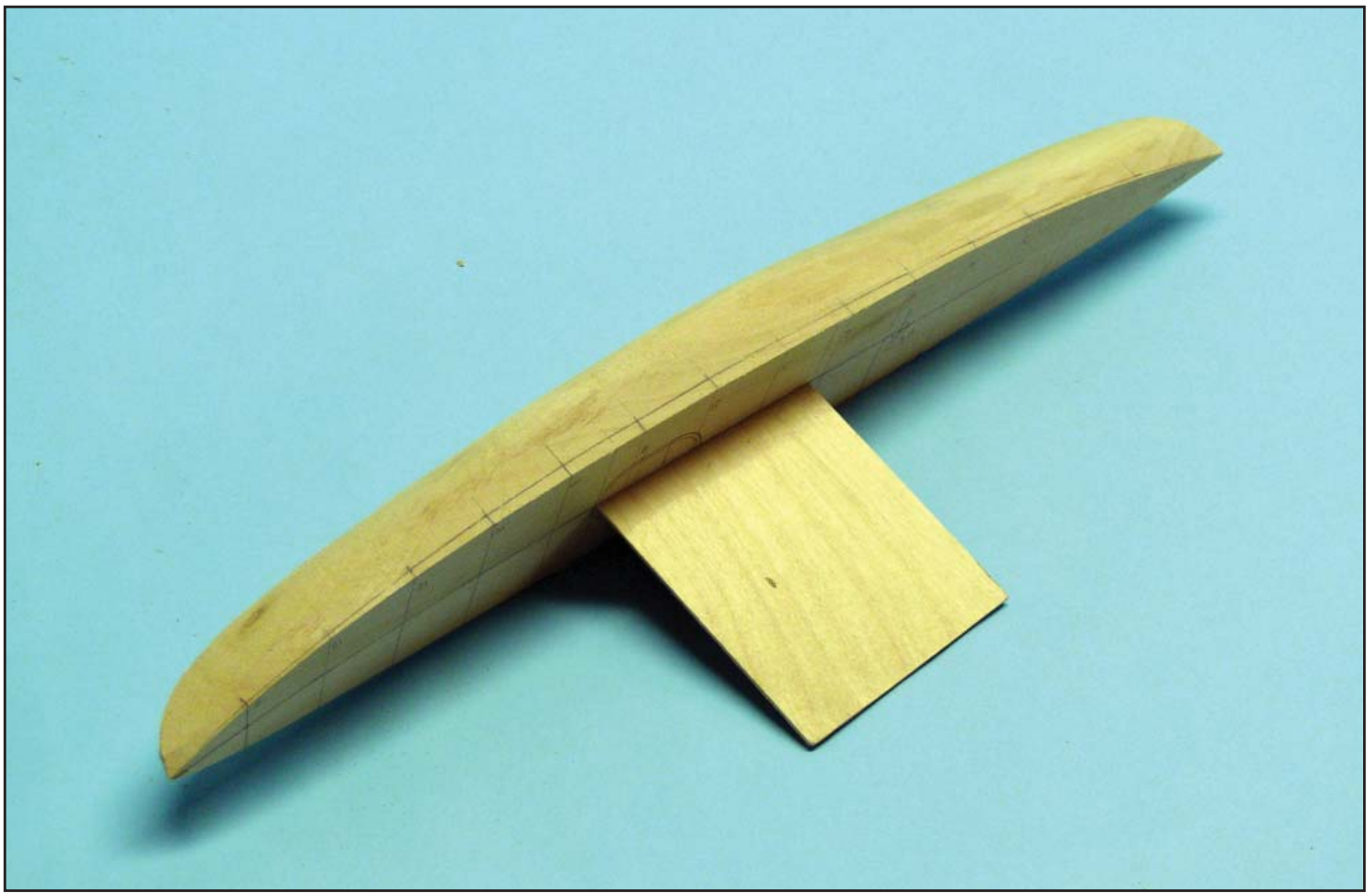


9. Here both the top and profile views have been sawed out and the offcuts have been stacked back together.

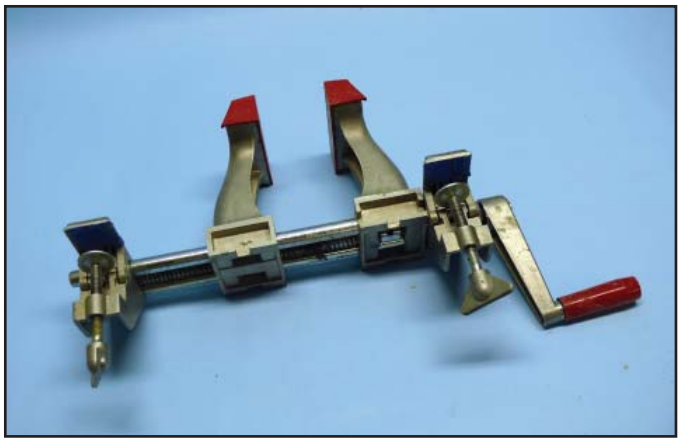
10.Sanding the bottom of the blank. The top and both sides of the profile have yet to be done.

a stand belt sander, on this occasion. (Figure 10) A jig (or sabre) saw works well in the absence of a band saw and a hand belt sander, or even hand sanding, can substitute for the stand belt sander.

The first problem in shaping a hull like this is figuring out how to hold it. The centerboard slot provided the ideal solution. It was just under 1/16-inch wide, so I friction-fitted a piece of 1/16-inch plywood into it. This worked equally well for holding the model with either side facing up. (Figure 11) To hold it, I used my DRI Industries "Vunder Vise" (Figure 12) purchased many years ago; it is identical to a vise from Zyliss (and both usually can be found on eBay for reasonable prices). This is my "go-to" tool for such work; it is light, strong, completely portable, and will clamp to almost anything less than two inches thick. It also is reversible so the handle can be used from either side. Mine came with a lot of accessories but I only really use the red plastic soft jaws that fit over the vise's metal ones.



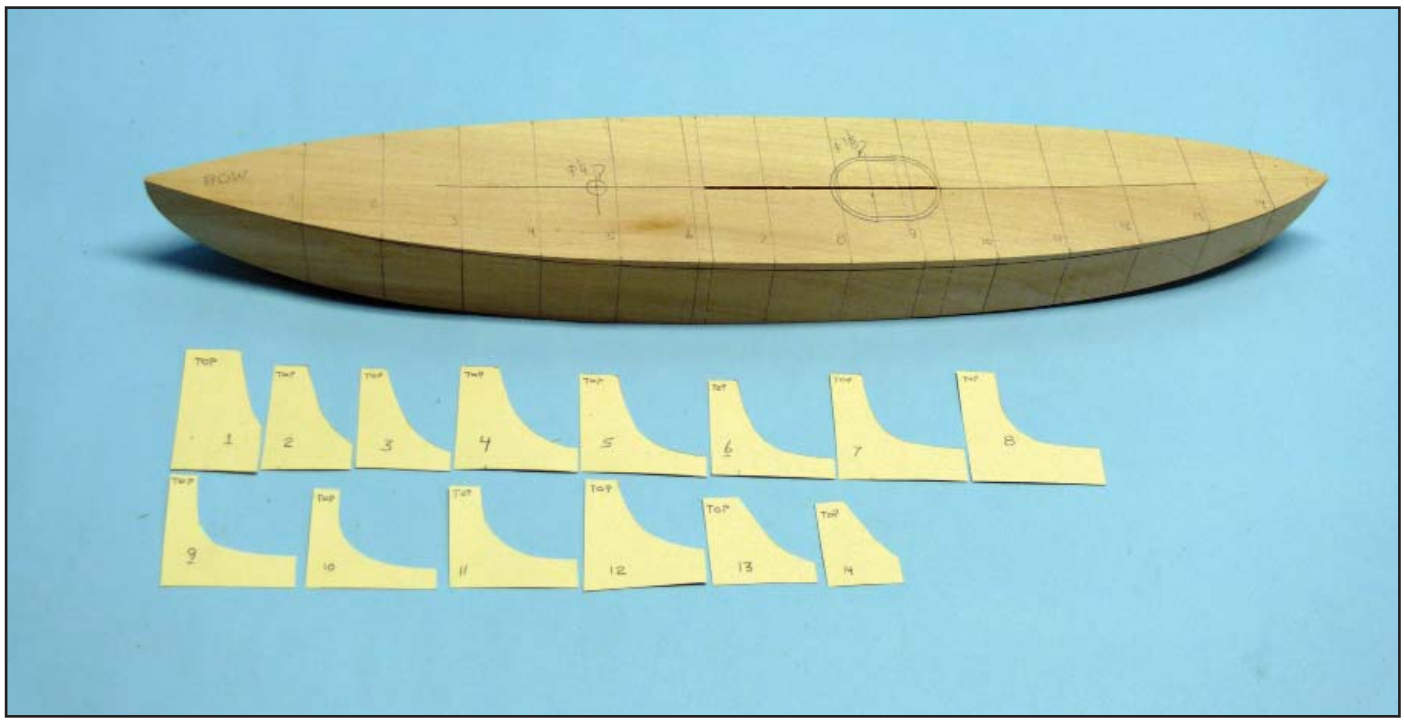
11. My plywood model holder. Other models probably need other solutions and these need to be thought out beforehand.



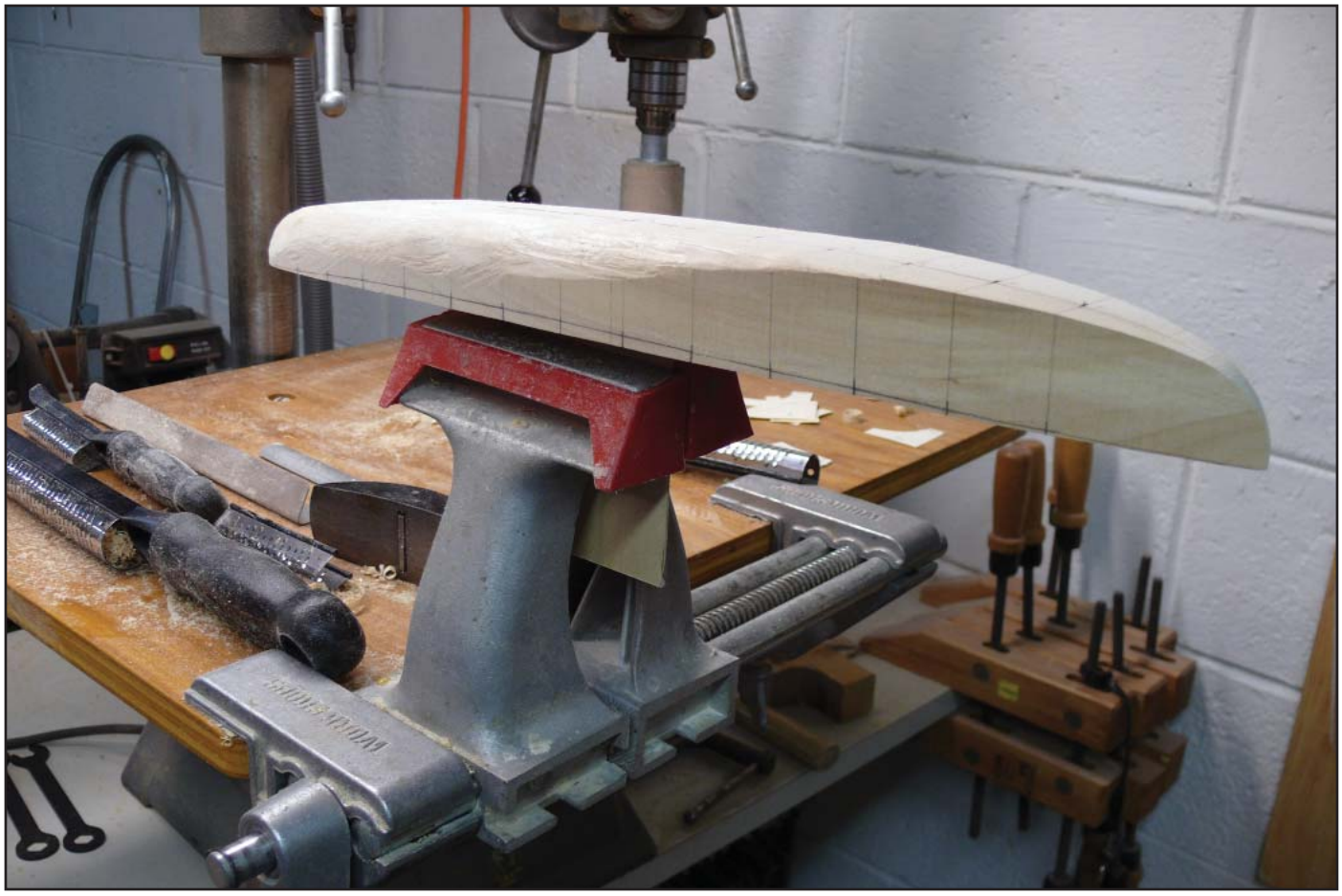
12. My DRI "Vunder Vise".

Before I started carving, I laid out all fourteen station lines on the blank along with the outboard edges of the deck and some other information, all from Martin's drawings, and made templates of each one of the stations. (Figure 13) I did the carving with everything mounted on my drill press table. (Figure 14) I usually rough carve down to about 1/16-inch from the finished size with some of the tools in Figure 15; a couple of small planes and an assortment of "Micro Planes"—rasp-like tools available in several shapes and in both fine and coarse grades. These are less aggressive than traditional woodworking rasps and leave a smoother surface. Find them on the web at us.microplane.com, in some larger woodworking outlets, or on eBay. I check often with my templates and renew the station lines (at least at the ends) while roughing out the blank.

To refine to the final shape a few more tools come in handy. Perma-Grit abrasives have tungsten carbide grains brazed to a steel core and come in several sizes and grits. (Figure 16) Perma-Grit's website is www.permagrit.com and some of the tools can be found on eBay. Sandpaper on assorted sanding blocks is an alternative. One last tool I use for final shaping is the little spokeshave in Figure 17. Some X-Acto sets



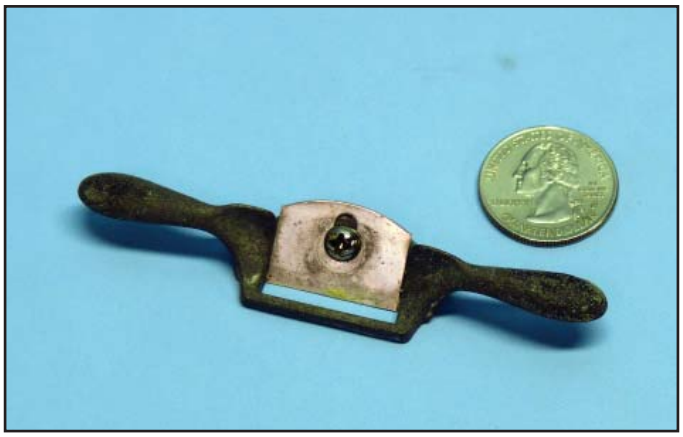
13. The hull blank and templates, all ready to carve.



14. Carving has started.

15. An assortment of carving tools.

16. Perma-Grit carbide abrasives.

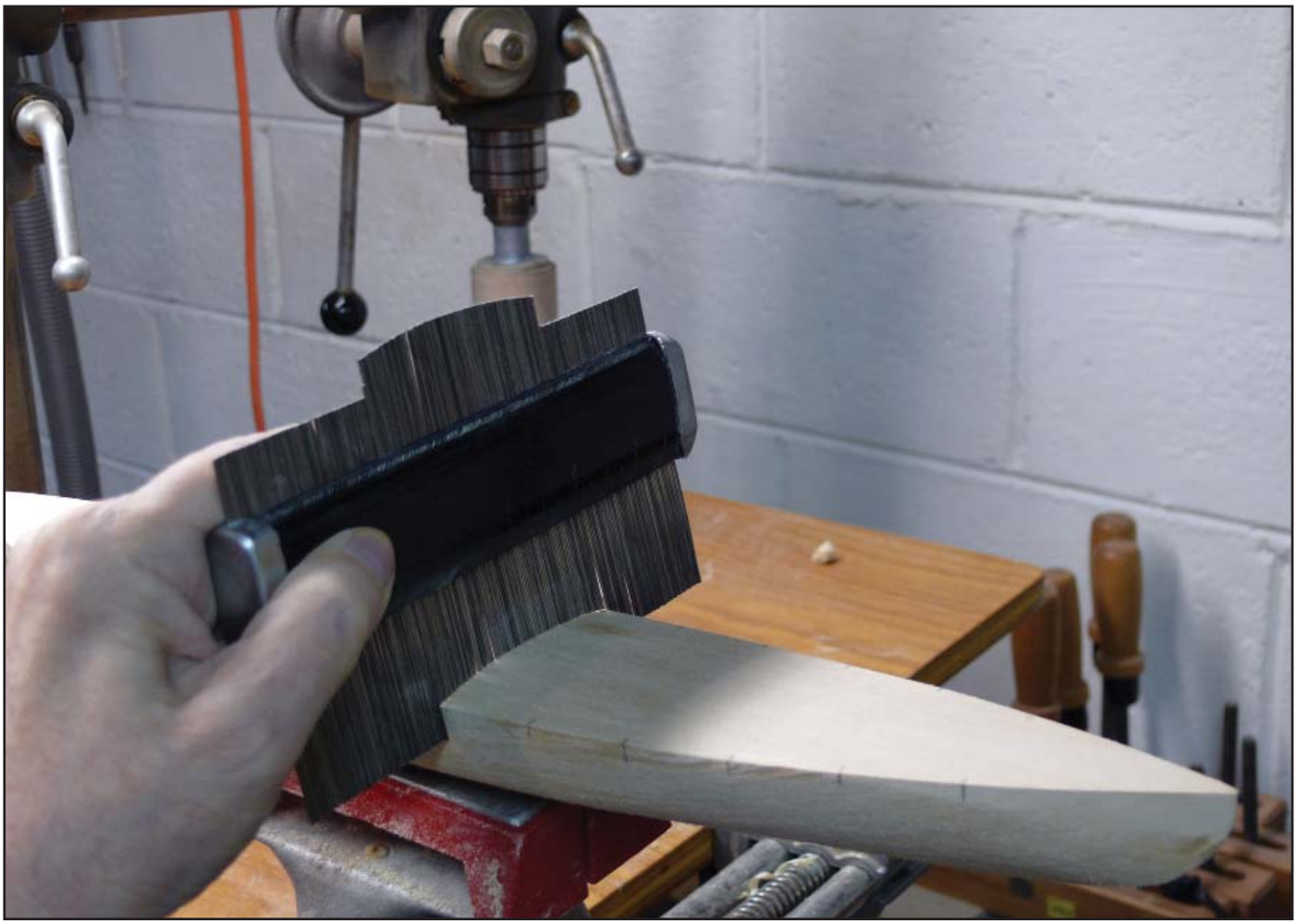


17. The Zona 37-320 spoke shave. The overall width is about 3½ inches.

used to include them, and may still do so, but ZONA makes the identical tool (part number 37-320). I find it gives me much better control for fine work than a full-size spokeshave and it was particularly useful in shaping the deck.

The deck

The upper drawing in Figure 1 shows both the curve of the deck's centerline and the sheer line; these two allow shaping of the deck. When I laid out these lines on the blank I allowed for the 1/16-inch thickness of the added deck planking. I assumed that the deck's crown would be parts of circular arcs and I did not bother to calculate them. I just started shaping with my little spokeshave, which made quick work of it. To make sure the deck was symmetrical, I used a common contour gage, available in most good hardware stores. By setting it to a curve at one point across the deck and then reversing it end to end, symmetry problems are quickly revealed if a space appears under the gage. (Figure 18) I then applied the actual deck planking, using very tight grained cedar



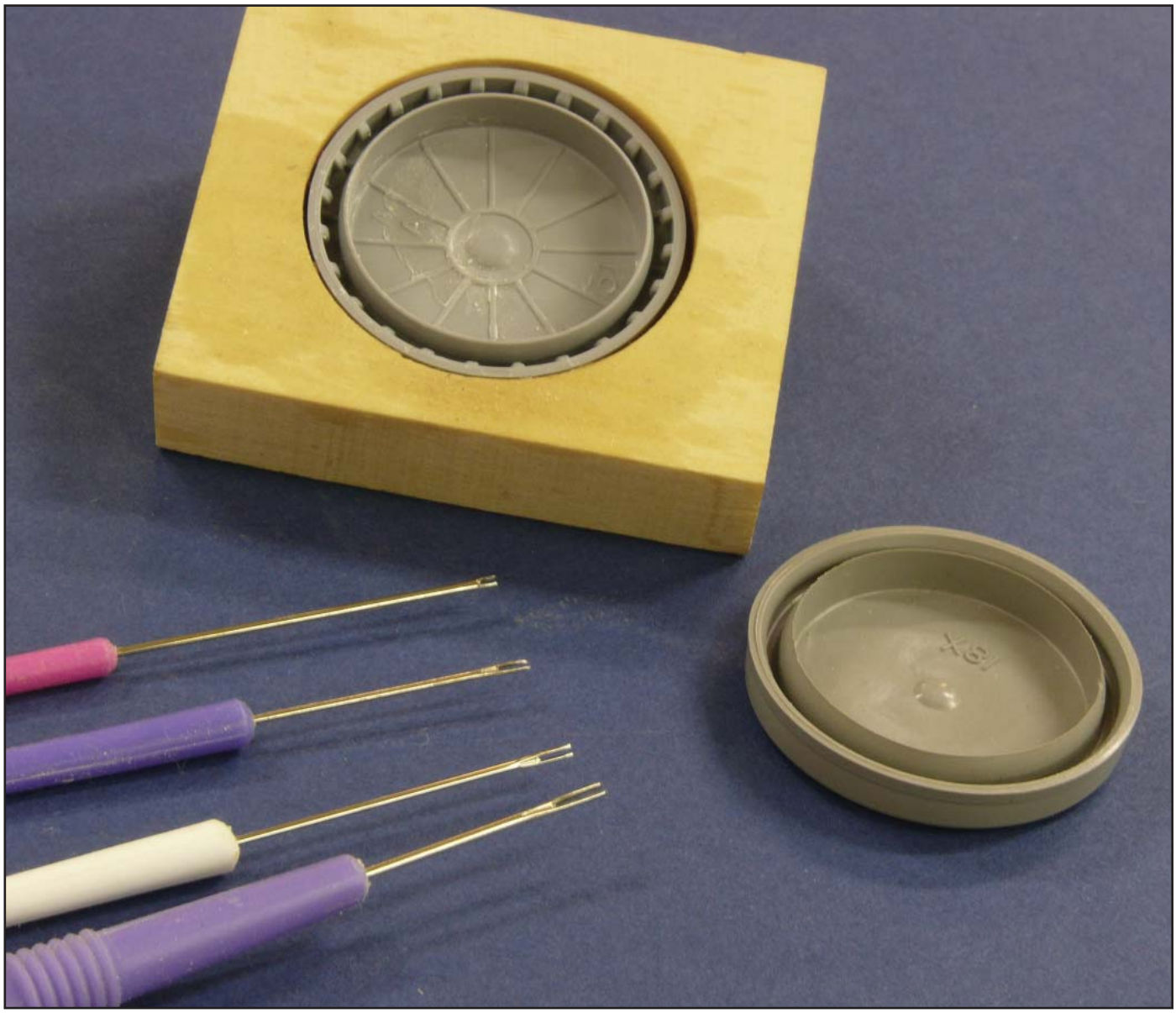
18. Using a contour gage to check symmetry of the deck crown.

19. Decking. The pear king plank and cedar deck planks are glued in place.

(from a lumberyard fence picket) for the field and pearwood for a king plank and covering boards. The cedar looks much like spruce and the pear mimics mahogany, both of which were commonly used in boats like this. (Figure 19)

I typically bond everything with thin cyanoacrylate glue (CA) and the little tools in Figure 20 make this a lot easier. A set of sewing needles with the tops of their eyes cut off, embedded in dowels or scrapped out paint brush handles, will pick up measured amounts of CA (if dipped into a small puddle) and deposit it into a joint. Those small gray plastic tops from 35-millimeter film containers, or similar small flexible plastic lids, make good palettes for small amounts of CA. I hold them in a drilled hole in a block of wood with a slightly angled bottom. When the CA has hardened, flex the plastic lid and the CA will pop out.

I painted one edge of my cedar deck planks black and bonded them in place by tacking them down about every inch or so with my little CA needles, flowing more CA into the joint when I was satisfied that everything was tight. These small tack bonds usually can be broken, if necessary, without damage to the parts and then the parts can be repositioned. At this point I also drilled out the cockpit opening, with a Foerstner bit. It was oval, so I drilled a pair of overlapping holes and chiseled out the waste on the sides. (Figure 21) The opening was sized to fit a finished cockpit that would be inserted later. At the



20. Tools for applying cyanoacrylate glue.

same time, I turned over the hull and drilled two sets of holes in its bottom, a pair for the mounting pins, offset from the centerboard slot, and another pair (one on each side of the slot) for a couple of drain plugs.

