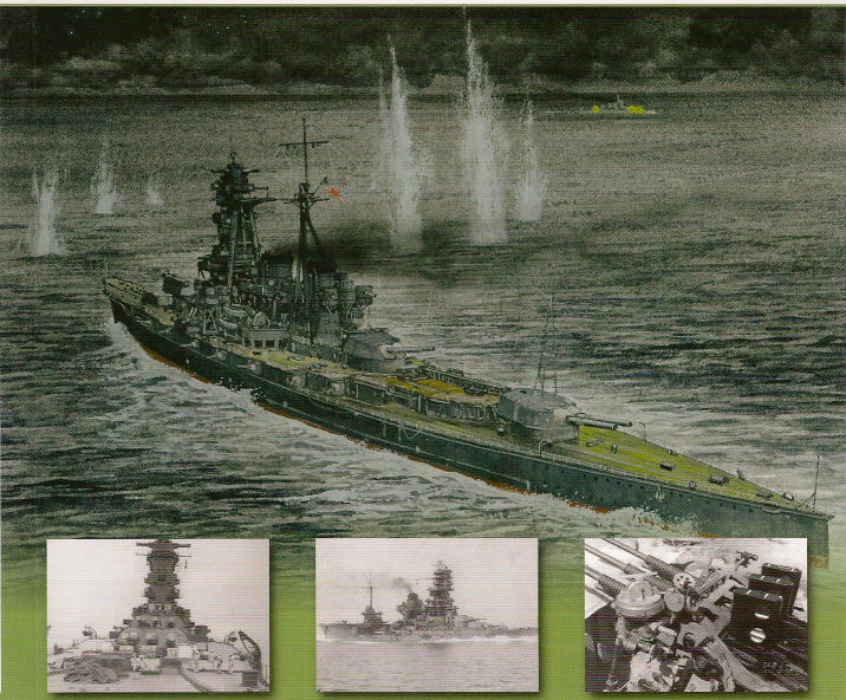
IMPERIAL JAPANESE NAVY BATTLESHIPS 1941–45



MARK STILLE

ILLUSTRATED BY TONY BRYAN

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EDITOR'S NOTE

For ease of comparison between types, imperial measurements are used almost exclusively throughout this book. All "miles" refered to are US nautical miles. The following data will help in converting the imperial measurements to metric:

1 US nautical mile = 1.85km
1lb = 0.45kg
1 yard = 0.9m
1ft = 0.3m
1in. = 2.54cm/25.4mm
1 gal = 4.5 liters
1 ton (US) = 0.9 tonnes

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DEDICATION

To my mother, who gave me my love of books.

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IMPERIAL JAPANESE NAVY BATTLESHIPS 1941–45

INTRODUCTION

At the start of the Pacific War, the Imperial Japanese Navy included ten battleships, giving it the third largest battle line in the world after the American and British navies. These ships would soon be joined by two "superbattleships" of the Yamato class, easily the largest battleships ever built. Japanese prewar strategy still saw the battleship as the final arbiter of fleet action. Held in reserve for the expected decisive fleet engagement, the Imperial Navy's battleships saw relatively little service during the early and middle parts of the war. Eventually, all of them were committed to stopping the US advance, and all but one was destroyed by war's end. This book tells the story of the 12 Japanese battleships that saw service between 1941 and 1945.

Japanese naval strategy and the cult of the battleship

Even before the decisive victory over the Russians at the battle of Tsushima in May 1905, Imperial Navy strategists detailed the need for an aggressive, blue-water defense of Japan. These concepts formed the basis for Japanese naval thought until the Pacific War, and provided the framework for the navy's construction program. As early as 1913, the Imperial Navy proposed that it should be structured according to the required minimum force necessary to defeat a hypothetical enemy. In the long run, this enemy could only be the United States. Imperial Navy planners acknowledged that Japan could never build a fleet as large as that of the US. However, when the Japanese considered the requirement for the Americans to maintain a two-ocean navy, as well as the vulnerability of the US fleet as it crawled across the Pacific, they assessed that the Imperial Navy had to be only 70 percent as strong as the US Navy to guarantee success in a decisive engagement. Because all navies measured their strength by the numbers of capital ships (battleships or battlecruisers) they possessed, the safety of Japan and the viability of its naval strategy depended on an adequate number of battleships.

The envisioned basic outline of an American–Japanese naval war featured the early fall of the American possessions of Guam and the Philippines in the Western Pacific. This would be followed by an American advance across the Pacific, culminating in a decisive naval encounter between battle fleets in the Western Pacific, with the Japanese fleet operating close to home and the American fleet operating at the end of a long supply line. The Americans possessed more battleships, but the Japanese planned a campaign of attrition against the advancing American fleet to reduce the American numerical

The battleship *Mutsu* in 1941, showing her massive beam and forward 16-in. main battery. The beam has been increased by the fitting of a torpedo bulge. The Imperial Chrysanthemum is evident on her bow. (Yamato Museum)

Mutsu, *Ise*, and *Fuso* in line-ahead formation, prior to the Pacific War. Like all navies of the interwar period, the strength of the Imperial Navy's battle line defined its status. (US Naval Historical Center)

advantage. When the two fleets joined, the Japanese fleet would outrange the enemy until the Japanese battle line could close with and annihilate the weakened enemy.

The role of the battleship remained paramount in Japanese naval thinking before and into the Pacific War. The Japanese continued to plan for a decisive fleet action with the battleship central to the strategy. Scenarios of the decisive fleet battle in the Western Pacific were continually played out at the Naval Staff College at Tsukiji, Tokyo, which in turn resulted in periodic revisions to the official Battle Instructions. This focus on the battleship as the ultimate arbiter of naval power remained absolute within the Imperial Navy and served to overshadow possible alternative strategies and weapons. As flawed as this premise turned out to be when war actually commenced, it must be pointed out that both the US Navy and the Royal Navy also adhered to the belief that battleships would be the dominating factor in naval warfare.

Japanese naval tactics and the role of the battleship

Japanese naval tactics centered around its battle lines. Early Japanese tactics favored forming the battle line into a line-ahead formation. The Japanese formation would maneuver to cross the enemy's T (aligning the ship's broadside to the enemy's bow) and deal devastating blows by concentrating fire on selected targets. Japanese destroyers would launch night torpedo attacks on the enemy battle line should a decisive result not be reached after the first day. The battle line was too valuable to risk at night, with the exception of the fast battleships, which were tasked to support the breakthrough of lighter units delivering torpedo attacks. The battle line would maneuver to be in position to engage the weakened enemy at dawn and finish them off. The desired number of battleships to execute these tactics was 16. This was considered the maximum number of ships that could be controlled by a single commander, and would be broken down into two *sentai* (divisions), each consisting of eight ships.

A critical component of Japanese tactics was the concept of outranging the enemy, an advantage calculated to allow the Japanese to strike the enemy before they could effectively retaliate. This range requirement applied in particular to the big guns of the battleships. The concept was first put into practice with the 14-in. guns aboard the *Kongo*, and continued up through the deployment of 18.1-in. guns on the superbattleship *Yamato*. The development of greater gun elevation and specially designed shells led the Japanese to assess in the mid-1930s that their battleships outranged US battleships by 4,324–5,468 yards. Naval Staff College studies indicated that the Japanese could track targets at 44,000 yards and open fire at 37,000 yards. This capability gave the Japanese the opportunity to cripple

their targets before they could retaliate. In 1939, the Japanese claimed a 12 percent main battery accuracy at 35,000 yards, using spotting aircraft (claims which proved totally unfounded during the war).

The Revised Battle Instructions of 1934 stated that "battleship divisions are the main weapon in a fleet battle and their task is to engage the main force of the enemy." Other elements of the fleet, including carrier aircraft, submarines, cruisers, and destroyers, would conduct torpedo attacks to cripple the enemy, but it was up to the battleships to deliver the decisive blows. In these intricate tactical scenarios, the main battle force consisted of the two battleships of Battleship Division 1 (the Nagato class), and the four battleships of Battleship Division 2 (the four Fuso and Ise class units). The fleet vanguard included the four fast battleships of the Kongo class. The Kongos were assigned the mission of opening lanes for the cruisers and destroyers to allow them to deliver massed torpedo attacks. Once the torpedoes had done their work, the battleships would assume a parallel course some 38,000 yards distant from the enemy battle line and begin to fire with the aid of spotter aircraft. The Japanese assessed that the combination of massive torpedo attack and battleship gunnery would cause extensive damage to the American fleet. In the battle's final stages, the Japanese battleships would close to between 21,000 yards and 24,000 yards to deliver the final blows. Interestingly, while these complex plans looked viable in the halls of the Naval Staff College and to the Naval General Staff, they were never tested in their entirety in fleet exercises.

JAPANESE BATTLESHIP DEVELOPMENT

The launch of the British *Dreadnought* in 1905 had made all existing battleships obsolete.

Not until January 1909 did the Imperial Navy begin construction of its first true dreadnought, *Settsu*. Her sister ship *Kawachi* was begun four months later. By 1910, the Imperial Navy was ready to put its cherished eight–eight fleet plan into reality (the numbers referring to the desired numbers of battleships and battlecruisers required to produce a modern, homogeneous battle line). Given the economic aftermath of the war with Russia, such an immediate expansion was impossible, but approval was given for the construction of a single battleship and four battlecruisers. These four battlecruisers became the Kongo class, and the single battleship was the lead Fuso class ship. In 1913, the Navy Ministry requested three new battleships, which also received funding in due course. The first to be launched was *Yamashiro*, the sister ship of *Fuso*, and the other two were planned as improved versions of the Fuso class.

Kongo's appearance upon completion in 1912. Her World War I origins are clearly shown by her very small bridge and two large tripod masts. When first completed, the ship had three smokestacks and 3-in. guns fitted atop the main armament. (Yamato Museum)

The two ships of the Fuso class, seen here, were the Imperial Navy's first attempt to produce a battleship superior to that of any other nation. In the background is *Haruna*. (US Naval Historical Center)

Navy Minister Tomosaburo Kato requested funding for four more battleships in 1915, which was refused, but in 1916, funding was granted for one battleship and two battlecruisers. While the Imperial Navy was having problems reaching its cherished eight–eight goal, the American Congress passed a navy bill in 1916 which included massive funding for capital ships. In response, the Japanese Diet (parliament) passed an authorization in 1917 for three additional battleships, followed in 1918 by approval for two additional battlecruisers. The Imperial Navy finally seemed to be on the verge of realizing its eight–eight fleet.

The battleship approved in 1916 became *Nagato*, which was to carry 16-in. guns, larger than any gun then in service in any other navy. The 1917 battleship authorizations became *Nagato*'s sister ship *Mutsu*, and the even larger *Kaga* and *Tosa*. These were 38,500-ton ships, mounting ten 16-in. guns, with more armor and a higher speed than the Nagato class. Laid down in 1920, both would later fall victim to the Washington Naval Treaty. *Kaga* gained a reprieve from the scrapyard when she was converted into a carrier in 1923. *Tosa* was turned over to the Gunnery School in June 1924 for use as a target, and was sunk in February 1925, but not before she rendered invaluable data for reconstruction of existing ships and for design of future battleships. The 1916 battlecruisers were named *Amagi* and *Akagi*. These were to be joined by *Atago* and *Takao*; all were 40,000-ton designs carrying ten 16-in. guns, and possessing a top speed of 30 knots. None were destined to join the battlefleet: *Amagi* was damaged in an earthquake while under construction and was scrapped; *Akagi* survived to be converted into an aircraft carrier; and the final two were canceled.

In 1919 the Americans had announced further plans for capital ship construction. Without a Japanese response, American naval dominance was assured. To keep pace, the Imperial Navy planned another four battlecruisers and four battleships, but this was clearly beyond the means of the Japanese economy. Japan's inability to compete successfully with the US in a battleship construction race was the driving force behind the Japanese decision in 1922 to participate in the Washington Naval Conference. The results of the conference were extremely disappointing for the Imperial Navy. The treaty limited the US and Britain to a total of 525,000 tons of capital ships, as opposed to 315,000 tons for the Imperial Navy. New construction was permitted to replace aged ships, but no new battleship could exceed 35,000 tons or carry guns bigger than 16in. The treaty dashed Japanese hopes of ever achieving the sacred eight–eight fleet, or of maintaining the Imperial fleet at the crucial 70 percent of US Navy strength.

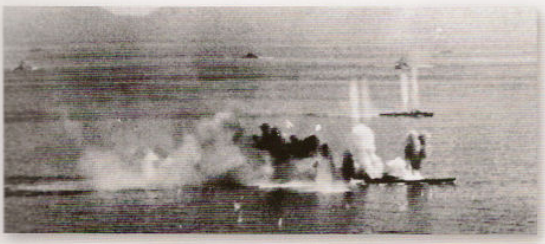
Throughout the interwar period, the Imperial Navy continually looked for ways to compensate for its position of numerical inferiority against the US Navy. The preferred method was to create a qualitative superiority to swing the balance in its favor. With the collapse of the Washington Naval Treaty, the Imperial Navy was given a new chance to create a qualitative edge. The Japanese announced in December 1934 that they would renounce the treaty (technically in force until January 1937), and were already making plans to dramatically turn the tables on America. Accordingly, the Navy General Staff had approved secret plans to build four superbattleships. These were equipped with 18-in. guns and sufficient armor to withstand 18-in. shellfire. Authorization of the first two ships, *Yamato* and *Musashi*, was given in 1936, and the final two superbattleships, later canceled, were approved in September 1939.

Hyuga being launched on January 27, 1917. Despite its best efforts, the Imperial Navy remained in a position of numerical battleship inferiority to the US and Royal navies. (US Naval Historical Center)

Weapons

Eight of the 12 Pacific War Japanese battleships carried 14-in. main guns. This gun was based on a British Vickers design. The 16.1-in. guns fitted aboard the Nagato class were of Japanese design. The heaviest guns ever fitted aboard a warship were the 18.1-in. guns used on the Yamato class. This weapon was designed in 1939 and was called the 40cm (or 16-in.) Type 94 gun by the Japanese for security reasons.

