

## The Sinking of the First Rate *Victory* (1744): A Disaster Waiting to Happen?

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The sinking of the First Rate, 100-gun English warship the *Victory* on 4 October 1744 was widely attributed to defects in her construction. The era when she was built in Portsmouth dockyard from 1733-37 coincided with a period when the proportions of warships and the leadership of the surveyor general of the navy were severely questioned. Matters came to a head in a series of extraordinary attacks on the establishment in 1744 by Admiral Edward Vernon.

The *Victory's* construction overlapped with a succession of moderate winters from 1730-39 that made the seasoning of cut timbers for shipbuilding a long, if not impossible, process. Combined with declining wood supplies in the New Forest, wood rotation mismanagement in dockyards, and criticisms of inadequate ship ventilation causing internal dry rot, this paper enquires whether the sinking of the *Victory* was a matter of ill winds and stormy seas or was alternatively caused by human error – a disaster waiting to happen.

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### 1. Introduction

The historical presumption that the First Rate English warship *Victory* sunk off the Channel Islands, after being lured onto the black rocks of the Caskets by a negligent lighthouse keeper, has not stood up to rigorous investigation (Fig. 1). An enquiry convened by Trinity House in 1744-45 at the behest of the Admiralty found the declarations signed against the lights' keeper to be unconvincing and malicious. Ultimately, Odyssey Marine Exploration's discovery of the wreck of the *Victory* in 2008, around 100km west of the Channel Islands and 80km southeast of Plymouth (Cunningham Dobson and Kingsley, 2010), unequivocally confirmed that the battleship never got within sight of Alderney, but was overcome in the midst of the sea deep within the western English Channel (Kingsley, 2015).

With one line of enquiry focused on the geography of the *Victory's* sinking closed, the question of what factors underlay the warship's sinking arises. Was the *Victory's* loss merely ill fortune under ferocious storm waves? Did Admiral Sir John Balchen simply find himself in the wrong place at the wrong time (Fig. 2)?<sup>1</sup> Or did underlying structural issues contribute to the ship's vulnerability? This paper examines the severity of the storm that engulfed Balchen's squadron on 3-4 October 1744 and the damage inflicted on individual fleet vessels. Behind any warship's constant vulnerability throughout history to major storm episodes, in the case in question a specific concern existed about unstable ship design between the 1720s and 1740s. Early modern historians mirrored 18th-century accusations that

the royal dockyards were producing badly proportioned ships of the line that made them crank and inferior to French battleships. What was considered a scandalous state of affairs in the minds of several high-ranking naval officers came to a head in 1744, when the loss of *Victory* was tied to a deep-rooted "general mistake" in shipbuilding. The use of unseasoned wood and poor internal ventilation below decks may also have contributed to the sinking of Sir John Balchen's flagship.

### 2. Stormy Seas

The storm that engulfed Admiral Balchen's fleet on 3 October 1744 was unquestionably severe. Late autumnal bad weather had been brewing and wreaking havoc since the first half of September. In Ballyconnell in northwest Ireland, the *Blundel* from Liverpool was forced into the bay



Fig. 1. Detail of the *Victory* sinking on 4 October 1744 on the Balchen Memorial in Westminster Abbey, London.



Fig. 2. Copy of a portrait of Admiral John Balchen by Jonathan Richardson, c. 1695. Photo: courtesy of Robert Balchin.

en route home from Barbados on 10 September after the ship was forced to cut down all its masts, after which “there came on a violent Gale, which drove the Vessel ashore, where she beat into a thousand Pieces; all of the People perished except the Master, who went on Shore before the Storm begun” (*Daily Advertiser*, 26 September 1744).

Two weeks before the *Victory* sank, nearly 50 of 150 ships sailing from Hamburg to Holland were reported lost by *The Daily Advertiser* (29 September 1744). By 26 September the storm was lashing southwest England, when the *Westminster Journal* (of 13 October 1744) gave an account from Lyme Regis in Dorset of “the most violent Storm that was ever known in these Parts... It being upon the Top of a Spring Tide, the Sea was much higher than was ever known in the Memory of Man”. With the wind blowing from the southeast to south-southwest, the tempest broke down and destroyed a great part of the Cobb seawalls, as well as the storehouse, and blew two ships out of the harbor, causing low estimate damage of £4,000.

The same storm, described as a “violent hurricane”, broke down a wooden bridge at Gravesend and carried it away (*Westminster Journal*, 13 October 1744). By 28

September the elements were lashing Plymouth, where the *London Evening Post* reported how:

On Wednesday Night we had the highest Tide here that was ever known, attended with a violent Gale of Wind. It has done a great deal of Damage here and in the Western Ports, having not only spoiled and damaged great Quantities of Goods that lay in Cellars, but also wash’d away Houses and Sea Banks, and staved a great many Fishing-Boats... Several Ships were drove from the Posts to which they were fasten’d, and their cables broke, as if they had been Packthread. In short, the Storm was beyond any thing yet seen here: The Boats floated upon our Keys and about the Streets.

Trinity House confirmed that near Plymouth “the late dreadful storm” caused great damage to the exterior timbers and solid structure of the Eddystone lighthouse (4 October, LMA MS30048/4). At Newcastle in northern England, on 28 September Captain Proctor of Gateshead’s *Old Trial* was “dash’d to Pieces off Tinmouth-Bar, and five of her People drown’d. Several Ships &c. in the River were also drove from their Moorings” (*Daily Advertiser*, 4 October 1744).

The storm front that engulfed Admiral Balchen and his squadron on the afternoon and evening of 3 October 1744 had been raging on and off for three weeks, inflicting significant damage before overwhelming the *Victory*. The conditions would continue for a further week. On 11 October, the *Yarmouth* warship was still stuck at Torbay in “very thick weather” and could not reach Plymouth to be repaired (ADM 1/87). On 10 October the *Falmouth* could not leave Spithead in search of the vanished *Victory* due to bad weather (ADM 1/909). The climatic pattern continued later into the month, when Admiral Steuart reported from the *Princess Royal* at Portsmouth on 23 October that during the last 24 hours “we have had our yards and Topmast struck, with such very bad weather, that a Boat has not been able to pass from ship to ship... which retards all business” (ADM 1/909).

### 3. Admiral Balchen’s Squadron

The ferocity of the storm that struck Admiral Balchen’s squadron should not be underestimated as a primary causal factor of the *Victory*’s sinking. Serious damage was inflicted on almost all the other warships in the fleet and its support vessels. As well as reflecting the widespread severity of the damage, logs reporting the effects of the weather and vessel defects enable the final hours of the *Victory*’s drama to be reconstructed to some extent and postulated by proxy (the captain and lieutenants logs of the flagship of course sank with Admiral Balchen).

The warships in Balchen's squadron returning from Gibraltar spotted the lighthouse of St Agnes on the Scilly Isles between 1pm and 2.30pm on 3 October 1744 and signaled confirmation of the sight of land. During the late afternoon and the evening the storm intensified in strength with the wind blowing from the west-southwest (Admiral Stuart, 6 October 1744, ADM 1/909). The captain's log for the Second Rate *St George* recorded that at 6pm the weather was "very squally", after which the "yard broke in the springs, which split the sail, we cut the sail from the yard & saved it". At 10pm the wind blew a "meer storm" (ADM 51/854). Worse was to come. While the men were on the yards, the new buntlines broke, forcing the crew to cut away the sail. At the same time "the sea running very high & the ship not answering her helm she broached too with her head to the soward... we lay too, not being able to loose any sail for the violence of the wind... The brick work (by the rolling of the ship) of the Furnaces fell down." At daylight on the morning of 4 October the warship spied only two sails, amidst "a most violent sea & the ship rolling exceedingly". On Friday 5 October a small spring was found in the damaged tiller.

The Second Rate *Duke* managed to ride out the storm despite a serious scare. The warship sighted the Isles of Scilly at 2pm on 3 October. At midnight the wind blew so hard that the main topsail blew away. At 2am on 4 October the fore-tops separated from the bolt rope and the warship broached to. At this time the *Duke* lost sight of the *Victory* "and lay in the trough of the sea till 7". The storm continued violently until 6pm, when the warship spotted Guernsey (ADM 51/282). A letter written on the *Duke*, and reproduced in *The Penny London Post* of 10-12 October 1744, confirmed that "On the 3rd Instant we met with a hard Gale of Wind which tore all our Sails and Rigging that we were obliged to submit to the Mercy of the Waves. On the 4th we had Ten Feet in our Hold, which made our Condition very bad, and the Dread of Death appeared in every Face, for we momentarily expected to be swallowed up."

