The Olympic Class and the Rise of the "Super-Intermediate" Liners

By
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There are two goals of this article: To discuss the affect White Star's Olympic Class had on the Transatlantic express run, and the success of the "Super-Intermediate" liners that appeared just before the First World War as a result. I hope to persuade the reader that the arrival of the Olympic in 1911 heralded a new breed of ocean liner that changed the face of the Atlantic forever and showed that the pursuit of speed could lead to a dead-end road. (For the sake of the discussion here, I define an express liner as one that can cruise at 20 knots or more.)

In the years just prior to the Great War, competition in the prestigious transatlantic passenger trade was fierce. The White Star Line, Cunard, and Hamburg-Amerikan Line (Hapag) were developing ever larger liners to run against each other. Cunard's Lusitania and Mauretania ruled the Atlantic until the appearance of White Star's Olympic and Titanic. Hapag responded with perhaps the most magnificent trio of them all-the Imperator class liners. The Imperator, Vaterland, and Bismarck were obviously intended to be the ultimate expression of the friendly rivalry in the passenger trade. Cunard, unwilling to be left behind in this marathon, placed an order for a four funneled vessel that would hopefully become the pride of the company. The Aquitania would not disappoint them. She went on to become one of the most successful liners of all time. But where did Cunard and Hapag get their primary inspiration for their giant ships? Quite obviously, White Star's Olympic set a standard they could not ignore.

The Olympic represented a new breed of ocean liner when she appeared in 1911. In a day long before massive oil tankers, Olympic was the largest ship in the world. At over 45,000 gross tons, she was about 50% larger than the Lusitania and Mauretania. Olympic was the first vessel to exceed 800 feet in length and to break the 40,000 ton mark. Although she was a fast ship with a service speed of more than 21 knots, speed was not her main forte. It was her passenger accommodation that set her part from her contemporaries. The public spaces were breathtakingly spacious for their day. First Class patrons were treated to a virtual feast of facilities that easily exceeded anything else afloat. Olympic's swimming pool, Turkish Baths, Smoking Room, lounge, squash racquet court, gymnasium, and main staircase epitomized the new standards of luxury passengers expected. There were even small "skidlights" at the base of some of the deckhouses to provide sunlight to cabins on A deck. It was obvious there would be no going back after the Olympic. The expectations of the sea going public had been raised to a very high point. With these sumptuous surroundings, what would a few extra hours at sea matter when compared to the Lusitania? Titanic would up the ante once again with her deluxe private suites and Café Parisian.

From the standpoint of marine engineering, the Olympic also set new precedents. Unlike the Lusitania and Mauretania, the Olympic Class ships were not intended to be record breakers in the category of speed. While the Cunard twins could average 25-26 knots per trip, the Olympic would be comfortable with a speed range of 21-22 knots. Olympic would be a "seven-day ship", making the crossing of the Atlantic in a week as compared to six days for the Lusitania and her sister. (This included nearly two days of steaming to the ports of Cherbourg and Queenstown on westbound runs.) This had distinct advantages for White Star. Speed requires strict design criteria, such as great length along the waterline, a certain hull shape, and a narrow beam. This means the amenities available for the passengers must fit within this constraint. Fuel consumption