Secondary batteries were intended principally to defeat destroyer attack. The 6-in. secondary guns for the Kongo and Fuso classes were based on Vickers designs. These 72-ton guns could fire four to five rounds per minute. These were replaced by the Japanese-designed 5.5-in. gun on the Ise and Nagato classes with a lesser weight of 36 tons and a rate of fire of six rounds per minute. The Yamato class returned to a 6-in.-size gun fitted in triple mounts.



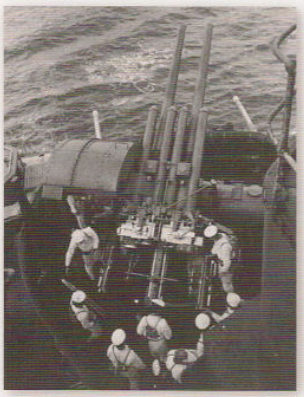
In the first encounter between American carrier airpower and the Imperial Navy's superbattleships, the Japanese came off a poor second. Here *Musashi* is shown under intense torpedo and bomb attack on October 24, 1944, during the battle of Leyte Gulf. By 1944, the US Navy could sink even the most heavily armored ship by air attack, an eventuality totally unforeseen when the Yamato class superbattleships were designed in the late 1930s. (US Naval Historical Center)

JAPANESE BATTLESHIP WEAPONS	
Type	**Maximum range**
Main guns	
14-in./45 41st Year Type (1908)	38,770 yds
16.1-in./45 3rd Year Type (1914)	42,000 yds
18.1-in./45 Type 94	45,960 yds at 45 degrees elevation
Secondary guns	
6-in./50 41st Year Type (1908)	22,970 yds at 45 degrees elevation
5.51-in./50 3rd Year Type (1914)	21,600 yds at 35 degrees elevation
6.1-in./60 3rd Year Type (1914)	29,960 yds at 45 degrees elevation

These were originally mounted on Mogami class cruisers, but became excess when this class was up-gunned to 8-in. guns. The turrets weighed 177 tons, and possessed a rate of fire of 5 rounds per minute.

Since both navies used the same British equipment suppliers, Japanese battleship fire control was developed initially in conjunction with the Royal Navy. During World War I, the Imperial Navy attempted to develop its own fire-control instruments, but during the interwar years, it gradually fell behind the US and Royal navies. In 1926, the Japanese obtained sophisticated fire-control tables for *Kongo* from the British. These provided the basis for the first fire-control tables manufactured in Japan, and by the 1930s, the Imperial Navy had developed its own fire-control system that could measure a target out to 43,740 yards. However, this system was heavy, and relied on manual instead of automatic inputs. On the other hand, Japanese fire-control optics were very good and crews were well trained in their use. The desire to get fire-control optics as high as possible, thus extending their range, resulted in larger and taller "pagoda" towers on battleships.

Overall, the quality of Japanese battleship gunnery was mediocre during the war. Japanese battleships were presented with only a handful of opportunities to use their main guns. On March 1, 1942, *Hiei* and *Kirishima* engaged a US destroyer south of Java with 297 rounds of 14-in. fire, scoring a single hit. During the Guadalcanal campaign Japanese battleships participated in two night surface actions. In the first, *Hiei* and *Kirishima* gained several 14-in. hits against targets at point-blank range, and in the second *Kirishima* engaged American battleships and scored only a single hit at close range with her 14-in. guns. During the battle of Leyte Gulf, Japanese battleship gunnery was undistinguished. At Surigao Strait, *Yamashiro* scored no main battery hits in another night action. Most condemning was the gunnery of four Japanese battleships that surprised a force of six slow American escort carriers off the island of Samar. In an action of over two hours, only one of the escort carriers was sunk; these destroyers and destroyer escorts approached to within 4,400 yards of Japanese battleships and survived the experience. In the end, of the seven American destroyers and destroyer escorts present, only three were sunk. The confused nature of the action precludes a definitive accounting for the number of hits scored by Japanese battleships, but the mere survival of the bulk of the American force speaks volumes. During the war, the state of Japanese fire control fell farther behind the US Navy after the Americans developed radar-controlled gunnery. Perhaps by way of explanation for their undistinguished gunnery record, throughout the entire war Japanese battleships never engaged in the type of long-range gunnery duel for which they were designed.



An overhead view of the Type 89 5-in. antiaircraft gun. This twin mount was fitted on all Japanese battleships of the Pacific War, but proved mediocre in service. It was inferior to its US Navy counterpart, the 5-in./38 dual purpose gun. (*Ships of the World Magazine*)

Antiaircraft protection was increasingly important as the war went on. Of the 11 battleships lost during the war, six were sunk solely or primarily by American aircraft. Long-range antiaircraft protection was provided by the 5-in. Type 89 gun. The weapon itself was respectable, but its fire control was inadequate and doctrine for its use flawed. Japanese crews were trained to use barrage fire at the estimated height of the attacking aircraft. Against carrier aircraft that did not maintain a constant course and height, this was virtually useless. Additionally, the Imperial Navy did not develop a proximity fuse during the war, further reducing the effectiveness of its 5-in. weapons. In desperation, the Japanese developed incendiary shrapnel rounds for 14, 16 and 18.1-in. guns to improve long-range antiaircraft protection. These operated with fuses set to explode a number of incendiary tubes at pre-designated altitudes. The effect was spectacular, but proved ineffective in service.

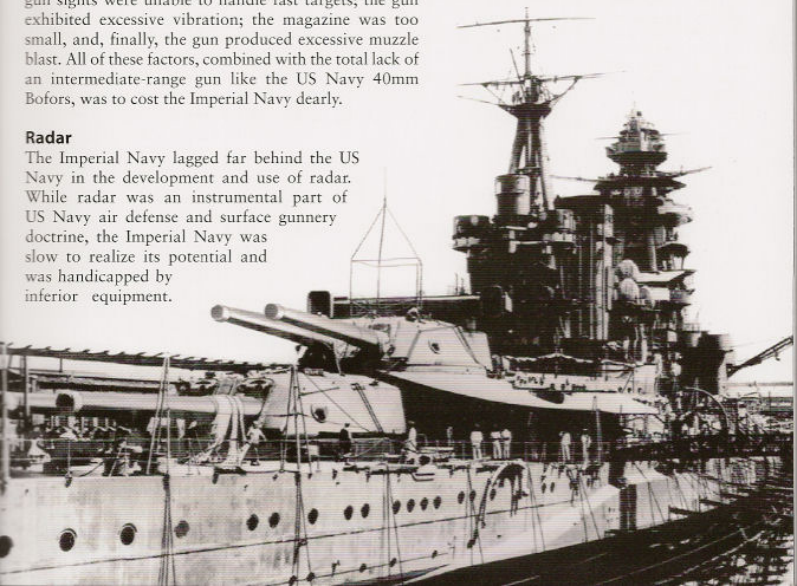
JAPANESE BATTLESHIP ANTIAIRCRAFT WEAPONS

Type	Range	Rate of fire (per minute)
5-in./40 Type 89 (1929)	16,075 yds (effective range 2,300–4,900ft)	maximum 14, 8 sustained
25mm Type 96 (1936)	8,200 yds (effective range 2,300–4,900ft)	200–260 nominal, 130 actual

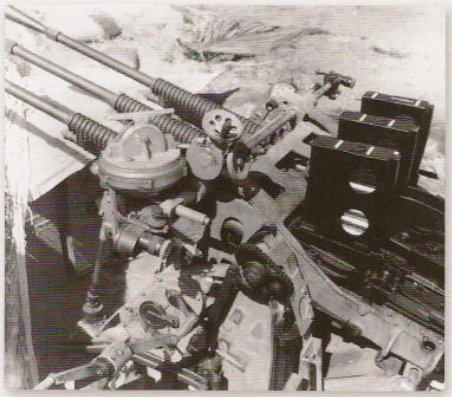
The standard light antiaircraft gun throughout the war was the Type 96 25mm gun. This was an adaptation of a French Hotchkiss design, and was used in single, double and triple mounts. The 25mm gun was ineffective in its envisioned role – despite a growing profusion of these weapons, Japanese battleships proved vulnerable to air attack, while losses of attacking American aircraft was low. The Japanese view of the 25mm gun speaks for itself: the twin and triple mounts lacked sufficient speed in train or elevation; the gun sights were unable to handle fast targets; the gun exhibited excessive vibration; the magazine was too small, and, finally, the gun produced excessive muzzle blast. All of these factors, combined with the total lack of an intermediate-range gun like the US Navy 40mm Bofors, was to cost the Imperial Navy dearly.

Radar

The Imperial Navy lagged far behind the US Navy in the development and use of radar. While radar was an instrumental part of US Navy air defense and surface gunnery doctrine, the Imperial Navy was slow to realize its potential and was handicapped by inferior equipment.



The rear 16-in. gun turrets on *Mutsu*. The Japanese were the first to put a 16-in. gun into service. Each turret weighed just over 1,000 tons. Firing cycle at low elevation was 21.5 seconds. (US Naval Historical Center)



The standard light antiaircraft weapon used aboard Imperial Navy warships during the Pacific War was the Type 96 25mm gun. The most prevalent version aboard battleships was the triple mount, shown here. It was a dismal failure and proved unable to counter growing American airpower. (US Naval Historical Center)

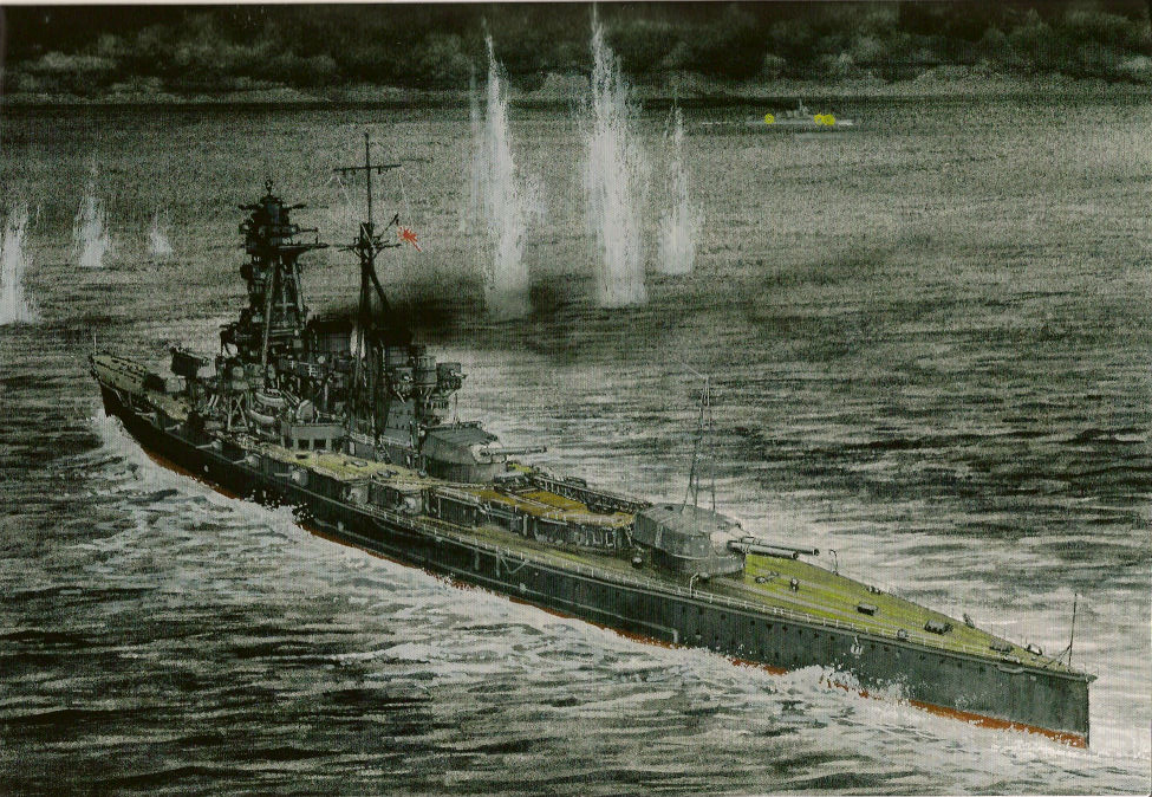
The first set, put into widespread service in 1942, was the Type 21 air and surface search radar. This used a large mattress-like antenna that was placed on the top of battleship towers. Performance was mediocre, with the ability to detect a group of aircraft at approximately 60 miles, a single aircraft at 45 miles, and a large surface target at 12 miles.

A dedicated air search radar, the Type 13, was introduced in 1943, but its performance was little better than the Type 21. Because of its long ladder-like antenna, it was mounted in pairs on the mainmast of most Japanese battleships. Against a group of aircraft, it had a maximum range of just over 60 miles, and against a single aircraft its range was 30 miles. However, on some occasions, performance was much better. At the battle of Leyte Gulf, the Type 13 radars on *Hyuga* and *Ise* detected groups of aircraft at 105 and 125 miles, respectively.

The standard surface search radar was the Type 22. This set had two horn-shaped antennae, one for transmission, and one for receiving. These were mounted high on the pagodas of the battleships in pairs. Performance against a large surface target was reportedly in excess of 21 miles. The Type 22 was also capable of providing a limited fire-control capability. In this role it had a maximum range of 27,300 yards against a battleship-sized target with an optimal accuracy of plus or minus 110 yards in range and 2–3 degrees in bearing. Though the Japanese heavily practiced the use of radar-controlled gunnery in 1944, in service it proved of little value because the accuracy of the Type 22 was inadequate for gunnery control.

