Fighting at Restigouche

Gilles Proulx

The men and vessels of 1760 in Chaleur Bay

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Translated from the
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Cover. Remains of the *Machault* (step of the main mast) and profile (in the background) of a British Man-of-war. *Department of Canadian Heritage* and *Cécile Bilodeau.*

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1 View of the port of Bordeaux, from which the *Machault* expedition set sail in 1760. *Painting by Joseph Vernet, Musée de la Marine, Paris, Photo RMN.*

Two Hundred Years ago in Chaleur Bay

On April 10, 1760, six French merchant vessels—five ships and an escort frigate—left Bordeaux (Fig. 1) for Canada. Chartered* by the King, the six sailing ships were transporting supplies, munitions and some 400 soldiers to a colony in which the main settlement, Quebec City, had fallen into enemy hands eight months earlier. Led by François Chénard de la Giraudais, captaining the frigate *Machault*—named after the Minister of the navy, Machault d'Arnouville—the expedition left Gironde and first attempted to evade the British Royal Navy ships that were blockading the French coast. On April 12 and 17, the British navy stopped two of the convoy's ships, the *Soleil* and the *Aurore*, and escorted them back to Great Britain. A third vessel, the *Fidélité*, suffered a more tragic fate, sinking not far from the Azores on April 30. Upon entering the Gulf of St. Lawrence in mid-May, the three other vessels in the expedition, the *Machault*, *Bienfaisant* and *Marquis-de-Malause*, seized a British sailing ship and learned that British ships were ahead of them in the St. Lawrence River.

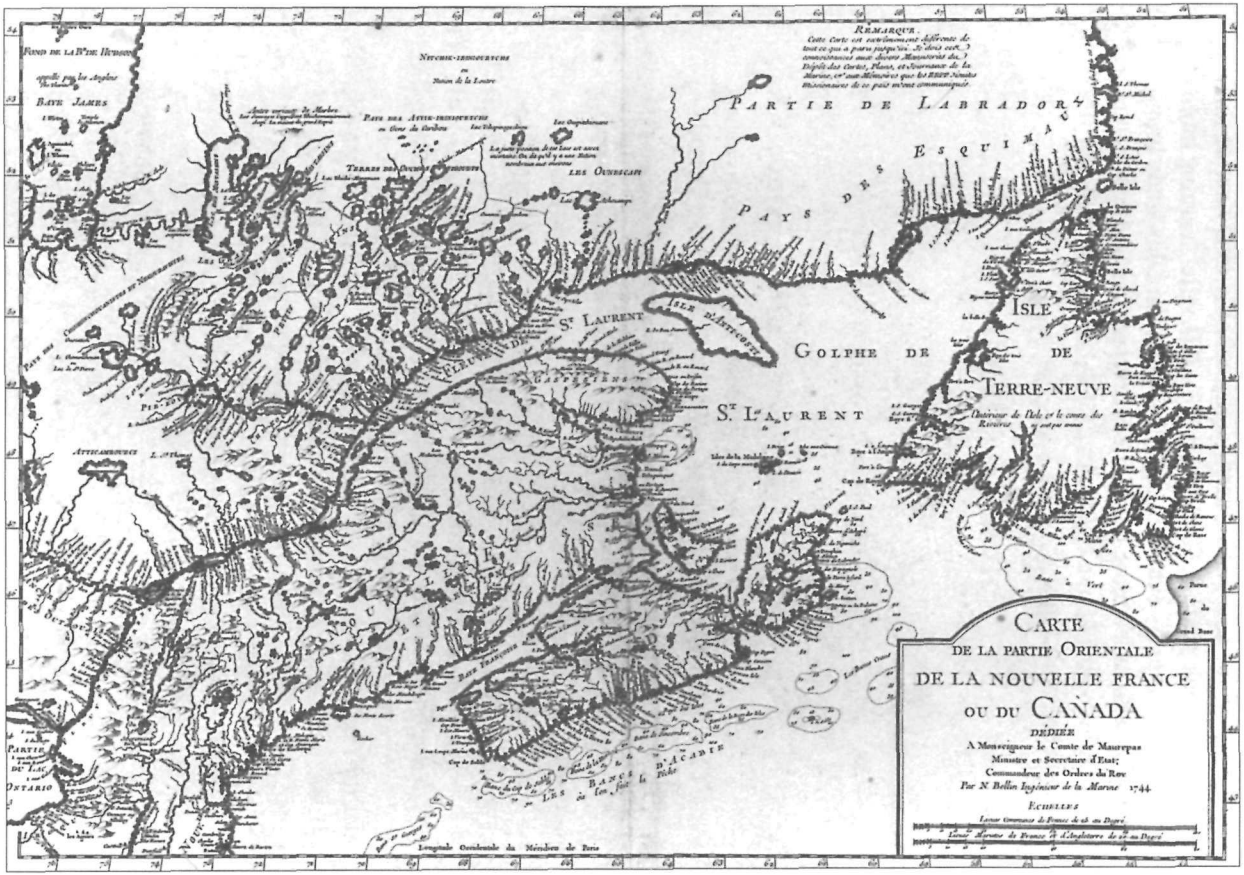
The small French fleet then decided to take refuge in Chaleur Bay (Fig. 2); they sailed for the Bay, seizing six or seven small British ships along the way. The need to restock drinking water and biscuit

* An asterisk after a word indicates that it is explained in the Glossary of naval architecture and sailing terms.

supplies, and the presumed presence of a number of enemy men-of-war along the Atlantic coast, probably explain this decision. The French ships soon found themselves trapped by five ships of the British Royal Navy that had sailed at full speed from the port of Louisbourg. There were three third-rate ships: the 74-gun *Fame*, the 70-gun *Dorsetshire*, and the 60-gun *Achilles*; and two frigates, the 32-gun *Repulse* and the 30-gun *Scarborough*.[1] After a two-week siege and a five-hour battle, the *Machault* was scuttled on July 8, while the other two French ships burned. The five attacking British vessels then sailed back to their North American home port.

From 1967 to 1972, a team of archaeologists working for Parks Canada conducted research in the estuary of the Restigouche River. Their underwater work turned up remains of sailing ships and a vast quantity of objects that had been there since 1760. They discovered not only the hull of the *Machault*, a 24-gun frigate that had belonged to private Canadian interests during its final campaign, but also tools, weapons, articles of clothing and an impressive quantity of wineglasses, earthenware and even china. This maritime archaeological exercise provided a wealth of information about trade at the end of the French regime and about naval architecture in the 18th century. Before describing the vessels that participated in these events, and the *Machault* it is particular, it is important to talk about New France at war, and the origins and campaigns of the *Machault*. An account of the vicissitudes of the siege and the Battle of Restigouche,

1 The French expedition included the following vessels: the *Bienfaisant*, 320 tons*, Captain Jean Gramon; the *Marquis-de-Malause*, 354 tons, Captain Antoine Lartigue; the *Fidélité*, 450 tons, Captain Louis Kanon, called Kanon le jeune; the *Soleil*, 350 tons, Captain Paulin Clémenceau; and the *Aurore*, 450 tons, Captain François Demortier. The 500-ton *Machault*, armed with 20 12-pounders and 8 6-pounders, carried a crew of 100 men and a corresponding number of small arms. The captains of the British men-of-war were, for the 74-gun *Fame*, Captain John Byron; the 70-gun *Dorsetshire*, John Campbell; the 60-gun *Achilles*, Samuel Barrington; the 32-gun *Repulse*, John Carter Allen, and the 20-gun *Scarborough*, John Stott. Jean de Maupassant. *Les armateurs bordelais au XVIII^e siècle, Les deux expéditions de Pierre Desclaux au Canada* (Bordeaux, 1915), pp. 29, 35.



2 Map of the eastern part of New France, showing Chaleur Bay and Restigouche. *National Archives of Canada, Nicolas Bellin, 1744, C40030.*

and the strategies and tactics used, completes the overview of the conflict that took place in Chaleur Bay in 1760. After learning more about sailing ships by examining naval architecture, this study looks at the men who sailed these boats, the characteristics and constraints of the sailor's life in the age of sail and how these affected the Restigouche combatants.

North American Conflict and Naval Weaponry in the Atlantic

A Country at War

Seeds of conflict and declaration of war

Although the Seven Years' War between Great Britain and France was officially declared in May and June 1756, it was preceded by numerous war-like incidents in North America and on the Atlantic. In 1755, Great Britain began attacking French commercial vessels, and seized some 300 of them. Skirmishes between French soldiers and American settlers in the Ohio Valley in 1754 underscored the fragility of the peace accords that France and Great Britain had signed in 1748, despite the creation of a commission to set the borders between New France and New England. The death of a French officer named Jumonville at the hands of George Washington's men, and the capture of Fort Necessity by the French, revived the conflicts. When the British Admiral Boscawen captured the *Alcide* and the *Lys*, and the troops they were carrying to Canada on June 8, 1755, it lit a powder keg on the ocean. These events were the result, in North America at least, of a rivalry dating back to 1690 and the first Anglo-American incursion into the heart of New France, right up to the walls of Quebec City.

The European wars of the League of Augsburg (1689-97), Spanish Succession (1702-11) and Austrian Succession (1744-48) were carried over into North America. They gave rise to numerous back-and-forth border raids, a few successful invasions and territorial

grabs, most of them at the expense of New France. The surrender of the French possessions in Newfoundland, Hudson Bay and most of Acadia by the Treaty of Utrecht in 1713 profoundly affected thousands of French colonists. Many were forced to move to Île Royale (Cape Breton) and Île Saint-Jean (Prince Edward Island), while others decided to accept British rule and remain on their land on the baie Française (Nova Scotia). The accelerated demographic growth of the British colonies and their need for a land base clashed with the French search for an ever expanding economic space made necessary by their harvest economy. Ill-defined borders gave rise to clashes and the only definitive solution to the perpetual competition appeared to be the elimination of one of the colonial rivals.

British setbacks

Although its population was some twenty times greater than that of its rival, the British colony was beset by serious difficulties at the start of the Seven Years' War. In fact the first three years from 1755 to 1757 were disastrous. Three campaigns launched in 1755 to capture French posts in Ohio, and on Lake Champlain and Lake Ontario were fiascos. In 1756, the French dug in at Carillon (Ticonderoga), at the same time they captured Oswego on Lake Ontario. The following year, General Montcalm took Fort William Henry on Lake George, while a British fleet sailing toward Louisbourg was scattered by a storm. Faced with a politically unified New France, the 13 American colonies had to contend with strongly divergent political and economic interests. Not all the colonies experienced the same problems with New France, so some were less eager to engage in combat. The incompetence of certain military leaders, and in particular, the lack of efficient supply methods, also explain the failures and setbacks the British forces experienced.

In Canada, much of the French colony's strength resided in the weakness of its adversary. From 1755-57, eight battalions* of land forces also landed at Louisbourg and Quebec City, with a few hundred soldiers in naval franches.* Placed under a unified command, the 8000 to 10 000 soldiers in New France, supported by some 14 000 militia men, were well armed and well equipped. Transporting all

the necessary troops to Canada required the services of a number of vessels. The large number undoubtedly facilitated their passage on a sea closely patrolled by the British Royal Navy. While more ocean travel and longer campaigns put a strain on the French naval vessels, the military activities in New France were extracting more and more from the economy.

French failures

In 1758, the tide shifted in favour of the British colony. New, more energetic leaders took power in Great Britain and changes followed. The British Royal Navy blockaded the coast of France, made several raids, and monitored the traffic to New France. This was an effective tactic: since the French warships were preoccupied with defending France's ports, fewer made the trip across the North Atlantic. This in turn created a greater reliance on merchant ships to assist New France. At the same time, changes were made to the supply system in British North America, with many boats being built for service on the lakes and rivers of the American continent. The decision to launch a multi-pronged attack on the borders of New France led, in 1758, to the fall of Louisbourg and the capture of Fort Frontenac on the Great Lakes. Only Carillon escaped the British offensive on Lake Champlain, and the Canadians built up a supply of small boats there. The year 1758 also saw the last major dispatch of French Royal Navy vessels to North America. The capture of Louisbourg also led to the destruction of some dozen French frigates and vessels stationed in this port.

The year 1759 was decisive for the fate of the French colony in North America. Some twenty British warships and a hundred British transport vessels arrived in the St. Lawrence River, and, after a two month siege, Quebec City surrendered on September 18. The planned British offensive against Montréal to the west encountered too much resistance and, despite the capture of Fort Saint Frédéric and Fort Niagara, the onset of winter thwarted its main objective. New France had now lost most of its territory and was caught in a vice between Jacques-Cartier River and Lake Ontario. The British army encircled Canada completely. The colony was also suffering material deprivations.

The occupation of the government of Quebec and the siege of the town caused the loss of hundreds of houses.

Food shortage

The military vise was also closing on a land besieged by hunger. In November 1759, the Chevalier de Lévis declared that, "A lack of munitions and supplies means that no expedition or enterprise can be undertaken this winter, we will be lucky to survive, we will end up eating most or all of our cattle and horses."[2] The four years of war that New France had just experienced were not the sole cause of its difficulties in the fall of 1759. Agricultural production of the previous decade has seen poor harvests in the colony from 1751-53 and again from 1756-58. This was due in part because of bad weather and the farming methods used, which exhausted the soil and produced crops of mediocre quality. Poor harvests one year naturally meant fewer seeds for the following year.

The authorities introduced rationing in Canada in 1757. The agricultural production was very poor, and the demand for supplies had increased considerably since 1755. Canada's population had grown by some 5000 with the arrival, since the beginning of the war, of battalions of land forces and new navy troops. There were also some 2000 Acadians transplanted from their ancestral lands since Major Lawrence had burned down the homes in Grand-Pré, and about 2000 Amerindians taking part in the military operations. Feeding these thousands of new mouths with a declining agricultural production meant using the livestock and, in 1759, Governor Vaudreuil commandeered from the government of Trois-Rivières, "All cattle, except those required to pull a plow for every two by two farms."[3] The inhabitants put all their energies into the war and killed their cattle and horses, their most useful agricultural instruments, to feed their fellow citizens. Inevitably agriculture declined and hunger took hold.

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2 Doughty, Arthur G., ed. *An historical Journal of the campaigns in North America for the years 1757, 1758 and 1760, by Captain John Knox*, Letter from the Chevalier de Lévis quoted at the end of the *Journal of John Knox*, Vol. 3, pp. 355-56.

3 Frégault, Guy. *La guerre de la Conquête* (Montréal: Fides, 1955), p. 330.

War profiteers

The shortage created by clearly insufficient agricultural production was exacerbated by an artificial shortage created by certain politicians and a few war profiteers. In October 1756, Joseph Cadet was given responsibility for supplying the Canadian troops under conditions that, for all practical purposes, gave him a stranglehold on commercial activities. Cadet did not have to pay duties on imported flour and it was forbidden to export provisions until the commissary* had a two-year supply, provided either by imports from France or local supply. This gave Cadet a fairly broad power to requisition, and thus to fix purchase prices, which in the long run inevitably reduced Canadian agricultural production. What was the point of growing and producing more, just to supply Cadet's storehouses with the surplus and be paid in money of little value? At that time, Montcalm even accused Cadet of diverting supplies to the Antilles. Since the commissary received 23 sols for every military ration in the forts, and only 9 sols for each ration in the towns, he preferred to supply the forts generously to the detriment of the towns. With the complicity of local men, not having to pay labour or transport, Cadet could indulge in these abuses.

Cadet's commercial manipulations, the shortfalls in agricultural production and the increases in the population help explain why the colony was on the brink of starvation in the winter of 1759. Help was needed. In December 1759, General Amherst wrote, "Even without another blow, Canada must fall, or its inhabitants die of hunger."[4] Could the Canadians disprove this gloomy prediction and hope for help to change the course of events? The colony sent two appeals for help to France. The first was a private initiative. On October 26, 1759, Joseph Cadet wrote to a friend in Bordeaux, Pierre Desclaux. It was Desclaux who, in 1759, raised an expedition of twenty sailing ships for New France, and outfitted eight of them himself.

A colony at bay

In October 1759, Joseph Cadet ordered only provisions, in impressive quantities. Cadet asked for flour, salt provisions, vegetables,

4 Frégault, Guy, *ibid.*, p. 358.

seasonings, butter and spirits. The biggest order was for flour, 50 000 barrels of 180 pounds each. That represented an encumbrance of 6250 tons,* a little more than all the barrels that had been sent to Canada in 1758 and 1759, when the St. Lawrence River was still under French control. The total encumbrance of the order, if Desclaux sent all the provisions requested, would be 10 840 tons, 672 of it in spirits. The spirits represented six percent of the cargo. The average tonnage of vessels sent to Canada between 1755 and 1760 was 220 tons. It would thus take some 50 ships to fill Cadet's order. In 1759, only twenty or so ships had arrived in Canada, carrying 6000 tons of merchandise. This represented 80 days' worth of supplies. Under the circumstances, Cadet's large order in October 1759 still only met the Canadians' needs on a very temporary basis.

The political and military authorities, represented by Vaudreuil and Lévis, also made appeals to the mother country. They charged the commander of the artillery, François Le Mercier, with carrying them to the Court personally. They demanded a fleet capable of transporting 4000 troops, 50 000 quarts of flour, 20 000 quarts of lard, 24 cannons, goods for trading and clothing for the soldiers. This fleet required an escort of five or six warships. The provisions requested were similar in quantity and kind to those that Cadet had ordered. Le Mercier even suggested that the King charge some merchants with sending the assistance in return for payment on commission. The 4000 troops requested represented eight battalions, as many as had been sent to Quebec City in 1755, 1756 and 1757. Asking for an escort of five or six warships, after the very recent and bitter defeat of a large French fleet off the coast of Brittany, and when only two frigates had gone to Canada in 1759, was undoubtedly asking a lot.

The French authorities were taken aback by the Canadian requests, which they estimated would cost eight million. That was scarcely 130 livres per inhabitant, but in December 1759, Minister Berryer had obtained only 30 million for the entire navy, and 21 million of that was for obligations that had already been contracted. The Canadian requests had to be analysed from that budgetary perspective. In a

report presented at Court in January 1759, Bougainville, a member of the general staff of the army serving in Canada, argued that in order to re-establish a fragile balance between the enemy forces in North America, France would have to send at least 10 000 soldiers with equipment aboard 100 sailing ships. Sending such a fleet was already unthinkable in early 1759 because of the navigation hazards and, "Canada must be treated like a desperately ill soul that one treats with cordials while waiting for him to perish, or for some crisis to save him [...]."[5] The lack of funds, the pessimistic intelligence from officers serving in New France, the events of 1759 and the fall of Quebec City, none of these were likely to make the minister attempt the impossible. Louis XV responded to the requests in 1760 by sending five commercial vessels escorted by the merchant frigate *Machault*.

The campaigns of the *Machault*

French privateering

The *Machault*'s first sortie or campaign was in early 1758. Its commission, drafted on July 17, 1757, was that it was "outfitting* for privateering." Its first crew, whose term ended on December 24, 1757, was hired "To privateer for 3 months at sea for shares."[6] The *Machault*'s mission as a privateer* was firmly established. In a period of conflict, France considered privateering a perfectly legitimate activity, one encouraged by the King. Even before the declaration of war in 1756, Louis XV promised to pay a bonus of 100 to 300 livres for every cannon taken, and 30 to 50 livres for every prisoner captured. The rewards varied with the calibre of the cannons and the tonnage of the vessels attacked. Added to the bonuses for any captures made were the commitments made to encourage the construction of privateer's frigates. In November 1755, the King promised the shipowners of Bayonne that he would buy all the privateers they built if privateering was not authorized, or as soon as it ceased. This promise certainly encouraged the construction of the *Machault* in the dockyards of Bayonne.

5 Casgrain, H.R. *Collection des manuscrits de Lévis, Lettres et pièces militaires, instructions, ordres, mémoires, plans de campagne et de défenses 1756-1760* (Québec City: Imprimerie J.L.Demers, 1891), Vol. 4, pp. 81-82.

6 France. Archives communales de Bayonne, registre de l'Amirauté, No. 37.

The Bayonnais frigate was not the only private sailing ship to bear the name *Machault* during this period. From 1756 until the beginning of 1758, the British navy boarded four French vessels of between 30 and 350 tons known respectively as the *Machault* of Nantes, Cherbourg, Granville and Dunkirk. With the exception of the 30-ton sailing ship, they all carried about a dozen cannons, and three of these vessels were privateers. The *Machault* of Bayonne was apparently a replacement, but almost never became a privateer, because a month after its first commission ended, the King revised his policy and prohibited individuals from privateering. Fortunately, this prohibition did not affect all the French privateers. The King excepted a dozen, including the *Machault*. The Bayonnais privateer thus took to the sea and on March 15, 1758, at latitude 46° 30' north by longitude 3° west, it captured the *Pembroke*, a 300-ton British slave ship. Sailing from Liverpool to Guinea, the vessel had a crew of 45 and 16 cannons. It was the only capture the *Machault* made during that campaign. The sale of the slave ship and its tackle brought in 24 000 livres for the Bayonnais privateers, but the sale price of the cargo is not known. The owners of the *Machault* had spent 373 000 livres outfitting it. It was quite obvious that the benefits of the operation were a meagre return on that investment.

The convoys of 1759

The King's prohibitions and the apparent unprofitability of this first campaign led its owners to sell the *Machault* on October 28, 1758. Jean Lano Guéhéneuc, the Bayonnais correspondent for the Bordeaux merchant Pierre Desclaux, bought it for the sum of 180 100 livres. It had cost 179 600 livres to build the year before. The two merchants were in fact acting for Joseph Cadet, the commissary for Canada. He had asked his Bordelais correspondents, Desclaux and La Tuillière, to procure four frigates or privateers to protect the merchant ships he was having come to Quebec City in 1759. In addition to acquiring the escort ships he needed, Joseph Cadet also hired a commander for the expedition whom he could trust. On July 11, 1758, in Quebec City, he engaged the services of frigate lieutenant Jacques Kanon. He was paid 200 livres a month, was given 50 tons of freight in the expedition's ships, and the use of the frigate of his choice.

He chose the *Machault*. Jacques Kanon took charge of the frigate in Bayonne and sailed it to Bordeaux, where the supply ships of the Canadian commissary were gathered. Escorting some dozen boats, including the *Bienfaisant* and the *Chézine*, the *Machault* sailed out of the Bordeaux River on March 10, 1759, accompanied by another frigate, the *Maréchal-de-Senneterre* and, in mid-May docked in Quebec City. The crossing went smoothly; the expedition easily avoided the British fleet of Rear-Admiral Philipp Durell. The crew was apparently spared the illnesses that had ravaged the crews of vessels sailing to Canada in previous years. Only two or three sailors from the *Machault* spent time in the hospital at Quebec City during May and June 1759. The frigate also managed to capture two British sailing ships during the crossing; these were sold in Quebec City.

Cadet's merchant fleet arrived only a few days before the British troops that laid siege to Quebec in 1759 sailed up the river. While most of its crew helped man the artillery on the ramparts of Quebec City, the *Machault* sailed up the river as far as Trois-Rivières. During the entire siege of Quebec City, it served as a storehouse for provisions and munitions. In November 1759, Governor Vaudreuil praised Jacques Kanon, commander of the *Machault* : "This gentleman is one of the finest naval officers I have ever known; there is nothing that can daunt his enthusiasm in the service of his King."[7] He demonstrated that enthusiasm on the evening of November 24 by setting sail for France. It was not an easy departure, since the French ships had to pass by Quebec City and face the full power of the British artillery. On December 23, after having captured an enemy vessel, Kanon and the *Machault* finally arrived in Brest. He brought Canada's pleas for help to the King. The King authorized the expedition of 1760. The third and final campaign of the *Machault* had begun.

Trade with Bordeaux

As in 1759, the 1760 expedition originated in Bordeaux. In fact, between 1749-55 about 180 ships left Bordeaux for Louisbourg and

7 France. Archives nationales, Colonies, C[11]A, Vol. 104, Fol. 115v-116, Vaudreuil to the Minister, Montréal, 8-11-1759.

Quebec City. This represents roughly half of the vessels from the six major French ports destined for Canada during this period. The Bordelais sailing ships were of the same tonnage as the vessels from the other French ports, around 175 tons. After 1755, two-thirds of the outfitting was done in Bordeaux, and the average tonnage of the Bordelais vessels increased some 50 tons in comparison to the tonnage at the other ports. According to several historians, the close relations that existed between some Bordelais merchants and the clique that controlled the economy of New France explains Bordeaux's preeminence in France-Canada trade and, consequently, the origin of the expedition of 1760. As plausible as this explanation is, it does not seem completely satisfactory.

Canada needed salt provisions and flour, and it called on Bordeaux, as the best supplied region of France because of its commercial network and its agricultural backcountry. Large vessels were needed to transport this flour, and Bordeaux had them in large numbers for trading heavy and bulky products with the Antilles. The drop in traffic to the islands, indicated by France's trade balance with its colonies with the beginning of the Seven Years' War, freed up some large vessels and allowed Bordeaux to ship deadweight cargo* to Canada. Large cash advances were needed to outfit these vessels. The outfitters had to be in good financial shape, which is why Gradis, Jauge and Desclaux, among others, were chosen. Bonds of friendship may have come into play, but they were not the only factor in the Bordeaux-Canada trade relations.

Chartering vessels

Given the full background, it is easier to understand the 1760 expedition of six vessels of good capacity from Bordeaux to Canada. The 2000 tons authorized by the King in 1760 were thus distributed among six vessels outfitted at Bordeaux by three separate companies or groups of individuals, but all with some connection to Joseph Cadet, the commissary for Canada. As a rule, the commercial outfitter had to find the ships for an expedition, refit* them as necessary and rig them for the voyage. The outfitter was responsible for hiring the ship's crew and, especially for gathering the merchandise to be trans-

ported. The outfitter assumed the expenses of these activities and advanced the necessary money. The outfitter acquired the money through bottomry* loans, at interest rates that varied with the destination and the hazards of the voyage.[8]

The outfitter usually owned or leased the commercial vessels in the expedition. He would load them with his own merchandise or charge rent or freight to others wanting to use the vessels. The freight was calculated on the tonnage and was normally paid on delivery of the merchandise. Insurance covered the outfitters for the possible loss of the ships and the merchandise; it could not guarantee the freight or the anticipated profits. During the Seven Years' War, the insurance rates, which had never been more than ten percent, climbed to prohibitive levels of fifty to sixty percent. The rent on vessels sailing to Canada was sometimes as high as 600 to 800 livres a ton. In 1760, it was set at 450 livres, 250 of which was payable before departure. The orders then went through the King who paid the freight. Given the growing perils of transatlantic navigation and the prohibitive cost of charters,* French merchants lost all interest in the Canadian trade as early as 1757. Throughout the war, the King chartered most of the commercial vessels sailing to Canada. Since the French Royal Navy did not have enough ships to transport all the soldiers, munitions and supplies that the King sent, the State had to use commercial vessels.

Even though the rents paid by the king were attractive to outfitters, the organization of the 1760 expedition caused some problems. As a result of poor harvests in Guyenne and the consequent prohibition on exporting flour, the outfitters found it extremely difficult to obtain the flour that the King wanted to ship to Canada. The most crucial problem, however, was finding the crews needed to man the expedition's ships. With the exception of the *Machault*, which required over 150 sailors, each vessel required about forty crew members. Problems arose with the *Machault*, because the crew refused

8 Cavignac, Jean. *Jean Pellet commerçant du gros 1694-1772* (Paris: S.E.V.P.E.N., 1967). Suggested reading to gain an understanding of the organization of commerce of the period.

to re-sign until they were paid for the 1759 campaign to Canada. The sailors then threatened to seized the frigate and the minister intervened with the Bordeaux court of justice, asking it not to honour the crew's requests. The Desclaux-Bethmann group, which outfitted the *Machault* in 1759, was replaced by the group of Ravesies and Cassan in 1760. Did this change in outfitters give the sailors the confidence to sign up again? As difficult as it is to document, the hypothesis seems plausible.

The cargo of 1760

Once the material and financial problems were resolved, the outfitters shipped the merchandise out on the six chartered vessels. According to the records of the historians Maupassant and Beattie, the cargo included 6500 barrels of flour and 3400 quintals, or 1700 barrels of meat; these authors did not mention spirits. These provisions alone represented an encumbrance of some 1000 tons, or half of the authorized tonnage. Added to that was 200 tons of blankets and hardware for the Amerindians. The cargo also included 10 500 pairs of shoes, 2400 rifles, 6000 4- to 12- pound cannon balls, 500 6- to 12-pound bombs, 15 000 rounds of powder, and so on. It is impossible to calculate the encumbrance of all this cargo exactly and to know whether all 2000 tons of merchandise was sent. The outfitters also unloaded 1104 barrels of flour from the *Soleil*, *Fidelité* and *Machault*. The withdrawal of this flour represented an encumbrance of some 140 tons at least, which reduced the shipment to Canada by that much. According to a letter from the minister of the navy, there was a total of 2189 tons of cargo gathered at Bordeaux.

The manifests for the *Soleil* and the *Aurore*[9] establish the encumbrance of these two vessels exactly. The cargo on board each of these vessels represented 84 percent of the total encumbrance of their holds (Table 1). The six vessels had a total tonnage of 2424 tons, and 84 percent of the encumbrance of all six vessels would mean that the cargo occupied roughly the entire 2000 tons authorized. The

9 London, Public Records Office (PRO), HCA 32, Bundle 165, Papers of the *Aurore*, and Bundle 243 for the *Soleil*.

outfitters probably reserved the 400 tons of encumbrance or space still available to ship their own merchandise. The outfitters for the *Aurore*, La Malétie and Latuillière, ended their instructions to Captain Desmortiers by recommending: "If he arrives happily in Canada, to supply to Monsieur Foucault, First Advisor to the High Council of that Colony, with his requirements in wine, flour, lard and so on, from those of the vessel that he commands."[10] Foucault was the father-in-law of the outfitter La Malétie. The captain of the *Aurore* also had his own private cargo. The free space was well filled.

Table 1: Encumbrance of the cargo on the *Aurore* and the *Soleil*

	Aurore (450 t)		*Soleil* (350 t)	
	Tonnage	Percentage	Tonnage	Percentage
Flour	175	46	137	46
Spirits	31	8	26	8
Meat	63	17	69	24
Total provisions	269	71	232	78
Cloth	39	10	10	3
Clothing	11	3	8	2.50
Munitions	49	13	43	15
Tools	4	1	1	0.50
Utensils	8	2	2	1
Total dry goods	111	29	64	22
Provisions and dry goods	380	100	295	100

In the two cargos, foodstuffs represented 71 and 78 percent of the holds' encumbrance, the single largest element of the chartering. Spirits represented barely eight percent of the total shipment. Cloth, clothing, weapons, tools and utensils made up the rest of the cargo. The almost identical distribution of the various merchandise on the two vessels is noteworthy, and was done at the request of the authorities. The soldiers were similarly divided. The *Aurore* and the *Soleil* had 64 and 63 respectively. Two hundred soldiers reached Restigouche aboard three vessels, with the frigate *Machault* transporting more than the other vessels. Since the *Soleil* and *Aurore* were

10 *Ibid.*, Bundle 165.

outfitted by two distinct groups, the distribution of merchandise almost certainly holds for the rest of the fleet. The figure of 84 percent of the cargo encumbrance on the six vessels should be fairly close to the reality. This encumbrance corresponds to the 2000 tons promised and includes a high proportion of provisions. Although less than requested, the quantities of goods that the mother country shipped in the expeditions respected the order of magnitude that Canada wanted.

The bond notes* for the two vessels indicate that they were transporting merchandise besides that found on the manifest. This merchandise was the provisions for the crew and the items needed to manoeuvre the ship properly, such as oakum,* pitch,* canvas and ropes. The merchandise also included wicker, hoops,* salt and, on the *Soleil*, a cask* of drinking glasses. These items were part of the victuals of these vessels. The bond note for the *Aurore* also mentions playing cards, barrels of rice, women's shoes and linen handkerchiefs. This limited quantity of merchandise was not part of the *Aurore*'s victuals. It was most likely part of the captain's private cargo. With the exception of the cauldrons listed in the cargo manifest and the cask of drinking glasses, there is no evidence that these vessels were transporting much dinnerware.

The three ships that reached Restigouche had a tonnage of 1174 tons. The supplies sent by the King therefore had an encumbrance of some 1000 tons. The local authorities distributed the provisions to the Acadians and soldiers. Despite the losses suffered during the fighting in early July and a stay of more than five months in Chaleur Bay, the supplies were not exhausted in November. "We were employed till the 5th Novr in getting on board the stores from their magazines in which was 327 barrils powder, muskett ball, small shot, blankets coarse brown cloth, flour, pork, wine rum & brandy the particular quantity cannot ascertain there being a great deal more than the three schooners we had we could received on board."[11] wrote a British

11 Doughty, Arthur G., ed., *op. cit.*, p. 418.

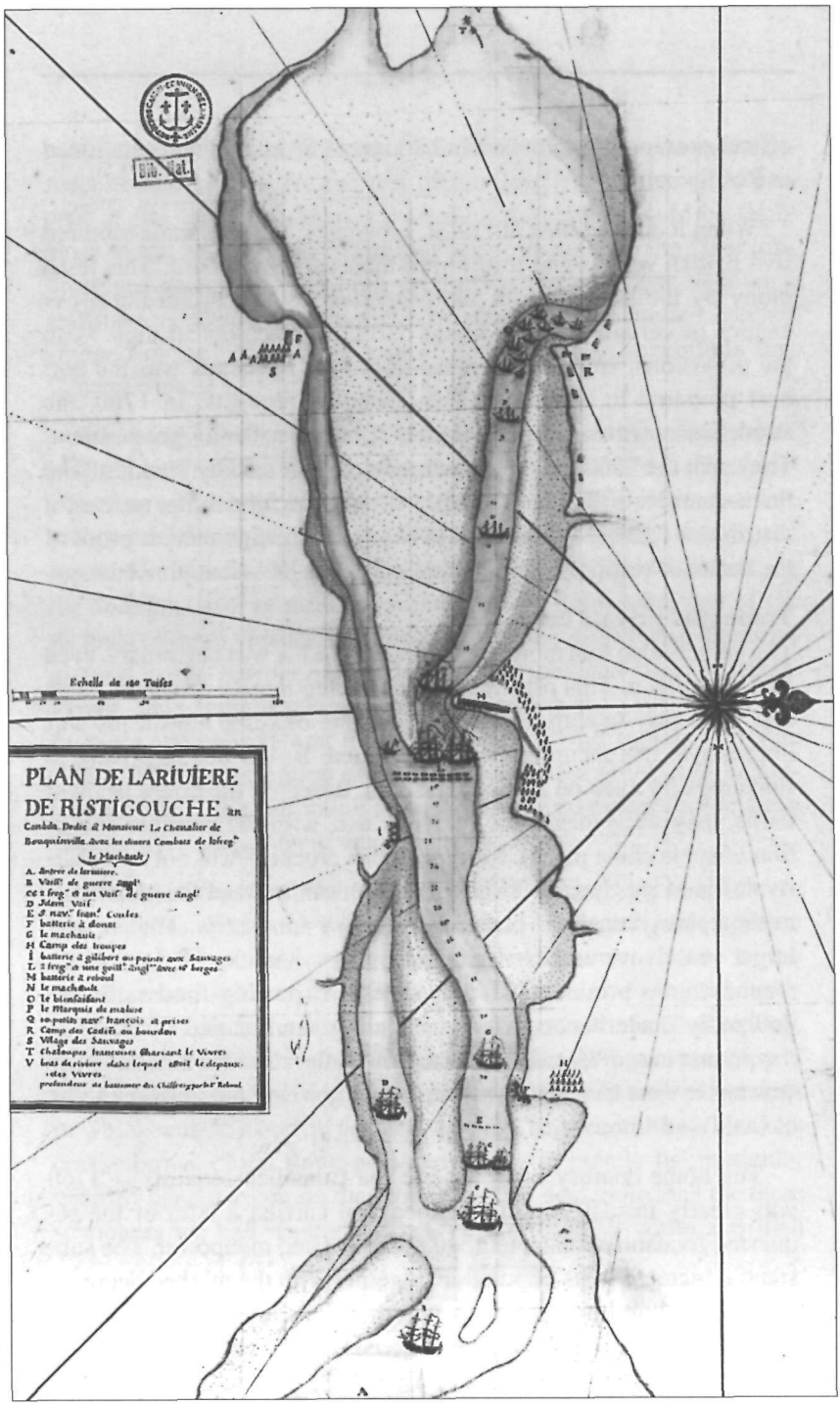
officer present during the re-embarking of French soldiers stationed in Restigouche.