I then started to deal with the covering boards. I had left the cedar planking slightly oversize at the edges and needed to trim those edges to nice, smooth curves of the right width. The simple solution was to trace the outside edge of the deck onto a length of thin scrap wood and cut it to shape, making a template that I attached to the deck with double-stick tape. (Figure 22) Running a new, sharp X-Acto blade next to the template cut off the excess. The pear covering boards had to be bent, which I did by soaking them in hot water for about ten minutes and carefully bending them around the same template. (Figure 23) There was a little spring back, but they easily conformed to the edges of the cedar deck planks, where I bonded them down with CA. (Figure 24) Thinking ahead, the outside edges of the covering boards, which would be left natural, would be right next to the painted hull. Masking such very thin items is hard, and it is

21. Drilling out the cockpit opening. The hull is held in a drill press vise using that piece of plywood in the centerboard slot.

difficult to prevent paint from bleeding under the tape. I, therefore, left the covering boards over-thick, to give the tape more adhesion area, and cut down the thickness later, after all the hull paint was finished and I was ready to sand the deck.

Painting the hull

Before starting to paint I made sure the outside edges of the covering boards were flush with the outside of the hull and then I masked them off with 3M 218 Fine Line tape, which is very thin and will not leave much of a ridge after paint is sprayed. Everything was sprayed. I primed the hull with Krylon gray

22. The template for cutting the deck planking.

primer, sanding between coats until there were no imperfections. I wanted a white base under the color coats so I sprayed a final overcoat using white Badger Stynylres, since a white base is preferable under lighter color coats. This is an acrylic primer made primarily for plastics and usable on other materials but, since it is water-based, it will raise unsealed wood grain. I painted the hull with Badger 16-436 Tug Light Green mixed with Badger 16-02 Reefer White to lighten it up somewhat; the sheer plank was painted with Badger 16-415 Caprail Green. I later sprayed the entire hull and the deck and cockpit with Floquil F110015 Flat Finish. This solvent-based clear coat imparts a nice eggshell sheen to the paintwork. The Floquil line has been discontinued but other clear coats probably work just as well. I will not have to deal with that until my dwindling stock is gone.

Steve Wheeler passed away on November 26, 2019 at the age of 75. Steve had been ill with pulmonary fibrosis but his death from complications of the disease and medications was unexpected.

Steve was a 25-year member of the NRG. He was a member of the Rocky Mountain Model Shipwrights

23. Bending the covering boards.

when he lived in Colorado. He was a current member of the three Chicago area clubs, The Nautical Research & Model Ship Society, The Midwest Model Shipwrights and the North Shore Deadeyes.

Steve was a master modeler who freely shared his knowledge of modeling and was always the first to say his garbage can was one of his most used tools. He urged modelers to keep on working until each part is correct; don't settle for good enough. His attention to detail rewarded him with a wall at his home in Racine, Wisconsin covered in awards for his modeling. Steve won a Gold award for every model he entered at the annual Wisconsin Maritime Museums starting in 1997. During the 22 years Steve was involved with the museum's Midwestern Models Ships & Boats Contest, he was the recipient of 22 gold awards, nine Best of Show, nine Best Great Lakes Awards, and 7 times his won the Modelers' Choice award. Steve even won Best of Show two times at International Plastic Modelers shows in Illinois with wooden boat models.

The award from the Wisconsin Maritime Museum's annual contest for the Best Novice Award sponsored by the North Shore Deadeyes club is being renamed "The Steve Wheeler Best Novice Award" to honor Steve's commitment to educating and helping novice

24. Covering boards bonded in place. Note that rub rails, at the level of the sheer plank shown on Martin's plan, are also in place here.

model builders advance their skills. Steve never won this award but the first model boat he built, the Great Lakes tug *Sharon W.*, resides in the museum's main model room. It won a gold award and would have surely won the Best Novice award had it been awarded at the time.

Steve wrote dozens of articles and Shop Notes in the *Nautical Research Journal* and has two articles scheduled for upcoming Journals as well as several more Tips & Techniques. He wrote many articles for *Model Ship Builder* and *Ships in Scale* with several covers for both publications. He also wrote two books about boat building in the Racine area:

The boat and yacht designs of Fred W. Martin: reprinted from existing original drawings, ca. 1896-1902. Racine: Racine Heritage Museum, 2009

An Industry Forgotten: A Half-Century of Boat-Building in Racine, Wisconsin ©2011

Steve enjoyed writing about model building almost as much as building models. He always wrote his articles with the less experienced modelers in mind rather than the modelers closer to his level because the novice builders must be encouraged and shown how they can improve their skills so they achieve better modeling results.

Steve gave numerous talks on aspects of modeling at club meetings, the Tri-Club meetings in Illinois, the annual Wisconsin Maritime Museum's Modeler's Symposiums, NRG Symposiums and NRG Conferences. Steve's last appearance at an NRG Conference was at the 2018 event in Las Vegas where he spoke on lapstrake hull construction. He always had a word of encouragement for fellow modelers and, when a modeler asked him to pick apart his or her model, all of Steve's comments were certain to be positive and encouraging to the modeler.

We will all miss him.

Seventeenth-century Dutch ship design drawings. Real or counterfeit?

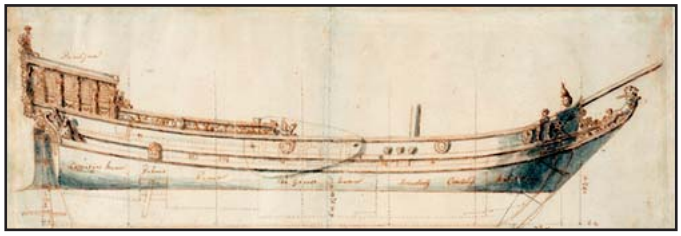
By Ab Hoving

The method used by Dutch shipbuilders in the construction of their ships in the seventeenth century was the so-called shell-first system, in which the outer planks were decisive for the shape of the frames. Drawings were not involved. This is reason enough to take a closer look at a group of seventeenth-century technical drawings in the collection of Het Scheepvaartmuseum Amsterdam. The conclusion of this study is surprising.

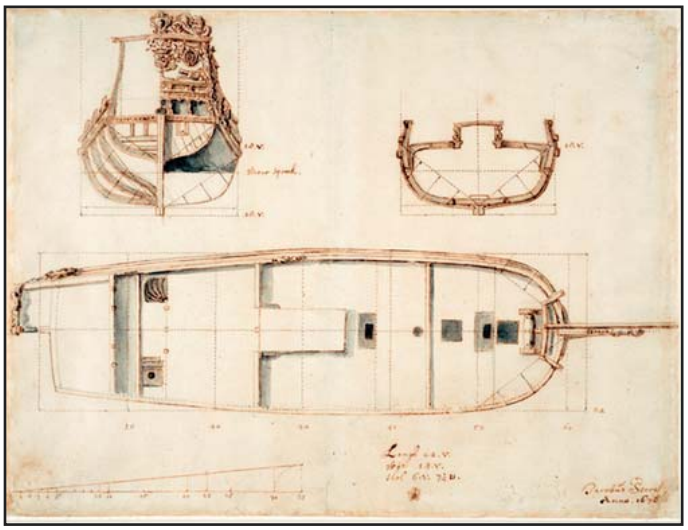
The *Statenjacht* drawings by Jacobus Storck

Het Scheepvaartmuseum Amsterdam has a number of architectural ship drawings from the seventeenth century with a strong technical character. Two of them give different views of the same *statenjacht*: 62 feet long, 18 feet wide and 6 feet 7-1/2 inches deep. One shows a side view with a foot scale, the other a top view with, on the right, a midship section and, on the left, a section of which one half shows a couple of frames and the shape of the stern, and the other a rear view of the ship. (Figures 1 and 2) Both are signed and dated by Jacobus Storck, 1676. (Inventory numbers: 2015.4375 and 2015.4376.) They are drawn on remarkably thin paper and measure 19.6 x 39.9 and 29.3 x 30.7 centimeters respectively. The drawings have recently been inventoried as 'unknown in depot', a formulation that indicates that they have probably been there for much longer and that the origin is unknown. They are depicted on page 17 of the 1943 *Beschrijvende Catalogus der Scheepsmodellen en Scheepsbouwkundige Teekeningen 1600-1900* (the Descriptive Catalog of Ship Models and Ship Architectural Drawings 1600-1900) of what then was the Nederlands Historisch Scheepvaartmuseum Amsterdam (Dutch Historical Shipping Museum Amsterdam).

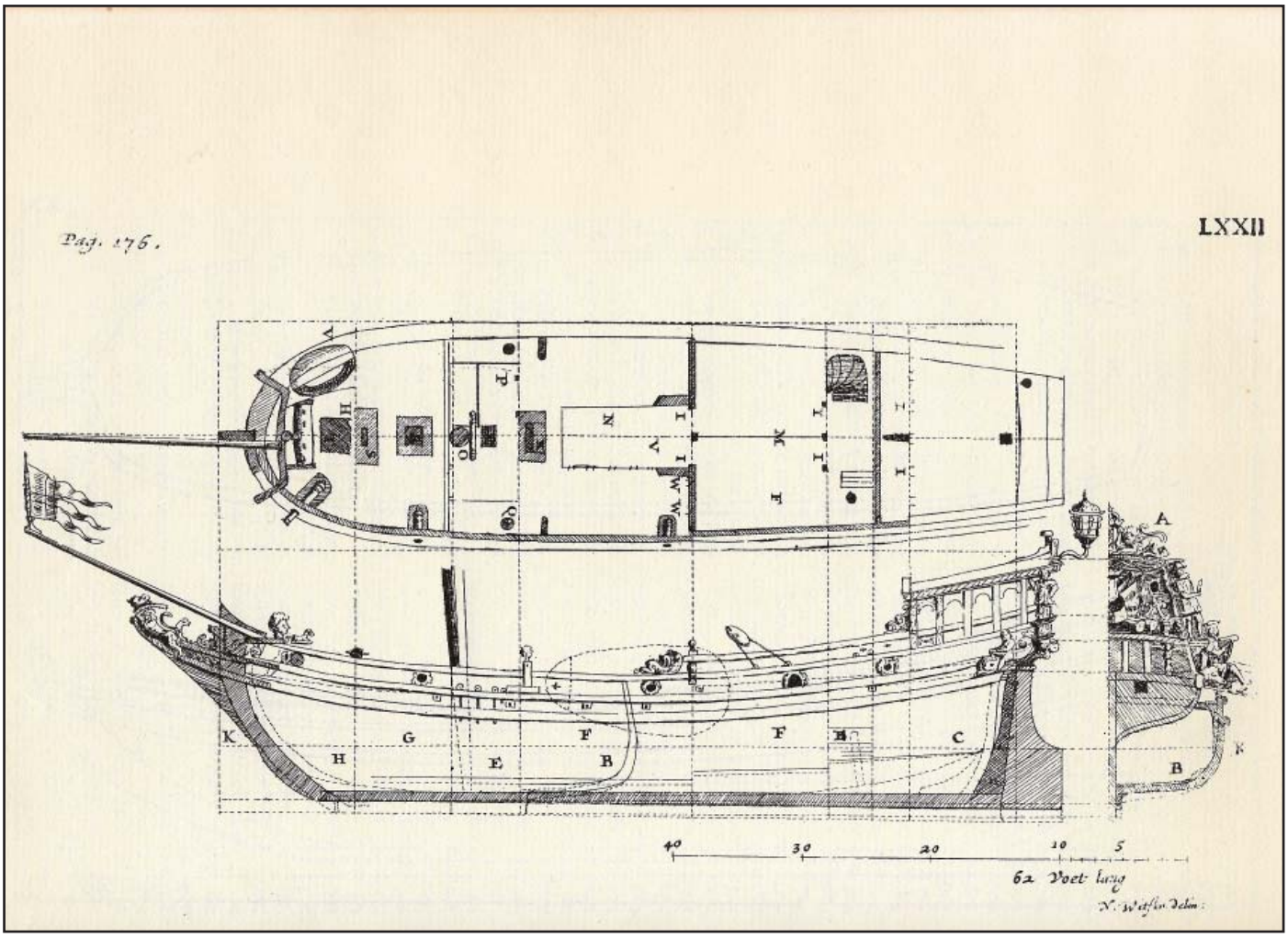
Jacobus Storck lived in Amsterdam from 1641 to after 1692, where he ran a painter's studio with his younger brother Abraham (1644-1708). Their father was the painter Jan Jansz. Sturck later called himself Sturckenburch, a name that his sons also used initially. Abraham was a successful maritime painter, while Jacobus focused more on city and river views and Italian coasts and capriccios (romantic fabricated



1. Drawing of a statenjacht of 62 x 18 x 6 feet 7½ inches, signed and dated; Jacobus Storck 1678. Het Scheepvaartmuseum Amsterdam, inventory number: 2015.4375 and 2015.4376.



2. Drawing of a statenjacht of 62 x 18 x 6 feet 7½ inches, signed and dated; Jacobus Storck 1678. Het Scheepvaartmuseum Amsterdam, inventory number: 2015.4376.



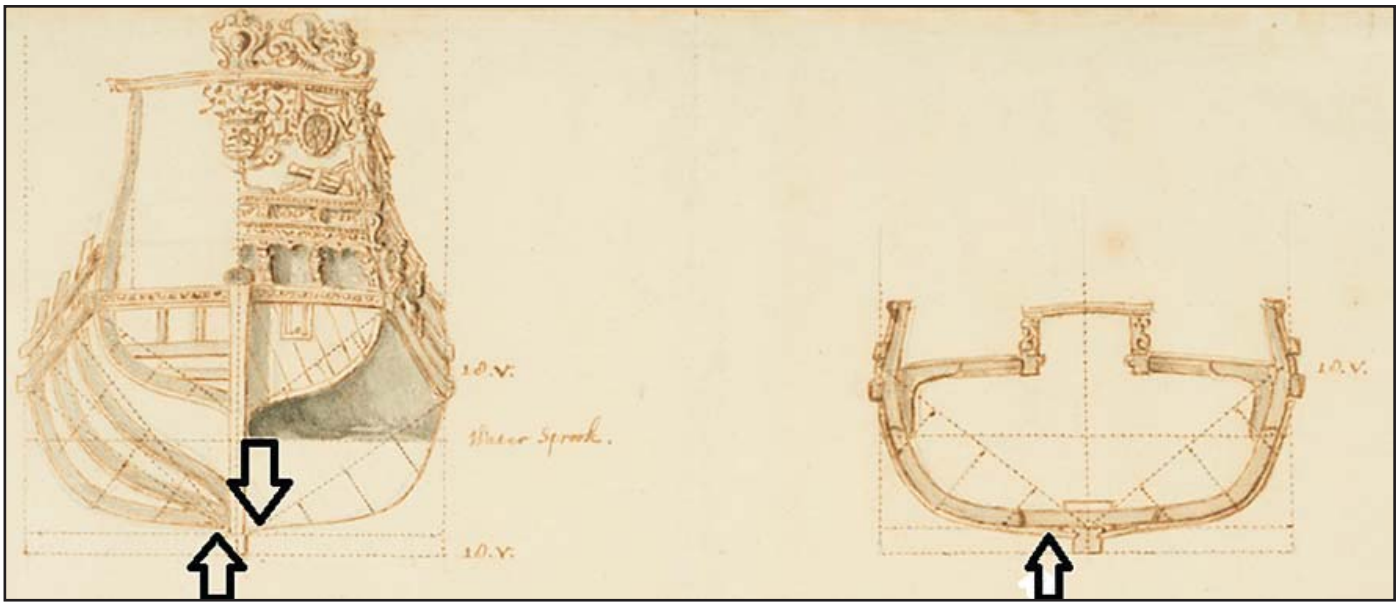
3. From: Nicolaes Witsen, *Aeloude and Hedendaegse Scheepsbouw en Bestier*, 1671. Plate LXXII. Compare the details with the Storck drawing.

compositions of landscapes), on which ships were always depicted. There was a third brother, Johannes (1630-1673), of whom no paintings are known.

The drawings of the *statenjacht* were clearly made by someone who had experience with portraying ships. Very convincing shadows are indicated on the hull with brush and ink to emphasize the shape. This drawing is surprisingly similar to the drawing of a *statenjacht* that is portrayed by Nicolaes Witsen on Plate LXXII in his *Aeloude and Hedendaegse Scheepsbouw en Bestier* (1671). Many details are the same, including the lion figurehead holding a sword over its shoulder. (Figure 3)

Witsen's drawing, however, does not show the frames, with the exception of the main frame. It seems very likely that the artist Storck copied this image. The half-view of the aft of the vessel shows a nicely detailed stern with the arms of Zeeland on the starboard side: the upper body of a rampant lion protruding from the water. The choice of the coat-of-arms from a different province than the one in which the maker lived is peculiar for an Amsterdam painter but not impossible.

Three frames have been drawn on the port side. They are not represented with single lines, as in later body plans, but executed in duplicate, as if the draftsman wanted to indicate the thickness of the timber. Next to the frame we see a section of the vessel at the location of the main frame, at # 30. The frames in the forebody are not depicted.



4. Detail of Figure 1. Left arrow: the underside of the unplanked frame is drawn above the top of the keel. Middle arrow: The planks are drawn on the top of the keel. Right arrow: The planking is drawn below the top of the keel, the only correct location.

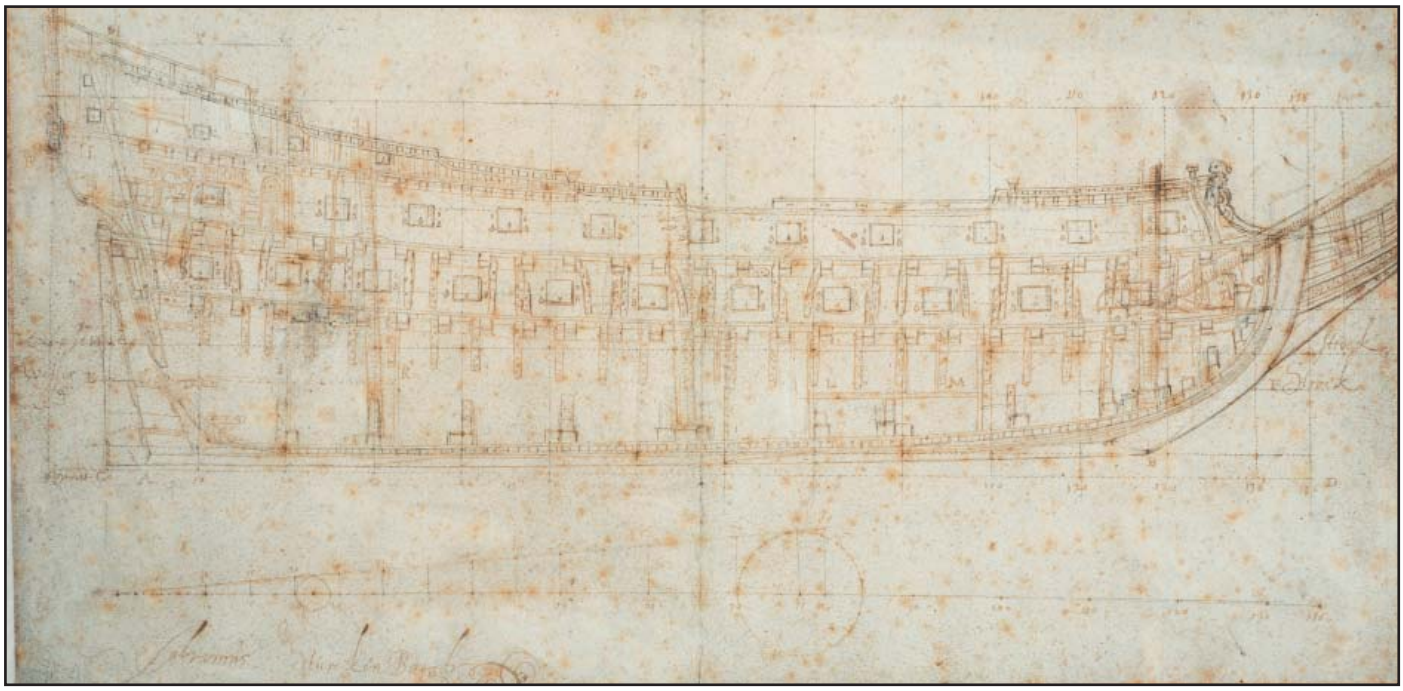
In the side view, the interior is indicated by dotted lines and provided with explanatory captions in beautiful seventeenth-century script: *Paviljoen* (pavilion), *Cappitijnskame*r (captain's cabin), *Sekreet* (toilet), *Kamer* (room), *de Groote kamer* (great cabin), *Bottelerij* (steward's pantry), *Combuys* (galley) and *Kabelruym* (cable tier). The use of the term *Cappitijnskamer* is notable. In the seventeenth century 'captain' was an army rank and was only used on men-of-war. On all other ships, the commander was called 'skipper'. In Holland the title 'captain' for the captain of a ship generally comes into vogue much later. Witsen therefore calls the compartment in question in the notes on his plate *Schipperskamer*.

There is another example of a term that is probably incorrectly used. At the level of the waterline *waterstrook* is written, a word that does not appear in any of the available contemporary sources about shipbuilding. These mention *scheerstrook* and, in rare cases, *waterlijn*, but the combination *waterstrook* is at the least suspect.

There are construction lines in the drawing, suggesting that this is not a preliminary design drawing, but rather the representation of an already existing measured ship. A corresponding system between the different views is missing.

When looking at it from a technical point of view there are some remarkable things. The construction lines are dashed lines that connect two extreme points of a curved part, such as the bow in top view, the stem post or a frame. They are divided into four equal parts, on which perpendicular lines are erected up to where they hit the curved line. The length of those perpendicular lines defined the bend, a simple and effective way to capture the shape of an existing ship. The curvature of the stem post also is depicted with a diagonal divided into four equal parts. It is understandable that for the measurement the lower point the lip of the stern on the keel was chosen, but it is hard to grasp why the 7-3/4-foot rake was also calculated from that point, because in Dutch shipbuilding the rake of the stempost was always measured from the upper front of the keel.

If for a moment we forget the technical irregularities in Storck's drawing, such as the mentioned absence of the fore frames, the erroneously depicted rake, the unusual terminology, such as *waterstrook* and *Cappitijnskame*r, and technical mistakes in the



5. Drawing of a warship of 46 guns, signed Johannes Sturckenburgh. Inv. Nr. A.0149 (855) Het Scheepvaartmuseum Amsterdam.

drawings like the locations of the displayed planking in the two cross sections (one above the top of the keel, the other one on top and a third one below, as seen in Figure 4), not much seems to be wrong. Still it adds to our suspicion.

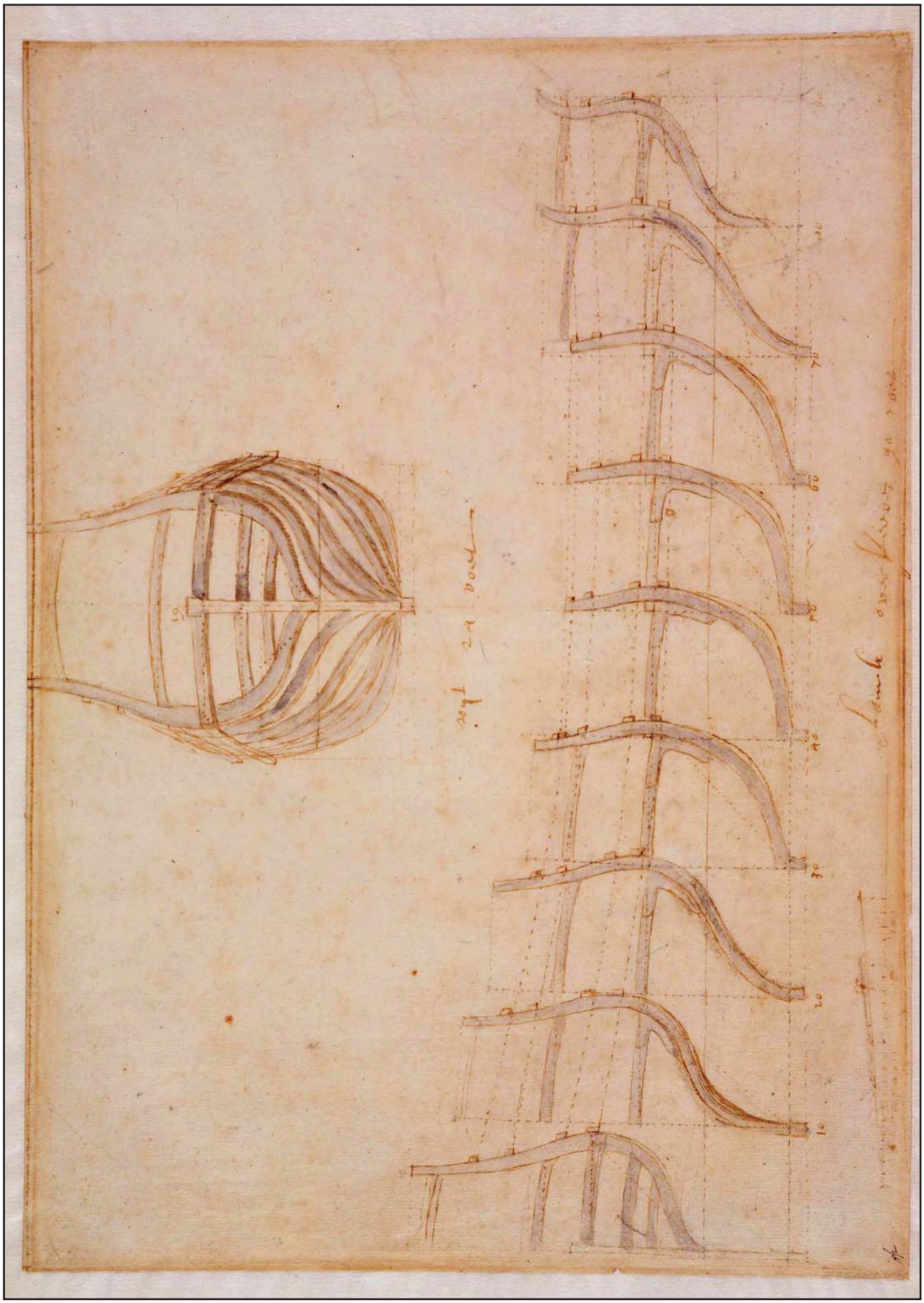
It also remains unclear why a landscape painter, even one who also portrayed many vessels, would resort to making a technical drawing. There is no way in which such a person could have much use for such an elaborate image, unless it was made to build a model, which then would help to paint a similar vessel on the canvas, thus literally serving as a 'model'. Experience shows, however, that with such a use a drawing rarely survives the construction of the model, so this does not seem like a real option.