BATTLESHIP *KIRISHIMA* ON NOVEMBER 15, 1942

This scene depicts the clash between *Kirishima* and USS *Washington* during the second naval battle of Guadalcanal. Early on the night of November 14–15, *Kirishima* led a force of two heavy cruisers, two light cruisers, and nine destroyers to bombard Henderson Field. The Americans could only counter with two battleships and four destroyers. In the first battleship action of the Pacific War, *Kirishima* engaged USS *South Dakota* with her main and secondary batteries, claiming many hits. However, she actually scored only a single 14-in. hit, which exploded against the barbette of Turret 3 and blew a 30-sq. ft hole in the main deck of the American battleship before being stopped by the ship's armored deck. As *Kirishima* and the heavy cruisers focused on *South Dakota*, *Washington* targeted *Kirishima* from the point-blank range of 8,400 yards. From this range she sent 75 16-in. projectiles and 107 5-in. rounds toward *Kirishima*. Of the 75 main rounds fired, nine hit; additionally, over 40 5-in. rounds scored hits. *Kirishima* tried to fight back, but her nearest shell was 200 yards off *Washington*'s port quarter. The scene shows the moment before *Washington* opened fire. The 2,700lb 16-in. rounds knocked out two turrets, flooded the steering room, caused flooding from waterline hits, and set *Kirishima* afire fore and aft. Flames later forced the magazines to be flooded and when the engine rooms were rendered inoperable, the ship was scuttled at 0425hrs. Over 300 crewmen were lost, but 1,125 crewmen were saved by destroyers.



Shown on the light cruiser *Sokawa* after the war are all of the primary types of radar used on Japanese battleships. The Type 21 air-and-surface search radar was mounted on the front of the fire-control director at the top of her tower, and the two Type 22 surface-search radars are mounted lower down on the bridge wings. The ladder-shaped Type 13 air-search radar was mounted on the rear of the foremast. None of these radars compared favorably with their US Navy counterparts. (US Naval Historical Center)

KONGO CLASS

Design and construction

After the launching of the world's first class of battlecruiser in 1907, the Royal Navy's *Invincible*, the Imperial Navy was determined to build a superior ship. After much work, the Japanese came up with an 18,725-ton design. However, in the meantime, the British had already laid down a larger battlecruiser, the 26,270-ton *Lion*. The Japanese decided to scrap their design and seek British assistance and expertise. Accordingly, in 1910, an order was placed with the Vickers firm for a 27,000-ton improved *Lion* design to be built at Barrow.

The first ship of the class, *Kongo*, was laid down in January 1911, and launched in May 1912; she entered service in August 1913. *Kongo* was the last major Imperial Navy ship built outside Japan. After completion, she arrived in home waters in November 1913. Three more ships were completed to the same design. *Hiei* was built at Yokosuka using a large number of parts imported from Britain. She was laid down in November 1911, and completed in August 1914. *Haruna* was built at Kobe by the Kawasaki Shipbuilding Company from all-Japanese parts; she was begun in March 1912 and completed in April 1915. The final ship of the class, *Kirishima*, was built by the Mitsubishi Shipbuilding Company at Nagasaki, also of all-Japanese construction. She was laid down in March 1912 and completed in April 1915.

The Kongo class was built as a battlecruiser, and as such, possessed relatively light protection. Even after extensive modernization, the weakness of the class remained its inadequate protection. As built, the entire weight of armor on the ship was 6,500 tons, or some 25 percent of the standard displacement. The main belt was 8in. at the waterline and 6in. above it. The main belt tapered to 3in. forward, and aft and below the main waterline belt was another 3in. The barbettes had 10in. of Vickers cemented armor, and the turret faces 9in. The turret roofs had a mere 3in.; overhead protection for the remainder of the ship was limited to a 2-in. armored deck.

Kongo as she appeared after her first modernization. The ship's appearance has been altered with the provision of a large tower structure and the deletion of one of the tripod masts. The three smokestacks have been retained; note the large caps on the forward two stacks. Her primary armament remains unaltered. (Yamato Museum)

The Kongo class was the fastest of the Imperial Navy's modern dreadnoughts. The maximum speed of 27.5 knots was provided by four shafts powered by Parsons turbines from steam generated by 36 Yarrow boilers. The original 36 boilers were coal-fired with oil sprayers. Three smokestacks were required to service the eight boiler rooms.

Armament

The Kongo class was originally planned to mount the same 12-in. guns as contemporary British battlecruisers. However, the British had been testing a 13.5-in. gun that was planned for *Lion*. When the Japanese learned of this, they decided to upgrade *Kongo*'s main armament. In fact, anticipating an American move to a 14-in. gun, the Japanese worked with the British to develop such a weapon and placed it on *Kongo*.

The four main turrets on *Kongo* were arranged two forward, one amidships, and one astern. All had traverse to both sides, giving *Kongo* a powerful broadside of eight 14-in. guns. When completed, this arrangement made her the most powerful ship afloat.

Secondary armament was 16 6-in. guns arranged eight per side in casemates. This was more than the usual number, and reflected the Japanese concern for destroyer torpedo attacks. When completed, the class was fitted with 3-in. pedestal-mounted single guns – 16 in *Kongo* and eight in the remainder of the class. A peculiar Japanese feature was a heavy armament of torpedo tubes on their capital ships. Eight 21-in. submerged torpedo tubes were installed, making this the heaviest torpedo armament of any capital ship of its day.

Hiei before 1929, when she began her conversion into a training ship, as required by the London Naval Treaty. (Yamato Museum)

Kongo in 1936, in the configuration in which she would go to war. The tower has been further augmented and the mainmast reduced. The forward stack was removed in her first modernization. Despite two extensive modernizations, she remained comparatively weakly armored. (Yamato Museum)

Service modifications

The Kongo class had the longest life of any Japanese dreadnought. They began as battlecruisers, but ended their careers as fast battleships. During the course of their career, each ship was given two major modernizations. The first modernization took place between 1927 and 1932, *Haruna* being the first unit to undergo work and *Hiei* the last. In order to address the ships' principal weakness, another 3,811 tons of armor were added to improve horizontal protection over the magazine and machinery spaces. Anti-torpedo defenses were enhanced, with the addition of bulges that increased the beam to over 95ft. The armament was left unaltered except for the removal of four torpedo tubes. However, the maximum elevation of the main armament was increased to 43 degrees, thus increasing its range. The propulsive system was modernized by the removal of the 36 original boilers and the fitting of ten (*Haruna*) or 16 (*Kongo* and *Kirishima*) newer, but still mixed firing boilers. This allowed the forward stack to be removed. Provisions were made to embark three floatplanes for spotting of gunnery, but no catapult was fitted.

Hiei was a special case. Between 1929 and 1932, *Hiei* was demilitarized to meet the provisions of the London Naval Treaty by having her main armor belt removed and her top speed reduced to 18 knots by the removal of 25 of the original boilers. Her after 14-in. turret was removed and later all 6-in. secondary guns were also deleted.

Another, more radical, modernization for the entire class was begun in 1933 with *Haruna*. After this work, the ships were typed as battleships. Protection was further increased to a total of 4.75in. of horizontal armor. Torpedo protection for the machinery spaces was also increased. The existing

B

THE KONGO CLASS

This plate includes profiles of two of the four ships of the class. The top profile shows *Hiei* in December 1941, as she appeared during the Pearl Harbor raid. Her World War I ancestry can clearly be seen from her hull form, the casemate secondary armament, and the amidships 14-in. turret. Note that the foremost casemate is empty. *Hiei* can be distinguished from her sisters by a different searchlight arrangement and altered stack appearance, but the major departure was her bridge tower. This was a prototype for the tower being designed for *Yamato*. *Hiei*'s appearance was not altered up until her loss in November 1942.

The second profile shows *Kongo* as she appeared in October 1944 in her late war configuration during the battle of Leyte Gulf. Note the different tower style as opposed to *Hiei*. Only four 6-in. casemate guns remain per side. A Type 21 radar is located on the top of the tower rangefinder and the Type 22 radar is located one level down. The ladder-like Type 13 is on the mainmast, just above the stack. Triple 25mm guns have been placed anywhere with a clear arc of fire, including on top of the main turrets, on the tower and after control stations.

HIEI

KONGO

Haruna before her second modernization. When completed, the modernization would further alter the appearance of her tower and add a catapult abaft Turret 3. Her two most forward 6-in. casemate guns have been deleted. (Yamato Museum)

machinery was entirely replaced and 11 oil-fired Kampon boilers and new turbines increased power to 136,000 shaft horsepower (shp) with the resulting maximum speed of between 29.7 and 30.5 knots. The stern was rebuilt and made 25ft longer, which also helped to increase speed. The appearance of the class was altered, with a heavy pagoda tower being fitted. Armament was adjusted with the deletion of two 6-in. guns and the final four torpedo tubes. Antiaircraft armament was increased with the addition of four Type 89 twin 5-in. guns, and by 1936, of ten twin 25mm mounts. A catapult was added abaft the Number 3 turret to launch the three floatplanes. The last of the four ships to be modernized was *Hiei*. Work on her was completed in 1940 to the same configuration mentioned, with the difference that her bridge was built in a configuration similar to the new *Yamato* class.

During the war, modifications to the class centered on its antiaircraft and radar fit. *Hiei* and *Kirishima* were both lost before any major additions were made. *Kongo* was the first ship in her class to be equipped with radar when she received a Type 21 on her foretop rangefinder in August 1942. In early 1943, after the loss of *Hiei* and *Kirishima*, additional concrete protection was added in the area of the steering gear. Also at this time, two triple 25mm mounts were added, and two 6-in. guns removed. In January 1944, four more 6-in. guns and two twin 25mm mounts were removed and the antiaircraft fit further strengthened with the addition of two 5-in. Type 89 mounts and four triple 25mm mounts. In June 1944, Type 22 and Type 13 sets were fitted. The total of antiaircraft guns was brought up to over 100 with the addition of 13 triple and 40 single 25mm guns. In August, another 18 single 25mm guns were fitted in Singapore – by this time, only eight of the 6-in. guns remained.

Haruna's wartime modifications were similar. In October 1942, a Type 21 radar was installed. During a February–March 1943 overhaul, a Type 22 set was installed, six 6-in. guns removed and additional 25mm guns fitted. As on *Kongo*, concrete protection was added in the vicinity of the steering gear. In June 1944 a Type 13 radar and more 25mm guns were installed.

Hiei, seen after she had been demilitarized. Her after 14-in. turret has been removed. Also evident is her missing belt armor. The reduced size of the forward stack is due to the reduced number of boilers. At this time she retains her secondary armament, but this was later also removed. (US Naval Historical Center)

This is *Hiei*'s appearance in 1939 after rejoining the fleet. She was then the most modern among her class. Her tower differs from those of her sister ships, and resembles that which will be placed on *Yamato*. She can also be distinguished from her sister ships by a different stack and searchlight arrangement. The forward 6-in. casemate gun has been removed. (Yamato Museum)

Before she sortied to participate in the battle of Leyte Gulf, the total antiaircraft fit was six dual Type 89 5-in. guns and 122 25mm guns (30 triple, two double, and 28 single).

Wartime service

At the beginning of the war, *Kongo* and *Haruna* were assigned to cover the invasions of Malaya and the Philippines. The same two ships would later provide distant cover for the Dutch East Indies invasion in January 1942. By March 1942, they joined *Hiei* and *Kirishima*, which had spent the entire war escorting the carrier fleet, to conduct a massive raid into the Indian Ocean with the Imperial Navy's carrier force. This was the only time in the entire war that all four Kongos operated together. For the Midway operation, *Kongo* and *Hiei* were assigned to the Midway invasion force, while *Kirishima* and *Haruna* escorted the carriers. In this role, *Haruna* was slightly damaged.

All four Kongo-class ships were active in the struggle for Guadalcanal, beginning in August 1942. *Kirishima* and *Hiei* participated in the carrier battle of the Eastern Solomons. On October 13, *Kongo* and *Haruna* conducted the most successful Japanese battleship action of the war. Together, they plastered Henderson Field with almost 900 14-in. rounds, destroying over 40 aircraft. Later in October, all four participated in the battle of Santa Cruz: *Kongo* and *Kirishima* were both attacked by carrier aircraft but were undamaged.

In November, *Kirishima* and *Hiei* were tasked to repeat the bombardment of Henderson Field as part of an operation to move a major convoy to Guadalcanal. The US Navy committed a cruiser–destroyer force to prevent the bombardment. Early on November 13, a vicious night battle developed with the intercepting American force. *Kirishima* scored hits on the cruisers *San Francisco* and *Helena* and against a destroyer and in return was hit by a single 8-in. shell. *Hiei* took the brunt of American attention. She was struck by some 28–38 8-in. shells from the cruisers *San Francisco* and *Portland*, and some 70–75 5-in. shells. In return, *Hiei* crippled *San Francisco* and damaged

Kirishima in 1939, pictured with the carrier *Akagi*. The speed of the Kongo class made them the best-suited Japanese battleships to perform carrier escort duties, and they spent much of the war in this capacity. (Yamato Museum)

Wartime photography of Japanese battleships is rare. This shot shows *Hiei* in home waters in July 1942. Note the aerial recognition flags placed atop Turret 2 and 4, and that the rangefinder atop her tower has been painted white. (US Naval Historical Center)

the cruiser *Atlanta* and a destroyer. Despite the topside devastation on *Hiei*, she suffered little underwater damage. However, two 8-in. shells flooded her steering compartment, which prevented her from departing the area. In the morning, *Hiei* became the target of some 70 aircraft sorties as she circled at 5 knots. By evening, she was scuttled after being hit by several bombs and as many as four torpedoes.

The following day, *Kirishima* led another Japanese attempt to deliver a battleship bombardment of Henderson Field. Early on November 15, *Kirishima* and her escorts entered Ironbottom Sound, but this time they were intercepted by two modern American battleships, *Washington* and *South Dakota*. In the first battleship clash of the Pacific War, the Japanese came off a distant second. *South Dakota* suffered extensive topside damage from Japanese gunfire, but *Washington* sank *Kirishima* with 16-in. gunfire.