When it entered the Gulf of St. Lawrence, the *Machault* captured five British vessels and transferred their cargo on board. This testimony by the boatswain of the *Machault* could explain the provenance of certain artifacts found during archaeological digs. With the provisions, vessels and outfitters it had, Bordeaux was the port best prepared to respond to the Canadian requests. In 1760, the Bordeaux outfitters respected their contract with the government. They sent the 2000 tons of merchandise authorized by the king. The three-quarters of this merchandise which was foodstuffs, most of it distributed to the Acadians and Mi'kmaq of Restigouche, is proof of the desire to resupply New France and meet its essential needs.

Trade and private cargo

The vessels also transported private cargo. This was customary, even in times of war. This private cargo consisted largely of useful items that were easy to ship. Even if the content of some hogsheads was impressive, the encumbrance was limited. It was not surprising to find crockery even on a rescue mission. Based on the prices of these items, they were meant for everyday use, with the possible exception of some china pieces. Moreover, this crockery was not necessarily destined for Canada. Throughout the war, most of the shipments to the colony consisted primarily of bulky foodstuffs. That is why larger vessels were needed; previously they had exported primarily manufactured products. This change to exporting foodstuffs undoubtedly made it necessary to include manufactured products in the private cargo. Besides, the mission of the captains and outfitters was not to save Canada; it was to resupply it, but not at the expense of their own interests.

The home country's response to the Canadian requests in 1760 was clearly insufficient. The expedition carried a fifth of the requested foodstuffs, and a tenth of the requested manpower. The substantial increase in its population, together with the marked decrease in its agricultural production, meant that Canada was going hungry. More ships were needed to meet its needs, but maritime traffic could



3 Map of the Restigouche River in 1760 showing the locations of the *Machault* battles and siege activities. *National Archives of Canada, Ph 210, Rr. [1760].*

barely holds its own with the British Royal Navy patrolling the Atlantic. France could do no more. Its navy was impotent and its merchant fleet decimated. French colonial trade was clearly declining, and its finances suffered the consequences. In 1760, only six ships set sail for Canada. It was too little, too late. However, merchant ships were in short supply, and a small fleet had a better chance of getting through.

Under Siege at Restigouche

The arrival of the combatants

At eleven o'clock on July 8, 1760, the *Machault* was scuttled in the Restigouche estuary and sank to the bottom of Chaleur Bay (Fig. 3). Since seven that morning, it had been subjected to a violent bombardment by two British Royal Navy frigates, with 32 and 20 cannons respectively, and a four-gun schooner. At ten o'clock, the commander of the *Machault*, François Chénard de la Giraudais, lowered his colours. Short on munitions, caught in an impasse and incapable of any tactical manoeuvre, he blew up his ship rather than deliver it to the enemy. An hour later, the *Bienfaisant* did the same. These explosions marked the end of the last naval engagement in North American waters before the surrender of New France at Montréal, on September 8, 1760. The fate of the final French rescue expedition to Canada was sealed forever.

The three vessels that had left Bordeaux on April 10, 1760, found several British sailing ships in the St. Lawrence ahead of them, and took refuge in Chaleur Bay on May 20. Their orders had called for them to sail to Louisiana if they found the St. Lawrence blocked; but the need to take on fresh supplies of drinking water and the desire to get news through to the Canadian authorities by sending messengers to Vaudreuil and Lévis pushed them on. As they advanced into Chaleur Bay, the French expeditionary force encountered about a thousand Acadians who had been hiding in the woods since 1758, most of them starving. The three ships from Bordeaux were joined or preceded by a number of brigantines, schooners and bateaux that the Acadians used for fishing and coastal trading. The crews settled temporarily on the banks of the Restigouche to regain their strength.

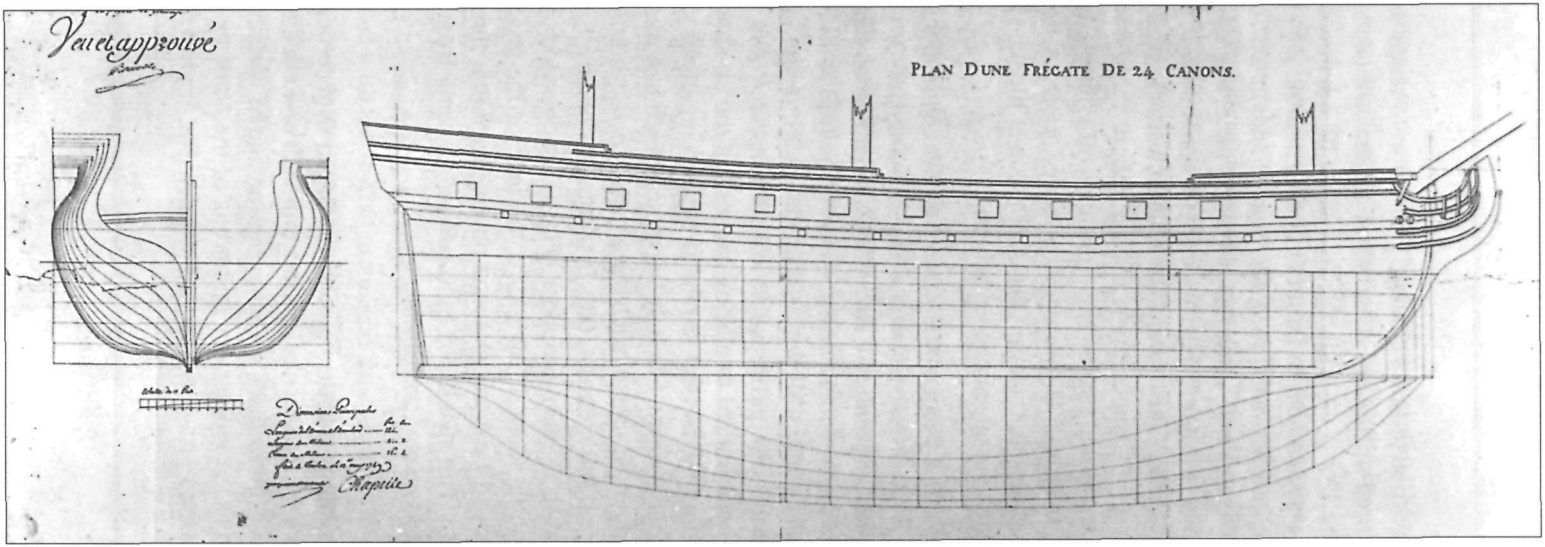
They spent the months of May and June exploring the coasts, taking hydrographic soundings and pursuing small British vessels.

Informed of the French presence in Chaleur Bay, the British sent three men-of-war and two frigates from Louisbourg in late June. The British ships, which mustered some 256 cannon and 1850 men, left the port of Louisbourg on Wednesday, June 18. The French opposed this British firepower with the 26 cannons of the *Machault*, 16 of the *Bienfaisant* and 12 of the *Marquis-de-Malause*. When it left Bordeaux, the *Machault* was armed with twenty 12-pound cannons and six 6-pound cannons. Two hundred soldiers and some 250 sailors provided the defence of the merchant vessels. The French expeditionary force could also count on 300 Acadians and some 250 Mi'kmaq capable of bearing arms. After an initial skirmish on June 22, in which the British captured an Acadian schooner, the hostilities resumed on June 28 with an exchange of cannon fire between the *Fame* and a coastal battery. Erected on the north shore of Chaleur Bay, this battery had six cannons from the *Machault*. It was protected by a line formed of five small sailboats sunk slightly downstream to prevent the enemy advancing.

While the draught of the French vessels allowed them to move around easily in Chaleur Bay, the three British vessels could not. Because of the difficulty navigating, the 60 cannons of the *Achilles* and the 70 cannons of the *Dorsetshire* played no direct role in the hostilities that erupted shortly after their arrival in the Bay. They took up a station at Pointe-Goacha (Miguasha). Their non-participation thus eliminated 130 cannons and some 700 men; however, the two vessels continued to block the exit from Chaleur Bay. While studying possible routes and surveying the sea floor, the French forces also placed detachments of soldiers at several locations along the coast to monitor and hamper the British advance. Their geographical and hydrographical knowledge of Chaleur Bay were tactical advantages for the French.

The siege

The *Fame's* cannonade against the battery at Pointe-à-la-Garde (Escuminac) continued until July 3, while the *Repulse* and the *Scarborough*, accompanied



4 Draft of a frigate with 24 12-pounders: the *Gracieuse. Archives maritimes de Toulon, 1L 442.*

by a schooner, tried to find a channel in an effort to reach the French vessels anchored upstream.* After silencing the last cannon in the battery led by Donat de la Garde, first mate of the *Machault*, the British sent a detachment to burn the houses that the Acadians had built there and abandoned during the *Fame's* attack. On July 5, the two British frigates and a schooner weaved their way through the wrecks to reach two more batteries, built on either side of the banks of the Restigouche. These were the Gilbert battery, with three 4-pound cannons (at Campbellton), and the Reboul battery, with three 12-pound cannons and two 6-pound cannons (at Pointe-à-la-Croix); two officers from the *Machault* commanded them. A new boom formed of five vessels sunk on Giraudais's orders blocked access to the three French vessels anchored behind.

The British first attacked the battery on the south shore, but because of the French resistance and the difficulty in navigating, it took them until the evening of July 7 to stop the French cannons. At dawn the next day, the three British vessels managed to slip between the wrecks and come well within half-gun range of the *Machault*. Up to that point, the participation of the *Machault* and its commander had been limited to placing cannons in the on-shore batteries and guarding the tactical retreat of the two merchant vessels in the Restigouche estuary. The only hope the French had was that the British would not be able to reach them there. On the morning of the July 8, trapped 300 metres (1000 ft.) from the enemy forces, the *Machault* had to fight or surrender (Fig. 4). Supported by the battery on the north shore, it fought. At the time of the engagement, there were only 14 cannon mounted on the *Machault*, three on the starboard side. The attack, led by the *Repulse*, came from the port side. The outcome was predictable.

Trapped

It seems astonishing that the French, who began with certain tactical advantages, could find themselves in a trap with no exit. The French could also be criticized for not taking advantage of certain circumstances, such as the momentary grounding of the *Fame* on June 25, to attack, always opting instead for the defensive. It must be recog-

nized however, that some of the French's tactical advantages may have been more theoretical than real. When it was grounded, the *Fame* could not move, but that did not prevent its cannons from firing. If the French, with their more mobile vessels, had tried to board it, they would have risked a firing broadside from the ship. As well, from the top of its double-deck, the British soldiers could easily sweep the decks of the Acadians schooners and brigantines with fire. Given the *Fame's* firepower, the chances of a successful boarding were rather slim.

The French's hydrographical knowledge and the shallow draught of their vessels undoubtedly made movement easier, but in one direction only further into Chaleur Bay. If the French vessels tried to leave the Bay, they risked an encounter with the clearly superior opposing forces. By moving in, the French could hope to avoid the enemy; sooner or later, however, the trap would close in on them. The French also held the shores, but the batteries they set up there never had more than six cannons from firing. That is not much when facing a 74-gun vessel. The mobility of the French ground troops was also rather limited because of the terrain and the forests in the Gaspé.

Strengths and weaknesses

Even without the cannons of the *Achilles* and *Dorsetshire*, the British artillery was clearly superior. It had twice as many guns as the French artillery, and the calibre of its guns gave it a further advantage. The range of the French cannons, and their effectiveness at the point of impact was clearly inferior. In addition to the 12-pound guns on the *Repulse*, the *Fame* carried guns of 32 and 18 pounds. The 36 pound French gun had a range of 575 verges (526 metres or 1750 feet), and the 12-pound gun a range of 295 verges (270 metres or 900 feet). Faced with the British numerical superiority in ships, men and guns, the French had no alternative but to retreat up the river as far as their vessels could go.

It is true that the French and British forces, not counting the crews of the *Dorsetshire* and *Achilles*, were numerically equal. Their physical and psychological state was another matter. The British

sailors and soldiers left the port of Louisbourg on June 18, when it was learned the French had arrived in Chaleur Bay. The French had left Bordeaux on April 10. After an eight-week crossing, in the close quarters of 400-500-ton ships, they reached Chaleur Bay. A thousand Acadian refugees, who had suffered hunger all winter and who perhaps demanded more care than provide help were there to welcome them. After an undoubtedly difficult time settling in, and no doubt plagued by insects all June long, the French force was certainly not well rested when the British arrived. Moreover, the weather that besiegers and besieged faced between June 25 and July 8 was particularly gloomy.[12]

The French may have occupied a good defensive position, but they had neither the arms nor the munitions to hold it. At Restigouche, the French forces retreated upriver as far as their vessels could go. Trapped, they offered heroic resistance to clearly superior forces. La Giraudais's refusal to go on the offensive was not due to any defeatist attitude. The battle on the morning of July 8 demonstrates quite the contrary. The choice of a defensive posture was a continuation of the policy of tactical retreats that the French navy had practised since the beginning of the Seven Years' War. The instructions given to the commanders of French vessels normally contained a recommendation to avoid encounters with British vessels and to fight only when honour was at stake. When a captain believed he had a clearly superior position, he authorized combat only after having taken the most advantageous positions. At Restigouche, honour was at stake, nevermind the tactical manoeuvring. And on July 8, 400 km (250 mi.) from Restigouche, Murray left Quebec City with 4000 men on 52 vessels, headed for Montréal. On September 8, 1760, the surrender of New France was not far off. The description of all the vessels and the evaluation of their methods of attack and defence give us a window onto the maritime world of the refugees from Restigouche and a better understanding of the events of the siege and its outcome.

12 The daily logs of the five British vessels mention fog, rain and thunderstorms for the entire period in question, except for a fine day on July 2. London, PRO, Admiralty 51, Vols. 262, 866, 3747, 3830, 3952.

Sailing Ships and the Mariner's World

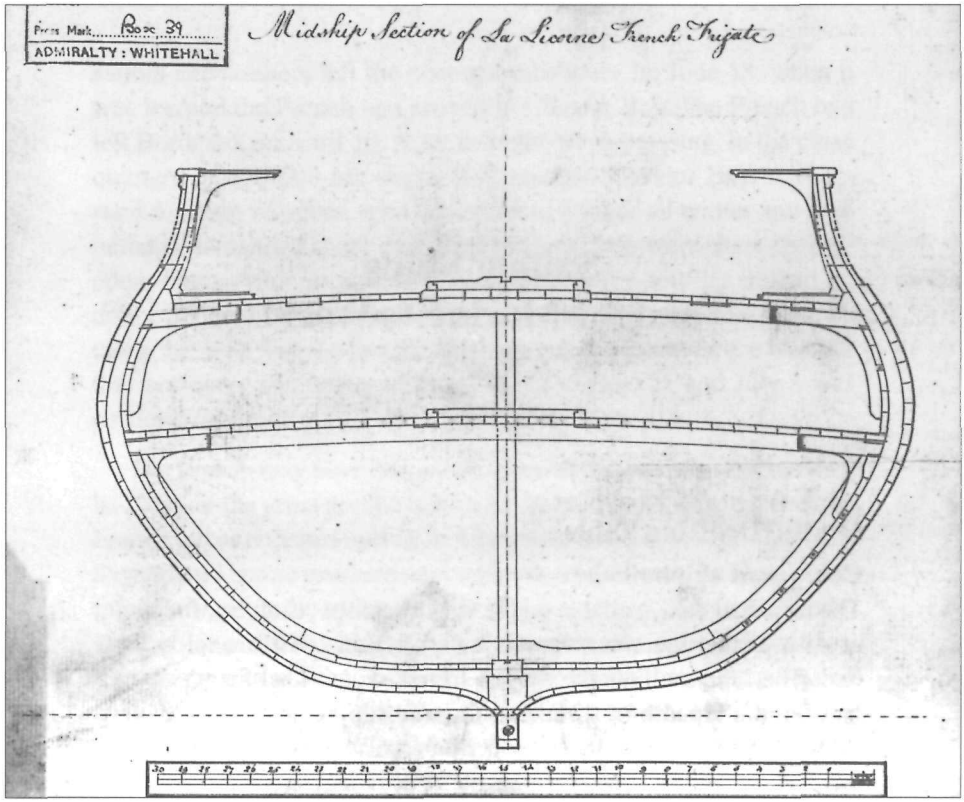
On the Drafting Table

Competent shipbuilders

The technical data available on the structural aspects of the *Machault*, as on the other merchant vessels it escorted in 1760, are fairly limited. The *Machault* was a 550-ton frigate with a keel length of 108 feet[13] and a breadth of 32 feet at the midship beam*. There was an orlop deck in the hold. Its draught when the ship was laden was 14½ feet. It carried 24 12-calibre guns on its deck and two 6-pounders on the castle*. Twelve ports* were therefore cut in each side at the deck level. The *Machault* was built in Bayonne in 1757 by shipwright Jean Hargous from plans drawn up by the royal shipbuilder, known to us only as Geffroy. Although the construction specifications* for the *Machault* are not available, we do have another set of specifications (Appendix B) prepared from plans by Geffroy, "builder for the King in this port," for the construction "of a frigate with a battery* of 24 12-pounders suitable for privateering"[14], Joseph Laporte, a master shipbuilder from Bayonne, was commissioned to execute

13 The foot used in the text is the old French foot, which was equal to 1.066 English feet, or 32.5 centimetres. However, there is an exception to this general rule in the section entitled "Restoration of the *Machault*" as well as certain tables where the data come from British archives, where the English foot (30.5 cm) is used.

14 Archives of the La Rochelle chamber of commerce, 22:3, No. 7460.



5 Draft of the midship frame of the *Licorne,* French frigate, work of Geffroy the Elder, captured by the British in 1778. *National Maritime Museum, London, Box 39, No. 6213.*

the plans in 1757. It is therefore quite plausible that the *Machault* and its fittings were built according to similar specifications, since the architect was obviously the same.

Studies on French naval architecture reveal that at the time the *Machault* was built, there were two royal shipbuilders called Geffroy, namely P. Geffroy the Elder and J. Geffroy the Younger, who were particularly active between 1750-70, primarily in the Brest area. They were the sons of François Geffroy, a shipbuilder in Brest, and the grandsons of another shipbuilder, G. Hélie. The Geffroys built mainly frigates and launched four of them between 1751-55: the *Thétis*, *Héroïne*, *Améthiste* and *Licorne*. These four frigates carried 24 or 26 8-calibre guns and were 114 to 120 feet long. The plans for the *Machault* must have been drawn up by either Geffroy the Elder or Geffroy the Younger. The lists of royal shipbuilders compiled by French historians appear to be sufficiently complete and detailed, when combined with what we know about the field of specialization of the two Geffroy brothers, to support such a conclusion.

The sailing qualities attributed to two of the Geffroy frigates match the general profile of French frigates of the period. The *Licorne*, for example (Figs. 5 and 24), helmed very well and pointed* well during a pursuit, while the *Thétis* sailed well off the wind* and before the wind*, according to their respective captains. The vessels' sailing qualities were very much dependent on their point of sail and they unfortunately experienced problems when close hauled*. In the early 1750s, Duhamel du Monceau commissioned Geffroy, an assistant shipbuilder in Brest, to conduct tests on the density of various types of wood from Canada and France for use in shipbuilding. Naval architect F.H. Chapman was a keen observer while Geoffroy the Elder was building his 64-gun *Célèbre*. At the request of King Louis XV, the navy intendant of Brest, Gilles Hocquart, facilitated the Swedish visitor's access to the *Célèbre's* shipyard and its royal shipbuilder. It was there that Chapman became convinced that the 64-gun man-of-war (*vaisseau*) must become the centrepiece of the Swedish navy. Ten years later, he published his famous *Architectura Navalis Mercatoria*. The quality of the Geffroys' work, as well as

their reputation, ensured that the *Machault* would be a reliable and well-built vessel. The plans for this frigate were obviously the work of a family of specialists, men well-versed in naval architecture.

Although chartered by the king, all of the French ships that confronted five British Royal Navy vessels at Restigouche were owned by private interests. Each of these sailing ships was constructed framework first*, followed by external planking* and internal planking* assembled using the carvel* joint method. The 1757 Bayonne specifications (Appendix B) mentioned certain species of wood used, such as oak for some of the hull planking, and hemlock and fir planks for the decks and orlop decks*. According to archeological data, the frames* (also called timbers or ribs) of the *Machault*, the deck planking, and the internal and external planking were made from red oak (*quercus rubra*). By following the various phases of the work in the shipyard, we can see the main divisions of sailing ships as well as their use. Can the archeological findings confirm our theoretical data or bring to light any significant differences? Was comfort limited or even possible on these vessels? The similarities between the Bayonne specifications of 1757 and the contemporaneous specifications of Pierre Morineau for the construction of a 26 12-calibre gun frigate, for the French Royal Navy, suggest that there were few differences between private frigates and royal frigates. Were there more significant differences between French and British shipbuilding?

Naval typology

The types of sailing vessels that took part in the Battle of the Restigouche are known by various names. Simply by examining the definitions of these types of vessels, we can already identify some of their major features. The Acadian and British *bateaux* [light river boats], schooners and brigantines, the French *navires* [full-scale ships, hereinafter referred to simply as "ships"] and frigates, and the British men-of-war and frigates that faced each other in battle in Chaleur Bay each have very distinctive features. Bateaux, schooners and brigantines are distinguished and defined primarily by their rig*. The bateau was a single-masted vessel with a fore-and-aft rig*; those present at Restigouche did not exceed 90 tons. The schooner, which

usually had a capacity of less than 100 tons, had two aft-raked masts with a fore-and-aft rig. The brigantine, which was also two-masted and which could sometimes be as large as 150 tons, had an aft-raked mainmast with a fore-and-aft rig and a square-rigged* foremast* stayed forward. These three types of vessels also had bowsprits*. In the 18th century, every square-sterned vessel, rigged with three masts and a bowsprit, was called a ship. These vessels were usually more than 150 tons. This description therefore encompasses the terms men-of-war and frigates, and applies to royal and private navies alike. At Restigouche, the *Bienfaisant* and the *Marquis-de-Malause* were merchant ships or merchantmen.

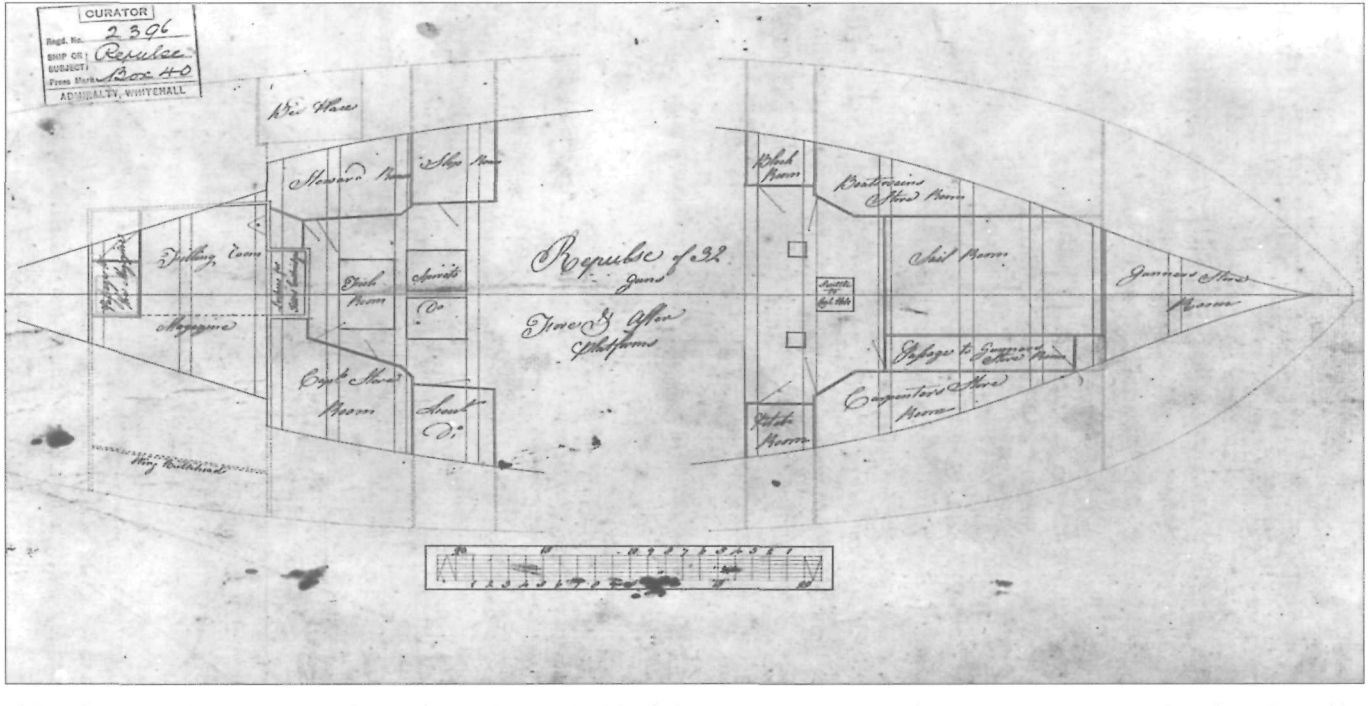
From the second half of the 17th century onward, both the British and the French organized their warships into men-of-war of different ranks or rates based on the number of guns they carried. Frigates made up the last rank, i.e. the fifth in France and the sixth among their British rivals. While, in both nations, men-of-war were distinguished from one other and classified into various ranks based on the number of guns they carried, the status of the frigates was slightly different. The British always classified their frigates by the number of guns, while the French differentiated them by the calibre of the guns. The 74-gun *Fame*, the 70-gun *Dorsetshire* and the 60-gun *Achilles* were third rates in the British classification. The main subject of this study, the *Machault*, with a battery of 24 12-calibre guns on its upper deck, was a 12-calibre merchant frigate. The *Repulse*, formerly the *Bellone*, was originally an 8-calibre frigate. However, at Restigouche, re-armed by the British after its capture in 1759, it became a 32-gun frigate, with most of the guns being 12 calibre. The *Scarborough* was a 20-gun frigate, in the sixth and last rank of men-of-war. All the definitions of the term frigate agree that it was a light vessel, whose speed was its important characteristic. Its sailing qualities had to enable it to evade men-of-war. Hence, frigates did not need a strong framework to withstand artillery. The frigate did not take part in the line of battle; instead, it served as a scout, auxiliary and convoy escort vessel.

Blaise Ollivier, a French theoretician and shipbuilder in the 1730s, designed a frigate with a single battery of 24 to 30 8-calibre guns

that was more stable and lighter than the two-decker frigate of the early part of that century. France launched some 30 frigates of this type before the Seven Years' War. The problems of the War of Austrian Succession and the naval losses suffered at the hands of the British highlighted the inadequacy of vessels armed only with 8-calibre guns against vessels often armed with 12-calibre guns. The abandonment of two-decker frigates, too heavy and armed with 12-pounders in their lower battery, prompted the construction of frigates similar to the 8-calibre ones (Fig. 1) that were intermediate between the 50-gun men-of-war armed with 18-pounders and the 8-calibre frigates. Frigates with a single battery armed with 24 or 26 12-calibre guns began appearing in 1748. The French Royal Navy built only six of these frigates prior to 1760, of which only two were 24s. The construction in Bayonne, by private interests, of two frigates with a single battery of 24 12-pounders in 1757 clearly shows that developments in the merchant navy parallelled those in the royal navy, characterized by starts and stops as well as new experiments. The *Machault*, with a single battery of 12-pounders, was one of those frigates.

From theory to specifications

The years during which the *Machault* was built were a period of fairly intense activity in French shipbuilding. After the work of Blaise Ollivier, Pierre Bouguer with his treatise on ships circa 1742 enabled shipbuilders to determine a ship's centre of gravity and to calculate stability. The publication of Duhamel du Monceau's treatise on naval architecture in 1752 and his experiments on the density of different kinds of wood and the use of steam to curve them, as well as Pierre Morineau's works on shipbuilding during the same decade, gave new inspiration to shipbuilders. The opening in 1741 of a school of naval architecture, attended by most of the shipbuilders, advanced the knowledge of shipbuilding. Plans and specifications began to be used more systematically. Such plans had existed since about 1690. The plans of the *Machault*, the work of a royal shipbuilder, show that this frigate, though a private sailing ship, was undoubtedly similar to the royal frigates. Despite theoretical efforts, shipbuilding remained an art; hull* shapes defied calculation and,



6 Draft of the forward and aft platforms in the hold of the *Repulse*. *National Maritime Museum, London, Box 40, No. 2396.*

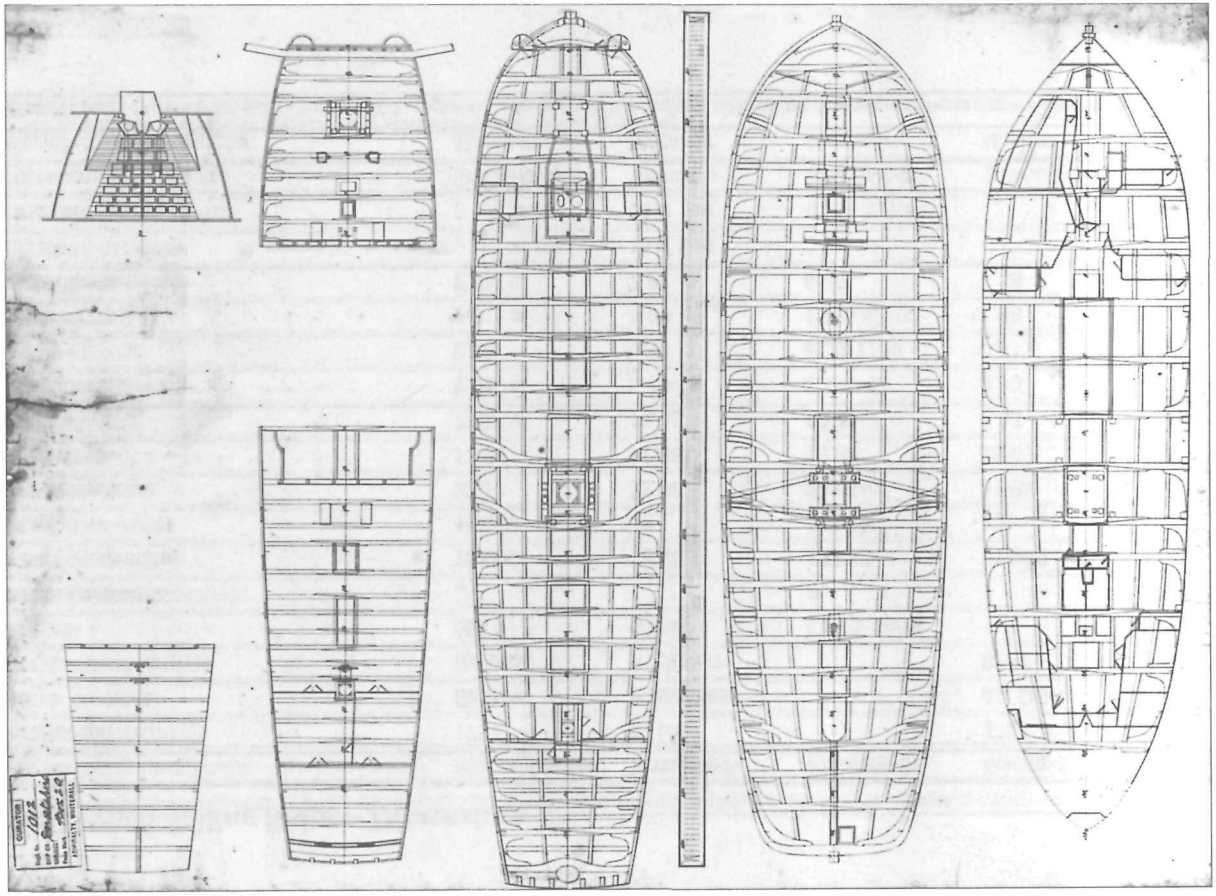
although there were certain rules which specified the main dimensions, there was no standard plan.

One frigate plan dated 1750, namely that of the *Gracieuse* (Fig. 4) with its battery of 12 ports on each side, despite some Mediterranean construction features such as much more frequent oar ports, undoubtedly best illustrates the profile and section of the *Machault*. We need only eliminate the oar ports. All 18th-century shipbuilders' plans follow the same format. A profile (longitudinal) view showed the keel, the rake of the stem*, the rake* of the sternpost*, the alignment of the frames, the location of the wales* and ports, the lines of the ship up to the waterline and sometimes certain internal divisions. The section view (cross section) showed the frames of the ship with the bow on the right and the stern on the left. Some shipbuilders, mainly British, also provided bird's-eye views of the ship's decks (Figs. 6 and 7). The *Gracieuse* was a frigate with 24 12-calibre guns, just like the *Machault,* and had a length of 124 feet, a breadth of 32 feet 8 inches and a depth of 16 feet 4 inches. The distance between ports, as shown on the plan, was approximately 6 feet 6 inches. These dimensions are comparable to those of the frigates analysed in Table 2.