also increases quite a bit for only a few extra knots of speed. Indeed, it was said at the time that each knot of speed a ship was intended to go beyond 20 cost as much as the previous 20 knots! The powerplant in such ships may also be larger, taking up space that could be used to generate revenue. Essentially White Star expanded on the concept of the intermediate liner, such as the "Big Four" that the company used to maintain a weekly service out of Liverpool. The Celtic, Cedric, Baltic, and Adriatic were large ships in the 20,000 ton range that cruised at about 16 knots. Coal use of these ships was very low for the period, around 280 tons per day. But the main express service would demand a speed in excess of 20 knots. (Sixteen knots would not be competitive.) This allowed weekly departures using three vessels instead of four. Two sister ships would be built first, Olympic and Titanic, with a third sister (Britannic) to follow later. With their new ships White Star was aiming for a middle ground between the intermediate and Blue Riband contenders. Basically, they created the first "Super-Intermediate" class of liner-a ship of more than 30,000 tons and with a service speed in the 20-24 knot range. By designing for a slightly less speed than Cunard, White Star saved considerable cost, in terms of construction and operation. For example, Titanic cost about $7.6 million to build. The Mauretania had a price tag of $8.9 million. Olympic consumed about 620 tons of coal per day on her maiden crossing, averaging 21.17 knots. This resulted in a fuel use of 1.4lb of coal per shaft-horsepower, per hour. The Lusitania, in contrast, burned over 850 tons of coal per day at 25 knots! (It could have been worse. Initial projections were for 1000 tons a day!) This worked out to a fuel use of 1.43lb/shp/hr for the Cunard ship. Fuel consumption was in favor of Olympic by about 20%, based on overall daily consumption. This amounted to a difference in crossing time measured in hours, but with greatly reduced coal consumption for Olympic. (Indeed, Cunard depended on a government operating subsidy for their twin sisters to make them economically viable. White Star had no such arrangement.) Reduced speed also permitted greater beam, making it possible for increased public room size. The passenger capacity could also be increased. The less stringent length-to-beam ratio of slower vessels also contributed to a smoother ride with less rolling and pitching. The Lusitania Class had a reputation as "rough rides." The lack of flare in the bow also allowed a considerable amount of water to be pushed into the air when they were underway, leaving the forecastle area quite wet. (Although this was a trait of nearly all ships of that era to some degree.)

White Star's choice of a propulsion system for the Olympic Class was also innovative. Contrary to what some believe, the direct drive marine turbine was not superior to reciprocating engines in all respects. Since a turbine has a very high rotational speed, but the RPM's of the screw should be much lower to maintain efficiency, the diameter of the shafts has to be very large to keep the propeller rotation reasonable. This results in a considerable waste of energy powering the massive shaft. Actual analysis of the fuel consumption of the Cunard sisterships Carmania and Caronia (1905) provides an excellent example. Carmania was fitted with direct drive turbines, while Caronia had quadruple expansion reciprocating engines. Both ships had a cruising speed of 18 knots. Although Carmania's speed was almost a knot faster than Caronia, her fuel consumption was much higher. This lead Cunard to return to the reciprocating power plant for additional pre-World War I vessels. It was only practical to fit turbines to ships of the fastest types at that time. The Lusitania and Mauretania had to have turbines to develop the high speeds called for. The reciprocating engine had just about reached the limit of its capability in regards to speed. But most other vessels of the period were not aiming for the Blue Riband, and the turbine was an expensive choice for them. Unfortunately, problems with cutting gears made the direct drive turbine the only option in the years preceding the First World War. It would not be until the development of the geared turbine (in combination with earlier advances in the triple expansion turbine) in the

twenties that the reciprocating engine would be outclassed for ships of moderate speed.

White Star was interested in economical operation with the Olympic and her sisters. As explained above, at that time the turbine was unsuitable for most vessels in regard to fuel use. Perhaps a combination of the turbine and reciprocating plant could represent the best of both worlds? The Laurentic and Megantic resulted from this theory. The Megantic had standard four-cylinder triple expansion engines, while the Laurentic was fitted with two outboard reciprocating engines and a turbine on the center screw. Normally, after the steam expanded through the cylinders of the reciprocating engine it was no longer powerful enough to be useful and was routed back to the condensers. However, there was still enough energy left in the steam to drive a low pressure turbine. This system proved to be quite efficient on the Laurentic. Developing the same horsepower as her sister, Laurentic used 12-15% less coal than Megantic. A speed of 16 knots was provided. The machinery also weighed 5% less than that of Megantic. The combination machinery allowed White Star to take advantage of the new turbine technology while still using the well developed and efficient reciprocating engine in the Olympic Class. More power could be developed with basically the same fuel consumption. Harland & Wolff's use of this power plant on other ships for other lines seemed to validate the design. Although this system would become outdated rather quickly, it was an effective solution at the time and Olympic's power plant proved to be very reliable and efficient over her long career.

