SHIPBUILDING IN COLONIAL PORTSMOUTH:

THE RALEIGH

On December 13, 1776, the Continental Congress awarded America's first defense contracts. Congress, aware of the necessity to keep sea lanes open to import war material, and under pressure from the seaport colonies to protect trade, resolved to build thirteen warships. One of these, a thirty-two gun frigate, was assigned to New Hampshire. John Langdon, Marine Committee member and Portsmouth merchant, was appointed to oversee the project. [1] Construction and fitting out of the Raleigh at Portsmouth in the late winter to the summer of 1776 required both the human and material resources of the Piscataqua maritime community and beyond. Contemporary observors in correspondence and newspaper descriptioons reflected a pride of accomplishment. Later regional and local historians viewed the project as a communal expression of revolutionary spirit, noting the involvement of prominent individuals, and commenting on the region's shipbuilding capacity. Naval and marine historians have viewed the Raleigh from various perspectives. On one hand, naval commentary

assessed the Raleigh's importance as a forerunner of American Naval policy, and concentrated on descriptions of her sailing career, sea battles, and capture by the British in Penobscot Bay in 1778. On the other hand, marine historians, intent on tracing the development of American ship design, have contributed exhaustive analyses of the Raleigh's plans, drawn by the Admiralty after her capture.[2]

This essay takes a different tack, seeking both to add to the historical awareness of the Raleigh, and to complement a general understanding of Piscataqua shipbuilding procedures in the late eighteenth century. Although much has been written about colonial shipbuilding, specific studies are conspicuously absent. Due to a lack of primary sources more comprehensive than merchant correspondence and contractual agreements between merchant and builder, scholars have relied on English and French shipbuilding treatises, analyses of the few extant plans of eighteenth century vessels, and trade statistics to deduce colonial practice.[3] However, the financial accounts of the Raleigh's contractor, John Langdon, are available. Analysis of these records, which include a double entry ledger, a daybook, and innumerable receipts, combined with chronological and descriptive documentation, form the basis of this study.[4] Its object is to make clear, insofar as the sources allow, the organizational structure of the project, the occupations, terms of employment and wages of

the men who built the Raleigh, and to indicate the costs and material supply networks for her construction. Departures from a "traditional" understanding of colonial shipbuilding procedures are apparent in the Raleigh's construction, particularly in terms of shipyard organization and discipline, building location, and division of labor, yet any evidence of new techniques or innovation needs to be tested by similar case studies.[5] no ¶

An understanding of the tradition of Piscataqua shipbuilding as well as the economic and political conditions preceding the Raleigh project is necessary to understand the operation itself.

When Congress awarded the building of the thirty-two gun frigate to New Hampshire, it did so on a basis of proven capacity. A natural harbor, an abundance of accessible wood suitable for ship construction, and the ready markets for wood products and fish in Europe and the West Indies encouraged the proliferation of Piscataqua shipyards. In an earlier period, supplying masts for both the Royal Navy and the British merchant fleet had given the region a monopoly that enriched local agents and surveyors as well as creating a demand for transport. Continued expansion of the West Indies trade in the eighteenth century was accompanied by an increase of shipbuilding activity both in Portsmouth and in the tributaries of the Piscataqua close to timber supply. Historians have estimated that one third of New England

shipping tonnage in the decade prior to the Revolution was New Hampshire built. Evidence from merchant correspondence in the 1770s reveals that ships themselves had become a speculative commodity, that, due to imperial trade restrictions, exceeded the market demand.[6]

Piscataqua shipwrights had also demonstrated their prowess in warship construction. In the 1690s, Governor William Phips of Massachusetts, a former shipwright from what is now Maine, secured a contract from the Admiralty, and the Faulkland, a fourth rate man-of-war, was launched from a yard near Portsmouth in 1692. The Bedford Galley of thirty-two guns was constructed locally two years later, and in 1749, Nathaniel Meserve obtained an Admiralty contract for a forty-four gun ship of the line through the services of Sir William Pepperell of Kittery. The America was launched from Meserve's yard near Portsmouth's North Mill Pond, adjacent to the Raleigh's later building site. In the decade before the Revolution, the shipbuilding industry in the region was active, blessed with both a cheap and plentiful supply of timber, and a group of skilled shipwrights.[7]

Imperial escalation of colonial trade restrictions eventually threatened to destroy the industry. According to a tax abatement petition of 1774, local shipping had declined in a decade from 12,000 tons to a mere 500. With the closing of the Port of Boston, Piscataqua merchants began

to rearrange their affairs, withdrawing capital from ship construction. By December 1774, the threat to Portsmouth maritime activity was actual. Royal ships _Scarborough_ and _Canceaux_ were anchored in the stream off Portsmouth, enforcing an embargo. In November of 1775 the Continental Congress prohibited exports of any type, "provided that nothing interrupt the importation of arms." Portsmouth prepared for defense. Following the departure of the Wentworth family in the summer of 1775, the entire fishing community at the Isles of Shoals was evacuated to Portsmouth. Under the direction of men like General John Sullivan of Durham, James Hackett, and Thomas Thompson, crews were organized to fortify the islands at the entrance to Portsmouth harbor, placing log booms across the river in strategic locations. Militia units drilled with muskets while ship stocks were empty or abandoned. As a "barometer of trade", shipbuilding activity forecast the approaching storm. In this atmosphere of anxiety and expectation the New Hampshire Committee of Safety received news of the congressional resolution.[8]

Josiah Bartlett, congressional delegate from Kingston, New Hampshire, wrote to the Committee of Safety on December 16, 1776, informing them of the commission for New Hampshire. Promising to forward "an exact draught of the ship in a few days," he outlined the dimensions: 132 feet on the gun deck, 110 feet 10-3/4 inches on the keel, 34 feet 5-1/2 inches beam, depth of hold 11 feet. Her capacity would be about 700 tons.

Skilled builders were to be hired, and an overseer appointed to keep "Exact and Regular accounts." Money for the project would flow from the Marine Committee of the Continental Congress to the "accountable" overseer who would be "handsomely rewarded." Furthermore, the overseer would be responsible for procuring materials and obtaining a "suitable site, both for convenience in materials and labor, and safety." Bartlett's letter concluded with a note that established John Langdon's appointment as the general contractor.[9]

Bartlett's promise of a draught in a "few days" proved to be wishful thinking. Congress did not approve standardized designs for the Colonial warships until January 13, 1776, when copies were ordered for each of the contractors. By February 3rd, the draught was at hand, but the size of the plans - over five feet long - presented Bartlett with a delivery problem. Finally a suitable messenger was found, and the designs forwarded to Portsmouth via Cambridge.