The Fourth Rate *Exeter*, only launched in March 1744 (Winfield, 2007: 126), was the most serious casualty other than the *Victory*. The ship spotted the Scilly Isles at 2.30pm on 3 October, after which the weather turned from moderate and hazy to a very hard gale and squally with rain. On the morning of 4 October (ADM 51/326), the captain logged that (Fig. 3):

Pumping all Night at 4 a:m the Chains broke and Shipt several heavy Seas the Water Gaining on us Cutt away the Mizon Mast and Maintopmt: with all the rigging yds. and Sails belonging to them which carried away the Driver Boom... the main Yard cut away the Mains: being Spit to pieces and the Buntlines and leechlines all Broke, gott the

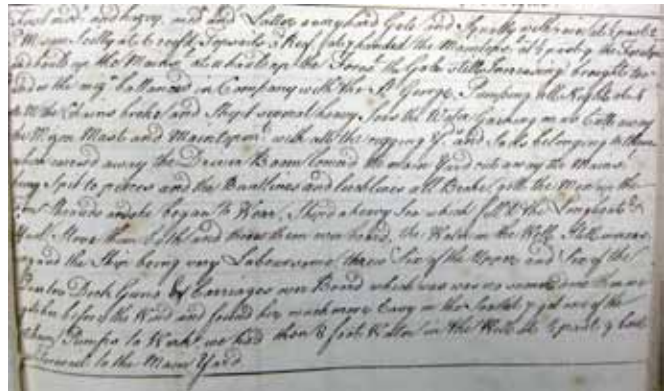


Fig. 3. The captain's log for 3 October 1744 for the Fourth Rate *Exeter* (ADM 51/326) that was almost lost during the storm that sank the *Victory*.

men up the Fore Shrouds and she began to Wear, Ship'd a heavy Sea which fill'd the Longboat and Yaul, Stove them both and threw them over board, the Water in the Well still increasing and the Ship being very Laboursome, threw Six of the Upper and Six of the Quarter Deck Guns & Carriages over Board which was no sooner done than we got her before the Wind and found her much more Easy in the Sea. at 7 got one of the Chain Pumps to work, we had then 8 foot Water in the Well at ½ past 9.

At 9.20pm on 4 October the gale was still increasing in strength when the *Exeter* brought too in company with the *St George*.

Meanwhile, a wave that struck the stern of the Fourth Rate *Augusta* at 10am on 4 October broke the great part of the wardroom windows (ADM 51/74). The storm took the lives of Thomas Henley on the Third Rate *Captain* (ADM 51/164), William Martin on the Third Rate *Prince Frederick* (ADM 51/735), Henry Taylor on the Fourth Rate *Sunderland*, when a great sea washed him overboard while he was working amongst the main chains (ADM 51/944), and Arij Woude Pot and Jan Klaasen de Koning on the 54-gun *Delft* (National Archives, The Hague, Inv. 1.01.46, 1338).

After the majority of Balchen's squadron had limped home into Spithead, Admiral Stuart and Captain Martin appraised the storm damage inflicted on all naval vessels caught in the storm of 3-4 October (both within and external to Balchen's fleet) and sent their accounts to Thomas Corbett, Secretary of the Admiralty, between 8-16 October (ADM 1/87, ADM 1/909). As Stuart observed on 6 October 1744, "the ships in general are very Sickly" (ADM 1/909). The following defects requiring repair were identified:

- *Duke* (Second Rate): sent to put up the coppers (cooking kettles) and to repair the fireplace, the bottom very foul and requiring caulking inside and out.



- *Edinburgh* (Third Rate): broke eight main shrouds, four fore shrouds and the remaining rigging and “is very much worn and not fit to be trusted” (ADM 1/87, 9 October 1744). The main mast and foremast were likely to be carried away in any gale of wind, endangering the loss of the ship.
- *Hampton Court* (Third Rate): the main mast and mizzen yard were sprung, three main and three mizzen shrouds and the main chain plate bolt had broken, one upper deck beam had sprung, the bulkhead of the steward room had also broken down, the casing around the mizzen mast in the bread room and powder room needed repairing, as did the brick work in the grates, while the sides, decks, quick work and the spurquetting counter (spaces between timbers along a ship’s side between the upper and lower futtocks, or between rungs fore and aft: Smyth, 1867: 646) were leaky.<sup>2</sup>
- *Monmouth* (Third Rate): five main shrouds (all on the larboard and some on starboard), three fore shrouds and a chain plate broke. The ship “is in a very bad condition at present (as are the best of us) for the Sea” (ADM 1/87, 9 October 1744).
- *Prince Frederick* (Third Rate): the standards on the lower deck were all loose, the mast beam much sprung, the beams loose, a leak was found in the larboard side about 7ft under water requiring pumping once an hour, “the Decks are so leaky for and aft, that not a Man lays dry when it Rains” (ADM 1/87, 9 October 1744), the coppers were loose, five pairs of main shrouds broke and others were not to be trusted, the “Haurzer” (hawser?) had dry rot, three fore and one mizzen shroud were broken and no maintop sail yard was left.
- *Exeter* (Fourth Rate): arrived in port with 4ft of water in her powder room, which damaged a great deal of its content.
- *Princess Mary* (Fourth Rate): foremast was sprung in the partners.
- *Fly* (sloop): was making 20in of water an hour, its bows were very leaky and needed repairing, the cable butts were in a bad condition and not to be trusted, the chain bolts very much started and making much water, the gunnels bad and needing repair, the main topsail sheet needing repair, the partners of the main mast very leaky, the decks very leaky and needing caulking, the upper works straining very much and very leaky, and the left half ports had all washed away.
- *Scipio* (fireship): the hull was very leaky and making 18in of water every half hour. The wales and upper works were weak and very leaky, the fire work wet and much damaged, the wooden ends open, the quarter deck worn so thin that it would not bear caulking and several planks in the main deck needed shifting.

In summary, the storm of 3-4 October 1744 that engulfed the *Victory* created havoc amongst Admiral Balchen’s squadron. The *Duke* and *Exeter* were in serious trouble with between 8-10ft of water in their holds and could easily have shared the flagship’s fate. The *Exeter* was arguably within minutes of sinking when she jettisoned 12 guns. The *Edinburgh* was close to losing its main mast and foremast. The defects needed repairing were substantial. In the cold light of day, however, all the squadron vessels reached land apart from the *Victory* to be satisfactorily repaired to recommence naval service. Several of the warships in Balchen’s fleet sailed on into the western Channel in July 1745 under Admiral Steuart to protect Britain from an acutely anticipated French invasion, including the *Duke*, *Hampton Court* and *Prince Frederick* (Hartmann, 1953: 170).

## 4. Early Georgian Shipbuilding Flaws

The question of why the *Victory* alone succumbed to the elements remains an undetermined and not uncontroversial conundrum (Figs. 4-8). Ship size, prestige as the navy’s flagship and a crew selected from the finest sailors of the land failed to assure her safety. These points force the argument to shift from considerations of weather and personnel proficiency to a scrutiny of potential structural forces at work that may have contributed to the flagship’s vulnerability. Certainly in the years and decades after the *Victory*’s loss, a prevailing historic position resolutely maintained that her build was structural flawed. Frederic Hervey asserted in *The Naval History of Great Britain* (1779: 258) that “The loss of this ship has been imputed to a defect in its construction, and many complaints were at that time made concerning the principles on which the men of war were built, and the conduct of the surveyor general of the navy.”

Whatever the nature of the defect underlying this accusation, naval historians widely shared the same conclusion. A year later, John Charnock vehemently argued in *An History of Marine Architecture* (1800: 52) that, apart from when a heavily armed First Rate blasted a fortress, since the death of Queen Anne “Ships of the first rate appear to have been somewhat disregarded, and it was a favourite maxim, extremely prevalent at that time, that they were capable of rendering little service in proportion to their magnitude, and to the expense of equipment”. To Charnock (1800: 18), both Spanish and French warships were superior to British men-of-war. While Britain readily converted French prizes for naval service (such as the *Invincible* in 1747: Bingeman, 2010), few British warships seized by the enemy were taken into the public service. Charnock (1800: 138) complained further that in 1744

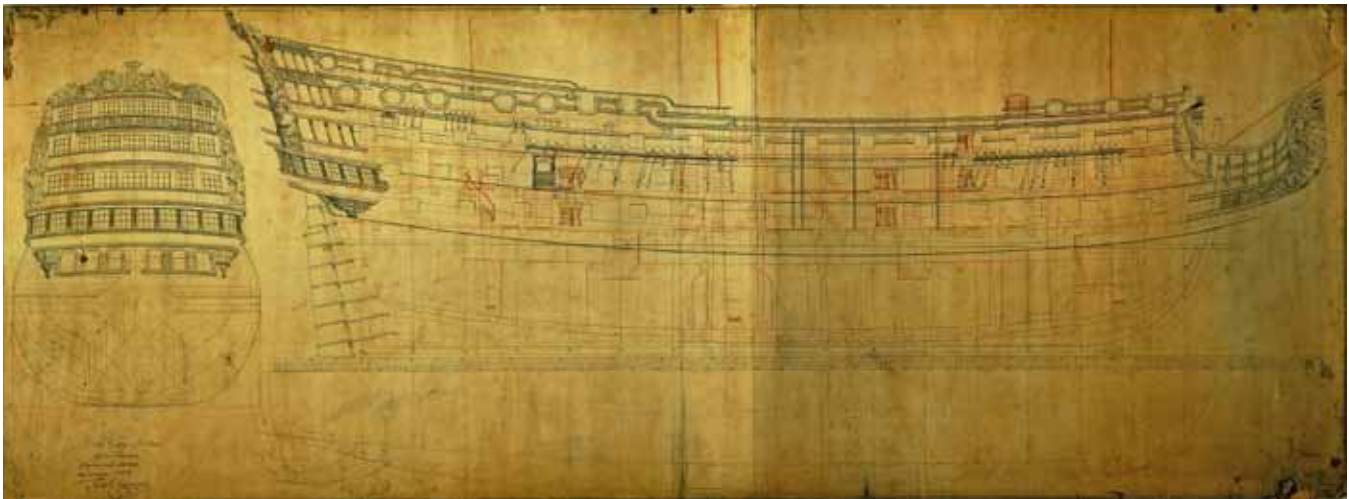


Fig. 4. Plan of the body and stern decoration of the First Rate *Victory* (launched 1737), copied by Frederick Chapman c. 1754. Photo: National Maritime Museum, Greenwich, ZAZ0145.