Did other liners also influence White Star? The Amerika, a 22,622 ton Hapag liner built by Harland & Wolff, would be a likely choice. She was the largest ship in the world when she left Hamburg for her maiden voyage to New York. The Amerika was the first ship to have an elevator for first class passengers to use. She was also the first to have an a la carte restaurant. Passengers could dine at their leisure for an extra fee. Her 17.5 knot cruising speed put her in the same league as White Star's "Big Four" and Cunard's Caronia Class. Amerika's competitors were left struggling to catch up.

White Star's new class of ships would also affect the future of ocean travel in a way the company could have never predicted: safety. The initial design of the watertight subdivision of the Olympic and Titanic seemed adequate for the time. Fifteen transverse bulkheads divided the vessels into sixteen watertight compartments. Since the worst disaster that could be contemplated was a grounding or collision with another ship, the bulkheads were carried high enough to allow any two compartments to be flooded without endangering the liner. They could also remain afloat with any three of the first five compartments flooded, and in a worst case scenario, the first four sections flooded. In addition, the double-bottom was itself divided into forty-four watertight compartments. This design seemed to anticipate every conceivable accident, and is safer than most passenger ships today, but it left very little margin for error. As any student of the Titanic disaster knows, the iceberg damaged at least the first six compartments of the ship. When you factor in that the pumps seemed to have the inrushing water under control in the sixth compartment, the damage was just outside the design capabilities of the watertight subdivision. Watertight decks (the sealing of the tops of the bulkheads) were not installed. Neither were longitudinal bulkheads, essentially an inner skin throughout most of the hull, fitted. These features were incorporated into the Lusitania, Mauretania, and Aquitania from the very beginning since their design was supervised by the Admiralty. The Imperator Class would also have longitudinal bulkheads and additional safety systems designed following the disaster. After the loss of Titanic, the Olympic was fitted with an inner skin, some of her bulkheads were increased in height, and another bulkhead was installed in the electric engine room. Olympic could now remain afloat with the first six sections flooded, theoretically allowing her to survive the damage that sank her sister. The other obvious impact of the tragedy was the inclusion of lifeboats for all, an

oversight that had been long overdue for correction.

Hapag decided to follow White Star's example. They would build three sisterships to maintain a weekly express service across the Atlantic. After White Star began planning the Olympic Class in late 1907, and rumors spread through the shipping world about the "monster" ships, Hapag moved forward. Between 1908 and 1910, the design grew on paper. As details of the Olympic became known more changes were made. The original conception for ships of 800 feet in length, 45,000-50,000 tons, and a speed of 20 knots soon gave way to more grandiose plans. Was it a coincidence that the Imperator Class would exceed the Olympic in many ways? The revised scheme of the liners was for over 50,000 tons, 900+ feet long, with a 23 knot service speed. This seems to confirm a response to the competition. Some of the public rooms would be three decks high, in contrast to the one deck affairs on Olympic. Indeed, originally the order for the second vessel was placed with Harland and Wolff, giving Hapag access to the firm that planned the Olympic. (The order was later cancelled and all three ships were built by German yards.) Hapag was also following White Star philosophy in building fast ships, but not record breakers. As detailed previously this made better economic sense for the company. The mammoth Hapag liners would dominate the Atlantic in the years just before World War I. They would also do so in the 1920's, but in a way the German company could have hardly imagined.

Cunard was not resting on its laurels at this time. Although the Lusitania and Mauretania were fabulously successful, a third ship of comparable capacity was needed to round out the weekly express schedule. The result was the Aquitania. Although it was stated at the time that the Aquitania was a larger version of the Lusitania, the influence of the Olympic was obvious. The new Cunarder would be 901 feet long overall, compared to 882 feet for the White Star trio. (Other comparisons can be made using the chart below.) A quick look at the deck plans of the Olympic and Aquitania show many interesting similarities in the layout of the public rooms. They seemed designed to match, and surpass when possible those on Olympic. Beginning on A Deck, the first class rooms followed a pattern quite familiar. The main staircase opened to twin salons flanking the funnel casings that led to the lounge and smoking room. The Olympic only lacked the salons, and had a Reading and Writing Room as well. The Aquitania's first class dining room was two decks high. It was on D Deck in both ships, placed at the center of the vessel for passenger comfort. An extra first class dining room, called the Grill Room, was also installed on D Deck, just a little ways down from the main restaurant. Unlike the example set by White Star and other companies however, the Grill Room was not an extra charge facility. It was treated as simply an additional dining room with a more intimate atmosphere. Unlike her "cousins" Lusitania and Mauretania, the Aquitania would also have a swimming pool. This relatively new shipboard amenity had been pioneered by White Star's Adriatic, and would soon become a standard feature in first class.

