

BRITANNIC: 'THE LENGTH AND BREADTH' OF THE SHIP

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One of many popular myths is that *Britannic* was marginally longer than her sister ships, with an overall length of 903 feet. It is one of those claims which has circulated and been repeated down the years, even though it has no basis in fact.

The truth about the ship's length is easy to establish. We know from Harland & Wolff's documentation of the order for 'Yard Number 433' that her length between perpendiculars (from the bow to the stern post) was 850 feet – precisely the same as her older sisters. The measurement was her 'moulded dimension', measured from the aft face of the sternpost to the inboard edge of the stem bar (at E-deck) at the bow, used by the ship's builders and the Board of Trade.

Her length between perpendiculars of 852 feet 6 inches was basically the same measurement, but taken outboard rather than inboard. This was the first of two measurements for the ship's length between perpendiculars on the ship's official registration papers:

'Length from fore part of stem, under the bowsprit, to the aft side of the head of the stern post': 852 feet 5 tenths (852 feet 6 inches).

'Length at quarter of depth from top of weather deck at side amidships to bottom of keel': 849 feet 2 tenths (849 feet 2.4 inches)

All these primary sources are in complete agreement: *Britannic's* length between perpendiculars, on any measure, was the same as her sister ships'.¹

Where Built.	When Built.	Name and Address of Builders.	
Belfast	1911	Harland & Wolff Ltd Belfast.	
Length from forepart of stem, under the bowsprit, to the aft side of the head of the stern post		FEET.	TENTHS.
Length at quarter of depth from top of weather deck at side amidships to bottom of keel... ..		852	5
		849	2

Olympic's length (above) and *Britannic's* length (below) as recorded on their official registration papers in 1911 and 1915, respectively. Both ships were exactly the same length. (National Archives, United Kingdom)

Where Built	When Built	Name and Address of Builders	
Belfast	1915	Harland & Wolff Ltd Belfast.	
Length from fore part of stem, under the bowsprit, to the aft side of the head of the stern post		Feet	Tenths
Length at quarter of depth from top of weather deck at side amidships to bottom of keel		852	5
		849	2

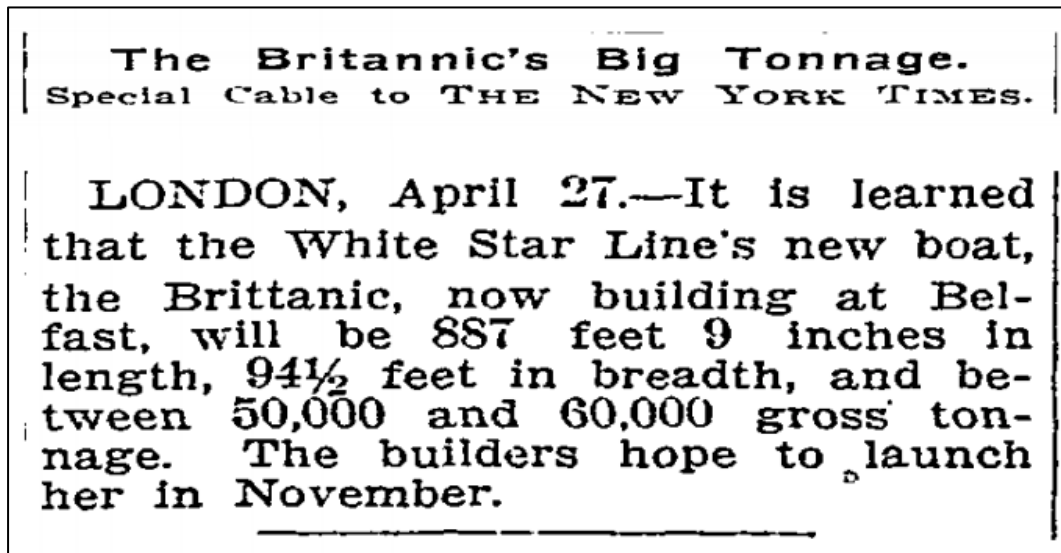
Given that she was the same length between perpendiculars, the only possible way to increase her overall length to 903 feet would have been to add about twenty feet to the overhang of the counter stern (increasing it from more than thirty feet to more than fifty feet). However, we know that the design of the stern was not changed in this way.

In June 1914, Harold Sanderson confirmed that *Britannic* was the same overall length as *Olympic*, stating: 'She is a sister ship with the exception of the beam, which is a little greater'.