The next combat action for the two remaining Kongo class ships did not occur until June 1944, during the battle of the Philippine Sea. Both were assigned to the Vanguard Force escorting Carrier Division 3. *Haruna* was hit aft by four bombs; *Kongo* was undamaged. At the battle of Leyte Gulf in October, *Kongo* was damaged by near misses by dive-bombers. *Haruna* suffered only minor damage from destroyer gunfire.

While returning to Japan after the battle, *Kongo* was attacked by the submarine *Sealion II* on November 21, 1944. The Americans scored two torpedo hits, one forward and one under the second stack on the port side. Within two and a half hours, *Kongo* had capsized due to uncontrolled progressive flooding; 1,250 crewmen were lost, and only 237 survived. *Kongo* was the only Japanese battleship lost to submarine attack during the war. *Haruna* returned to Japan in December, where she was repaired and moved to Kure. In carrier raids on March 19 and July 24, 1945, *Haruna* suffered minor damage from single bomb hits. *Haruna's* end came on July 28, 1945 when she came under concerted attack by carrier aircraft and USAAF bombers. A total of eight more bombs sank her in shallow water. She was scrapped in place between 1946 and 1948.

KONGO CLASS (following 1933–34 modernization)	
Displacement	32,056 tons standard; 36,601 full load
Dimensions	length 739ft overall; beam 95ft; draft 32ft
Speed	30 knots; range 10,000nm at 18 knots
Crew	1,221; approximately 1,500 in 1944

FUSO CLASS

Design and construction

The same bill that authorized the construction of the four Kongo class vessels also authorized the construction of a new class of battleship designed to work in conjunction with the battlecruisers. The lead ship, named *Fuso*, was laid down at the Kure Navy Yard in 1912 and completed in 1915. Her sister ship was named *Yamashiro* and was built at the Yokosuka Navy Yard between November 1913 and March 1917. As usual, the Japanese tried to better the foreign competition. To do this, *Fuso* mounted 12 14-in. guns, all in twin gun centerline turrets. This was a heavier broadside than the ten guns of the American New York class, and *Fuso* also possessed a higher speed. When completed, *Fuso* was the largest and most powerfully armed battleship in the world.

The ship's armor accounted for some 29 percent of the ship's design displacement, for a total of 8,588 tons. This was sufficient to provide a 12-in. waterline main belt, which was tapered down to 6in. below the waterline to cover the magazines and machinery. The belt tapered out to 4in. at its extreme ends. Horizontal protection was light with a maximum of only 2in. The turrets were more heavily armored than on *Kongo*, with 12in. of face armor – the barbettes were fitted with 8in., and the conning tower was provided with a maximum of 14in.

When first constructed, *Fuso* employed a coal/oil mixed firing system with her 24 boilers. These powered a steam turbine system to drive four main shafts with 40,000shp, which was enough to drive the ship at 23 knots.

Armament

The 14-in. armament of the Fuso class was increased 50 percent over that of the Kongo class. Though 12 14-in. guns were included in the design, giving the Fuso class a superior main armament to her American and British contemporaries, the location of the main armament was not ideal. Two of the six dual 14-in. turrets were mounted amidships on the centerline, and both had restricted arcs of fire. The retention of midship turrets also affected the ship's internal layout.

As with the Kongo class, *Fuso* mounted a strong secondary armament of 16 6-in. guns, all fitted in casemates, eight per side. Antiaircraft armament was originally limited to four 3-in. guns. The Japanese practice of fitting torpedoes to their capital ships continued on *Fuso*. She was fitted with six submerged 21-in. torpedo tubes.

In 1945, the remaining Japanese battleships retreated to home waters. Most were hunted to extinction. Here, *Haruna* comes under intense carrier air attack and was sunk in the area of Kure on July 28, 1945. (US Naval Historical Center)

Service modifications

In the 1930s, both ships underwent extensive modernization that would dramatically change their appearance. *Fuso* was the first to enter the yards from April 1930 to May 1933. During this process, armor protection was increased and the total weight of armor was raised to 12,199 tons or some 42 percent of the ship's total displacement. Improvements focused on improving

Fuso in 1933, with her trademark pagoda tower, single stack, and large after control tower. *Fuso* can most easily be distinguished from her sister ship *Yamashiro* by the forward-pointing position of Turret 3. (Yamato Museum)

horizontal protection, which was brought up to a maximum of 4in. Attempts were made to increase protection from torpedo attack by providing two blisters covering from the top of the belt down to the bottom of the hull. The lower blister increased the beam to a maximum of 127ft.

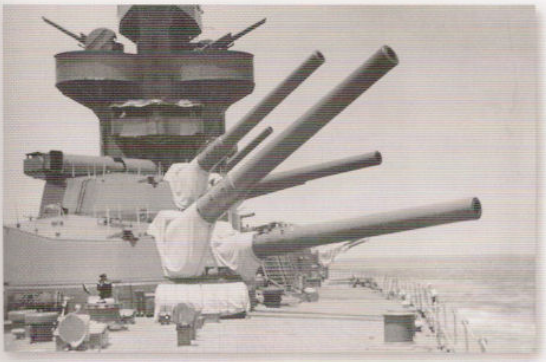
A major part of the modernization was the complete replacement of the main machinery. The original 24 boilers were replaced with six Kampon oil-fired boilers, and new Kampon 75,000shp turbines were fitted. This new machinery, nearly twice as powerful as the original equipment, and the addition of 25ft to the stern part of the hull, resulted in an increased maximum speed of almost 25 knots.

The modernization resulted in minimal changes to the ships' armament. The 12 14-in. guns were retained, but their maximum elevation was increased to 43 degrees. Two of the 6-in. casemate guns were removed, and the elevation of the remainder increased to 30 degrees. The antiaircraft armament was heavily reinforced, with the original 3-in. guns being removed and four twin Type 89 5-in. guns added. Short-range antiaircraft protection was provided by eight 25mm twin mounts. During the modernization, the torpedo tubes were removed.

At the conclusion of the modernization, both ships emerged with a drastically altered appearance. The salient feature of the class became the tall pagoda tower that replaced the earlier tripod mast. The aft control tower was also increased in height. The reduction in the number of boilers meant one of the stacks was removed. Both ships were fitted with aircraft handling facilities for three aircraft. *Yamashiro*'s modernization was begun in December 1930 and completed in March 1935. The work was similar to that performed on *Fuso*, but with some external differences. Aside from a difference in catapult placement, the pagoda tower on *Yamashiro* was of a heavier appearance and extended farther aft. This required that the stowed position of Turret 3 was in the aft position, not forward as on *Fuso*.

In August 1942, after the battle of Midway, during which the Imperial Navy suffered heavy carrier losses, consideration was given to converting the Fuso class into hybrid battleship-carriers. Plans were begun and work was scheduled to begin in June 1943, but the scheme was canceled.

Yamashiro, photographed in Chinese waters following her 1930–35 modernization. (US Naval Historical Center)



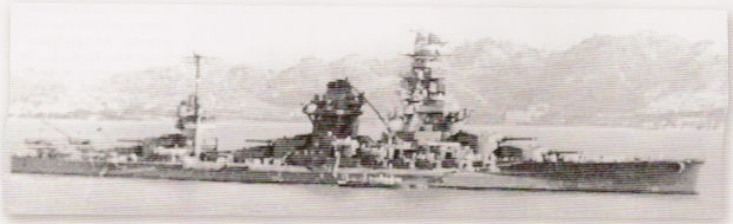
Pictured are the two aft main battery turrets on a Fuso class battleship. These are Type 41 36cm (14-in.) .45-cal. guns, the standard Japanese battleship main gun. It was based on a Vickers design with a firing cycle of 30–40 seconds at maximum elevation. (*Ships of the World Magazine*)

As second-line units, relatively little effort was expended during the war to increase their combat capabilities. In July 1943, *Fuso* received 21 additional 25mm antiaircraft guns (17 single mounts and two twin mounts) to bring her total 25mm fit to 37. Also during this time, she received a Type 21 radar. In August 1944, *Fuso* received her final modifications, when she was fitted with another eight triple, six twin and 17 single 25mm guns. Added to another five single guns on movable mounts, this brought her total 25mm gun fit to 95. The ship also received 10 13.2mm machine guns, two Type 13 (located on her stack) and two Type 22 radars. *Yamashiro*'s wartime modifications were similar to *Fuso*'s. In July 1943, she received a Type 21 radar. In July 1944, another 66 25mm guns (eight triple, nine twin, 24 single) were added, together with 16 13.2mm machine guns. *Yamashiro* also received two Type 13 and two Type 22 sets.

Wartime service

At the start of the war, *Fuso* and *Yamashiro* were in home waters with most of the Imperial Navy's other battleships, usually at the Combined Fleet's anchorage at Hashirajima in Hiroshima Bay. On May 29, 1942, the two ships departed Hashirajima to take part in the Imperial Navy's largest operation of the war, the planned invasion of Midway. Deployed as part of the distant screen for the invasion, they returned to Japan having seen no action. Not until August 1943 did the ships leave home waters again. *Fuso* was used to carry troops and supplies to Truk in the central Pacific. She remained attached to the Combined Fleet, and in May 1944 took part in the abortive attempt to reinforce Biak Island. In July 1944, Fuso returned to Japan, being attacked by an American submarine en route without being damaged. *Yamashiro* was much less active, being designated as a midshipmen training ship in September 1943. After refit in Japan, *Fuso* and *Yamashiro* were assigned to active service in September 1944.

FUSO CLASS (following 1935 modernization)	
Displacement	34,700 tons standard; 39,154 full load
Dimensions	length 698ft overall; beam 100.5ft; draft 31.75ft
Speed	24.75 knots; range 8,000nm at 14 knots
Crew	1,400 (1935), this was probably up to 1,800 or 1,900 in 1944



Hyuga, as seen by a British cruiser in Chinese waters in December 1938. *Hyuga* had already undergone her final modernization from November 1934 to September 1936, and this was her final prewar configuration. The ship was destined to play a minor role during the war. (US Naval Historical Center)

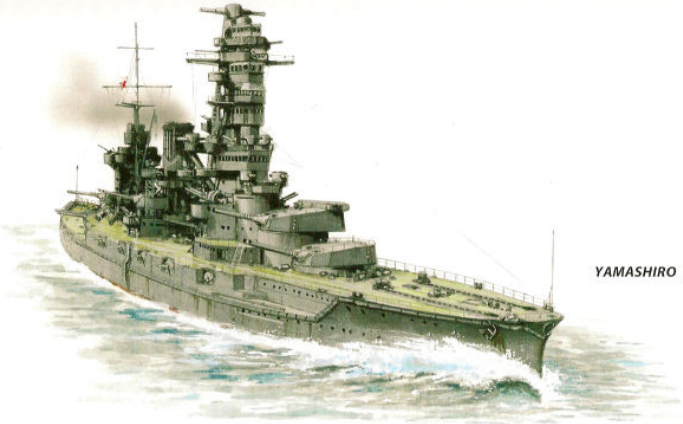
In October 1944, both ships arrived at Lingga Anchorage, south of Singapore. They were to participate in Operation *Sho-go* (Victory), the Imperial Navy's last attempt to fight a decisive battle to save the Philippine Islands from invasion. Because of their slow speed, *Fuso* and *Yamashiro* were detached from the main body of the First Striking Force and formed into Force "C" to enter Leyte Gulf from the south. The fleet departed Lingga on October 20 and headed to Leyte. On October 24, *Fuso* was attacked by carrier aircraft in the Sulu Sea and suffered damage from a bomb hit on her stern that destroyed her aircraft and catapult. To block the entry of Force "C" into Leyte Gulf, the Americans deployed the surface strength of the 7th Fleet, centered around six battleships. Entering Surigao Strait in the early morning hours of October 25, the two battleships came under torpedo attack by PT boats and destroyers. *Fuso* was hit at 0309hrs by one or two torpedoes. By 0338hrs, the resulting fire had spread to the ship's magazines, and at 0345hrs she blew up and split into two sections; there were no survivors. The same torpedo attacks that proved deadly to *Fuso* also damaged *Yamashiro* at 0321hrs when a single torpedo hit the ship on her port quarter, which forced two magazines to be flooded, and the subsequent loss of two main gun turrets. At 0331hrs, another torpedo hit amidships and slowed the ship to 5 knots. *Yamashiro* worked back up to 15 knots and continued up the strait, only to come under concentrated cruiser and battleship gunfire. The target of hundreds of shells, *Yamashiro* was hit an untold number of times. She returned fire, but her only success was possibly contributing to the damage of a single American destroyer. After a lull in the American barrage, *Yamashiro* headed south back down the strait. At 0409hrs, she was hit by two more destroyer-launched torpedoes, which finally resulted in the ship capsizing at 0419hrs. Of the crew of approximately 1,400, only three were rescued.

C

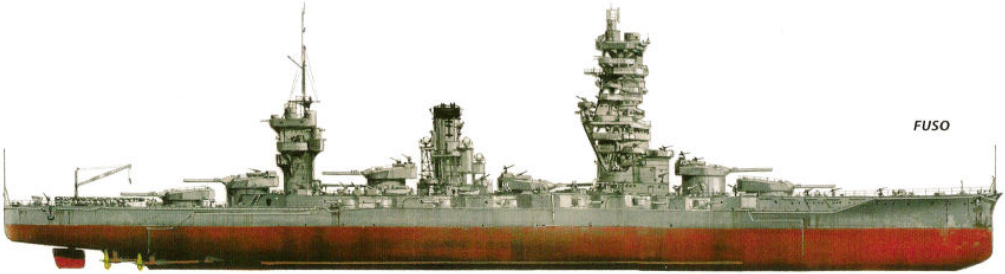
THE FUSO CLASS

These were the iconic Japanese battleships, with their towering pagoda-style bridge structures. The pagodas were a record 144ft above the waterline. The top profile is of *Yamashiro* as she appeared in June 1942 during the battle of Midway. The ship has six 14-in. twin turrets, indicative of her design dating from World War I. The ship has no radar and a sparse antiaircraft fit of only eight 25mm twin mounts (four are shown).