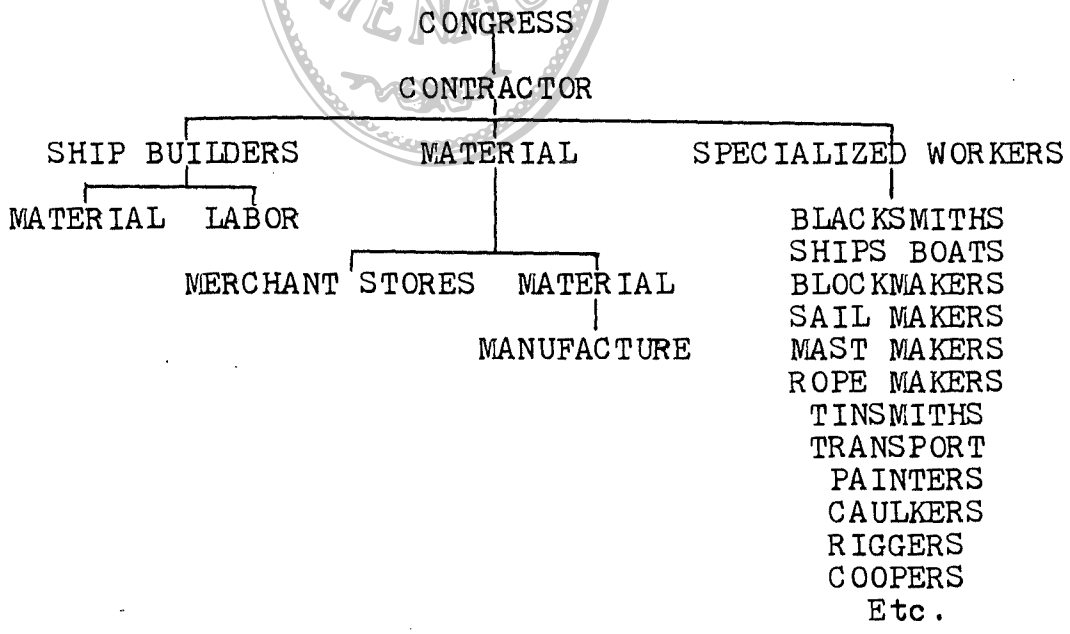
On the same day that the New Hampshire draught arrived in Newburyport to be forwarded to Langdon, he wrote to Bartlett in Philadelphia, "I have got no draught of the ship as Yet - but we are going on with one of our own drawing... pray send me down every necessary from Congress, don't cramp my genius and the ship shall be launched soon." Armed with the specifications and Bartlett's authorization, Langdon had proceeded to hire shipwrights capable of designing the warship to the required dimensions, established a yard and

building site, and was acquiring materials. Construction of New Hampshire's warship was underway.[10] Previously, Langdon had acquired Rising Castle Island across the river from the Portsmouth ferry landing. There he hired a caretaker, established a central depot for the stockpiling of construction materials, and there he also created a personal militia unit, ordering "everyone to attend muster at an appointed hour with a good fire arm. In case of failure they are to be Dismist the yard." More than one hundred men were enrolled by the middle of February. Officers' ranks corresponded to their place in the ship building hierarchy. Langdon became Colonel Langdon and builder James Hackett, Major Hackett. Undoubtedly the atmosphere of military discipline both promoted and maintained a high level of efficiency and organization.[11] Although the Raleigh was built near Jacob Rindge's wharf on the Portsmouth side of the Piscataqua, Langdon's island was the construction site of both numerous privateers and Revolutionary warships, Ranger in 1777, and America in 1778. As a prototype naval establishment the island shipyard combined a central location and military atmosphere.[12]

The business organization of the New Hampshire project was distinct compared to methods used by the other colonies to satisfy their commissions. Pennsylvania awarded contracts to individual shipyards. Rhode Island and New York established committees to select builders, resulting in what one historian

has termed "a political clambake." Silas Deane, Langdon's colleague on the Marine Committee from Connecticut, simply gave the contract to his brother, Barnabas. Thomas Cushing, Marine Committee member from Massachusetts, contracted with Newburyport builders for that colony's warships, Hancock and Boston, on a standard price per ton basis.[13] Langdon, however, retained personal control of New Hampshire's commission.

Serving as his own general contractor, Langdon kept accounts for both labor and material, subcontracted components of the warship to shipwrights and artisans, and purchased materials, either through the builders or directly from merchants and suppliers. The chart indicates the basic arrangement:[14]



Three shipwrights were employed for both specialized functions and overall direction. The masts were contracted separately, contracts for the ship's boats let out to local boatbuilders, and craftsmen, including blacksmiths, joiners, caulkers, painters, riggers, and sailmakers, were hired according to their functions and sequence in the building schedule. Locally available raw material was supplied by the builders who, in turn, billed Langdon. Gondola men and draymen transported the materials to the yard. Other necessary materials, Langdon either purchased from local merchant stores, or from Boston or Providence merchants. [15] The organizational chart suggests simultaneous material acquisition and production. However, the sequential nature of ship construction, as well as difficulties of transport, distance from supply, and availability of strategic materials, complicated the building process. Fortunately, because the financial accounts indicate terms of employment with a general description of the functions of the various workers, an approximation of the process, as well as specific procedures used in the Raleigh's construction, is possible.

Congress allowed approximately $66,000. per ship for each of thirteen warships. This included material, labor, two suits of sails each, and the armament. Canvas and gunpowder, unavailable in the Colonies, would be imported. Dimensions and tonnage for each ship were specified, and Congress eventually approved standardized draughts. The builders of the

Raleigh, however, produced their own design. Apparently this was acceptable practice because only two of the thirteen warships were built according to the approved draughts, although they all generally conformed to the specifications. Langdon proceeded on the authority of Bartlett's note. However, during January and February he sought and obtained formal authorization as well as additional rigging specifications from the Marine Committee. Actually, the contract specified only the size of the ship, the number of guns, conditions for payment, and an approximate cost.[16]

Design and construction of the Raleigh has been credited to three shipwrights, James Hackett, James Hill and Stephen Paul. Both Hackett and Hill were shipyard owners in their respective towns of Exeter and Newmarket. Stephen Paul was a fourth or fifth generation shipwright from Kittery.[17] Either individually or collectively they were responsible for not only all construction operations, but also the design, the selection and delivery of the natural growth timbers and structural members of the hull, the lofting process that enlarged and transfered common reference points from the draught to full-size patterns, preparation of the building site, launching, and overseeing the masting, rigging and completion of the ship.

Historical opinion attributes the design of the Raleigh to James Hackett, or to his cousin, William. In eighteenth century understanding, warship design meant a draught that indicated the lines of the ship from three

viewpoints: a cross section through the hull, that established the curves of the sides through sections or "stations", a plan or "halfsbreadth," that spaced the sections and illustrated the curves of the hull from above, and an elevation, or "profile," which depicted the bow, stern, and the sheerline, as well as "waterlines" and other reference points. From this draught, shipwrights and their crews enlarged the dimensions and transposed them to full size patterns according to the common reference points. With a knowledge of the sizes and curves of the ship, the shipwrights selected, either from local woodlots or previously cut stockpiles, the necessary timbers and structural members to conform to the patterns. Making the exact dimensions of the patterns on the timber completed the "lofting" process, and laborers, working either in tandem in a pit-saw operation, or singly with crosscut saws, cut the frame components -futtocks- and other timbers to the appropriate shapes.[18]

The financial records attest to the employment of the three shipwrights from the first of February through the first of June. Later positive evidence of his design prowess, as well as Langdon's testimonials, affirm the overall leadership of James Hackett. Both Hackett and Hill were referred to as "shipbuilders" by their accounts with Langdon, while Stephen Paul was designated "ships carpenter." James Hill's bill for £975.0, "on acc't of timber he purchased for the continental service", indicates at least one of his particular

functions. All three shipwrights were paid for "labour and sundry expenses" as well as receiving monthly credits for work done. Evidently they brought and used their own crews of apprentices and journeymen for the project. Stephen Paul's earnings suggest that he was responsible for a majority of the labor force.[19]

To oversee the project, and be Langdon's eyes and ears at the site, Langdon hired his friend and political henchman, Thomas Thompson. Officially, Thompson was project supervisor and inspector. He also kept accounts for the labor payroll, returning two bills: one on June 4, 1776 for £910.14.3 for cash "paid at several times to labourers and carpenters," and the other for £863.10.9, covering 132 days from the end of April to the 21st of July, ~~and~~ including Thompson's own charge for inspecting the ship at 12 shillings per day, or £79.4.0. total. Langdon's recommendations secured Thompson the appointment as Raleigh's first captain, and, after the completion of the ship, Thompson was responsible for the recruitment and maintenance of the crew, as well as normal command responsibilities.[20]