British warships were so extremely long in proportion to their breadth, and so deficient in bearings forward, that they pitched and violently labored in heavy seas. His robust criticism of the naval establishment concluded rhetorically by enquiring (Charnock, 1800: 107-108):

Whether it was to be imputed to Britain, that in the arrogant and supposed superiority of her numbers only, she rejected, as beneath her notice, those systems of improvement introduced by other countries; whether her ministers were blindly lulled into security from a confidence in that terror which her nominal power was expected to create; or whether a dull and ignorant prejudice persuaded a continuance in, and adherence to, certain principles which other countries had wisely overcome, and whose example the marine architects of Britain most contemptuously disdained to follow, is a point, which is now, and, perhaps, ever was, extremely difficult for more than a dozen persons in the whole kingdom, who prudently kept their secret securely locked within their bosoms, to decide... Destitute of almost every principle that could constitute a ship of war, fit for the varied species of service which it must ever be prepared to enter on, they were crank, in general heavy sailors, of ill stowage, confined, and inconvenient in the hour of battle; the larger ships frequently incapable of employing their lower-deck guns... except in the most moderate weather.

What were these secrets securely locked away within the bosom of the Admiralty? Hervey and Charnock's views were certainly aligned with the French perspective contemporary to the date of the *Victory's* construction. Blaise Ollivier, the Master Shipwright at France's foremost Royal Dockyard at Brest, who conducted rather open espionage at Portsmouth dockyard in 1737, and personally scouted the *Victory* in her dock while under construction, was

unimpressed by her lines. He described the heights between decks, and wrote a detailed account of her disposition, before announcing that "The midship bend of this ship is rounded; her floors are full and have a fair run; she has great fullness at her height of breadth; her capacity is very great, yet her upper works are scarce suitable for her lower body, for she is deep-waisted with much sheer" (Roberts, 1992: 54).

The escutcheon and taffarel-standards on the *Victory's* poop-royal formed part of her framework, and unusually elevated the height of the poop 2.52ft higher above the gundeck than on the *Royal-Louis*, a First Rate warship of 124 guns built by Ollivier at Brest. In general, English First Rates of 100 guns were built about 9ft shorter than the French equivalents, such as the *Royal-Louis* and *Foudroyant* of 110 guns. Meanwhile, the French Master Shipwright determined at Woolwich that the 90-gun *Duke* under construction during his visit was scarcely larger than a French ship of 74 guns, was too full at the stern and too slight forward. French vessels were characterized by a great difference in the depth of the hold, ranging from one-eighth to one-tenth deeper than English warships. Ollivier was informed by English shipbuilders that the preference for iron ballast on English warships, in contrast to France, stiffened the hull and counteracted the movements of a ship, especially rolling (Roberts, 1992: 61, 132-33, 135-36, 167).

Over the course of time, Charnock's blanket condemnation of all early 18th-century British warships has been downplayed as very dubious (Baugh, 1977: 198), while Blaise Ollivier's opinion could be rejected as the expected criticism of an enemy state, even though he was even handed in his accounts of British shipbuilding (for instance,

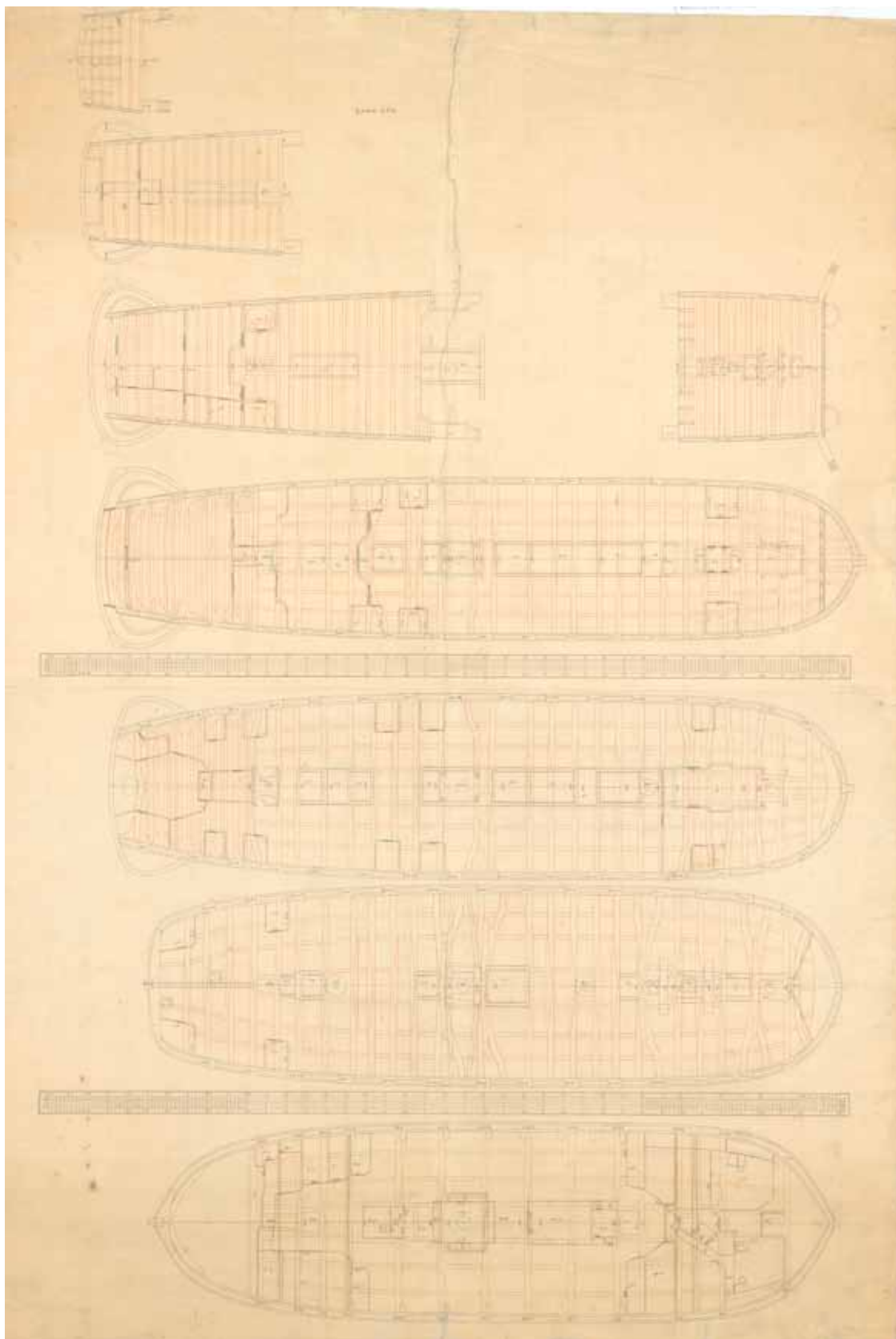


Fig. 5. Plan showing the poop deck, quarterdeck, forecastle, upper deck, middle deck and lower deck of the First Rate Victory (launched 1737). Photo: National Maritime Museum, Greenwich, ZAZ7847.



in describing English iron knees as superior to the French and being impressed with the 100-gun *Royal Sovereign's* draught lines; Roberts, 1992: 54, 80).

The contemporary English sources dating to the 1730s and 1740s, however, that evidently served as the direct inspiration for Hervey and Charnock's opinions, substantiate their authority. No less a luminary than Sir John Norris, the oracle of the navy and Admiral of the Fleet, who commanded the *Victory* between 1740 and 1744, complained about the *Victory's* poor construction. In a letter to Joseph Allin, Master shipwright at Portsmouth, dated 14 April 1740 (ADM 91/2), Sir Jacob Acworth, Surveyor of the Navy, advised that "This post will bring you an order to fit the *Victory* for Sir John Norris. He has promised to take the ship as she is, but complain much of her height abaft, treble balconies etc which I was much surprised to hear of. Our ships were too heavy, too loose and too high without those additional encumbrances, which I am sure cannot add beauty, but must be in every respect disagreeable" (Hattendorf *et al.* 1993: 484).

The functional requirement for ships of the line to carry heavy guns as high out of the water as possible made them more likely to be 'crank' or 'tender', with a tendency to roll or heel easily or excessively than to conform to the optimum requirement to be stiff. Since the late 18th century, marine architects applied the concept of metacentric height (the function of the center of buoyancy, configuration of the hull and center of gravity) to predict a ship's stability. Ships with small metacentric heights tended to be crank. Limited solutions were available to counteract crankness, including reducing the topside weight, adding heavy ballast as low down in the hold as possible, or increasing the beam artificially by girdling or doubling, which involved affixing an exterior belt of thick planking under the wales at the waterline. The first two remedies lowered the center of gravity, while girdling increased the righting moment because the enhancement of the beam substantially increased stability when a warship sailed at moderate angles of inclination (Baugh, 1977: 197).

Ballasting was an inexact art because it ran the risk of drawing down the lower tier of guns too close to the waterline. Increasing the beam mitigated this concern, but added a new complexity because ships too broad abeam often experienced a violent rolling action in heavy seas that loosened shrouds and stays, pried open hull joints (mainly by the working of the masts) and frequently led to loss or damage of masts and spars. The best balanced solutions were to increase a ship's total capacity, thus retaining the breadth in a suitable proportion to the length and reducing the weight of the upper works (Baugh, 1977: 197).