The second profile is of *Fuso* as she appeared in October 1944 in her late war configuration during the battle of Leyte Gulf. Note the different appearance from her sister ship. *Fuso*'s pagoda is less massive and her Turret 3 was stowed in the forward position. *Fuso* also shows a full array of radars, including, uniquely, her Type 13 on her stack, instead of on the mainmast. A number of single, double, and triple 25mm mounts have been placed on the main deck and on top of her main batteries in an effort to counter US airpower.



YAMASHIRO



FUSO

ISE CLASS

Design and construction

The two ships of this class were approved in late 1912, but work was not started on them until 1915. *Ise* was laid down at the Kawasaki yard at Kobe, and *Hyuga* was built at the Mitsubishi yard in Nagasaki. Originally it was planned that these were to be an improved version of the Fuso class. However, when completed in 1917 and 1918, so many improvements had been made that they were considered a separate class. Dimensionally, the Ise class was similar to the Fuso class, with an identical beam and an extra 10ft in length. The main difference was the positioning of the main armament. The Ise class retained a battery of 12 14-in. guns, but the two center turrets were positioned closer together, allowing a wider arc of fire. This also allowed the 24 coal-fired Kampon boilers with supplementary oil sprayers to be repositioned for better efficiency – the increased output of the main machinery resulted in 45,000shp and a top speed of 23.5 knots.

Protection was generally similar to the Fuso class, but was still somewhat below that of foreign designs. The main belt had a maximum of 12in. of armor, as did the conning tower and the face of the main turrets. Turret barbette armor was increased to 12in. and deck armor remained at an inadequate 2in. The total weight of armor, 9,680 tons, accounted for 30 percent of the total displacement.

Armament

Ise and *Hyuga* were fitted with 12 14-in. guns of the same type that *Fuso* had. As on *Fuso*, the main battery was arranged in six turrets, though the arrangement was improved. The secondary armament was increased to 20 guns, 18 arranged in casement and two fitted abreast the forward stack. However, the gun selected was different, the Japanese-designed 5.5in. Provisions were also made for 16 3-in. guns to be fitted on the top of the main turrets, but it is unclear if these were ever fitted. Antiaircraft protection was limited to four 3-in. guns, and, as was typical for Japanese capital ships, six 21-in. submerged torpedo tubes were also fitted.

Service modifications

The Ise class was the most modified of any Imperial Navy battleship. They began service during the World War I as "superdreadnoughts" and ended their careers in World War II as the world's only battleship-carriers.

Ise pictured in Chinese waters in May 1939. This is the configuration in which she went to war, and in which she remained in until converted to a carrier-battleship in 1943. (US Naval Historical Center)

Both ships underwent a major reconstruction at Kure before the war. *Hyuga* was the first between November 1934 and September 1936, followed by *Ise* from August 1935 to March 1937. This reconstruction generally paralleled that of the Fuso class. The hull was lengthened by 25ft and completely new machinery was installed. Eight oil-fired boilers replaced the combination coal/oil fired boilers, and with new turbines, power almost doubled to 80,000shp,

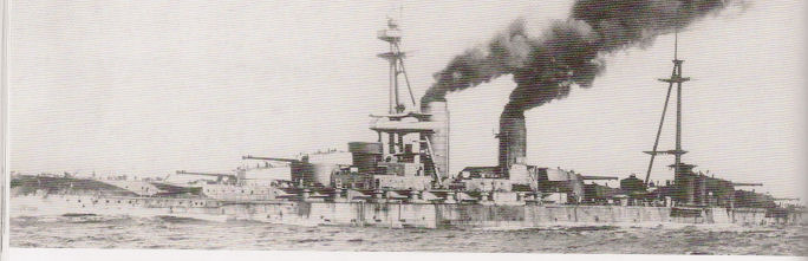
Ise in 1943, immediately after conversion into the world's first carrier-battleship. The conversion, while extensive, was comparatively simple. Turrets 5 and 6 were removed, and were replaced by a flight deck that overhung the stern. The starboard catapult can be seen – its interference with the arc of fire of Turrets 3 and 4 is obvious. All of the secondary 5.5-in. guns have been removed. The four starboard Type 89 5-in. guns can be seen, but many of the ship's 25mm guns have yet to be fitted. (Yamato Museum)

which resulted in a new top speed of 25.3 knots. The smaller number of boilers allowed the forward stack to be removed, leaving one stack amidships.

The main armament was left unaltered, but the maximum elevation was increased to 33 degrees. This was later increased for Turrets 1–4 to 43 degrees. Four of the 5.5-in. guns were removed, including the two mounted near the forward stack. The antiaircraft suite was significantly upgraded, the 3-in. guns were removed and four twin Type 89 guns were fitted, and short-range antiaircraft coverage was provided by ten twin 25mm guns. The torpedo tubes were removed.

Armor enhancements included augmenting horizontal protection over magazine and machinery spaces to 4.7in. and fitting a bulge for protection against torpedo attack. This bulge increased the beam by over 17 feet. It incorporated separate compartmentation and an inch of steel at the ship's side. Internal arrangements to defeat torpedo attack included two longitudinal bulkheads and the two fuel bunkers placed outboard to absorb shock. Other modifications included the construction of a large pagoda superstructure. A catapult was added on the starboard side of the quarterdeck and up to three floatplanes could be carried.

The most dramatic modification of any Japanese battleship began in 1943. After heavy carrier losses in the first year of the war, the Imperial Navy searched for ways to get additional aircraft to sea quickly. One idea was to create hybrid carrier-battleships out of the two Ise class battleships. This idea was approved and *Hyuga* was converted from May to November 1943 at Sasebo and *Ise* from February to August 1943 at Kure. The two after 14-in. turrets were removed and a 230ft-long flight deck was installed from the forward end of the aft control station to the ship's stern. A single T-shaped elevator moved aircraft from the hangar to the flight deck, which was covered with 8in. of concrete as a means to restore the ship's balance after removal of Turrets 5 and 6. This deck was not large enough to allow the launching or recovery of aircraft. Launching of aircraft was performed by two new catapults fitted forward of the new flight deck. These large 82ft catapults restricted the arcs of fire of Turrets 3 and 4. Once launched, aircraft would recover ashore or on a conventional carrier. By using the flight deck and the 131ft-long hangar, up to 22 aircraft could be carried – nine in the hangar, 11 on the flight deck, and two on the catapults. These were originally intended to be D4Y2 "Judy" dive-bombers, but a shortage of aircraft meant that a mix of 14 E16A1 "Paul" reconnaissance-dive-bombers and eight D4Y2s was



As completed, *Ise* had a small bridge and two large tripods. She can be distinguished from her near-sisters of the Fuso class by the different arrangement of the midships 14-in. turrets. (Yamato Museum)

eventually settled on. To the Japanese, this awkward arrangement was justified, as it added 44 dive-bombers to their carrier fleet's striking power.

As with other Japanese battleships, antiaircraft weaponry was greatly increased as the war went on. During their conversion, the Ise class received another four twin Type 89 guns for a total of eight. The twin 25mm guns were removed and replaced by 19 triple mounts. To compensate for the extra weight, all casement 5.5-in. guns were removed. Additional 25mm guns were added in May 1944 until a final total of 104 guns were fitted, 31 triple mounts and 11 single mounts. In September 1944, six 30-barrel 5-in. rocket launchers were fitted on sponsons located on the aft portion of the flight deck. These rockets were fitted with incendiary shrapnel charges and were activated by a time fuse, but proved ineffective in service. Since no aircraft were available late in the war, the catapults were removed in October–November to restore the field of fire for the aft 14-in. guns.

Ise was one of the first Imperial Navy ships to be fitted with radar. In May 1942, she received one of the first experimental Type 21 air search radars on top of her bridge. Two Type 22 surface search radars were fitted lower on the pagoda structure during conversion; these were replaced with two improved Type 22 sets in May 1944, in addition to two Type 13 air-search radars. *Hyuga* had an experimental Type 21 briefly installed in May 1942. This was replaced during her carrier conversion and two Type 22 sets fitted. In June 1944, she received improved Type 22s and two Type 13s.

Wartime service

During the early part of the war, *Ise* and *Hyuga* rarely left home waters. During gunnery drills in the Inland Sea in May 1942, *Hyuga*'s Turret 5 exploded and 51 crewmen were killed. The turret was not repaired, but was later removed and replaced with a circular armored plate, on which four triple

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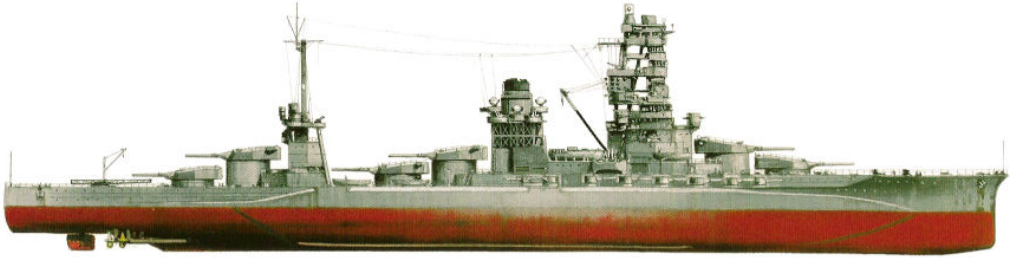
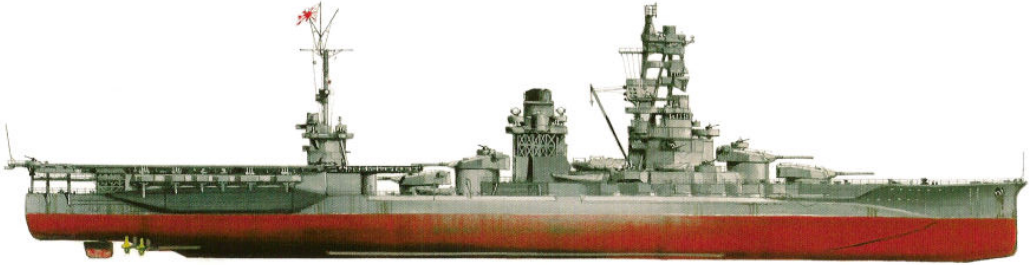
THE ISE CLASS

The top profile shows *Ise* in her June 1942 configuration during the battle of Midway. Note the placement of the amidships 14-in. gun turrets which are grouped together, unlike on *Fuso*. The shape and size of the tower structure is also different from that on *Fuso*.

The lower profile depicts *Hyuga* as she appeared in October 1944 during the battle of Leyte Gulf as a converted battleship-carrier. A flight deck has replaced the Number 5 and 6 turrets, and extends from the aft control station to over the stern. Two catapults were fitted, which severely restricted the arc of fire for Turrets 3 and 4 (these were removed after the battle). Alongside the flight deck are 25mm triple guns and the 5-in. rockets; *Ise* and *Hyuga* were the only Japanese battleships fitted with this weapon. As on other Japanese battleships, a Type 21, Type 22, and Type 13 radars are evident. The ship carries a total of 31 triple 25mm turrets; in addition, a number of detachable single mounts were fitted on the flight deck.



ISE



HYUGA

ISE CLASS (following 1934–37 modernization)	
Displacement	35,800 tons standard; 40,169 full load; 38,676 after conversion into carrier battleship
Dimensions	length 708ft overall; beam 104ft; draft 30ft
Speed	25.3 knots; range 7,870nm at 16 knots; 9,500nm at 16 knots after conversion
Crew	1,360; 1,463 after carrier conversion

25mm guns were installed. On May 29, both ships departed Japan to take part in the Midway operation, but saw no action.

After their conversion into carrier-battleships, both ships were assigned to Carrier Division 4 in August 1944. In October, as the Americans moved to invade the Philippine Islands, *Ise* and *Hyuga* were finally committed to action. However, Air Group 634, Carrier Division 4's assigned air group, was decimated in action off Formosa earlier in the month, so the carrier-battleships entered action with no embarked aircraft. Both ships were assigned to the Northern Force, which was tasked to lure the US Navy's Fast Carrier Force away from the Imperial Navy's surface forces tasked to enter Leyte Gulf. In this role, *Ise* and *Hyuga* departed home waters on October 20, and by October 25, they came under intense American Navy carrier air attack in an action known as the battle of Cape Eugano. The Americans threw 527 sorties at the Northern Force, most being directed at the four carriers present, all of which were sunk. In the morning strikes, *Ise* took eight near misses and one hit on Turret 2. *Hyuga* was damaged by near misses. In the afternoon, *Ise* was the center of American attention. The lucky ship suffered 34 near misses, which ruptured hull plates, but only a single bomb hit that damaged the port catapult. She escaped with minor damage from leaking. Surviving multiple submarine attacks, both ships arrived in Japan with no further damage.

In November, the sisters departed for Singapore, arriving there on January 1, 1945. Each battleship was loaded with 5,000 drums of oil and other strategic materials for the return trip to Japan. Escaping submarine attack, they arrived at Kure on February 20. Lacking fuel and aircraft, the two ships were not used again operationally. Both were used as floating antiaircraft batteries in the area of Kure. In this capacity, both were subjected to a series of American carrier aircraft attacks that eventually resulted in their destruction. During the first attack on March 19, 1945, *Ise* was hit by two bombs and *Hyuga* was hit by one. On July 24, *Ise* was hit by five bombs and many near misses, but damage-control efforts restored the ship to an even keel. On July 24, south of Kure, *Hyuga* was attacked by 50 aircraft, suffering ten bomb hits and multiple near misses. The subsequent flooding forced her crew to run her aground. *Ise* was finished off on July 28 with 18 bomb hits and many near misses. She sank by the bow in shallow water.