During the same period that the shipwrights and their crews were occupied with design, lofting, and preliminary timber preparation, Langdon hired blacksmiths Henry Sherburne and George Hart to produce the Raleigh's iron work. Although the materials in eighteenth century warships were oak, hemp

and canvas, and most fastenings were locust or hickory trenails, or "trunnels," iron bolts were used to pin together certain parts of the structure. For example, the keel for the Raleigh was a piece of oak 110 feet long and approximately fourteen inches square. Undoubtedly it was composed of more than one log, and probably consisted of three or four pieces, attached to each other by "scarfe" joints, and pinned with at least four bolts of one inch or more in diameter. In addition, other structural members, such as stem, sternpost, floorbeams and hanging knees would be joined in similar fashion. Later iron work included the innumerable eyes, rings, sheave pins, chain stays, mast trees and rudder attachments, as well as an iron hearth for cooking facilites. As construction proceeded, the shipwrights and labor crews were kept supplied by the steady production of the smiths. Apparently they supplied most of the iron from personal stocks, excepting sheet iron for the hearth and steel for tools. Both Hart and Sherburne were steadily employed from February through June.[21]

Langdon hired Moses Noble, a Portsmouth joiner and mast maker, to build the Raleigh's masts. In eighteenth century design practice, the dimensions of a mast were calculated as a function of the ship's breadth or "beam." According to the English "Establishments" of 1754, a mainmast, for example, would be, in length, two and one half times the breadth of the ship, and in diameter, three-quarters of an inch for every foot of beam. The thirty-four foot beam specified

for the Raleigh determined a mast length of 85 feet and a diameter of 25-1/2 inches. The masts Noble produced, however, were both shorter and thicker, being 81 feet tall and 27-inches in diameter. The other masts, that included mizzen and foremast, topmasts and top gallants for each of the lower masts, as well as the spars, booms and yards, were calculated in a similar manner with varying ratios. After establishing the ship's needs, Noble selected the proper trees from various suppliers, and probably supervised the felling and arranged transport to the work site. There the logs were first hewed square with broadax and adze, then eight-sided and sixteen-sided. Finally they were rounded according to specifications with planes and drawknives. Oak cleats were fastened along the axes of the masts around their circumference where chafe would occur. The masts were finished with an application of a mixture of rosin and tallow. Noble based his estimates of mast log prices on those of previous Royal Agent Edmund Parry. Noble and his fellow worker, Jack Marden, were paid in advance for the logs, agreeing formally to forfeit the payment if the spars were not finished and delivered according to schedule. Although Moses Noble was one of the few recorded workers on the Raleigh project who refused to sign the Association Test, evidently his need for employment and Langdon's need for his skills precluded his politics. Employed from February through the first of June, Noble was undoubtedly also involved in the complex process of stepping

and rigging the masts.[22]

By the middle of March, the preliminary work of design, lofting, and timber acquisition had proceeded to the point where actual construction began.[23] Crews, under the shipwrights' direction, laid the keel on holding blocks, and erected and fastened the stem, stern post and wing transom to it. Floor beams were spaced along the keel according to the draught, and construction of the frames followed. As the skeleton of the ship gradually emerged, it was braced longitudinally with ribbands, light planks that ran along the sides, and were shored to the ground to assure stability. As the frames rose from the keel and the "futtocks" were pieced together by the framing crew, another crew began the planking operation, shaping and fastening each oak plank to every frame. For the warship, thicker planking was used at the level of the gundeck, along with heavier deck beams and bracing.[24] As the Raleigh took shape under the direction of the builders, and while mastmaker and blacksmiths labored, Langdon hired other skilled workers.

Ship's boats were essential to the Raleigh, used for the obvious life-saving function as well as obtaining supplies, ship to shore communication, and ceremony. In late March, Langdon hired local boat builders William Blunt and Nathaniel Melcher. The process of boat design, lofting, and construction was similar to the procedures used for ~~larger~~ ships. However, the reduced scale of the project, and the relative lightness of

materials encouraged small boat shops, directed by one man with an apprentice or two. That both the service requirements differed according to type, and that the status of the owner was reflected in the quality of finish is apparent in the boats produced by Blunt and Melcher. Pinnaces and barges were long, narrow, and fine lined boats with small square sterns, used as naval ship boats, but also by officials in water born ceremonies and parades. The Raleigh's barge was thirty-two feet long, and was delivered by William Blunt complete with twenty-three nine-foot "square loom'd scoop't blade oars," at a cost to the Continent of £68. A 1778 inventory of the Raleigh's equipment reveals that the barge had cushions for the officers as well as uniforms for ten oarsmen. Nathaniel Melcher's yawl boat was completed in June for £14. Yawl boats were more utilitarian in purpose, having a greater breadth or beam for their length than the officers' barge, and finished in a plainer state. Materials for these boats were locally available. Pine planked and oak framed, the wood was purchased from the stockpiles available on Langdon's island. Oars were fashioned from spruce or ash, depending on their service. Nails were purchased from the stores of local merchants, and local blacksmiths fashioned the rudder fastenings and iron tillers. Both Melcher and Blunt were employed by Langdon from the end of March to the beginning of June, when the boats were delivered and accounts settled.[25]

Also, in late March, Langdon attempted to solve the

problem of rope, or "cordage," necessary for the Raleigh's rigging, anchor cables, and hawsers. The ropemaking industry existed in every seaport. Essentially it was a process of twisting together fibers of hemp that had been "crushed and hackeled". Rope walks, which were long sheds of one thousand feet or more, had existed in Portsmouth before the middle of the eighteenth century, both at the North and South Mill Pond building sites. To produce the 14,640 feet of line needed for the Raleigh's rigging, and the approximately 3000 feet for anchor cables and hawsers, Langdon leased a ropewalk from George Wentworth, hiring Wentworth back to manage the production, keep accounts of hemp, cordage, and cash, hire the necessary labor, and to maintain the equipment. Langdon agreed to provide additional equipment and to pay weekly in cash. Although this local manufacture supplied much of the Raleigh's cordage, all the raw materials had to be imported, and additional line purchased from other sources. Wentworth signed the contract in late March, and the ropewalk operated in Langdon's name through May.[26]

By the middle of April the Raleigh was a recognizable ship. The framing was completed, and planking and decking were nearly finished. Langdon hired additional artisans as they were needed for finishing. George Libbey of Portsmouth provided the materials and crew for caulking. As the plankers fitted the planks to the frames, they beveled the edges of each plank to leave a gap on the outboard side. Caulkers "payed" these

seams with a mixture of tar, pitch, and turpentine, then, using wooden mallets and iron wedges - "caulking irons," pounded twisted strands of tarred fiber from old rope or canvas into the seams to provide a waterproof seal and a flexible expansion joint. After the caulking was driven home in every seam, the underwater surfaces were "graved", that is, painted with a mixture of tallow and resin boiled together, sometimes with the addition of brimstone and fiber, such as horsehair. The "graving" process was the eighteenth century equivalent of anti-fouling measures. Libbey and his crew worked through April until the launching date in May.[27]

Painting the Raleigh probably consisted of oiling the topsides - the sides of the hull above the waterline - with a mixture of turpentine and oil, that, with time, turned the sides a dull yellow. Rails and thicker planks may have been picked out in black giving a striped effect. Decks were oiled, and the bulwarks usually painted red or brown. Paints were expensive commodities in the eighteenth century, and highly painted ships usually reflected the owner's status and fancy. In the Raleigh paint was probably reserved for the decorative details, including the stern and quarter gallery carvings, and the figure head. Joseph Simes, a Portsmouth selectman who had worked for Langdon in the same capacity on earlier ships, contracted for the painting work, providing materials and crew. The painting began in late April and finished in June.[28]

With the hull nearing completion other artisans contributed their skills. Daniel Hart, a joiner, was employed from April through May, to finish the interior, build furniture for the officer's quarters, and provide finish carpentry wherever it was needed. John Fernald, a local tinsmith, leaded the scuppers along the sides of the deck and the bulwarks. Henry Sherburne, the blacksmith, built a hearth for the galley near the foc'sle. By May 20th, shipwrights were finishing launching ways, the hawsers and anchor cables were aboard, and Langdon reported the imminent launching. On May 21st, maintaining silence in the yard and by use of well-timed signals, workmen chopped the holding blocks away, and the Raleigh slid down the greased ways into the Piscataqua.[29] Langdon's description in the Freeman's Gazette was enthusiastic.