Fig. 6. A contemporary full hull model of the First Rate *Victory* (launched 1737). Photo: National Maritime Museum, Greenwich, SLR0449.

British naval architects knew next to nothing about the science of metacentric theory in the early 18th century, but were highly conscious of the effects of poorly proportioned warships. Already in the late 1710s, generalized improvements were being proposed on a piecemeal basis. A letter from the Master Shipwrights of Dockyards written to the Navy Board at Deptford, dated to 7 November 1719 (NMM POR/B/5, ff.313-4), discussed some alterations introduced since the last establishment, whereby "The scantlings in general we have made somewhat smaller where the strength and safety would admit it, for the advantage of building ships lighter, better sailers, and more durable and cheaper." At the same time, the shipwrights added 2ft in length to the gundeck of ships of 90 guns, and 4in to the depth in the hold, to equip them with improved space for guns and make them more proportionate to 100-gun warships. On 16 Feb 1727 the Officers of the Dockyards were informed that the Navy Board observed in refitting ships that some were equipped with heavy awnings and other unnecessary encumbrances, which hindered sailing and should be removed. The great weight of brickwork in fireplaces was ordered to be replaced with iron fire hearths (NMM POR/B/5, f.430; Baugh, 1977: 211). The problem of lightened scantlings, a clear preference in this communication, would lead to serious problems in the 1730s and 1740s.

Nine years before assuming the command of *Victory* during her final fateful voyage, Admiral Sir John Balchen warned the Admiralty about this specific matter on 17 January 1734 in his capacity as captain of the *Princess Amelia*,



Figs. 7-8. Perspective paintings of a model of the First Rate Victory 1744, formerly in the collection of King George III. Photo: Science Museum Group, 1864-12/2.

which, he implored (ADM 1/796), needed girdling “for she is so tender a ship that no person will care to go in her, even with all her ballast in. She lay down so much that people had a notion she would overset... I expect the Surveyor of the Navy will object against it, but hope I may be allowed to be in some measure a judge” (Baugh, 1977: 212-3).

A defensive Navy Board reply to the Admiralty Secretary pointed out that the *Princess Amelia* was well maintained, having been in dock seven times in eight years for surveying since she was built (24 January 1734, ADM 1/3649). The causal instability was identified as merely a lack of ballast, but the Navy Board nevertheless endorsed Balchen’s

opinion to girdle her with five strakes of 6in fir below the wales and one strake of 4in planking beneath them for an eking (filling-out piece). A supplementary 60-70 tons of ballast was ordered to be added. The recommendation ended by cautioning that the forecastles “should be kept as clear of weight and every other weight in the ship kept as low down and all the ballast as low as possible” (Baugh, 1977: 213-4).

Admiral Balchen was incensed by the Admiralty Secretary questioning his account of the *Princess Amelia*’s seaworthiness and emphasized that when Sir George Walton formerly commanded her when she sailed from Portsmouth to Spithead, “she then lay along in such a manner that frightened the people, they thinking she would overset”. Balchen had formerly complained about the *Princess Amelia* “in every respect” when sailing on her with Sir Charles Wager in the Mediterranean, and disagreed with the Navy Board’s girdling solution. “I think he might have the good manners to have directed them [the yard] to have let me know what he would have them do, as I am on the spot”, the admiral complained”, adding that “he ought to have consulted me in girdling, and my opinion would have been to have had two strakes of 8-inch stuff under the wale and four strakes of 6-inch with an eking” (2 February 1734, ADM 1/796; Baugh, 1977: 214-5).

Whatever defensive stance the Admiralty assumed on paper, its high-ranking officials were fully aware of the serious prevailing shipbuilding deficiencies. Despite their ingrained defensive stance, the establishment admitted that some ranks of warship were top heavy, the same accusation directed at the *Victory*’s lines in 1737 by Blaise Ollivier. For these reasons, and to prevent as far as possible his Majesty’s ships “from complaining at sea”, on 15 April 1742 the Navy Board informed its dockyards “as ships come into your port to refit or are building, rebuilding or under repair, to do all that can be done to strengthen them, and to place as many standards of wood or iron on each deck as can conveniently be placed clear of the guns, adding bolts to the knees of the respective decks and by larger size of augers especially for the throat bits” (ADM 106/2507; Baugh, 1977: 219).

## 5. Admiral Vernon & the General Mistake

Admiral Balchen’s admonishment appeared meek compared to what was to follow, when Admiral Edward Vernon went to war with the navy in the 1740s over the mismanagement of ship construction. Vernon was a hugely cherished national figure, renowned the land over for taking Puerto Bello in modern Panama in 1739, the principal



rendezvous point of the Spanish *guarda costas* (Charnock, 1795: 355; Clowes, 1966: 55). ‘Old Grog’, as he became affectionately called below decks, was equally renowned within the navy for implementing rations of rum laced with lime (Ford, 1907: 217-18). The commander became increasingly powerful after being appointed the Member of Parliament for Ipswich in 1741 and Vice-Admiral of the Red in 1743 (Figs. 9-10).

Matters came to a head in April 1744 after Vernon supported Lord Granard’s motion in the House of Commons to investigate the conduct of the fleet during the past two years, especially through speeches attacking the First Lord Winchelsea and the Surveyor of the Navy, Sir Jacob Acworth (Ranft, 1958: 434). The Lords of the Admiralty were considerably angered and embarrassed by Vernon’s inopportune revelations on matters that were not sought and were seen as a betrayal to the navy (Hartmann, 1953: 182). Soon after, Vernon’s name was deliberately omitted from a list of flag officer promotions released by the Admiralty in June 1744.

The situation deteriorated further when Vernon’s broadside turned into a full on assault against the establishment. When he was invited to share his opinion, in an act of attempted reconciliation by the Admiralty, on whether the complement of 480 men allowed on a ship of 64 guns and 300 men on a vessel of 50 guns was appropriate, on 18 June 1744 Vernon exploited the opportunity to widely criticize the manning and building of warships (ADM 1/578). He pointed out in writing that the navy possessed many ships of 60 and 50 guns built of very different proportions and strengths, some of which could support batteries and others not, a problem that typified the 80-gun *Boyne*. Vernon’s explanation repeated earlier concerns by maintaining that “the apparent reason those upper batteries was not heavier was that the beams were so slight that the decks would not bear a heavier battery. And therefore the ships you mention, or any ships, would soon be crippled, if the strength of the deck be not the first consideration of what battery of guns it can support.”

Unlike the old *Royal Sovereign* and *Royal Oak* built by Fisher Harding under King Charles II, which were good sailers and stiff ships with fine batteries of guns, Vernon argued that contemporary warships were “eminently defective” in strength and life expectancy. The Member of Parliament reminded the Admiralty that the recently captured French ships of 64 and 68 guns were built to greater dimensions than British ships of the line “and at least as big as our seventy-gun ships. For they don’t generally crowd their ships with guns as we do, in which I think them much in the right, and that we cripple our ships by it, without any real inconvenience arising from



Fig. 9. Black and white print portrait of Admiral Edward Vernon, after an original by Thomas Gainsborough, c. 1753.

it.” Vernon concluded by complaining that “the arbitrary power with which a half-experienced, and half-judicious S-----r [Acworth] of the Navy hath been entrusted, had in my opinion half ruined the Navy”. The admiral proposed the builders of warships in the Kings Yards, and eminent builders of merchantmen, be invited to draw up a plan of proportions for a ship of each rank “before it be too late, as I apprehend our Royal Master’s true interests are most likely to be the fatal sacrifice of not making some such timely enquiry” (ADM 1/578, 18 June 1744).

At this stage Vernon’s views turned from opinion to campaign when he published the same letter in a public pamphlet priced 6 pence: *Admiral V---n’s Opinion upon the Present State of the British Navy: in a Letter to a Certain Board. To Which is Annex’d, by Way of Illustration, his Letter to the Secretary of the Same Board*. On 3 November the war of words was expanded to take in the sinking of the *Victory* in an anonymous letter published by ‘Nauticus’ in the *Westminster Journal*, which was swiftly syndicated in the *Gentleman’s Magazine* as ‘Reflections Occasion’d by the Loss of his Majesty’s Ships of War. With Adm. V---non’s Opinion on the Late Method of Building Them, &c.’.



Fig. 10. A medal issued to commemorate Admiral Edward Vernon taking Spanish Porto Bello in modern Panama on 22 November 1739. Obverse: Admiral Vernon and the legend 'THE.BRITISH.GLORY.REVIV.D.BY.ADMIRAL.VERNON'. Reverse: ships in the harbor of Porto Bello and the legend 'HE TOOK PORTO BELLO WITH SIX SHIPS ONLY'.

The ill-concealed author, Nauticus, proceeded in his *Westminster Journal* broadside to link the crisis in warship building to Sir John Balchen's flagship:

When such melancholy Accidents happen to the Nation, as Loss of our Ships of War without the Appearance of an Enemy, does it not behove us to enquire if they are owing to *human Fault*, or only to the *Winds*?... Of the *Victory's* misfortune it is not now likely we should have any Account, there being no Probability that a *single Soul* has been saved

out of her *many Hundreds*... But if our Ship-building for the Royal Navy has been many Years universally bad, ought we not to fear that the Structure of this great Vessel partook of the general mistake?