The drawing is particularly surprising because it appears to be prefiguring technical drawings of a later date, in which frames and sections are shown. At the date of this drawing, 1676, in Holland such representations on paper were not known at all. It seems as if we are dealing with an anachronism here. After all, the shipbuilding system in no way asked for a design drawing, since the builders worked according to traditionally developed and established proportions and rules of thumb.

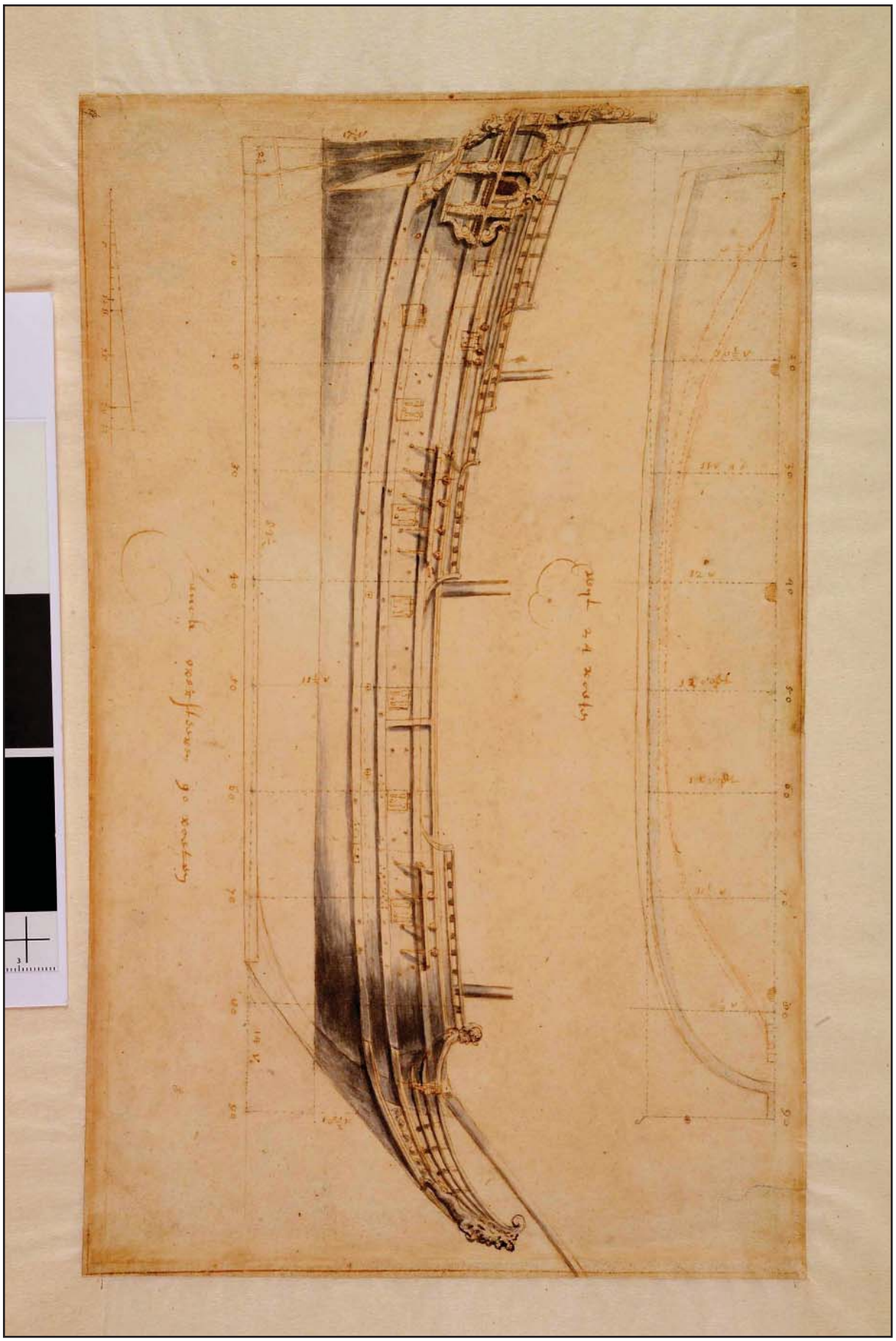
So where does this visionary view of the depiction of ships in three dimensions, with which Storck has conceived his views and sections, come from? All in all, there were more than a few reasons to doubt the authenticity of these drawings, and further study of the material seemed desirable.

Johannes Sturckenburg's drawing of a man-of-war

Another drawing, signed by Johannes Sturckenburgh, depicts a cutaway side view of a ship of war of 136 feet with 46 guns. (Figure 5) It is catalogued as A.0149 (855) and is dated by the museum to between 1650 and 1750. Johannes Sturckenburch was the third Storck brother who died in 1673. All inventory numbers of Het Scheepvaartmuseum Amsterdam starting with A.0149 followed by a number in parentheses are part of the same group of 125 drawings purchased on June



6. Drawing of a *pinas* 90 feet long. Undated, unsigned. Het Scheepvaartmuseum Amsterdam, inventory numbers: 0149 (0858).



7. Drawing of a *pinas* 90 feet long. Undated, unsigned. Het Scheepvaartmuseum Amsterdam, inventory numbers: 0149 (0859).

16, 1921. The group was probably purchased from a collector by G.C. Hooft. The drawing is on the same strikingly thin paper as the *statenjacht* drawings and has many similarities in content. For example, the same kind of foot scale is used and, beautifully calligraphed is written at the bow, *Last*, and at the stern at the same height, *Strook*. Below that at the stem is written *Wasser* and *Strook* again, suggesting that the lines between them are called *Laststrook* and *Wasserstrook*. Both terms are nonsense, just like the word *waterstrook* on the *statenjacht* drawing.

On top of that, capital letters have been placed at strategic places, suggesting that the drawing originally had a legend that is no longer available. Striking deviations from what is generally known are mainly the mizzen mast, the foot of which extends to the inner keel instead of into a mast step on the lower deck and the unusual scarf between the keel and the stempost. The bitt on which the anchor rope was belayed is also of an unusual construction. Instead of the bitt standards, the upright parts of the device running through the deck and resting on the bottom, as usual at that time, they are simply placed on the deck without additional support. Any pressure by the anchor cable would have disastrous consequences. The front of the beak head extends outside the drawing.

In itself it is not impossible to find a drawing of a section of a ship from the second half of the seventeenth century. Witsen did something similarly with his *pinas* in his book, albeit considerably less detailed. But the shortcomings identified here do not appear to raise much confidence in the value of this technical representation.

The eight drawings of *pinas* ships

In the collection of Het Scheepvaartmuseum Amsterdam there is another group of similar drawings of *pinassen* from the same period, namely a series of eight drawings that are very similar. These are in the museum's catalog:

Item no. A.0149 (0856) Top view of a *pinas* 110 feet long (11.4 x 37.7 cm)

Item no. A.0149 (0857) main frame and front and rear view of a *pinas* ship, 110 feet long (11.7 x 24 cm)

Item no. A.0149 (0858) Frame drawing of a *pinas* ship of 90 x 24 feet (18.8 x 26.4 cm)

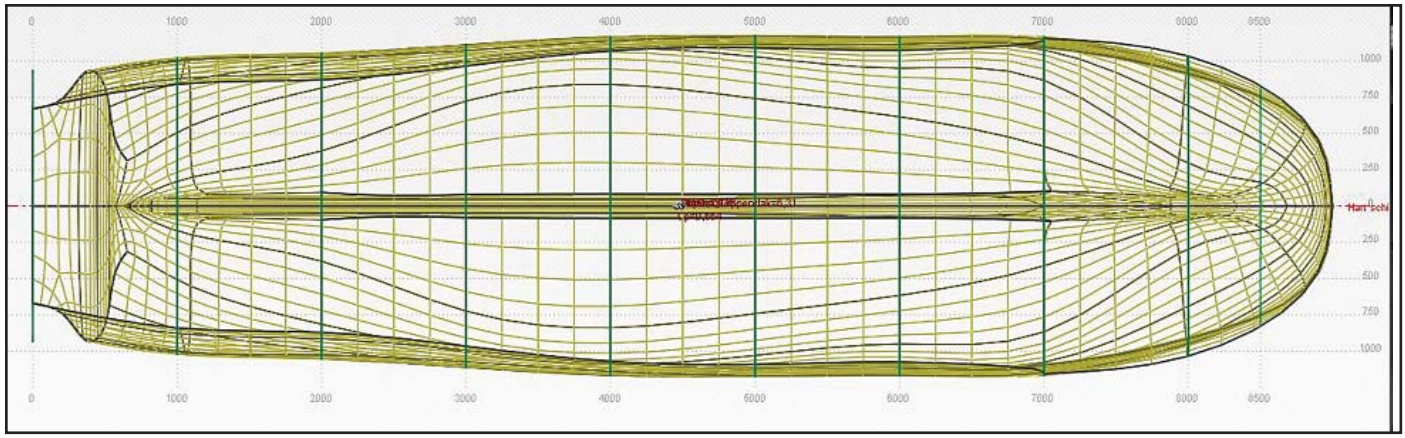
Item no. A.0149 (0859) Side and top view of a *pinas* ship of 90 x 24 feet (18.7 x 30.6 cm)

Item no. A.0149 (0860) Frame and top view of a *pinas* of 90 x 22 x 11 feet (30.3 x 39 cm)

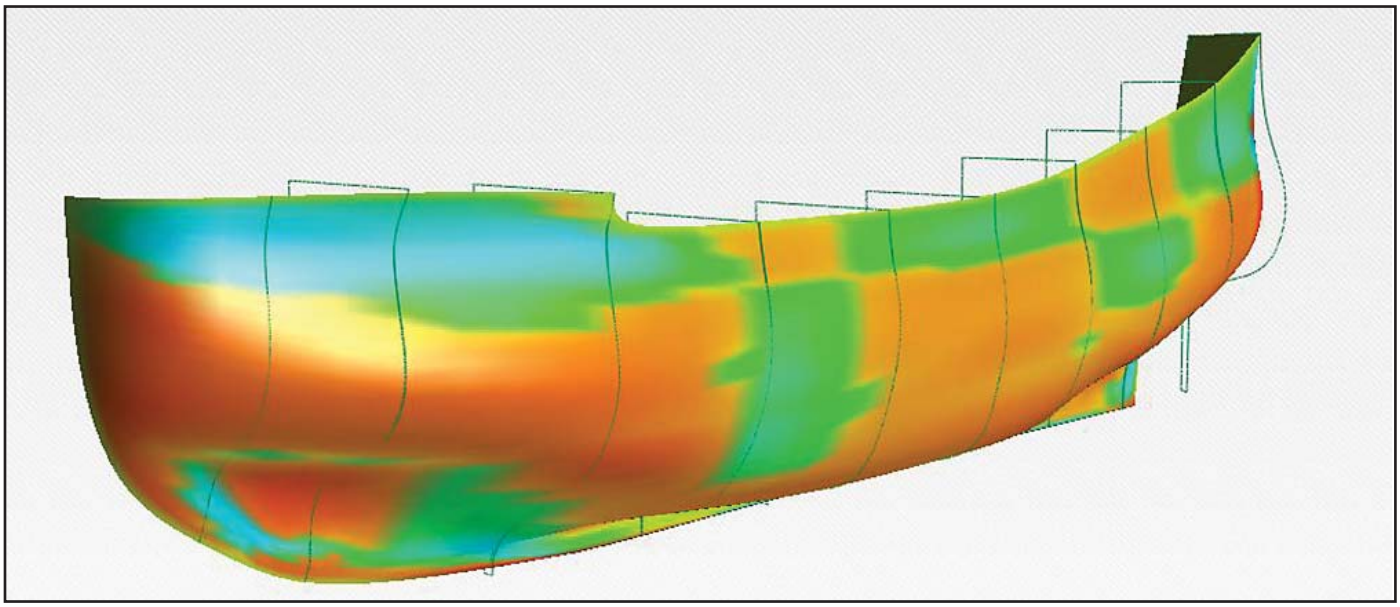
Item no. A.0149 (0861) Top view of a *pinas* of 90 x 24 x 10 feet

Item no. A.0149 (0862) Top view of a *pinas* ship or yacht measuring 70 x 19 x 9 feet (18.7 x 31.7 cm)

Item no. A.0149 (0863) Side view and frames of a *pinas* ship or yacht of 70 x 19 x 9 feet (17.3 x 30.5 cm)



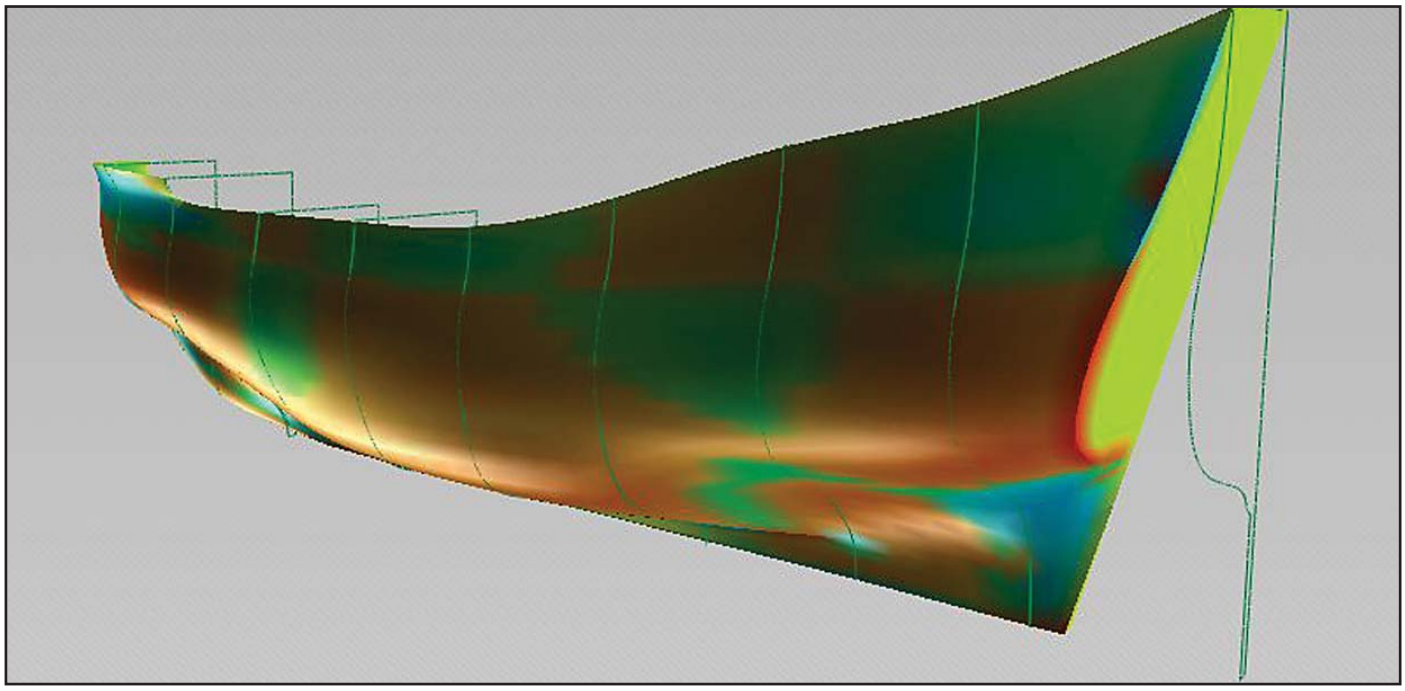
8. Top view in Delftship of the pinas of 90 x 24 x 10-1/2 feet with the original frames, drawn in Delftship.



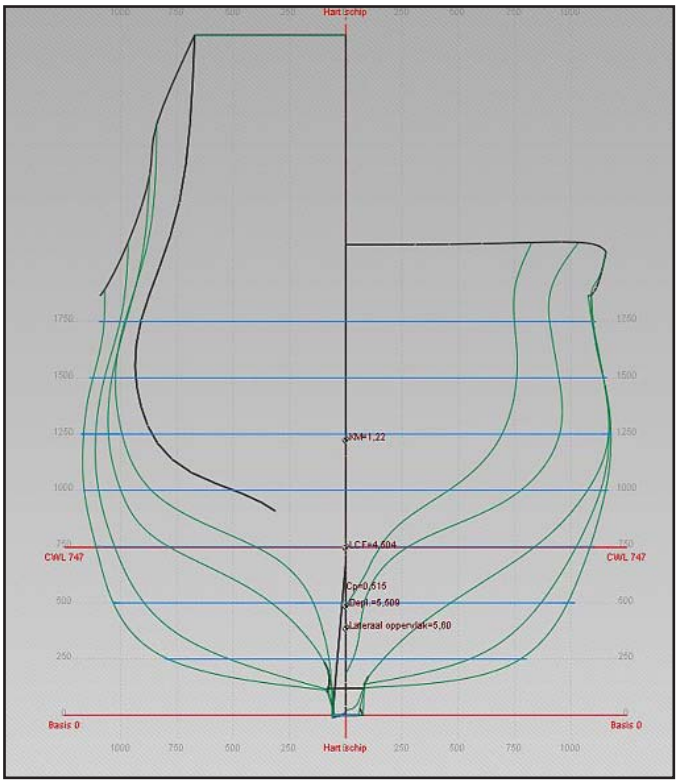
9. Three-dimensional view in Delftship of the uncorrected hull.

None of these drawings are signed or dated, but they are nevertheless included in this study, because they strongly resemble those of Storck's *statenjacht* and Sturckenburch's section in terms of execution. We see here, as with the *statenjacht* drawings, nicely suggested shadows with unmistakably artistic dispositions and, in the side and rear view, we recognize the dotted construction lines that were apparently intended to capture curved shapes.

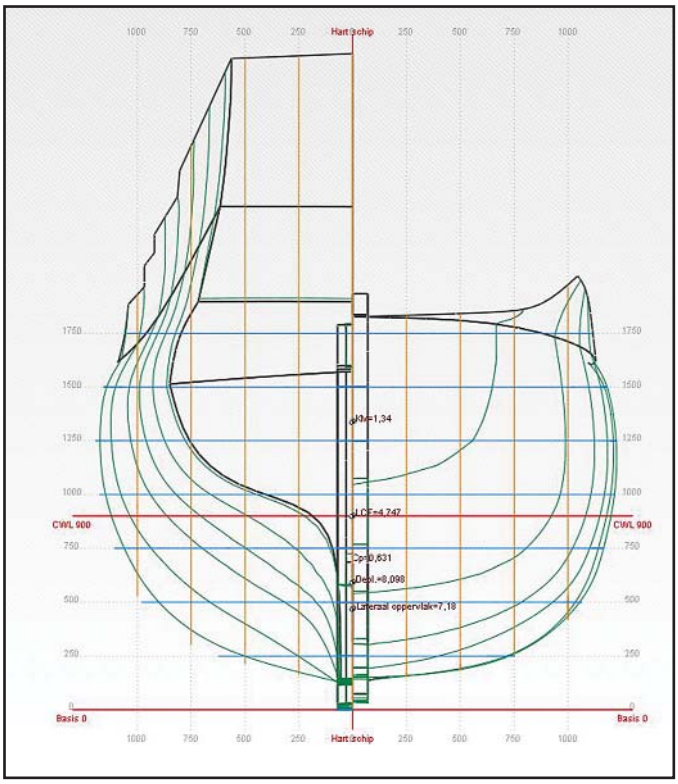
Because the drawings of the pinas of 90 x 24 feet appear to be the most complete, they were the first



10. Three-dimensional view in Delftship of the uncorrected hull.



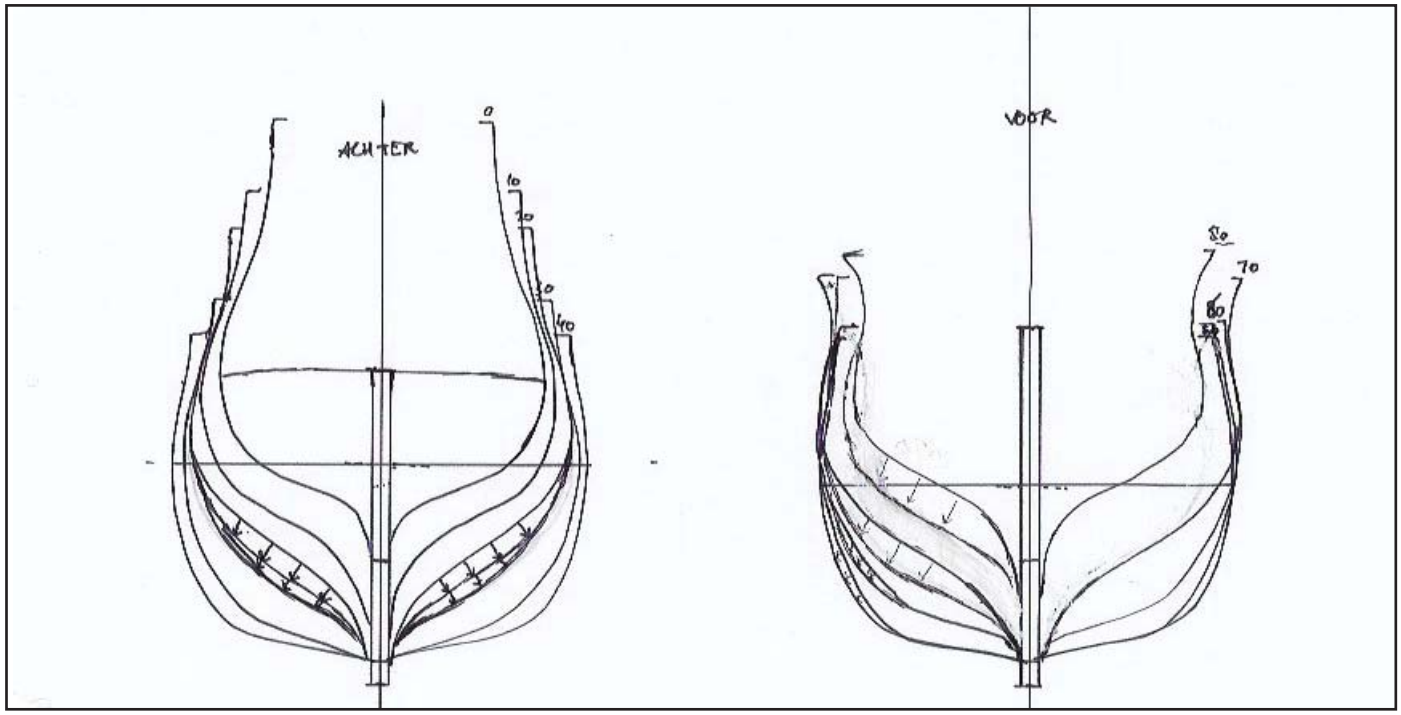
11. Body plan in Delftship of the uncorrected hull.



12. Body plan with the shape of the *pinas* corrected in Delftship.

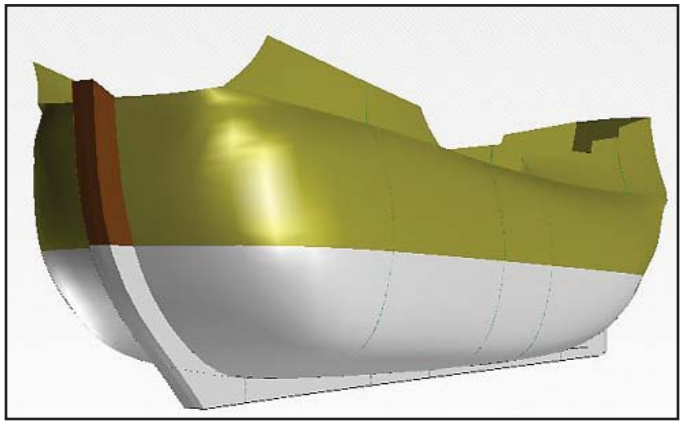
to be selected for further investigation (drawings 0149 (0858) and 0149 (0859)). (Figures 6 and 7) The remaining drawings will be discussed later.

We are presented with not only a side and a top view, but also a kind of abstract side view with frames folded forward, in their original location. In addition,



13. Corrections made to the original frames of the model.

14. Photograph of the corrected frames in the model.



15. Reconstruction in Delftship of the 'Certer of a Ship, 85 feet long, 22 wide, depth 11, Bulwark 4 feet, with a single deck, built in the year 1668 on page 143 of Cornelis van Yk, *De Nederlandsche Scheeps-Bouw-Konst Open Gestelt,(1697).* Compare the shape and volume of the hull with the corrected version of the *pinas* in Figure 12.

we see a separately drawn body plan, with which the shape of the vessel is therefore defined twice. Just as with the *statenjacht* drawing, both frame views are not executed in single lines, but doubled, apparently to indicate the frame thicknesses. Dimensions in feet and inches are applied to the drawing at tactical points.