Dimensions and proportions

The privateer frigate of 1757 and the *Hermione* carried 12-calibre guns, while the *Comète* and the *Bellone-Repulse* were armed with 8-pounders. All except the privateer frigate were frigates with a battery of 26 guns. While there was fairly little variation in breadth and depth[15] between the various calibres, there were somewhat greater

15 Calculation of dimensions is one of the major problems in architectural analysis during the period of the sailing ship. Depending on the shipyard, the merchant navy or the Royal Navy, and also the country, length was measured at the waterline, a the level of the upper deck or from the tip of the stem to the tip of the stern (length overall). Breadth at the midship beam was either outside of frame or outside of plank, but mainly the former. Depth was usually calculated from the top of the keel to the straight line above the midship beam in the Royal Navy, or below in the merchant navy. Jean Boudriot, *La Frégate, Marine de France, 1650-1850* (Paris: ANCRE, 1993), p. 46.



7 Plan view of the various decks of the *Dorsetshire. National Maritime Museum, London, Box 20, No. 1012.*

Table 2a: French Sailing Ships – Dimensions

Dimensions	Frigate-privateer	*Hermione*-Fr	*Hermione*-Br	*Comète*-Fr	*Comète*-Br
Year of construction	1757	1748		1752	1752
Shipbuilder	Geffroy	P. Morineau		J.L. Ollivier	
Shipyard	Bayonne	Rochefort		Brest	Havre
Tonnage	550 t	600 t	811 ts 84/94		647 35/94
Length on the upper deck					
Length overall (stem-stern)	128.00	127.5	130.83	118.00	126.31
Length of keel	112.00		108.28		103.75
Breadth at midship beam	32.5	33.66	37.54	31.66	34.25
Depth in hold	17.00	17.66	18.83	16.00	17.08
Height of hold	11.71	12.58	13.41	9.33	10.00
Length overall/breadth	3.94	3.79	3.49	3.73	3.69
Depth/breadth	0.52	0.52	0.50	0.51	0.50
Breadth/depth	1.91	1.91	1.99	1.98	2.01
Length overall/depth	7.53	7.22	6.95	7.38	7.40
Stern draught		15 ft 5 in			13 ft 11 in 1/2
Forward draught		14 ft 1 in			12 ft 11 in
Height of between-decks/midship	5 ft 3 1/2 in		5 ft 5 in		5 ft 2 in
Comparable vessels at Restigouche	*Machault*	*Machault*	*Machault*	*Machault*	*Machault*

Key: No. = number; Fr = French data; Br = British data; t = ton; ts = tuns; ft = English feet in the case of the British data and old French feet in the case of the French data; in = inches; lb = pounds; Ms = Marquis

Table 2a: French Sailing Ships – Dimensions (continued)

Dimensions	Frigate-privateer	*Hermione*-Fr	*Hermione*-Br	*Comète*-Fr	*Comète*-Br
Height of between-decks/forward	5 ft 3 in 1/2		5 ft 5 in 3/4		5 ft 3 in 1/2
Height of between-decks/aft	5 ft 3 in 1/2		5 ft 3 in		5 ft 2 in
Height of forecastle/forward	5 ft 6 in				5 ft 8 in
Height of forecastle/aft	5 ft 7 in		6 ft 0 in 1/2		5 ft 8 in 1/2
Length of forecastle/aft			28 ft 11 in		28 ft 4 in
Heigth of aftercastle/forward	5 ft 7 in				6 ft
Height of aftercastle/aft	5 ft 9 in		6 ft 2 in		6 ft 0 in 1/2
Length of aftercastle			65 ft		55 ft 11 in
Height of waist			5 ft 3 in		5 ft 1 in
No. of ports in battery/side	12	13	13	13	13
Calibre of guns in battery	12 lb	12 lb	12 lb	8 lb	9 lb
No. of ports in between-decks/side			6		
Height of battery		8 ft			
No. of ports on aftercastle/side				4	4
Calibre of guns on castle		6 lb		4	4
No. of ports on forecastle/side		2		2	2
Comparable vessels at Restigouche	*Machault*	*Machault*	*Machault*	*Machault*	*Machault*

Key: No. = number; Fr = French data; Br = British data; t = ton; ts = tuns; ft = English feet in the case of the British data and old French feet in the case of the French data; in = inches; lb = pounds; Ms = Marquis

Table 2b: French Sailing Ships – Dimensions (continued)

Dimensions	*Bellone-Repulse*	*Repulse-Bellone*	*Chézine*-Fr	*Chézine*-Br	*Bienfaisant*	*Cerf*
Year of construction		1757			1758	
Shipbuilder						
Shipyard	Rochefort	Rochefort			Bordeaux	
Tonnage		676 ts 54/94	450 t	404 ts 16 /94	340 -350 t	334 ts 28/94
Length on the upper deck		128.16				
Length overall (stem-stern)	120.50	122.58	115.00	119.50	93.00	97.33
Length of keel		104.08		99.75		76.52
Breadth at midship beam	32.25	34.96	27.83	30.2	27.00	28.29
Depth in hold	15.50	16.54	12.83	13.68	13.50	14.62
Height of hold	10.16	10.88		12.71		10.37
Length overall/breadth	3.74	3.51	4.13	3.96	3.44	3.44
Depth/breadth	0.48	0.47	0.46	0.45	0.50	0.52
Breadth/depth	2.08	2.11	2.17	2.21	2.00	1.94
Length overall/depth	7.77	7.41	8.96	8.74	6.89	6.66
Stern draught				14 ft 4 in	12	
Forward draught				12 ft 3 in 1/2		
Height of between-decks/midship		4 ft 11 in 1/4	4 pi	4 ft 4 in		4 ft
Comparable vessels at Restigouche	*Repulse*	*Repulse*	*Aurore*	*Fidélité*	*Bienfaisant*	*Ms-de-Malause*

Key: No. = number; Fr = French data; Br = British data; t = ton; ts = tuns; ft = English feet in the case of the British data and old French feet in the case of the French data; in = inches; lb = pounds; Ms = Marquis

Table 2b: French Sailing Ships – Dimensions (continued)

Dimensions	*Bellone-Repulse*	*Repulse-Bellone*	*Chézine*-Fr	*Chézine*-Br	*Bienfaisant*	*Cerf*
Height of between-decks/forward		4 ft 10 in		4 ft 4 in		4 ft
Height of between-decks/aft		4 ft 6 in		4 ft 4 in		4 ft 1 in 1/4
Height of forecastle/forward		5 ft 8 in		4 ft 7 in 1/2		5 ft 4 in
Height of forecastle/aft		5 ft 10 in	5 pi	4 ft 10 in		5 ft 4 in
Length of forecastle/aft		28 ft		25 ft		21 ft 6 in
Height of aftercastle/forward		5 ft 10 in		5 ft 3 in		5 ft 6 in 1/2
Height of aftercastle/aft		5 ft 10 in 1/2	6 pi	6 ft 4 in 3/4		5 ft 8 in 1/2
Length of aftercastle		54 ft 7 in 1/2		51 ft 6 in		48 ft
Height of waist		4 ft 10 in 1/2		4 ft 3 in		4 ft 3 in 1/2
No. of ports in battery/side	13	14	12	12		
Calibre of guns in battery	8 lb		6 lb			
No. of ports in between-decks/side	n/a		3			
Height of battery				3 ft 9 in 1/2		
No. of ports on aftercastle/side	4	2				
Calibre of guns on castle	4					
No. of ports on forecastle/side						
Comparable vessels at Restigouche	*Repulse*	*Repulse*	*Aurore*	*Fidélité*	*Bienfaisant*	*Ms-de-Malause*

Key: No. = number; Fr = French data; Br = British data; t = ton; ts = tuns; ft = English feet in the case of the British data and old French feet in the case of the French data; in = inches; lb = pounds; Ms = Marquis

differences in length, of 8 to 10 feet. The number of guns in the battery and their calibre obviously influenced the length. In one of his treatises, Pierre Morineau proposed the construction of a frigate with 26 12-calibre guns measuring 126 feet in length overall. He placed the first port 15 feet from the stem, set a distance of 6 feet between the ports and a port width of 28 inches, and located the last port 8½ feet from the stern. This yields a length of exactly 125 feet 9 inches. In the case of the *Machault*, the Restigouche restoration suggests a port spacing of more than 6 feet and indicates a port width of 28 inches. On the plan of the *Gracieuse*, the port spacing is 6½ feet. With Morineau's rules and the plan of the *Gracieuse*, we can deduce a length of approximately 124 feet for the *Machault*.

The ratios of length to breadth, again in Table 2, indicate that the 12-pounder frigate had a smaller rake than the 8-pounder. The former also had a slightly greater depth than the latter. The Bayonne privateer frigate, built from Geffroy plans like the *Machault*, had a length-breadth ratio of 3.94. This piece of information, applied to the *Machault* and its 32-foot breadth, gives the frigate a length of 126 feet from the perpendicular of the stem to that of the sternpost. In her studies on shipbuilding and her surveys on French frigates from 1740 to 1820, Martine Acerra deduced three length-breadth ratios based on geographic origin of construction for 12-pounder frigates. These proportions are always greater than 3.80. The longest model is the Atlantic type, built from Nantes to Bayonne, with a ratio ranging from 3.94 to 3.98. The hypothetical length of the *Machault*, of Atlantic construction, therefore seems fairly accurate. With 108 feet of keel and 126 feet in length, the rake of the stem and the rake of the sternpost of the *Machault* is therefore calculated at 18 feet. Since the rake of the sternpost usually is equal to one-fifth of the rake of the stem, for the *Machault* it is established at between 2 and 3 feet. An examination of the remains of the sternpost and of the stem, exposed at Restigouche, suggests a rake of the stem of 15 feet 8 inches and a rake of the sternpost of 2 feet 4 inches.

The breadth-depth ratio for the 12-calibre frigate of the Atlantic type is found to be 1.97, again according to Acerra. This ratio is

1.91 for the *Hermione* and the 1757 frigate. The first 12-pounder frigates appear to have had a somewhat deeper draught, while those constructed after 1760 had shallower draughts. Hence, this indicates a depth of 16 feet 9 inches for the *Machault*. The restoration of one section of the *Machault* at Restigouche appears to confirm this depth. These data, theoretical though they may be, help us to imagine somewhat the approximate size of the *Machault*. The heights of the between-decks and of the castles indicated in the documentation for the various frigates listed in the table are around 5 feet and 6 feet respectively. The observation of these averages and the fact that the plans of the *Machault* were drawn up by the same shipbuilder as the plans of the anonymous frigate of 1757 suggest that the dimensions of the castles and the between-decks indicated in the 1757 specifications (Appendix B) may be applied to the *Machault*. The aftercastle was probably 60 feet long and the forecastle 26. There was therefore some 44 to 48 feet of free space between them on the upper deck of the *Machault*. This deck was in fact several feet longer than the length from stem to stern, according to the data collected on the *Bellone-Repulse*.

Merchant vessels

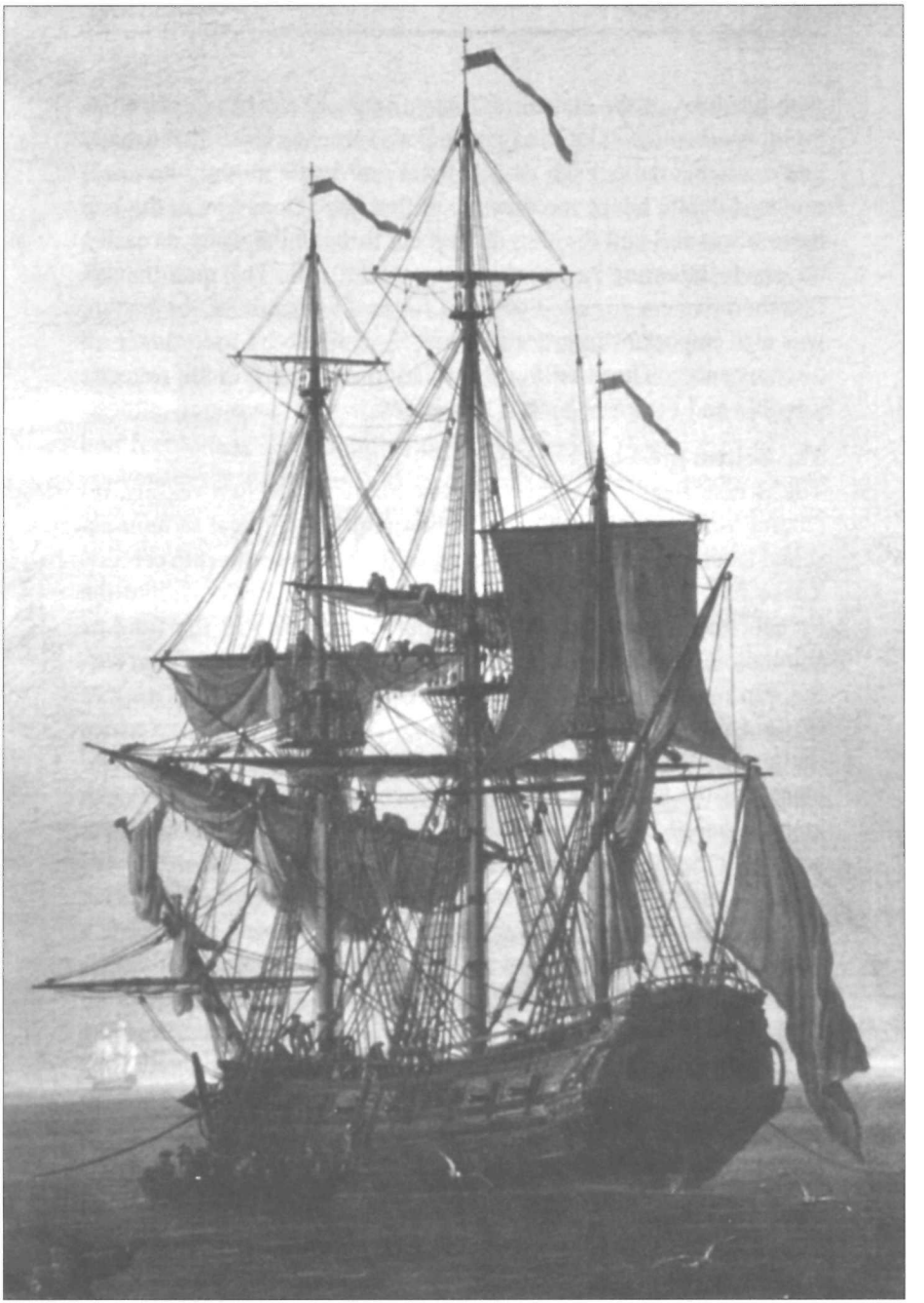
The *Bienfaisant* and the *Marquis-de-Malause*, two merchantmen that accompanied the *Machault* to Restigouche, both weighed approximately 350 tons. Until the mid-19th century, tonnage for merchantmen and men-of-war represented the dead weight of a vessel and corresponded to the potential capacity of the hold. As defined by the Naval Ordinance of 1681, a ton was equal to a capacity of 42 cubic feet or a weight of 2000 pounds. Formulas devised in the 16th and 17th centuries in several European countries made it possible to calculate the tonnage of a merchantman if the main dimensions were known. These formulas varied slightly from one country to another. In France, for example, tonnage was the product divided by 100 of the multiplication of the length overall* by the breadth at the midship beam and by the depth in hold. The divisor took into account the cubic capacity of a ton and the general shape of the ship. In Britain, however, they multiplied the length of the keel by the breadth and the depth in hold, and the divisor was 94. These formulas can be

verified in the examples of the merchantmen *Chézine*, *Bienfaisant* and *Cerf* in Table 2, since they yield results that are similar to the tonnages indicated in the documents for these ships.

Blaise Ollivier, who also described merchantmen, pointed out that they were similar in construction to the third or last rank of frigates, i.e. the smallest; they carried guns and were used for commerce (Fig. 8). They were 60 to 110 feet long with a breadth of 3 inches 3 lines to 3 inches 9 lines per foot of length. The depth varied from 5 inches to 5 inches 6 lines per foot of breadth and the floor frame*, or bottom of the ship, was equal to half the breadth. The largest ships were armed with a single battery of 20 to 24 guns, the medium-size vessels with 14 to 16, and the smallest with 4 to 8. These observations agree fairly well with the *Bienfaisant* and the *Marquis-de-Malause*, which with their fittings ranked among the medium-sized merchantmen. The merchantmen of the Compagnie des Indes, similar in tonnage to the *Bienfaisant* and the *Machault*, were also of comparable dimensions. For instance, their 360-ton merchantman had a length overall of 95 feet, a breadth of 26 feet and a depth of 12 feet 4 inches, and their 460-ton vessel had a length of 104 feet, a breadth of 28 feet and a depth of 13 feet 3 inches. These dimensions are undoubtedly a good indication of the size of the 450-ton *Fidélité* and *Aurore*.

The length-breadth and depth-breadth ratios of the merchantmen are more useful for distinguishing them from the frigates. The ratios determined in the case of the *Bienfaisant* and the *Cerf*, a ship very similar to the *Marquis-de-Malause*, situate these vessels within the averages of 3.41 to 3.68 observed for merchantmen in the first half of the 18th century. Obviously, there were exceptions to the rule: the *Chézine*, which was similar in tonnage to the *Aurore* and the *Fidélité*, was built en flûte* according to its French specifications. The British shipwrights considered her "almost a new Frigate"[16] and

16 The French specifications are reproduced in Gilles Proulx, *Entre France et Nouvelle-France* (Montreal: Broquet, 1984), pp. 177-179; the British specifications, prepared after the capture, appear in the English version of this book *Between France and New France* (Toronto: Dundurn, 1984), pp. 137-139.



8 Merchant frigate at anchor. *Painting by Joseph Vernet, "Le golfe de Bandol," 1756, Musée de la Marine, Paris, Photo RMN.*

with her rake of the stem, she looked more like a frigate. In shipbuilding, absolute values may have been rare. Merchantmen usually had a much smaller rake than frigates and had a slightly less pronounced depth, hence more drift*. With a large floor frame, the hull bottom was full and the ship did not cut through the water as easily, adversely affecting her performance under sail. The man-of-war, like the privateer frigate, had to be faster. The height of the battery was also important in order to allow the guns to be used under all circumstances. These sailing ships had to sit as high in the water as possible and therefore have a lighter frame than the merchantmen.

The British presence

The British fleet at Restigouche was composed of five vessels, including one recently captured French-built ship. Great Britain asserted itself as the world's leading maritime power in the 18th century. These five British ships belonged to the Royal Navy. Unlike the French, the British did not really pursue research in the field of shipbuilding, and despite impressive victories, their men-of-war suffered from certain weaknesses. The British Admiralty issued a series of rigid regulations specifying the main dimensions of the various ranks of men-of-war between 1706 and 1745. The last establishment* set the length of 70-gun men-of-war at 160 feet and 60-gun men-of-war at 150 feet. Since approval had to be obtained from the highest authorities in order to deviate from these regulations, modifications were rare. Governed by these establishments, the British men-of-war were slightly smaller than their French and Spanish counterparts. Their artillery was fairly heavy and consequently their framework had to be strong. Although more robust, they were often slower and less manœuverable than the vessels of their adversaries. The capture of certain French 74-gun men-of-war and privateer frigates among other ships during the War of Austrian Succession led to new experiments in British naval architecture. The British vessels at Restigouche benefited from these efforts.

The British sailing ships at Restigouche were built and launched between 1754 and 1759. In the case of the third rates, they were vessels with two battery decks carrying 60 to 74 guns. The fifth and

sixth rates had only one gun deck. Fortunately, the general dimensions of all these men-of-war and frigates (Table 3) as well as the plans of some of them, can be found in the British archives. The men-of-war were slightly longer than set out in the 1745 establishment. They are evidence of the first deviations from general British shipbuilding practices. These men-of-war must have been better sailing ships. The modifications were quite timid since when the plans for the *Dorsetshire* were sent to the Admiralty for review, care was taken to avoid mentioning that the vessel was two feet longer than stipulated by the 1745 establishment. The *Achilles* was three and a half feet longer. The examination of the French 74-gun men-of-war convinced the new shipbuilders at the Navy Board, Thomas Slade and William Bately, to adopt the 74 as the standard vessel for the British royal fleet. The first 74-gun models were planned as 70s; guns were added to the castles. The *Fame* was the first man-of-war officially commissioned as a 74-gun vessel.

The *Repulse*, built in 1755, was actually a French frigate named *Bellone*. When it was captured in 1759, it was carrying 28 8-pounders in a battery and 4 guns on the castles. The British re-armed it with 12-calibre guns (Figs. 9 and 10). The tonnage and the dimensions of the *Repulse* are very similar to those of the *Diana*, the British fifth-rate frigate with comparable artillery. The dimensions of this new British frigate are similar to those attributed to the *Machault*, with between-decks that were approximately 3 or 4 inches lower and somewhat shorter castles, but some additional 9 inches at the midship beam. Although of British Construction, the *Scarborough* with its 20 9-calibre guns was based on a French model, namely the 26-gun privateer *Tigre*, seized in 1746. The length-breadth ratios of the British vessels clearly indicate that these sailing ships had a smaller rake than the French frigates.

In the Shipyard

Construction methods

Shipbuilding in the 18th century began with the fitting of the ship's backbone the laying of the keel, of the stem at the bow and of the sternpost at the stern. In so doing, the shipbuilder determined the

Table 3: British Men-of-War – Dimensions

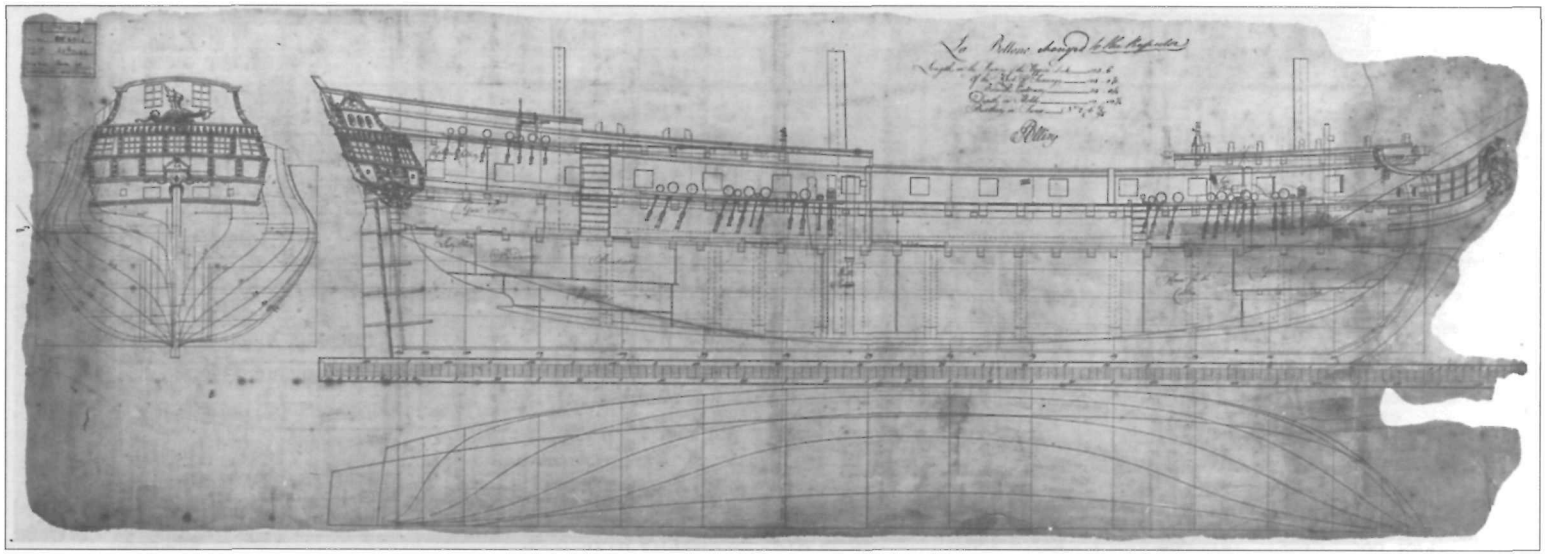
Vessel name	*Fame*	*Triumph*	*Dorsetshire*	*Chichester*	*Achilles*
Date of construction or of observation	1759	1757	1754	1748	1757
Rate	3	3	3	3	3
Number of decks	2	2	2	2	2
Tonnage	1541 8/47	1793	1426	1401 33/94	1216 32/47
Artillery (number of guns)	74	74	70	70	60
Lower deck (number-calibre)	28 x 32		28 x 32		24 x 24
Upper deck (number-calibre)	28 x 18		28 x 18		26 x 12
Aftercastle (number-calibre)	14 x 9		12 x 9		8 x 6
Forecastle (number-calibre)	4 x 9		2 x 9		2 x 6
Length overall (stem-stern)	165.50	171.00	162.00	160.00	153.50
Length of keel	134.00	139.00	134.50	131.54	127.25
Breadth	46.50	49.25	44.66	44.75	42.41
Depth in hold	19.75	21.25	19.66	19.50	18.71
Length overall/breadth	3.56	3.47	3.63	3.58	3.62
Depth/breadth	0.42	0.43	0.44	0.44	0.44
Breadth/depth	2.35	2.32	2.27	2.29	2.27
Length overall/depth	8.38	8.05	8.24	8.21	8.20
Forward draught	21 3				19 2
Stern draught	23 9				21 4
Cost	26 392 £10 .9				18 797 £14.4
Crew	650		# 460		# 380
Captain at Restigouche	J Byron	N/A	A Cambell	N/A	S Barrington

Key: £ = pound sterling or 20 times the French livre; # = average and comparative data; N/A = not applicable. The dimensions in this table are in English feet (30.5 cm)

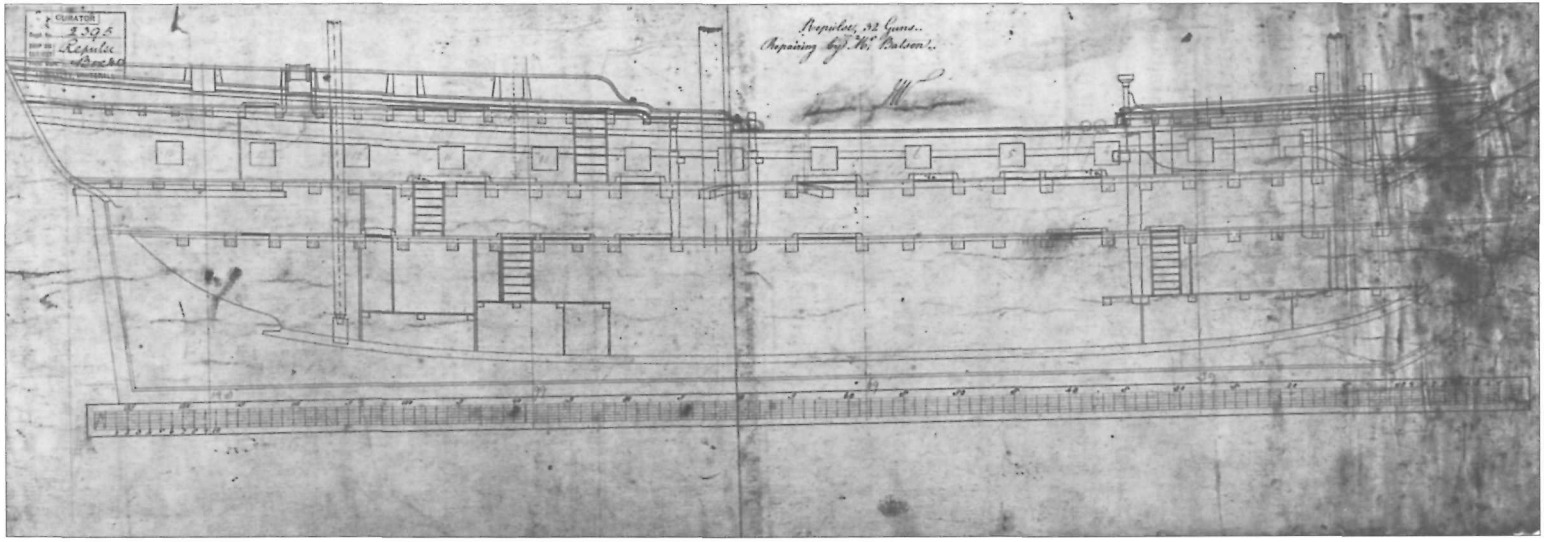
Table 3: British Men-of-War – Dimensions (continued)

Vessel name	*Dunkirk*	*Repulse*	*Diana*	*Scarborough*	*Liverpool*
Date of construction or of observation	1748	1759	1756	1755	1756
Rate	3	5	5	6	6
Number of decks	2	1	1	1	
Tonnage	1216 27/47	676 27/47	652 51/94	433 6/47	506 15/47
Artillery (number of guns)	60	32	32	20	20
Lower deck (number-calibre)					
Upper deck (number-calibre)		26 x 12	26 x 12	20 x 9	
Aftercastle (number-calibre)		4 x 6	4 x 6		
Forecastle (number-calibre)		2 x 6	2 x 6		
Length overall (stem-stern)	153.50	128.16	124.33	107.66	118.33
Length of keel	127.14	104.08	102.12	97.29	
Breadth	42.41	34.95	34.66	30.33	33.66
Depth in hold	18.75	16.54	17.00	14.66	15.5
Length overall/breadth	3.62	3.67	3.59	3.55	3.52
Depth/breadth	0.44	0.47	0.49	0.48	0.46
Breadth/depth	2.26	2.11	2.04	2.07	2.17
Length overall/depth	8.19	7.75	7.31	7.34	7.63
Forward draught			15 7	6 3	
Stern draught			15 11 1/2	13 3	
Cost			1427 £ 2.6		
Crew		# 220		# 140	
Captain at Restigouche	N/A	J Carter Allen	N/A	J Scott	N/A

Key: £ = pound sterling or 20 times the French livre; # = average and comparative data; N/A = not applicable. The dimensions in this table are in English feet (30.5 cm)



9 Lines and profile of the *Bellone,* which was renamed the *Repulse* following its capture in 1759. *National Maritime Museum, London, 6056.*

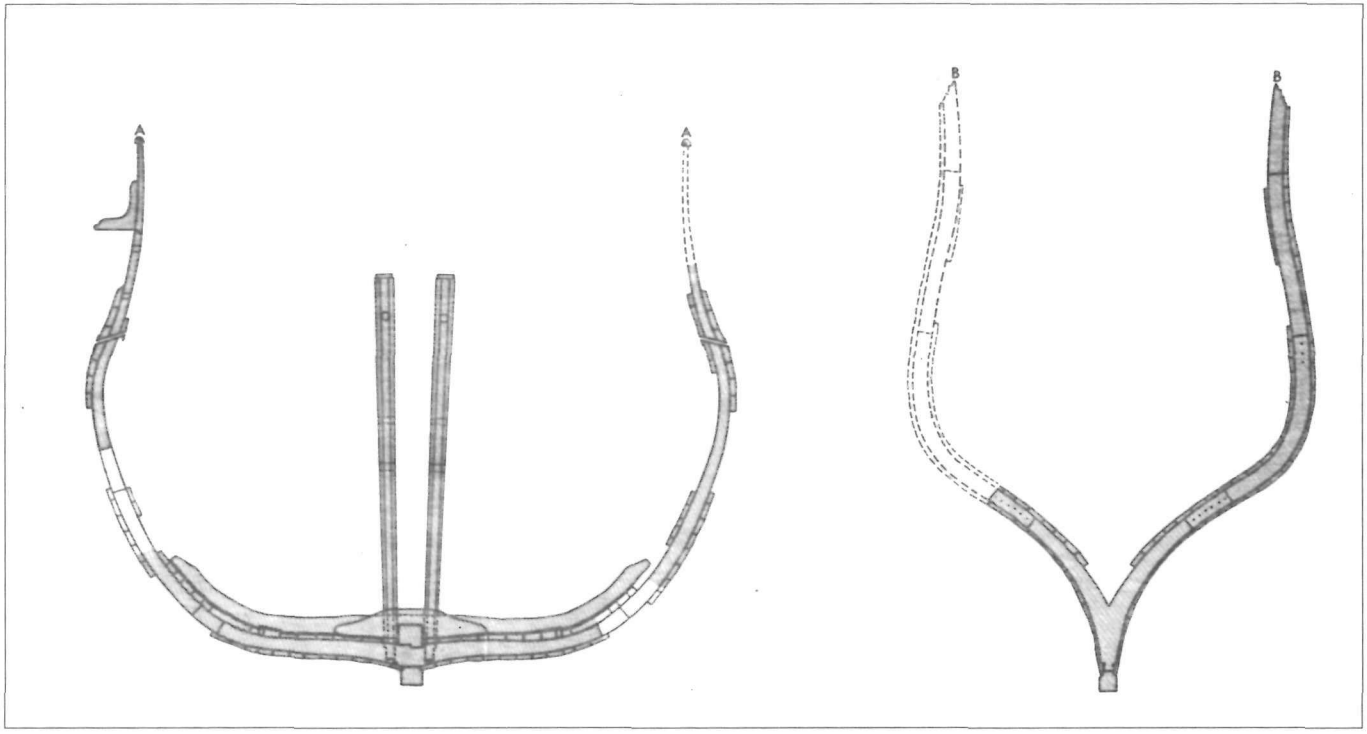


10 Profile of the 32-gun *Repulse* refitted by M. Batson. *National Maritime Museum, London, Box 40, No. 2395.*

length, the rake of the stem and the rake of the sternpost of his vessel. This was the first of five stages in the construction of a sailing ship. Depending on the port facilities, construction took place in either a dry-dock or, undoubtedly more often, particularly for merchantmen, on an inclined cradle set up at the seashore or along the shores of a river. For protection, the keel was sometimes sheathed beneath with a thin false keel; in most cases, a keelson was mounted above the keel for strength. The second stage consisted in erecting the frames, by applying the principle of framework first, to form the skeleton or framework of the vessel. Unlike in previous centuries, in the 18th century, the use of plans made it possible to graphically visualize the shape of the ship to be built. The shipwrights sometimes also made models or miniatures of future sailing ships.