Not only the largest *Ship* in our Fleet, and the finest Set of *Guns* belonging to our Yards, are gone to the Bottom by this Disaster; but with them are perish'd a considerable Part of the Flower of our *Mariners*, and many Families of Distinction have been put into Mourning for the Loss of their *Volunteer Relations*... Yet this indicated afresh the Necessity of looking into Causes, especially as they had been before *more than hinted* to Those in Authority, by a Gentleman of unquestion'd Judgment.

Nauticus was clearly arguing rhetorically to an issue he was convinced about, and now linked the condition of the *Boyne*, rebuilt in 1739, to the *Victory*, built in 1737, "both under the same *Direction*."

The author behind Nauticus's attack on the Secretary of the Admiralty, which went unanswered, was of course Admiral Edward Vernon, who enquired in conclusion whether "Would it not be worth while now to make Enquiry, by proper Evidence, if there did not want *Roomliness and Strength of Decks* in the *Victory* and *Colchester*. Whether they were able to bear the Batteries laid on them, or *crippled* by a croud of Guns, that could afford no real *Conveniency*?"

In a series of extraordinary attacks on the Admiralty between April and November 1744, the highly experienced and qualified Edward Vernon clearly linked the loss of the *Victory* to what he called the "general mistake", which he defined as building warships with slight beams that could not accommodate suitable gun batteries, weakened decks and ended up crowding and crippling ships of the line.

## 6. A Rotten Affair

The construction of English warships depended on vast volumes of timber (Fig. 11). Building a single First Rate warship required approximately 5,500 loads of wood (Lavery, 1991: 57), and between 1730 and 1789 Britain's six main dockyards consumed over 40,000 cubic meters of oak annually (Nail, 2008: 27). In turn, the dockyards often had to wait at least two to three generations for trees to mature. The minimum profitable age at which to fell an oak of at least 20in diameter required for shipbuilding was between 80 and 150 years (Albion, 1926: 99).

Alongside the swirling criticisms of poor ship construction that struck the heart of the naval establishment, the Admiralty had to contend with accusations of wood mismanagement and disturbingly low stocks that created fleet maintenance problems in the first half of the 18th century. Such concerns were certainly nothing new.



In 1609 a Naval Commission of Inquiry appointed by King James I had cautioned that “In building and repairing with greene Tymber, Planck and by heate of the Houle de meeting with the greenesse and sappiness thereof doth immediately putrefie the same and draws that Shippe to the Dock agayne for reparation within the space of six or seven years that would laste twentie if it were seasoned as it ought and in all other partes of the world is accustomed” (Albion, 1926: 13).

Green timber is wood that is unseasoned, which results in a tendency to accelerate dry rot. In turn, dry rot robs timber of its vitality and eventually reduces it to powder. Seasoning involves naturally allowing the sap to gradually draw out by exposure to air so the inner heartwood becomes extremely durable. In warm months cylindrical wood cells are full of watery sap, which is considerably reduced in winter. Logs require two to three years to dry adequately (Albion, 1926: 12-13).

Despite a popular trend in historiography to argue against shipbuilding being a major contributor of deforestation (Rackham, 1990: 96), the rate of usage did most plausibly outpace regeneration in the Early Georgian era. The ceaseless cutting of great oaks for shipbuilding very likely stripped the landscape more quickly than they could reproduce, causing a gradual and dispersed reduction in the quality and quantity of timber available (Melby, 2012: 3-4).

Wood suitable for shipbuilding was an ever-dwindling resource in Britain following severe tree depletion between the reigns of Kings James I and Charles II (1603-1685). A Forest of Dean survey completed in 1661 found that only 30,000 trees were growing on its 18,000 acres, 70,000 fewer than 23 years previously. The great destruction of trees under the Commonwealth resulted in a petition of complaint being presented to the king upon the re-establishment of the monarchy in 1660. Such was the concern about Britain’s dwindling woods in the Dean, New Forest, Windsor and Sherwood forests that the resultant Royal Society study written by John Evelyn in October 1662, *Sylvia Or A Discourse of Forest-Trees and the Propagation of Timber in His Majesties Dominions*, sold over a thousand copies (Perlin, 1991: 213-15).

The situation was compounded by a spike in ship construction for the Anglo-Dutch wars in the third quarter of the 17th century and abundant timber required for urban regeneration after the Great Fire of London in 1666. The development of agro-forestry (coppicing) to serve the fast-evolving iron industry during the late 17th and 18th century decreased the timber reserves available to the navy (Perlin, 1991: 228). The over-exploitation of raw material was further compromised by a failure to enforce the

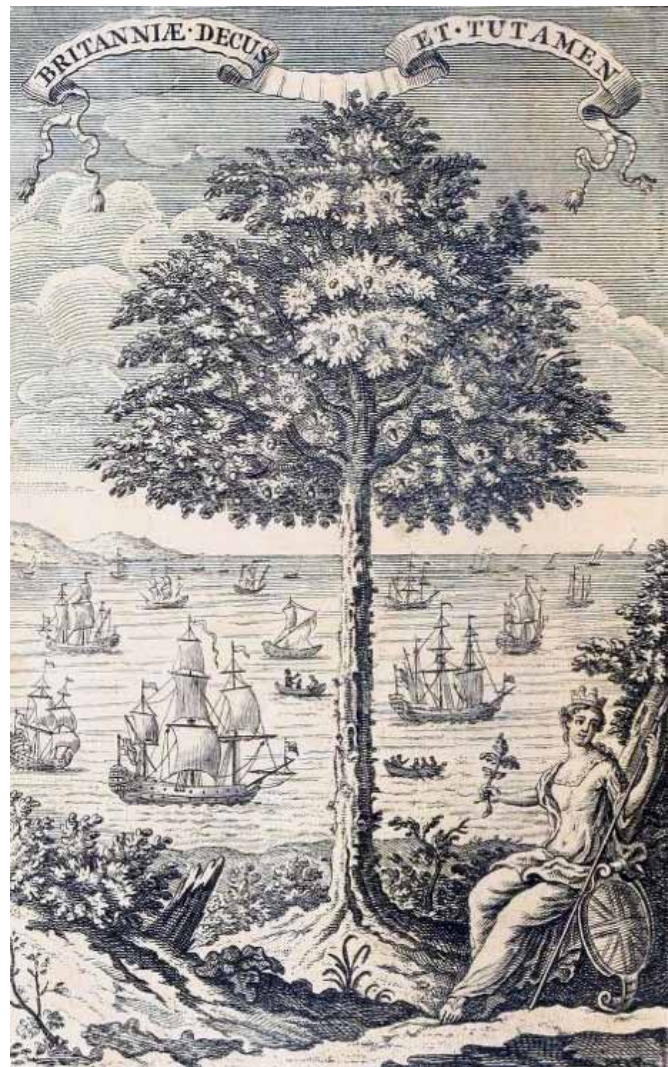


Fig. 11. Britannia sitting beneath a mature oak tree and in front of naval ships. A banner above reads (in translation) ‘The Glory and Protection of Britain’. Possible propaganda promoting the re-planting of oaks to ensure the perpetuation of Britain’s maritime power. Frontispiece of James Wheeler’s *The Modern Druid, Containing Instructions... For the Much Better Culture of Young Oaks* (London, 1747).

enclosure policy in the Dean and New Forests, first voted by Parliament in 1668, when over 8,000 acres were enclosed and planted. The scheme required enclosures to remain in place until new trees were safe from cattle and deer, but by 1725 the plan was suffering neglect. The New Forest’s wood reserves fell from 123,927 acres in 1608 to 32,611 acres by 1783 (Albion, 1926: 132-3, 136). Roger Fisher, an English specialist in wood supply, recalled towards the end of the Seven Years’ War (1754-63) that “Indeed, so great has the consumption been that one of the most eminent timber dealers in the county of Sussex now living, has declared to me, that there is not now, as he



verily believes, more than one tenth part of the full grown timber, standing or growing, as there was when he entered into business, forty-five years ago" (Marcus, 1975: 12).

Already under Samuel Pepys planks were imported from the Baltic to finish warships under construction (Perlin, 1991: 223), a pattern that grew steadily throughout the 18th century. Norway developed into the largest source of redwood (Scots fir, well resistant to decay) and white-wood (common spruce). From 1700-70, 20,000 loads of fir were imported into Britain annually, and in 1750 Norway supplied 258 great masts of 12in plus diameter, 1,721 middle masts and 1,789 small masts (Kent, 1955: 63-64). By 23 May 1740, Norway fur imported under contract with Richard Haydon was used in Portsmouth Dockyard for baulks, uphroes and spars (ADM 106/920/233). Portsmouth's cumulative timber sourcing deficiencies begs the question of whether the construction of *Victory* between 1733 and 1737 was similarly affected.

The navy's various wood management issues overlapped with the *Victory's* build, and evidence exists that timber deficiencies impacted attempts to prepare the *Victory* for sea service in 1739. When Commissioner Richard Hughes expressed a great need on 12 February for large knees for the wind transom, cheeks of the head and standards on the decks of the *St George* and the *Victory*, the navy was advised by Mr Sutherland that the previous year's timber stocks had been so heavily drained that "very little is expected from what is behind" (ADM 106/920/80). If the requisite timber could not be obtained from the royal dockyards or merchants, it was expected to be procured directly from the New Forest (ADM 106/920/80). On 17 February, Commissioner Hughes bemoaned the lack of "Due Care" taken in providing the wood for these warships, and in the same breath promised to hasten to submit the defects found in several vessels (ADM 106/920/85), which presumably had to be repaired with new wood. New timber was subsequently sourced to supply the *Victory* and *St George* with between six and ten large knees for the transom and cheeks for the head, as well as 25 standards, all to be cut down under the direction of Mr Sutherland and Mr Fellows from five or six trees in the New Forest (ADM 106/920/93, ADM 106/920/98, ADM 106/920/99). Due to time pressures the timber ended up being felled prematurely "before barking time" (ADM 106/929/18). The emergency cutting of what are hinted to be immature trees for these warships makes it impossible that the wood could have seasoned suitably before being incorporated into the vessels, which may have introduced structural weak points in their design.