The 90-foot *pinas* ship

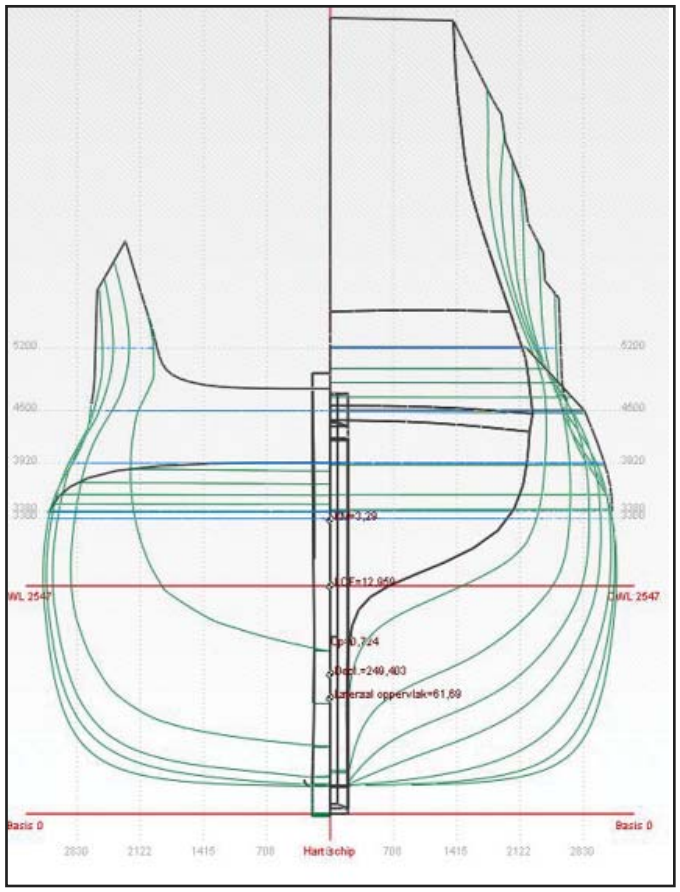
First of all, a comment about terminology is appropriate here. A small ship with an armament of no less than eighteen guns must be intended as a warship. The term *pinas* does not seem appropriate here, because a *pinas* was an armed merchant ship. We should rather speak of a yacht or a frigate. The drawings have been in the possession of Het Scheepvaartmuseum Amsterdam since June 16, 1921. The term *pinas* does not appear on the drawings themselves, so it would have been given to them by G.C. Hooft, who bought the collection.

The shape of the shown vessel requires elaboration in three dimensions, so I did that. First of all, the frames of the body plan were compared with those in the side view. There is hardly any similarity between the two parts of the drawing. Although, for example, it is clearly visible in the side view that the front frame is mounted higher than the keel at the stern, it is set much too low in the body plan. It is difficult to determine which half represents the front and which the rear view, but if we assume that the port half is the forebody, the first frame is drawn considerably too low. The same problem occurs if we assume the converse. We decided to set aside the body plan and took the frames in the side view as a starting point for a model, because at least they are in the right location. The Delftship ship design program is an excellent tool for this. In previous publications I have already referred to this free downloadable computer program, and also to the extraordinary skill of my cooperator, René Hendrickx. In less than no time, the frames were entered three-dimensionally into virtual space.

The result was visually shocking. (Figures 8-11) The frame at # 20 (20 feet from the back) was so much too thin that an ugly dent was visible on the spot and in fact all the frames in the forebody (# 60, 70 and 80) showed the same problem with reference to the main frame. We let Delftship, which has a fairing function, perform the fairing of the lines. (Figure 12) To better visualize the situation, a model was made in which first the frames were placed according to

the original drawing and then corrected according to the consistent method of Delftship. The images speak for themselves. (Figures 13 and 14)

The Delftship program also offers the possibility to make shipbuilding calculations. The vessel appears to have an uncorrected shape at the draft of 2.11 meters (6.9 feet) indicated in the drawing, with a displacement of 121 tons. The corrected version was found to displace 128 tonnes of water. That is little more than the weight of the ship itself, and the weight of armament, crew, supplies and any cargo has not yet been added. When loaded, this ship will be much deeper than the indicated waterline. For comparison, a specification in Van IJk, *De Nederlandsche Scheepsbouwkonst Open Gestelt* (1697) of a comparable single-deck ship, appears to have a displacement of 190 tons. (Figures 15 and 16) The design of the ship in the Het Scheepvaartmuseum Amsterdam drawing therefore raises serious doubts.

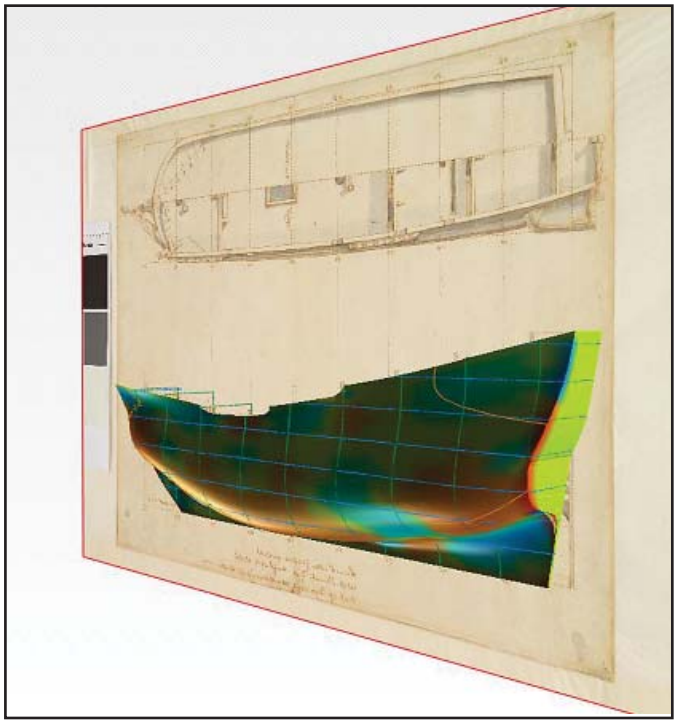


16. Body plan of Van IJk's ship of 85 feet.

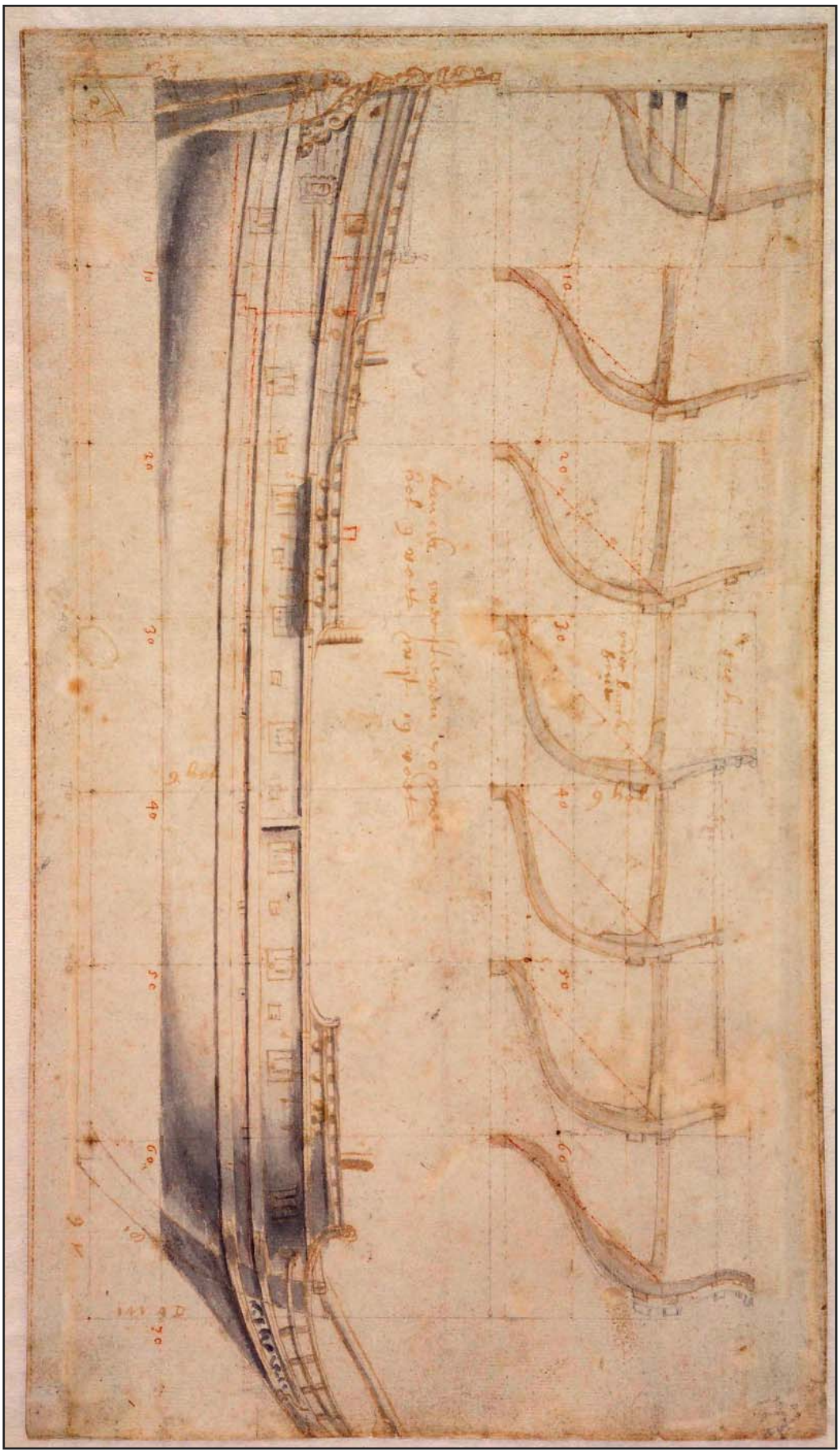
More doubts

If we study the drawing more closely, we will notice even more strange things. In the first place it is odd that the ship is single-decked. On a ship with a length of 90 feet a second deck could easily have been placed, which would have considerably increased the usability of the vessel. In the list by Grebber, which is reproduced on page 114 of Witsen's book, we already find a second deck appearing on a ship with a length of 85 feet. Why does this vessel only have one single deck? It becomes all the more strange when we see that it is equipped with no less than eighteen guns. Of course, they would not have been of large caliber (at most 6 pounders), but for their effective use in a combat situation, a total crew of seventy is just about the minimum. Where would they have found accommodation on a ship without a tween deck?

Furthermore, the water line is placed in the side view of the drawing at a height of 2.11 m (slightly less than 7 feet), measured from the bottom of the keel, at a considerable distance from the lower wale. On



17. Three-dimensional rendering in Delftship of drawing 0149 (0860) of a 90 x 22 x 11-foot ship. Frames # 20 and # 70 cause hollows in the hull.



18. Drawing 0149 (0863), a *pinas* of 70 feet in length.

all ships depicted from the seventeenth century, the water line is on half of the lower wale. If we did that here, the deck would be submerged at the slightest list. This vessel cannot be reconciled in any way with the rules known to us from contemporary literature.

The last striking phenomenon in the side view is the dotted baseline, which starts at the rear on top of the keel but ends up considerably lower in the forebody. This seems to be a stunningly premature way of portraying depth in the stern. Finally, I have analyzed hundreds of maritime paintings from different painters and times, but in none of them have I encountered a ship of this type and size (90 feet long, single-decked with eighteen guns). Warships were popular subjects in paintings and were often depicted. That a ship like this is nowhere to be found is telling. Nevertheless, on page 143 of Van IJk's book, we find a specification contract for an 85-foot ship with a single deck, so although the drawing is not entirely impossible, it remains a most unusual vessel.

The other drawings

A quick examination of the other six drawings in the series yields a number of unlikely points.

Drawing 0149 (0856), the top view of a ship of 110 feet in length, appears to have only one deck, just like the previous ship described. There are (presumably) places for eighteen guns (of which only sixteen can be seen in the top view, but it is unclear what is still standing there).

Drawing 0149 (0857) shows a cross-section and a cut-away front view of the 110-foot ship, on which the flat planking of the bottom is indicated, but where the bilge boards are missing. If this shows a picture of a construction phase, the bilge boards should have been mounted. The drawn frames in the bow are of an unlikely arrangement and seem to be based on a drawing by Van IJk, in which he shows the bow construction of an English ship (Cornelis van IJk: *De Nederlandse Scheepsbouwkonst opengestelt* (1697), pict. C on page 18.). This is another type of ship that I have never encountered in paintings.

Drawing 0149 (0860) again depicts a 90-foot ship, just like the one we worked out, but with a smaller beam of 22 feet and a larger depth of 11 feet, against 24 and 10-1/2 feet respectively of the examined design. A side view is missing, the reason why this drawing was not selected to be worked out. This is unfortunate, because this drawing was considerably better as a lines plan than the model we examined. It is true that, in particular, the frames at 20 and 70 feet are clearly too narrow, but with some correction work this drawing can certainly be made into a usable lines plan. (Figure 17) We did do calculations using Delftship which produce a displacement of 185 tons, very close to the vessel we calculated from the Van IJk specifications. It is a pity that this ship does not have a side view.

That missing side view could have been on drawing 0149 (0861), which represents a side view of such a ship, but whose depth is indicated as only 10 feet and this therefore concerns a different design. This drawing is very similar to the one we used, up to the number of eighteen guns. Could it be intended as an improved version? Was the one a preliminary study for the other?

Drawing 0149 (0862) represents a single-decked 74-foot-long ship with four guns on the half-deck and two in the cabin!

The most unbelievable is drawing 0148 (0863), an image of a 70 x 19 x 9-foot ship with no less than twenty guns. (Figure 18) The almost complete absence of sheer, which makes the ship look unusually flat, makes this design the most far-fetched of the series. Here we again see the laterally folded frames in the side view. The figure of five shrouds for the main mast does not seem to match the usual shipbuilding rule for a vessel of these dimensions. On page 221 of

19. Watermark in 0149 (0856) with initials IV, used by Van der Ley in 1762.

20. Watermark in drawing 0149 (0860) with initials AJ (Abraham Jansen), used from 1679 to 1712.

his book, Van IJk gives the rule that we also find in the *Evenredige Toerusting van Schepen van Oorlogh totter Zee* (Proportional Equipment of ships for war at sea): six shrouds for a ship 100 feet long and, for every 15 to 16 feet more, one extra. This rule can also be applied to ships shorter than 100 feet, as evidenced by the many checks that I have carried out on images of smaller ships. This vessel should have had four shrouds on the main mast.

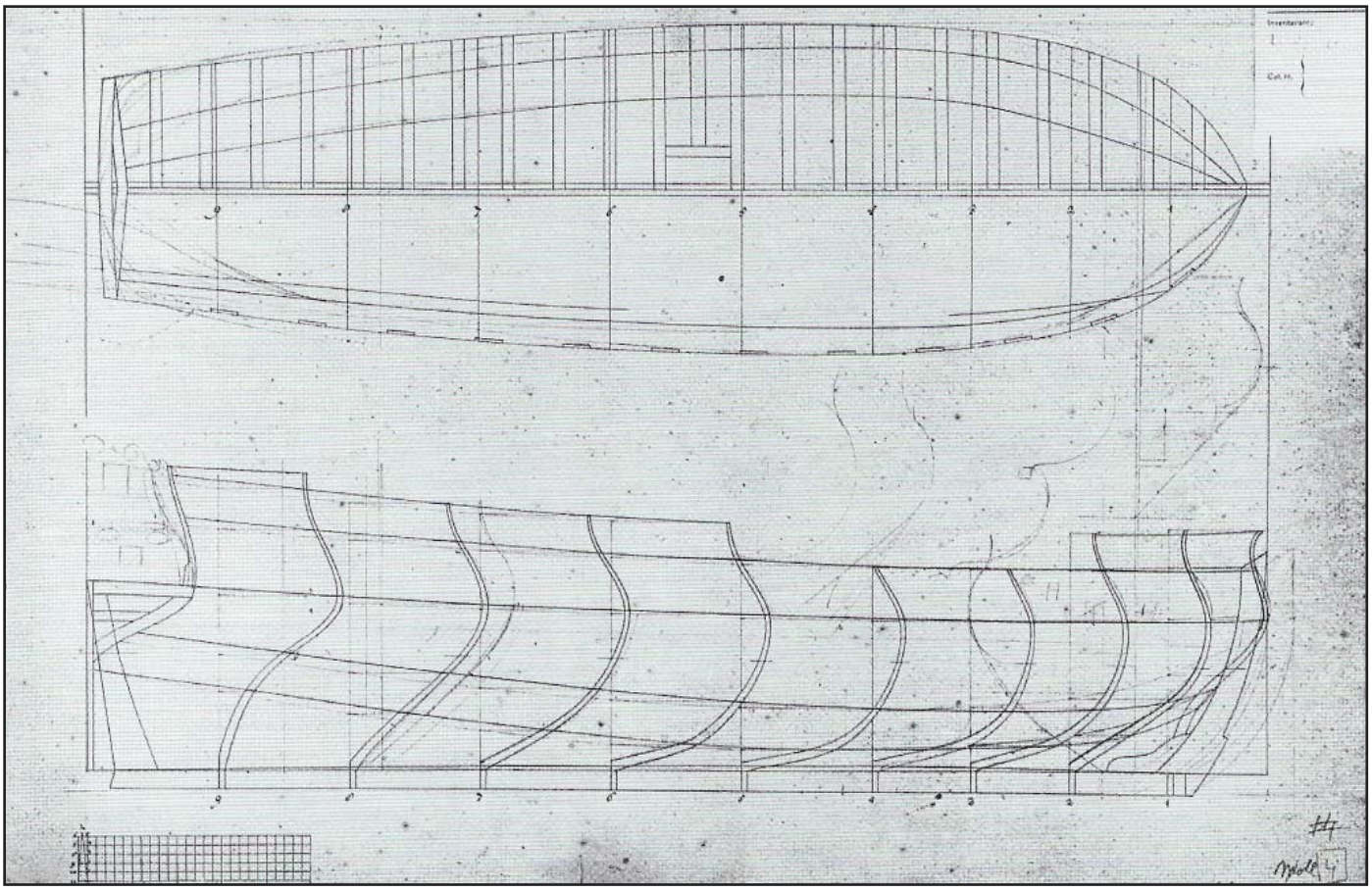
The paper

The paper on which all drawings are made is special. All design drawings I know are drawn on thick, handmade paper. All the drawings discussed here, however, are on extremely thin paper, although also handmade and provided with watermarks, but clearly produced for printing. They are probably cut out of a book as blank pages.

The watermark in the paper of the *statenjacht* drawings corresponds to that in *pinas* drawing A.0149 (858) (the pinas ship of 90 x 24 feet) and with that in the section by Sturckenburgh, which makes a single origin plausible. The watermarks are easy to identify. They are depicted in H. Voorn's book, *De papiermolens in de provincie Noord-Holland* (The Paper Mills in the province of Noord-Holland) of 1965, which means that a number can be dated. The watermark in drawing 0149 (0856) (the top view of the 110 foot pinas) has the initials IV, which was used by Van der Ley's Zaanse paper mill in 1762. The watermark in drawing 0149 (0860) (frames and top view of a 90 foot pinas) shows the initials AJ (Abraham Jansen) and was used from 1679 to 1712. (Figures 19 and 20) At the dated time of the drawings, those pieces of paper did not yet exist. We must, however, always keep a close eye on this, because through reuse and adaptations to the sieves used for watermarking, the proof is not watertight.

Conclusion

All in all, the conclusion seems inevitable to me: the series of *pinas* drawings is completely unreliable as a historical source for shipbuilding in Holland and for the *pinas* as a ship type. The *statenjacht* drawings and the section of the warship belong to the same group and are anachronisms. The state of the art in Storck's days was at a different level than presented here. The

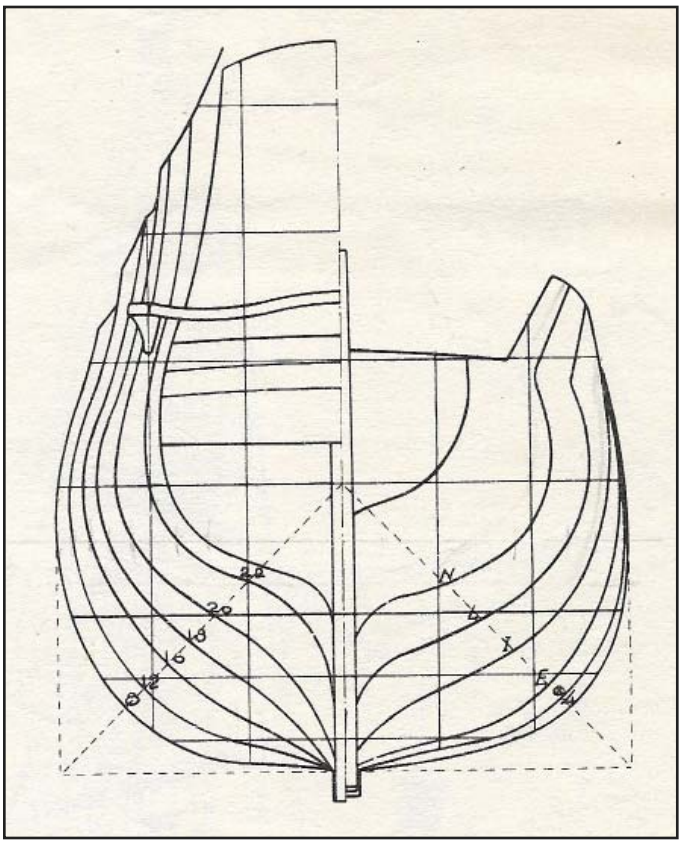


21. Draught of *Wageningen,* a 26-gun frigate (1723) by Gerbrandt Slegt, prepared as an aptitude test for the Admiralty of Amsterdam.

first Dutch design drawings showing folded frames in a side view date from almost half a century after the date applied to the *statenjacht* drawing. They were not made by an outsider such as Storck, but by the Zaanse shipbuilding master Gerbrandt Slegt, who worked for the Amsterdam Admiralty yard from 1723 to 1726.

The artist who made these plates cut blank pages out of old books and produced what are on first sight surprising authentic looking ship plans that, on closer inspection, prove to be of no value. Neither the display of the frames for the *pinas*, nor a large number of technical aspects, or even just the type of ship can be reconciled with what we know today about ships of the period. The similarities in the technique of drawing and watermarks are evident. In addition, we see the same characteristic errors and the same foot scale applied to both the *statenjacht* drawings and the *pinas* drawings.

I fear that, partly on the basis of the watermarks, we have to conclude that the *statenjacht* drawings were not made by Storck any more than the *pinas* drawings and that the section by Stuckenburch can be attributed to Johannes. They all come from the same much more recent unknown source. It is regrettable that it is precisely these *pinas* drawings that have become a popular building subject for many model builders. In 1976 the Delius, Klasing & Co publishing house published a book for model builders: *Risse von Schiffe des 16. und 17. Jahrhunderts* (Sketches of 16th and 17th-century ships). Although nowhere mentioned as such, Hans Szymanski drew the reconstruction of the frigate *Berlin*, which was part of the Brandenburg fleet in 1674, on the basis of the series of drawings mentioned here. The model was built by the model maker Browatzky under the direction of Rolf Hoeckel, known from several model building publications from the same publisher. Since then, dozens of *Berlin* models have been produced in the modeling world by industrious model builders who thought they were



21. Draught of *Wageningen,* a 26-gun frigate (1723) by Gerbrandt Slegt, prepared as an aptitude test for the Admiralty of Amsterdam.

23. Model of the frigate *Berlin*, released as a kit by the manufacturer, Corel.

building a seventeenth-century Dutch ship model based on respectable sources. We even see models of this imaginary vessel popping up in various small German museums. (Figures 22 and 23)

Worse yet, publicists on the subject of seventeenth-century shipbuilding (not excluding myself) have been misled for years and have thought that something like building plans must have existed in the second half of that century. I hope to have demonstrated that this series of eleven technical drawings belong together, that they cannot possibly have been made in the suggested year, and that we are dealing with counterfeits. Het Scheepvaartmuseum Amsterdam would do well to conduct an in-depth investigation into the material of this group of drawings and their provenance.

Many thanks to Kees Paul for his help writing this article, to paper conservator Thea Vorstman and to the helpful staff of Het Scheepvaartmuseum Amsterdam.

This article originally was published in Dutch in 2018 in *Scheepshistorie* 24 and in German in Das *Logbuch* 2018 Heft 1. Translation by Emil Hoving and Paul Fontenoy.

Ab Hoving was the lead restorer of model ships and curator of the Marine Model Room at the Rijksmuseum in Amsterdam from 1989 until 2012. He has published many articles on Dutch shipbuilding and its history in academic and modeling journals, including the *NRJ*, and wrote *Nicholaes Witsen and Shipbuilding in the Dutch Golden Age*, *The Statenjacht Utrecht*, *17th-Century Dutch Merchant Ships*, and *Message in a Model*. He also was involved in the creation of the full-size replicas of *Duyfken* in Australia, the statenjacht *Utrecht*, and the revised design for Michel de Ruyter's *De Zeven Provincien*.

