

ENGLISH TRANSLATION OF  
KOJINSHA No.6

'WARSHIPS OF THE IMPERIAL JAPANESE NAVY'

SHOKAKU CLASS  
SORYU  
HIRYU  
UNRYU CLASS  
TAIHO

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IJN TAIHO: Tabular Record of Movement" reprinted by permission of the Author, Colonel Robert D. Hackett, USAF (Ret). Copyright 1997-2001.

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IJN aircraft mentioned in the text. By Sander Kingsepp.

Page 2. SHOKAKU CLASS

The origin of the ships names.

Sho-kaku translates as 'Flying Crane'. During the Pacific War, this powerful aircraft carrier and her name became famous throughout the conflict. However, SHOKAKU was actually the third ship given this name which literally means "the crane which floats in the sky" - an appropriate name for an aircraft perhaps, but hardly for the carrier herself!

Zui-kaku. In Japan, the crane ('kaku') has been regarded as a lucky bird since ancient times. 'Zui' actually means 'very lucky' or 'auspicious'. ZUIKAKU participated in all major battles except for Midway, being the most active of all IJN carriers.

Page 3. 23 August 1941. A near beam photo of SHOKAKU taken at Yokosuka, two weeks after her completion on 8 August. This is one of the few pictures showing her entire length from this side, which was almost 260m. Because her deck //was closer to the waterline, SHOKAKU gave the appearance of being even longer than AKAGI, which was actually not the case! A lot of people, including many who served on her were convinced that SHOKAKU was the longer!

Page 4. SHOKAKU during training in autumn 1941 for the attack on Hawaii. With her small island-type bridge set up starboard forward, the downwards-projected funnels, and AA guns along both sides, SHOKAKU was seen as the model for Japanese aircraft carrier development during this period. She was also considered a major improvement over the HIRYU class. The SHOKAKU class became the prototype for IJN post-treaty fleet carriers, comparing favorably with U.S. and British aircraft carrier development of the same period.

Page 5. CarDiv 5's SHOKAKU and ZUIKAKU working up in autumn 1941. The training was intense and many airplanes were lost or damaged in landing accidents. On a number of occasions planes crashed into the island itself! Such accidents happened almost every day. Furthermore, many accidents happened during ship-to-ship refueling drills at sea. As a result, because the degree of skill was seen as low in comparison with other groups, CarDiv 5 was given secondary duties such as attacking airfields etc. As it happened, on the day the "Fifth" fulfilled its role successfully.

Bottom picture. SHOKAKU or ZUIKAKU seen during training. This picture was taken from an escort destroyer. The date is not known.

Page 6. The Battle of Coral Sea. Attacked by U.S. carrier-based aircraft, SHOKAKU suffered severe damage from three bombs. Despite this, she managed to return to Truk. These three photographs of SHOKAKU under attack were taken from U.S. aircraft. The time is approximately 1100 on 8 May 1942.

Top left picture. A bomb explodes near the bow.

Top right picture. Attempting to avoid attack at the speed of 30 knots. A column of water rises from an explosion off starboard.

Right picture. The moment when SHOKAKU was hit near the bridge.

Page 7. Top picture. The buckled anchor deck after the first bomb hit during the battle of Coral Sea (pictures taken right after the battle). The scene shows the bow as seen from below the flight deck. One of the main anchors was blown off and the entire anchor gear was also destroyed. Despite all this damage to the anchor deck and the flight deck supports, the flight deck did not collapse!

Bottom picture. The same damage as viewed from the top of the flight deck. White lines radiating from the front of the flight deck were used to indicate wind direction. The bold white line marks the centerline of the flight deck. The metal front section of the flight deck can be seen clearly.

Page 8. The same damage as seen on the previous page. The top of the front edge and side of the flight deck has been blown off. Timber was used for emergency support and repair.