"Super-Intermediate" Comparisons

Ship	Length Overall (ft.)	Beam (ft.)	First Year of Service	Gross Tonnage	Service Speed (knots)
Olympic	882	92	1911	45,324/46,359	**21½ -22**
Imperator*	909	98	1913	52,117	**22-23**
Aquitania	901	97	1914	45,647	**22-23**

*This is the actual length of Imperator. The eagle figure is not included in this measurement.

The Aquitania would also match, and slightly exceed, the Olympic in the area of propulsion. There was no attempt to produce a record breaker; Cunard was quite content to leave that to the Lusitania and Mauretania. Why compete against your own ships? Since a government subsidy was not in the cards for Aquitania, efficiency won out. A service speed of 23 knots was anticipated, with Cunard opting for direct drive, triple expansion turbines. The development of this type of turbine, pioneered by the France of 1912, improved the operation of the turbine to the point that Cunard was comfortable choosing it for the Aquitania. Instead of only high and low pressure turbines, intermediate pressure turbines were incorporated to squeeze as much energy as possible from the steam. (The Imperator Class would also use this system) More economy was possible when compared to the Lusitania and Mauretania, the Aquitania using 1.38lb/shp/hr while her "cousins" consumed 1.43lb/shp/hr. This was also slightly better than the Olympic, reflecting the considerable advances made in the relatively brief span since the arrival of the twin Cunard greyhounds. The refinement of the "Super-Intermediate" liner continued.

This new class of ocean liner fulfilled the promise of their design. By offering greater luxuries, and size, they lured passengers to them in droves. The extra time at sea when compared to the Lusitania and Mauretania hardly seemed to matter. Since some of that time was spent sleeping, it seemed to matter even less. People in a hurry would book on the "Lucy" or "Maury", but most would cross in the more comfortable ships. Passenger carrying figures back up this claim, over the long term.

Passenger Carryings

Ship	Average Passengers Per Crossing 1913	Average Passengers Per Crossing 1914	Average Passengers Per Crossing 1925
Lusitania	1291	1142	**NA**
Mauretania	1462	1540	**812**
Olympic	1216	1255	**870**
Imperator/Berengaria	2552	3009	**1136**
Aquitania	NA	1863	**972**
Vaterland/Leviathan	NA	2407	**1041**
Bismarck/Majestic	NA	NA	**1193**

Special Note: At the time, the actual passenger capacity of the liners was usually much higher than what they normally carried. Many of the ships above regularly sailed at 50%, or less, of their total capacity. This was quite common for the time, especially considering the huge steerage capacity that was not used much on eastbound runs.

As you can see, the traveling public was quite satisfied with the newest breed of ocean liner. The Lusitania and Mauretania did not rule the Atlantic unchallenged for long. A gradual shift to the new type ships was underway. The dramatic drop in passengers caused by the immigration restrictions enacted by the U.S. in 1921 is obvious when looking at the chart. Although the addition of Tourist Third (basically an upgraded third class) stemmed the losses somewhat, it could hardly compensate for the end of the immigration boom. Luckily, the conversion from coal to oil fuel after the Great War kept the bigger liners viable, at least until the Depression.