La Galera Real – A model of the flagship of Don Juan de Austria at the Battle of Lepanto in 1571, Part 1

By D. Roger Moore

Introduction

The Mediterranean Sea, bordering lands that produced some of the earliest civilizations, has long been the site of naval conflict. Some of the greatest sea battles in history took place in these waters, one being a battle in 1571 between Christian and Muslim forces—the Holy League comprised of Spanish, Venetian, Genoan and Vatican-sponsored navies and the navy of the Ottoman Empire—which has come to be called the Battle of Lepanto.

The Ottoman Empire had been proceeding on a course of westward expansion for many years prior to Lepanto. This included the capture of the island of Rhodes in 1523, the naval battles of Preveza in 1538 and Djerba in 1560, the invasion and siege of Malta in 1565, and the invasion of Cyprus in 1570. Part of the reason for the aggression of the Ottomans was that the Western Europeans had not put up a strong, united defense. In 1570, Pope Pius V finally was able to bring together the naval forces of Venice, Spain and Genoa along with Vatican-sponsored private contractors to form the Holy League. The first Holy League expedition, in 1570, was designed to help relieve the Cyprus siege. It suffered from a weak command structure that led to internal squabbling and untimely delays. There was no relief of Cyprus and the Ottoman fleet was not engaged, so the expedition was a dismal failure. This led to a shake-up in the command structure of the Holy League ,which was to have a great influence on next year's campaign.

For the 1571 campaign, the choice for the overall commander fell to King Philip II of Spain. He selected his half-brother, Don Juan of Austria, for the role. (Figure 1) Although Don Juan was only twenty-three years old, he had chosen a military career early in life. He was made Captain General of the Sea at the age of twenty, gaining battlefield experience fighting North African corsairs and the Moriscos. He was said to have been a handsome and dashing man who longed for glory and the chance to gain recognition in the Spanish royal court that he had been denied due to

1. Don Juan de Austria, the 23-year old commander of the Holy League Fleet at the Battle of Lepanto. Portrait by Juan Pantoja de la Cruz, Museo del Prado, Madrid

2. The Battle of Lepanto. Fresco probably by Ignazio Danti after an engraving by Ferrando Bertelli. Vatican Museums. Alonzo de Mendoza photograph.

his illegitimacy. While previous commanders of the western naval forces had mostly avoided conflict and its attendant risks, Don Juan would welcome the opportunity for battle when the time came.

On the Ottoman side, the death of Turgut Reis (known as "the drawn sword of Islam") at the siege of Malta in 1565, left a similar opportunity for new blood to step into command of the Ottoman fleet. Sultan Selim II chose Müezzinzade Ali Pasha, previously Governor of Egypt, for this role. Like Don Juan, Ali Pasha had a bit of a chip on his shoulder, coming from a poor Turkish family without influence and rising in rank through a merit-based bureaucracy. His birth date is not known but he was probably in his mid to late thirties in 1571. He also longed for glory and recognition, and his orders were explicit: "find and

3. The Battle of Lepanto. Fresco by Giorgio Vasari and his school, Sala Regia, Vatican. Sailko photograph.

attack the Infidel's fleet in order to save the honor of our religion and state."

The 1571 campaign began in March for the Ottoman forces. The fleet was used to support the ongoing assault on Cyprus. During the summer months the navy conducted raids throughout the Adriatic Sea, including one on Venice itself. In September, the fleet began to wind down operations and made for its safe harbor at Lepanto in the Corinth peninsula.

The Holy League forces required considerably more time to organize and assemble, as Don Juan did not depart from Barcelona until the middle of July aboard his flagship, *La Galera Real* (the royal galley). The fleet finally assembled in September at Messina

in Sicily, where all the commanders agreed to attack the Ottoman navy. It sailed to Corfu for a conference on September 27, when the attack plan was finalized, then moved along the Greek coast for a final approach to Lepanto.

On October 6, the Ottomans began to move their fleet from the protected anchorage at Lepanto and out into the Gulf of Patras to face the Holy League. As dawn broke on October 7, the two fleets began to position themselves into a line abreast formation, approaching each other head on. Both fleets formed into three groups: center and left and right wings. (Figure 2) The Ottoman wings had the objective of flanking their opponent by relying on the shallow draft of their galleys and their local knowledge of the coastal waters. The two flagships, Don Juan's *Real* and Ali Pasha's *Sultana*, would lead the fight for the center. The Holy League planned to utilize cannon fire as a primary weapon; the fleet included six galleasses that were placed in front of the battle line and used as floating gun platforms. The Ottomans preferred to use archers as their main weapon and planned to close with their opponents and fight at close range by attempting to ram and then board the enemy ships and fight hand-to-hand. The battle line extended for four miles from side to side and consisted of some 450-500 ships and over 100,000 oarsmen, soldiers and crew. The Ottomans were believed to have an advantage in number of ships, approximately 280 to 220, but the Holy League had heavier galleys with more firepower.

The battle started with the Ottomans engaging the galleasses as they approached the Holy League battle line. The galleasses' broadside firepower was effective and disabled several galleys. The other galleys found a way through to start to engage their adversaries. On board *La Real,* Don Juan waited to fire the forward cannons until the Turks were within point blank range. After this, *La Real* and the *Sultana* collided, and the Ottomans attempted to board. This fighting continued for over an hour, as the two sides remained deadlocked in the center. On the left wing, the Venetian galleys had good success at preventing the Ottomans from turning the flank, and many Ottoman galleys were run aground onto the shore. On the right wing the Ottomans were commanded by Uluch Ali, a renowned Algerian corsair who was perhaps the Ottomans most accomplished sailor. He was opposed by the Genoan Gian'Andrea Doria, the great-nephew of the venerable Admiral Andrea Doria. The fight here was more of a cat and mouse game with each side maneuvering for the advantage. Finally, a gap opened between the center and right wing of the Holy League line, and Uluch Ali succeeded in penetrating into the rear of the Holy League fleet. Had this happened earlier in the battle it might have proved decisive, but the battle in the center had turned against the Ottomans, as Ali Pasha was hit by a bullet and disabled, and then beheaded. The soldiers on *La Real* stuck his head on a pike and displayed it to the Ottomans, who began to fall back. This allowed the Holy League galleys to regroup and fight off the flanking threat. Uluch Ali then retreated from the fight, taking 80-90 ships with him back to Istanbul. Most of the remaining Ottoman ships were sunk, burned or captured. The battle lasted approximately four hours and the total loss of life was estimated between 30,000 and 40,000 men. (Figure 3)

In the aftermath of the battle, the Venetian and Spanish governments both negotiated peace treaties with the Ottomans, who tended to stay in the Eastern Mediterranean thereafter. Fighting continued in North Africa over Algiers and Tunis, which remained the lairs of Muslim corsairs for many years. The victor of Lepanto, Don Juan of Austria, gained fame and renown with everyone except Philip II. He retained command of the fleet for a raid on Tunis in 1573, but he was then sent to the Netherlands as governor-general to fight the ongoing Protestant rebellion. He died of typhoid in Flanders in 1578.

The war galley of the Renaissance era

The galley was the main weapon of all the Mediterranean battle fleets for two millennia. It evolved through one, two and three tiers of oarsmen to

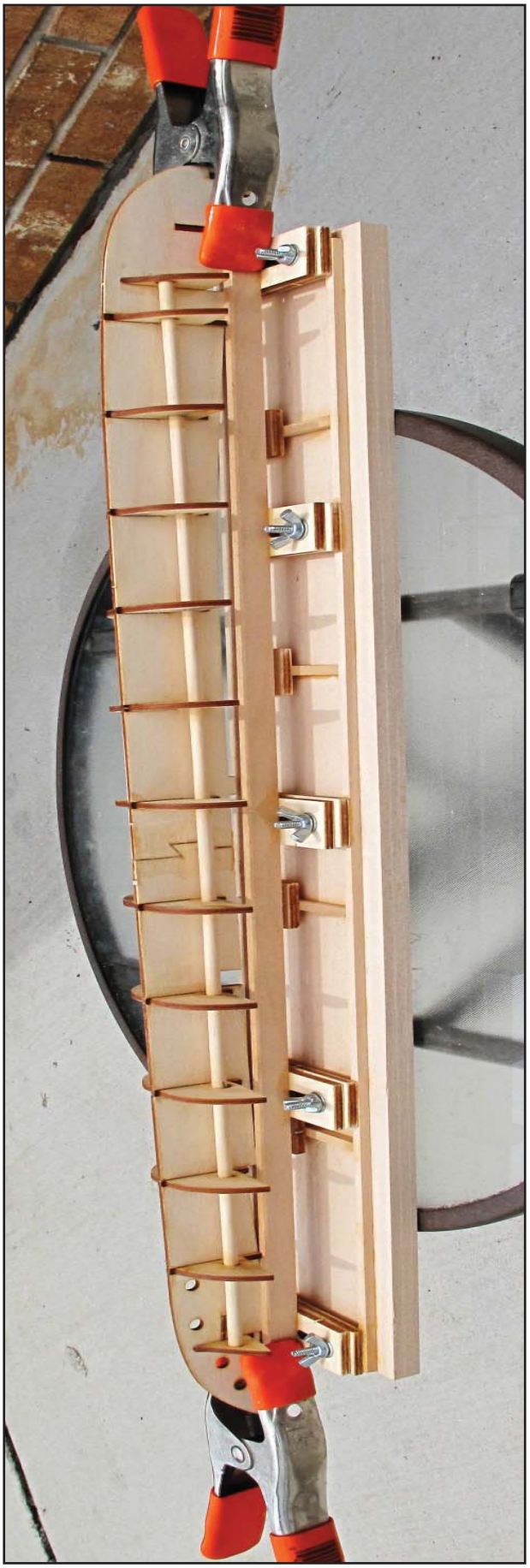
create an effective ramming weapon. By the medieval era galleys relied mainly on distance weapons, such as catapults and Greek Fire, and boarding instead of ramming as their primary offensive tactics.

The galley of Renaissance times had the same basic form as these earlier ships but generally was longer and wider. It rowed *alla scalaccio*, with one tier of oars using three to five rowers per oar. Cannons were their primary weapons; the large cannons were mounted in the front of the ship firing forward with several smaller swivel-type guns mounted along the sides. Soldiers serving on galleys carried arquebuses (a type of musket) bows (especially on Ottoman vessels) and pikes, which were particularly effective when a phalanx of soldiers charged the decks of an opponent's ship.

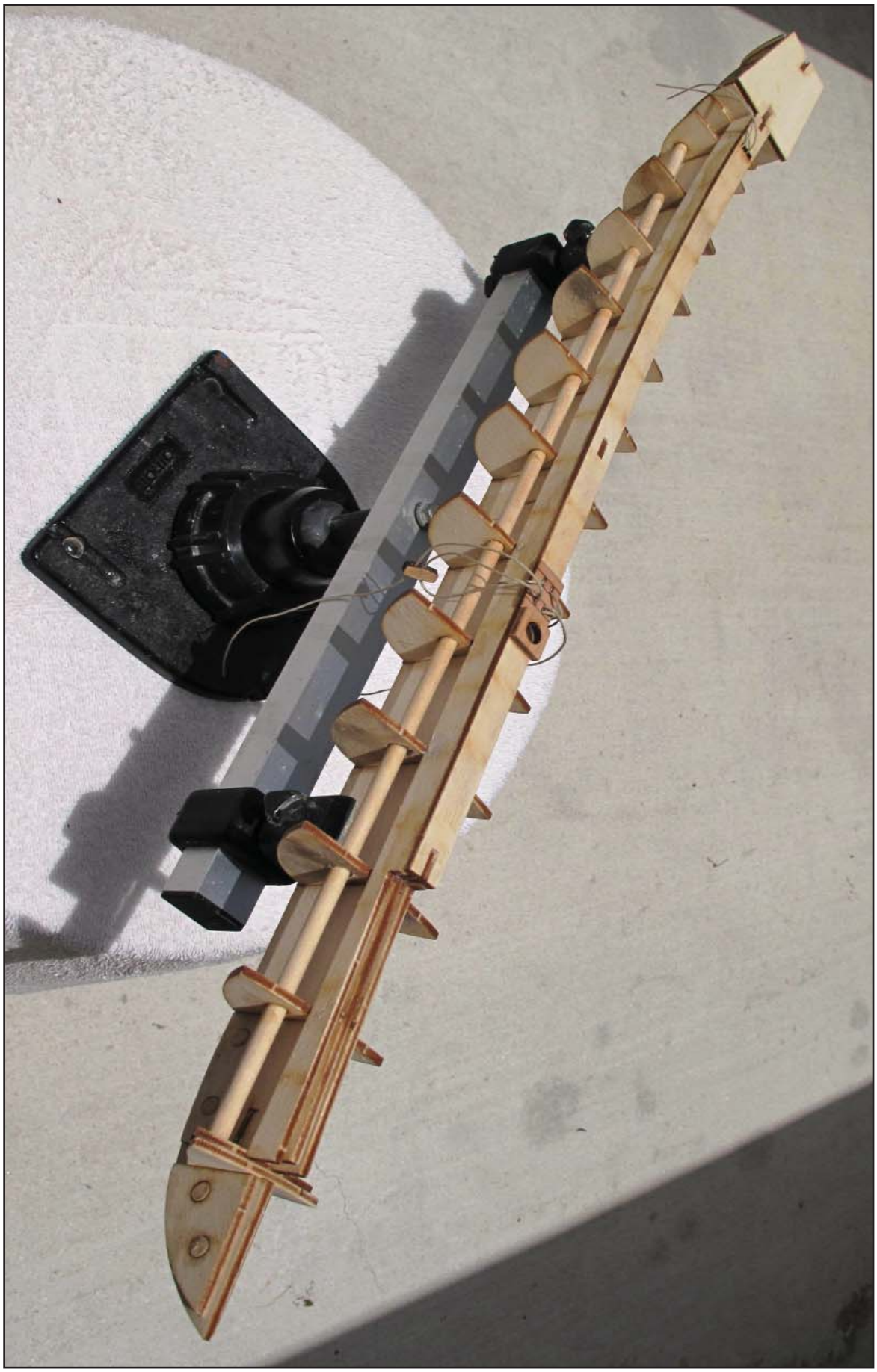
The *Galera Real* was the flagship of the Spanish fleet, and so was especially fine in terms of qualities and decoration. The galley was 60 meters (197 feet) long, 6.2 meters (20 feet) in beam, and 8.4 meters (28 feet) wide across the outrigger or rowing frame, with a crew of around 400. There were 59 oars, each 11.4 meters (37 feet) long and rowed by four men. One side carried one less oar to make room for a cooking area built close to the side of the ship. The ship was highly decorated with many gilded figures, paintings, and statues, and three elaborate stern lanterns; one of the hallmarks of a flagship. A replica was built in 1971 to commemorate the 400th anniversary of the battle of Lepanto. It is housed in the Museu Marítim in Barcelona, Spain and there is an article about it in *Ships in Scale* for July/August 2010.

Building the Model

A Czech supplier, Daniel Dusek, produces a 1:72-scale kit of *La Real.* The finished model is 795 millimeters (31.3 inches) long, 380 millimeters (15 inches) wide and 640 millimeters (25.2 inches) high. The kit is quite complex, containing over 600 individually numbered



4. Keel assembly clamped to a Fair-A-Frame device. All photographs by the author unless otherwise indicated.



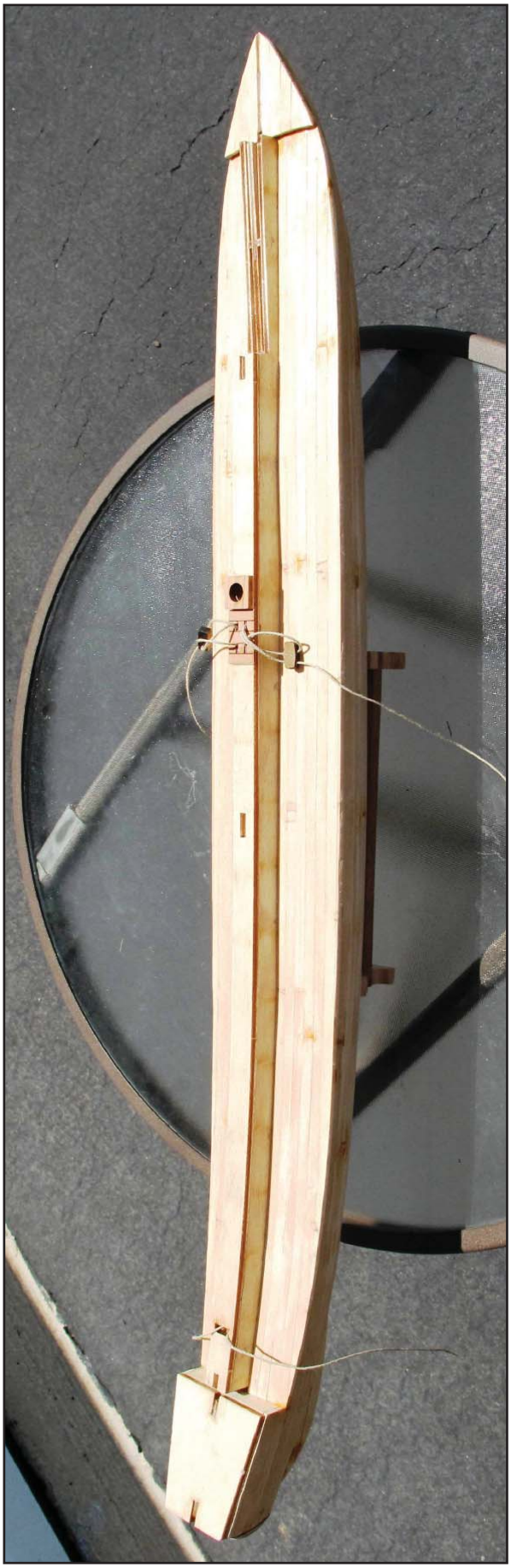
5. Completed keel assembly prior to the installation of the planking and decking.

pieces including laser cut plywood sheets of various thicknesses and a variety of wood strips and dowels. There is also a sheet of photoetched brass pieces and several cast resin moldings. Also included are white cloth sail material, a variety of spools of thread, and blocks for the rigging as well as a set of flags printed on paper. All the materials are of high quality and are nicely packed for overseas shipping.

The plans come on five large sheets. These present the main assemblies at full size and include detailed insets of some of the subassemblies. The instruction booklet is limited to three pages of terse English text which mostly refers to the plans. There is also a six-page part list and several sheets which refer to the individual laser cut parts on each sheet of wood. Given the complexity of the kit and the lack of detail in the instructions I would not recommend this kit for anyone who does not have extensive ship modeling experience.

The model uses plank on bulkhead construction; a frame assembly of 3-millimeter (1/8-inch) thick plywood planked with strip wood. The first step was to assemble the keel, which was composed of two parts glued together to form a 680-millimeter (26.75-inch) long structure. Next the two 3-millimeter plywood bulkhead end frames were glued to the keel. An unusual feature was that these two end frames were installed into slots cut into the top of the keel whereas the other twelve frames were fitted into slots cut into the bottom of the keel. Next the foremast support was installed into a horizontal slot cut into the front of the keel behind the first frame. This support is offset from the center of the keel, indicating that the foremast and main mast are not aligned along the centerline.

The next step was to install two 6-millimeter (1/4-inch) dowels through holes cut into the individual bulkheads to serve as reinforcements for the frame assembly. It is important to carefully dry fit the keel, bulkheads and the dowels before gluing them together as the fit is tight and any misalignment will



6. Hull showing the first layer of planking and decking.

7. Hull showing the finished decking and the yokes that will support the rowing frame.

make it difficult to achieve a stable frame assembly. I used a Fair-A-Frame device to ensure good alignment of this frame assembly. (Figure 4)

The model then was set into a keel clamping device to continue construction. (Figure 5) I added the remaining bulkheads to the bow and stern, and then fitted reinforcing pieces to the bow and stern, following the plans. The stern section received a 3-millimeter thick plywood subdeck (there is no subdeck for the main and foredeck sections). I then installed side supports that form the catwalk along the center of the hull to the upper part of the keel. These 3-millimeter thick plywood strips were glued to the bulkheads, creating a slot on each side of the keel. These curved strips had a tendency to come adrift as they were under some stress and there was not much glue surface to establish good adhesion. I therefore reinforced the bond by drilling holes through the supports, bulkheads and keel and installing round toothpicks into these holes.

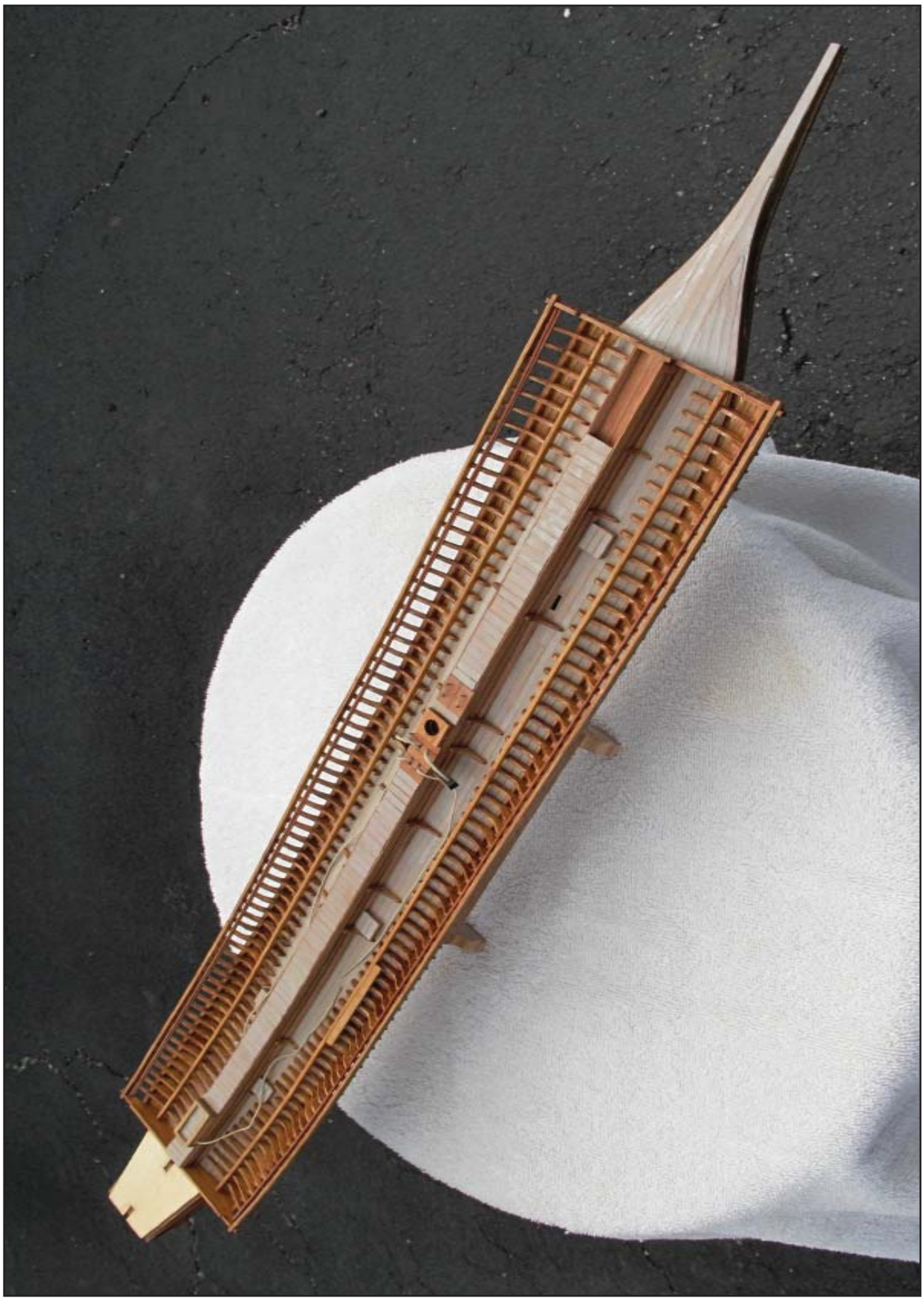
Before completing the final step in assembling the frame, I ran 1-millimeter (0.02-inch) rigging lines from the stern to holes cut just abaft of the mainmast opening. These were attached to two 12 x 5-millimeter blocks which needed to be installed at this point prior to sealing up the framing. The final step was to install a top covering strip over the keel and two support strips, taking care not to glue the rigging line to the wood. (Figure 6)

The next step was to install the first layer of planking using 2 x 5-millimeter strips of basswood. The main deck was installed first followed by the hull planking and then the foredeck. All the planks were installed directly to the framing as no plywood sub-structures were used. The support pieces in the bow required fairing to align them with the first bulkhead, which allowed the hull planking strips to be glued to them. The hull planks required tapering of the front and back sections to provide for even hull coverage. This was especially true of the planks at the bow of the ship, which were tapered to half or less of their 5-millimeter width. The planks were soaked in warm water and then clamped to the bulkheads. After drying, the planks retained their shape which allowed for the final shaping prior to glue up. After the planking was complete any gaps or uneven spots were filled with an epoxy-based wood filler material. Then the hull was treated with sanding sealer and sanded thoroughly. The stern support pieces were faired to provide an even surface for the second layer of planking.