In the mould-lofts of the dockyards, used primarily for royal shipbuilding, workers made full-scale drawings of the components which determined the shape of the vessel's hull. Moulds* were then used to cut the framework components. The frames, composed of floor frames, half floors* and futtocks*, were thus scarfed* and secured by treenails* on the ground. The chief frames* placed every two or three ribs, i.e. 7 to 8 feet apart, were then erected as a single piece on the keel (Fig. 11). Stringers linking the stem to the sternpost kept these chief frames in place. Filling frames were then inserted between the chief frames. The scantlings* of the French frigates indicate a frame spacing* of almost identical width as the spacing of the floor frames. The archaeological excavations reveal that all the frames of the *Machault* were double, giving a width of 16 inches on the keel for the double floor frames. In the specifications of the Bayonne 24-gun frigate, all the floor frames were 8 inches wide and the document clearly specifies that "on the moulding* its frames will be 16 inches on the keel" (Appendix B). Although the thickness of the frames gradually decreases with vertical distance from the keel, the scantlings of the frigates from the period of the *Machault* indicate a fairly strong framework. Furthermore, usually about 10 riders* were added on certain frames opposite the ports to strengthen the vertical framework.

Parallel to the keel and fitted into the floor frames, the keelson* strengthened the bottom of the ship from stem to stern. These two

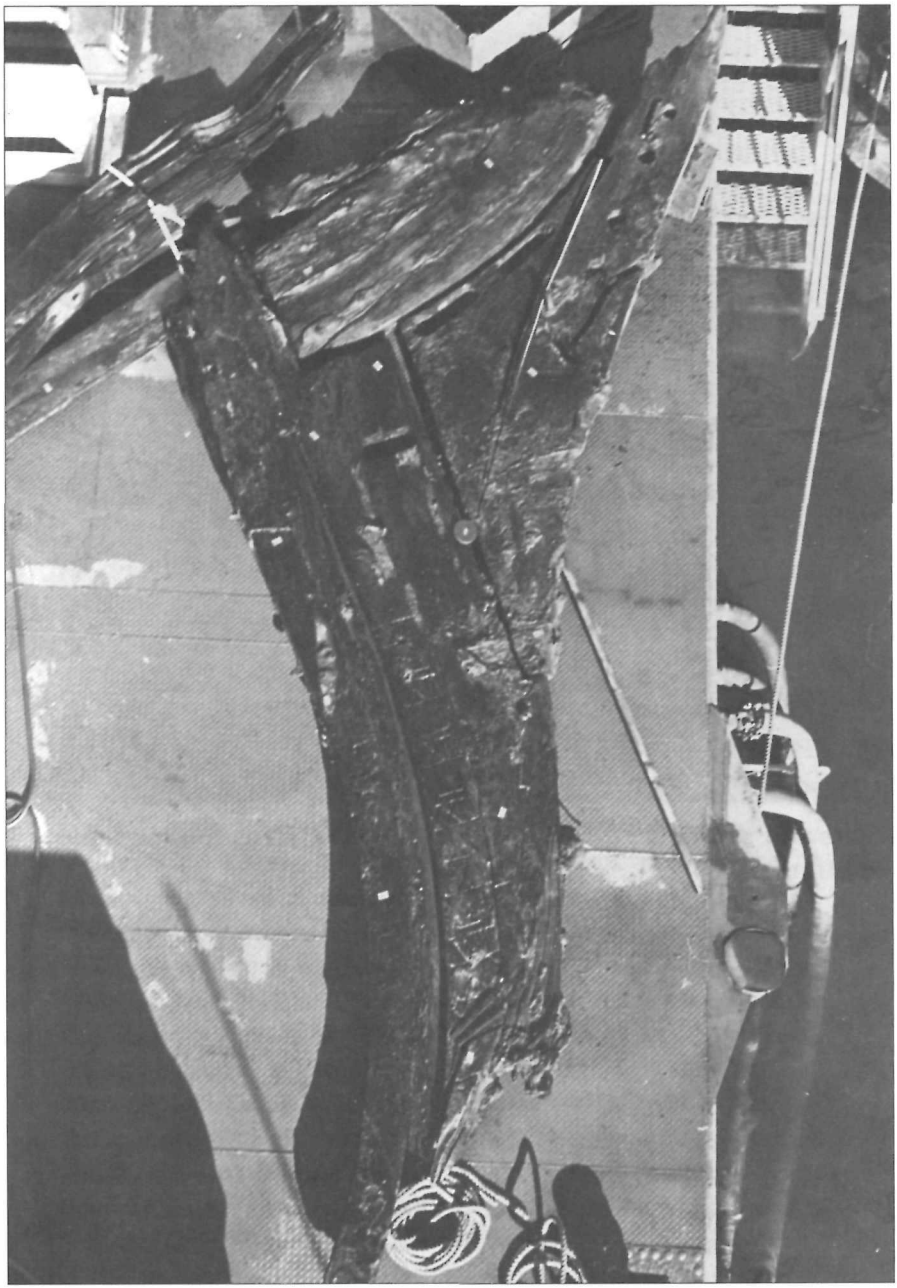


11 Draft of the midship frame and aft balance frame of the *Machault. Department of Canadian Heritage.*

components were also butt-jointed* to the keel and supported by knees*. The horizontal arms of the knees extended the keelson while at the same time supporting the cant frames* which, because of their shape, the floor frames of the bow and stern of the ship constitute. The stem with its forefoot* and its cutwater* ended with the ram, which supported the head* or bow of the ship. Hawse* pieces, in which round holes were bored on either side of the stem, completed the bow of the ship. The framework of the bow of the ship was also reinforced by a stemson*, a piece of wood attached to the apron, and by four or five breast hooks*, timbers placed perpendicular to the stem. Iron bolts secured the main parts of the framework to each other. The rounded stern of the vessel, a shape that became standard after 1730, was comprised of several escutcheon* transoms attached in the upper part of the inner sternpost. The upper counter* and its counter timbers*, which rested on the wing transom*, served as the floor of the galleries that fair-sized men-of-war and frigates often had. Futtocks scarfed to the counter timbers went as high as the taffrail*. Between these futtocks, windows provided light to the rooms located on this level. A sternson, secured in the axis of the keel, and escutcheon knees, usually angled, on either side reinforced the internal framework of the stern.

Cross girders, whose length obviously determined the breadth of the ship, carling knees in the hold, beams and deck beams* higher up all supported the decks and castles. The beams were often 3 or 4 feet apart, but somewhat closer for the deck beams. They were more widely spaced to allow for the installation of hatchways and the passage of the mainmast and pump tubes. Most 8- or 12-calibre frigates, according to the plans consulted, had about 30 beams on the upper deck or battery deck and two or three fewer on the orlop deck. The aftercastle had about 15 and the forecastle about 10. The thickness of these girders varied depending on the use of the decks. A deck supporting heavy artillery required beams that were thicker than the deck beams of a castle. These girders were usually supported at the ends by wooden or iron knees. In the hold and between-decks, stanchions* or joists also supported beams and deck beams. The hatchways which permitted movement from one deck to another

12 Starboard section of the hull of the *Machault. Department of Canadian Heritage.*



13 Wreck of the *Machault.* The roman numerals indicate the draught. *Department of Canadian Heritage.*

were framed by coamings, i.e. girders 3 to 5 inches thick that fitted into the beams of the decks.

The external planking of the ship and the internal planking, nailed to the ship's framework, constitute the third stage of the construction. While the internal planking was sometimes angled, the external planking was laid parallel to the keel and each strake* was nailed in such a way that no one joint was opposite the next. The thickness of the external planking obviously varied depending on the size of the vessel built. Two or three wales, butt-jointed, girded the vessel longitudinally in order to reinforce the hull and prevent it from coming apart. Although the specifications in the 18th century indicate fairly standardized dimensions for internal and external planking, the archaeological remains of the *Machault* reveal that it was a somewhat more varied in practice (Fig. 12). The strakes were not all 12 inches wide. The wales were thicker than the external planking of the lower and upper sections of the vessels, but the difference was not as great for the planks nailed between the wales at the level of the ports. This was obviously a very vulnerable area. While the internal planking was continuous at the level of the floor frames, the upper ceiling planks were spaced so as to allow ventilation of the frame spaces of the framework. The deck beam clamps* and inner waterways*, respectively supporting and maintaining in place the ends of the beams, completed the internal planking.

Restoration of the *Machault*

The archaeological remains of the *Machault*, on display at the Battle of the Restigouche National Historic Site, confirm the soundness of the construction methods and also add to our understanding of shipbuilding during the period. This partial restoration of the *Machault*[17] consists primarily of the midsection of the ship, starboard side, from the bulwark to the keel, including the keelson, the step of the mainmast and two pump tubes. The various parts comprising the stem as well

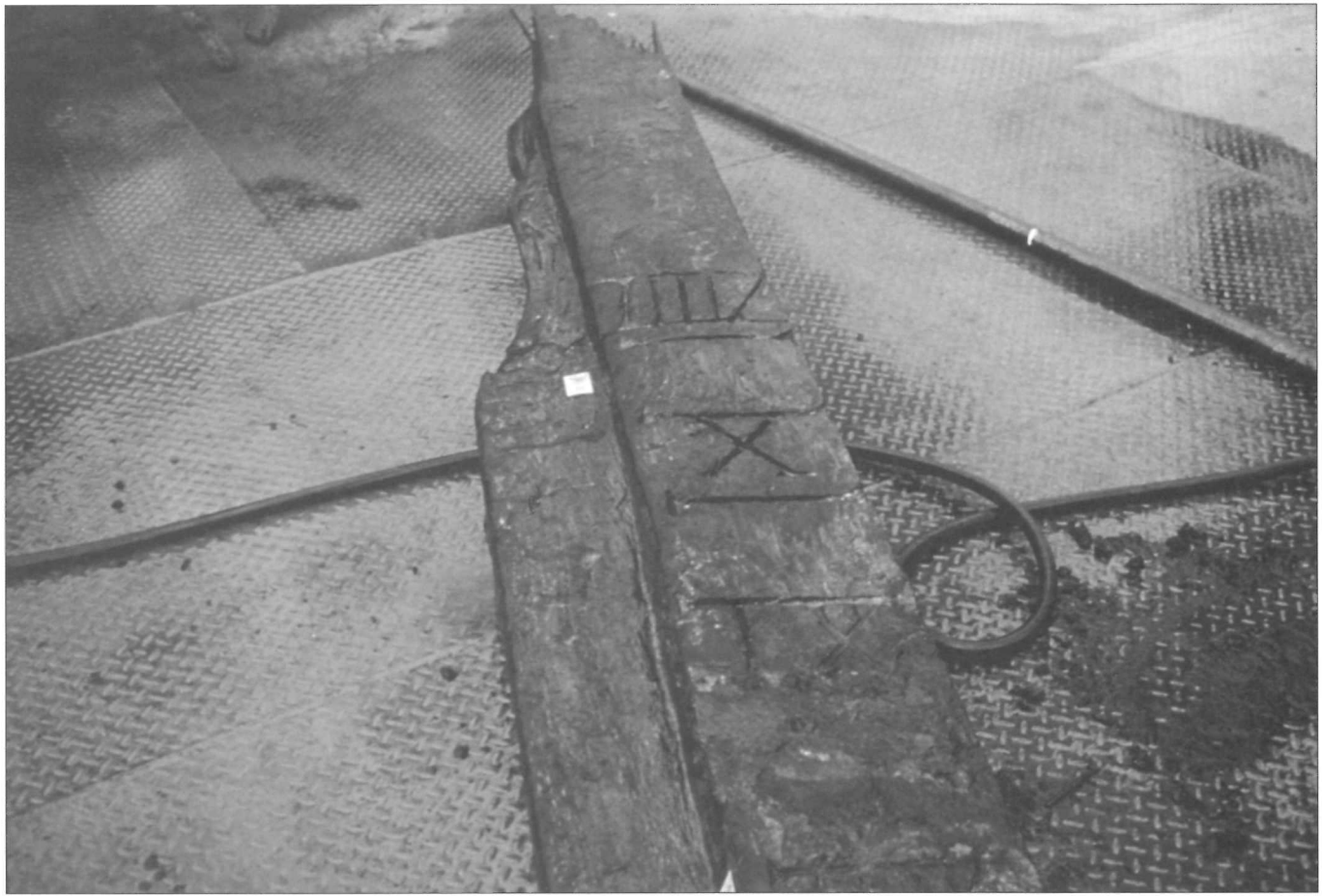
17 This restoration essentially uses pieces of the wreck of the *Machault*. It is the work of the Parks Canada archaeologists and architects specializing in naval archaeology. Exceptionally in this part, the dimensions are expressed in English feet.

as the sternpost and its rudder are also part of the exhibit. The restored section is 12½ feet wide. Only the aft portion of the keel can be measured; it is 12 inches square at 18 feet forward of the sternpost and ends at 9 inches wide by 12 high at the sternpost. It measures 14 inches high according to the archaeologist. There is apparently neither a false keel nor deadwood. The keelson is 14 inches wide by 12 inches high. The depth in hold, on the floor ceiling, is apparently 176 inches. By adding 22 inches for the height of the floor timbers, internal planking and deck beams, as does the 1757 specifications, this yields a total depth of 198 inches or 16½ feet.

The rake of the stem is approximately 17 feet, composed of three pieces of wood (Fig. 13), 12 inches wide. The cutwater is 15 inches high and is supported at the knee of the head by a 3-foot arm. The height between the Roman numerals indicating the draught on the stem is 12 inches. The rake of the sternpost is approximately 2½ feet by 9 wide. The heel knee is 5 feet high. It is composed of two pieces of wood, 4 and 17 inches thick (Fig. 14). The rudder, attached to the sternpost, measures 9 inches wide by 31 feet high. It is 36 inches thick at the base and is composed of three pieces of wood. The pintle* braces (at least five) or rudder hinges are 3 inches high by 35 long, and the hinge itself is 16 to 18 inches high (Fig. 15).

All the frames are double and the frame space ranges from 6½ to 8 inches. The floor frames are 7½ to 8 inches wide and 10 to 12 inches high. On the keel, the frames are 16 inches wide. The limbers* are 2½ inches square at the bottom of the floor frame near the keel. The first futtock which measures 7 feet long, is 7½ inches wide and 8 inches high. The futtock at the main breadth* is 8¼ inches wide by 6¼ inches high. The top timber is 6 to 8 inches wide by 4 inches high and measures 5 feet above the chain wale*. There is approximately 10 feet of height from the main deck* clamp to the plank sheer of the forecastle. The port measures 30 inches square (the port lid* is 31 inches) and the minimum distance between the ports is definitely more than 6 feet. We should mention the presence of a leather-rimmed scupper* on the waterway at the deck level and what appears to be a ventilation port measuring 5 inches high by

14 Heel of the keel and base of the sternpost of the *Machault. Department of Canadian Heritage.*



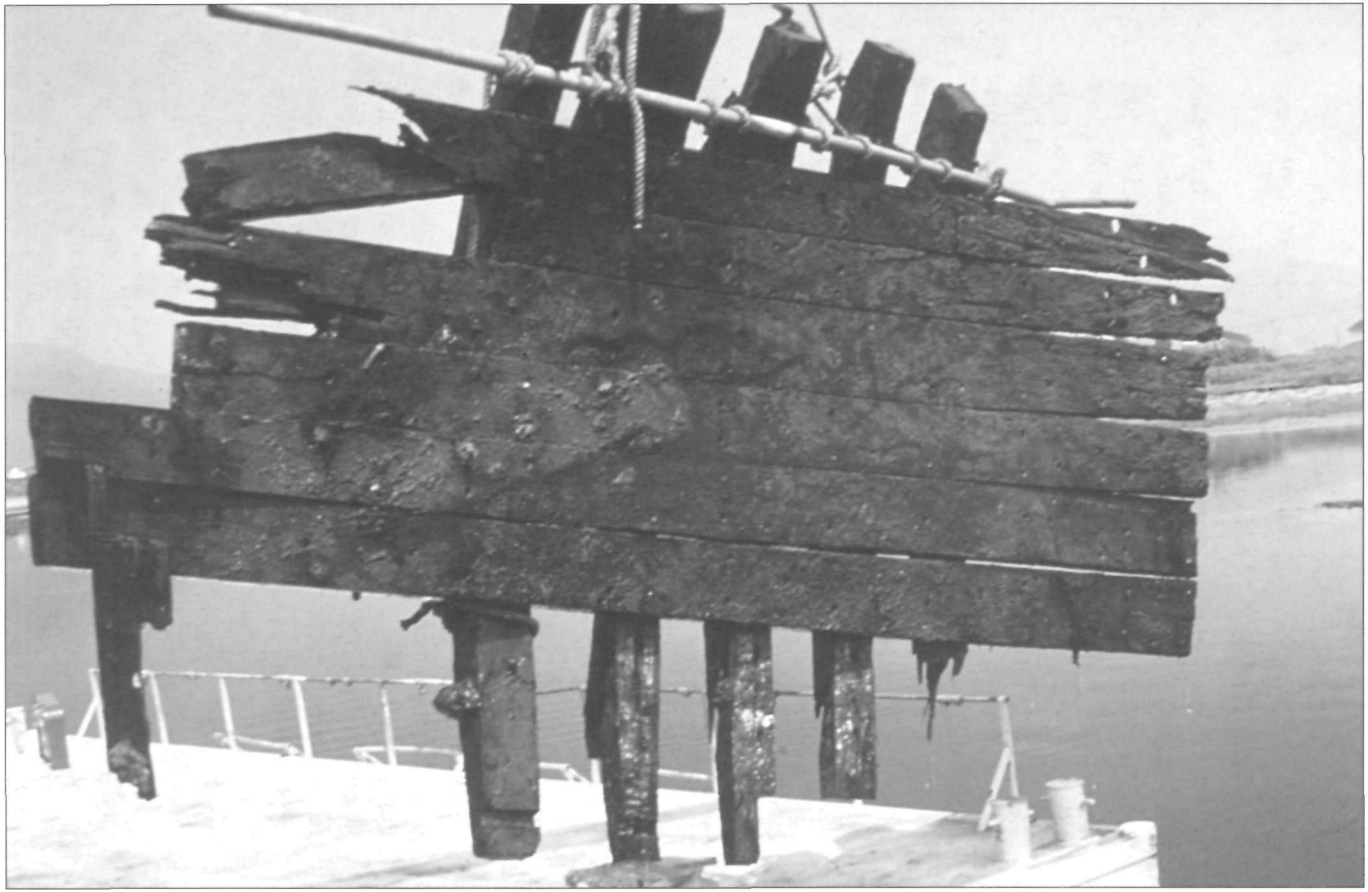
15 Sternpost-rudder of the *Machault,* with stern draught marks. *Department of Canadian Heritage.*

6 inches wide, with a port lid of 8 inches by 11 inches, at 40 inches below the gunport.

The external planking, from the keel to the orlop deck, is 3 inches thick by 9½ to 10 inches wide. The first wale is 4 inches thick by 12 wide. The strake of the gunwale is 2½ inches by 7 to 8 inches wide. The external planking is 5½ inches thick and 11 inches wide at the level of the ventilation port. There is 12 feet of casing on the starboard side in the bottom of the ship (Fig. 16). The inner planks are 2½ inches thick and range from 7 to 12 inches wide. The two outside cross braces forming the step of the mast and resting on the keelson measure 8 feet long, 12 inches high at the centre and 9 inches wide. The pump tubes are 9 inches in diameter. The exposed deadeyes* are 15 inches in diameter (Fig. 17). The chain wales are 22 inches wide, 3 inches thick and their knees have arms 22 inches long. They are attached above the ports.

Internal layout

The 1757 specifications provide some additional information applicable particularly to the layout of the *Machault*. In the hold and at the stern, there was a spare parts storeroom* for the master gunner. Forward of it were the bread storage rooms on either side, separated by a passage, with a powder magazine immediately below. The latter included a pump well* for a lantern. There was a platform for distributing provisions between the bread storage rooms and the mainmast. The floor of this platform was located just below that of the adjoining storerooms. Amidships, at the foot of the mainmast, the pump well with its oak risers was used to drain any water that accumulated in the bottom of the hold. Forward of the mainmast was the shot locker. A passage running along the hull was used to conduct inspections and effect repairs made necessary by accidents, without having to move the cargo in the hold. The Bayonne document does not provide any details about the layout of the forward hold. However, plans of frigates similar in size to the *Machault* indicate storerooms for cables and sails forward of the hold, with a space reserved for water casks forward of the mainmast. The artifacts taken from *Machault* confirm that the aft storerooms contained food and beverages and that the ship's gear, cables, sails and tools were stored forward.

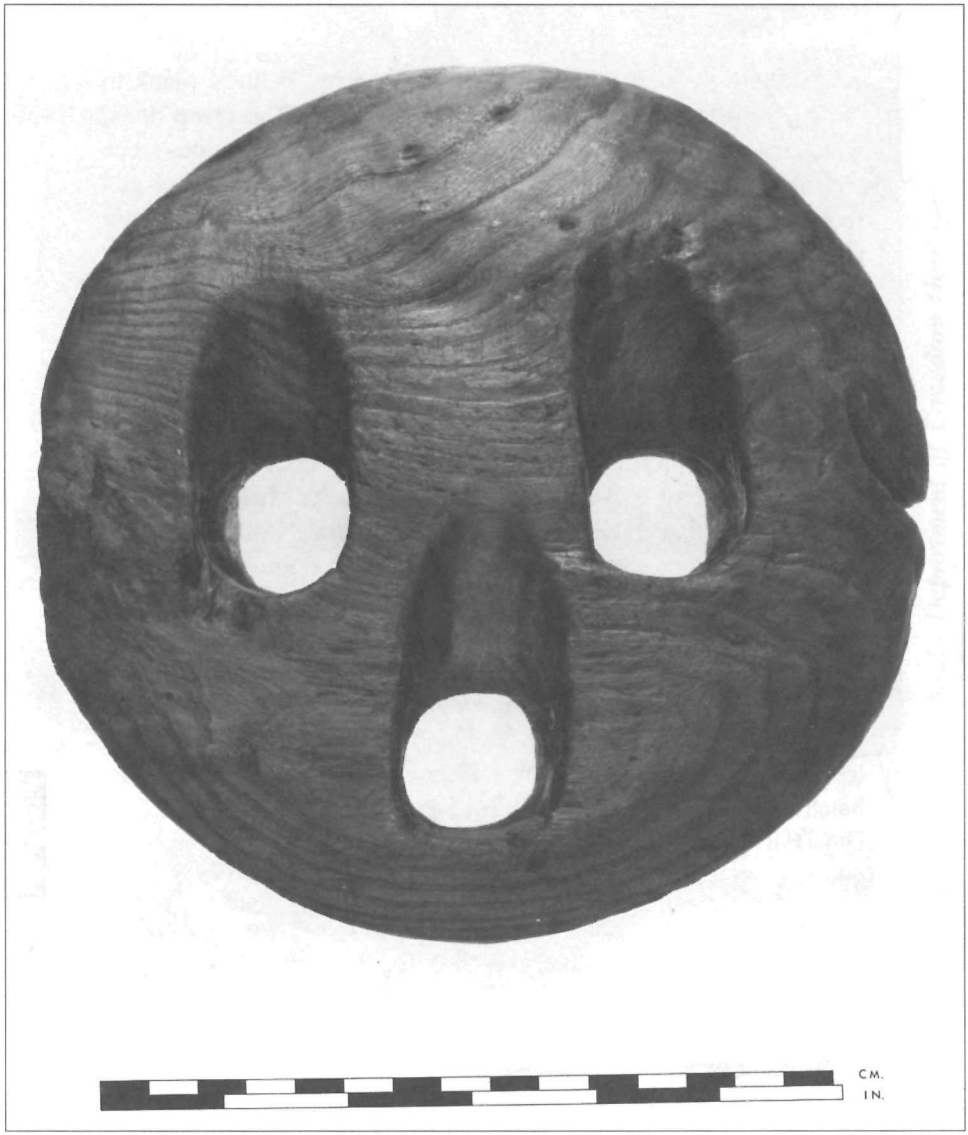


16 Floor frames and bottom planking from the *Machault. Department of Canadian Heritage.*

The between-decks measured 5 feet 3 inches 6 lines, plank to plank, from the orlop deck to the battery deck. The orlop deck, which was not designed to carry artillery, had been continuous since the mid-18th century. Abaft, at this level, the Sainte-Barbe* or gun room contained the weapons under the supervision of the master gunner; this room was also used as sleeping quarters for a certain number of petty officers. In the forward part of the ship and separated by a bulkhead was the cable room* and sick bay. All the rest of the between-decks was apparently free and used as sleeping quarters by the crew and the soldiers on board. They slept in hammocks suspended from the deck beams. On some frigates, especially in the French Royal Navy, cabins six feet long were often installed forward of the Sainte-Barbe to house the ship's junior officers. There is no indication that the *Machault* had such cabins. Hatchways provided access from one deck to another or to the hold. The Bayonne specifications indicate, for example, a hatchway between the Sainte-Barbe and the master gunner's spares storeroom, and another opposite the provisions platform for lowering casks into the hold. There were usually four or five such hatchways per deck, located mainly along the centre line of the vessel. On the *Ville-de-Bordeaux*, a 600-ton ship, "The large hatchway will be 5 feet 3 inches square, the hatchways forward and aft will measure 3 feet 6 inches square."[18] Closed by gratings*, these hatchways also served as the ship's ventilation, despite the drawback of water seepage.

The battery deck included, in addition to guns, two galleys, one for the captain and his table, the other for the crew. They were located on either side of the ship between the first and second forward ports, hence under the castle, which was approximately 5 feet 6 inches high. The galleys on Morineau's frigate were located under the castle, one forward of the foremast, the other aft so that the fire hearth of the captain's galley was starboard, and that of the crew's galley was port*. The *Pallas*, a 250-ton ship, had two galleys, one oven and one warmer. The *Machault* undoubtedly had the same number. The latter's galleys were located at the bows, just abaft the foremast. The

18 Jean Cavignac, *ibid.*, p. 45.



17 Elm deadeye, recovered from the mud of the Restigouche River. *Department of Canadian Heritage.*

presence of bricks still cemented to the fore part of the frigate provides evidence that this was the case, according to the archaeologists responsible for the excavation. The galleys of 18th-century French sailing ships were usually made of brick resting on an oak floor and a gravel bed. The interior was covered with sheets of tinplate and there were iron rings on the walls to secure the pots and iron bars on the hearth. There were not always moveable panels above the galleys and the chimney flues were not always efficient. This may explain the damaged castle deck beams, since they were heated by the galley hearths, on board the frigates *Hermione* and *Friponne*.

While the forecastle ended abaft the capstan* of the cable room, the aftercastle ended above the jeer bitts (or knightheads)*, close to the mainmast. Gangways* connected the two castles, on their level, the length of the waist* bulwarks* over a distance of just under 50 feet. Four-foot gangways on the *Licorne* (Fig. 5) were supported by knees. The chief officers slept in quarters fit up under the ship's aftercastle: the height was approximately 5 feet 9 inches. Their quarters, like the wardroom also located on this level, were all ceiled and panelled. The bulkheads were installed so as not to hinder the use of the guns or the operation of the capstan. When they were not made of canvas, the bulkheads were often removable. The tiller was located in the wardroom and two stern ports were also cut there. The situation on the *Licorne* was the same. The senior officers took their meals in the wardroom, lit by the windows of the stern. Aside from some gear, there were no particular fittings on the castles. The presence of poop decks*, which were common on French frigates, is however debatable since they increased the height of the deadworks*. Thus when the British captured French frigates, they removed the poop decks without delay. The existence of a poop deck on the *Machault*, while it cannot be verified, is not improbable.

French merchantmen

The French merchantmen at Restigouche generally followed the same shipbuilding methods. They had fairly flat aprons, and therefore flat bottoms, and were often bluff-bowed. They included the usual five major divisions: the hold, the between-decks, the battery

or upper deck, as well as the forecastle and aftercastle. According to historian Jean Cavignac, "The 18th-century merchantman differed very little from vessels of previous centuries. The bow and the stern tended to be increasingly lowered to align them with the midship deck: in fact, the height of the forecastle and aftercastle was reduced, thereby facilitating the rigging and making it possible to sail close to the wind."[19] The same can undoubtedly be said of the frigates and men-of-war. However, the internal layout of the merchantman appeared to be very simplified. According to shipbuilder Blaise Ollivier, in most merchantmen, the hold contained only the pump well, cable room, small powder magazine, or just the pump well. He also observed, on the between-decks, a Sainte-Barbe, bread storage rooms and storerooms for provisions.

The between-decks of French merchantmen were generally very low, usually about four feet. This is one criticism which the British shipwrights had regarding the *Cerf*, a 334-ton French vessel, after its capture. British criticisms of French merchantmen were not limited to this one aspect. The lack of finishing seemed to be common among French privateers and other vessels. They were also criticized for their lack of cabins. There may have been a few exceptions to this rule, as attested to by a survey of the *Joseph-Louis* from Bordeaux, a ship with 85 feet of keel with "a saloon* on the aftercastle with two cabins and a table, a wardroom with eight English-style cabins, a large antechamber starboard with two beds and another port side with one bed, two lockable cabins on each side adjoining the two previous ones, all separated from the castle by a bulkhead."[20] Although the divisions seem numerous, they were temporary. The two vessels mentioned had tonnages and dimensions similar to those of the merchantmen at Restigouche.

In addition to the matters of layout, the British shipwrights criticized the French merchantmen for being of light construction, with a weak framework and of mediocre quality. These defects were ap-

19 Jean Cavignac, *ibid.*, p. 344.
20 Jean Cavignac, *ibid.*, p. 344.

parently attributable to overly weak scantlings, the lack of knees and bolts, and pieces of wood that were too short and improperly dried. Given the documentation available, it is very difficult to assess the quality of the vessels at Restigouche from the perspective of French shipbuilding. However, the archives do permit some fairly revealing comparisons. The specifications for the 250-ton *Pallas* indicate, for example, that "in each breast hook there will be 11 iron bolts of 12 lines each and 7 in each cant frame."[21] The 1757 Bayonne document 1757 places knees at the ends of all the beams. The French documentation therefore indicates bonds that were well designed. The remains at Restigouche and its double frames reveal that in the final analysis, the framework of the *Machault* was fairly typical and most likely strong.

The *Repulse-Bellone*

The frigate *Repulse*, which initiated the final battle with the *Machault* on the morning of July 8, 1760, was also a French-built ship. It was actually the former *Bellone*, a French frigate officially with 26 8-calibre guns, captured in 1759 and renamed the *Repulse*. The British shipwrights' examination of this prize left us specifications, certain critical comments and, especially, several plans (Figs. 6, 9 and 10). Its main dimensions (Tables 3 and 4) were similar to those of the *Machault*, meaning that both frigates were of comparable size. The heights of the between-decks and the castles were, however, slightly lower by several inches. When it was captured, the *Bellone* had 28 9-pounders (British measurements) in the battery with 14 ports on each side. There were also four 4-pounders on the aftercastle, with two starboard* ports and an equal number on the port side. During the campaign of 1760, the artillery on the battery deck of the *Repulse* was increased from 8 calibre to 12 calibre. To support the additional weight of these new guns, the British shipwrights added iron hanging knees every two beams of the orlop deck as well as a lodging knee to every beam of the battery deck. The British shipwrights attributed the rust observed on the iron work of the ports to

19 Jean Cavignac, *ibid.*, p. 334.

Table 4: Displacement and Weight of French Sailing Ships

Estimated displacement	*Machault*	*Bienfaisant* and *Marquis-de-Malause*
	LW x B x D x 0.55 (frigate) / 28 c.f.	LW x B x D x 063 (merchantman) / 28 c.f.
	123.5 x 32 x 14 = 55 328	91 x 27 x 12 = 29 484
	55 328 x 0. 55 / 28 c.f = 1087 t	29 484 x 0.63 / 28 = 663 t
Hull : estimated weight		
Quantity of wood used	550 x 23 c.f. or 12 650 c.f.	350 x 23 c.f. = 8050 c.f.
Weight of oak	12 650 x 95 % x 59 = 709 032 lb	8050 x 95 % x 59 = 451 202 lb
Weight of fir	12 650 x 5 % x 45 = 28 462 lb	8050 x 5 % x 45 = 18 112 lb
Total weight of wood used	737 494 lb	469314 lb
Weight of iron	3.20 x 12 650 = 40 480 lb	8050 x 3.20 = 25 760 lb
Weight of oakum and pitch	0.75 x 12 650 = 9 487 lb	8050 x 0.75 = 6037 lb
Total weight of the hull	787 461 lb (394 t approx.)	501 111 lb (250 t approx.)
Representing	36.25 % of the ship's displacement estimated at 1 087 t.	37.70 % estimated at 663 t
Gear & equipment : estimated weight		
Masting	32^3 x 1.80 = 58 982 lb	27^3 x 1.80 = 35 429 lb
Rigging	32^3 x 1.04 = 34 078 lb	27^3 x 1.04 = 20 470 lb
Sails	32^2 x 4.40 = 4 506 lb	27^2 x 4.40 = 3207 lb
Cables	32^2 x 20.00 = 20 480 lb	27^2 x 20.00 = 14 580 lb

Key: LW = length at waterline; B = breadth; D = draught; t = tons; c.f. = cubic feet; lb = pounds; approx. = approximately 32^3 or 27^3 = cubic breadth; 32^2 or 27^2 = square breadth

Table 4: Displacement and Weight of French Sailing Ships (continued)

Estimated displacement	*Machault*	*Bienfaisant* and *Marquis-de-Malause*
Gear & equipment : estimated weight		
Anchors	32 ^{2} x 10.00 = 10 240 lb	27 ^{2} x 10.00 = 7290 lb
Boats (2)	32 ^{2} x 7.5 = 7 680 lb	27 ^{2} x 7.5 = 5467 lb
Galley-oven	32 ^{2} x 8.00 = 8 192 lb	27 ^{2} x 8.00 = 5832 lb
Sub-total	144 518 lb	92 277 lb
Men and provisions		
Crew (160 men + 100 soldiers)	250 lb x 260 = 65 000 lb (or 40 000 for 160)	250 lb x 100 = 25 000 lb
Provisions (3 months)	540 lb x 260 = 140 400 lb (or 86 400 for 160)	540 lb x 100 = 54 000 lb
Water (2 months)	535 lb x 260 = 139 100 lb (or 85 600 for 160)	535 lb x 100 = 53 500 lb
Sub-total	489 018 lb (245 t approx.) (or 356 518 - 178 t)	224 777 lb (112 t approx.)
Total hull and gear/equipment	639 t approx.,with soldiers or 572 (crew only)	362 t
Artillery	1100 shot = the 12-pounders at 21.60 lb	280 shot = the 6-pounders at 11.15 lb
	and the 6-pounders at 11.15 lb	and the 4-pounders at 8.6 lb
	20 12-pounders x 4064 = 80 280 lb	8 6-pounders x 1923 = 15 384 lb
	8 6-pounders x 2146 = 17 168 lb	6 4-pounders x 1572 = 9432 lb
	total = 97 448 lb or 49 t	total 24 816 lb or 12 t
Grand total	639 + 49 = 688 t	362 + 12 = 374 t
Cargo space	1087 - 688 = 399 t	663 - 374 = 289 t

Key: LW = length at waterline; B = breadth; D = draught; t = tons; c.f. = cubic feet; lb = pounds; approx. = approximately 32 ^{3} or 27 ^{3} = cubic breadth; 32 ^{2} or 27 ^{2} = square breadth

a previous use. This comment suggests that French naval architecture recycled materials, even though this practice was criticized, undoubtedly because of the military constraints created by this first worldwide conflict.