> On Tuesday the 21 inst. the Continental Frigate of 32 guns, built at this place, under the direction of John Langdon, Esq. was launched amidst the acclamation of many thousand spectators. She is esteemed by all those who are judges that have seen her, to be one of the compleatest ships ever built in America. The unwearied diligence and care of the three Master Builders, Mess. Hackett Hill and Paul, together with Mr. Thompson under whose inspection she was built, and the good order and industry of the Carpenters deserve particular notice: scarcely a single instance of a person's being in liquor, or any differences among the men in the yard, during the time of her building, every man with pleasure exerting himself to the utmost: and altho' the greatest care was taken that only the best of timber was used, and the work perform'd in a most masterly manner, the whole time from her raising to the day she launch'd did not exceed sixty working days, and what afforded a most pleasing view (which was manifest in the countenances

> of the Spectators) this Noble Fabrick was compleatly to her anchors in the main channel, in less than six minutes from the time she run, without the least hurt: and what is truly remarkable, not a single person met with the least accident in launching tho' near five hundred men were employed in and about her when run off. 30

Much remained to be done. Blockmakers Paul Laighton, John Dennett, and William Greene worked from May to September, hand carving the various blocks, parrels, dead eyes, rings, and thimbles necessary for rigging and control of sails, masts, and yards. For a ship the size of the Raleigh approximately 600 of these were needed, of varying shape and complexity.[31] The Raleigh's masts were stepped by June 14th, and Langdon reported that the ship was all painted, carved work completed, "masts and yards all compleated, all in, all standing rigging overhead and rattles down." The ships boats were delivered, and the "sails soon to be compleated."[32] Specific identification of the sailmakers and riggers is not possible. Rigging and sailmaking were traditionally done by mariners. and the financial accounts do not specify either particular individuals or operations. The additional employment of Samuel and Richard Jackson, Francis King, and George Turner following the launching suggests their involvement in either or both of these operations.[33]

By the middle of June, Langdon was settling accounts and dismissing the work force, "except for two or three to make cleats, etc.." A week later he reported that "the top gallant masts were all on end," and that the Raleigh with "the ports all hauled up makes a grand picture, as handsome a

ship as can be built in the Kingdom (seasoning of timber excepted)." [34] In July the riggers finished, and, although certain craftsmen, such as the blockmakers and cooper John Cutts, who built the casks and barrels for the Raleigh's provisions, were occupied with finishing and equipping the ship through September, the construction process ended. By employing a multiplicity of skilled workers for specific tasks - a functional separation of labor - the contractor assured the rapid construction of the warship and demonstrated an efficient building procedure. [35] The relative value of individual skills is illustrated by the wages paid to the workers and total payments made for particular jobs.

At the top of the skilled hierarchy were the three ship builders, Hill, Hackett, and Paul. They were individually credited in Langdon's double entry ledger on a bi-monthly basis. The frequency of a credit of £21.12.0 suggests a guaranteed minimum wage, that can be calculated as approximately £1.7.0 per day. Apparently, all three were paid the same rate, and variance in their earnings suggests that they were credited according to actual time and labor spent on different functions. For example, James Hackett, the designer and presumably the overall director of the project, earned the standard wage every month except May, when he was credited with just £2.0.0. Yet Hackett was also credited with two payments of £108.0.0 each in February and April, and one £43.0.0 in March. A final payment in late June of £51.0.0, plus an additional

£ 177.12.9 "for labour and sundry expenses", settled his account. Accounts of the other builders reveal a similar pattern, with varying amounts. James Hill received £ 21.12.0 for three months, February, March, and again in June. The credit to his account in May was £ 15.0.0, and at the settling he received £ 101.0.2 plus £ 140.12.9 for "labour and sundry expenses." Stephen Paul made £ 21.12.0 in February and June, with all other monthly credits exceeding that amount, particularly, his final charges of £ 247.12.9. Paul's labor and expenses came to £ 484.6.9. By themselves the figures are ambiguous. Combined with an understanding of a partial division of function, they make more sense. Hackett, as designer, received the bulk of his payment during the period of his greatest labor, in preparing the design and lofting the patterns. Evidently he was either not needed during the last weeks before launching, or failed to submit a bill. As the former is unlikely, his final payment on June 27th represents charges unaccounted for previously. James Hill received the standard wage for the first two months of construction. Yet, as the timber procurer, this period was one of intensive labor for him. Langdon's payment of £ 975.00.0 to Hill for the timber probably included Hill's labor costs. In like manner, the credits to Stephen Paul increased from February to late April, coinciding with the increase in the number of workers performing different but simultaneous tasks. The final payment to Paul, as well as the credit for "labour and sundry expenses" can be

interpreted as a settlement for previously unbilled charges. Totals for each builder as well as the collective shipwrights payments are illustrated by the chart. [36]

	James Hackett	James Hill	Stephen Paul
February	£ 21.12.0	£ 21.12.0	£ 21.12.0
	108. 6.3		
March	21.12.0	21.12.0	
	43. 0.2	39. 0.0	36.12.0
April	21.12.0	32.12.0	43. 4.0
	108. 6.3	42. 0.0	79.16.0
May	2. 0.0	15. 0.2	43. 4.0
June	21.12.0	21.12.0	21.12.0
	51. 0.8	101. 0.2	247.12.9
	399. 9.6	295. 8.4	493.12.9
Plus labor	177. 9.6	140.12.9	484. 6.9
Total	£ 577. 2.5	£ 436. 1.3	£ 977.19.8

Total to the three shipwrights * ..... £ 1991. 2.8

* Includes payments for their crews, unspecified in number or worth.

Among other specialists who were paid £ 21.12.0 at various times were the blacksmiths, the mast maker, mast supplier Joshua Wentworth, and the provisioners, Benjamin Bigelow and Richard Truesdell. The smiths' accounts, credited from February through June, were not settled until October. Total cost of the ironwork, which included materials, came to over £ 600.0.0.