The next step was to glue a 0.6-millimeter (0.025-inch) thick veneer deck strip to the top of the gangway to cover the plywood strips that remained uncovered after the planking was finished. After this was the installation of the fore and aft outrigger supports or yokes to the hull. These are 2-millimeter (0.080-inch) thick laser cut wood pieces that are glued into slots between the main and aft deck and main and fore deck in the hull. The forward yoke came with an intricate pattern of decoration which was made by laser cutting around the individual decorative elements so that they are exposed on the top of the wood surface. These decorations needed to be painted to achieve the desired gilded look. I did this with a DecoColor extra fine liquid gold paint pen, carefully applying the gold color after the piece had been stained with golden pecan wood finish. Using a hands-free lighted magnifier while applying the paint made this easier to accomplish.

After the yokes were glued in place, 0.6-millimeter veneer wood strips were applied to the sides of the central gangway to cover the plywood strips. Two strips about 15 millimeters (0.60-inch) high were applied to each side followed by two 5-millimeter (0.20-inch) high strips glued to the bottoms of the first pieces. Then two 1 x 1-millimeter (0.040-inch) strips were glued to the first strips on each side. Next, a housing was built over the hole in the aft part of the gangway where the 1-millimeter rigging line was pulled through earlier. At this point all of the newly installed wood was stained with the golden pecan finish.

8. View of the model showing the spur, finished fore decking and hull planking.



9. Completed support structure for the rowing frame.

The next step was to apply the finished decking. The supplied 0.6-millimeter thick veneer strips were finished with sunbleach stain sanded to give a grayish, aged look to the wood. The decking was applied first to the top of the gangway with the strips running perpendicular to the underlayment and then to the main deck with the strips running parallel to the subdecking. A 15 x 15-millimeter hatch cover made of 0.6-millimeter veneer was glued to the gangway forward of the mainmast opening, after which two photoetched brass handles were attached to the cover. After the decking was completed, five 13 x 13-millimeter (1 x 1-inch) platforms 4 millimeters (0.16-inch) tall were installed on the deck next to the gangway. Finally, two 5 x 10-millimeter (0.020 x 0.040-inch) hawse holes were cut into the decking and the inside edges planked with 1 x 1-millimeter strip wood. (Figure 7)

I next installed the keel composed of five 3-millimeter thick pieces glued to the main body section along the bottom edge. The first forms the spur that extends out over the hull and terminates in the ram. Four 3-millimeter thick pieces that tapered to 1-millimeter at the bow end reinforced the spur and also were glued to the sides of the hull. Two 1 x 1-millimeter strips glued to the end of the spur in between the support pieces formed the ram.

The instructions called for the installation of the wale strips next, the main wale being a 2 x 2-millimeter strip that extends from the end of the bottom reinforcing piece to the stern, where it wraps around the end blocks. The unusual aspect of this is that the wales are meant to be installed prior to the finished planking, which apparently is meant to be fitted in around the wale strips. I decided to reverse this by installing the finished planking from the sheer down, put in the wale once the planking had reached the top of the wale's position, and then continue the planking to the bottom of the hull. The finished planks were 1 x 3-millimeter strip wood. It was somewhat softer than basswood but still required soaking in water to allow them to be bent into shape. This was particularly true at the stern, since the planks had to be bent into a U-shape to cover the rounded stern sections. The kit included a bending jig to help with this, but a considerable amount of work was required to shape these planks. The 2 x 2-millimeter main wale strip was kerf cut first at the stern end, then soaked in water and bent using an electric plank bender. Even after all preparation the stern planking did not conform exactly to the hull and the gaps required wood filler. In addition to the main wale, there were two other wales at the stern. These were placed on top of the finished planking and then sanded down to match the thickness of the main wale.

After installing some of the planking I noticed that the keel pieces had begun to come loose in places, so I reinforced the bond by drilling holes through the keel into the hull and gluing in wooden dowels (toothpicks).

After the hull planking was finished any imperfections were filled with stainable wood filler. Then the hull was coated with sanding sealer and sanded to a smooth surface. Pictures of the full-scale replica show that the area between the wales on the stern of the hull painted a dark red color, so I first applied a cherry stain to this area. I applied the golden pecan stain finish to the rest of the hull above the waterline but, because the planking strips were much lighter than the veneer wood used previously, the color did not match. I then applied a light coating of a walnut stain to the hull to act as a primer followed by applying the golden pecan stain, which gave a more satisfactory result. Then the foredeck was planked with 0.6-millimeter plywood strips stained to match the main deck. The hull below the waterline was to be a white color but I decided to put off applying this finish until the hull was more complete. To complete this step, I used a gold Sharpie paint pen to gild the wale strips. Figure 8 shows the model at this point.

The next step was to install the rowing frame on top of the hull. This is a rectangular structure bounded at the ends by the yokes and on the sides by

10. Forward gun support structure installation.

support beams which have the frames and planking attached to them and the main deck. First, I installed 2-millimeter supports to the bottom of the yokes and 1.5-millimeter (0.060-inch) thick plywood supports to the sides of the gangway. Wood strips 2 millimeters thick and 580 millimeters (22.85 inches) long formed the side support beams. Gilded 0.6-millimeter veneer strips were glued to the outside edge of the beams. After installing the beams, 67 paired frame supports were glued to the deck and the beams on each side. These were 1.5-millimeter plywood pieces that all had different dimensions. A notched side wall strip (installed later in the process) established the spacing between the supports. I stained the support frames before installation and fitted them in pairs, alternating from the bow to the stern. This process took several weeks to complete.

Next, a 2 x 2-millimeter and a 2 x 1-millimeter strip extending the full length of the rowing frame were fitted to the bottoms of the support frames and were glued to the yokes. These pieces helped to support the 1 x 3-millimeter flooring strips that were glued to the bottom of the frames and then attached to the hull. Next, a 2-millimeter support beam was glued to the top of the frame supports in notches precut into each support member. One side also had a 2 x 5 x 68-millimeter support beam for the ship's boat glued alongside the main beam. Finally, two 0.6-millimeter veneer strips were glued to the upper part of the frame supports in notches between the main upper support beam and the end of the frame support. All the rowing frame assembly was then stained to match the hull. (Figure 9)

The next construction stage was installing the rowing benches and the forward gun support structure. The first step involved gluing in place the two 0.6-millimeter side walls, previously used as spacers while installing the frame supports. Fitting these thin strips required widening the slots to get them to fit down onto the supports. They also tended to split and had to be repaired several times during the process. Then 1 x 1-millimeter strips were cut to fit on both sides of each frame support to the top of the side wall. In all, 272 of these pieces were cut and glued into place. Finally, four 1 x 2-millimeter support beams were fastened to the top of the frame supports. The material supplied was not long enough to make these beams in one piece, so they were spliced together to get the required length. The rowing frame was then stained again with golden pecan prior to the next steps.

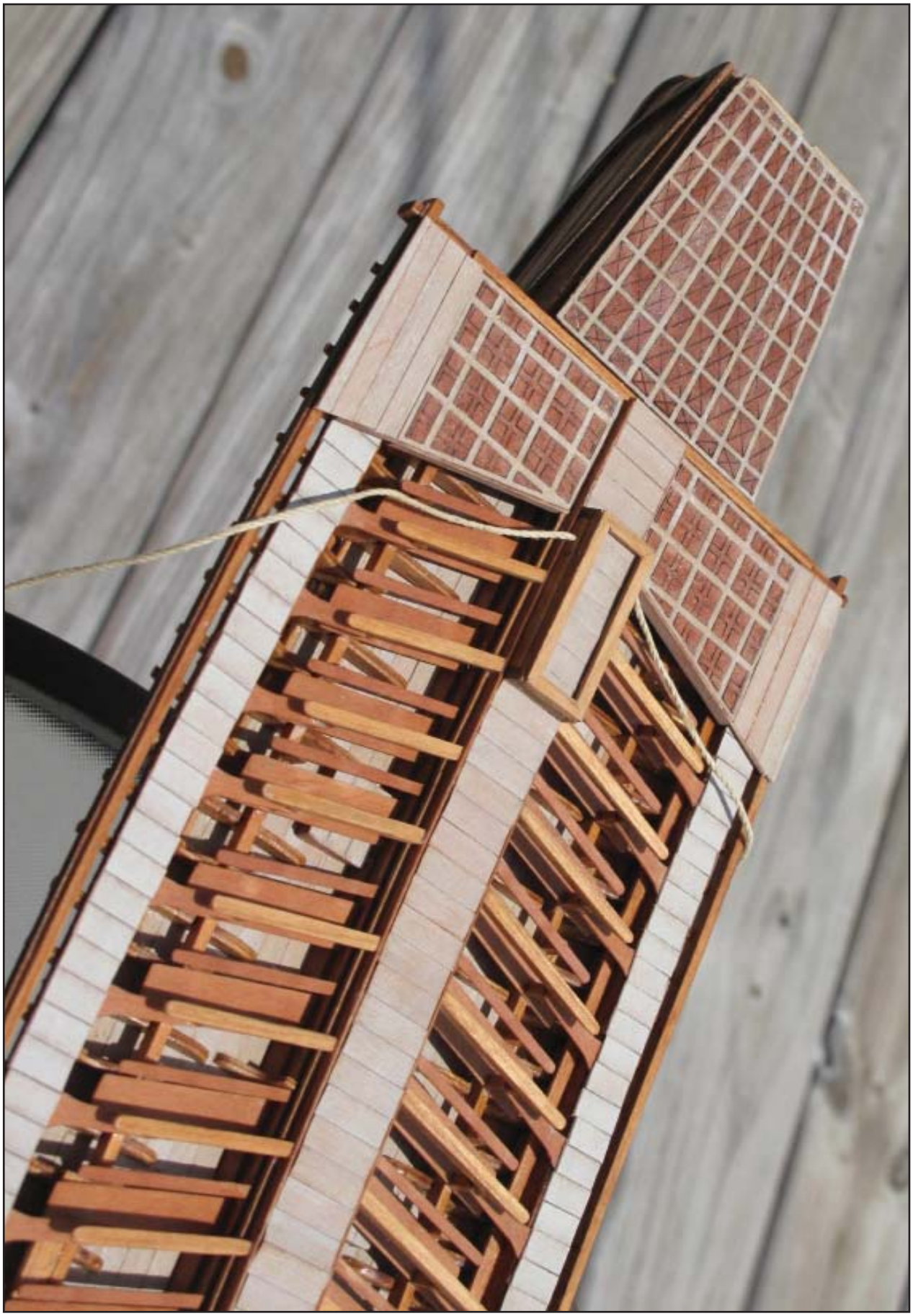
I decided to drill out the 6-millimeter diameter hole for the foremast prior to starting the forward gun housing support structure. This hole was framed early in the hull framing process and then covered with deck planking, so it had to be drilled out. The forward structure was assembled from 2 x 2-millimeter strip wood frames and 2-millimeter thick plywood laser cut pieces following the details shown on the plans, and then finished with golden pecan stain. (Figure 10)

The rowing benches were constructed from eight separate pieces each, four of which were laser cut, preformed structures and four others that needed to be fabricated from strip wood. There were fifty-nine benches in all, with one bench omitted to allow for a cooking area placed close to the port side of the ship. They also were finished with the golden pecan stain. (Figure. 11)

The next step was to fit more decking. First, 10-millimeter (0.40-inch) long decking pieces cut from 5 x 0.6-millimeter veneer were fitted on top of the previously installed bench supports. There were 105 decking pieces per side, all finished with sunbleach stain before cutting them.

The stern has three decks, one covering the poop area and two forward of the poop on either side of the gangway. These have the appearance of parquet floors. The poop deck was made by gluing a 0.6-millimeter thick veneer grid framework to the subdeck, then filling the holes in the grid with 81 individual floor pieces. The frame was finished with sunbleach stain

11. Rowing benches installed in the rowing frame.



12. Decking covering the poop area and the two decks at the end of the rowing frame.

13. Finished forward gun area and foredeck.

and the floor pieces with a gunstock stain to give some color contrast. The two other decks were made in a similar way on pieces of 0.6-millimeter veneer subdeck. They also had a 0.6-millimeter veneer support strip glued to one edge and then four 4 x 0.6-millimeter strips glued to the edge of each deck. These finished decks were glued into place forward of the poop deck and on each side if the gangway. (Figure 12)

The next project was to complete the foredeck area. The decking covering the space forward of the first rowing bench was 4 x 0.6-millimeter veneer strip wood tinted with sunbleach stain. Next, eight 1 x 1-millimeter guide tracks for the four smaller gun carriages were glued to the deck; the main gun carriage track is part of the gun housing support structure at the forward end of the main gangway. The carriages themselves were assembled from four laser cut pieces each and stained. The gun housing support structure, partially constructed earlier, required ten side supports, fabricated from 2 x 2-millimeter strip wood and then stained and glued in place. The structure framing was completed using a variety of laser cut pieces on the top and sides. I then planked over the top of the structure with 1 x 3-millimeter strip wood and finished the entire structure with antique walnut stain. The final step was to install the five guns on the foredeck under the housing structure. The barrels were resin castings that required scraping away mold flashing and drilling out the bores before painting them metallic black. The barrels were glued to the carriages and small brass strips were glued on top of the pins to hold the barrels to the carriages. The finished guns were then glued to the foredeck. (Figure 13)

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I have been involved with model building for many years, starting as a pre-teen building plastic model kits with my father. My first experience with wooden ship models started when I received a USS *Constitution* kit for my 14th birthday. This was the Scientific kit with a preformed solid wood hull and what I recall as a bewildering collection of small wooden, metal and plastic parts along with spools of string. This project was quite unlike building plastic kit models but I completed the ship after a couple of years of off and on effort.

After finishing undergraduate school I kept building kits, first with preformed hulls and then moving to plank on bulkhead models. After completing graduate school I continued building model kits, and then moved on to scratch building with my first effort being the 1870s sidewheeler *J. M. White*. I published the build of this radio-controlled model in *Ships in Scale* in 2006. I then went back to kits, and my build of a Greek trireme was published there in 2011. My next effort was *La Galera Real*, which took about three years to build. This is my first publication in the *Nautical Research Journal*.

My current build is another USS *Constitution*, this time using an old Mamoli kit that I got from the secondary market. I am applying copper strips to the hull bottom for the first time, so I am still learning new techniques at age 64.

Some guidelines for photographs submitted for publication

By Ian Poole

In the last few years there has been a steady decline in the quality of some photographs published in the Journal as a direct result of the quality of photographs submitted for publication, though this was more pronounced with *Ships In Scale*. This can probably be traced back to the time that the majority of us switched from film to digital images.

There are two possible explanations for this:

1. Digital images are cheap to make (apart from the capital investment in equipment) so we can make multiple images and then pick the best. Consequently, we all tended to pay a little less attention compared to the accuracy required when shooting film to submit color slides for publication.
2. Most of us choose to shoot in the JPEG format, but JPEG is "lossy" and can tolerate very little after-shot processing. Every time you adjust or edit and then save a JPEG image, data is dumped. It does not take too many adjustments before this degradation of the image becomes noticeable.

Rather than debate this issue, and remembering that this is not a photographic magazine, I would like to offer some guidelines for those of us who are not "photographers" and are thinking of submitting articles for publication. This is not aimed at "photographers".

First, and most important, take the best possible image that you can with the equipment you have. Keep at it till you get it right, do not rely on post image processing.

The next issue that has to be addressed is color versus black-and-white. Not all color images convert well to black-and-white. An image relying on contrast between the colors, and which is a very striking color image, may be "flat" and lacking in contrast when

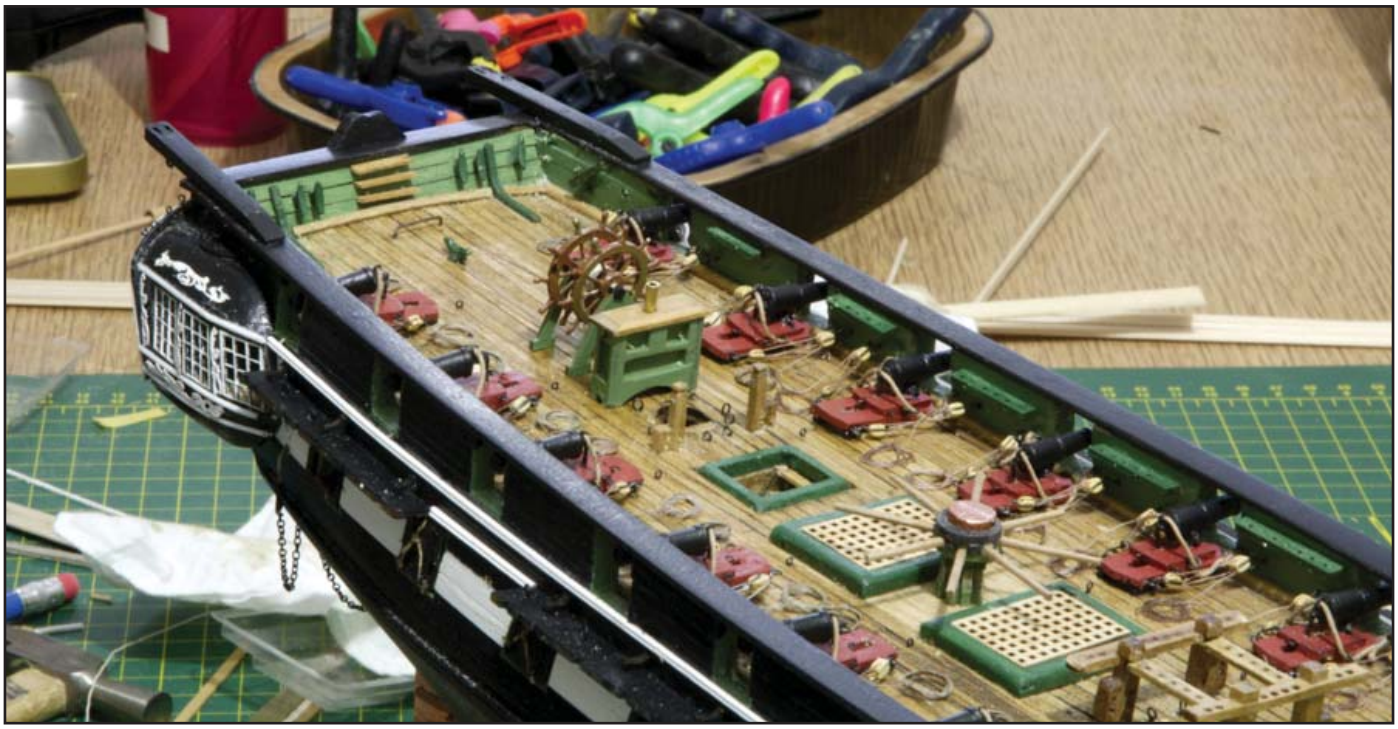


Figure 1.

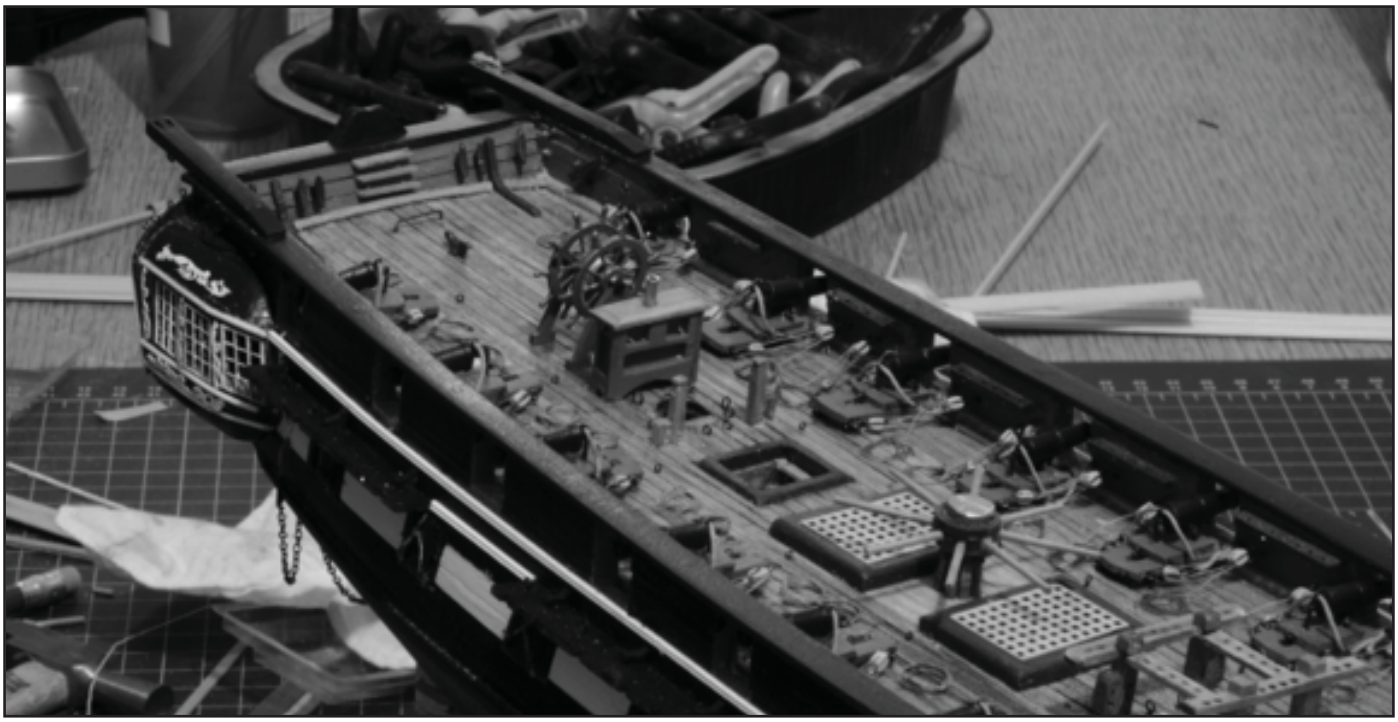


Figure 2.

converted to black-and-white. For example, red and green are similar shades of grey, and these are fairly common colors on our models. (Figure 1) As can be seen in Figure 2, when converted to black-and-white, the red gun carriages are the same grey as the green bulwarks. This can be corrected by darkening the red and lightening the green, as in Figure 3. Color can also be a distraction when the photograph is intended to illustrate a procedure or small detail, rather than a completed model. I would suggest that images intended to support a detailed procedure or method be submitted in black-and-white, and that images of complete models be submitted in color.

The next area to address is the setting in which the model is to be photographed. The background must be neutral and free from any distractions. Figures 1 to 3 are examples of extremely poor background. The model should be placed on a white or light grey surface. In general, the hull area below the waterline on our models is often copper or white, both of which will show poorly if a color is reflected onto them. Figure 4 illustrates the vast improvement that results from correcting the background. Figure 5 shows the correct rendition of the copper color from placing the model on a pale neutral background. You need something pale under the keel to reflect light up on to the lower surfaces of the hull

The camera should *always* be mounted on a tripod. You will need to set a small aperture (between f 8 and f 22) to ensure maximum depth of focus, and you will need to set the camera's ISO as low as you can (100 or 200) to get the best possible quality image. This will result in a low shutter speed, making the tripod essential. If your camera or lens has any form of vibration reduction, turn it off when the camera is on the tripod, as it can cause vibration while hunting for vibration. The other advantage of the tripod is that it will force you to slow down and think about what you are doing. *There are no short cuts.*

Natural or diffused lighting is always best. Light from a flash can be harsh, producing unwanted shadows. It can also show defects you do not want people to see, such as brass under where paint is chipped or thin.

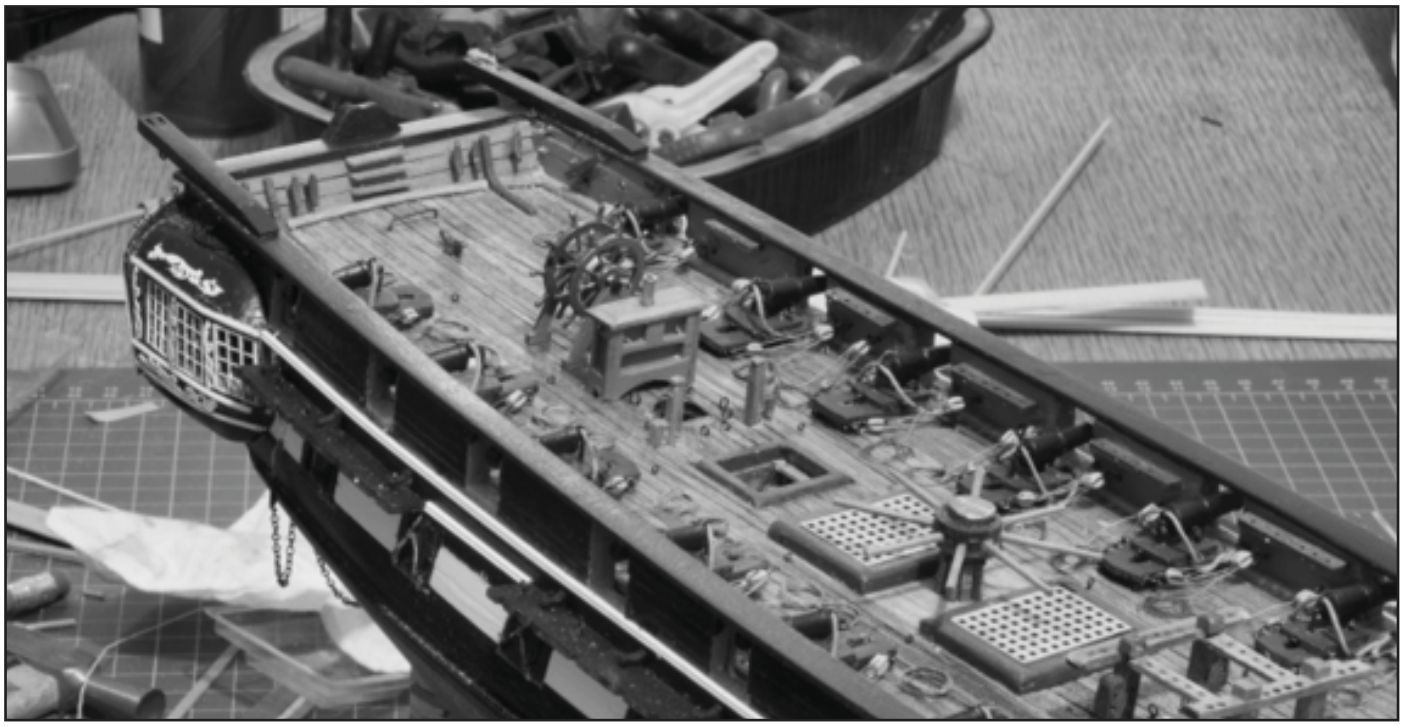


Figure 3.