The fittings of the *Bellone* seemed limited and undoubtedly warranted the description of inadequate. "In hold: there are no fish, brandy, steward, bread or sail rooms, captains, marines, gunner, boatswain or carpenters storerooms, magazine, well or shot lockers, fore platform to build for the fireplace."[22] wrote the members of the Admiralty Office after its capture. The specifications, however, mentioned a raised quarterdeck on the aftercastle, as is established by the existence of two windows on the stern taffrail on the plans of the *Repulse*. While the plans of the *Repulse-Bellone* confirm the presence of about 30 beams, more or less equidistant except at the mainmast and the hatchways, they also reveal somewhat more varied uses of space. The subdivisions were probably made after the frigate's capture other than several provisions storerooms in the aft part of the hold, gear forward, cabins aft on the between-decks, the general layout of the French frigates was followed. Apparently, there was no Sainte-Barbe. Nevertheless, the British Admiralty considered the vessel to be in good enough condition to be pressed into service with the Royal Navy.

British men-of-war

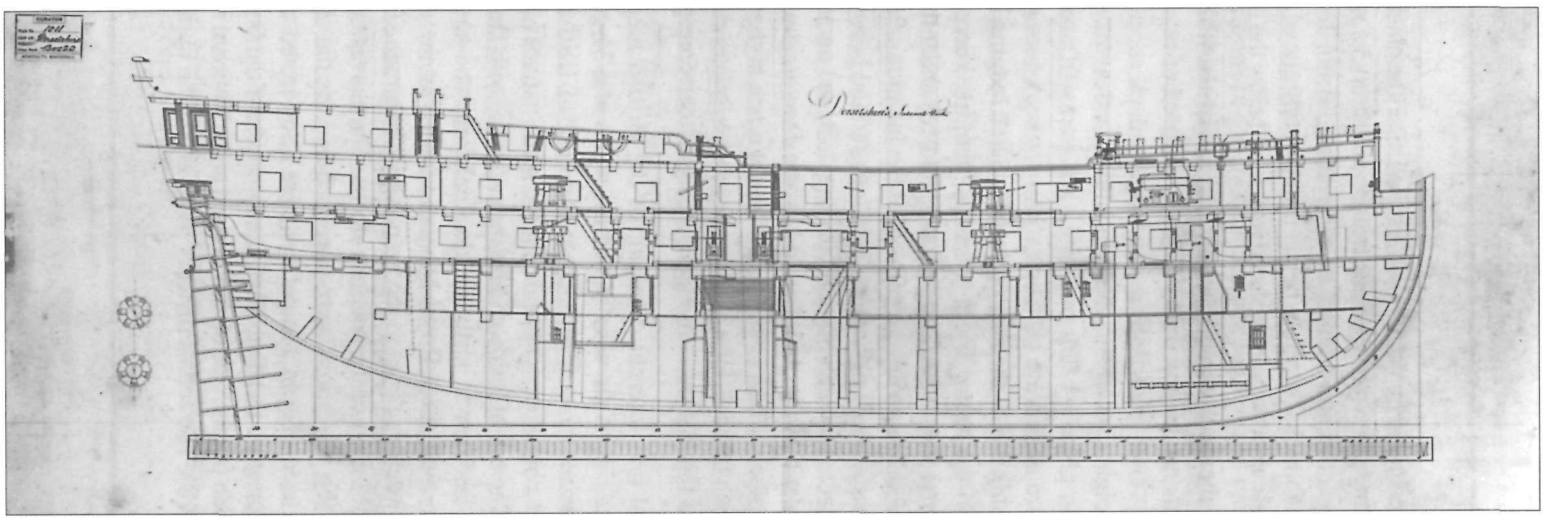
With the British fleet of four sailing ships that accompanied the *Repulse* in Chaleur Bay in 1760, the shipbuilding methods as well as the general layouts are comparable to those observed in France. The British men-of-war, with the exception of the *Scarborough*, were obviously larger than the French ships and therefore provided more space. The use of the space does not really seem to be significantly different. The example of the *Bellone*, a 74-gun man-of-war similar to the *Fame*, had a keel composed of six pieces and a 7-inch thick false keel of the same width to protect it. Butt joints were used so that the keel joints were not located opposite those of the false keel.

22 National Maritime Museum, Greenwich, ADM B, Vol. 162, Navy Board specifications, Dan Devert.

The frames, interrupted by ports, were inserted after the chief frames. Those frames that consisted of floor frames and futtocks were also double; however, the second part of the frame did not have floor frames, and the futtocks therefore began immediately above the keel. On British vessels wooden bolts replaced iron work below the waterline.

Because of the considerable breadth of the British third rates, their beams and deck beams were usually composed of two or three sections, always butt-jointed. Since the battery deck supported the considerable weight of the guns, the shipbuilders endeavoured whenever possible to place a beam opposite each port and another between. The beam ends were all fitted with hanging knees bolted to the side of the ship and to the side of the beam, and lodging knees on the other side of the beam. There were also hanging knees, though not as many, above the decks. The presence of knees under the beams and their lateral sides obviously influenced the location of the ports in the various batteries. Half beams* were laid parallel between each beam and connected to each other by carlings*. Based on an examination of the plans of the *Achilles* and of the *Dorsetshire* (Figs. 7 and 18), the number of beams per deck was not much higher than on the shorter French frigates. However, the distance between each beam was greater and the thickness of each piece was therefore greater.

The external and internal planking of the British men-of-war depended on the size of the vessels, and the wales of a 74-gun could be up to 8½ inches wide. The internal planking of British sailing ships, while not continuous, appeared to be more extensive than on French ships. The use of holds and between-decks, with storerooms and the Sainte-Barbe, was virtually identical from one navy to the other. However, the British Royal Navy did not adopt the approach of very low between-decks as in the French merchantmen. The plans show several cabins aft of the between-decks. The canvas bulkheads which divided the wardroom were also used and for the same reasons on British men-of-war. The galleys were also located under the forecastle. An iron stove installed below the forecastle of the *Dorsetshire* is shown on a plan of this man-of-war housed at the National Maritime Museum (Fig. 18). The senior officers lived aft on the upper decks,



18 Profile of the 70-gun man-of-war *Dorsetshire,* also involved in the fighting in Chaleur Bay in 1760. *National Maritime Museum, London, Box 20, No. 1011.*

where windows and galleries ensured a marginal improvement in comfort. Their lavatories were located in the quarter galleries* on the aft sides of the men-of-war. As in all navies, the crews' lavatories were located forward on the head.

Wood and iron work

Based on the formulas proposed by various authors in the early 19th century, who were familiar with shipbuilding, we can determine the displacement and weight of older sailing vessels. These calculations make it possible to estimate the quantities of materials needed to build the French vessels that went down at Restigouche. Table 4 provides details on the estimated displacements and weights of the *Machault*, *Bienfaisant* and *Marquis-de-Malause*, based on formulas that use certain dimensions of length at the waterline, draught as well as the cube and square of the midship beam. The displacement of the *Machault* is thus estimated to be 1087 tons,[23] i.e. nearly double its dead weight of 550 tons. This is in keeping with the average displacement of 12-calibre frigates estimated at 1082 tons, according to recent studies.

The total weight of the hull of the *Machault* can be estimated at approximately 400 tons, i.e. 350 for the wood and 20 for the iron. Adding the weight of gear, provisions, beverages, 260 sailors and soldiers as well as artillery, the *Machault* weighed 688 tons. Since the displacement is 1087 tons, this leaves a cargo space of approximately 400 tons. The calculations performed for the *Bienfaisant* or the *Marquis-de-Malause*, weighing 350 tons, suggest a cargo space of 289 tons. The encumbrance of the *Soleil*, another 350-ton ship that was part of the Bordeaux expedition, was 295 tons. The amount of cargo loaded on board the sailing ships of the expedition apparently filled all the available cargo space. All these figures on the

23 The formula used is: length at the waterline x breadth x draught x 0.55 (ratio for a frigate type ship, or 0.63 for a merchantman) / divided by 28 cubic feet corresponding to the seawater ton of 2000 pounds. For the dimensions of the *Machault*, we determined a draught of 14 feet, corresponding to the highest figure indicated on its tempost, the known breadth of 32 feet and a length at the waterline of 123.5 deduced from the 126 feet of length overall.

displacement and weight of the French sailing ships therefore seem very realistic.

Of the tree species used in shipbuilding, oak accounted for 95 percent of the wood required. The construction of an average frigate required, the felling of 800 trees or the equivalent of 13 000 cubic feet of squared oak, which is close to the 12 650 cubic feet of wood estimated for the *Machault*. The oak used to build the *Machault* evidently came from the area around Bayonne, at the very least the Pyrenees region. This area was known as a good producer of excellent quality oak. "Most of the wood pieces used in the construction of ocean-going merchantmen are made from oak; fir is used only in the planking of the second deck and the planking of the castles, and sometimes their bottom planking is made of elm."[24], reported the shipbuilder Blaise Olivier. For the frames and deadworks, the more resistant thin oak was mainly used. Thick oak, which is less sensitive to moisture, was more suitable for the planking of the submerged parts of the ship.

Iron was the other material most used in shipbuilding, accounting for about 20 tons for the *Machault* and about 12 tons for merchantmen, such as the *Bienfaisant*, excluding the weight of the anchors and guns. The most common ironwork was undoubtedly the bolts, mainly for assembling the framework, and the knees connecting beams and internal planking. There was also a large quantity of nails, undoubtedly quite varied, since for a 600-ton ship such as the *Superbe* (previously the *Ville-de-Bordeaux*) about 15 different types of nails were identified. Iron was also used for the various attachments in the rigging, such as shackles, hooks, chains, mast hoops, locks and padlocks for hatches and doors and iron bars for the stoves or for the tops*. Although there were iron bolts 12 feet long on a 74-gun man-of-war, such as the *Fame*, British men-of-war made somewhat more limited use of iron than the French. On British vessels, the knees were more often made of wood and the bolts below the waterline were also wooden, in order to minimize rust.

24 Jean Boudriot, *Compagnies des Indes, 1720-1770 : Vaisseaux, hommes, voyages, commerce* (Paris : ANCRE, 1983), pp. 271-72.

19 Step of the mainmast of the *Machault,* with interior planking, floor frames and keelson, as recovered from the Restigouche River. *Department of Canadian Heritage.*

Rigging a Vessel

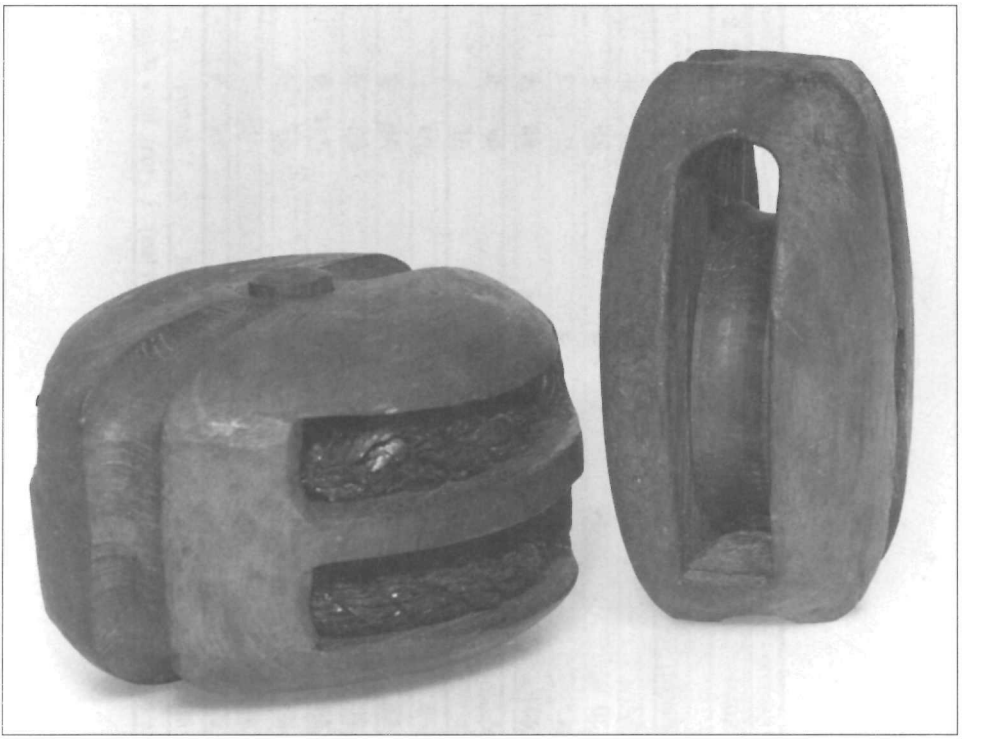
Masting

> Once the frigate is in the water, she will be supported on two barges and, keeping her straight on her keel, will prevent her from bearing on the half floors, and it will be in this condition that she will be given her masts, ballasts and the part of the rigging needed to convey her to Rochefort.[25]

The fifth and final stage of construction, whether the vessel was a light frigate or a 74-gun man-of-war, began this way. Apart from a few pieces of information gleaned from the restoration of the *Machault*, its chain wales above the ports and the archaeological remains, we have little detailed information about the masting of the *Machault*. The 1757 specifications (Appendix B) for the Bayonne frigate make no mention of it. The illustrations of the step of the mainmast of the *Machault* (Fig. 19), the blocks and the deadeyes (Figs. 17 and 20) are the most tangible evidence we have. The entire question of the rigging and outfitting of the sailing ships at Restigouche is therefore difficult to evaluate. However, the remains do provide a great deal of information about some of the equipment and gear* of the *Machault* such as its rudder, pumps and artillery. Comparisons of iconographic and manuscript data provide certain details concerning the supplies essential for the construction and handling of the vessels in Chaleur Bay in 1760.

The sailing vessels at Restigouche were all three-masted, except for a few brigantines, schooners and Acadian bateaux that had taken refuge in Chaleur Bay in 1760. The mainmast, foremast and mizzenmast* were composed of three pieces slotted together and held by mast caps*, and the bowsprit was made of two pieces. The tops, lookouts and shroud attachment areas of the topmasts were located at the junction of the lower masts and topmasts. The tops tended to be

25 Archives of the La Rochelle chamber of commerce, 17:3, 5869. Table of the proportions of a frigate with 24 to 26 guns and the costs thereof, according to two sets of specifications, one drawn up at La Rochelle and the other at Rochefort.



20 Blocks of elm and lignum vitae, from the archaeological excavations of the *Machault. Department of Canadian Heritage.*

Table 5a: French Masting

Name of sailing ship	*Comète*	*Héroine*	*Ville-de-Bordeaux*	*Ville-de-Bordeaux*	*Chézine*
Breadth at midship beam (or tonnage) in 1/2	32	30	(600 t)	(600 t)	30 ft 2
	Height	Height	Height	Diameter/in	Height
Mizzenmast	55	53	72	17	52 2
Mizzen topmast	35	30	34	9	29 1
Mizzen topgallant	x	x	x	x	9 3
Total height	**90**	**83**	**106**	**x**	**90 6**
Mizzen yard	60	x	59	11	57 6
Mizzen topgallant yard	30	x	30		30
Mainmast	78	75	79	25	74
Main topmast	52	47	48	15 1/2	45 2
Main topgallant	25	25	24	7	23 6
Total height	**155**	**147**	**151**	**x**	**142 8**
Main yard	69	x	64	18	67 4
Main topsail yard	48	x	43	11	45 9
Main topgallant yard	28	x	27	6 1/2	29 9
Comparable vessels at Restigouche	*Machault*	*Machault*	*Machault*	*Machault*	*Aurore*

Key: x = unknown data; ft and in mean data in English feet and inches. The other dimensions are in French feet (1.066 English feet); t = tons; Ms = Marquis

Table 5a: French Masting (continued)

Name of sailing ship	*Comète*	*Héroine*	*Ville-de-Bordeaux*	*Ville-de-Bordeaux*	*Chézine*	
Foremast	72	68	73	24	68	10
Fore topmast	49	42	44 1/2	14 1/2	42	9
Fore topgallant	23	23	22 1/2	6 1/2	21	9
Total height	**144**	**133**	**140**	**x**	**133**	**4**
Foreyard	61	x	59	17	63	1
Fore topsail yard	45	x	39 1/2	10 1/2	42	8
Fore topgallant yard	25	x	25 1/2	6	26	3
Bowsprit	44	45 1/4	48	24 1/2	44	6
Spritsail topmast	x	x	x	x	x	
Flying jib boom	24	24	32	9	31	8
Total height	**68**	**69 1/4**	**80**	**x**	**76**	**2**
Spritsail yard	45 1/2	x	42	11	42	8
Spritsail topgallant yard	30	x	x	x	39	
Comparable vessels at Restigouche	*Machault*	*Machault*	*Machault*	*Machault*	*Aurore*	

Key: x = unknown data; ft and in mean data in English feet and inches. The other dimensions are in French feet (1.066 English feet); t = tons; Ms = Marquis

Table 5b: French Masting (continued)

Name of sailing ship	*Chézine*	*Cerf*	*Cerf*	*Bellone-Repulse*	*Bel.-Repulse*
Breadth at midship beam (or tonnage)		28 ft 3 in 1/2		34 ft 11 in	
	Diameter/in	Height	Diameter/in	Height	Diameter/in
Mizzenmast	13 3/4	56 7	12 3/8	70	16 1/2
Mizzen topmast	9	31 3	8 1/8	37 7	10 1/8
Mizzen topgallant	4 1/4	x	x	x	x
Total height	**x**	**88**	**x**	**107 7**	**x**
Mizzen yard	9 5/8	27 10	6 5/8	67 6	11 3/4
Mizzen topgallant yard	7 1/2	28	5 5/8	37	6 7/8
Mainmast	20	64 9	18 1/4	84 6	25 1/4
Main topmast	12 1/2	47	12	51	15 1/2
Main topgallant	6 5/8	22 9	6 1/2	25	8 3/4
Total height	**x**	**134 8**	**x**	**160 6**	**x**
Main yard	15	61 8	13 1/2	75	17
Main topsail yard	10 1/2	43 4	10 3/4	56 1	11 1/8
Main topgallant yard	5	30 10	6 1/4	36	6 5/8
Comparable vessels at Restigouche	*Fidélité*	*Bienfaisant & Ms-de-Malause*		*Bellone-Repulse*	

Key: x = unknown data; ft and in mean data in English feet and inches. The other dimensions are in French feet (1.066 English feet); t = tons; Ms = Marquis

Table 5b: French Masting (continued)

Name of sailing ship	*Chézine*	*Cerf*		*Cerf*	*Bellone-Repulse*		*Bel.-Repulse*
Foremast	19 1/8	60	6	16 1/2	74	8	22 1/4
Fore topmast	12	39	6	11	45	2	15 1/2
Fore topgallant	6 5/8	22	9	5 3/4	22	6	7 1/2
Total height	**x**	**122**	**11**	**x**	**142**	**4**	**x**
Foreyard	13 3/4	52	3	12	65	6	15
Fore topsail yard	10	39	6	9 1/2	48	10	10 1/8
Fore topgallant yard	4 1/4	26	8	5	30	0	6
Bowsprit	19 3/4	43	8	17 3/4	50	7	25 1/4
Spritsail topmast	x	x		x	x		
Flying jib boom	7 7/8	29		9 1/8	36		10 1/2
Total height	**x**	**72**	**8**	**x**	**86**	**7**	**x**
Spritsail yard	10	37	8	8 1/8	48	10	10 1/8
Spritsail topgallant yard	8 5/8	37	8	7 1/8	x		x
Comparable vessels at Restigouche	*Fidélité*	*Bienfaisant & Ms-de-Malause*			*Bellone-Repulse*		

Key: x = unknown data; ft and in mean data in English feet and inches. The other dimensions are in French feet (1.066 English feet); t = tons; Ms = Marquis

squared in the paintings by Vernet[26]; British-style tops had three rectilinear sides and were commonly used in France after 1750. The masts of a ship, like those of a man-of-war or frigate, were therefore usually composed of about 10 pieces, whose height varied depending on the width of the sailing ship. If we assume that Giraudais' frigate had masts of similar dimensions to those of a man-of-war with a beam of 32 feet, according to papers that belonged to Jean Marie Lorant, a man-of-war helmsman circa 1756-57, then the mainmast of the *Machault*, including the main topsail and main topgallant*, would be 155 feet and the foremast 144 feet. The main yard* and the foreyard would be 69 and 61 feet long, respectively. These were also the dimensions of the masts of the *Comète*, a frigate with 26 8-calibre guns and a beam of 32 feet, as shown in Table 5. An examination of this table also reveals the mast dimensions of merchantmen similar to those at Restigouche. The sailors thus had to climb to these dizzying heights and clamber about on thin ropes along the yards in order to brail* the sails. And all this work had to be done even in heavy seas and howling winds or when rain and cold made it difficult to keep one's grip on the rigging!

In the late 17th century, the lower mainmast was equal to 2.5 times the mainmast, the main topsail, 1.5, and the main topgallant, 0.62. According to these proportions, the mainmast of the *Machault* would measure 148 feet. In reality, mast height changed very little between the late 17th century and the early 19th century; the variations were mainly in the topsails and topgallants. By comparison, the 26 8-calibre gun frigate the *Bellone*, remasted by the British in 1759 and renamed the *Repulse*, had a mainmast of 150 feet 7 inches and a foremast of 133 feet 6 inches, hence slightly lower than the theoretical heights of the masts of the *Machault*. The lower yards of these masts measured 70 feet 4 inches and 61 feet 5 inches long each, i.e. the yard dimensions were quite comparable. The masting of British men-of-war also depended on the breadth at the midship beam. According to the 1745 establishment for third and sixth rates like those at Restigouche, the lower mainmast was equal to 2.27

26 Joseph Vernet, a navy artist, painted the main ports of France in the 1750s.

times the midship beam; the main topsail was 0.6 times the lower mast and the main topgallant, 0.49. The foremast was equal to 0.9 times the mainmast. The diameter of the mainmast was equal to 1 inch per 3 feet of length. These proportions are close to the dimensions indicated for the masts of the *Dorsetshire* and the *Achilles* (see Table 6). The mainmasts of the British men-of-war at Restigouche were therefore some 20 to 25 feet higher than the mainmast of the *Machault*.

While the mainmast and the foremast were anchored in the keelson at the bottom of the ship and held in place on each deck by partners*, the mizzenmast and the bowsprit were secured in the keelson and on the between-decks, as were the spindles of the capstans. Because of a shortage of trees, the French used "built" masts for the lower masts as well as for the large yards. The masts could therefore be made of four to seven pieces, depending on the size required, skilfully slotted together. They were bound with iron hoops approximately every 4 feet. This was the case of the mast on the *Machault*, as is evident from the some 10 iron hoops found during the archaeological excavation. The loss of sap, caused by the cutting of these various components, as well as the iron hoops, reduced the flexibility of the masts somewhat. Since wood of good size was more readily available, British vessels used pole masts much more frequently. All the vertical masts were raked slightly aft at a rate of 1 inch per 30 feet of length for the main mast, 3 inches per 30 feet for the foremast and 4 inches per 30 feet for the mizzenmast.

The masts weighed nearly six times as much as the anchors, i.e. approximately 60 000 pounds of wood in the case of the *Machault*, while the rigging weighed three times as much (Table 4). Although Northern Europe supplied the best fir masts, the Pyrenees were also known as an excellent source of tall pines, used mainly for masts. It is quite plausible that the masts of the *Machault* came from that region. The masts were usually treated with yellow ochre, or at the very least were payed with pine tar; the yards were also yellow, with black arms. The colours of the masts were similar to those of the battery. The vertical masts, at least in the second half of the 18th

Table 6: English Masting

Size of man-of-war	70 guns and breadth of 45 feet						60 guns and breadth of 42 feet 8 in					
	masts		diameter	yard		diameter	masts		diameter	yard		diameter
	ft	in	in	ft	in	in	ft	in	in	ft	in	in
Main mast	100	2	33 3/8	91	3	21 3/4	94	9	31 5/8	86	4	20 5/8
Topmast	60	7	18 1/4	65	8	14 1/8	57	4	17 1/4	62	3	13 1/4
Gallantmast	30	9	10 1/4	45	4	9 1/4	29	1	9 3/4	42	11	8 3/4
Total	191	6	N/A	N/A		N/A	181	2	N/A	N/A		N/A
Foremast	90	3	30 1/8	80		19	85	6	28 1/2	76	1	18 1/8
Topmast	55	2	18 1/4	57	6	12 3/8	51	4	7 1/4	54	4	11 5/8
Gallantmast	27	9	9 1/4	40		8 1/4	26	2	8 3/4	37	6	7 3/4
Total	173	2	N/A	N/A		N/A	163		N/A	N/A		N/A
Mizzenmast	86	9	19 3/4	77	6	14 3/8	82	2	18 3/4	70		13 1/8
Topmast	43	6	12 1/8	45		9	41	2	11 1/2	40	9	8 3/8
Total	130	3	N/A	N/A		N/A	123	4	N/A	N/A		N/A
Bowsprit	61	5	30 3/4	57	6	12 3/8	58	2	28 1/8	54	4	11 5/8
Spritsail topmast	N/A		N/A	40		8 1/4	N/A		N/A	37	6	7 3/4
Crossjack yard	N/A		N/A	57	6	12 3/8	N/A		N/A	54		11 5/8
Flying jib-boom	45		13 1/8	N/A		N/A	42	8	12 1/2	N/A		N/A
Similar men-of-war at Restigouche	*Dorsetshire* (breadth of 44 ft 8 in)						*Achilles* (breadth of 42 ft 5 in)					

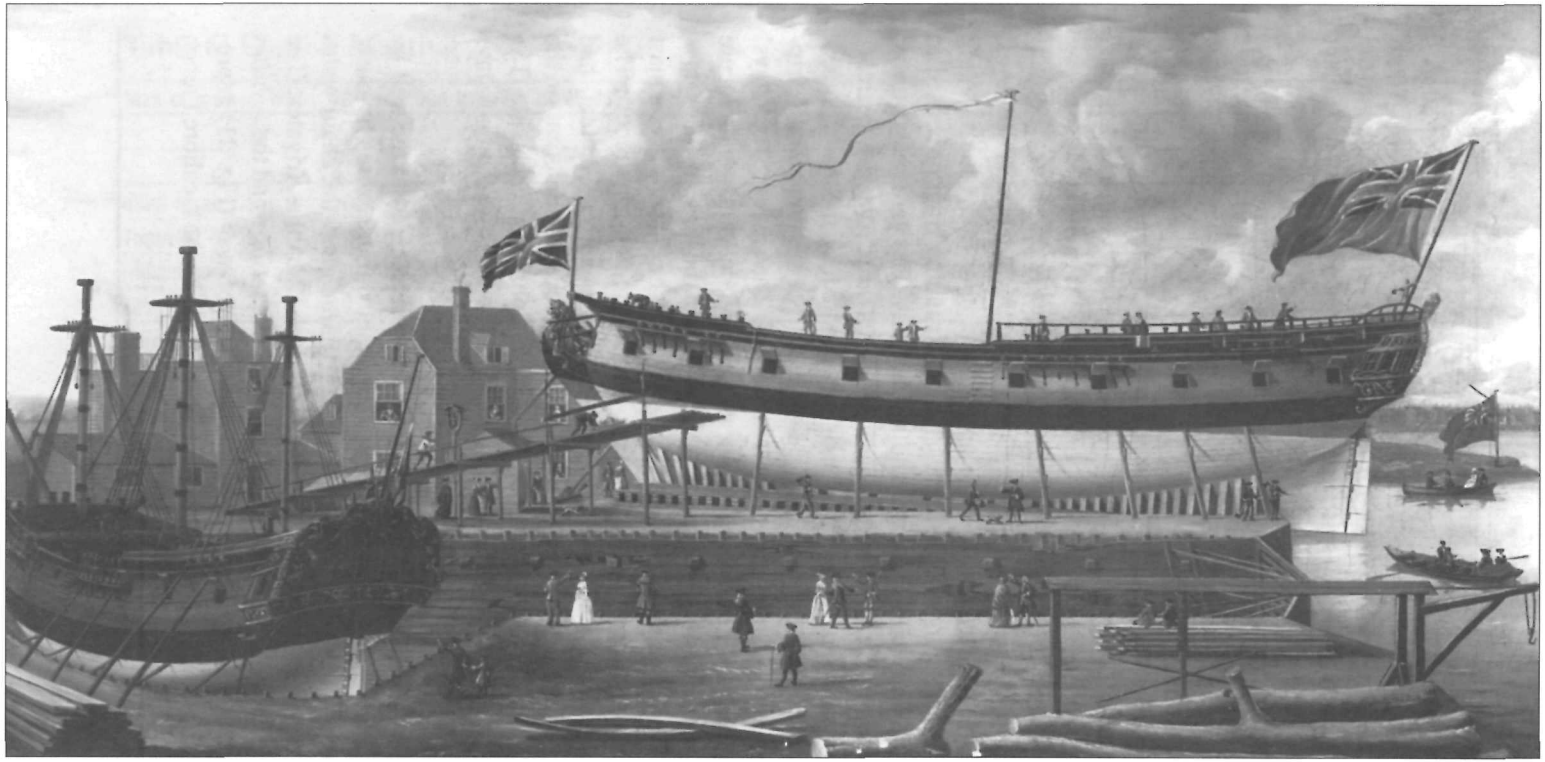
Key: all dimensions are in English feet (30.5 cm); ft = feet; in = inches; N/A = not applicable

century, were located approximately at 1/9th of the length overall for the foremast, at 5/9th for the mainmast and at 17/20th for the mizzenmast. The bowsprit, and there had been no spritsail topgallant since the early 18th century, formed an angle of 33 to 36 degrees with the ram of the ship; the angle increased with the size of the vessel.

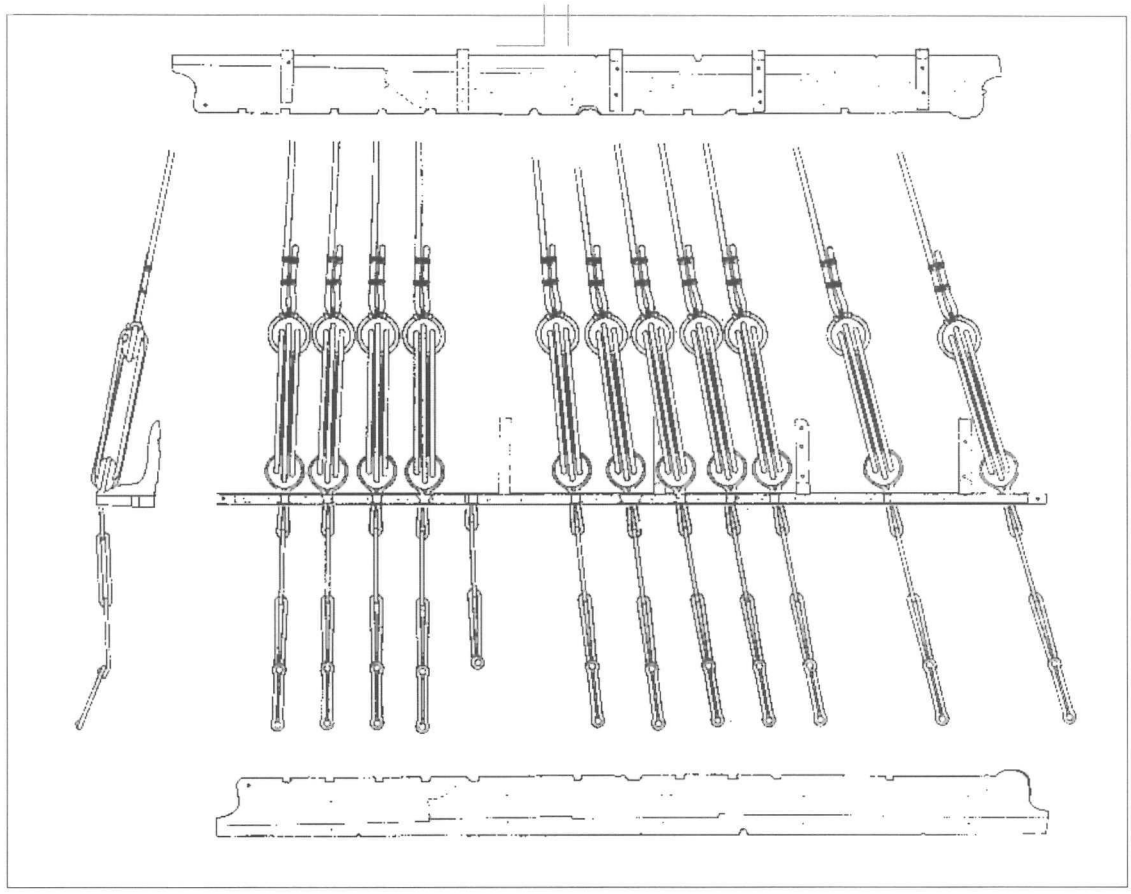
Blocks and rigging

More than 325 different lines are needed to rig a sailing ship with a breadth of 32 feet; they form a veritable spider's web. The largest is the main stay* with a circumference of 11½ inches. Most of the cables measured from 1½ inches to 4 inches in diameter. The lines of the 74-gun *Fame* weighed 50 tons, and the blocks and deadeyes, 11 tons. All these ropes make up the running or (moveable) rigging and the standing (or fixed) rigging. The running rigging is used to position the yards and trim and set the sails. The yard lines consist essentially of the tyes*, braces*, lifts*, halyards*, vangs*, parrels*, footropes* and slings*. The sails are handled by means of tacks*, sheets*, bowlines*, buntlines*, leech lines*, stays*, downhauls*, tripping lines*, lashing ropes* and reef tackle*. The shrouds, backstays* and forestays form the standing rigging. While the shrouds secure the various parts of the masts to the hull or to the tops, the backstays run from the hull to the top of the topmasts. The shrouds give a mast its lateral support while the stays give it fore-and-aft support. The *Renommée*, an 8-pounder frigate, with a breadth of 33 feet, had seven shrouds on the mainmast, six on the foremast and four on the mizzenmast, for the lower levels and, obviously, on each side. The topsails and topgallants were secured to the hull by two backstays and by three or four shrouds to their respective tops.