In June Moses Noble was paid a total of £ 153.0.0 for the mast work, exclusive of material. Dividing this total by his term of employment establishes his average wage at £ 30.0.0 per month. Included in that average is the amount Noble paid his helpers or apprentices. Although £ 15.0.0 was the largest monthly payment to boatbuilder William Blunt, he charged £ 68.0.0. for the highly finished barge, a sum that included both material and labor, and that approximates payments to the skilled smiths and mastmakers. Similarly, Daniel Hart was paid £ 40.13.6 for two month's joiner work. Blockmakers and other skilled workers, such as riggers, sailmakers, tinsmith and cooper, received less. Paul Laighton, William Greene, and John Dennett divided between them equally £ 235.11.5 for the Raleigh's blockwork, completed in a four month term. The cooper, John Hart, was paid £ 23.6.0 for his work in June and July. Calculating from these totals on the basis of a twenty-six day work month allows an approximate scale of daily wages. [37]

Shipbuilder	£ 1. 7.0
Ship's boats builders	1. 4.0
Mast maker	1. 2.0
Joiner	0.16.0
Blockmaker	0.14.0
Cooper	0. 8.5

Although the amounts paid to skilled workers, which includes labor provided by them in the form of apprentices

and journeymen, are clearly represented by the financial accounts, the number, identification, and wages of unskilled labor involved in the project are by no means apparent. Yet a labor return by the inspector of the America, finished by essentially the same crew in 1778, indicates a relative wage scale and identifies both skilled carpenters and laborers. For example, William Hackett, a carpenter on the America crew, received nine shillings per day. Less skilled workers, Joshua Jones and Roger Rackley were paid 6-1/2 shillings, and laborers John Spinney and Cesar Gerrish charged £0.3.6 and £0.4.0 respectively.[38] By this time Inflation and scarcity of labor had affected prices, and a direct comparison with 1776 wages is misleading. However, an internal comparison of relative differences is possible. A carpenter made more than double the unskilled workers wage, and one and one-half the wage of a medium skilled worker. Transposing this scale to the Raleigh work force, we can speculate that a laborer would receive less than half the daily wage of a joiner, while an apprentice or journeyman working under the direction of a skilled carpenter might obtain two-thirds of the carpenter's rate. Bills for the painting and caulking of the Raleigh are not available. Yet on the bases of work done on both earlier and later ships, Joseph Simes and his crew were paid approximately £300.0.0, including materials, to paint the Raleigh.[39] Other workers maintaining accounts with Langdon were "gondola"

men, draymen, and captains who transported materials to the building site. Samuel Ham, for example, rented his gondola for £1.4.0 per day to provide the Raleigh's ballast. Captain Mark Fernald delivered canvas from Blue Hill Bay, and Truckman Samuel Hall received £39.0.0 for transporting cannon from Cambridge.[40]

There remains the question of John Langdon's remuneration for the general contracting. Undoubtedly the success of the project earned the approbation of Congress and Marine Committee members. Langdon was able to establish important commercial and personal connections with Robert Morris, merchant-financier of Philadelphia. The Langdon shipyard won contracts for two more warships and Portsmouth was designated a Naval district. Langdon himself was appointed Naval agent for the district, ensuring lucrative commissions for the building and fitting out of ships in the Continental service.[41] Langdon also supplied certain materials to other colonies. For example, the spars and masts for Rhode Island's warships came from New Hampshire forests through Langdon's efforts. More tangibly, Langdon charged commissions for both the building and fitting out of the Raleigh. Traditionally, the merchant who commissioned a ship agreed to furnish those materials that were not locally available to the builder. Iron work, cordage, and canvas were such commodities. For his efforts in providing this service the merchant charged a

commission that was either absorbed by the ship's cost to a potential buyer, or, if the merchant kept the ship in his service, that was reflected in its insured value. In effect, then, the Continent was purchasing the Raleigh from New Hampshire, and the ship's value was a combination of labor and material costs plus commissions according to the contractor's accounts. Unfortunately, the accounts do not indicate Langdon's individual charges for the Raleigh specifically, but, when he was called to account for expenditures, Langdon stated his practice with some force: "And most Certain, for building of ships is worth 5 p Cent or its worth nothing."[42]

Knowledge of the precise amounts of various materials used in the construction of the Raleigh is likewise difficult to assess. Some materials were purchased in volume and their use was unspecified. The Raleigh was built entirely of oak, except for her decks that were pine planks, and her spars, that were pine or spruce. His bill of £975.0.0 suggests that James Hill supplied the oak timbers, but the specific timber needs of the Raleigh are unknown and much of the timber may have been stockpiled for future use. Similarly, Langdon purchased lumber from a variety of sources during this period, including John Sullivan and Stephen Cogan of Durham, and Ephraim Robinson of Dover. These men were sawmill owners in their respective towns and undoubtedly supplied wood used in the Raleigh. Langdon also purchased spars and masts from suppliers in Berwick, Yarmouth - in what is now Maine, and Somersworth.

In some cases the transactions were direct and in others the stock was purchased by Moses Noble and the costs charged to Langdon. The origin of the particular spars used in the Raleigh is unknown. What is apparent, however, is that Langdon, his builders, and skilled workers, maintained connections or networks of supply for timber and spar material that included the hinterland of the Piscataqua basin as well as the downeast coast. Payments for timber were calculated at £4./ton, while masts and spar stock were priced according to diameters.[43]

Lumber & Spar Suppliers 1776-1777

Lumber

Ephraim Robinson	Dover	Merchant-wood
John Sullivan	Durham	Sawmill owner
Stephen Cogan	Durham	Sawmill owner
James Hill	Newmarket	shipbuilder
Thomas Palmer		
J. Hackett	Exeter	shipbuilder

Timber prices: £4./ton

Masts

			amount of account and/or size acquired
J. Whipple			200. 0.0
John Abbott	Berwick		
John Wentworth	Somesworth		21.12.0
Daniel Drinkwater	Yarmouth		6./inch (dia.)
Thomas Gilpatrick		delivery	3.12.0

Much of the rope for rigging and anchor cables was produced in Wentworth's leased ropewalk. Yet additional cordage was purchased from the merchant stores of Nathaniel Sparhawk of Kittery, and the raw materials of hemp and yarns came from Boston merchants Thomas Cushing and Henderson Inches.[44]

Rope and Cordage Supply

Local Manufacture	George Wentworth	£ 64. 6.4	
	Cost of manufacture.....		£ 64. 6.4
Local Merchants	Nathaniel Sparhawk	£ 293. 5.0	
	John Langdon	5.11.3	
	Woodbury Langdon	3.12.6	
	Cost of Purchased Cordage.....		302. 8.9
Boston Suppliers	Thomas Cushing (hemp)	£ 337. 6.3	
	Henderson Inches (yarns)	121. 7.0	
	Cost of Raw Materials.....		458.13.3
	Total cost.....		£ 825. 8.6

Other materials, including nails, paint, caulking supplies, anchors, tools, and compasses were available either from Boston or Portsmouth merchants, or were provided from the personal stocks of the particular tradesman. For example, Williamm Langdon, a Portsmouth tanner, delivered five green hides

to be used for rigging purposes and pump leathers. George Libbey itemized the caulking supplies and equipment. Iron for the Raleigh was available from the smith's stock, except for sheet metal that was procured from Boston. Langdon himself charged for miscellaneous tools.[45]

Although timber, lumber, spars, and steer hides were local products, , it is apparent that the New Hampshire builders were dependent on imported materials. Iron, steel, and hemp, as well as manufactured products, came to the colony from external sources, and their replenishment depended upon trade and continual imports. The scarcity of canvas for sails was particularly frustrating. There was no sailcloth manufacture in the colonies before 1790, although both Massachusetts and Connecticut had encouraged the industry in the 1720s. British monopolistic legislation in 1746 destroyed the development of the industry by resolving that "every ship built in Great Britain or in any plantation shall upon her first setting to sea one complete set of sails manufactured in Great Britain." Failure to comply with the act carried a £50 penalty or six months imprisonment. The best imported sail cloth was made in Russia and Holland, and this, with French cloth, was imported illegally into the colonies before the Revolution cut off the trade completely.[46] Congress had recognized the problem and in February had commissioned Langdon to send out a ship to import sail cloth. Evidently this

mission was only partially successful. Some of the Raleigh's canvas was delivered to Portsmouth by Captain Mark Fernald in June. Hearing of a shipment of Russia Duck that had arrived in Providence in late April, Langdon used political pressure from the Marine Committee to secure canvas for the Raleigh. Robert Morris wrote to Nicholas Browne of Providence directing him to "immediately send forward 100 pcs. Russia Duck.... to John Langdon of New Hampshire for the use of the Continental Frigate building there." Langdon wrote to Browne also, requesting 150 pieces to be sent overland to Ipswich "from where I have them by water without risk to the continent." Eventually the canvas arrived. Sails were also purchased from Thomas Russel of Boston.[47]