Further evidence indicates that despite tree volume deficiencies, the timber that arrived in many dockyards was not properly supervised for seasoning. When the royal

dockyards were accused of wood stock mismanagement in *A Proposition of Using Seasoned Timber in Building, Rebuilding, and Repairing his Majesty's Ships, and not Green Timber*, the Navy Board closed ranks to strongly defend its position in a letter of 6 October 1718 (ADM 1/3632), which asserted "That his Majesty's ships are now built, rebuilt and repaired with such timber as hath been usual in all times past". Officers of his Majesty's yards had consistently used "that timber first which has been longest in store, and that little, if any, can be wrought up under less than a summer's seasoning after its fall." The accusation that any ships had become entirely rotten and decayed within five years of being built with either green or seasoned timber was rejected out of hand (Baugh, 1977: 207-208).

Yet on 17 March 1737 the Commissioners of the Navy had ordered Portsmouth dockyard, where the *Victory* was built, to conduct a "Strict and Careful Survey of all the Knees in Store, and send you a True account of them, and their Condition, and particularly those Complained of to be daily Rotting and Perishing" (ADM 106/899/233). While planks were stacked under cover with great care at some dockyards, such as Woolwich (Roberts, 1992: 74), numerous correspondence points to negligent stock management. In 1737 the French naval spy Blaise Ollivier expressed surprise at the poor state of "middling good quality and extremely dry" English timber used in the dockyards at Deptford, which "is used with little care; much of the sapwood is left on and I saw many frames, timbers of the stern and transoms where there were two or three inches of sapwood already half rotted on one or two of their edges... the compass timber and scantlings other than plank are scattered and piled up without any system at all about the docks and in very great quantity". Ollivier further observed that unlike the Dutch, who routinely submerged timbers for up to six months to prevent sap fermenting, the same practice was rare in Britain and where it did occur, as at Chatham, frames were only submerged for one or two weeks (Roberts, 1992: 54).

Rather than Gallic mischief, on 6 January 1745 Commodore Charles Knowles confirmed to Lord Winchelsea, the First Lord of the Admiralty, the reality of the dilemma, writing from onboard the *Superbe* at Antigua that one reason why British warships were inferior to the French was due to the timbers selected (BL Add.MSS 15956, ff.119-22; Hattendorf, 1993: 489):

the timber as it is purchased and brought into the yards is laid in heaps, and not regularly expended according to its ages and the times of its being cut down, so that I have seen green timber (which has lain uppermost) used soon after it has come into the yards, and the old timber which has lain undermost (and been seasoned fit to use) lay till it has

rotted, or been so bad that it has decayed soon after it has been converted to use.

The problem was not just a matter of human error. The first 40 years of the 18th century coincided with a sustained positive phase in the North Atlantic Oscillation, when high pressure associated with a strong westerly air-flow resulted in a succession of moderate winters, when the decadal temperature stood 0.6° centigrade above normal. The mild winters of 1730 to 1739, encompassing the period when the *Victory* was built, were frost-free. Cut timber thus contained more sap than normal, making the time required for the seasoning process longer, if not impossible: wood may simply have started to rot instead of season (Wilkinson, 2004: 74, 88-89).

The overlap of the mild snap with periods when newly constructed or rebuilt ships rapidly decayed is not considered coincidental. Compared to the 12-16/17-year longevity of most 18th-century warships, ships built between 1735 and 1742 had an average longevity of just 8.8 years between the time of launch and docking for a major repair (sample size 24 ships). Admiralty progress books reveal that ships repaired in the 1730s and early 1740s needed subsequent attention within the space of four to eight years. Building and repairing warships with timber that was insufficiently seasoned created a vicious circle as the demand for timber increased because more repairs became necessary (Wilkinson, 2004: 74, 85, 88-9).

The problem of green wood was intensified by yet another problem, inadequate ship ventilation throughout the 1730s as the Navy Board repeatedly reminded the Admiralty in 1730 and 1732. The situation came to a head in 1737, when the Navy Board was urged by Master Shipwrights to resolve the problem. A letter of 15 August 1737 (ADM 1/3651) advised that 45 ships, including 29 of the line, had not been opened for air ventilation since coming into harbor “and being apprehensive that they may receive considerable damage if they continue longer closed, they prey they may have an order for the taking down the bulkheads in the hold and opening the proper strakes of planks on the gundecks... it is absolutely necessary for the preservation of His Majesty’s ships that they be opened to give all the air that is possible whilst they lie in harbor” (Wilkinson, 2004: 81-2). Once again, ill-ventilated ships tended to rot.

The system of air pipes leading from a ship’s oven into the hold to draw out foul air by means of a process of convection, proposed by the brewer Samuel Sutton in 1741, had found favor by 1747 in ships fitted at Portsmouth and was used effectively until 1752 (Wilkinson, 2004: 83). Hales’s *Description of Ventilators etc* of 1748 proposed constructing

special tubes between the double skin and floors of a ship to protect against dry-rot (Moll, 1926: 364). While the question of interior ventilation will always remain nothing more than speculation in the question of what caused and contributed to the *Victory*’s sinking, certainly the weight of historical sources suggests that an inadequate use of seasoned timber must be seriously considered as one potential contributing flaw in her loss of structural integrity during the great storm of October 1744.

## 7. Conclusion: *Victory*, a Disaster Waiting to Happen?

Behind the menacing climatic impact of the storm that damaged large parts of Admiral Sir John Balchen’s squadron in early October 1744 stood a series of man-made problems that are likely to have contributed to the sinking of the *Victory*. Wood accessibility deficiencies, mild winters, limited timber seasoning, poor wood rotation management and insufficient ship ventilation may all have played a role in the flagship’s structural vulnerability. The most grievous concern, however, was the question of unharmonious proportions combined with cannon crowding on light decks that made English warships crank, expressed with the ultimate ferocity by Edward Vernon. Was the admiral correct in his condemnation or should his comments be dismissed as a bitter personal rage against the Navy Board?

Despite a failure to control his temper, a polemical zeal and a tactless penchant for pamphleteering, “this mad hero”, as Horace Walpole called him, was an outstanding naval expert, who was judged to be sincerely honest (Ford, 1907: 210; Clowes, 1966: 52). The restoration of Vernon’s name to the Navy List as Admiral of the White was one of the first acts addressed by the Duke of Bedford as First Lord of the newly formed Board of the Admiralty in December 1744, demonstrating that Vernon retained the respect of his peers. Like Balchen in 1744, it was Vernon, called back from a quiet country life, who was turned to in July 1745 to mastermind the counterattack at Dunkirk and Ostend of the attempted French invasion of England (Ford, 1907: 201, 202, 207). To this day various landmarks from London’s Portobello Road to George Washington’s plantation estate, Mount Vernon, commemorate his achievements. The independent concern and displeasure directed at the Admiralty between the 1720s and 1740s by the highest ranking naval officers of the land – including Admiral John Balchen on the *Princess Amelia* in 1734, Sir John Norris on the *Victory* in 1740 and Commodore Charles Knowles from the *Superbe* on 6 January 1745 – leave no shadow of a doubt that these fears were rooted in reality.

In summary, the complaints directed at the structural problems inherent in Early Georgian English warships demonstrate that:

1. British warships were extremely long in proportion to their breadth, and built higher and broader than French vessels, causing them to be so deficient in bearings forward that they pitched and labored violently in heavy seas (small metacentric heights).
2. Royal dockyards built warships of significantly divergent proportions and strengths, with varying successes in supporting gun batteries.
3. By the late 1710s English warship scantlings were reduced in size to produce lighter and cheaper vessels believed to more durable sailors.
4. Warships with heavy topside weights and guns carried as high as possible above the waterline tended to be crank or tender, rolling or heeling easily or excessively (e.g. the *Princess Amelia*, 1734, and *Victory*, 1737 and 1740).
5. British three-decker warships carried too much armament for their capacity. The *Victory's* 28 x 42-pounder lower deck guns were heavier than the French equivalents, such as the 32 x 36-pounders on the lower deck of the 110-gun *Foudroyant* (built at Hélie in 1724).
6. Upper gun batteries were not suited to heavy ordnance on English warships because the deck beams were slight. English ships of the line were crippled by light deck beams overcrowded with guns.
7. In the later 1720s the Navy Board ordered heavy awnings and other unnecessary encumbrances to be removed from warships, including brickwork fireplaces. The Navy Board ordered its dockyards in the early 1740s to strengthen ships brought into port for refitting or repair by increasing standards of wood or iron on each deck and adding bolts to the knees of decks.
8. Crankness was countered by adding heavy ballast low down in the hold to lower a ship's center of gravity and by increasing the beam artificially by girdling or doubling at the waterline to improve the righting moment. The use of iron ballast rather than gravel stiffened warships.
9. Ballast supplementation ran the risk of drawing down the lower tier of guns too close to the waterline. Whether the lower-deck gun ports on British warships could be opened in the presence of the enemy was unreliable.
10. The ballasting/gun lowering effect was countered by increasing a ship's beam. Vessels too broad abeam often experienced violent rolling in heavy seas that loosened shrouds and stays, pried open hull joints and led to a loss or damage of masts.