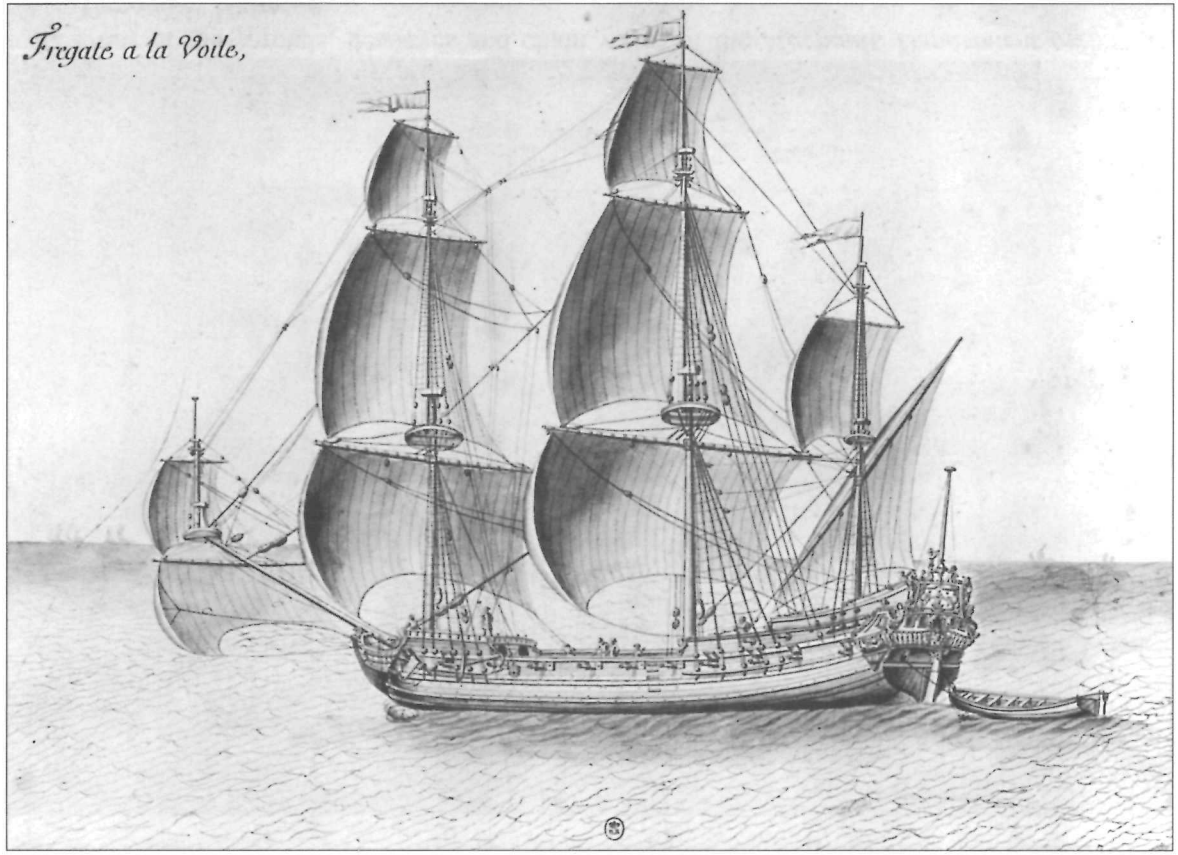
The lower shrouds of the *Machault* were secured to the hull by chains (Fig. 22). The topsail and topgallant shrouds were obviously secured to their respective tops. On the *Machault*, the chain wales were placed above the ports, as on most 12-calibre frigates. The same was true for the chain wales on the *Dorsetshire* and the *Achilles* (Fig. 18), as well as for the 20-gun man-of-war (Fig. 21) represented at Restigouche by the *Scarborough*. Like the 8-calibre French



21 Small man-of-war in dockyard, 1758, John Cleverly. The 20-gun *Scarborough* at Restigouche was undoubtedly very similar to this vessel. *National Maritime Museum, London, 7932.*



22 Draft of the shrouds, deadeyes and chain wales of the *Machault. Department of Canadian Heritage.*



23 Frigate under sail, 18th century. With its 11 or 12 guns in a single battery, the rigging of this frigate at full sail is probably similar, with the exception of the shroud attachments, to that of the *Machault. Paris, Bibliothèque nationale de France, Estampes.*

frigates, the chain wales of the *Bellone-Repulse* (Figs. 9 and 10) were below the ports. This different position of the chain wales on 8- and 12-calibre frigates can be explained by the usually less pronounced tumble-home of the 12-calibre frigates. A more pronounced tumble-home reduced the distance between the shrouds and, consequently, their ability to reinforce the masts. The archaeological excavations of the *Machault* reveal six different types of round deadeyes, made of elm, all with three holes, used to tighten the shrouds (Fig. 17); a seventh pear-shaped type had two holes. The diameter of these deadeyes ranged from 4½ to 18 inches.

All the blocks on the *Machault* for the running rigging had shells made of elm and sheaves* made of *lignum vitae* (Fig. 20). These blocks were single, double or triple depending on the number of parallel sheaves they had. Fiddle blocks had two sheaves, one above the other. The blocks on the *Machault* originally came from Saint-Sébastien (Appendix B). At least 750 blocks were needed for the rigging of a fair-sized frigate. Some were bound with iron when they were subjected to very great pressure. The diameter of the blocks on a 350-ton ship, for example, ranged from 5 to 18 inches, and the deadeyes from 4 to 16 inches. These blocks may have been painted, as is suggested by the traces of red paint found on the single blocks of the sloop *Boscawen* during archaeological excavations at Lake Champlain. Jeer bitts, which made the yards easier to handle, have 4- or 5-sheave tackles, while the yards are secured to the masts by parrel trucks. The ends of the lines were tied to metal or wooden cleats*, attached to the vessel's bulwark (Fig. 18).

Sails

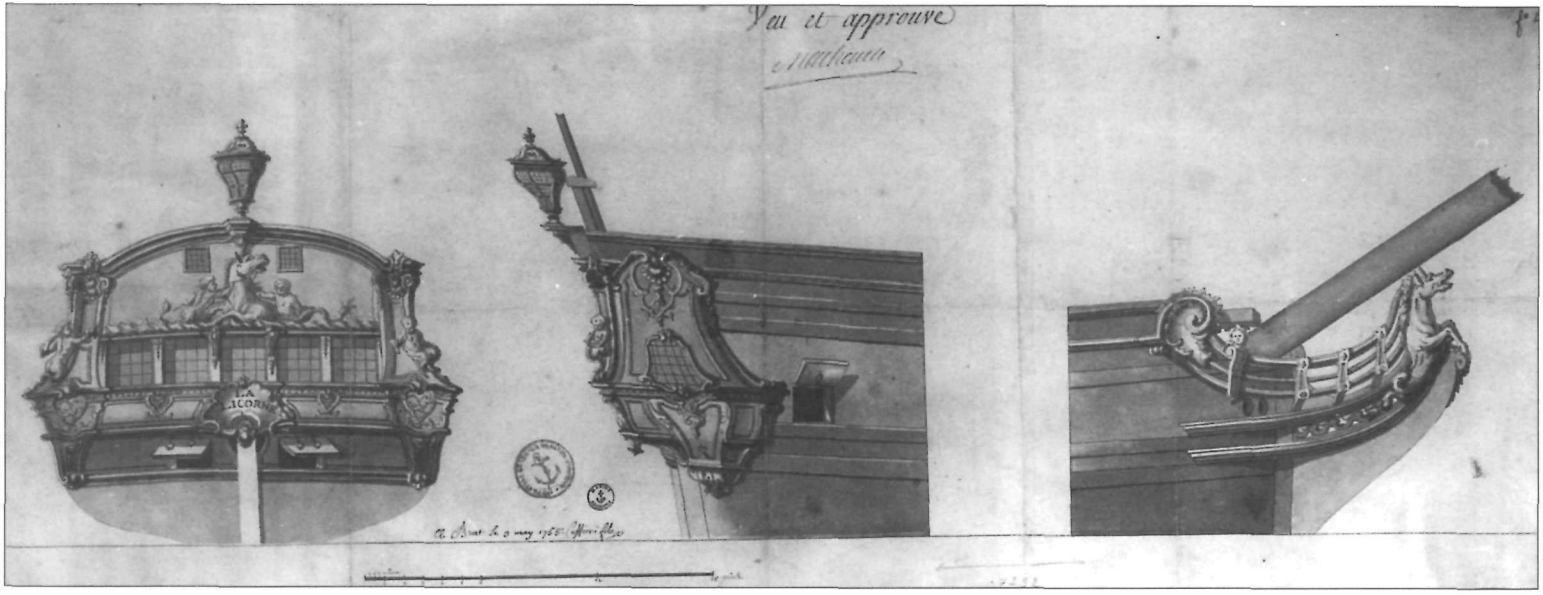
Rigging a frigate that carried 24 8-pounders on its deck and six on its castle, with a keel of 106 feet and a breadth of 31 feet, required 800 quintals of rope and 8000 ells* of sailcloth (Fig. 23). Since the *Machault* was slightly bigger, the quantities needed for her rigging must have been somewhat greater. For the sake of comparison, the mainsail and main topsail of a 74-gun man-of-war such as the *Fame* required approximately 1683 yards of cloth. Smaller ships also required a substantial quantity of cloth. To replace the main topsail

and mizzen-sail of a 100-ton snow*, its captain purchased, in Quebec City in 1757, 183 ells of cloth, 111 for the main and fore topgallant sails. Sail cloth could not be overly retted, which made it stiff, nor too bleached because this would weaken the cloth. The weft of this cloth was 1, 2, 3 or 4-thread. Dutch- and British-made cloth was apparently superior to that made in France, where the best, however, came from Brittany.

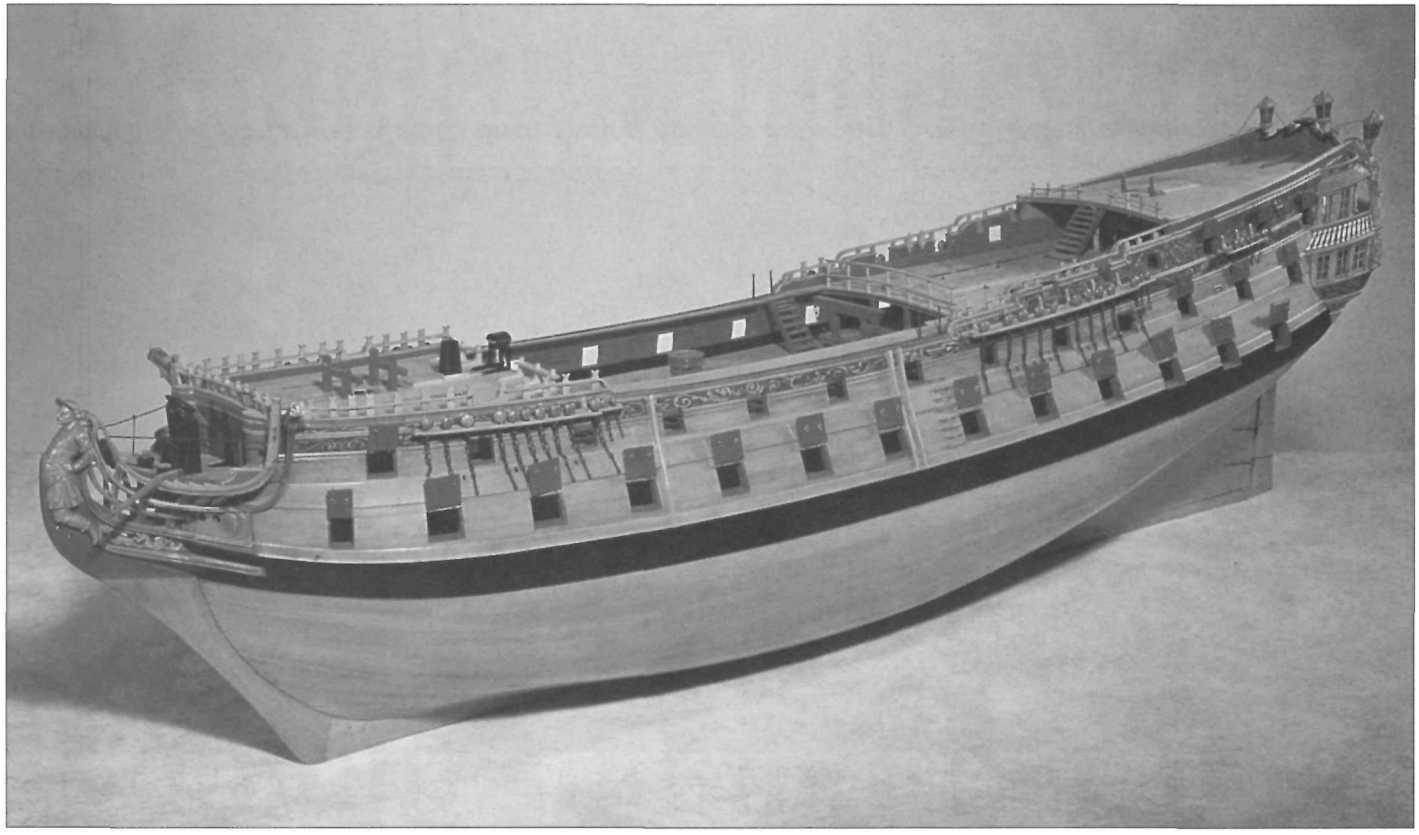
The sails included two types, namely square sails, which provided the driving power, and fore-and-aft or working sails. Square sails were perpendicular to the keel and supported by the yards. Although called square sails, they were actually trapezoidal, and could be expanded by adding bonnets*, thus capturing the wind more effectively. Fore-and-aft-sails were longitudinal to the keel and, except for the mizzen-sail, all were supported by lines. They were mostly triangular in shape. Given its composite mast structure, a frigate such as the *Machault* included at the lower mast level, from stern to stem, the mizzen-sail, mainsail, foresail and spritsail*. The next level up, and again in the same order, the sails were the jigger topsail, main topsail, fore-topsail and sprit-topsail. Finally, at the top level, there was the jigger topgallant sail, main topgallant sail and fore topgallant sail. The staysails and jibs*, which were triangular, were arranged in twos or threes between each mast. The royal sails*, forming a fourth level on the masting, did not appear until late in the 18th century and did not yet exist at the time of the Battle of the Restigouche.

Decoration and carvings

The bow and the stern were usually the most ornate parts of sailing ships. Figureheads in the form of humans, mythical deities, animals or, at the very least, carved escutcheons* decorated the bow of ships (Fig. 24). The *Machault*, because it was named after the Minister of the navy, Machault d'Arnouville, undoubtedly had a human figurehead. The decoration of the *Castor*, a royal frigate built in Quebec City in the 1740s, gives us reason to believe this was the case: "The ship is square stern decorated with light carv'd work, as are the quarter pieces & 2 small flat galleries ...has a knee of the head with



24 Ornamentation on the *Licorne,* Caffiéri draft. *France, Archives nationales, Service hydrographique de la marine, D1 68.*



25 Model of the 60-gun *Achilles* that was present at Restigouche, dated 1757. *Science Museum, London/ Science & Society Picture Library.*

a carved figure of a Beaver let thereon his forefeet supported on a shield with three flowers de lis..."[27] The approximately 330-ton *Joseph-Louis*, with " its head* decorated with a lion, with its headrails*, its carved taffrail and quarter galleries"[28], is probably fairly typical of the decoration of merchantmen of that size, represented at Restigouche by the *Marquis-de-Malause* and the *Bienfaisant*. The *Bellone*, the future *Repulse*, was decorated with the figure of a woman, while a soldier representing the legendary king of Thessaly, hero of the *Iliad*, adorned the bow of the *Achilles* (Fig. 25).

The sides of the head were enclosed by three rows of headrails, running from the ram to the cheeks* of the ship. On each side of the ram, two hawse holes usually led into the upper deck. Their lead-lined openings were about two and a half times the size of the largest cable that can pass through them. Inside, the manger* formed an alcove allowing the cables to drain and preventing any water that might have entered through the hawse holes from running throughout the ship. The castle decks were bound by front bulwarks or bridge fronts* composed of rails* and stanchions*, or wooden or iron pillars, to provide protection from the sea. The ship's bell was usually mounted on the bridge front of the forecastle. The construction records of the *Machault* mention the purchase of two bells weighing 160 pounds. The gangways were also protected by rails. Not all ships, particularly the smallest, were so ornately decorated. This was the case of the *Épreuve*, a 260-ton French frigate, of which the British shipwrights provided the following description after her capture: "neither has she any carved Tafferel or quarter pieces, nor figure at her head, more than a shield at the head scarce any decorations are to be found about either within or without board... It had no light but from a small grating on the quarterdeck."[29]

27 National Maritime Museum, Greenwich, ADM, B, Vol. 137. Rev. Father Nau to Father Richard, Quebec City, 20-10-1734, in *Rapport des archives de la province de Québec, 1926-1927*, p. 267.

28 Jean Cavignac, *op. cit.*, p. 344.

29 National Maritime Museum, Greenwich, ADM B, Vol. 166.

A study of the plans and some illustrations of old models shows that the sterns of ships were very often decorated with carvings of varying degrees of ornateness depending on the size of the sailing ship. The example of the *Achilles* is quite informative in this regard (Fig. 25). Men-of-war usually had two rows of windows, a gallery and two or three taffrail lanterns* at the stern. The gallery was located at the poop deck level. The aft sides ended with quarter galleries with windows and carvings. The bulwarks of the castles and poops, at least of the men-of-war, were often decorated with trophies and garlands painted outboard. The *Achilles* had a number of these. The *Fame* and the *Dorsetshire*, which were more powerful, were undoubtedly equally decorated. Since French royal frigates did not usually have galleries, there were most likely none on the *Machault*, a private frigate. Furthermore, the fittings of French privateers sometimes lacked finishing. The *Bellone-Repulse* does not appear to have had any galleries according to the plans (Fig. 9). One row of windows, or two if there was a poop, two quarter galleries, lanterns and a few carvings were in most cases the ornamentation found on the sterns of frigates and merchantmen over 300 tons. The names of French ships were usually painted on the stern in a scroll.

Caulking and painting

Ships were made watertight by stuffing oakum between the planks. Caulking* was essential on carvel-built ships. In theory, there were more than 9000 pounds of oakum and pitch rammed into the seams of the *Machault* (Table 4). The archaeologists found about 20 caulking tools on board the wreck of the *Machault*. These tools are of average quality, all somewhat similar, but quite representative of a caulker's toolbox. Furthermore, on examination of the hull of the *Machault*, " no remains were recovered to suggest evidence for breaming, pitch coating, sheating, painting or leading."[30] A mixture of dry pitch, sulphur and tallow, which constituted a waterproofing

30 Lester A. Ross, *Eighteenth-Century French Naval Duties as Reflected by the Tools Recovered from Le Machault, A 5th-Rate Frigate Sunk in Chaleur Bay, Quebec, AD 1970* (Ottawa: Parks Canada, 1981), p. 213.

coating, seems however to have been routinely used on old sailing ships. The outfitting records, dated 1759, of the *Machault* mention the purchase of 47 barrels of tar and dry pitch and fat. Paint was also used on sailing ships of the period, even small ones. Merchantmen were painted in different combinations of yellow, red, blue, green and white. On the merchant vessels of the Compagnie française des Indes, " the paints are those of royal men-of-war, the rubbing strake and wales in black, the battery in yellow ochre, the upper decks in blue or sometimes olive green; the interiors in red ochre."[31] The inside quarters were usually painted grey or white. On royal men-of-war, the use of paints seems to have been more uniform and there appear to be few differences between the French and British navies. The hulls below the waterline were covered with the waterproofing mixture described previously, the wales were painted black, the batteries yellow ochre and the upper decks blue, with several designs of trophies. Naples yellow, which simulated gilding, was used mainly for carvings. An examination of the model of the *Achilles* (Fig. 25) is quite informative about the use of paint in the navy.

Some 500 pounds of red ochre and 600 pounds of whiting were estimated to be required on the Canadian frigate, the *Castor*, in Quebec City in 1744. Red ochre, which resembles freshly dried blood, undoubtedly had a psychological effect by masking the effects of a bloody battle; it was also apparently a good wood preservative. Privateers, especially pirate ships, were often painted completely in black. In all navies, black was used systematically for the iron work and artillery. In the case of the *Machault*, according to the construction records of 1758 and the outfitting records of the following year, two painters received a total of 1000 *livres tournois* [franc minted at Tours of 20 sous] for painting the frigate. Unfortunately, the colours used and the sections painted were not specified, with the sole exception of the quarter cloths which were painted red. The quarter cloths were normally used along bulwark handrails, mainly opposite the gangways, and were also used to wrap the tops on the

31 Jean Boudriot, *op.cit.*, p. 59

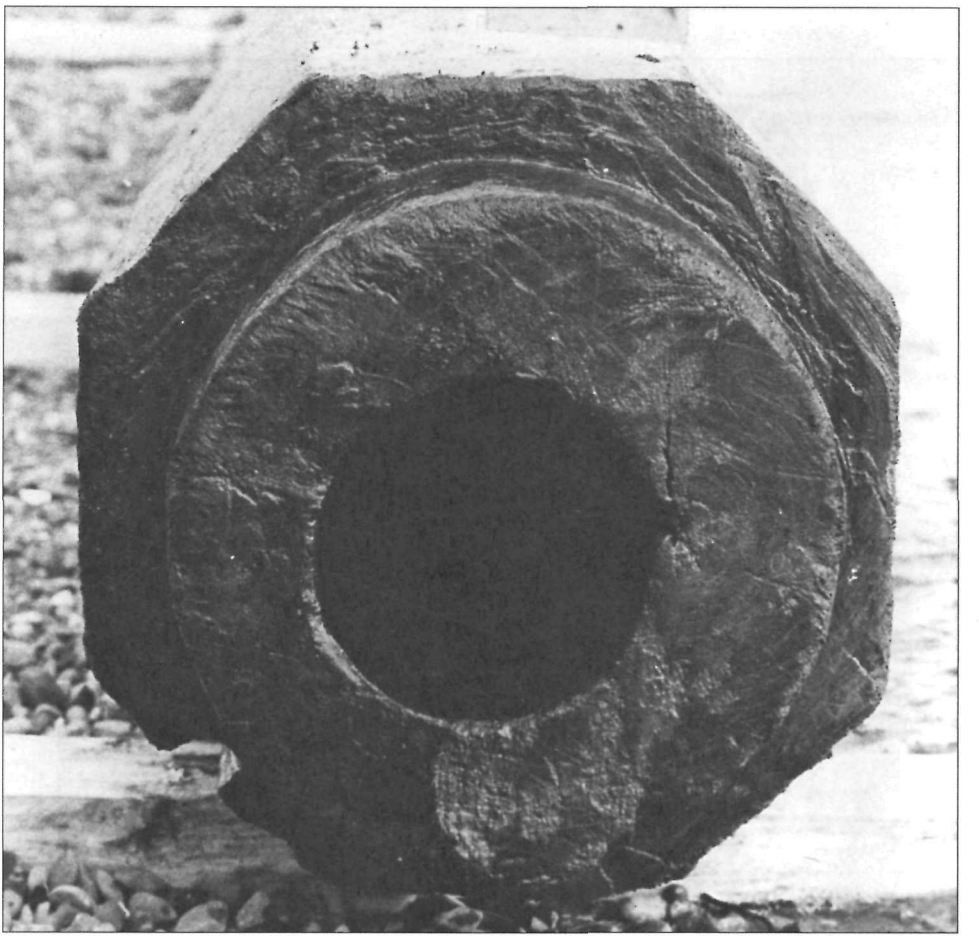
masts. On the *Machault*, it is likely that the wales were painted black, the battery pale yellow, the interiors red and the quarters grey or white.

Pumps and capstans, longboats and launches

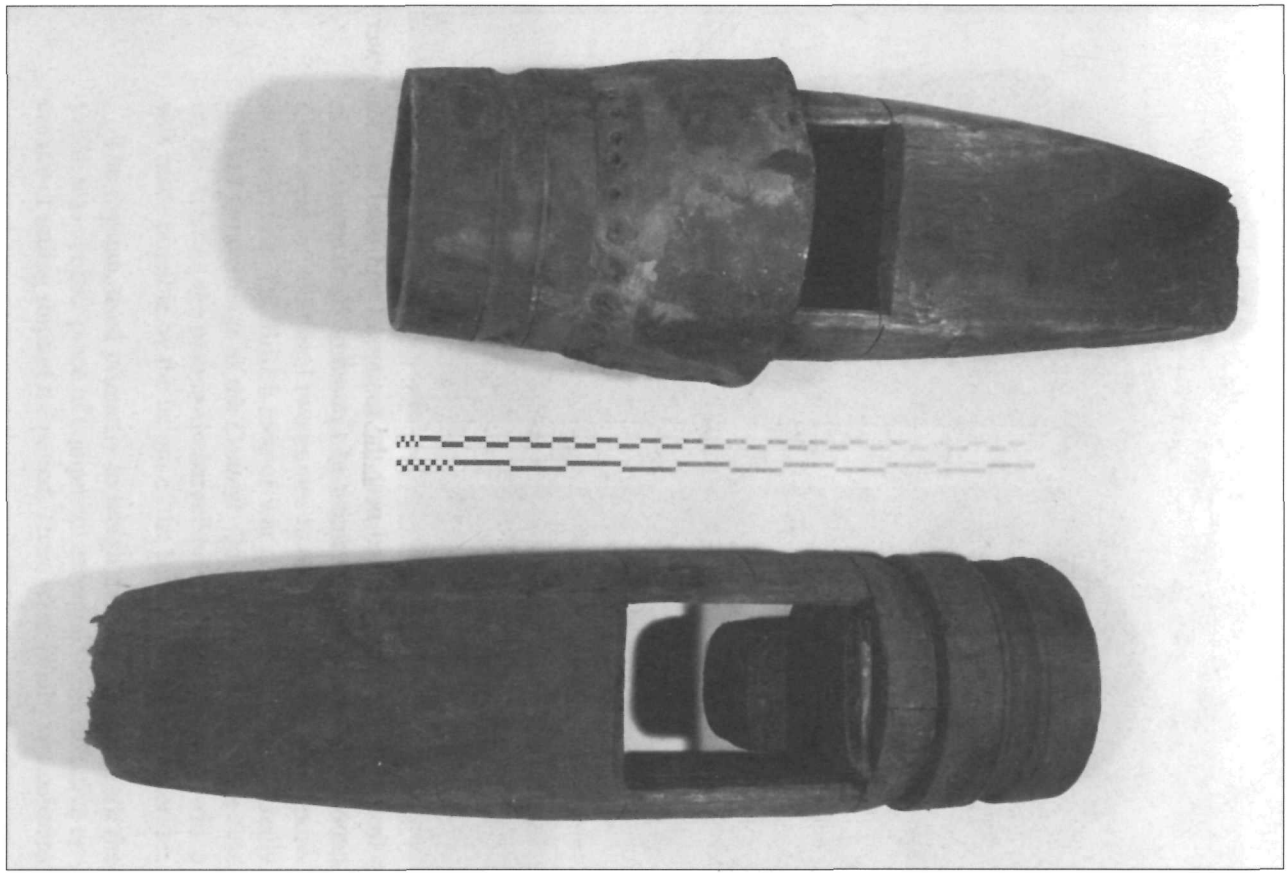
Pumps were installed to deal with water seepage, which was inevitable on ships despite all the caulking work. The mainmast of the *Machault* was flanked on each side by two pumps; the archaeologists at Restigouche recovered three with a number of valves and pistons (Figs. 26 and 27). A small variation in the internal dimension of the tubes undoubtedly explains the two different sizes of valves and pistons found. The tube and pistons of the *Machault's* pump, a common suction type, were made of elm. The pump's tubes were usually installed inside a pump well composed of four planked oak pillars surrounding the mainmast. The limbers, channels cut the length of the keel, brought the water to the pump. In the construction records of the *Machault*, a lift-and-force pump purchased in Bordeaux cost 136 livres tournois.

The pumps on single-battery frigates such as the *Machault* discharged their water over the deck. The mainmast of the *Mignonne*, an 8-calibre frigate slightly smaller than the *Machault*, was also flanked by four pumps made entirely of wood and a pump well. One of the pumps on the *Repulse-Bellone* was a *pompe à la royale*, i.e. with a central body made of bronze. This type of pump, which had been commonly used in France since the 1720s, did not yet appear to be in general use in the merchant navy, and even one of the pumps on the *Repulse-Bellone* was still made of wood. The 64-gun *Content* also had four pumps around the mainmast; however, there were an additional two pumps in the lantern well of the powder magazine. The British men-of-war at Restigouche undoubtedly had the same fittings as the *Content*. On men-of-war, as is the case on the *Achilles*, the pumps discharged on the between-decks, which was made possible by the height of the battery above the waterline.

The capstan, used primarily to weigh the anchors and work the yards, was another piece of equipment essential to the effective operation of sailing ships of the period. There were usually two capstans



26 Pump from the *Machault,* located near the mainmast and used to drain water that seeped into the ship. *Department of Canadian Heritage.*



27 Piston from the pump, of elm, rotating inside the pump tube used to suck up water on the deck. *Department of Canadian Heritage.*

on men-of-war and frigates. On the *Achilles*, as on the *Dorsetshire*, there were two double, or double-barrelled, capstans, located in the between-decks and on the upper deck with a spindle firmly anchored in partners bolted to two beams; both were located more or less equidistant fore and aft of the mainmast (Fig. 18). On French frigates and merchantmen the capstans were not double. There was one on the forecastle and the second was located aft of the mainmast on the battery deck; they were often anchored in the lower deck. The 350-ton frigate *Friponne* had a 12-bar capstan, although 14 bars were desirable in order to avoid having to use a messenger*. The 600-ton *Ville-de-Bordeaux* had a 10-bar capstan, and the *Joseph-Louis*, which was approximately 300 tons, had an 8-bar capstan. The capstans on the *Machault*, the *Repulse-Bellone* and the two French ships at Restigouche were undoubtedly single capstans with between 8 and 12 bars to work them.

All sailing ships of the period were equipped with at least one boat, and usually two when they reached a certain tonnage, in order to facilitate communication and permit meetings. The 250-ton *Pallas* included: "A longboat and a new launch in proper proportion to the size of the ship, with their rudder and brace in place, windlass* and davit* for said longboat and their own masts."[32] The archives provide the example of a 100-ton snow* which had a launch with a 17-foot keel and a breadth of 5 feet 2 inches. The *Machault*, like all the other men-of-war and ships at Restigouche, therefore had two boats whose dimensions were certainly greater than the snow's launch. When not in use they were stored, one inside and the other forward of the mainmast, in the waist. The *Machault's* longboat also had a cover, undoubtedly to protect it; on board the frigate there were also 12 35-foot oars and 16 12-foot oars. The 35-foot oars were probably used in the ports of the frigate by the sailors of the *Machault* in the event of emergency or to enable the ship to draw alongside another.

32 Jean Cavignac, *op. cit.*, p. 336.

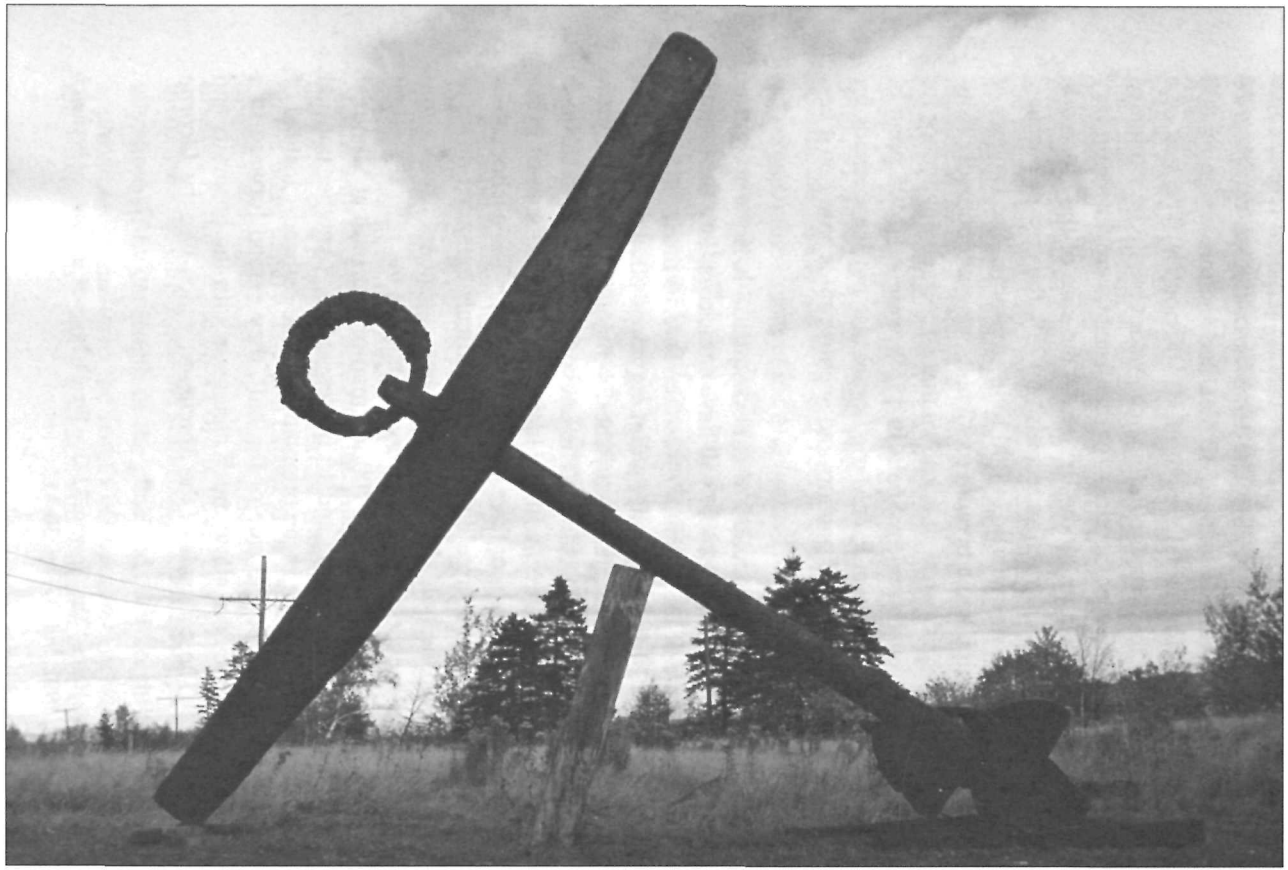
The rudder and anchors

Since the 12th century, most sailing ships have had a stern rudder to improve steering. Thanks to archaeology, we know the dimensions and attachments of the *Machault's* rudder (Fig. 15), which was 31 feet high and had 16- to 18-inch pins. While the number of these attachments seems adequate (five for the *Machault*), their effectiveness was sometimes less than satisfactory. The survey conducted on the *Hermione* following its return home reported thus: "The pins of the rudder to be overhauled have a great deal of play in the gudgeons, thus putting considerable strain at sea on the safety chains; said rudder must therefore be rebuilt."[33] In order to prevent accidental loss of the rudder, a chain, attached by two shackles to the sides of the ship, was led through a hole in the wood, approximately 15 inches above the waterline.