If the truth is clear from the primary source documentation, then why is there so much confusion? Why do so many sources assert *Britannic* was over 900 feet long? Part of the explanation lies in the unfortunate reality that once inaccurate claims appear in secondary sources, they tend to get cited again and again, but the misinformation on the subject is not a modern-day issue. It goes back to before she was even completed.

Newspaper reports included the exaggeration that she was going to be 1,000 feet long as early as 1911. On 7 May 1912, the *New York Times* said that she would be 'nearly twenty feet longer than the *Titanic*'. Might this explain where the figure of 903 feet came from? *Olympic* and *Titanic's* overall length of 882 feet 9 inches is sometimes rounded to

883 feet and an additional length of almost twenty feet might account for someone concluding that the new ship would be 903 feet overall. At the end of May 1912, the same newspaper was a little more accurate when they said that the new ship would be 'the same length as the *Olympic*', but they reported her length inaccurately at '869 feet'. The inaccurate and contradictory information shows the danger in relying on newspaper reports.



Above: Some newspaper reports were more accurate than others. This one was close to the ship's length and breadth, but exaggerated her gross tonnage and miss-spelt her name. (*New York Times*, 1913)

It is plausible that these inaccurate press reports led to confusion among professionals and officials. In November 1913, members of the Institution of Civil Engineers were discussing the recent changes at Southampton including the construction of the new wet dock and the extension of the dry dock. They thought *Britannic* 'would be little, *if at all*, [author's *emphasis*] short of 900 feet', noting that Southampton's Trafalgar dry dock 'had to be lengthened and widened to take vessels of the "*Olympic*" class' soon after it had been completed. On 22 December 1913, postal officials wrote to the Admiralty in connection with a discussion about the port facilities at Queenstown. During their correspondence, they referred to 'the Cunard liner *Aquitania* of over 900 feet in length' and 'the *Britannic*, building for the White Star company, which it is believed will exceed that dimension'.

Perhaps the reference to *Aquitania* is worth highlighting. White Star seem to have been none too keen on revealing that *Britannic* would be

shorter than her Cunard rival. Unlike *Olympic* or *Titanic*, *Britannic* was going to be neither the longest ship in the world nor the largest ship in the world (measured by gross tonnage) when she was expected to enter service. Even if she had been 903 feet long, that length would still have left her shorter than the new HAPAG ships being built in Germany.

Olympic and *Britannic* would both be larger than *Aquitania* by gross tonnage, relegating her to the third largest British ship. In fact, it was gross tonnage that was the fairest measure of which ship was larger, nonetheless White Star came up with a solution to try and avoid drawing attention to *Britannic*'s length. Instead of releasing her precise length overall, they took to describing her as 'about 900 feet long'. Their statements were correct as far as they went, providing a handy way to avoid disclosing explicitly that she was shorter. Even so, technical journals such as *Engineering News* reported her overall length correctly. On 11 June 1914, they stated *Britannic* was 882 feet 9 inches long overall but then got *Olympic*'s length wrong when they said she was 883 feet – implying she was 3 inches longer!

Shipping lines could take a particular interest in how a ship's length or other particulars might appear in the press or for advertising material. In January 1910, when plans for Cunard's *Aquitania* were under consideration, the company was discussing one proposal that envisaged her being 775 feet long between perpendiculars and with an overall length of over 800 feet. A memo to Cunard's general manager noted that '775 feet B.P. [between perpendiculars] will give an overall length of just over 800 feet for advertising purposes'. They were aware that a ship of that length would still be shorter than the White Star liners, even if their private information estimated *Olympic* and *Titanic* at thirty feet shorter than they actually were. As time went by, Cunard's plans changed and their completed ship gained about one hundred feet in length.

When Edward Wilding, representing Harland & Wolff, testified at the Limitation of Liability hearings in 1915 he was asked about *Britannic*'s size compared to *Titanic*. He replied: 'So far, the owners have not published it. I think you had better ask the owners'. Then he said: 'The owners [White Star] have made a deliberate point of refraining; I know, of course, perfectly well, but I don't think I had better tell'. In the end, he did not comment on her length directly at all. All he felt able to say was: 'She is a little larger, but not much'.

* * *

When the White Star Line confirmed the order for 'Yard Number 433' in June 1911, she was envisaged as the same breadth as *Olympic* and *Titanic*. The shipyard and engine works were ordered to proceed on 28 June 1911 but the formal 'letter of agreement' was not signed until 23 October 1911.