Arming the Raleigh proved to be Langdon's greatest supply challenge, as well as his ultimate frustration. Although the Raleigh was launched in sixty days, and fully rigged and equipped by the end of summer in 1776, it was September, 1777, when she finally set sail for France, still without her guns. The story of Langdon's failure to obtain cannon includes elements of political favoritism, envy, over-pricing, poor administration, and personal animosity. A detailed narrative of the repeated efforts and failure to obtain armament is beyond both the scope and the intent of this paper. Briefly, however, the Browne foundry in Providence was casting cannon, and Langdon expected to acquire them. Nicholas Browne evidently intended to reserve the cannon for

the Rhode Island frigate, although her construction had lagged far behind that of the Raleigh. Langdon's use of political pressure to obtain the cannon for New Hampshire backfired, and Browne raised the price of the cannon to a level that infuriated Langdon, causing him to curse the day he accepted the commission. Eventually cannon were delivered from a foundry in Cambridge, but proved to be worthless as "they exploded upon proving." The Raleigh was finally armed in France.[48]

Thus, materials for the Raleigh depended on a variety of sources. Local networks among wood cutters, builders, craftsmen and merchants supplied the one raw material that was abundant, wood. Similarly, local merchants and artisans were able to provide other materials from their stocks. Those fittings and raw materials, such as anchors and hemp, for example, that were unobtainable in New Hampshire, were purchased from Boston merchants. Sail cloth, however, was scarce, and its availability demanded the protection and maintenance of routes European trade. Finally, colonial casting facilities for cannon were either rare or inferior. Those few capable foundries were backlogged with orders and subject to political pressures and priorities that were often subserved by financial self interest. Dependence on imports and strategic materials that were controlled by external sources hampered production, while local supply networks facilitated a rapid and efficient completion.

Local autonomy in all successful phases of the Raleigh's

construction characterizes the project. The terms of the contract for the Raleigh were vague, and although Congress promised standard designs, the Raleigh's draught was a local product. Similarly, Congress estimated an average cost and sent money in installments, but the distribution of capital was the responsibility of the contractor. Furthermore, Langdon's business methods, material acquisition practices, and ship yard organization all illustrate an individual and local discretion. If connections with Congress were vague and time consuming due to distance, political machinations, and the nature of bureaucratic decision making, a marked contrast is apparent in the salient features of the New Hampshire operation.

The choice of an urban building site and the development of the island yard, as a means of stockpiling materials and of providing a focal point for the mobilization of maritime skills and labor, attests to a high degree of centralization. All materials were delivered to the yard, and workers gravitated toward employment opportunity. James Hackett and James Hill, for example, left homes and businesses to relocate in Portsmouth, presumably bringing their individual crews with them. The urban setting provided a labor pool of men, both skilled and unskilled, that may have offset greater material costs. Likewise the organization of the shipyard militia implies a strong central authority and suggests a structure

characterized by order and discipline. Langdon's accounts by themselves, exhibit the centralization of financial authority as well as illustrating particulars of the organizational structure. Subcontracting the ship's components to individual craftsmen underlines the centrality of the contractor, but more significantly, indicates a separation of function with specialized areas of production and expertise. These functions are further defined by employment terms and payments. Also, the logistics for the Raleigh are clarified by the payment to merchants and suppliers from one source.

A central authority, division and specialization of labor, military discipline, as well as the evidence of efficiency and speed in the building of the Raleigh, denote a strong well-defined organization. Although external conditions of supply and lack of strategic materials eventually frustrated the ambitions of the builders, Continental Congress recognized the success of the Raleigh's construction by appointing Langdon Portsmouth Naval Agent and by assigning his island yard two more warships in October of 1776. Moreover, in 1801, a permanent naval establishment was established in Kittery. Origins of the American defense budget and the beginning of a military industrial complex is one thing; colonial shipbuilding practice is quite another. From a perspective which focuses on the latter, the building procedure of the Raleigh raises questions. Were the methods illustrated

by Langdon's prganization unique? Was it an ad-hoc effort spawned by the political or economic exigencies of Revolution, successfully delivered and raised by the enthusiasm of patriots? Or, if the techniques represented a visible link in a continuum of developing ship construction and business procedure, what were the antecedents of these methods and how were they modified? The answers to these questions depend on future research among the records of merchant builders, shipwrights, and naval contractors.

Notes to the Text

1. William Bell Clark, ed., Naval Documents of the American Revolution, (Washington, DC, 1969), vol.3, 90; Howard Irving Chapelle, The History of the American Sailing Navy, (New York, 1949), 55,59.

2. New Hampshire Gazette, Freeman's Journal, May 25, 1776; Belknap Jeremy, History of New Hampshire, (Boston, 1791), c. II, 407; William G. Saltonstall, Ports of Piscataqua, (Cambridge, MA, 1941), 95-98; Nathaniel Adams, Annals of Portsmouth, (Portsmouth, NH, 1825), 260; Richard Upton, Revolutionary New Hampshire, (Hanover, NH, 1936), 112; Gardner Weld Allen, A Naval History of the Revolution, (Cambridge, MA, 1913), 32; American Neptune, I, 1941, 168-170; Howard I. Chapelle, "The Design of the American Frigates of the Revolution and Joshua Humphreys," American Neptune, 9, 1949, 161-168; M.V.Brewington, "The Designs of our First Frigates," American Neptune, 8, 1948, 11-13.

3. Howard I. Chapelle's The History of the American Sailing Navy, (New York, 1949), The History of American Sailing Ships, (New York, 1970), and The Search for Speed Under Sail: 1700-1785, (New York, 1967), trace colonial shipbuilding through a variety of sources, primarily the few extant plans of eighteenth century ships. The most comprehensive treatment of colonial shipbuilding, Joseph A. Goldenburg's Shipbuilding in Colonial America, (Newport News, VA, 1976) relies on shipping statistics to indicate volume and type of ships built, and enumerates a variety of practices ~~without being specific~~ Goldenburg's opinion on the state of colonial shipyard organization is challenged by the findings of this paper.

4. The Langdon Papers, New Hampshire Historical Society, Concord, New Hampshire, consist of four boxes of correspondence, bills, receipts, etc, as well as two account books, one a daybook and the other a double-entry ledger. Particularly detailed in the account books are Langdon's business activities during the Revolutionary period of 1775-1780.

5. The lack of specific studies is noted by Goldenburg in Shipbuilding in Colonial America, and Carl Bridenhaugh suggests in his Colonial Craftsmen that builders' accounts exist for comparison.

6. Belknap, The History of New Hampshire, vol.III, 197, chapter 8; Bridenbaugh, Colonial Craftsmen, 108; John Cook Parish, Shipbuilding in Portsmouth from 1740 to 1800, unpublished Dartmouth College senior thesis, 1936, 5, 19-20,25. Saltonstall, Ports of Piscataqua, 1-69.

7. History of the American Sailing Navy, 47; New England Historical and Geneological Register, 1868, vol.22, 393-402; Granite Monthly, 59, 22-30.