The rudder rose approximately 12 to 14 inches above the head of the sternpost[34] and entered the upper counter inside the ship through the rudder trunk*. Since the early 18th century (1708), a wheel had been used to move the rudder. This wheel was usually about 5 feet in diameter and had a 20-inch drum. The steering wheel on men-of-war such as the *Achilles* and *Dorsetshire* was placed under the aftercastle, abaft the mizzenmast. These vessels had a double wheel. The *Repulse-Bellone* had a single wheel, also located abaft the mizzenmast, but fitted on the castle as on all frigates (Fig. 10). The tiller, connecting the rudder to the wheel and its cables, usually went through the interior of the wardroom, located below the castle or in the between-decks. In all likelihood, the same equipment could be found on the *Machault*, as well as on the *Bienfaisant* and *Marquis-de-Malause*.

33 London, PRO, High Court of Admiralty 32, Vol. 198 and France, Archives maritimes, Rochefort, 2G2, Bundle 2. This is also the case with the *Friponne*, its rudder pins had a great deal of play in their gudgeons, causing the rudder to put considerable strain on the sternpost.

34 Since the rudder of the *Machault* measured 31 feet according to the archaeological data, its sternpost must have been approximately 30 feet. For a frigate of comparable size (the *Castor*), the sternpost contained 100 cubic feet of wood. France, Archives nationales, Colonies, $C^{11}A$, 80:109-109v.



28 Anchor of the *Machault. Department of Canadian Heritage.*

A frigate the size of the *Machault* usually required five anchors to anchor it safely (Fig. 28). The *Comète*, a frigate carrying 26 8-calibre guns with a breadth of 32 feet, had anchors weighing 800 to 3000 pounds, for a total weight of 10 100 pounds. The lack of a fifth anchor for the *Repulse-Bellone* can undoubtedly be explained by the fact that the specifications for this frigate were drawn up very shortly after its capture by the British. In the case of the *Machault*, according to the construction records of 1758, the cost of purchasing five anchors was nearly 14 000 livres tournois. The anchors of this frigate, which had a breadth of 32 feet, were undoubtedly similar to those of the *Comète*. It is known that a replacement anchor for the *Machault*, purchased in Spain in 1759, weighed 2405 pounds. The papers of helmsman Jean Marie Lorant also outline methods for calculating the weight of anchors and anchor cables based on a vessel's dimensions.

The weight of the anchors was also equal to half the weight of the cables "and the main cable will have a thickness half the beam." The main cable of the *Machault* was therefore 16 inches in circumference and 120 fathoms long, weighing about 6000 pounds. This was a minimum. The anchors of the 74-gun *Fame* apparently totalled 14 tons with 34 cables. The anchor cables passed through hawse holes located level with the battery deck for frigates or in the between-decks for two- or three-deck men-of-war. The anchor cables were wound around large bitts* whose verticals extended down to the bottom of the hold. The catheads, heavy timbers used to manoeuvre the anchors, projected from the bow of the ship at a slight angle. The two catheads of a 700-ton man-of-war built at Montréal in 1740 were 20 feet long and 15 inches square. "Another unusual feature on the *Licorne* is the orientation of the catheads. Instead of projecting out from the side of the hull, they extend forward in a fashion that does not allow much clearance with the headrails and bumkins."[35] The catheads of the *Machault*, which like the *Licorne*

35 Harold M. Hahn, "The *Licorne*: 32-Gun French Frigate" in *Nautical Research Journal*, 1992, Vol. 37, pp. 36-43.

was designed by a Geffroy, were undoubtedly oriented the same way and comparable in volume.

Artillery

Of the various kinds of gear and rigging needed to outfit the *Machault*, the guns were the most well-known pieces of equipment. When first outfitted in 1758, the *Machault* carried 24 12-pounders, two 6-pounders and 800 12-pound cannonballs. For the campaign of 1760, the frigate carried 1100 pieces of shot. During the excavation of the *Machault*, the archaeologists recovered about 500 iron cannonballs marked with the French fleur de lys. Hence, the munitions had not been exhausted when she was scuttled. In Chaleur Bay in 1760, there were 54 French guns to the 256 British guns of various calibres (Fig. 29). Table 4 on the dimensions of the British men-of-war details the calibres of the British artillery. The fire power of the *Repulse* was comparable to that of the *Machault*. The various artillery pieces on a man-of-war such as the 74-gun *Fame* also represented a weight of approximately 157 tons, and the carriages, 27 tons. Although the number of guns on board the *Machault* varied depending on the campaign, there were only 12 gunports on each side of the battery deck. The battery gunports, probably spaced 6 feet 6 inches apart on the *Machault*, were cut in the filling frames so as not to weaken the chief frames.

Because of their heavy weight, the guns and their carriages were located above the beams. The stresses placed on the *Repulse-Bellone* by changing the calibre of her artillery after her capture required that her beams be reinforced with additional knees. On British men-of-war with two-level batteries, the gunports were staggered so that the knees of a beam did not interfere with the opening of a gunport on the other battery. The gun carriages of the *Machault* were made of elm and the axles of oak. The carriages were secured to the hull in order to reduce the recoil of the guns when fired and to prevent them from moving when the ship rolled. The carriages were generally three-fifths the length of the guns and their height was always approximately one-third the length of the gun. The rate of fire of the 18-calibre gun was 5 minutes, and 4 minutes for the 8-calibre.

Table 7: Crews of Merchantmen in the North Atlantic

Rank / Vessel	*Machault*		*Machault*		*Maréchal-de-Senneterre*		*Aurore*		*Soleil*	
	1758		1759		1759		1760		1760	
	Number	Age	Number	Age	Number	Age	Number	Age	Number	Age
Chiefs officers	17 (-1)*	27.4 (-27)*	7	27	8	31.5	4	34.8	4	33.5
Supernumerary officers	3	25.7	I	24	I	24	0		0	
Petty officers	37 (-31)	30 (-29.5)	24 (-1)	28 (-25)	25 (-1)	27 (-33)	7	27.8	8	28
Other officers	15	24.6	10	24.9	12	26.9	5	22.3	4	27.3
Able seamen	95 (-58)	20.8 (-25.4)	80 (-16)	24.7 (-26.6)	80 (-49)	22.5 (-30.5)	14	24.8	12	25.3
Ordinary seamen	7 (-7)	(-22.1)	33	19.8	28 (1)	21.1 (-28)	7	19	10	21.4
Ship's boys	25 (-1)	13.5 (-14)	11	14.6	11	14.2	4	15.3	4	15.5
Volunteers	79 (-18)	28.3 (-27.2)	0	N/A	2 (-2)	(-41)	1	17	1	22
Total	278	278	166	166	167	167	42	N/A	43	N/A
Individuals sampled	N/A	228	N/A	163	N/A	162	N/A	38	N/A	43
Crew augmentation	25	N/A	9	N/A	17	N/A	0	N/A	0	N/A
2nd total	303	N/A	175	N/A	184	N/A	N/A	42	N/A	43
Total foreigners	(-116)	N/A	(-17)	N/A	(-53)	N/A	0	N/A	0	N/A
General average	N/A	25 years	N/A	23.8 years	N/A	24.9 years	N/A	24.1 years	N/A	24.9 years

Key: * The figures in parentheses and preceded by a minus sign indicate foreign sailors, mainly Spaniards; N/A = not applicable.

We can therefore imagine the rate of fire of the guns on the *Machault*. While cannon fire was effective at 600 metres (2000 feet), maximum damage was done at ranges of 300 (1000 feet) metres or less. During the encounter on July 8, the distance between the two frigates was half the effective gun range.

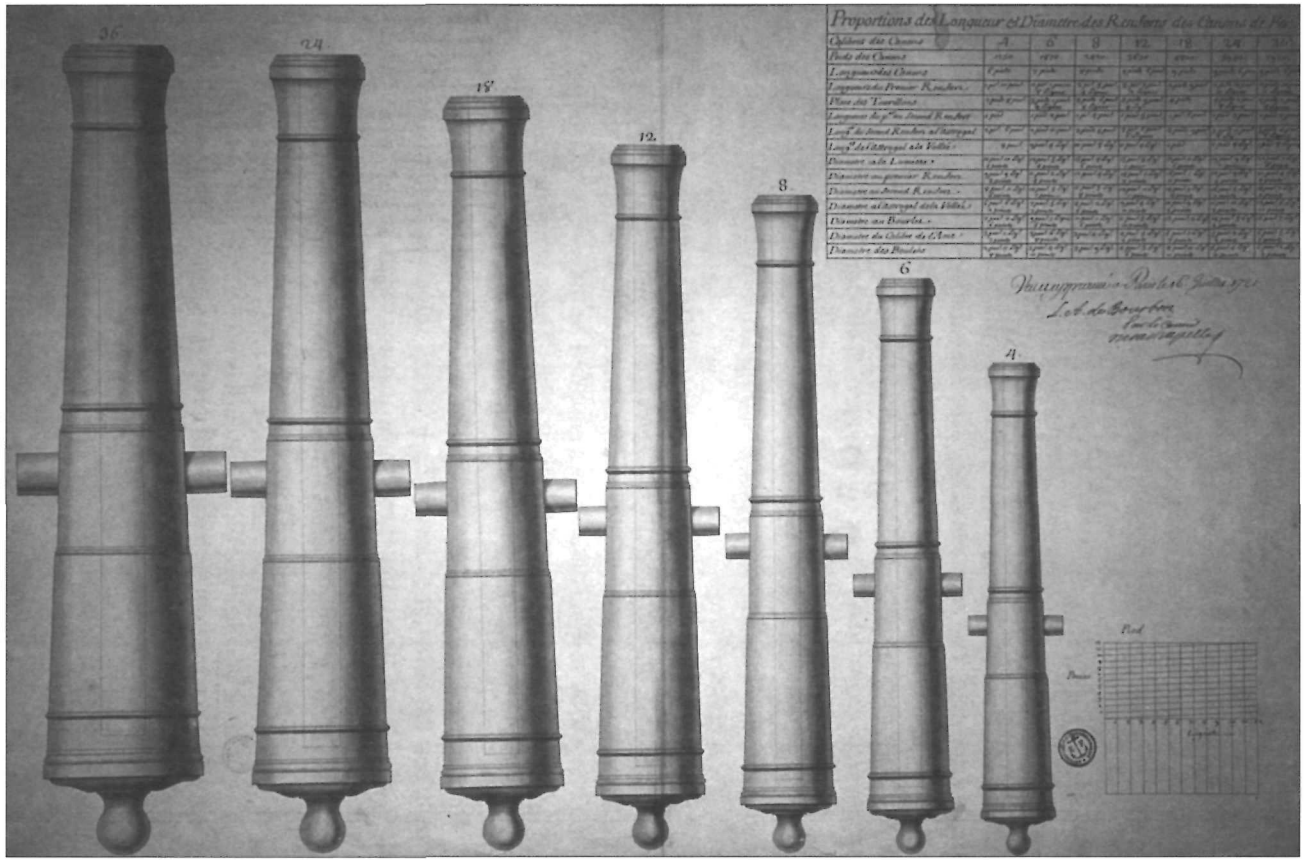
Heading Out to Sea

The ship's crew

A large crew was obviously needed to handle all these ships and to operate the guns. The crew list of the *Machault* for the 1760 expedition no longer exists. However, the size of her crew at that time can be fairly accurately deduced. On a vessel of this type, more than 300 people were crowded on board for voyages of varying lengths. During its first voyage in 1758 to engage in privateering, the *Machault* had a complement of 303. Table 7 shows the number of men required to handle the various types of sailing ships. This table indicates the number of crew on the *Machault* as a privateer frigate in 1758, on the *Machault* as an escort frigate in 1759, as well as on the *Maréchal-de-Senneterre*, another frigate, with a breakdown by rank or occupation. The crews of two merchantmen that were part of the 1760 expedition to Canada but were captured as they were leaving French waters[36] are also provided in the table. These were the crews of the 450-ton *Aurore* and the 350-ton *Soleil*.

Despite the fairly substantial difference in tonnage between the *Aurore* and the *Soleil*, the crew on both sailing ships was essentially identical. Hence, the other three ships that took part in the 1760 expedition, the *Bienfaisant*, *Marquis-de-Malause* and *Fidélité*, quite likely had similar complements, of approximately 40 men, since

36 The information on the crews of the *Machault*, 1758-1759, the *Maréchal-de-Senneterre*, the *Soleil* and the *Aurore*, such as their number, average age and wages, is taken from the crew lists of these various ships. These documents also provide information on the tonnage and outfitting of the vessels. France, Archives maritimes, Rochefort, 13 P 8, Vol. 26, No. 72-73, Vol. 112:20. London, Public Record Office, HCA 32, Bundles 165 and 243; since the *Soleil* and the *Aurore* were captured by the British, their papers are located in the London archives.



29 Proportions of length and diameter of iron guns, Paris, 1721. *France, Archives nationales, Service hydrographique de la marine.*

their tonnages were essentially identical to those of the *Aurore* and *Soleil*. The size of the crew required to handle a merchantman and to operate a man-of-war was, in this case, quite different. For instance, to man royal frigates of 30, 26 and 24 guns in 1758, the crew numbered 182. This difference cannot be attributed to the small size of the sample since generally only vessels over 500 tons had crews of more than 60. The great majority of French merchant ships were under 500 tons and only the Compagnie des Indes had merchant vessels of greater tonnage.

If we exclude from the *Machault's* crew in 1758 all the volunteers, who were in fact soldiers used only during combat, the crew needed to handle the *Machault* was reduced to about 220 members. Privateering therefore required a much larger crew, especially of chief officers and petty officers, and a small crew when the sailing ship was assigned to convoy escort duties, as was the case of the *Machault* and the *Maréchal-de-Senneterre* in 1759. Although these frigates fulfilled a military role, they were owned and outfitted by individuals. The crews needed to handle such frigates were fairly comparable to those of frigates of similar size outfitted by the king. A complement of 160 to 180 was adequate to handle the *Machault* in 1760. On the British side, the crew of the *Fame*, *Dorsetshire*, *Achilles*, *Repulse* and *Scarborough* at Restigouche, consisted of about 1800 sailors and soldiers.

According to the Naval Ordinance of 1681, regular ship's crew, for obvious reasons of physical strength, had to be between the ages of 17 and 50. The ship's boys were the youngest. The crew lists show that the average age of a sailor was approximately 24 or 25, on both men-of-war and merchantmen. Despite a fairly limited sampling, it can be assumed, based on the average age observed (Table 7), that a crewman was a ship's boy at 15, an ordinary seaman at 20, an able seaman or other officer at 25, and a petty officer at 30. In 1760, in addition to the sailing crew, the *Machault* carried about 100 soldiers. Of the 400 soldiers that boarded in Bordeaux, 300 were distributed over the five merchantmen. In 1760, the *Machault*, a 550-ton frigate, therefore carried on board between 260 and 280 people.

Privacy and comfort

> At the mere sight of the Sainte-Barbe, which was to be our sleeping quarters for the voyage, our hearts sank, mine first of all. It is a room about the size of the Rhétorique de Bordeaux, in which hang a double tier of cots meant to serve as beds for passengers of both sexes, junior officers and the gunners. We were crammed into this dark, foul place like so many sardines; it was impossible to get into bed without banging our heads and knees twenty times. A sense of propriety prohibited us from undressing, and after a while our clothes caused us appalling discomfort. The motion of the vessel would dismantle the apparatus, slinging people into each other's cots. Once I was dropped, still in my bed, upon a poor Canadian officer, descending upon him like the Angel of Death. I lay there for five or ten minutes, unable to extricate myself from my cot, with the officer half suffocated and barely able to summon the strength to swear.[37]

This description indicates that the officers, like some of the passengers, had beds on board the ships. There were also permanent private cabins for the chief officers, i.e. the captains and lieutenants. For the junior officers, the cabin partition might be a simple piece of cloth that was removed when necessary, during combat for example. Obviously officers enjoyed more privacy than the seamen.

Crowded into the *Machault*, sailors and soldier/passengers lacked any comforts. Their only bedding consisted of a hammock and a blanket. The hammocks were hung from the ship's beams in the between-decks. If the waves were fairly high, water seeped in and everything became soaked. Because of the demands of duty, the sailors always slept fully clothed. Working in four-hour watches, half the crew worked while the other half took their meals or rested. The sailors therefore shared their hammocks. The dampness, constantly wearing one's clothes and sharing bed linen all did little to promote hygiene.

37 Rev. Father Nau to Father Richard, Quebec City, 20-10-1734, in *Rapport des archives de la province de Québec, 1926-1927*, p. 267.

A day in the life of a sailor

To avoid having the same sailors always working the same hours, there was a change in shift halfway through one watch, between 4:00 and 8:00 p.m. While the petty officers, under the direction of the chief officers, attended to the sailing and pilotage of the vessel and gave orders accordingly, the other officers were also carrying out important duties. The cooks and bakers fed the crew while the gunsmiths looked after the guns. The officers usually had good naval experience. For example, to become a captain, the candidate had to have at least five years' experience and sit an examination assessing his knowledge. The remaining 60 percent of the crew simply took orders. All these sailors were hired by the month.

While the ship's boys, who were on their first voyage, ran errands, the ordinary seamen learned about the able seaman's duties, for which they did not yet have the ability or strength. The able seamen handled the sails and the anchors. Depending on their abilities, they hoisted, trimmed or took in sails; raised or cast anchor; took turns at the pump, occasionally fired the guns, or rowed the launch or longboat. In brief, these were the main duties of sailors at sea. However, raising an anchor that could sometimes weigh as much as 3000 pounds, moving a 70-foot-long yard or untangling lines made stiff by the damp and cold was extremely demanding work and required diversions as well as adequate food.

Recreation

To entertain themselves while at sea, the sailors and passengers participated, on arriving at the Grands Banks of Newfoundland, in the baptism of those who were on their first voyage. This was an initiation ceremony aimed at collecting a little money from victims who could be exempted by paying a small contribution. The arrival on the banks also gave everyone a chance to catch and eat fresh fish; after several weeks of highly salted food, this was a very welcome event. Besides these diversions, the sailors could always smoke a pipe, dance on the quarterdeck or belt out a few songs. Life on board was strictly ordered, with a rigid set of do's and don'ts, from which it was difficult to escape in the closed world of the sailing

ship. It was forbidden to go ashore without leave, to stay ashore all night, to sleep undressed, but they had to respect the officers and inform on deserters. Sailors had many constraints placed upon them and few excuses were accepted.

The sailor's dress

While officers in the French Royal Navy had been wearing dark blue and red uniforms since the early 18th century, the British officers did not adopt a uniform, also blue, until early in 1748. The cut of this clothing was similar to that of civilian dress. The condition of the clothes issued to the sailors and loaded on board the royal frigate *Écho* on route for Louisbourg in 1758 suggests a certain uniformity in the clothing of the seaman. Although the colours were not indicated, the quantities and prices provided strongly suggest that this was the case. In the French merchant navy, the few officer inventories consulted do not indicate a uniform for officers. The dress of the merchant captain Mangon in 1755, for example, mentions only black breeches, blue frock coat, grey jackets, white shirts, and whitish or burgundy overcoats. The ordinary sailor was certainly not better clothed. Obviously, only the officers and soldiers of the new navy troops wore uniforms at Restigouche.

Food rations

To keep up their strength and their ability to handle the gruelling work, sailors had a diet for which it is difficult, two centuries later, to calculate the caloric value and vitamin content. The most we can do is form an opinion based on its description. In the French Royal Navy, the diet was governed by regulations. Sailors were not permitted meat on Wednesdays, Fridays and Saturdays according to the precepts of the Catholic Church. The daily ration consisted of 18 ounces of biscuits and three-quarters of a pint of wine diluted with an equal amount of water to produce a total of three half-litre mugs of drink; it was distributed in three portions. Jugs of approximately five litres found during the excavation of the *Machault* were used for the daily distribution of beverages.

At breakfast, the sailors received either 1½ ounces of cheese or 4 ounces of salt pork or 1 ounce of fish (sardine, herring). Lunch was

much more substantial, as they were entitled to 6 ounces of salt pork or 8 ounces of salt beef or 4 ounces of cod; they also received 2 ounces of rice or 4 ounces of peas, broad beans or kidney beans. These vegetables were sometimes replaced by 3 ounces of cheese. For the evening meal, around 6:00 p.m, the ration was 4 ounces of peas, broad beans or kidney beans. All these dishes were seasoned with salt, olive oil and vinegar. The utensils were limited and distributed by group of seven men, with each member of the group eating and drinking from the same dishes. The chief officers were entitled to a double ration and the petty officers to one and a half rations. Senior officers of the French Royal Navy often enjoyed sumptuous meals prepared using abundant provisions by good cooks and cook's boys.

The sailing ships outfitted by individuals were not regulated quite so strictly in terms of food, but based on the provisions loaded on board the *Machault* in 1758 and 1759, the diet of the merchant navy crews consisted of the same basic foods as in the royal navy. For the *Machault's* 1759 voyage, more than 38 941 pounds of biscuits and at least 255 large casks of fresh water were loaded on board. These quantities, needed for the crossing to Quebec City in 1759, were probably carried by the *Machault* in 1760. As was the case for senior officers of royal men-of-war, merchant officers enjoyed a better and more varied diet than the seamen. The construction and outfitting records of the *Machault* indicate a large variety of fresh, salted and cured meats, vegetables, condiments and beverages for a well-laid officers' table. Both the quantities and prices indicated suggest that the sailors and soldiers of the *Machault* sometimes varied their diet.

At most, the ration of a sailor in the French Royal Navy provided 3700 calories. This figure is far removed from the 4500 calories which heavy labour requires. What is more surprising in this ration than the inadequate calories is the deficiency of vitamins and nutrients. There were negligible quantities of vitamins A, C and D from dairy products, fresh vegetables and meat in this diet. Fats, carbohydrates and calcium were not very abundant. This caused stunted

growth, rickets, scurvy and other diseases. Poor hygiene and an inadequate diet, combined with strenuous physical labour performed in often harsh weather conditions, make it clear than the sailing ship was an environment conducive to the spread of disease. Scurvy, caused by a vitamin deficiency, was the most frequent problem on vessels crossing the Atlantic. Fevers, which often took on epidemic proportions, were a close second, striking all ranks without distinction. The life of a sailor making the Atlantic crossing, whether heading for Restigouche or elsewhere, was certainly daunting and unpleasant. Given these conditions alone, the sailors and soldiers of the *Machault* undoubtedly needed rest on landing in 1760, after a crossing of seven or eight weeks. The duration of the siege and the French loss were therefore easily understandable.

Restigouche and its Maritime Heritage

A siege of about ten days and a naval battle lasting several hours between French and British sailing vessels left a number of artifacts of international maritime heritage lying in the waters of Restigouche. The ten or so sailing ships that took part in the last naval battle in North America prior to Canada's capitulation in September 1760, provide concrete evidence of French and British shipbuilding techniques of the 18th century. An analysis of their components illustrates the various stages in the life of a sailing ship, from the time the trees were cut in the forest, transformed into timbers and planks, assembled in the shipyard under the skilful eye of the shipbuilder, until the ship met her fate in battle. The sailing ships at Restigouche are also evidence of the progress suggested by the experiments in naval architecture conducted in both France and Britain.

The *Machault* was built during a period of innovation in French royal shipbuilding. Talented theoreticians and architects proposed new types of vessels and wrote treatises, as exemplified by the works and achievements of Blaise Olivier, Pierre Bouguer and Duhamel du Monceau. The light frigate with its single 8-calibre battery, an initiative of Blaise Olivier, which when tested during the War of Austrian Succession proved to be ineffective, was replaced by a higher calibre frigate, the 12-calibre frigate. Although this frigate did not really become popular until after the Seven Years' War, the first ships of this type were built during that period. French ship-

building influenced foreigners, and the presence of the Scandinavian architect Chapman at the shipbuilder Geffroy's shipyard at Brest is revealing in this regard. This period of conflict with its prizes of war and espionage also provided opportunities to study foreign vessels. The British, while they neglected the theoretical aspects, were very active in this field and began at this time to move away from the rigid rules that had governed British shipbuilding since 1706; the dimensions of sailing ships, which until then fixed and invariable, could now change. The British 74-gun man-of-war replaced the 70. The *Fame*, which was present at Restigouche, was the first vessel ordered and built as a 74-gun man-of-war.

These major changes inevitably benefited the merchant navy. The *Machault*, a 12-calibre frigate built in 1757, was one of the first attempts to build this class of frigate. Built from plans drawn up by a shipbuilder from a family of experts in naval architecture, the *Machault* was undoubtedly a good example of shipbuilding. The scantlings of this frigate, revealed by the remains at Restigouche, are indicative of solid construction. The vessel's framework, comprised of floor frames, half floors, futtocks and beams, was reinforced by knees, stanchions, breast hooks, stemson, sternson and riders. The defeat at Restigouche was not the result of any architectural weakness. Rather, the scuttling of the *Machault* is evidence to the contrary. Why deliver a good vessel to the enemy? The length-breadth and length-depth ratios determined from the dimensions of the *Machault* establish that this frigate had a slightly smaller rake and a shallower draught than the men-of-war of the royal navy. This sailing ship was therefore faster and more manoeuvrable than a man-of-war. However, in heavy weather, the *Machault* undoubtedly drifted more easily and therefore did not keep the sea as well. This seemed to be a general failing of French frigates.

The close agreement between the cargo records of the ships that participated in the 1760 expedition and the available cargo space obtained by calculating the displacement of these ships and their weight tends to confirm the accuracy of the somewhat theoretical analyses on the quantities of gear needed. The remains at Restigouche,

which indicate for example that the gear storerooms were located forward and the provisions storerooms aft on the *Machault*, confirm the layouts shown on the historical plans. While small vessels such as brigantines and schooners can easily be differentiated by their rigging, the differences are less obvious between frigates and merchantmen such as the *Machault* and the *Bienfaisant*. Blaise Ollivier reported that frigates and merchantmen were similar in construction; to differentiate between the two, we must rely on the ratios, according to which merchantmen had a smaller rake and shallower draught. While the archaeological remains at Restigouche do not allow us to draw any definite conclusions about the masting and sails of a frigate such as the *Machault*, the numerous treatises of the period provide some insight into the amount of rigging on sailing ships in 1760. The extreme variety of lines needed to properly sail a ship with a breadth of 32 feet forms a complex network of running and standing rigging. The impressive quantity of blocks and deadeyes required to rig a frigate is also a good indicator of the complexity of naval architecture and outfitting.

In 1760, the French merchant navy stood in for the French Royal Navy at Restigouche. The war exhausted Canada and proved too much for the French government. The aid received from France was minimal, despite the hopes of the officials in New France, although it came from the region of France best equipped to meet the requirements of cross-Atlantic trade. A single French ship in the St. Lawrence River in the spring, thought Lévis, would be enough to turn the tide and restore Canada as a French colony. True or false? Historians cannot change the course of history, and the Bordeaux expedition of 1760, preceded in the St. Lawrence River by the British frigate *Lowestoffe*, sailed into Chaleur Bay. However, the unkind fate they met in battle is a rich source of information for our time. The archaeological remains at Restigouche are not only important evidence of maritime heritage, but also provide invaluable comparative data for understanding the material culture and commerce of the North American colonial period. They help bring this historical period to life.

Appendices

These two documents cast light on aspects that are essential for understanding the events of 1760. The first (A) describes the campaign of 1760 as experienced by the besieged defenders in Chaleur Bay. The second (B) examines the dimensions and scantlings of a frigate with 24 12-pounders intended for privateering, just like the *Machault*, and built from plans by the same shipbuilder.

Appendix A :
Giraudais' voyage: his account of 1760[38]

LOG OF SIEUR GIRAUDAIS ON THE MACHAULT

Summary of what has happened from the time of my departure from Bordeaux until my arrival at Santander in Spain in the campaign of 1760 on board the royal frigate the Machault, commanded by me, François Chenard Giraudais.

I received command from His Majesty of said frigate, outfitted in Bordeaux with 20 12-pounders and 8 6-pounders and a small crew of 150 men with a corresponding number of small arms. My convoy consisted of 5 merchant vessels en route to Canada, namely, the Bienfaisant under Captain Granmon, the Marquis-de-Malause under Captain Lartigue, the Fidelité under Captain Kanon le Jeune, the Soleil under Captain Clemenceau, and the Aurore under Captain Desmortier; all 5 as well as myself were laden with war munitions and provisions for the Colony; there were 400 soldiers distributed among the 5 ships and my frigate. We set sail down the river from Bordeaux on April 10, 1760, with a light northeasterly breeze.

By 10:00 am, we were out of all danger from the river, all 6 vessels, as well as several others that were under my escort to clear the headlands. I steered until night along the Arcachon coast. At that latitude, I set my course to the west, as did all the other vessels. On the 11th, I became aware of several vessels to leeward and windward; the winds at the time were out of the north. Then to the west, the vessels to windward caught sight of 2 enemy ships, and having recognized them as such - one with 56 guns and the other with 26 - I signalled to my small fleet that they should each try to escape as best they could, which they did by heading SW by SE, while I headed WNW. The winds, as I said, were out of the north, and the enemy vessels were to the north heading for us. But when they saw me sail close to the wind and reef my lower sails, they both aimed at me. Since the smaller of the two vessels was closest to me, I waited until she came within range of my guns and I adjusted my sail trim to match hers, which was not difficult. Being faster than both of them, I had the amusement of making them pursue me and fire on me until night, and I saved the

38 France. Archives de la Marine, series B4, Vol. 98, 1760.

whole fleet from 2 vessels, the smallest of which was as powerful as mine. On the 12th, the Marquis-de-Malause rejoined me, and on the 17th, the Bienfaisant. I had no news from the others. I continued en route with these two vessels. We did not encounter anything until the 15th of May. Being north and south of the Iles aux Oiseaux, at the entrance to the St. Lawrence River, I captured a British ship that was headed for Quebec City. I learned from the letters I found on board that 5 or 6 men-of-war and an equal number of British frigates had preceded me to Quebec City. I immediately called a council, during which it was decided to head for Chaleur Bay, which I did. On the 16th, within sight of Bonaventure, I took 4 prizes. And on the 17th, just within the headlands of the entrance to Chaleur Bay, I seized another British ship; I led them all to Petit Bonaventure, where I anchored that night. The next day, I signalled to set sail and that day I, with my entire small fleet, sailed some 25 to 30 leagues into the Bay. And on the 19th, we sailed to within 6 leagues of the Restigouche rapids, where I anchored and I had all my ships anchor in a very suitable spot. From there, I dispatched Sieur St Simon, officer of the Colony, who had made the crossing with me, to Monsieur Vaudreuil with the papers in my charge. And since I had orders to wait for a response from Monsieur Vaudreuil, I landed the troops from my frigate and from the other two ships, comprising a total of 200 men. I kept one part of my crew busy building a battery on a headland that defended the channel and the others unloading a schooner of our prizes in order to use it as a scout. During this time, I took on water and biscuits in order to be ready to leave upon the first orders from Monsieur Vaudreuil, which seemed to be taking a long time. The scout set sail out of the Bay on the 12th of June under the command of Sieur Lavary le Roy, one of my first lieutenants, but did not see anything until the 22nd, except for a few Acadian schooners, bateaux and skiffs that came daily to join us with many desperate Acadian families seeking relief. On the 23rd, the crew of the scouting vessel rejoined me after being forced to run their ship aground by the approach of a British 74-gun man-of-war and 4 barges. I immediately transferred 4 of my 12-pounders and one 6-pounder to the battery and scuttled a chain of vessels in the channel within half range of the guns of the battery. Everything was ready. The night of the 26th to 27th of June, I learned of the arrival of another 2 men-of-war and 2 frigates. On the 27th, the 2 frigates and the 74-gun man-of-war made their way up the river and dropped anchor outside this chain of wrecks. The land battery which I mentioned, commanded by Sieur Donat de la Garde, my second-in-command, opened fire on them and the fighting did not cease on either

side until nightfall, when the 2 frigates withdrew into the secondary channel to the south. I had planned to remain with my frigate to support the battery but since the enemy's fire power was much greater, I was forced to rejoin all the other vessels that I had ordered upstream the moment I heard news of the first man-of-war in order to put their cargoes ashore. I did likewise in the meantime, unloading as much as we could of the King's goods; I rejoined them on the 28th. The battery held out until the 3rd of July with as much bravery as possible and was eventually forced to spike its guns, since the 74-gun man-of-war was heading in its direction via the secondary channel to the south, dominating it as well by the superiority of its artillery.

On the 4th, the 2 frigates endeavoured to clear a passage through the chain of sunken vessels and finally made it through on the 6th. On the 7th, they sailed within range of a battery of 3 4-pounders, commanded by Sieur Gilbert, one of my lieutenants, that I had ordered erected on the southern shore to prevent a schooner from coming to sound the channel. In fact, they succeeded in preventing the schooner from doing so until the 2 frigates forced them to abandon the battery, after doing everything expected of such brave men. On the 8th at 5:30 in the morning, they came within half gun range of my ship. They would have come closer if it had not been for the second chain of vessels I had sunk outside of my position and a battery I had ordered erected on the northern shore with 3 of my 12-pounders and 2 6-pounders from the Marquis-de-Malause; this battery was commanded by Sieur Reboul, my first lieutenant. These tactics delayed the approach of the enemy and gave me time to put the King's goods ashore.