After the order to proceed, *Britannic's* breadth was altered from the original moulded breadth of 92 feet to 93 feet 6 inches – an increase of eighteen inches. (All three '*Olympic*' class ships' breadths can be seen in certain period specifications as differing by six inches, but this is dependent on whether the 'moulded breadth' or 'extreme breadth' was used as a measurement. As Thomas Andrews explained, the former measured 'from heel to heel of [hull] frame' whereas the latter represented 'the overall of the plating on the ship's side'.) The ship's breadth is more commonly cited using the extreme figure, making her 94 feet wide in comparison to her older sisters' 92 feet 6 inches.

In the same way that the original moulded breadth had been written in black ink and then subsequently amended in red ink, another alteration followed. The ship's twenty-four double-ended boilers were enlarged in length from twenty feet to twenty-one feet and the alteration was made in red ink and dated '3 January 1912'. The change accompanied the decision to increase the power of her propelling machinery.

Why was *Britannic's* propelling machinery more powerful than her sisters'? *Olympic's* performance in service was more than satisfactory. She proved easily capable of speeds considerably beyond what she had been designed for and exceeded 23 knots in 1911. Harland & Wolff's records contain reference to a service speed of 21½ knots for *Britannic*, compared to 21 knots for *Olympic*, yet in all likelihood it simply reflects the reality that her older sister had proven significantly faster than anticipated. No attempt was made to increase *Britannic's* speed. Her owners stuck to a tried and tested formula of a designed service speed of around 21 knots with ample power in reserve to make up for delays.

The decision to increase *Britannic's* breadth resulted in an increase in her displacement (or weight) at her designed draft. The consequence was that she needed increased power to be sure she could obtain her designed speed. As *The Engineer* put it: 'It is to this increase in beam that the rise in gross tonnage [and displacement]... is chiefly due. *This again, reacts on the machinery.* [author's emphasis]'. Cunard's *Aquitania* was widened during the course of the design process and her designer

noted then that the proposed 'increase of beam would probably mean a slight increase of power' required for the boilers and propelling machinery.

Britannic's increased breadth brought her length to breadth ratio more into line with other large liners of the period:

<i>Lusitania</i>	<i>Aquitania</i>	<i>Imperator/ Berengaria</i>	<i>Britannic</i>	<i>Bismarck/ Majestic</i>	<i>Olympic</i>
8.6	8.9	9	9	9.1	9.2

N.B. The method of calculation is based on taking a ship's length between perpendiculars and dividing it by the ship's extreme breadth.

The graving dock at Harland & Wolff's Belfast yard, opened only recently, was one hundred feet wide at the dock floor but the dock entrance was even narrower. The margin on either side of *Olympic* was less than two feet, but *Britannic* had a foot – although she did have three feet either side once she was in the dock. The dimensions of the graving dock in all likelihood prevented the shipbuilders making her any wider.

If increasing the power of *Britannic's* propelling machinery was a result of increasing her breadth, then why was her breadth increased in the first place? The decision was taken after the initial order to proceed was recorded on 28 June 1911, because the initial specification was that she would be the same breadth as her sisters.

In the summer of 1911, officials from Harland & Wolff including Thomas Andrews and Edward Wilding were keen to observe all aspects of *Olympic's* performance and learn any lessons that they could use to improve her sister ships. One of the changes the shipbuilder implemented when *Olympic* returned to Belfast for repairs after the *Hawke* collision was to make an adjustment to her port and starboard propellers by increasing the pitch of the blades. The change was apparently successful in achieving improved performance and they did something similar on *Titanic*, further increasing the pitch of her wing propellers and changing the centre propeller specification. Although *Olympic* was generally free of vibration, there were particular areas where it could be reduced such as the fore and aft ends of the superstructure. (Harland & Wolff used devices to measure the amplitude and frequency). In consequence, Andrews specified minor alterations to some of *Titanic's* deckhouses and, presumably, the same changes or similar were then applied to *Olympic* when the opportunity

arose. Similarly, it did not take long for Ismay to suggest expanding the first class stateroom accommodation on B-deck, or for the decision to expand the first class reception room because it was so popular.

Olympic earned a reputation as a generally good, comfortable sea boat, but there was always room for improvement. On Thursday 24 August 1911 she was nearing the end of her third eastbound crossing, running through moderate to light westerly winds and moderate swells on her fifth full day at sea. She had left New York on the preceding Saturday, loaded to a draft of 35 feet 5 inches with a large general cargo, baggage and 7,000 tons of coal. As the voyage progressed, fuel and stores were used up and she became lighter. One naval architect, who was onboard as a passenger, noted 'she rolled from three degrees to five degrees in from 18 to 20 seconds for each complete roll' and suspected that 'the ship under ordinary conditions of lading would be tender towards the end of the voyage, and with a sea on the quarter would roll considerably, but easily'. It looks like Harland & Wolff felt the same way.