All digital cameras have a number of variables that are easy to set and control. Here are a few recommendations:

- If you are taking images from various angles or locations, do not set the white balance to Auto, since it will assess each image that you take and can result in slight difference in color hue. If you are only taking one image, leave it on Auto White Balance, but for multiple images, set the white balance to suit the ambient light conditions.
- Set the exposure mode to A, aperture priority, as this is what you want to control.
- To get the best quality image, set the ISO to the minimum your camera has available.
- You do not want your model to appear more brightly colored than it is, so set the picture control to Standard and avoid Vivid.
- If you using JPEG as your format, set the camera to JPEG fine for maximum quality.
- Set the camera's metering system to matrix metering.

Take many multiple images of the photograph you want and keep adjusting until you have the best possible image you can make. This applies whether you are shootong in JPEG or RAW. At whatever level of photography you are, you want to minimize the amount of time and effort spent on post-image processing.

When you have the best final image you can achieve, write down every detail of the set up, lighting, and camera setting. File this somewhere for future reference so that you will not have to go through the process again and can just refer to your notes when you photograph your next model.

If the image is to be published in black-and-white, then submit a black-and-white image. Do not rely on the layout designer to process the conversion.

Of all these recommendations, the single most important is to take the best possible image that you can and not rely on post-image processing to correct a poor photograph.

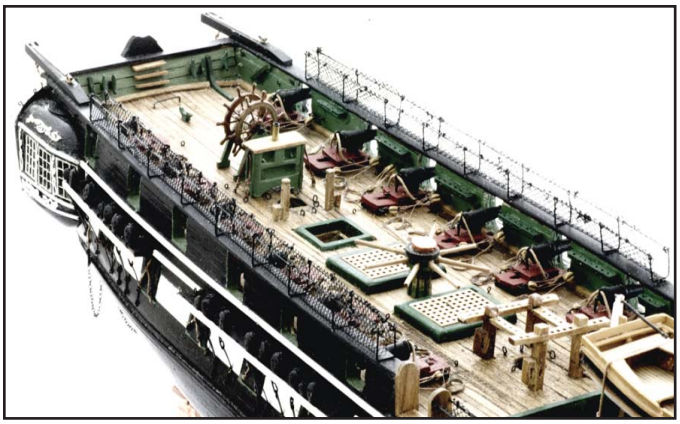


Figure 4.

Figure 5.

Lastly, the most expensive digital SLR cameras are very capable of taking very poor images, and cell phones can take excellent images. It is you, not the camera that takes the photograph; the camera is just a tool.

I have been making model ships for around seventeen years, both scratch and kit. Before model ships I had a model railroad that filled the basement and took around four of us to operate. In both cases I used photography as a means of quality control; most errors show up in photographs, but you tend to ignore them when you look. I have written articles for the Journal both on model making and photography. In the days of film, I was very active in the local camera club and competitive photography. In my misspent youth I was stoker on a minesweeper (it was a diesel boat, but we were stokers even if it was a nuclear submarine). I sailed the North Atlantic and the Eastern Seaboard as an engineer on an old steam-powered cargo ship. I spent most of my working life in coal-fired generating plants and finished up as production manager in what was one of the largest coal-fired power plants.

1. Photograph of a man and wife in Dayton, Ohio, stranded on top of their front porch during the Great Flood of 1913. (Courtesy of Wright State University)

"River Cutter" *Yocona* pioneers technology on the nation's rivers and desegregation in the Deep South

By William H. Thiesen

Throughout the history of the United States Coast Guard, the nation has tasked the Service with new missions to respond to all sorts of maritime threats and crises. Such was the case with the Great Flood of 1913, considered by many as the most devastating flood to strike the United States.

In the history of deadly American floods, the Great Flood of 1913 ranks only second in number of lives lost. The 1889 Johnstown Flood distinguished itself as the deadliest with approximately 2,200 victims killed in the small city of Johnstown, Pennsylvania. However, the 1913 flood affected over a dozen states, wiped out between 600 and 900 civilians, caused hundreds of millions in damage and made homeless 250,000 Americans.

As a consequence of this natural disaster, Congress voted to fund Federal flood relief and rescue work on the Ohio and Mississippi Rivers. And, on August 29, 1916, Congress passed a naval appropriations bill that included money for the construction of three "light-draft river steamboats" for the Coast Guard. Their mission was to "give relief, succor, and assistance to victims of floods" on the two major rivers. In addition to their specialized riverine duty, the cutters would support the usual Coast Guard missions of "rendering assistance to vessels in distress, saving life and property, protecting the revenue, enforcing the navigation and motor-boat laws, and prosecuting

2. Faded image of river cutter *Yocona*. Visible on its decks are members of the African American crew standing watch. (Courtesy of U.S. Coast Guard)

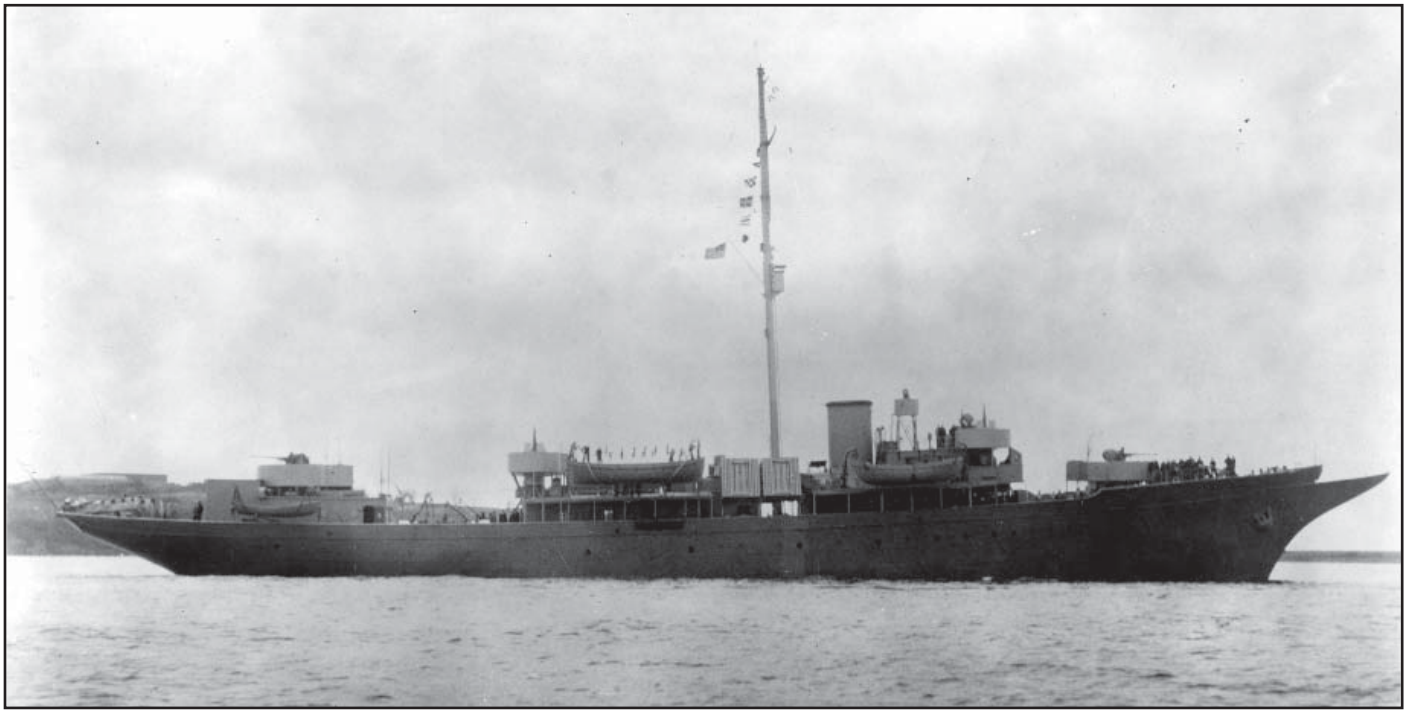
3. A rare image of Yocona's crew in 1925 shows the black enlisted men and white officers and non-commissioned officers on board the cutter. (Courtesy of U.S. Coast Guard)

such other work as properly may come with the purview of the service."

Of the three "river cutters" funded by Congress, only two were completed. These were the cutters *Yocona* and *Kankakee*, constructed in Dubuque, Iowa. The Service commissioned them both on October 19, 1919, and stationed *Kankakee* on the Ohio River at Evansville, Indiana and *Yocona* on the Mississippi River at Vicksburg, Mississippi. *Kankakee* took up its station on March 20, 1920, and *Yocona* took up its station earlier that year, on January 18. As the earliest river cutter to take up its duties, *Yocona* became the first Coast Guard cutter of any kind to operate on the nation's inland rivers.

Designed as flood response command ships, *Yocona* and *Kankakee* incorporated the latest riverine technology. These 182-foot steel-hulled riverboats were powered by a stern paddlewheel specifically for river navigation and carried a complement of thirty-five officers and men. Drawing only three-and-a-half feet when fully loaded, *Yocona*'s flat hull was ideal for reaching narrow and shallow waters. The cutters were also equipped with dual searchlights, powerful pumps, advanced radio equipment and spacious cabins to house flood victims. And, in the event of a flood, they could support a flotilla of small boats and river craft used to rescue and transport disaster victims.

In addition to this specialized design, *Yocona* proved unique in the nation's history of racial desegregation.



4. Cutter *Sea Cloud* earned greater fame as the first officially desegregated Federal ship, with African Americans serving not only as ordinary petty officers but also as officers and non-commissioned officers. (Courtesy of U.S. Coast Guard)

Beginning in 1920, the cutter boasted an entirely black enlisted force while *Kankakee*'s crew was composed of white officers and men. With the exception of officers and non-commissioned officers (NCOs), *Yocona*'s enlisted crew was entirely African American, including petty officers in every rating.

By enlisting an all-black force of petty officers, *Yocona*'s officers had set a precedent for desegregating the nation's sea service vessels. While *Yocona* may be considered the first desegregated Federal ship in American history, the Service never publicly recognized the cutter as such. More than likely, the Coast Guard recruited the best-qualified watermen near its homeport of Vicksburg. The fact that the Coast Guard operated a cutter with an integrated crew nearly a hundred years ago is history making in itself. However, the fact that *Yocona* was homeported in a state that boasted the nation's worst record of discrimination and violence toward blacks makes this achievement all the more remarkable.

Desegregation of United States Navy ships came over twenty years later. In the spring of 1944, the Navy desegregated its first ship using *Yocona*'s system of black enlisted men with white officers and NCOs. On the other hand, the Coast Guard's wartime desegregated cutters, such as USS *Sea Cloud*, assigned African American men to every level of command, including officers and NCOs. And, the Coast Guard's desegregated cutters began operation a year earlier than the Navy's first integrated warships, such as destroyer escort USS *Mason*, which has been made famous through recent books and movies.

Through 1925, the Coast Guard stationed cutter *Yocona* at Vicksburg to provide assistance during the seasonal floods that historically plagued the Mississippi. It proved a pioneering cutter in three ways. In a service known to adopt new kinds of ship hulls and propulsion, this was the Coast Guard's first stern paddlewheeler. *Yocona* was also the first Coast Guard cutter stationed on the nation's rivers. More importantly, *Yocona* proved the first Federal vessel in peacetime manned by a racially integrated crew. Ironically, this desegregated river cutter's homeport was located in the heart of the Deep South.

Shop notes

LED shop lights

By Bill Sproul

The change from 4-foot fluorescent overhead lights to 4-foot LED overhead lights has brought a lighting miracle to my ship model shop. The LEDs are about two to three times brighter, have a Kelvin temperature of 5000K (the sun is about 5300K) which makes taking photographs much easier, have an anticipated life span of about 20,000 hours, use 15 watts of power per 4-foot bulb (less than one-half the wattage of a fluorescent), and are available everywhere. The downsides are that you have to change the ceiling light fixture from a T-12 for fluorescents to a T-8 for LEDs and the entire installation is about twice the cost of fluorescents in bulbs and fixtures. An LED installation (a unit) is about $25 for each fixture and two 4-foot bulbs. I installed four units for $98; I now almost have to wear sunglasses when I am working. However, the long-term amortization (20 to 30 years) significantly reduces the overall cost of installing and running the LEDs.

The description above covers the permanent ceiling shop lighting. But the real improvement in the lighting is in updating the desk lamp-type lighting (changing from incandescent bulbs to LEDs). You can make all the LED desk lamps you need right in your shop for about $10 each. With a little ingenuity you can now provide lighting for every conceivable work bench need. Also, and not to be minimized, when you have both overhead lights and smaller desk lamp bulbs all producing light at 5000K, many photographic problems (especially casts) just

Figure 1.

Figure 2.

disappear. Photographs that looked terrible under mixed fluorescent lighting suddenly look like a genius (think Ansell Adams) took them using the 5000K LEDs.

In an article I wrote a couple of years ago, I talked about using incandescent lighting with a microscope for the job of making and stropping blocks, making boats, anchors and other general woodwork. LEDs blow that lighting configuration right out the window. Figure 1 shows a typical desk lamp with two arms and a 100-watt incandescent bulb, one of the lights I was using at the time. This mechanism has two arms and a bulb; both of these features are poorly adapted to ship modeling (at least compared to LEDs). The 100-watt bulb has a color temperature of about 3000K (much too red, especially for photographing models) and the two parallel arms are much too long which means you cannot point the light where you want it most of the time. For me, using these commercial desk type lights (which I did for seven years) was a constant battle but, since they were all that was available at the time, what was one to do? Even though I was constantly making modifications to the arms, the changes did not really solve any of the problems. Then, someone invented the LED and made it cheap, small and powerful; the perfect solution to all the problems. With a little creativity I fashioned some great lamps out of scrap wood and standard hardware, and used a modified LED desk lamp from Wal-Mart for the electrical components. Figure 2 shows one LED lamp as purchased and one LED lamp disassembled and almost ready for re-soldering and mounting on an

Figure 3.

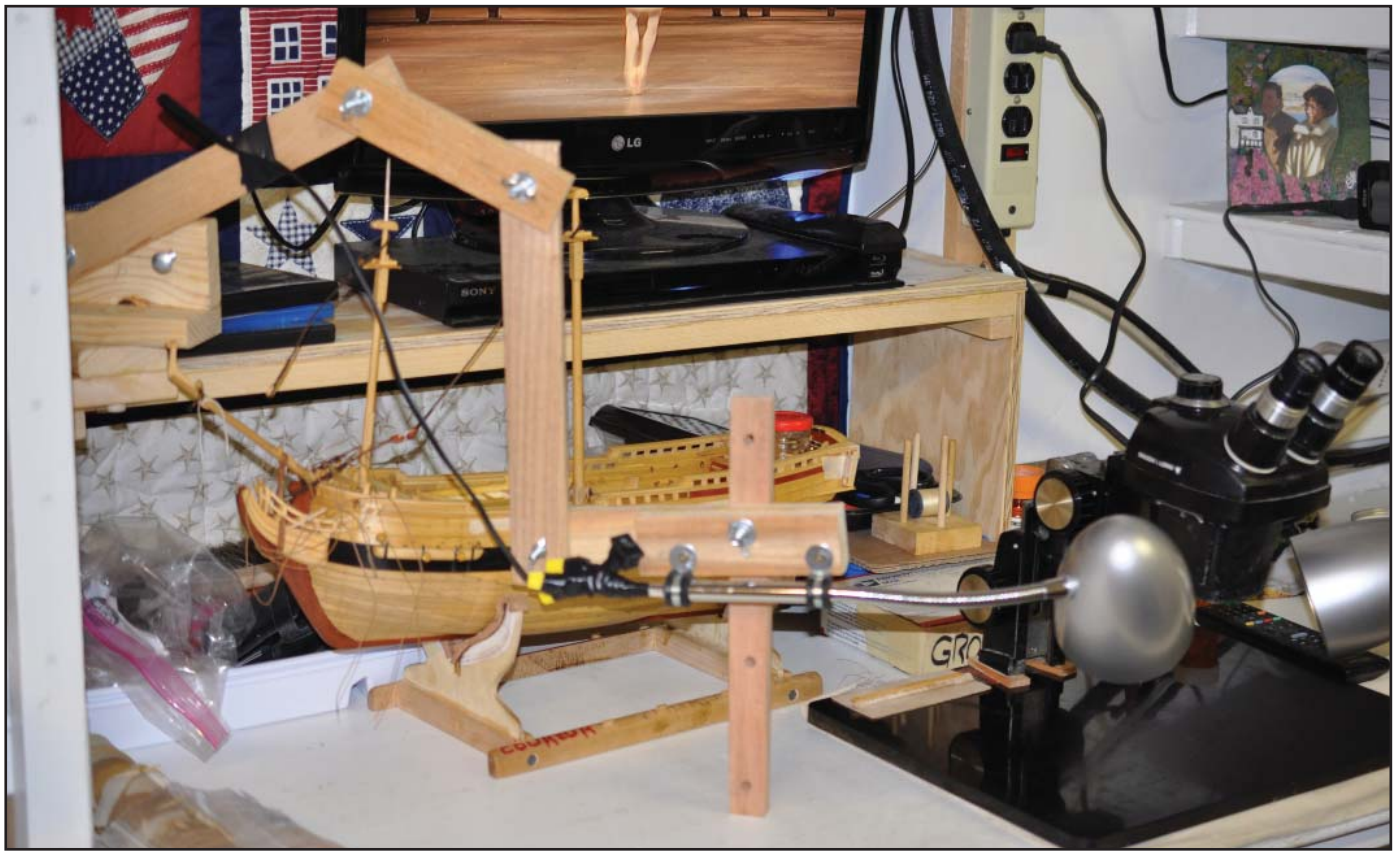


Figure 4.

Figure 5.

arm, perfection at last. Figure 3 is a typical LED lamp as I make them. Instead of two arms there can be four, five or six. Instead of parallel metal arms there are single wooden arms. Everything is held together with ¼"-20 standard cheap hardware (bolts, washers and wing nuts). The light is a standard cheap ($5.68) LED desk lamp from Wal-Mart with its heavy base removed. All the original wiring was used as is; no money was spent on electrical. The diffuser plate in the can was removed, probably doubling the available light from the LED itself. (Figure 2) A wooden bench mount (which can be seen in Figures 3, 5, and 7 and can have many configurations and be mounted anywhere) was made from scrap wood, which allows for rotating the entire fixture or moving the entire fixture anywhere you want (clamping it or screwing it to the bench). All of the above for about $10 per lamp. I now have ten of these units in my shop (two per workstation, one on the right and one on the left) and a couple spares. I intend to make more for the drill press, mill, and other tools.

Construction is simple. All the details are in Figures 4-7. The wood used was spruce rough cut from six-foot wooden fence pickets (from Home Depot or Lowe's, very light, stable and easy to work with). The width cut size is about 1-1/2 inches. You get about

Figure 6.

18 feet of arms per picket (they cost about $2.25 per picket, about $1 per lamp). The hardware is all ¼"-20, the least expensive you can buy; and it works perfectly. Each joint requires one bolt (1-1/2 to 2-1/2 inches long), one washer and one wing nut (cost about 75 cents per joint). The mount is scrap wood as needed. The lamp was from Wal-Mart; a simple desk lamp with a high-powered LED and a flexible neck (for $5.68). The metal base was removed. The wire, switch and plug were used as is; some wires were cut, re-soldered and wrapped with black plastic tape as necessary. (Figure 2) The lamp was mounted to the wooden arms with two metal pipe clamps from Lowe's, costing 70 cents. (Figures 3-6) The mount is simple; look at the photographs. The lamp rotates on a piece of ½-inch wood dowel.

The lengths of the wooden arm pieces are purely arbitrary. I initially used pieces 6, 8, 10 and 12 inches long, but cut whatever lengths work in your shop. Initially, I just bolted together whatever pieces looked

Figure 7.

like they would work. If they did not, I swapped pieces until the configuration did work; hardly sophisticated engineering. The real revelation was not about the length of the arm pieces used, but in how many arm pieces I used. I knew that two arms were probably going to be a failure. The revelation revealed itself when I bolted 4, 5 and then 6 pieces together. With this many-armed configuration I could point the light anywhere I could think of; high, low, right, left, up, down, you name it.

Another important feature is the number of holes in the arms to use for bolting. Initially I just put one hole at each end of an arm; not flexible enough. Now, I put holes about every two inches over the entire length of each arm for maximum flexibility. I have now cut and drilled about 80 feet of arm pieces (5 pickets). If one configuration does not work, just throw in another arm piece; sooner or later something will do the job.

There are many important features to the system: low cost, reliable access to more parts (you are making them), ease of construction, zero maintenance, portability (if you do not like it where it is, move it), adaptability (if a new stronger light is available, get one and mount it), ease in moving the light for best illumination (grab it and push or pull it), light weight. All-in-all, this homemade lamp is one of my better ideas, at least in my shop. As an aside, a parallel arm desk lamp now costs in the realm of a $100. If you are careful, you can build a dozen of these lamps for that amount of money; and they all work orders of magnitude better.

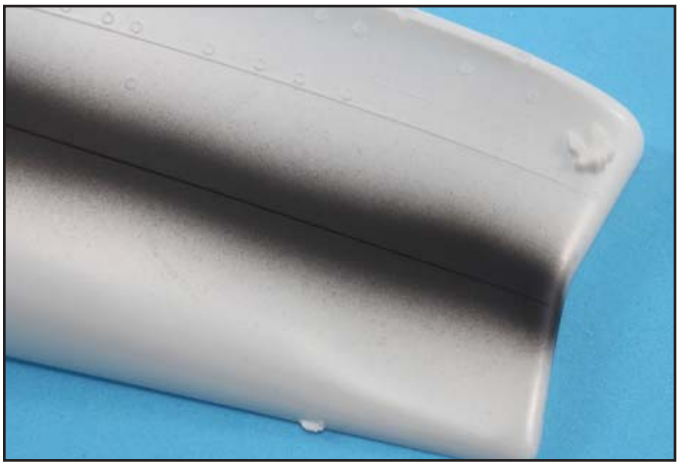
Tips & Techniques

Painting a waterline – mask only one time

By Kurt Van Dahm

Follow the sequence of photographs to see a way to paint a waterline with only having to mask carefully a single time. Once the waterline tape is in place all subsequent masking steps are done over the waterline tape. For tips on using the right tapes see my previous article on selecting masking tapes in NRJ 64:3 (Autumn 2019), 282.