8. Ports of Piscataqua, 91; New England History and Geneological Register, 1869, vol.23, 50-59; Naval Documents, vol.I, 34; Revolutionary New Hampshire, 29; Nathaniel Bouton, Provincial Papers Relating to the Province of New Hampshire from 1764 to 1776, (Nashua, NH, 1873), vol.VII, 376-390, 425, 428, 492, 495, 500, 506, 580, 632, 635, 642,650,673, 709.

9. Brewington, "The Designs of Our First Frigates," 13; Frank C. Mevers, ed., The Papers of Josiah Bartlett, (Hanover, NH, 1979), 33.

10. Naval Documents, vol. IV, 79; Brewington, "The Designs of Our First Frigates," 14, 17; Ports of Piscataqua, 96; Bartlett Papers, 36; The History of the American Sailing Navy, 59,65.

11. Nathaniel Bouton, State Papers Relating to the State of New Hampshire During the Period of the American Revolution from 1776 to 1783, (Concord, NH, 1878), 73; Naval Documents, vol.4, 33; Langdon Papers, New Hampshire Historical Society, Box 2 folder, 15, 17.

12. Naval Documents, vol.4, 41; vol.6, 1308; vol.7, 223; Peter Force, American Archives, Ser.IV, Vol.IV, 1477.

13. The History of the American Sailing Navy, 52-61; American Neptune, 8, 1948, 22.

14. Interpretation of the contracting procedure and material acquisition is based on the Langdon papers and account books. These occupations are listed as well as suppliers of materials and transporters. Individual accounts will be made clear during the analysis of the process, wages, and materials.

15. See page 29, 31, and material supply lists in Appendix.

16. A Naval History of the Revolution, 23-25; Bartlett Papers, 42; Naval Documents, vol. 3, 90.

17. Ports of Piscataqua, 96; Charles H. Bell, Exeter in 1776, (Hampton, NH, 1972), 239-244; American Neptune, 8, 1948, 13; Everett Stackpole, Old Kittery and Her Families, (Lewiston, ME, 1903); Charles Henry Page, The Pioneers of Maine and New Hampshire: 1623-1660, (Baltimore, 1965),156.

18. The History of the American Sailing Navy, 24-26; Search for Speed, 13; Shipbuilding in Colonial America, 86-87.

19. Naval Documents, vol.2, 159; "John Langdon Double Entry Ledger," New Hampshire Historical Society, "Stephen Paul" account, 106, 107.

20. "John Langdon Daybook," New Hampshire Historical Society, "Thomas Thompson" entry, June 4, 1776, 34, 43.

21. "Daybook", 36, 43; Double Entry Ledger", 106-107; William Sutherland, The Shipbuilder's Assistant, (London, 1711), 100; Ports of Piscataqua, 172.

22. "Double Entry Ledger", 107; Langdon Papers. Box 2, folder 15, "Apprisemt of Masts for Ship Raleigh," "Memorandum of Mast Prices given by Mr. Parry."

23. Ports of Piscataqua, 96.

24. The History of the American Sailing Navy, 14.

25. "Daybook", 35; "Double Entry Ledger," 108; Langdon Papers, Box 2, folder 15; American Neptune, 26, 1966, 71, "Thompson Inventory;" Howard I. Chapelle, American Small Sailing Craft, (New York, 1951),

26. "Double Entry Ledger", 108; Naval Documents, vol.4, 1355, "Memorandum of Rigging for a 72-Gun Frigate vizt."; Langdon Papers, Box 2, folder 15, "Memorandum of Agreement between John Langdon and George Wentworth, March 1776."

27. Langdon Papers, Box 2, folder 15, "George Libbey's memd of Supp$ to Raleigh and Hampshire"; "Double Entry Ledger," 110; Search for Speed, 15.

28. Shipbuilding in Colonial America, 90; The History of the American Sailing Navy, 77; Langdon Papers, Box 3, folder 5, "Joseph Sime's Receipt"; Search for Speed, 15.

29. Naval Documents, vol. 2, 159, 246, 264; American Neptune, 8, 1948, 24.

30. New Hampshire Gazette, "Freeman's Journal," May 25, 1776.

31. "Daybook", 40; "Double Entry Ledger", 107; Estimate based on rigging list in The Shipbuilder's Assistant, 126-137.

32. Ports of Piscataqua, 97.

33. The History of the American Sailing Navy, 27; Daybook, 76; "Double Entry Ledger", 112.

34. Naval Documents, vol.2, 559; "Langdon to Bartlett," 24, June, 1776, 784. A standard criticism of colonial shipbuilding was that because unseasoned wood was used in the frame, the life of the ship was short due to rotting. See Albion A

35. See Sequence and Term of Job Chart in Appendix. The accounts make clear explicit terms of employment. However, there is a possibility that Langdon was building another ship, either at the same time, or shortly after the Raleigh. The accounts do not reflect this; in fact, the skilled work force employed in the February to July 1776 period are not credited again until October 1776, when the Langdon crew was commissioned to build the "Ranger", raising a question about Langdon's accounting.

36. "Double Entry Ledger", 106, 107.

37. See list of skilled workers and wages in Appendix. B

38. See "Return of Carpenters and Labourers" in Appendix. C

39. Naval Documents, vol. 7, "R.Morris to Silas Deane"; Langdon Papers, Box 3, folder 4, "Joseph Simes Bill"; "Double Entry Ledger", 103, "Joseph Simes Account".

40. "Daybook", 42,67; Langdon Papers, Box 3, folders 5,6.

41. Naval Documents, vol.5, 160, 264, 334, 453, 704, 846, vol.vi, 55; Bartlett Papers, 67,70.

42. "Daybook" 38, August 15, 1776, "Memorandum"; Naval Documents, vol.7, 1020, "John Langdon to William Whipple".

43. Naval Documents, vol.7, 215, "John Langdon to Thomas Cushing"; Langdon Papers, Box 3, folders 5,6, Box 2, folder 14; "Daybook", 33, 38, 51.

44. Daybook, 46, "Cash to Breck and Hannatt"; Double Entry Ledger, 108.

45. Langdon Papers, Box 2, folder 15, folder 4, "Memorandum", August 19. 1776; Daybook, 35, 37, 45, 53; Double Entry Ledger, 109, "Sparhawk Account". See Appendix D.

46. Ports of Piscataqua, 177-179; Elton W. Hall, "Sailcloth for American Vessels", American Neptune, 31, 1971, 130-133; Daybook, 39.

47. Naval Documents, vol.1, 1377, "Robert Morris to John Langdon," 1 May 1776; 1417, "John Langdon to Nicholas Browne", 6 May 1776; vol. 2, 264, "John Langdon to Jeremiah Stamford," 27 May 1776.

48. Naval Documents, vol. 6, 55, 150, 151, 203, 350, 360, 721, 815, 1154, 1188; vol. 7, 31, 56, 271, 957, 1226.

Appendix A.

Ship Construction Process - RALEIGH

Dec.1775 Contract

Jan.1776 Design - wages start*
Selection & Cutting of Timber

Feb. Moulding or Lofting Process
Site Preparation

Mar. Laying of Keel
Setting Up

Apr. Framing-Ribboning, Floorbeams
Planking- Interior Structure
Decks
Caulking - Graving

May Painting - Carving
Launching

June Mast - Rigging
Finish
Provision

July Equipping
Crewing

Aug.

Sept.