A ship's metacentric height (GM) is a measure of her stability as a floating object, expressed as the difference between the ship's metacenter and her centre of gravity. The larger a ship's GM, the greater her stability. However, a balance of factors needs to be taken into consideration. A large metacentric height can lead to a ship that rolls for very short periods and corrects herself quickly, making her uncomfortable for passengers. A 'tender' ship in this sense would be one with a smaller GM, implying that she would roll for a longer period (as observed on *Olympic* near the end of her third eastbound crossing). A ship's metacentric height varies depending on her state of loading. Her displacement reduces and her draft decreases as a typical voyage progresses.

Data from March 1925 shows this quite clearly for *Olympic*:

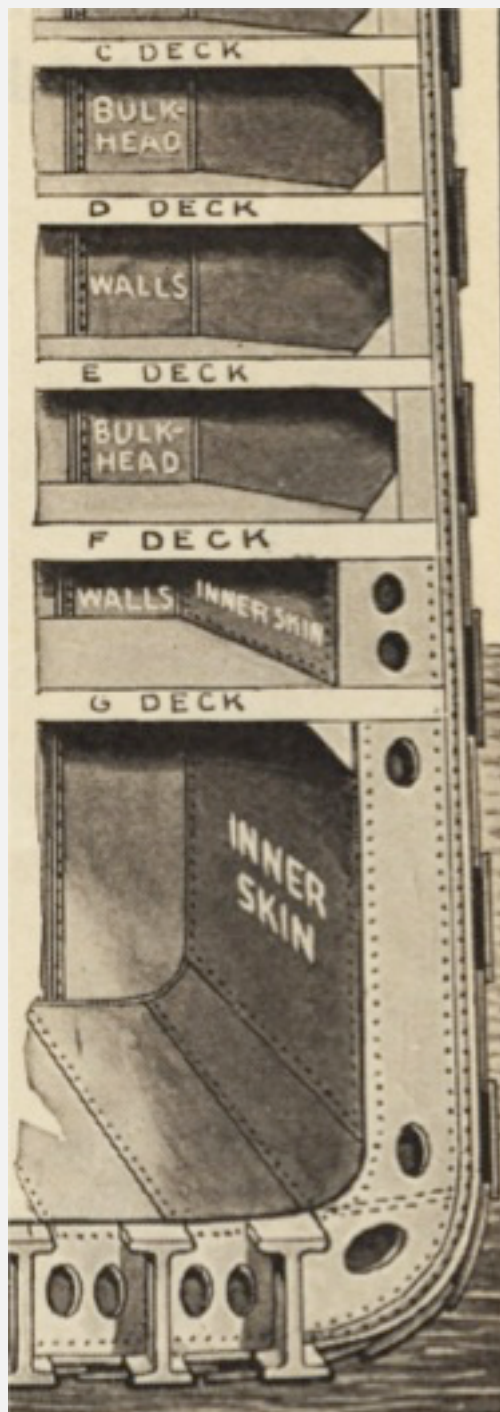
Condition	Mean Draft	Particulars	GM
'No. 3. Loaded', leaving New York.	34 feet 7 inches	Including 643 tons of cargo, 7,631 tons of oil fuel loaded, 324 tons of passengers and crew, 2,207 tons of fresh water	2.73 feet
'No. 6. Loaded, arriving New York.	30 feet 10 inches	Including 643 tons of cargo, 550 tons of oil fuel unused, 324 tons of passengers and crew, 792 tons of fresh water and 2,414 tons of water ballast	1.17 feet

It is difficult to obtain comparative data for different liners of the period, because there are so many potential scenarios and different assumptions about the state of loading. Even if two ships are compared in the 'loaded, departure' condition then the results are not necessarily comparable. If we take *Olympic's* then-running mate *Bismarck/Majestic* (1922) loaded to her designed draft then her estimated GM was 2.82 feet, but no conclusion can be drawn without further details to determine a true comparison.

The proposed changes to *Titanic's* passenger accommodation, particularly the expanded first class accommodation on B-deck and the additional weight it represented higher up, resulted in her GM being six inches less than her sister *Olympic's* in the same condition according to calculations undertaken by Harland & Wolff in 1911. What they implied was that any tenderness on the part of *Olympic*, when she was lightly loaded, would be more evident on *Titanic*.