On October 25, 1944, both of the Ise class carrier-battleships came under intense US Navy carrier aircraft attack during the battle off Cape Eugano. Neither was severely damaged, but this was their only engagement of the war against American forces. One of the carrier-battleships is show here in action. Note the heavy smoke from her 25mm antiaircraft guns, and the absence of any aircraft on the stern flight deck. (US Naval Historical Center)

Nagato in 1920, after completion. The ship presents a well-balanced appearance, with its two forward and two aft 16-in. turrets. Note the secondary armament fitted on two levels forward. (Yamato Museum)

NAGATO CLASS

Design and construction

This two-ship class was constructed under the 1916 and 1917 programs. *Nagato* was laid down in August 1917 at Kure Navy Yard and *Mutsu* was laid down in June 1918 at Yokosuka. They were designed by Hiraga Yuzuru, the most famous of Japanese naval architects. He intended to build a ship that incorporated a number of technological and design advances, with the goal of building a battleship qualitatively superior to any other navy's. The original design was finalized without benefit of the lessons from the great dreadnought clash at Jutland in 1916, so Hiraga was forced to recast his design. What emerged was a ship more powerful than the most advanced dreadnought of the day, the Royal Navy's Queen Elizabeth class. *Nagato* was bigger at 32,720 tons, faster, and carried larger guns.

Nagato's engineering system was entirely of Japanese design and manufacture. Originally 15 oil-fired and 6 mixed-firing Kampon boilers were installed, which produced the steam to drive Kampon turbines on four screws. This was sufficient to develop 80,000shp and could drive the ship at 26.5 knots, far superior to the US Navy's 16-in. gun dreadnoughts, the 21-knot Colorado class.

For protection, the Nagato class possessed slightly inferior armor protection compared to the American Colorado class. *Nagato* and *Mutsu* possessed a main belt of 12in. plus another 12in. on the barbettes. The conning tower armor was 14.6in., while the main turrets possessed 18in. of frontal armor, 11in. of side, 7.5in. of rear armor, and 9in. on the turret roof. Horizontal protection consisted of an upper deck and two armored decks with a maximum of 5.7in. In total, protection accounted for 31.7 percent of the design standard displacement.

Armament

Because the *Nagato*'s 16-in. guns fired a heavier shell, her designers reduced the number of main guns from 12 to eight, producing considerable savings in weight and space. When commissioned in November 1920, *Nagato* was the first battleship in the world to carry 16-in. guns. The eight guns were arranged in four twin turrets, two forward and two aft, with the Number 2 and 3 turrets superfiring. The turrets had 30-degree elevation. Secondary armament was the now-standard 5.5-in. gun; 20 were fitted, all in casemates. Four 3-in. guns provided antiaircraft protection. The Japanese continued their custom of fitting torpedo tubes on capital ships, fitting eight 21-in. tubes on the Nagato class – four above water, and four submerged.

A beam view of *Mutsu* taken in the late 1930s. This configuration was basically unchanged until her loss in June 1943. (US Naval Historical Center)

Service modifications

Both ships were reconstructed in the mid-1930s; *Nagato* was the first to enter the yards in April 1934 at Kure, followed by *Mutsu* in September 1934 at Yokosuka. Work was completed on the ships in January 1936 and September 1936, respectively.

The nature of the reconstruction paralleled that of the other Japanese battleships. To enhance underwater protection, a torpedo bulge was added that extended from the bottom of the hull to up above the side armor. The bulge was composed of two sections, with the upper compartments filled with crushing tubes, and the lower one used as a fuel bunker. The new bulges increased the beam to 111ft. Increasing horizontal protection was another concern, so the machinery and magazine spaces were covered with 1.5in. of armor on the upper deck and another inch to the upper armored deck; maximum horizontal armor in some areas was now more than 8.1in. Following reconstruction, the total weight of armor rose to 32.6 percent of displacement.

To compensate for the increased beam, the hull was lengthened by 26ft. All of the original 20 boilers were removed and replaced with four Kampon oil-fired boilers, in addition to six smaller rebuilt boilers; new turbines were also fitted. The reduction in the number of boilers permitted the forward stack to be removed. The new machinery saved 500 tons of weight, but resulted in no increase of power. Because the displacement increased to over 46,000 tons' full load, the top speed dropped from 26.7 knots to 25 knots. Only minor modifications were made to the armament. The elevation of the secondary armament was increased to 35 degrees and antiaircraft protection was enhanced by removing the four 3-in. guns and replacing them with four twin Type 89 guns. The torpedo tubes were removed.

In 1937, a new catapult was fitted that replaced the original model fitted in 1933. Three floatplanes were carried. In 1939, ten twin 25mm antiaircraft guns were added.

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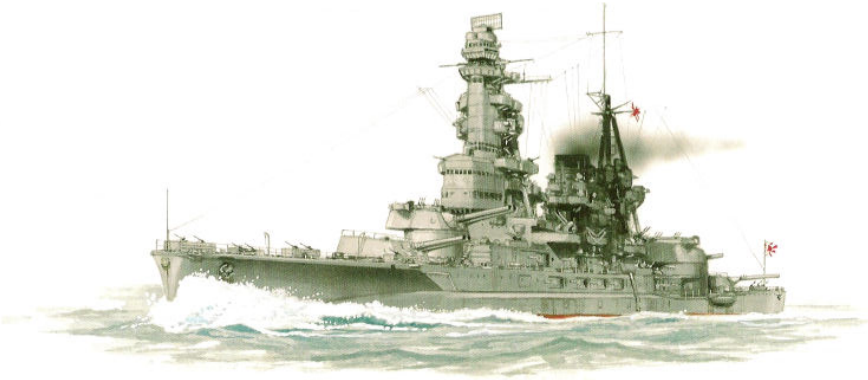
THE NAGATO CLASS

The plate shows the two ships of the Nagato class. This class was the backbone of the Imperial Navy's battle line in the 1920s and 1930s. The top profile shows *Mutsu* as she appeared in August 1942 during the battle of the Eastern Solomons. Her appearance has been unaltered since the start of the war, and she would remain essentially unchanged until her loss from a magazine explosion in June 1943. Note the main armament of 16-in. guns fitted in four twin turrets. The secondary armament of 5.5-in. casemate guns is fitted on two levels.

The lower profile is of *Nagato* as she appeared in October 1944 in her late war configuration during the battle of Leyte Gulf. Her appearance has been altered by the addition of radar and 96 25mm guns in single, double, and triple mounts. All of her portholes have been plated over.

MUTSU



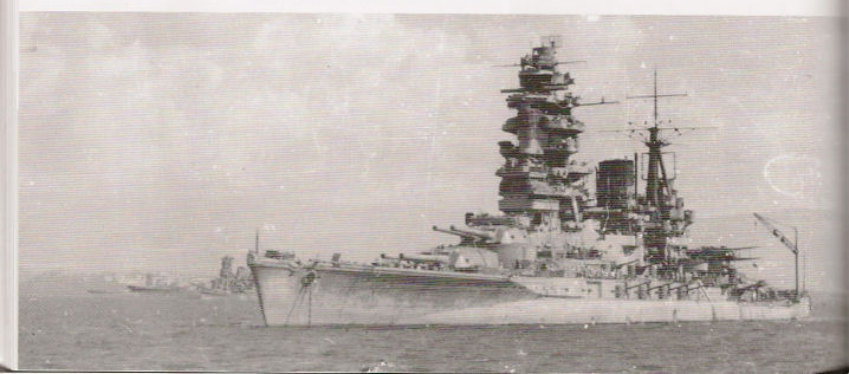
NAGATO

NAGATO CLASS (following 1934–6 modernization)	
Displacement	39,130 tons standard; 46,356 full load
Dimensions	length 734ft overall; beam 108ft; draft 31ft
Speed	25 knots; range 8,560nm at 16 knots
Crew	1,368; 1,475 in 1942; approximately 1,735 in 1944

During the war, *Mutsu* was not modified before her loss. *Nagato* received little modification until later in the war. In May 1943, *Nagato* was equipped with a Type 21 radar and two additional 25mm triple antiaircraft guns. When *Nagato* returned to Japan in June 1944, she received extensive modifications to her radar and antiaircraft suites. At this time, two Type 22 and two Type 13 radars were fitted. Two of the 5.5-in. secondary guns were removed and the total number of 25mm antiaircraft guns brought up to 96 – 16 triple, ten twin, and 28 single mounts. Also at this time, all portholes below the upper deck were plated over. In 1945, *Nagato* was modified for use as a floating antiaircraft battery. Her 5.5-in. guns were removed, and many additional triple 25mm mounts were added. The stack and mainmast were removed to improve arcs of fire for the antiaircraft guns. By the time the ship was surrendered, only the main battery remained onboard.

Wartime service

Nagato and *Mutsu* began the war assigned to Battleship Division 1. *Nagato* also served as flagship of the Combined Fleet. In this capacity, it was from her decks that orders to start the Pacific War were issued. Both ships remained in home waters until May 29, when they departed to take part in the battle of Midway. Being deployed some 300 miles behind the Japanese carrier force, they saw no action during the battle. *Nagato* remained in home waters through 1942, but *Mutsu* departed Japan in August, and deployed to Truk to take part in the Guadalcanal campaign. Even in the forward area she was little used, but did participate in the battle of Eastern Solomons in August, before returning to Japan in January 1943. On June 8, 1943, *Mutsu* was at anchor at Hashirajima. Just after noon, *Mutsu*'s Number 3 turret magazine exploded, breaking the ship in half. Of the crew of 1,474, only 353 survived, and only 13 of 153 visiting flying cadets and instructors were saved. Initially it was thought that the Type 3 "*Sanshiki-dan*" incendiary shells for the main battery were to blame, but tests showed this was not the case, and final blame was conveniently assigned to a disgruntled seaman assigned to Turret Number 3 who was facing theft charges.



Nagato as she appeared immediately before the battle of Leyte Gulf. All of her radars are noticeable, with the Type 21 atop the tower, the two Type 22s just below the tower rangefinder, and two Type 13s on her mainmast. Much of her increased antiaircraft fit can also be seen. The aircraft crane has been rigged, and an F1M2 "Pete" aircraft can be seen. Behind *Nagato* are *Yamato* and *Musashi*. (Yamato Museum)

Nagato in 1946, under US Navy control. The ship is obviously in poor material condition, with unrepaired war damage evident. The stack and her mainmast have been partially removed, as have all of her 5.5-in. secondary guns, and almost all of her 25mm guns. The ship's late-war paint scheme can still be seen. (Yamato Museum)

Nagato remained in home waters through mid-August 1943, before deploying to Truk. Following the Imperial Navy's evacuation of Truk, *Nagato* and the Mobile Fleet moved to Lingga. During the battle of the Philippine Sea in June 1944, *Nagato* was assigned to Force "B" as an escort to Carrier Division 2. She was not damaged during the American air raids on the Mobile Fleet on June 20.

After the Japanese defeat at Philippine Sea, *Nagato* returned to Japan for refit and repair. By July, she had returned to Lingga and was now assigned to Force "A" of the First Striking Force. In October, the Americans invaded Leyte in the Philippines, and *Nagato* and six other of the Imperial Navy's battleships departed Lingga on October 18 to attack the American invasion force. On October 24, *Nagato* suffered two near misses in the morning, and in the afternoon she was hit by two bombs and experienced three near misses. Damage was light, but the ship's speed was impaired temporarily.

On October 25, Force "A" came upon the six escort carriers of "Taffy 3." For the first time in the war, Nagato used her main batteries against an enemy, opening fire at 20 miles. Overall, her part in the battle was minor. She only fired 45 rounds from her main gun and 92 5.5-in. rounds. Her only claim was a damaged cruiser (none were actually present, so her actual target was a destroyer). While retiring, *Nagato* was hit by another two bombs forward, one of which destroyed her anchor deck. Overall, despite two days of intense air attack, damage to *Nagato* was minimal, with 38 killed and 105 seriously wounded.

After Leyte Gulf, *Nagato* returned to Japan on November 25. With no fuel available, she was modified for use as a floating antiaircraft battery and assigned to the Yokosuka Naval District. In April 1945, *Nagato* was reassigned as a reserve ship. The ship was stripped of its remaining 5.5-in. guns, and most antiaircraft guns were moved to a nearby mountain. The crew was reduced to 1,000 men. *Nagato* was heavily camouflaged, with her main guns covered with scaffolding, and trees placed on her upper deck. Despite this attempt at concealment, she was subjected to carrier air attack on July 18, 1945. One bomb hit the bridge causing heavy casualties, and another hit aft of the mainmast. This was the only damage, and in this condition *Nagato* was the only Japanese battleship to survive the war. On August 30, *Nagato* was boarded and taken over by the US Navy. Her end was ignominious. On March 18, 1946, *Nagato* departed Yokosuka at her best speed of 10 knots for Eniwetok. She proved unseaworthy because of unrepaired war damage and

later ran out of fuel. After finally arriving by tow at Eniwetok, she was moved to Bikini Atoll in May 1946. There she was subjected to two atomic bomb tests in July 1946. Following the second, she capsized on July 29 in about 160ft of water.

YAMATO CLASS

Design and construction

The Yamato class comprised the largest battleships ever built. These ships were the result of the Japanese strategy of countering American numerical superiority with a qualitative overmatch. *Yamato* was commissioned in February 1942, only weeks after Pearl Harbor displayed the emerging importance of the aircraft carrier. Thus, despite all the efforts put into her design, *Yamato* was obsolete by the time she entered service. The Yamato class has been condemned as a failure as neither ship was ever used for their intended roles, and both were sunk by aircraft. However, examining the Imperial Navy's dilemma in the mid-1930s, the Japanese decision to build an enormously expensive class of superbattleships appears rational, even inspired. The Imperial Navy was unable to compete with the US Navy on a quantitative basis, so it was forced to seek a qualitative edge. The eventual nemesis of the class, carrier airpower, was a relatively primitive tool when the ships were designed, and no navy foresaw the rapid technological advances of carrier aircraft, and the subsequent domination of airpower. When completed, *Yamato* became the mythical symbol not only of Japanese sea power, but of the entire nation.