1. Mark the waterline on the hull.



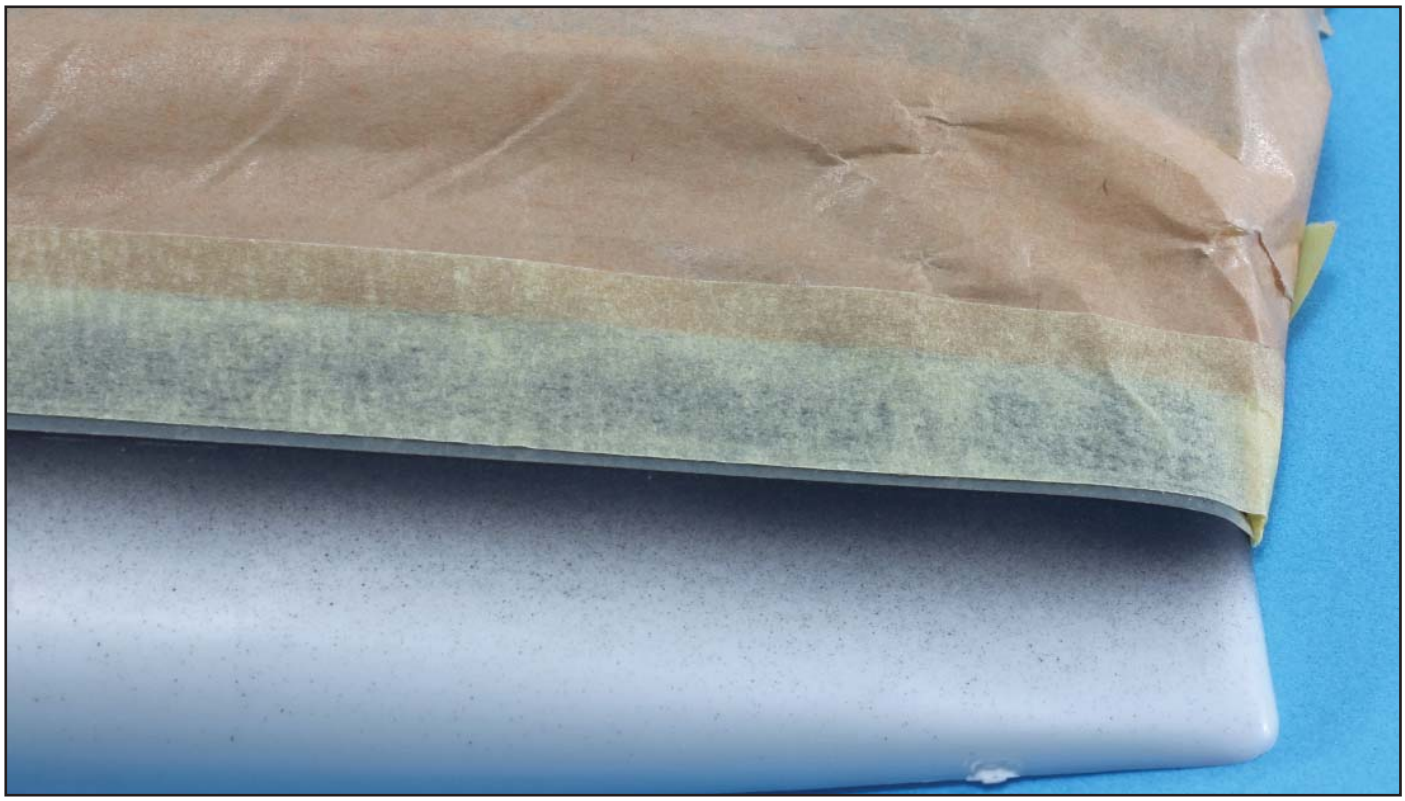
2. Spray the waterline color wider than the finished waterline.

3. Remark the waterline and apply tape the width of the waterline.

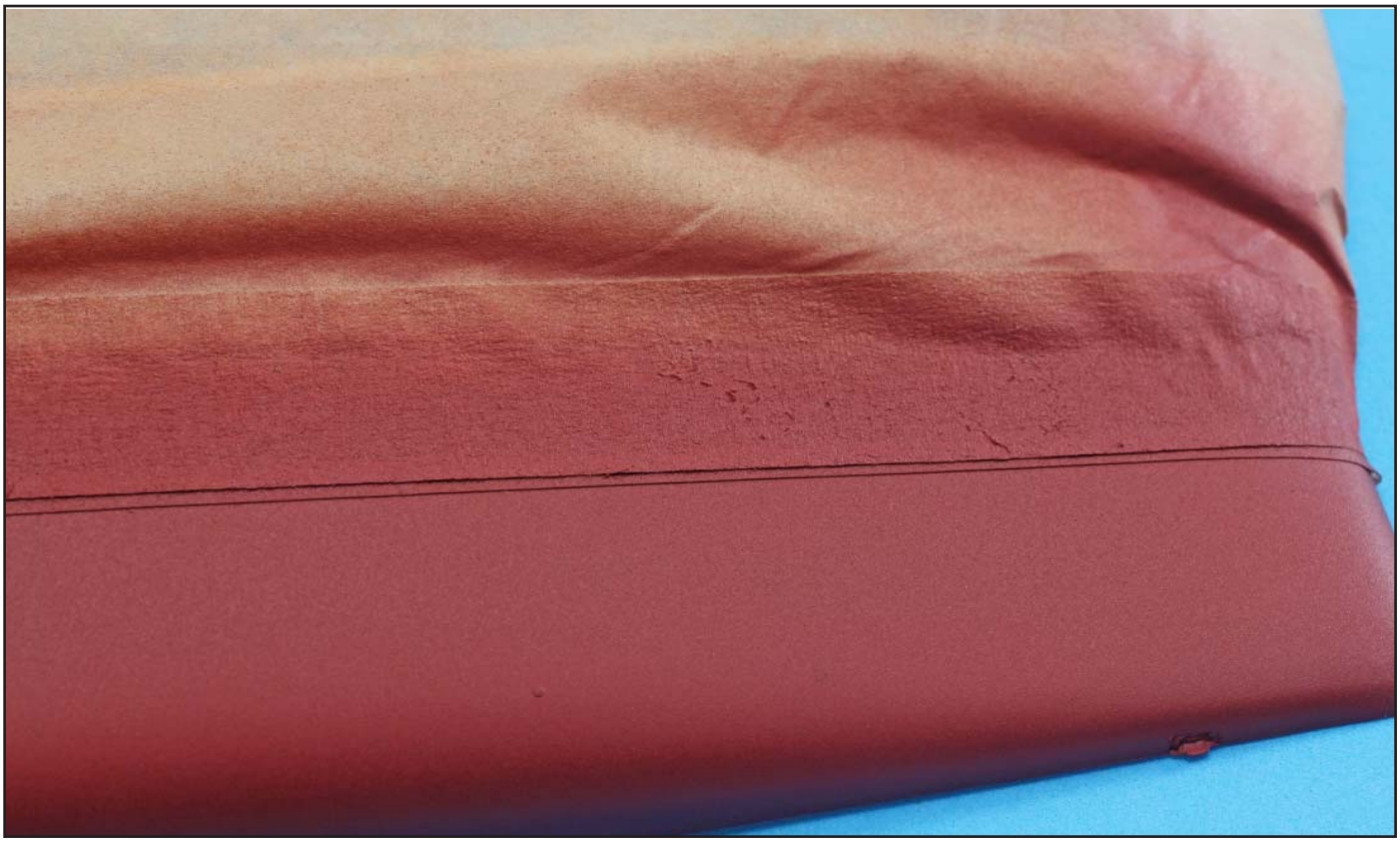
4. Burnish the waterline tape down to the hull – make a really tight seal.

5. Tape burnished to hull.

6. Overspray the waterline tape to seal the edges to prevent any bleed of upper or lower hull colors under the tape. If there is any bleed it will be the same color as the waterline and, hence, invisible.



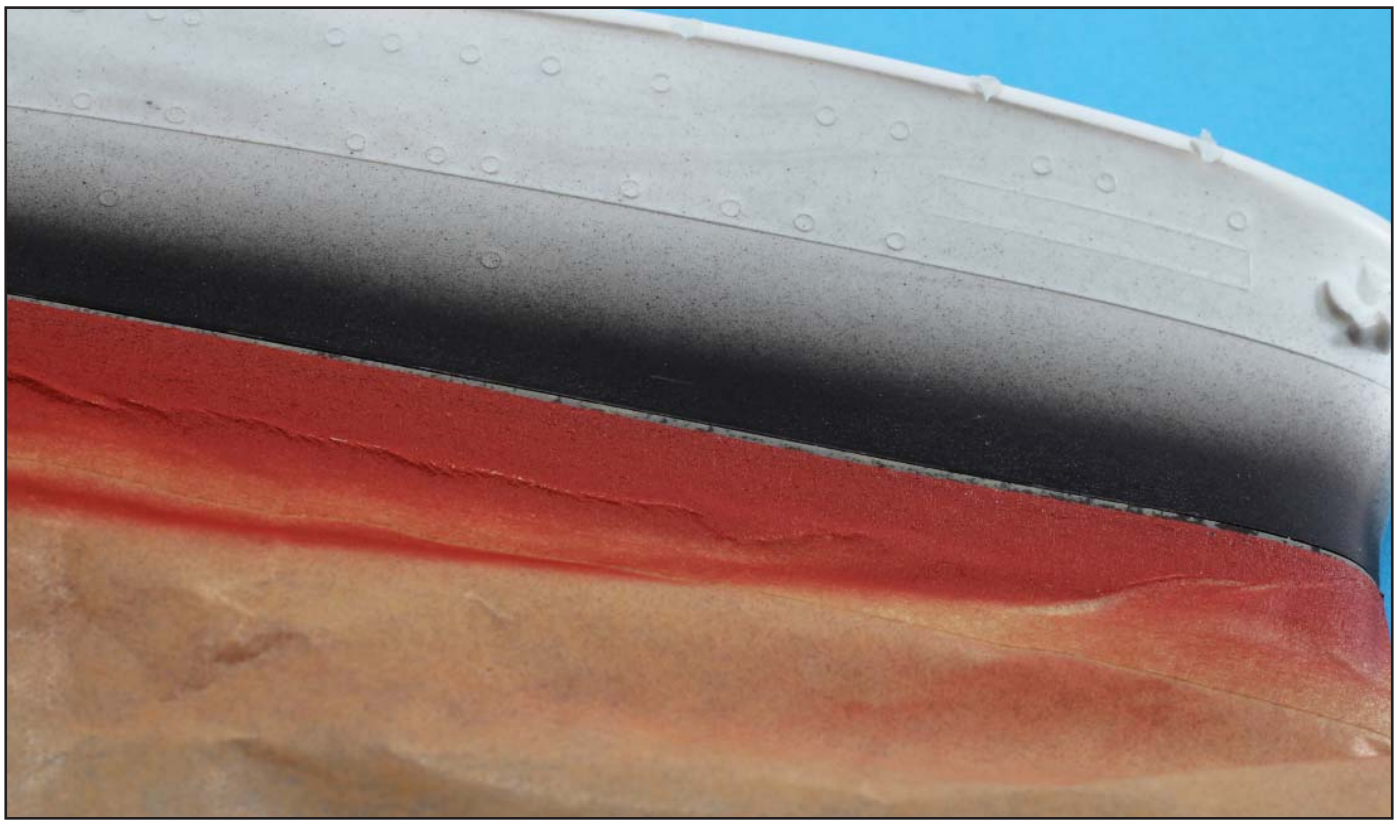
7. Mask off the upper hull using ProMask or tape and paper to mask the upper hull.



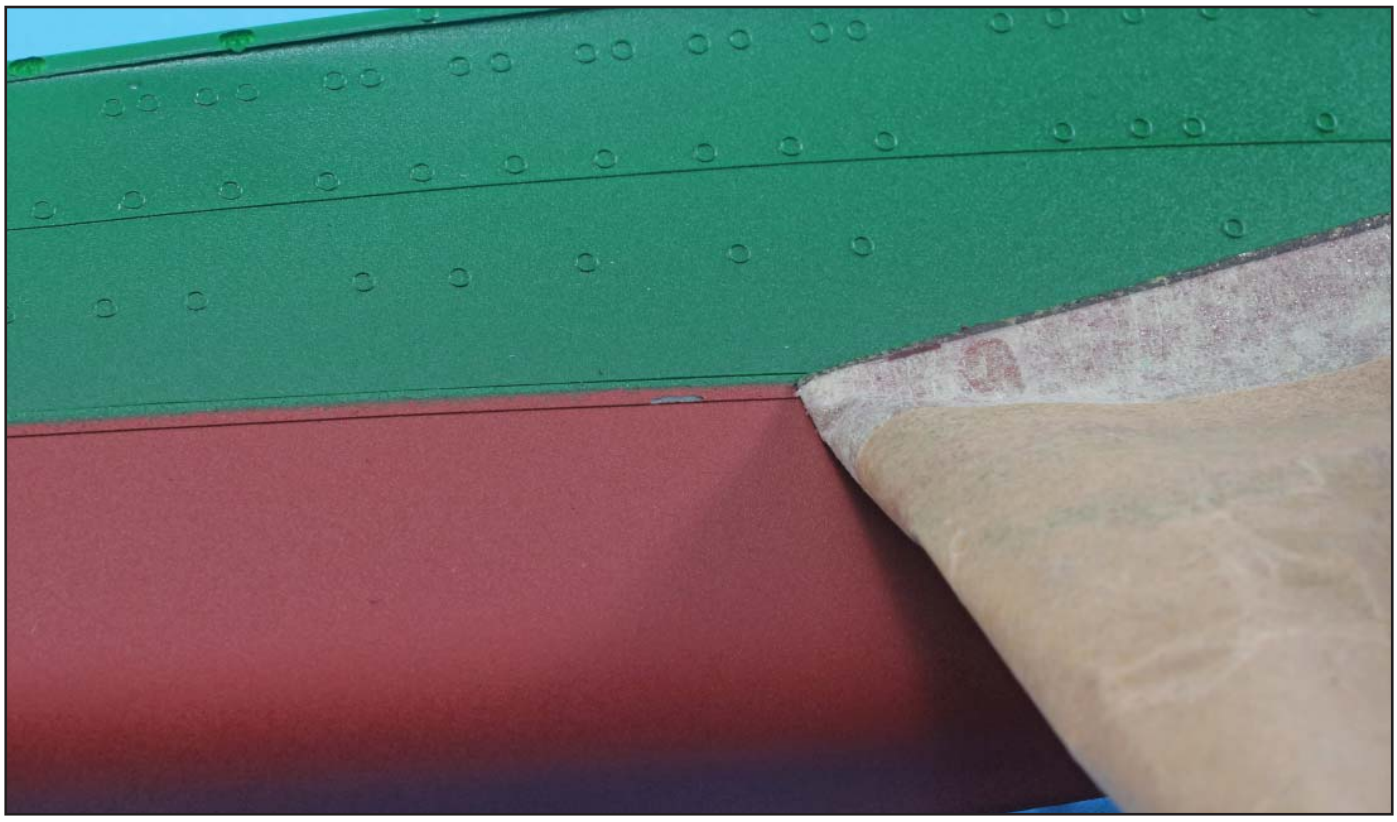
8. Spray the lower hull color.

9. Remove the mask from the upper hull. Do it carefully so it can be reused.

10. Mask removed from upper hull. Note the waterline tape showing the lower half with the lower hull color.



11. The lower hull is now masked off with the reused upper hull masking material.



12. Removing the masking after the upper hull has been painted.

13. Finished paint job after removing the waterline masking tape. Note there is no need for touch up.

Tips & Techniques

Making pipe fittings

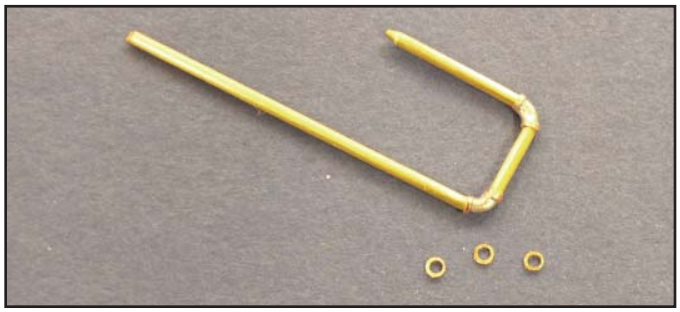
by Steve Wheeler

Sometimes we are faced with making odd pieces of hardware. Models containing exposed plumbing or fuel lines sometimes need elbows or other fittings where the pipes change direction. Occasionally these things may be available commercially (Plastruct has a series of plastic ones) but those may be the wrong size or shape. It can be fairly easy to make your own, though.

A simple elbow can be fabricated by simply sliding small washers onto a piece of bent brass rod (Figure 1) and coating the space between them with 5-minute epoxy. The washers can be anything: metal or plastic and can be made by slicing thin rings off of suitably sized tubing; Model Motorcars Ltd (www.modelmotorcars.com) now sells the products formerly offered by Scale Hardware and, along with scale machine screws, has a line of chemically-etched washers down to 0.5-millimeter inside diameter. Those will work for the flanges on smaller fittings. The epoxy will build up the intervening space and the result will look like a cast fitting. Epoxy is self-leveling and will smooth itself out between the washers, and a coat of paint will finish the look. The final appearance can be seen in Figures 2 and 3.

A muffler assembly may need a slightly different approach. Here, a jacket of larger diameter aluminum tubing is joined at the bends with brass elbows that have been bent to the necessary angles. If you are able to drill out holes in the ends of aluminum bar the elbows can be made like the simple ones in Figure 1; if not they can be machined to fit as in Figure 4. An assembled muffler is shown being test fitted in a hull in Figure 5.

The process can be adapted to many sizes of pipe.

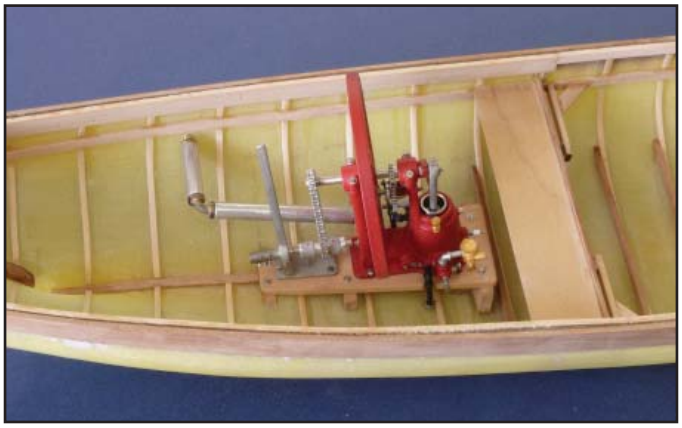


1. Brass washers and epoxy on a piece of bent brass rod.

2. Plastic washers and epoxy fill on a pair of "pipes".

3. A pair of pipes with fittings, painted.

4. Parts of a muffler assembly.



5. Test fitting the muffler assembly. There are several other pipes with elbows in the photograph, but they may be hard to see.

Letters to the Editor

To the Editor:

I want to send a heartfelt 'Thank You' to all the NRJ readers who followed my HMCS *Chicoutimi* build and who gave such positive feedback. The model now resides proudly in the Naval Museum of Alberta, part of the Military Museums located in Calgary.

— Bruce LeCren
Beaumont, Alberta

1. Bruce LeCren with his model of HMCS *Chicoutimi*.

Advertisers Index

Book reviews

British Town Class Cruisers: Design, Development & Performance, **Southampton & Belfast *Classes***
By Conrad Waters
Barnsley: Seaforth Publishing, 2019
Annapolis: Naval Institute Press, 2019
10" x 11-3/4", hardcover, 320 pages
Photographs, scale drawings, appendices, notes, bibliography, index. $54.95
ISBN: 9781526718853

This book has three defining characteristics. It is large. It is heavy. It is excellent. Readers who have any of Norman Friedman's books on United States warships will find themselves on familiar ground here since the format and content are very similar and to the same high standard.

The author is a lawyer by training but a banker by profession who comes from a maritime family. Despite his technical background his writing style is lively, interesting, and the manner in which he unfolds the story of these ships makes the narrative flow very well. The primary function of these cruisers was trade protection of merchant ships on a global empire scale, a role for which they were well suited, but they were often thrust into far different roles as World War II escalated and new technologies evolved.

The author has written what surely must be the penultimate history of these ten ships in the class: *Newcastle, Southampton, Glasgow, Sheffield, Birmingham, Liverpool, Manchester, Gloucester, Belfast, and Edinburgh.* The author goes into great detail in an objective manner listing the pros and cons of these ships. Like anything built by man, this class of ships represented a compromise of conflicting requirements. Constructed to the limitations of the Washington Naval Treaty of 6 February 1922, the class had a maximum displacement of 10,000 tons making them weak on armor and anti-aircraft armament. Habitability was always a problem. Finding space for the complement of 770 officers and men was never easy, many having to sleep in stairwells and passageways. This was exacerbated later in the war when radar and anti-aircraft armament with their concomitant crews were found to be necessary. Despite this the ships

performed admirably and are remembered fondly by crewmembers and recorded history.

The book's contents include a list of abbreviations, Class Origins, The Design Process, From Construction to Delivery, Design Description, Wartime Improvements, Wartime Operations & Performance, Post-War Requirements & Repair, Post-War Operations & Disposal, Evaluation, with appendices that cover Camouflage & Appearance, Supermarine Walrus, Battle Honours, Bibliography, and an index. This title sets a very high standard for comprehensiveness.

The book is heavily illustrated. There are no fewer than 278 black & white photographs which generally are quite sharp. Many of them are reproduced full-page and at least eighteen are spread across two pages to make details more discernible. This is a dramatic touch which draws the reader into the image creating the illusion that he is seeing the action first-hand. Several photographs are in color, and the list of illustrations includes over thirty-five plan views, inboard and outboard profile drawings, fifteen line drawings, and fourteen color profiles. The *pièce de résistance* is an incredible presentation of fold-out color constructors' drawings taken from the National Maritime Museum at Greenwich archives: two are two-page fold-outs while the third is a four-page color inboard general arrangement profile of *Southampton* produced by one of the class builders, John Brown & Company. These are nothing less than a grand visual treat.

This reviewer was greatly impressed by this volume and recommends it very highly.

— Robert N. Steinbrunn
Phelps, Wisconsin

The Battleships Yamato and Musashi: _Selected Photos from the Archives of the Kure Maritime Museum_
Edited by the Kure Maritime Museum and Kazushige Todaka
Translated by Robert D. Eldridge
Annapolis: Naval Institute Press, 2019
12" x 8-1/2", hardcover, 143 pages
Photographs, scale drawings. $75.00
ISBN: 9781682473856

This book is a compilation of photographs of the super-battleships *Yamato* and *Musashi* from the collection at the Kure Naval Museum. Kure shipyard is where *Yamato* was built (*Musashi* was built at the Mitsubishi Shipyard in Nagasaki) and is the location of a 1:10-scale model of the battleship. The book is hardbound with an attractive jacket displaying *Yamato* during its 1941 sea trials. The book contains 144 pages and is primarily a compilation of photographs from construction to each ship's final battle (*Musashi* was sunk in October 1944 and *Yamato* in April 1945).

The book begins with 39 images of *Yamato* followed by 34 images of *Musashi*. There are 25 memorial plates taken aboard both ships. This is followed by 26 technical drawings from the original design team members of the ships. They saved the drawings in their personal collections. These proved very valuable since most *Yamato*-class drawings were destroyed after the war, making these drawings very rare. The

end of the book contains a compilation of thumbnail-sized photographs showing a chronological history of each ship. There is a technical specification of both vessels showing their configuration at launching.

Many of the photographs in the book have been published before. What makes this book unique is they are shown here with exceptional clarity. The famous picture of *Yamato* under construction next to the carrier *Hosho* is a prime example. Page 8 shows the original photograph, and pages 9-11 shown increasing zoom shots of the original image. All magnifications show excellent clarity. The close-ups reveal great detail of the main and secondary gun turrets. Next are some images of *Yamato*'s main gun turrets under construction followed by several shots of sea trials. A half dozen pictures of *Yamato* at Truk Harbor in 1943 are followed by several shots of the ship under air attack at the Battle for Leyte Gulf in October 1944 and the final battle off Okinawa in April 1945. The attack photographs were all taken by United States Navy pilots.

Most photographs of these ships capture them from construction up until the 1943 Truk Harbor images. Both ships carried 6-inch triple wing turrets at this time. The wing turrets were removed prior to the Battle of the Philippine Sea in June 1944. This was done to greatly augment the anti-aircraft capability of both ships. *Yamato*'s anti-aircraft capability was further upgraded in early 1945 prior to its sinking. Few photographs of these later war configurations exist. The few that were taken were destroyed at the end of the war. Most late war shots that do exist were taken by attacking enemy planes.

The photographs are published in original form. Some are out of focus and some are scratched. The authors wanted to publish them due to the rarity of *Yamato* and *Musashi* photographs. This in no way detracts from their importance, and I am glad they were included in this book.

Overall this is an excellent photographic compilation of these two famous ships. The closeups of previously-published photographs are very well done. Modelers will have no shortage of close-up, detailed images to aid in their models. I highly recommend this book.

— Joe Simon
Jackson, Wisconsin

More Book Reviews

Many more significant new books on naval and maritime history and technology, containing valuable information for researchers and modelers, appear than the Journal's review pages can accommodate. To improve the Journal's service to its readers, additional book reviews are on the Nautical Research Guild's website here:http://www.thenrg.org/nrg-book-reviews.php

***Captain Kidd's Lost Ship: The Wreck of the* Quedagh Merchant**
By Frederick H. Hanselmann
Gainesville: University Press of Florida, 2019
6-1/4" x 9-1/4", hardcover, xxii + 198 pages
Illustrations, drawings, tables, maps, bibliography, index. $85.00
ISBN: 9780813056227
Allyson Ropp
St. Augustine Lighthouse & Maritime Museum

Confederate Ironclads at War
By R. Thomas Campbell
Jefferson, North Carolina: McFarland, 2019
7" x 10", softcover, vii + 268 pages
Illustrations, appendix, notes, bibliography, index.
$49.95
ISBN: 9781476676401
Andrew Duppstadt
North Carolina Division of State Historic Sites

Sailing School: Navigating Science and Skill, 1550-1800
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Baltimore: Johns Hopkins University Press, 2019
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$59.95
ISBN: 9781421429533
Kendra Lawrence
East Carolina University

The British Civil Wars at Sea, 1638-1653
By Richard J. Blakemore & Elaine Murphy
Woodbridge, Sussex: The Boydell Press, 2018
6-1/2" x 9-1/2", hardcover, xiv + 225 pages
Illustrations, maps, appendices, notes, bibliography, index. $115.00
ISBN: 9781783272297
David Bennett
North Carolina Maritime Museums

NAUTICAL RESEARCH JOURNAL

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