Blacksmith starts

Mast selected & delivered
Mast Work

Ships Boats

Joiner Work

Painting

Rope Making

Sails

Canvas

Block Makers

* This chart is based on a general understanding of the building process as written by Howard I. Chapelle in History of the American Sailing Navy, Joseph A. Goldenburg in Shipbuilding in Colonial America, Steel's Elements of Mastmaking, Sailmaking and Rigging, and William Sutherland's The Shipbuilder's Assistant, combined with specific terms of employment according to accounts in Langdon's Double Entry Ledger.

Appendix B.

MEN INVOLVED IN RALEIGH CONSTRUCTION - 1776

SKILLED WORKERS

Name	Occupation	Term of Employment	Payment
John Langdon	contractor	Dec.1775-Sept.1777	commissions
Thomas Thompson	superintendent	Feb.1776-Sept.1778	1019. 0.0
James Hackett	master builder	Feb. -June 1776	399. 9.6
James Hill	ship builder	Feb. -June 1776	295. 8.4
Stephen Paul	master carpenter	Feb. -June 1776	493.12.9
Moses Noble	mast work	Feb. -June 1776	153. 6.0
William Blunt	ships boats	Mar. -June 1776	64.17.0
Nathaniel Melcher	ships boats	Mar. -June 1776	13.19.0
Henry Sherburne	blacksmith	Feb. -June 1776	394. 7.7
George Hunt	blacksmith	Feb. -June 1776	306. 1.1
Paul Laighton	blockwork	May -Sept.1776	78.10.5
William Greene	blockwork	May -Sept.1776	78.10.5
John Dennett	blockwork	May -Sept.1776	78.10.5
David Hart	joiner	Apr. -May 1776	40.13.6
Joseph Simes	painter	Apr. -July 1776	?
George Wentworth	rope maker	Apr. -May 1776	64. 6.6
John Cutt	cooper	May -July 1776	23.12.6
John Fernald	tinsmith	May -June 1776	?
George Libbey	caulker	Apr. -May 1776	?
William Jackson	?	June -July 1776	?
Stephen Jackson	?	June -July 1776	?

* These men maintained accounts with Langdon during the periods indicated, accprding to Langdon's Double Entry Ledger and Daybook.

RETURN OF CARPENTERS AND LABOURERS WORK BUILDING THE CONTINENTAL SHIP OF 74 GUNS AT HONORABLE JOHN LANGDON'S ISLAND FROM OCTOBER 4, 1777 UNTIL MARCH 31, 1778

Joseph Ham	139	£ 62.11.0	@ March 31
William Hackett	25½	11. 9.6	9/ 1778
William Badger	22½	7. 6.3	9/
Jacob Persons	22½	7. 6.3	6/6
Walter Shute	21½	6.19.9	6/6
Joseph Deanin	114	37. 1.0	6/6
Jonathan Nelson	-	---	6/5
Gabriel Hale	151	45. 6.0	6/
John Bond	111½	30.13.3	5/6
Joshua Jones	150	48.15.0	6/6
James Jones	150	48.15.0	6/6
Jpsiah Beal	-	---	-
Roger Rackley	16½	5. 7.3	6/6
Thomas Priest	45	11. 5.0	5/
William Waldron	-	---	-
Joseph Shaw	95	23.15.0	5/
Joseph Shaw	74	25. 1.8	5/
Thomas Flawel	148½	37. 2.6	5/
Thomas Sherburne	148½	4.16.0	4/
John Frost	32	6. 8.0	4/
John Spinney	3	0.10.6	3/6
Cesar Gerrish	20	4. 0.0	4/
To My Superintending from May 10 to March 31, 1778 (290 days)		261. 0.0	18/
Total		£ 777.19.9	

* Source for this return is Manuscript #129, Historical Society of Pennsylvania, Philadelphia, PA.

Appendix D.

MEN INVOLVED IN RALEIGH CONSTRUCTION - 1776

SUPPLIERS

Name	Location	Occupation	Material	Payment
		LUMBER		
Ephraim Robinson	Dover	Merchant	wood	
John Sullivan	Durham	sawmill owner		
Stephen Cogan	Durham	Sawmill owner		
George Turner	Portsmouth	Merchant	staves	54.10.0
James Hill	Newmarket	shipbuilder		975. 0.0
Thomas Palmer	Portsmouth	?	lumber	30.12.0
James Hackett	Exeter	shipbuilder		
		MASTS		
J. Whipple	Portsmouth	masts		200. 0.0
John Abbott	Berwick	masts		
John Wentworth	Somersworth	masts & bowsprits		21.12.0
Daniel Drinkwater	Yarmouth	spruce spars		6/ inch (dia.)
Thomas Gillpatrick	?	timber & spars		3.12.0
		ROPE AND CORDAGE		
Thomas Cushing	Boston	Merchant	hemp	337. 6.3
John Langdon	Portsmouth	Merchant	cordage	5.11.3
Nathaniel Sparhawk	Kittery	Merchant	cordage	293. 5.0
Woodbury Langdon	Portsmouth	Merchant	cordage	3.12.6
T. McIntyre	Portsmouth	Captain	marline	3.12.6
Henderson Inches	Boston	Merchant	yarn	121.17.0
George Wentworth	Portsmouth	Rope Walk owner	cables, hawsers	64. 6.4

MEN INVOLVED IN RALEIGH CONSTRUCTION - 1776

SUPPLIERS, cont.

CANVAS AND SAILS

Thomas Russel	Boston	Merchant	sails	50. 6.0
Nicholas Browne	Providence	Merchant	Russia duck	
John Manly	Portsmouth	Sea Captain	canvas	8. 0.0
Mark Fernald	Portsmouth	Sea Captain	canvas	11. 8.0

TAR

Nathaniel Sparhawk	Kittery	Merchant		293. 5.0
George Libbey	Portsmouth	caulker	caulking supplies	
Benjamin Andrews	Boston	Merchant		35.10.8

PAINT

Joseph Simes	Portsmouth	Painter-Glazer		

NAILS

Daniel Hart	Portsmouth			1. 6.0
Stephen Paul	Kittery			2. 9.0
Woodbury Langdon	Portsmouth			0. 3.0
Nathaniel Sparhawk	Kittery			0.12.0
Noah Parker	Portsmouth		3 bundles	3.15.0

STEEL (for tools)

Jeremiah Platt	? (Boston)		137 pounds	23.19.6

PROVISIONS

Richard Truesdell	Portsmouth		beef	21.12.0
Abraham Trefethen	Portsmouth		bread (1 ton)	7. 0.0
David Lang	Portsmouth		flour (15 bbls)	
Edward Hart	Portsmouth	Baker		
Benjamin Bigelow	Portsmouth		groceries, candles, fresh produce	21.12.0

MEN INVOLVED IN RALEIGH CONSTRUCTION - 1776

SUPPLIERS, cont.

TRANSPORT

Samusl Ham, Jr.	Piscataqua area	Gondelow	ballast	1.4/day
John Gilman	Piscataqua area	Gondelow		
William Coffin	Piscataqua area	Gondelow		
Samuel Hall	Piscataqua area	Truckman	cannon (Cambridge)	39. 0.0
Daniel Lord	Piscataqua area		cordwood to dock	3.12.0

RUM

The Marine Committee was billed for 1293 gallons 571. 1.6

PUMPS

William Langdon	Portsmouth	pumps, rigging leather	12.15.3

ANCHOR

Mungo Mackay	Boston	anchor	68. 2.8

TOOLS

John Langdon billed the Marine Committee for:

3 braces used at times by boatbuilders
1 codhook
1 scraper
3 caulking mallets
1 marling spike
4 tarr brushes 1. 4.0

* Materials and supplies are enumerated either by receipts and memorandums in the Langdon Papers, or by accounts in John Langdon's "Double Entry Ledger," in the New Hampshire Historical Society, Concord, NH.

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