The 1920's, for the most part, were a quiet time on the Atlantic run. The vessels built pre-war were adequate to handle the demand. The loss of immigrant traffic made it prudent to build small and medium size liners instead of huge ships. Some even thought the day of the big ship was over, although this turned out to be an exaggeration. There were several notable super intermediates built in between the wars, however. The French Line introduced the Paris and Ile De France in the twenties. Both ships were large, with service speeds of 22-23 knots. Like their pre-war competitors, these ships were designed

for economical operation and comfort over speed. (Although they were fitted with outdated direct drive turbines for some reason)

For most of the twenties, the transatlantic trade was dominated by the large ships built before the war, although not in the way originally intended. The Imperator Class was split up and given away as prizes of war. The Imperator became Cunard's Berengaria, while the Bismarck was christened Majestic and handed over to White Star. The Vaterland became U.S. Lines Leviathan, the largest passenger ship to sail under the stars and stripes for many years. These former Hapag liners lead the competition for many years. The Olympic and Aquitania continued to draw large passenger lists as well. White Star also received the 34,351 ton Homeric, the former Columbus of North German Lloyd. Although a fine vessel in every respect, she was not intended for the express service with a speed of 18-19 knots. With the loss of Britannic and Oceanic in the war, however, White Star had little choice but to run Homeric with Olympic and Majestic on the Atlantic. (White Star's deteriorating financial condition made it impossible to replace Homeric with the planned Oceanic III by the late twenties.) With the Lusitania gone, the only record breaker left by this time was the Mauretania. Although faster than ever before after refurbishment, the Maury's popularity began to wane. The expiration of the government operating subsidy in 1927 did not make things easy for Cunard. When the Mauretania lost the Blue Riband in 1929 to the Bremen, after a gallant struggle to reclaim it, her greatest attraction was gone. She began to turn to the cruise circuit more and more.

The 1930's heralded not only the arrival of a new decade, but also the Great Depression. This brought with it a catastrophic downturn in transatlantic travel. The total number of people crossing the "Great Pond" dropped from about 1,000,000 to 500,000 by the mid thirties. This loss of business would prove fatal for most of the older liners of the time. Newer ships like the Bremen, Europa, and Ile De France attracted the few passengers left. There were simply too many ships in service for the demand. The Mauretania, Olympic, Berengaria, Leviathan, Aquitania, and Majestic sailed into an ocean of red ink, where profits had once greeted them. Maintenance costs began rising, and outdated propulsion and hull design meant inefficient operation when compared to the newer ships. By 1938, the Mauretania, Olympic, Berengaria, Leviathan, and Majestic had been retired. Their day was over. Only the Aquitania soldiered on. The unstoppable march of technology had rendered them obsolete.

However, despite what some believe, Olympic remained an efficient and reliable ship right to the end. Maintenance costs were in line with her Cunard-White Star running mates, and her operating costs were lower. (Her retirement was by no means eminent as 1935 began.) The chart below helps to back up this claim. (The popularity of the ships listed was roughly equal)

Fuel and Speed Data for Selected Liners

Liner	Voyage number	Speed in Knots	Fuel consumption in Tons
Olympic	250-257	21.2-22.3	3340-3580
Aquitania	250-257	21.4-23.4	3510-4130
Berengaria	250-257	22.1-23.1	4160-4480
Majestic*	200-207	21.1-24	4190-5160

*Majestic never reached Voyage 250.
This chart adapted from Mark Chirnside's *Olympic-Another Premature Death* article. Used with permission.

Fuel Oil Consumption Per Mile of Selected Liners

Ship	Fuel Consumption Per Mile in Tons	Cruising Speed in Knots
Britannic (1930)	0.196	17.5
Olympic	1.075	21.8
Aquitania	1.170	22.6
Berengaria	1.370	22.1
Majestic	1.448	22.9

Before the technological advances of the late twenties, it had been difficult to fuse the concept of a fast and luxurious ship into one vessel. It seemed to be an either-or proposition. This was no longer a major obstacle. The Bremen, Europa, and Rex were record breaking ships that also incorporated the same comforts once the domain of the super intermediates. The Normandie, Queen Mary, and Queen Elizabeth were the ultimate expression of this new capability. The bulbous bow and advances in turbine design made it possible to build huge, and very fast, ships with reasonable fuel consumption. This did not mean the super intermediate was dead. More vessels of this type would be built. Canadian Pacific debuted the Empress of Britain in 1931. At 42,349 tons, she was the largest vessel ever built by that company. Her 24 knot cruising speed made her one of the faster of her breed, but a super-intermediate nonetheless. The Britain was also a very efficient ship, with lower fuel consumption than many of her contemporaries. The 36,287 ton Nieuw Amsterdam, flagship of the Holland America Line, was introduced in 1938. She epitomized the super intermediate liner with her large size and modest speed of 20.5 knots. The Nieuw Amsterdam was praised for her modern interiors and would serve with distinction for 36 years. Cunard also introduced the Mauretania (II) in 1939. She was a 35,738 tonner that could cruise at 23 knots. In some ways, the new ship was a smaller version of the Queen Elizabeth, but without the high speed.