11. Increases in English warship beam were rendered counter-productive by a reliance on masts and spars only proportionate to former ship breadths.
12. The *Victory* exhibited great fullness at her height of breadth. The escutcheon and taffarel-standards on her poop-royal framework made her 2.5ft higher above the gundeck than on French First Rates. The height of the stern and treble balconies made the *Victory* unusually heavy and high. The flagship's upper works were scarcely suitable for her lower body. She was deep waisted with much sheer (acutely angled hull). The vessel lacked roomliness and strength of decks. There is no evidence the *Victory's* beam was ever increased by girdling.

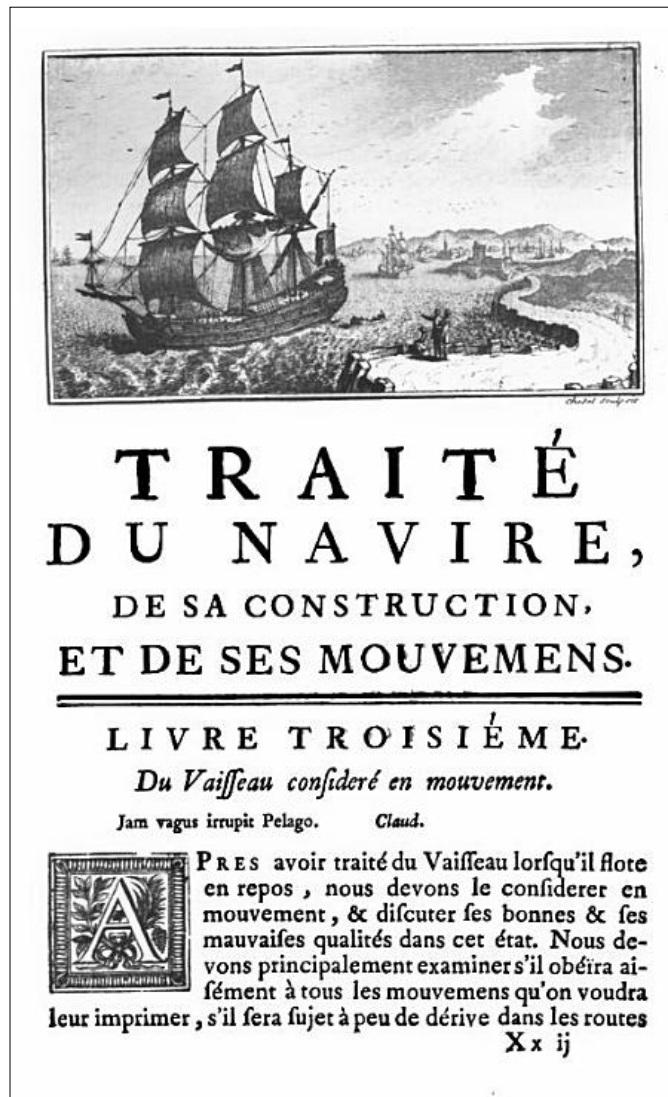


Fig. 12. Cover of Pierre Bouguer's *Traité du Navire* (1746), considered the most influential work written on naval architecture. Bouguer conceived the concept of the ship's metacenter.



13. Timber deficiencies resulted in imperfect wood use for shipbuilding that was susceptible to rotting. In 1737 knees stocked in Portsmouth dockyard were reportedly rotting and perishing. In 1739 timber had to be cut down prematurely for the *Victory*.
14. Officials failed to enforce the enclosure policy in the Dean and New Forests, resulting in ever-diminishing stocks.
15. Between at least 1718 and 1745 wood was poorly rotated in some royal dockyards. Green timber that tended to rot was introduced into warship builds.
16. The mild winters of 1730-39, when the *Victory* was built, were frost-free, compromising cut wood's ability to season. Warship longevity declined by up to a half between 1735-42.
17. The problem of green wood use was exacerbated by inadequate ship ventilation throughout the 1730s and early 1740s that accelerated timber rotting.

Whether financial pressures contributed to corner cutting in the build of *Victory* is hinted at in Admiralty correspondence. On 17 May 1731, Portsmouth dockyard enquired whether work on the *Victory* should be conducted under the wear and tear budget because no money was available for extra repairs that year (ADM 106/831/234). The dockyard again entreated on 8 May 1734 how work on the *Victory* should be accounted since no money was voted for in parliament (ADM 106/857/214). Four days later, Commissioner Hughes was warranted to charge the works to wear and tear (ADM 106/857/222). Finally, on 16 January 1735 the *Victory's* head was ordered to be made "as small, Light and as Cheap as possible" (ADM 106/890/25), taking the form solely of a lion. Since former orders of 5 July 1727 and 16 July 1734 required a figure to adorn the *Victory's* bows, for which the molds and materials were well advanced by January 1735 (ADM 106/890/18), the First Rate ended up with a highly elaborate figurehead – as befitted a capital ship – by chance rather than design.

Britain's historical backwardness in studying the science behind 18th-century shipbuilding, specifically compared to France (Ferreiro, 2007: 217-32), highlights the context of the Admiralty's struggle to turn out proportionate warships. Once Jean Baptiste Colbert (1619-83), the son of a merchant from Rheims, was appointed Minister of Marine in 1669, he encouraged the fusion of science and industry and was responsible for the foundation of the Académie des Sciences. After Colbert founded a school for naval officers and ship designers, shipbuilding shifted from a craft to a science in late 17th-century France. A series of conferences convened in Paris in 1681 addressed the application of scientific principles to shipbuilding, focusing on the

central question of hull form and the representation of its forms by simple geometrical methods amenable to calculation. Even greater debate followed the publication in 1697 of *Théorie de la Construction des Vaisseaux* by Paul Hoste, professor of mathematics at the royal seminary at Toulon (Stoot, 1959a: 215-18).

The Académie des Science's series of prizes offered for the best solution to specific problems in naval architecture attracted Europe's finest talents across the Channel. This enlightened environment led to Pierre Bouguer, son of the Regius Professor of Hydrology at Croisic, being awarded an Académie des Science's prize in 1727 on the masting of ships, after which he published his *Traité du Navire* in 1746, which is considered the most influential work written on naval architecture (Fig. 12). Bouguer, renowned as the father of naval architecture, conceived the concept of the metacenter, the point under which it is necessary to place the center of gravity of a ship, and experimented with models in water tanks, a practice that continues into the modern day (Stoot, 1959a: 217; Stoot, 1959b: 32, 33, 36, 41; Walker, 2010: 22). The French emphasis on a ship's individual strength resulted in the design of the two-decker 74-gun warship, which remained the mainstay of French naval warfare into the 19th century (Atkinson, 2007: 48).

In the absence of state encouragement, and the opposition of universities to teaching engineering, these developments had virtually no impact in Britain until the second half of the 19th century. Within the confines of the British Isles, building wooden ships remained a craft devoid of exchanges of information. Whereas the French translated important English books on naval architecture (essentially restricted to manuals for shipwrights), the English did not follow this example. Instead, as an institution the Admiralty largely relied on copying captured French ships (Stoot, 1959a: 218-19), epitomized by the 74-gun, two and a half deck *Invincible* (Bingeman, 2010: 5-16).

In the year when the *Victory* sank, William Horsley (1744: 4-5) confirmed the prevailing recognition that under King Louis XIV the French "of a sudden built their Ships of War better, than ours; that is to say, better contrived within, and their Bottoms better modeled... By this means the common Builders, came to understand the true Figure and Formation of a Ship both for War and Sailing; and every working Mechanick became, by degrees, as well versed, in the Art of Ship-building, as the Master-builder himself". By contrast, in Britain "the Science is not studied, nor propagated, and, I am afraid, not very well understood... Our three-deck Ships are generally defective in their upper Works, and, in my opinion, too much raised, which renders them weak and unable to bear the Weight of the Metal they carry" (Horsley, 1744: 8).

<b>First Rate Warship – 100 Guns</b>							
<b>Establishment</b>	<b>1677</b>	<b>1719</b>	<b>1733</b>	<b>Victory 1733-37</b>	<b>1741</b>	<b>1745</b>	<b>Royal George 1746-56</b>
<b>L. of Gun Deck</b>	165, 0	174, 0	174, 0	174, 9	175, 0	178, 0	178, 0
<b>L. of Keel</b>	137, 8	140, 7	140, 7	141, 7	142, 4	144, 6½	143, 5½
<b>Extreme Breadth</b>	46, 0	50, 0	50, 0	50, 6	50, 0	51, 0	51, 9½
<b>Depth in Hold</b>	19, 2	20, 0	20, 6	20, 6	21, 0	21, 6	21, 6
<b>Burden in Tons</b>	1550	1869	1869	1920	1892	2000	2046

Table 1. Dimensions in feet and inches established or proposed for 100-gun First Rate English warships, 1677-1745 (from Morgan and Creuze, 1827: 241). The dimensions for Victory 1737 and the Royal George 1756 are based on Winfield (2007: 4, 5).