One of the enemy frigates had 36 guns: 26 12-pounders and 10 6-pounders and its crew included reinforcements from the 3 men-of-war. The other frigate had 26 9-pounders in a battery, it had a full crew. There was also a schooner with 4 6-pounders and 17 barges with a crew of 25 to 30 men each. And I had to face such superior forces with 13 12-pounders and one 6-pounder, of which 10 were on the port side aimed at the enemy and 3 on the starboard side in case their barges attempted to board us from that side during the fighting. My crew now consisted of 70 men, as the others were being used during this time to tow all the small vessels loaded with the King's goods within musket range of land, where we had hurriedly set up a depot in addition to the one which was out of enemy range. Another part of my crew were being used at the battery commanded by Sieur Reboul who did everything they could. I also had on board 45 soldiers under the

orders of Monsieur D'Angeac. I will not speak of them as they are all known as brave men. It is not my job to praise them. So it was with these forces that we began the battle between 5:00 and 6:00 in the morning and continued until 11:00 or after losing 30 men, with 8 feet of water in the hold, and having sunk the large British frigate, which would not have been saved if she had not been in such shallow water, which made it easy to repair the holes that she had below her waterline. We were forced to set fire to the frigate; the Bienfaisant did likewise and the Marquis-de-Malause would have done so as well if it were not for the British prisoners on board whom we did not want to sacrifice to the fury of the savages. Once our vessels had burned, they sent the schooner and the 17 barges to take and burn all the small vessels loaded with the King's goods, which forced us to set fire ourselves to all those that were out of musket range from land and we defended all the others until 11:00 in the evening, when the British were forced to withdraw after retrieving their prisoners from the Malause and setting fire to it. That is all they did with 3 men-of-war and 2 frigates for 17 days and they did not dare go ashore within 6 land leagues. It is extremely flattering for me to have had such brave men as I did under my command.

On the 9th of the month, the two frigates headed downstream and joined the men-of-war. And on the 17th, they all left the river. The same day, Sieur St. Simon returned from Montreal. In 13 days, he brought me orders from Monsieur Vaudreuil to leave in my frigate and bring these papers to the first port of France, allied or neutral. Since my frigate had been burned, I did some work on an Acadian schooner that was there in order to outfit her for the sea voyage.

On August 10, we were north and south of Bonaventure, and on September 3rd, I anchored at Santander, after being pursued for 11 hours in the Strait of Belle Isle, and in 13 days, having made the trip from the New World to the Old World.

Giraudais of Bordeaux October 1760
Details of his campaign on the Machault
Frigate Lieutenant 1760.

Appendix B :
Specifications for a frigate with 24 12-pounders, 1757[39]

Bayonne, March 2, 1757, Specifications for a frigate with 24 12-pounders in a single battery suitable for privateering, from the plan of Monsieur Geffroy, royal shipbuilder in this port

Namely:

Length from stem to stern	128 feet
Breadth at the midship frame	32 feet 6 inches
Depth at the midship frame from below the rabbet* of the keel to the straight line above the beam	17
Rake of the stem	14
Rake of the sternpost	2
Length by the keel	112

This frigate will have only one deck on which will be located 24 12-pounders. There will also be an aftercastle which will end above the large knightheads and will have a height at the side, plank to plank, of 5 feet 7 inches, and at the very stern of 5 feet 9 inches; the forecastle will end 6 inches abaft the capstan of the cable room and will have a height at this point of 5 feet 6 inches and at the very front of 5 feet 7 inches.

There will be a between-decks below the deck extending into the hold, which will have a height, plank to plank, of 5 feet 3 inches 6 lines from bow to stern and connected just like the deck. And to support this between-decks, between the covering board* of the waterways and the beam clamp of the deck, we will fit out the Ste Barbe against the bulkhead of the decks in order to fit railings*, and above the beams in this Ste Barbe we will install racks for the brushes* and cartridges*. Forward against the bitts there will be a bulkhead amidships for the cable room.

In the hold, there will be a pump well around the foot of the mainmast whose pillars and covering planking will be made of oak; forward of this pump well will be the shot locker, which will be contiguous to this pump

39 France. Archives de la Chambre de commerce de La Rochelle, Box 22, File 3, No. 7460.

well. Abaft this pump well, there will be a platform for distributing provisions and a hatchway for lowering the casks into the hold. Abaft this provisions platform, on each side, will be the bread rooms, with a corridor in the middle to connect the provisions hatchway to the powder magazine. However, it will be observed that these storerooms must be higher than the provisions platform. Abaft the bread rooms, there will be a spare parts storeroom for the master gunner, which will connect with the Ste Barbe. Below the bread rooms, will be the powder magazine with a pump well in order to install a lantern. Abaft the bread rooms, along the side, a suitable place will be provided in order to effect repairs in the event of accidents that might occur during fighting on the deck. Between the first & second port forward, there will be a galley on each side, one for the captain & the other for the crew.

The tiller will be located in the wardroom and in the event it is lost, another can be placed above the castle since the rudder is to rise above the castle, with a mortise* all ready to accommodate this second tiller.

All timber dimensions are squared.

The keel will be composed of four pieces, not including the forefoot or the sternfoot*. It will be 14 inches high from below the keel to above the rabbet and 12 inches wide. The scarfs will be at least 4 feet 1 inch long, and above this keel will be deadwood 4 inches thick. All the floor timbers, knees and futtocks will be 8 inches wide. On the moulding, its frames will be 16 inches, on the keel, on the first rail, 8 inches 9 lines, on the second, 8 inches 4 lines, on the third, 7 inches 10 lines, on the fourth, 7 inches 5 lines, on the fifth, 8 inches 4 lines, which is the rail of the main breadth, on the sixth rail, 5 inches 6 lines, and finally, on the seventh rail or that of the gunwale* 4 inches. The frame space will be 8 inches to 8 1/2 inches or more. The scarf joints* of the frames will be at least 4 feet 6 inches to 5 feet long and will be connected by three bolts in each scarf joint of a thickness of 9 lines in the bottom and of only 8 lines in the deadworks. The keelson will have a thickness of 8 inches and will notched* 2 inches from stem to stern and each strake will be 7 inches 6 lines wide and secured independently of the nails by iron bolts of a thickness of 15 lines and ferruled* on the keelson.

At the bow and the stern, on the floor timbers, will be fitted a stemson and sternson, each of which will be bolted together with the floor timbers, the stem, the sternpost and the keelson. The internal planking will be 2 1/2

inches thick and this planking will be full, up to the height of the ballast, with filling pieces* between each frame to prevent the ballast from spilling into the frame spaces and between the interior planking there will be 1 foot 6 inches between each strake.The beam clamps of the orlop deck will be 3 inches 6 lines thick and those below 3 inches and 10 to 12 inches wide.

The beams of the orlop deck will have a width of 9 inches and a height of 8 inches, spaced 3 feet to 3 feet 6 inches apart, but those of the hatchways will be spaced further apart. All the beams will be notched in the beam clamps with a dovetail* notch of 3 inches 6 lines. All the knees will be 6 inches 6 lines wide and one at each end of the beams will be secured to the side by three iron bolts, and the other arm supporting the beam will be secured by three other bolts that will be pinned. On the knee between each double row of binding-strakes* there will be crosspieces* or carlings notched in the beams and the half beams also notched in the binding-strakes to support the caulking.

On this orlop deck will be placed at the bow a breast hook to which the external planking will be nailed and this breast hook will be securely bolted to the side and stem, and all the bolts securely rivetted, and of a appropriate size. Below this orlop deck, there will also be another two breast hooks, bolted like those of the orlop deck. Aft, in the runs, will be placed two escutcheon knees on each side of the sternson and placed at an angle on the transoms and frames that will be securely bolted.

The binding strakes will be 3 inches 6 lines thick and indented in the beams 1 inch 6 lines and will be 8 inches wide & will be made of oak. The first row of waterways which is against the side will be 8 inches thick by 9 inches wide and notched 2 inches, in the beams, and bolted from the outside and ferruled on the sides of the beams, and all its components will be made of oak. There will be some on both decks, and on each side a *tirepoint* from stem to stern of a corresponding width & thickness, securely bolted. All the exterior planking of the orlop deck will be hemlock planks, except for the partners of the masts.

The inner waterways will be 3 inches 6 lines thick and 10 inches wide on each strake; note that there will be two strakes on each side, above the inner waterway. The exterior planking that runs from above the inner waterway to below the beam clamp will be 2 inches 6 lines thick.

The deck beams will be 10 inches wide and 9 inches high, and will be dovetailed 3 inches into the beam clamp, and the clamps will be 3 inches 6 lines thick and 10 to 12 inches long. There will be a breast hook forward between each row of binding strakes. From one end to the other, crosspieces or carlings will be placed from stem to stern, as on the orlop deck, to support the half beams and the latter will be notched into the binding strakes like the crosspieces in the beams. And there will be a knee at each end of the beam which will be fastened to the side with the beams, as on the orlop deck. The binding strakes will be only 4 inches 6 lines thick and like the others will be indented into the beam 1 inch 6 lines.

The waterway ferrules will be 8 inches thick, indented* 2 inches into the beams, and they will have a width on edge from the top of 7 inches.

The waterways will be 5 inches thick and will be dovetailed into the beams 2 inches and will be 9 to 10 inches wide and connected with the side and the deck like those of the orlop deck. The rest of the deck will be planked with fir planks 3 inches thick, the orlop deck 2 inches under the forecastle, because of the galleys, and at the site of the partners of the masts and capstan which will be planked with oak.

The inner waterways will be 3 inches 6 lines thick and 8 inches wide for each row of strakes.

The rest of the bottom planking* on the inside of the ship between each port will be planked with fir planks 2 inches 6 lines thick. The deck will have bitts with their cleats, crosspieces and chocks*, knightheads for the main topsail, small bitts* for the main topsail top, and gratings and all the scuppers needed for water run-off.

In the between-decks, as in the hold, the pillars with inverted binding strakes, the deck beams of the aftercastle and forecastle will be 7 inches wide and 6 inches high, notched into the beam clamp, and this clamp will be 3 inches thick and 10 wide. The waterways will be 5 inches thick, notched into the deck beams 2 inches, and will be 12 inches wide. The midship binding strakes will be 3 inches 6 lines thick as will be the others, notched into the deck beam 1 inch 6 lines and planked with fir planks 2 inches with crosspieces or carlings and half beams as on the decks and secured in the same way. On the forecastle will be located the knightheads of the foresail, the foot of which will rest against the cleat of the bitts on the starboard side and notched. On the forecastle, will be located the pillars and dogs, the latter with their snatch blocks*.

On the castles will be fitted bridgefronts, supported by knees & on which will be attached a gunwale on each side, on the two bridgefronts of the castles as well as on that entering the ram, with the necessary stanchions & rails, as well as all the necessary cleats both large and small, plus the gangways.

The external planking from the keel to the orlop deck will be 3 inches thick, & from the orlop deck up to below the wale, they will increase proportionately, up to 5 inches thick. The first & second wales will be 5 inches 6 lines thick and 10 to 11 inches wide, and the filling piece will be 5 inches 6 lines and 10 to 12 inches wide and made of oak, as well as the planking and the strake above the second wale which will be 3 inches thick and from this strake to the gunwale planked with fir planks 2 inches 6 lines thick. The gunwale rails and the driftrail will be shaped by passing a moulding on each rail. On each strake of planking, care will be taken to insert a nail at each frame and a treenail and an iron bolt at each end of planking.

In the wardroom, two ports will be cut, equipped like those of the battery with grapnels* and rigs* for gun use, like those on the deck as well. The ship will be fitted with bitts & all the ring bolts both on the deck and on the castle.

There will also be a rudder, equipped with its braces, with the two tillers and wheel, half of it in the wardroom. All the officers' quarters will be panelled at the sides and ceiled between the deck beams.

In the wardroom, there will be panelling on the sides and ceilings as well as in the other rooms between the deck beams, as well as all the necessary window frames for all the rooms, without exception.

The binnacles* and all the ladders for climbing down into the between-decks as well as for climbing onto the castles, the chain wales with their knees fitted with their chains, the fenders*, chesstrees*, ram, pumps, and generally all ship's gear, without exception.

The two of us, Sieur Pierre Antoine Barerce, merchant, and Joseph Laporte, master shipbuilder, both from this town, have agreed that Sieur Laporte shall undertake to build the frigate from the above specifications, to carry 24 12-pounders on her deck, with all the possible accuracy, following the plan and according to the scantlings provided to him in these specifications, and all the joins shall be made with all possible accuracy.

Glossary

BACKSTAY: fixed line, standing rigging, which runs from the topmast and the topgallant mast laterally to the hull of the ship.

BALANCE FRAMES: two of the frames of a vessel placed approximately at one-quarter of its length, forward and aft of the midship frame, and for which shipbuilders determine the moulds in their plans. The forward balance frame is more specifically called the luff frame.

BATTALION: unit of 12 companies of 40 fusiliers and one company of 45 grenadiers under the authority of the war ministry. All told, it forms a contingent of 525 men. Three battalions make up a regiment.

BATTERY: on a warship, all the guns set up on a single deck.

BEAM (MIDSHIP BEAM): transverse girder supporting the decks of a ship. The midship beam marks the vessel at its widest point.

BEAM CLAMPS: series of strong timbers, on the inside of the ship, forming a clamp or strake supporting the ends of the beams.

BINDING STRAKE; COAMING: heavy planking connecting the deck joists of a ship to each other; planking reinforcing the decks around the hatchways, it supports the top of the pillars.

BINNACLE: housing in which the compass is suspended.

BITTS, RIDING BITTS: system of two strong parallel timbers which, fixed on the first deck, are solidly attached to the bottom of the vessel. They are connected, on the deck, by another timber placed horizontally, called a crosspiece, around which the anchor cables are wound.

BOND NOTE: note, originally duties collected by the nobility on fish and goods brought into their maritime domain. Here, list of products on which customs duties are paid.

BONNET: extra sail added to a mainsail to increase the area exposed to the wind.

BOTTOM PLANKING: second row of external planking near the keel.

BOTTOMRY: money loaned on a ship or its cargo and on which interest was paid if the vessel had a successful voyage, but which was lost if the cargo or vessel were lost at sea.

BOWLINE: rope attached by means of feet or arms to the bolt rope of a sail. It is hauled in to trim the sail to the wind.

BOWSPRIT: mast fixed more or less diagonally at the bow of a vessel.

BRACE: rope attached to each end of a yard used to control the position of the yard.

BRAIL: rope used to raise a certain part of a sail or to gather it in toward the yard on which it is hung.

BREAST HOOK: curved timber secured horizontally across the stem to give added strength to the bows of the ship.

BRIDGE FRONT, BREASTWORK: type of railing fitted breadthwise in a ship at the level of the castles and poop.

BRUSH: long-handled cylindrical brush used to clean the inside of the guns.

BULWARK: parapet, fixed or movable, raised around the deck to serve as protection.

BUMKIN: rounded timber placed at the front of some ships in order to trim the foresail there.

BUNTLINE: brail attached to the middle section of the foot of the sail and used to raise the bottom or middle of the sail.

BUTT-JOINT: hook-and-butt joint.

CABLE ROOM: part of the hold reserved for the storage of cables, at the front of the ship.

CANT FRAME: any timber with two arms forming an acute angle; frame located on the keel at the ends of a ship. *See* floor frame.

CAPSTAN: device used for heavy lifting work such as weighing anchor, hoisting the masts and swaying up the yards. Composed of a cylindrical component, the spindle, pivoting around its vertical axis, it is held on the deck by partners and can extend down to the keelson. It is worked by means of bars.

CARLING: timber placed between two others, usually between two beams, to strengthen them.

CARTRIDGE: casing of paper, parchment or cloth containing the powder needed to load a gun.

CARTRIDGE CHEST: chest to protect cartridges.

CARVEL, CARVEL-BUILT: type of planking in which the pieces of wood, or planks, are placed side by side. They are nailed or bolted to the framework, and their joints caulked.

CASK: cooperage product, general term meaning casks, tuns and barrels.

CASTLE: deck raised in relation to the main deck, at the bow and at the stern of a ship.

CAULKING: action of filling the joints of planking with oakum and a coating of pitch to make them waterproof.

CHAIN WALE, CHAIN: timber placed perpendicular to the hull used to spread the shrouds (*see that term*).

CHARTER PARTY, TO CHARTER: agreement whereby an outfitter rents out the use of his vessel in exchange for a fee.

CHEEKS: upper section of the bows of a ship adjacent to the hawse holes.

CHESSTREE: timber fixed on the inside of either side of a sailing ship used to secure a line. See tack.

CHIEF FRAMES: principal frames located equidistant along the keel, traced out on moulds and erected first in order to give the ship it's general shape. The filling frames are then inserted between the chief frames and adjusted by sight.

CHOCK: wooden fitting used to protect the cables from chafing.

CLEAT: wooden or metal bolt with two arms, attached to the deck or to the bulwark, used to secure lines.

CLOSE TO THE WIND, CLOSE HAULED: today, a ship is said to be close to the wind when the angle of its sails to the wind is greater than 12°.

COAMING (HOLE IN): hole in the panel of the cable room hatchway through which the cables pass when the hatch is laid.

COMMISSARY: person in charge of providing food and munitions to an army.

COUNTER TIMBER, COUNTER STAY: *see* headrail; also the support of the upper counter at the stern.

COVERING BOARD: piece of framing that completes the angle formed by the beams and the frames at each deck.

CROSSPIECE: heavy timber set horizontally between the two vertical posts of the bitts. *See* bitts.

CUTWATER: projecting timber set on the front of the stem to cut through the water.

DAVIT: wooden roller fitted at the stern of a boat to pay out the cables and protect them from chafing.

DEADEYE: a round, flattened wooden block, grooved around the circumference and pierced with three holes, through which ropes to be tightened are threaded.

DEADWEIGHT CARGO: heavy bulk cargo.

DEAD WORKS: the portion of the ship's hull above the waterline, as opposed to the quick works, which is the submerged part of the hull.

DECK BEAM: transverse girder used to support the decks. Deck beams are to the castle decks and orlop deck what beams are to the first and second decks.

DOVETAIL: tenon in the shape of a dovetail inserted into a notch of the same shape to comprise a joint.

DOWNHAUL, DOWNHAULER: small rope used to haul down the fore-and-aft sails as well as the staysail and jibsail (bent on the stay).

DRIFT: for a ship, to stray to varying degrees from a given course or heading because of wind or current.

ELL: old measurement of length (1.18 m, then 1.20 m).

ESCUTCHEON: carved decoration, shield or scroll located at the bow or stern of a ship; also part of the stern of a ship running from the bottom of the fashion pieces (two curved timbers in opposite directions that form, one on each side, the last rib of the stern of a ship) to the wing transom (girder located at the widest part of the stern).

ESTABLISHMENT: a series of regulations specifying the main dimensions of the various rates of British men-of-war between 1706 and 1745.

FENDER: piece of wood or rope suspended against the side of a ship to protect its walls.

FERRULE (TO FERRULE): band placed at the end of certain objects or timbers to prevent them from splitting.

FILLING PIECE: indented piece of timber inserted between the frames to more solidly bind the vessel and keep objects from falling.

FIRING: to burn bundles of firewood against the planking of the hull in order to clean the planks and harden the oakum.

FLOOR FRAME: curved timber whose centre is attached to the keel and support for the futtocks. The floor frames in the middle of the ship look like the bottom of a U and those at the ends look like the bottom of a V. *See* cant frame.

FLÛTE: flat-bottomed cargo vessel; or man-of-war armed *en flûte* (i.e. carrying half its guns): any sailing ship used to transport goods, stores, as well as troops.

FOOTROPE: rope hung from the yard to enable the sailors to move about on the yard.

FORE-AND-AFT SAIL: sail, usually square or trapezoidal. This sail is set on a gaff or boom and can also be hoisted on a stay.

FOREFOOT: curved timber joining the keel to the stem by means of a scarf joint.

FOREMAST: the first vertical mast at the front of the ship.

FRAME: name given to each of the ribs of the ship; they are formed from several pieces scarfed together. Each frame is composed of a floor frame at the bottom of the ship, a half floor on each side and several futtocks to achieve the desired depth. The widest of all the frames is the midship frame. All the frames together make up the framework or skeleton of the vessel.

FRAME SPACE: distance between two frames in a ship's framework.

FRAMEWORK FIRST: principle of shipbuilding which consists in erecting the entire skeleton or framework of the vessel first as opposed to the method of external planking first, where the framework is inserted after the planking.

FRAMEWORK, FRAMING: skeleton of the ship or all the frames.

FRANCHE (TROOP, COMPANY): unit of companies of soldiers under the authority of the ministry of the navy, but not subject to the regimental organization.

FUTTOCK: lengthening piece; frames located above the half floors and floor frames which form the ribs and thus determine the depth of the vessel.

GANGWAY: part of the upper deck along the bulwark, at the level of the castles, serving as a passage between the forecastle and the aftercastle.

GEAR: means the sails, rigging, yards, blocks, anchors, cables, rudder and artillery of a vessel.

GRAPNEL: iron tool used to grapple an object.

GRATING: a frame of latticework that fits over a hatch or opening to provide ventilation of the between-decks.

GUNWALE: row of planks attached horizontally on the top of the walls all along the ship.

HALF BEAM: small deck beam inserted in the spaces between the beams; it facilitates the nailing of the planking of the deck.

HALF FLOOR: curved timber covering the ends of the floor frames of the first (or lower) futtocks.

HALYARD: name given to any rope or line used to hoist the yards and sails; each halyard is designated by the name of the object it raises.

HAWSE HOLE: vertical, rounded hole cut on either side of the stem through which the anchor cables pass.

HEAD: platform projecting from the bows of the ship, above the ram. The lavatories or latrines of the crew were located here.

HEADRAIL: curved timber that connects the ram to the ship. The timbers that cross them are called counter timbers or counter stays.

HOOP-WOOD, HOOP-IRON: wooden or iron slat used to hoop casks.

HULL: the entire submerged section of the vessel, from the keel to the waterline.

INDENTING: method of joining pieces of wood involving tooth-shaped notches.

INTERIOR PLANKING, CEILING: planks used as interior covering of the ship.

JEER BITTS, KNIGHTHEADS: large wooden vertical timbers solidly secured to the beams to which are attached the halyards of the lower yards (called jeers). *See* halyard.

JIB: triangular sail set on a stay between the foremast and the bowsprit.

KEELSON: long timber placed above the keel fitting into the floor frames which it supports. The heel of the mainmast and foot of the main capstan are set in the keelson.

KNEE: curved timber practically at a right angle used to connect various parts of the vessel.

LANTERN: lantern installed at the stern.

LASHING ROPE: small rope used for various purposes, such as tying a sail to a yard, hanging a hammock.

LEECHLINE: brail attached to the leech rope of a sail.

LIFT: name of a piece of rigging, rope or line which is led from the mast to support the ends of a yard.

LIMBERS: small channels cut in the floor frames along the length of the keel to allow water to run toward a pump in the middle of the vessel.

MAIN BREADTH: term designating the greatest width of the hull of a sailing ship, usually at the waterline.

MAIN DECK: name of the upper deck of a sailing ship.

MANGER: bulkhead fitted at the bows of the ship to receive and drain off the water that enters through the hawse holes.

MAST CAP: wooden block, rounded on the top; the head of the lower mast fits through its flat underside; on the front, an iron semi-circle serves as support for the second level of the masting. The British-style mast cap is a rectangular piece of wood with a mortice on one side to cover the head of the lower mast and a hole on the other side to adjust the heel of the topmast.

MESSENGER: cable attached to the bars of the capstan to facilitate the tractive effort.

MIZZENMAST: the aftermost mast on a vessel with three or more masts. The smallest and aftermost mast on a two-masted ship.

MORTISE: cavity cut into a piece of timber to receive the tenon of another joined piece.

MOULD: full-size model, in light wood, of the main parts of the framework of a vessel.

MOULDING: contour of a frame moulded or shaped according to a mould of some kind.

NOTCH: in carpentry, an opening made in a piece of wood in order to insert another piece.

OAKUM: old rope, unpicked, beaten and re-spun, used to caulk the joints or seams of a ship.

OFF THE WIND: point of sail of the vessel; a ship is said to be off the wind when the direction of the wind forms an angle of less than 112° measured aftwards from the point of the keel.

ORLOP DECK: light deck located directly above the hold, not bearing any artillery and in which various storerooms can be fitted up.

OUTFITTING: action of equipping a ship or man-of-war with everything she needs to take to the sea.

OVERALL: dimension or length of the ship measured from the upper end of the stem to the upper end of the sternpost.

PARREL TRUCK: multi-row string of wooden balls and small planks through which a rope is threaded and used to slide the yards along the masts.

PARTNERS: set of timbers comprising the opening into a deck for the passage of the masts, capstan spindles and pumps.

PARREL: *see* parrrel truck.

PILLAR: vertical timber placed under the beams or deck beams of the ship to support them.

PINTLE: male part of the hinge forming the joint with the rudder; it fits into a brace called a gudgeon.

PITCH (TO PITCH): mixture of gum and resin that forms a hard, dry, blackish substance which is used to coat the joints of planking after they have been stuffed with oakum; to cover with pitch.

PLANKING, EXTERNAL PLANKING: all the planks that cover the frames or sides, forming the framework of the vessel. Internal planking is also called ceiling.

POINT, TO: to sail close to the wind.

POOP, POOP DECK: raised deck on the aft section of a castle.

PORT: left side of the ship for an observer located at the stern and looking forward. Opposite of starboard.

PORT, GUNPORT: opening, usually square, made in the sides of a sailing ship to allow for the passage of (the chase of) the guns. There are also smaller ports for oars and ventilation.

PORT LID: a panel used to close the port.

PRIVATEER: vessel outfitted in times of war by individuals to attack, with the permission of the State, ships of the enemy nation.

PUMP WELL: compartment of planks fitted around the foot of a mast and pumps; it forms a square, the base of which rests on the bottom of the ship and the top of which extends to the first deck.

QUARTER GALLERY: small structure, built on the two sides of the stern, fit up to serve as the officers' lavatories.

RABBET: channel or groove made in the planks or a timber (keel, stem) to receive the end or the lower edge of another plank.

RAIL, RAILING: straight, rectangular timber, of varying thickness, used for various purposes.

RAKE (OF THE STERNPOST): distance, from which the perpendicular dropped from the top of the sternpost deviates, from the aft end of the keel.

REEF: fold which a sail makes when its surface is reduced.

REEF TACKLE: small tackle used to hoist the reef band of the sail up to the yard in order to reduce the sail surface.

REPAIRING, REFITTING: work performed by shipwrights and caulkers to restore a vessel after it is has been damaged in battle or during a storm.

RIDER: name of an interior frame set on the keelson above certain chief frames to provide a more solid attachment to the hull.

RIGGING: all the ropes, wires and chains used in working the sails and supporting the masts and yards.

ROYAL, ROYAL SAIL: square sail set above the topgallant sail forming a fourth level of sails on the mast of ships (late 18th century).

RUDDER TRUNK: opening cut into the upper counter at the stern of a ship through which the main piece of the rudder enters.

SAINTE-BARBE: patron saint of gunners, and by extension the name given to the master-gunner's room controlling access to the powder magazine.

SALOON: structure located on the aftercastle used as officers' accommodation.

SCANTLINGS: dimensions of a timber; also extended to mean the dimensions of all parts of the ship's hull.

SCARF: junction or abutment of two planks or wales. There are several types of scarfs: in a plain scarf, the two ends merely touch; with a hook-and-joint scarf, the two ends fit into each other.

SCARFING, SCARF JOINT: method of joining two pieces of wood which meet end to end; the joint may be strengthened by a plate or timber fixed across it.

SCUPPER: holes cut in the wall of a vessel to allow water to drain over the side.

SHEAVE: wooden disk grooved around the edge, suspended by a pin in the case of a block.

SHEET: rope or line attached to the bottom corner of a sail used to haul it in.

SHROUD: fixed line, standing rigging, which runs from each level of the mast laterally to the hull of the ship or the tops.

SLING: heavy rope supporting the weight of the lower yards and taking some of the strain off the halyards.

SMALL BITT: small bitt set close to the masts to hold the cables there.

SNOW: small-tonnage vessel whose masting does not differ from that of a brigantine except for a small trysail mast stepped abaft of the mainmast.

SPECIFICATIONS: detailed statement provided by the shipwright, the mason or any other worker employed on the construction of the ship, outlining the quality, order and layout of their work, the materials to be provided, their price, quantity and any other costs to complete their installation.

SPRITSAIL: square sail bent on the yard of the same name, at the bowsprit.

SQUARE-RIGGED: vessel whose main sails are square.

STANCHION: type of railing composed of upright wooden or iron supports.

STARBOARD: right side of the ship for an observer located at the stern looking forward. Opposite of port.

STAY: any taut line that follows the axis of the ship to which a sail is attached through a ring.

STAY (OF A MAST): large, fixed line located on the longitudinal axis; stays take their name from the masts to which they are attached and which they support against the pitching of the ship (forward and aft motion).

STEM: curved timber extending the keel at the bows of the ship.

STEMSON: heavy timber connecting, on the inside of the ship, the keelson to the stem of the ship.

STERNPOST: heavy timber fixed in the longitudinal plane of the ship, at the aftermost end of the the keel.

STOREROOM: room fitted under the decks of the ship to store supplies and gear.

STRAKE: row of planks or planking applied to the framework of the ship.

STRINGER: planking forming a belt inside the vessel.

TACK: rope used to hold in the weather lower corners of a lower sail when sailing close-hauled.

TACKLE: a lifting device consisting of a reduction gear (combination of two blocks) to hoist a load.

TAFFRAIL: after rail at the top of the stern of a sailing ship.

TON (TONNAGE): unit used to measure the carrying capacity of a ship. The ton as a unit of weight is equal to 2000 pounds and the ton as a unit of volume is equal to a capacity of 42 French cubic feet.

TOP: rectangular, round or semi-circular platform fitted with a railing and located at the top of the lower masts. It is used as a lookout.

TOPGALLANT: third section up of the mast, or sail, on the foremast and mainmast.

TRANSOM (WING TRANSOM): the framework of the aft section of the stern with its horizontal and vertical timbers crossing at right angles to form a grid. The widest transom is the wing transom. Last beam of the stern which is levelled athwartships on the sternpost.

TREENAIL: wooden pin used in the jointing of pieces of the framework.

TRICING LINE, TRIPPING LINE: small rope used to furl or take in the sails; it is attached to the bolt ropes at the foot of the sails.

TYE: rope with a weight at one end which it must lift using a tackle attached to the other end.

UPPER COUNTER: aft section of the hull of a vessel overhanging the rudder.

UPSTREAM: means further in the direction of flow of a river; above, situated upstream. Opposite of downstream.

VANG (OF MIZZEN YARD): line specific to the mizzenmast used to turn its yard.

WAIST: part of the upper deck between the forecastle and the aftercastle.

WALES: series of strong planking, wider and thicker than the skin planking, scarfed and running all along the outside of the ship at various heights.

WATERWAY: heavy timber connecting the decks and walls of the vessel and used to carry the water away to the scuppers.

WINDLASS: large winch, mounted horizontally, used mainly on commercial vessels and performing the same function as a capstan.

WINDWARD (VS. LEEWARD): Windward, said of a boat which in relation to another vessel is located closer to the direction from which the wind is blowing; the opposite of leeward.

YARD: spar or long timber from which sails are hung and on which they are furled.

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Suggested Reading

The study *Rencontre navale sur la Ristigouche* (Quebec: unpublished, 1996), contains the entire scholarly apparatus (*apparatus criticus*) of this publication. The French terminology was taken essentially from the Augustin Jal glossary. For additional information on shipbuilding and on marine archaeology at Restigouche, the reader may also consult the following documents:

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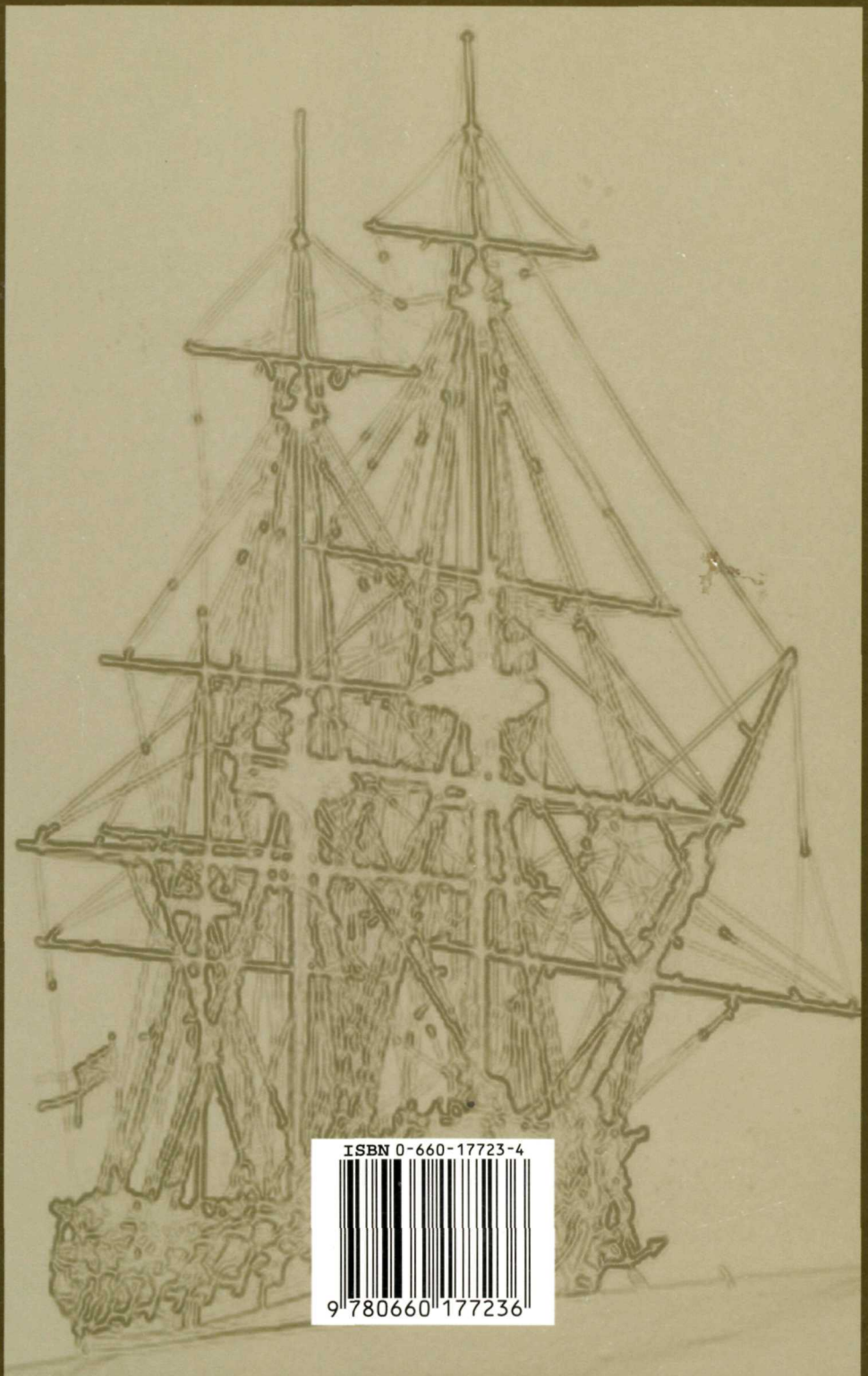

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