In 1950, the grand old Aquitania was handed over to the ship breakers. She had steamed over 3,000,000 miles in her career and served in two world wars. She was the last of the pre-World War I super intermediates. Her demise singled the end of an era. But a proud legacy was left in her wake. White Star led the way with the Olympic Class. The Olympic, Aquitania, Imperator, and Vaterland had been true floating palaces that set new standards for their time. They proved that the pursuit of speed could be an unnecessary and expensive race, justifiable only with government aide. The face of transatlantic travel was never the same again.

Sources Cited

Aquitania. Edited by Mark D. Warren. PSL. 1988.

Ardman, Harvey. *Normandie: Her Life and Times*. Watts. 1985.

Aylmer, Gerald. *R.M.S. Mauretania: The Ship and Her Record*. Publisher unknown. 1934.

Braynard, Frank O. *Classic Ocean Liners Volume I: Berengaria, Leviathan, & Majestic*. PSL. 1990.

Braynard, Frank O. *Leviathan: World's Greatest Ship*. Six volumes. Various Publishers. 1972.

Brinnin, John Malcolm. *The Sway of the Grand Salon*. Barnes & Noble Books. 2000 Reprint.

Chirnside, Mark. *The Olympic Class Ships*. Tempus Publishing. 2004.

Chirnside, Mark. *R.M.S. Olympic: Titanic's Sister*. Tempus Publishing. 2004.

Distinguished Liners from the Shipbuilder, Volume 1 & 2. Edited by Mark D. Warren. Blue Riband Publications. 1995 & 1997.

Encyclopedia Titanica: Titanic Research Articles: An 'Olympic' Class Propulsion System [www.encyclopedia-titanica.org] Accessed Mon Mar 22 16:22:27 2004.

Graham-Maxtone, John. *The Only Way to Cross*. Barnes & Noble Books. 1997 Reprint.

Graham-Maxtone, John. *Crossing & Cruising*. Scribner Publishing. 1992.

Griffiths, Denis. *Power of the Great Liners*. PSL. 1990.

Griffiths, Denis. *Steam at Sea.*. Conway. 1997.

Hutchings, David F. *Caronia: Legacy of a Pretty Sister*. Shipping Books Press. 2000.

Jordan, Humfrey. *Mauretania: Landfalls and Departures of Twenty-Five Years*. Hodder and Stoughton Limited. 1936.

Kludas, Arnold. Great Passenger Ships of the World. Volumes 1-6. PSL. 1975-1986.

Kludas, Arnold. *Record Breakers of the North Atlantic*. Chatham Publishing. 2000.

Miller, William H. *Pictorial Encyclopedia of Ocean Liners, 1860-1994*. Dover. 1995.

Mills, Simon. *R.M.S. Olympic-The Old Reliable.* Waterfront Publications. 1993.

Olympic & Titanic: Ocean Liners of the Past. Edited by John Maxtone-Graham. 1970.

RMS Olympic: Another Premature Death? by Mark Chirnside (Encyclopedia Titanica Research Article) [www.encyclopedia-titanica.org] Accessed Mon Mar 22 16:23:30 2004.

R.M.S. Olympic: Evolution of A Design. P. 246-256. By Bruce Beveridge. *Titanic Commutator*. Number 152. 2000.

Sauder, Eric and Ken Marschall. *R.M.S. Lusitania: Triumph of the Edwardian Age*. Transatlantic Designs. 1991.

Williams, David L. & Richard P. De Kerbrech. *Damned by Destiny*. Teredo Books. 1982.

Williams, David L. *Glory Days: Cunard*. Ian Allan Publishing. 1998.

Williams, David L. *Glory Days: Transatlantic Liners.* Ian Allan Publishing. 2000.

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