Planning for *Yamato* began in the fall of 1935. Twenty-three various designs were considered before the final plan was accepted in July 1936. The architects were challenged to come up with a design to meet the Navy General Staff requirements that called for a ship with nine 18.1-in. guns, armor capable of withstanding 18-in. shellfire, underwater protection capable of defeating torpedoes with a 660lb warhead, a top speed of 27 knots, and a cruising range of 8,000 miles at 18 knots. To accomplish this, the designers determined that the ship needed a displacement of 69,000 tons.

Two superbattleships were authorized in 1936. *Yamato* was built in Kure after the dock there was deepened, and gantry cranes strengthened to handle the enormous armor plates. *Musashi* was built at the Mitsubishi shipyard at Nagasaki. Expansion of this facility required that the slipway be extended some 50ft into the hillside. Extreme security precautions taken during the ship's construction were successful in denying US Naval Intelligence an accurate assessment of the ship's size and capabilities throughout the war.

A fine study of *Yamato* as she conducted trials in 1941. Her fine lines and raked stack gave her a graceful appearance. Note the beam 6.1-in. triple turret. (Yamato Museum)

In 1939, two more were authorized. The first of these was named *Shinano* and the second (Number 111) was never named. *Shinano* was intended to be completed with a different armor scheme, and to be equipped with the new Type 98 4-in./65 antiaircraft gun. After Midway, it was decided to complete her as an aircraft carrier. She was finally completed in late 1944 but was sunk on November 28, 1944 on her first voyage by submarine attack. The fourth Yamato class ship was only 30 percent complete before work was stopped in November 1941.

This view from the forecastle of *Musashi* was taken during her shakedown cruise in June 1942. This angle demonstrates the ship's extreme beam, and the size of the formidable 18.1-in. main battery. (Yamato Museum)

The hull had a very broad beam of 127.7ft, with overall length being 839 feet. Draft was relatively shallow for a ship with such a large displacement. However, fully loaded the draft was still 35.4ft, which required that several harbors be dredged. A new feature was a giant bulbous bow that was shown during tests to reduce hydrodynamic drag. The enormous beam allowed the four main turbines and their boilers to be placed side-by-side instead of in tandem along the length of the hull. This reduced the area that had to be armored to protect the machinery to a very low 53.3 percent of the ship's length.

As demanded in the design specifications, the armor scheme was of such a scale that it provided the class with an unparalleled degree of protection in surface combat. Armor was laid out in an all-or-nothing principle with almost all armor being placed in the central main citadel to protect vital machinery and magazine spaces. In order to minimize the portions of the ship that were to be protected, the ship was designed with an unprecedented beam instead of a long narrow hull design. *Yamato* was the most massively armored ship ever, with a total weight of armor of 22,534 tons or 33.1 percent of the design displacement. The armored center section featured a main belt of just over 16in. inclined at 20 degrees, half of which was below the waterline. The lower armor belt was just under 11in. in the area of the magazines, and 8in. covering the machinery spaces. The ends of the armored citadel were covered by two transverse 11.8-in. bulkheads. Deck armor was between 7.9 and 9.1in., which was thought to be capable of withstanding armor-piercing bombs of up to 2,200lb dropped from 3,280ft. The front of the barbettes were covered by 21.5in. of armor plate with the sides covered by 16in., both specially hardened. The three main turrets featured some 26in. of armor on their face, 10in. on the sides, 9.5in. in the rear, and almost 11in. on the roofs. The conning tower was covered by a maximum of 19.7in. of steel. A torpedo bulge was also fitted, which extended 9ft 2¼in. from the main belt, from the waterline to the bottom of the ship.

The propulsive system included four Kampon geared turbines with steam provided by 12 Kampon boilers. This provided a total of 150,00shp to the four propeller shafts, which met the design speed of 27.5 knots. *Yamato* was reported to have made in excess of 28 knots in June 1942. Maneuverability was excellent. A small heeling angle even at high degrees of rudder at high speed maintained a good platform for gunnery. The class possessed highly developed damage-control features. The ships possessed increased watertight compartmentation and a reserve buoyancy of 57,450 tons. Stability could be

A port-quarter shot of *Yamato* on trials. Note her catapults fitted aft; just behind these is the aircraft elevator. (Yamato Museum)

maintained with a list of 20 degrees. Any list of up to 18.3 degrees could be corrected by the flooding and pumping system.

However, as formidable as the design appeared on paper, there were problems. The armor distribution scheme proved to be faulty. The entire bow and stern sections were unarmored, depending on compartmentation only. However, compartments in these areas were too large, and this, combined with the lack of armor, meant that damage translated into flooding and a list. The pumping system was unable to cope with excessive flooding in the bow and stern areas. The Achilles heel for the class was a defective joint in the armor at the junction of upper and lower side belts. When this failed, the armored citadel was compromised. Protection above the waterline had priority, which meant there were no voids that could absorb torpedo blasts. Additionally, the maximum width of the anti-torpedo bulge around the machinery spaces was only 16.7ft, well below that of foreign battleships designed during the same period. The lack of depth was compounded by the fact that the bulge was tied to the main belt armor. In 1943, the Americans introduced a new explosive, Torpex, with twice the explosive power of TNT. This rendered all the calculations of *Yamato*'s designers obsolete. While *Yamato*'s sheer size and heavy armor made her difficult to destroy, the weakness of her anti-torpedo defenses was amply demonstrated during the war.

Armament

The centerpiece of the Yamato class design was the main armament of 18.1-in. guns – the largest ever placed on a battleship. Each gun weighed 162 tons, and the rotating components of the triple turret totaled 2,774 tons, equivalent in weight to a fleet destroyer. Each gun fired an enormous 3,219lb projectile. The rate of fire was 1.5 rounds per minute. Secondary armament comprised four triple turrets with 6.1-in. guns. These were placed fore and aft, and one on each beam. The Japanese had hoped that these turrets would also augment the ships' antiaircraft protection, but they proved inadequate in that role, which resulted in the removal of the beam turrets.

Antiaircraft protection was below the standard provided to contemporary US Navy battleships. Long-range protection was provided by 12 5-in. guns mounted in six twin mounts. These were grouped amidships, three per side, and placed above the beam 6.1-in. triple turrets. As designed, the Yamato class was provided with 24 25mm guns in eight triple mounts and four 13mm machine guns on the bridge tower.

The Yamato class featured extensive facilities for handing aircraft. Two 59ft catapults were fitted on the quarterdeck. There was a hangar deck located below the main deck that could handle seven aircraft; however, the normal number was much less, usually three or four.

Service modifications

With the exception of augmenting their radar and antiaircraft fits, neither ship underwent any major modification during the war. While at Kure in July 1943, *Yamato* received two Type 21 radars placed atop the rangefinder on her bridge. Additionally, four triple 25mm guns were fitted on the weather deck, making a total of 36 25mm guns.

Yamato's next modifications took place in February 1944, when the two beam 6.1-in. turrets were removed and replaced with six twin 5-in. Type 89 shielded mounts. At this time, another 24 triple 25mm guns and 16 single 25mm guns were added. Type 22 and Type 13 radars were also installed. Later, between June 29 and July 8, 1944, another five 25mm triple mounts were installed. In November 1944, *Yamato* was drydocked to repair battle damage from Leyte. At this time, almost all of the single 25mm mounts were removed, and nine additional triple mounts added. *Yamato*'s final antiaircraft fit was an impressive 152 25mm guns in 50 triple and two single mounts.

During *Musashi*'s final fitting out in Kure, another four triple 25mm guns and two Type 21 radars were added. This was followed in July 1943 by the addition of two Type 22 radars. In April 1944, while in Kure for repairs to torpedo damage, *Musashi*'s two beam 6.1-in. turrets were removed, and replaced by a total of six 25mm triple mounts. Seven other triple mounts and 25 single mounts were also added at this time. *Musashi*'s final antiaircraft suite was thus 130 25mm guns – 35 triple and 25 single mounts. Also during her final refit, Type 13 radar was added and depth charge rails were fitted on the stern.

Close up of *Musashi*'s tower in 1942. Atop the tower is the Type 98 Low Angle Fire Control Director and the 15-meter rangefinder. Type 95 directors for the 25mm guns are fitted farther down. At the base of the tower can be seen two of the triple 25mm mounts provided with shields. (Yamato Museum)

Wartime service

Despite the massive resources put into their design and construction, the two units of the Yamato class saw little action during the war. *Yamato* assumed the role of flagship for the Combined Fleet on February 12, 1942. She was considered combat ready on May 27, 1942 and departed two days later for the Midway operation. In August 1942, she deployed to Truk, where she served as a headquarters ship. She was not committed to action during the six-month battle for Guadalcanal and her prolonged periods of inactivity and comfortable fittings earned her the nickname "Hotel *Yamato*."

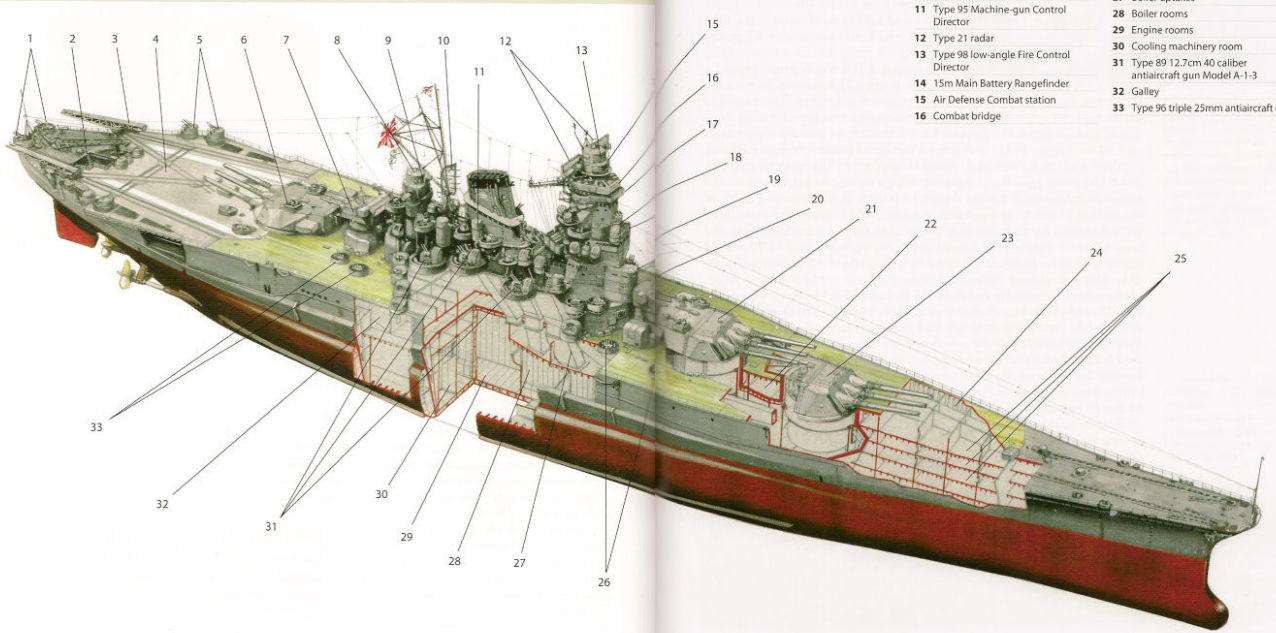
After returning to Japan in May for refit, *Yamato* again deployed to Truk in August 1943. During a transport mission, *Yamato* suffered her first war damage on December 25, 1943 when she was struck by submarine-launched torpedoes northwest of Truk, when USS *Skate* gained contact on the superbattleship and fired four stern tubes; one or two torpedoes hit on the starboard side near Turret 3. The damage caused the joints

YAMATO CLASS	
Displacement	62,315 tons standard; 69,998 full load
Dimensions	length 862ft overall; beam 121ft; draft 35.5ft
Speed	27.5 knots; range 7,200nm at 16 knots
Crew	2,300 (design); *Yamato* 3,300 in April 1945

F HIJMS *YAMATO*

This profile shows HIJMS *Yamato* as she appeared in April 1945 at the time of her loss. *Yamato* was the lead ship in a class of superbattleships that the Imperial Navy hoped would give it a technological edge over the battleships of the US Navy. This was her appearance on April 6, 1945, as she departed Japan for Operation *Ten-ichigo*, the virtual suicide mission to strike US forces off Okinawa. Despite myth to the contrary, she did possess adequate fuel for a round trip, but her return was considered unlikely. The ship possesses an elegant appearance with its sweeping lines and raked stack. Note the immense beam and the armored citadel in the center of the ship. The beam 6.1-in. turrets have been replaced with three twin Type 89 5-in. guns. An amazing 50 triple 25mm guns have been fitted, most around the armored citadel. Type 21 and 22 radars have been fitted on her tower and Type 13 radars have been placed on her mainmast – also note the large catapults fitted aft and the elevator for servicing the hangar below the main deck.

A detailed cutaway view of *Yamato* is not possible due to the sheer size of the ship. This view provides a sense of the scale of the vessel, including its multi-deck configuration, as opposed to individual compartment detail.



KEY

1 Type 96 triple 25mm antiaircraft gun
2 Aircraft elevator
3 Aircraft catapults
4 Aircraft deck
5 Type 96 triple 25mm antiaircraft gun with shield
6 Turret 3
7 6.1-in. triple gun turret
8 Type 98 low-angle Fire Control Director
9 10m Rangefinder
10 Type 13 radar
11 Type 95 Machine-gun Control Director
12 Type 21 radar
13 Type 98 low-angle Fire Control Director
14 15m Main Battery Rangefinder
15 Air Defense Combat station
16 Combat bridge
17 Type 95 Machine-gun Control Director
18 Compass bridge (second bridge)
19 Armored conning tower
20 6.1-in. triple gun turret
21 Turret 2
22 Gyro room
23 Turret 1
24 Officer quarters
25 Crew quarters
26 Type 96 triple 25mm antiaircraft gun
27 Boiler uptakes
28 Boiler rooms
29 Engine rooms
30 Cooling machinery room
31 Type 89 12.7cm 40 caliber antiaircraft gun Model A-1-3
32 Galley
33 Type 96 triple 25mm antiaircraft gun

Yamato under attack on October 24, 1944, the same day *Musashi* was lost. This overhead view shows her tremendous beam and her greatly augmented antiaircraft fit. The wood-covered areas of her main deck have been darkened in an attempt to provide concealment in a night action. (US Naval Historical Center)

between the upper and lower main armor belts to fail, flooding the upper magazine of Turret 3 and allowing a total of 3,000 tons of water to enter the ship. Following emergency repairs at Truk, *Yamato* returned to Japan in January 1944.