Despite the tragic sinking of the *Victory*, and the controversies swirling around English warship construction during the first half of the 18th century, a stubborn Admiralty largely ignored the body of evidence and wisdom demanding reform. On 6 January 1745, Commodore Charles Knowles wrote to Lord Winchelsea, First Lord of the Admiralty, along identical lines to Vernon, that “The many great complaints that have been made of late years about the badness of our ships of war, both in regard to their figure as to sailing, and to their incapacity for lodging their men, as well as the badness of materials, and the manner in which they have been built, are not without justification”. Like Vernon, Knowles proposed amendments (BL Add.MSS 15956, ff.119-22; Hattendorf *et al.* 1993: 486).

When the chance to vote for reform arrived, the result was a bitter disappointment. By the 1740s no new establishment had been introduced since 1719, despite attempts to develop one in 1733. On 27 November 1745, Sir John Norris, Vice Admiral of England and Commander in Chief of his Majesty’s fleet, replied with his Ad Hoc Committee of Senior Officers to the Admiralty Board’s request in June for the navy to consider methods for a new establishment. Norris’s statement confirmed the veracity of Vernon’s concerns about the ‘general mistake’ in warship building and maintenance, whereby (ADM 95/2; Baugh, 1977: 227):

the ships of the royal navy are not now built according to any certain and uniform standard or establishment; but every particular ship being built or rebuilt according to particular proposed dimensions, those of the same class, or denominations, have been of unequal sizes and proportions... And it being likewise observed that the scantlings of his Majesty’s ships in general are not so large and strong as they should be, and it also being a general complaint that the ships are crank and heel so much in blowing weather that they cannot open their lee ports at the same time that the ships of other nations go upright with all their batteries open and ready for action.

Norris and his advisors esteemed it “a matter of highest importance” that these complaints be rectified and amended to bring a “certain uniform size and standard according to their several classes”, primarily to enable warships to carry requisite guns with their lower tier positioned 6ft above the water line when furnished with four months of stores for foreign service. The enquiry underpinning the proposed 1745 establishment was comprehensive. Sir Jacob Acworth, the Surveyor of the Navy, was sent to the Master Shipwrights of his Majesty’s yards and several eminent shipbuilders to listen to their concerns. The flag officers of the fleet, commanders of the navy and captains also met to debate the consultation and enquired into how to increase the dimensions of First and Second Rates. The Master Shipwrights prepared scantlings for a ship of each class “being both larger and stronger than those now in use”, which were approved by Norris and his advisors (ADM 95/2; Baugh, 1977: 227, 229-31).

Ultimately, the 1745 establishment stuck with conservatism and rebuffed innovation. The capacity of larger ships was not increased to raise the lower tier at least 6ft above the waterline for the logistical reason that such ships would not fit in existing English drydocks. The reclassification of warships into ships of 74, 64 and 58 guns was rejected, and the 86-gun ship of the line was retained as a three-decker, rather than the newly proposed two and a half decks. The nature of the 1745 establishment was seemingly strongly influenced by Sir Jacob Acworth, whose long tenure as Surveyor of the Navy from 1715-47 deterred progress. Characterized as having “much of the nature of Pompey the Great”, Acworth vigorously defended existing methods to support the land’s more conservatively inclined Master Shipwrights. The traditional deep draught and sharpness of English men of war was retained to the detriment of better-balanced, full-bodied hull forms (Baugh, 1977: 200-201).

The best balanced solutions to shipbuilding involved increasing a ship's total capacity, thus retaining the breadth in a suitable proportion to the length and reducing the weight of the upper works. This objective failed to be achieved during the era when the *Victory* was built from 1733-37, but was taken into consideration for the 1745 establishment. By then, compared to the *Victory* the length of the gun deck on First Rates was increased by 3ft 3in to 178ft, the depth of the hold by 1ft and the burden by 80 tons (Table 1). Whether the minor increase in the maximum breadth by just 6in was sufficiently balanced remains a mute point. Charnock (1800: 138) certainly considered the First Rate *Royal George*, laid down in 1746 and launched in 1756, to be "The first attempt towards emancipation from the former servitude... the paragon of beauty, and considered as the *ne plus ultra* of perfection in the science of marine architecture". The *Royal George* was significantly larger in all respects than the *Victory* (gun deck 3ft 3in longer, keel 1ft 10½in longer, breadth 1ft 3½in longer, 1ft deeper in the hold, 126-ton greater burden) and adhered largely to the dimensions of the 1745 Establishment, except with a 46-ton heavier burden (Table 1).

In the highly expensive game of naval supremacy, the very existence of the great battleships was a matter of reputation and grandeur (Fig. 13). Despite drawing upon a somewhat archaic frame of mind with its old-fashioned all-brass guns, the *Victory's* success as a naval deterrent capable of shock and awe is evident in its efficiency in scattering the Brest fleet that blockaded the British Mediterranean fleet down the River Tagus in late August 1744 (Richmond: 1920: 109; Cunningham Dobson and Kingsley, 2010: 267-68). What happened precisely to the navy's flagship and why

during its return voyage to England on 3-4 October will never be known. The absence of a progress report for the *Victory* (see ADM 95/23-95/27) prevents any sailing flaws being formally identified. The warship's great fullness of breadth, scarcely suitable for her lower body, sheer hull and unusually high poop-royal and stern made her a vulnerable target for strong winds and storm waves. Ultimately, she may have been a disaster waiting to happen, a self-fulfilling prophesy of many admirals' worst fears.

The *Victory's* hull may have worked loose at the point where the deck beams took the stress of the masts and joined the side frames. Due to violent laboring and rolling, a ship would then break her sheer and become so twisted and sprung that she lost her design contours (Baugh, 1977: 201). The washing up onto the shores of Guernsey of the *Victory's* mainmast may reinforce such a view (Kingsley, 2015: 5-6), if it was not cut down deliberately. Incapable of holding the wind, and with the elements buffeting her unusually elevated stern, the greatest warship of the Early Georgian era rolled over into the ocean, turning 180°, and vanished beneath the waves (Newman, 2015). She settled with the bows to the northeast and the stern to the southwest (Seiffert *et al.*, 2013: 10-12).

Future studies of the wreck of the *Victory* will hopefully start to address some of the outstanding questions for the reasons of her loss, in line with the research agenda formulated in *Project Design. A Mitigation Strategy for the Wreck of the First Rate Warship Victory (1744)* (February 2014: 28-31). To what degree was she using iron rather than wooden knees, if at all? What volume of ballast was she transporting and was it sufficient, with lightened stores consumed after more than two months at sea, to counteract the ship's

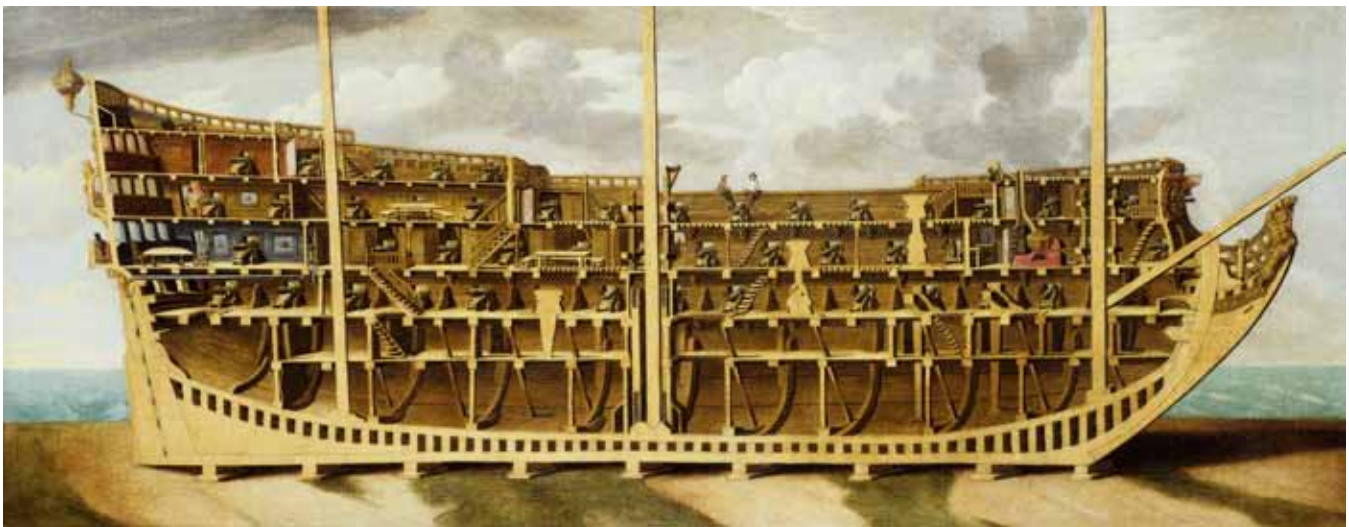


Fig. 13. A cross-section profile of a First Rate English warship by Thomas Phillips, c. 1701. Photo: National Maritime Museum, Greenwich, BHC0872.



topside weight and crankness? Dendrochronological analysis could assess the longevity of any surviving large timbers, such as knees, and thus durations between repairs and replacement. These are just a few of the questions that the Maritime Heritage Foundation hopes to address on-site in the near future. The wreck of the *Victory* remains an untapped primary archaeological resource.

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## Notes

1. For the etymology of the Admiral Balchen's name from the original Baltchin to Balchin and Balchen, see Kingsley, 2015: note 1.
2. The *Hampton Court* separated from Balchen's squadron after helping capture six French prizes on 18 August 1744, arriving at Spithead on 22 August (ADM 52/576).

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