All proposals to improve *Titanic's* passenger accommodation were also implemented, with some variation, on *Britannic*. The White Star Line went even further, specifying an enormous increase in the ship's private bathroom accommodation among many improvements. Any reduction in *Titanic's* GM, compared to *Olympic*, would be experienced by *Britannic* as well unless Harland & Wolff made some design changes. It was essential that *Britannic's* accommodation was superior to her sisters', so that she could meet growing commercial competition from Cunard and the German ships. Foregoing the improvements in her first class accommodation was out of the question. Instead, Harland & Wolff resolved to increase her breadth.

A table of particulars was prepared for Lord Pirrie dated 17 October 1911, giving the new ship's moulded breadth as eighteen inches greater than her two older sisters. The table included the comparative calculation that *Titanic's* GM was six inches less than *Olympic's*. Harland & Wolff's C. Hackett & J. G. Bedford presented this data in 1996, writing that the increase in *Britannic's* breadth 'was to restore her lightship GM closer to that of *Olympic*'.² The 'letter of agreement' to proceed with construction came only six days after the table of particulars was prepared for Pirrie.



Above: An extract from an advertisement for *Olympic* after her 1913 refit, illustrating the new inner skin. (*Harper's Weekly*, 1913/Author's Collection)

The common suggestion that the ship had to be widened to accommodate the new inner skin is impossible because the chronology does not work. *Britannic* was laid down on 30 November 1911 and she was already fully framed to the height of the double bottom by 12 March 1912, a month before the *Titanic* disaster.

Harland & Wolff were able to fit an inner skin to the narrower *Olympic* in any case, making an adjustment by reducing the size of the middle boiler in boiler room 5. The inner plating of the new inner skin was thirty inches from the ship's side, at the inboard extremity of the existing very strong thirty-inch deep web frames. In effect, the inner skin simply created a series of watertight voids between web frames, which already existed.

Hackett & Bedford wrote 'it has always been assumed by commenters and authors that the eighteen inch increase in moulded breadth was a direct result of the decision, after the loss of *Titanic*, to fit a double hull over the length of the engine and boiler rooms. This seems an appropriate time and place to correct this misapprehension once and for all'. They noted: 'It does not require much thought to appreciate that an increase of eighteen inches would not make much easier the fitting of a double hull of three to four feet width port and starboard'. In fact, the double hull – or inner skin – was two-and-a-half feet on each side.

When Cunard were discussing plans for *Aquitania*, they resolved to adopt no design proposal that would result in a ship with a reduced GM compared to *Lusitania* or *Mauretania*. In October 1910, their preliminary plans showed a ship 850 feet long between perpendiculars, with a moulded breadth of 95 feet and a moulded depth of 65 feet. The proposed draft of 35 feet and the intended hull form equated to a displacement of about 48,500 tons.

These preliminary plans for *Aquitania* envisaged a ship the same length as *Olympic* and *Titanic* and virtually the same moulded depth (six inches greater) but three feet wider. Even so, Cunard's naval architectural staff calculated that her 'estimated metacentric height in the light condition' would be about half a foot: 'This is considered to be scarcely sufficient: the *Mauretania* and *Lusitania* each have eleven inches [0.92 feet] in the light condition, which is found not to be too much'. As a consequence, they discussed reducing the ship's depth and reducing her load draft in order to increase her metacentric height to one foot when she was loaded in the light condition (almost the same as her older running mates). Two months later, the shipbuilders were asked to quote for a ship fifteen feet longer and with an additional foot added to her breadth. The builders requested a further increase of half a foot: 'The additional six inches of beam will give satisfactory stability in all conditions [of loading] from light to [full] load'. She ended up four and a half feet wider than *Olympic*.

Cunard noted:

Experience has taught us that during the construction of large passengers steamers, the estimated GM is partially absorbed through developments of passenger accommodation etc., it is therefore highly desirable that the beam should not be cut too fine.

Following experience with *Titanic* and the improvements in her accommodation over *Olympic*, the documentation shows Harland & Wolff were of the same opinion when it came to *Britannic*.

ACKNOWLEDGEMENTS

I am grateful to Scott Andrews and Bruce Beveridge for their input and advice. Any errors are my own responsibility.

¹ Researchers such as Charles Dragonette had examined the ship's general arrangement plans and come to the conclusion that she was the same length as her sister ships in the 1970s. See: 'Britannic Memorial Issue'. *Titanic Commutator*; 1977. Page 19.

² Hackett, C., and Bedford, J. G. 'The Sinking of SS *Titanic* – Investigated by Modern Techniques'. The Royal Institution of Naval Architects; December 1996: Page 197.