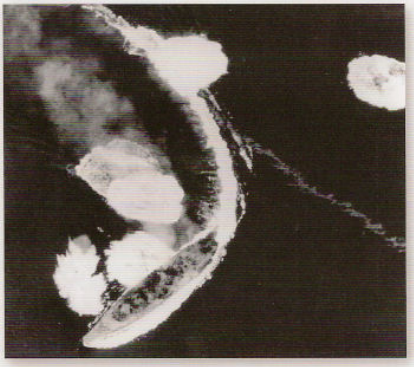
Musashi was commissioned on August 5, 1942. She departed Japan on January 18, 1943, and arrived at Truk on January 22 to assume duties as the flagship of the Combined Fleet from her sister ship. In May, she returned to Japan with the ashes of Admiral Yamamoto who had been killed in April 1943. While in Japan, the Emperor visited *Musashi* on June 24. She returned to Truk in August 1943. Following a sortie in October in response to an expected raid on Wake Island, *Musashi* returned to Yokosuka in February 1944. Departing Japan later in the month, she transported two battalions of troops to Palau, and remained there for a month. While departing Palau on the night of March 29 to avoid an expected air raid, she was hit by one of six torpedoes fired by the submarine *Tunny*. The torpedo struck the bow and created a 19ft-diameter hole, causing the ship to flood with 3,000 tons of water. *Musashi* was forced to return to Kure in April 1944 for repairs. By May, *Musashi* rejoined *Yamato* at Lingga.

Yamato departed Kure in April 1944 and arrived at Lingga on May 1. On June 10, 1944 both *Yamato* and *Musashi* were committed to Operation *Kon*, to relieve the Japanese garrison on Biak Island off the northern coast of New Guinea. However, before the superbattleships could join the operation, the Americans invaded the island of Saipan and Operation *Kon* was canceled. During the battle of the Philippine Sea, both *Yamato* and *Musashi* were assigned to the Vanguard Force. Neither was damaged and both returned to Lingga in July 1944.

The battle of Leyte Gulf proved the toughness of the *Yamato*-class design. During the approach of Force "A" to Leyte, the Japanese came under intense carrier air attack on October 24, 1944. *Musashi* became the primary target,

A poor-quality but compelling photograph of *Musashi* on October 24, 1944, in the Sibuyan Sea. Her profile is unmistakable. As a result of torpedo and bomb damage, she is considerably down by the bow. (US Naval Historical Center)

and by that evening she had been sunk. As *Musashi* was acting as a sponge for American bombs and torpedoes, the remainder of Force "A" suffered relatively little. *Yamato* took three bomb hits; the first destroyed the port chain locker when it exploded below the waterline and holed the bow. Two more bombs hit Turret 1. The damage to her bow resulted in *Yamato* taking 3,000 tons of water and developing a 5-degree list. This was reduced to 1 degree by counterflooding, and the ship was able to continue with the rest of the formation. The following day, when the Japanese surface force came across Taffy 3, *Yamato* used her 18.1-in. guns against a surface target for the first and only time of the war. She opened fire on a carrier at 20 miles and immediately claimed hits. However, she was forced to execute torpedo evasion maneuvers, and was absent for portions of the battle. On October 26, during the retirement of Force "A," she was hit by another two bombs, one on the forecastle and a second near Turret Number 1.



Yamato under attack by US Navy carrier planes in the Inland Sea on March 19, 1945. On this occasion, she was not seriously damaged, but she had less than three weeks to live. With the augmentation of her 25mm antiaircraft suite, this was her final configuration prior to her loss. (US Naval Historical Center)

By November 23, 1944, *Yamato* had returned to Kure. On March 19, 1945, she suffered minor damage from a single bomb hit on the bridge while under attack from carrier aircraft in the Inland Sea. The American invasion of Okinawa in April 1945 prompted the Imperial Navy to commit its remaining surface units to attack American naval forces supporting the invasion. At 1520hrs on April 6, *Yamato* sortied with a light cruiser and eight destroyers as a Surface Special Attack Unit to conduct the Imperial Navy's last major operation of the war. Despite myth, *Yamato* was issued with enough fuel for a round trip to Okinawa, though her return was considered unlikely. The small force was tracked by submarines and aircraft and on the following day, over 400 carrier aircraft attacked the fleet. In no case did a bomb penetrate *Yamato*'s armored deck, but no ship could withstand the pounding of torpedoes that the Americans concentrated on her port side. Learning from the *Musashi* episode, American torpedo bombers deliberately concentrated their attacks on one side of ship. Hit by as many as 11 or 13 torpedoes and at least eight bombs, *Yamato* rolled over to port. An explosion of her aft magazines left a huge plume of smoke visible in Kyushu, over 100 miles away, and marked the end of the Imperial Navy. Only 269 survivors were rescued while 3,063 were lost. American losses were ten aircraft and 12 aircrew.

Yamato and *Musashi* at anchor at Turk Atoll in 1943. Neither ship had been much altered from its original appearance by this point in the war, and both had yet to see action. (Yamato Museum)

CONCLUSION

The Imperial Navy's battleship force contributed very little to Japan's war effort. The Pacific War did not turn out to be a clash of dreadnoughts as the Japanese had foreseen, and unlike US Navy battleships, Imperial Navy battleships never found a new role for which they were well suited.

In the opening stages of the war, only the Kongo class was active. Despite the speed of these ships, which permitted them to operate with the carrier force, they were basically unsuited to that role, since they lacked sufficient antiaircraft power to defend themselves, much less the carriers. Most of the Imperial Navy's battle line remained inactive during the initial stages of the war. All were committed at Midway, where they contributed nothing.

In the six-month struggle for Guadalcanal, the Imperial Navy's battleships had the potential to make a significant contribution to a Japanese victory. Against American surface forces, or used against the pivotal airfield at Guadalcanal, their gunpower would have been a significant addition. The Kongo class was committed to close action around the island, but none of the heavier battleships ever got close to it. Whether this was because of a lack of proper ammunition for shore bombardment, a lack of fuel in the forward areas, or a reluctance to commit what was still viewed as the Imperial Navy's most important assets, has not been fully explained. However, the US Navy did not share the same reluctance, and risked two of its most modern battleships at a key point in the battle. While *Yamato* sat at Truk, the battle for Guadalcanal was being decided in November 1942. Had the Japanese

G

MUSASHI UNDER ATTACK BY US CARRIER AIRCRAFT IN OCTOBER 1944 DURING THE BATTLE OF LEYTE GULF

October 24, 1944 was the first occasion on which the Imperial Navy's superbattleships met overwhelming airpower. Both *Yamato* and *Musashi* were sailing through the Sibuyan Sea en route to Leyte, when they were attacked by hundreds of American carrier aircraft. *Musashi* quickly become the focus of the American aviators' attention. The first air strike placed a bomb on top of Turret 1 that failed to penetrate. However, the first torpedo hit amidships caused a 5.5-degree list due to flooding. The second raid resulted in two more bomb hits and three torpedo hits, all on the port side – the resulting 5-degree list was corrected by more counterflooding, but now *Musashi* was down 6ft by the bow and her speed was reduced to 22 knots. The next attack resulted in six more bomb hits and four torpedo hits, two to port and two to starboard. Counterflooding reduced the starboard list to 1 degree, but now the ship was down 13ft by the bow, with little extra capacity for counterflooding.

After a brief respite, the American aircraft continued to focus on *Musashi* which had fallen astern of the rest of the formation. The next attack placed four more bombs on the ship, and hit her with three more torpedoes. The last attack of the day provided the final blows – as many as ten bombs struck the ship, combined with as many as seven torpedoes. The last two torpedoes struck aft on the port side, and the ship developed a 10-degree list to port. At this point, it was clear the ship could not be saved, and *Musashi's* captain tried to run the ship ashore on the nearest island, but the engines stopped before this could be done. *Musashi* sank at 1930hrs, rolling over to port. Of the ship's crew, 1,376 survivors were rescued, but 1,023 were lost. The punishment absorbed by *Musashi* was a testament to her design and her well-trained damage control crew. The exact number and location of bomb and torpedo hits is still unclear. Japanese sources suggest 11 torpedoes, ten bombs, and six near misses, but American sources indicate 19 torpedo (ten port, nine starboard), and 17 bomb hits, plus 18 near misses.

This scene shows *Musashi* as she comes under dive-bombing attack. By 1944, the beam 6.1-in. turrets have been removed; because no 5-in. Type 89 guns were available, 25mm guns have been fitted in their place. Many other triple 25mm guns can also be seen, some shielded and some not. Some of the 25 single 25mm guns can be seen on the main deck. Note the wooden deck has been darkened as a means of camouflage in a night engagement.

This towering column of smoke marks the death of superbattleship *Yamato* on April 7, 1945. The demise of *Yamato* symbolized not only the death of the Imperial Navy's battleship force, but also marked the end of the entire Imperial Navy. (US Naval Historical Center)

decided to risk their prestige battleship, the remaining American carriers and the small air force on Guadalcanal would not have possessed the killing power to handle her. By 1944, the Americans could commit literally hundreds of aircraft to pound even the most armored ships under the waves, but in 1942 this would have been problematic. In the end, the Guadalcanal campaign cost the Imperial Navy two battleships, and the result was still a major defeat.

After Guadalcanal, the battleships were hoarded until late in 1944, when the American invasion of the Philippines forced the Imperial Navy to commit its last resources. Following Philippine Sea and the demise of the Imperial Navy's carrier force, the success of the Japanese plan to defend the Philippines was predicated on the firepower of its nine remaining battleships. Despite being committed with almost no air cover, this strategy placed the four remaining battleships of Force "A" in a favorable tactical position to inflict a sharp local defeat on the US Navy. Even in this battle against unarmored, slow escort carriers and their weak escorts, the Japanese battleship force came out second with a display of poor gunnery and lack of aggression. The battle for Leyte cost another three battleships, and again resulted in a major defeat.

Leyte broke the back of the Imperial Navy and five of the remaining six battleships returned to Japan to sit idle for lack of fuel. Of the five, only one remained afloat at the end of the war. Three others had been sunk in harbor. The fate of *Yamato* symbolized the ineffectiveness of the entire Japanese battleship force. Built at great cost to the nation, she fired her main armament at a surface target once during the war. This was not during a great clash of battleships to decide control of the Pacific, but at an insignificant escort carrier. Unable to face the prospect of national defeat while leaving the symbol of the nation intact, the Imperial Navy recklessly committed *Yamato* on a virtual suicide mission in the face of waves of carrier aircraft. Her loss contributed nothing and epitomized the futility of the Imperial Navy's battleship force.

APPENDIX: Japanese Battleship Color Schemes

All Imperial Navy battleships were painted in a dark navy gray. The basic shade was made up of a 75 percent white/25 percent black blend with a blue tint (this is very similar to the current color of modern Japanese Maritime Self Defense Force ships). Each of the major naval depots in Japan exhibited an unintentionally slightly different shade of the basic dark gray color. *Maizuru* was the lightest, with *Kure*, *Yokosuka*, and *Sasebo* each becoming

more dark. Later in the war as material shortages occurred, the base color became more silver-gray in tint. The hull below the waterline was painted in a reddish-brown mixture of 65 percent brown, 20 percent red, 10 percent black, and 5 percent white. Black semi-gloss paint covered the upper part of the stack and the fore and mainmasts. The rangefinders atop battleship towers were painted white as a recognition symbol. Canvas was used in all blastbags and to cover reels and searchlights, and as wind-screens at various levels of the tower. This was white in peacetime, but in wartime was replaced by light brown or gray canvas.

The deck was unpainted teak. This would weather to a gray-tan over time. Linoleum covered the parts of the weather deck devoted to aircraft operations. This was a dark brown color. The linoleum was laid in 6ft 7-in.- wide sheets and was joined by brass strips. On *Yamato* and *Musashi*, the aircraft deck was covered with concrete that was left unpainted, which, as it aged, turned from a medium gray to a darker gray.

Unlike the US and Royal navies, the Imperial Navy did not customarily use camouflage schemes on its battleships. However, as dictated by tactical circumstances, forms of camouflage were occasionally used. *Yamato* and *Musashi* had black camouflage applied to their wooden decks in October 1944 for an expected night action in San Bernardino Strait. Most of the black was soot from the ships' stacks. In 1945, as the Imperial Navy's last battleships huddled in home waters under threat of air attack, the Japanese took measures to make them less conspicuous. *Haruna* was painted olive green with light green turrets and gray-color stripes on the turret. *Ise* was camouflaged olive green with dark green, yellow, gray, and red-brown splotches. *Hyuga* maintained her dark gray, with dark green curves on her turrets. *Nagato* had much of her upper superstructure painted olive green with brown splotches.

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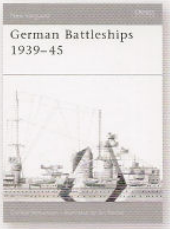

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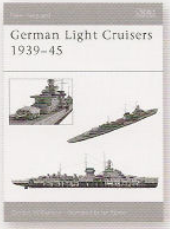

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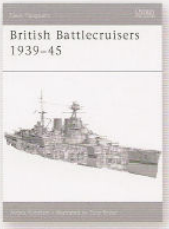

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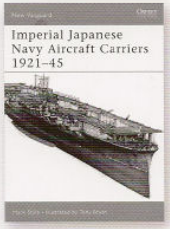

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