Page 9. SHOKAKU had three elevators. The forward elevator was shaken loose by the shock from a bomb hit (photo taken right after the battle). The crew are attempting to undertake repairs.

Page 10. The third bomb exploded around the signal mast area aft the bridge. Because it exploded at the junction of the hull and the deck, the damage to the bridge and the surrounding area was much less than it could have been. Two of the three signal mast feet were uprooted and as can be seen here, the mast is leaning forward. Most of the crew stationed in this area were killed as a result of this explosion. A 'rope shield' for protection against gunfire and shrapnel is stretched in front of the bridge, and a steel plate for the same purpose covers the compass bridge window.

Page 11. Another view of the same damage. The damage to AA guns and the surrounding area are viewed from the back of the bridge. The circular platform belongs to 25mm AA gun director No. 1, whose operator was killed when the bomb hit. Further back, No.3 position can be seen with the gun still in place. After the attack, a severed hand was found still clutching the trigger. Such tragic scenes were not uncommon.

Page 12. Top picture. Damage caused by the second bomb hit. A lifeboat was damaged by fire and lifeboat-lifting machinery was also destroyed. A burned boat is seen here. Bottom picture. More damage caused by the second bomb, showing the aft boat stowage beneath the flight deck. The strafing damage from machine-gun fire is clearly seen. In the upper right is 25mm AA gun No. 11. All the men stationed at this mount were killed during the attack.

Page 13. 1942 in the South Pacific. SHOKAKU at sea. These shots appear to be frames from a cine-film. Some think this may be ZUIKAKU. It is not clear whether 25mm guns were fitted in the bow, although Type 21 air-search radar can be seen mounted on top of the bridge. After the Battle of Midway, radar was regarded as essential. The bottom picture is part of the same sequence. The ship is in swell and moving at considerable speed.

Page 14. A Zero taking off from SHOKAKU during the Battle of Santa Cruz (official photo released by Imperial Naval Department). By then SHOKAKU was already equipped with Type 21 radar but its aerial (as well as the AA fire control directors) has been obliterated by the censor. The Zero in this fine photo is a brand-new A6M3 Model 32 about to intercept an incoming strike.

Page 15. 26 October 1942 - the Battle of Santa Cruz. SHOKAKU is ready to launch an air strike. At the front are Zero fighters, the rest are D3A1 (Val) dive-bombers. Most of the deck crew can be seen holding the wheel chocks. Tension is high as all await the flag signal from the bridge to launch the attack. SHOKAKU suffered severe damage during this battle, again from bombs. Despite this, she was involved in the sinking of the USS HORNET. By this time, most of the IJNAF experienced carrier pilots have been killed. This was the last occasion when Japanese carrier-based planes succeeded in sinking a U.S. carrier.

Page 16. 26 October 1942 - the Battle of Santa Cruz. Lieutenant Commander Hideki Shingo, the first flight group leader, pilots this Zero fighter. The markings on its tail indicate CarDiv 1. The white line around the fuselage shows that this is an aircraft from SHOKAKU (aircraft from ZUIKAKU displayed two white lines). The deck centerline can be seen, as well as the folded-down crash barriers.

Page 17. Top picture. The Battle of Santa Cruz. Damage to SHOKAKU after attack by US carrier aircraft. She was attacked after launching her first and second attack groups. Bombs caused similar damage as at the Battle of the Coral Sea. All bombs hit the flight deck (portside three, starboard one) near the back elevator. The flight deck is buckled as a result of bombs exploding actually inside the hangar. Also in this area, an AA gun was completely destroyed. Damage control crews are still trying to douse the fires. Bottom picture. Fire-fighting operations. A serious fire developed after a munitions explosion, and soon SHOKAKU was in a very dangerous situation. All her air group managed to avoid the bombing. As fire-fighting systems had been improved after the battle of Midway, the fires were extinguished in an hour. Unable to retrieve or launch any aircraft, SHOKAKU could play no further role in this battle. Therefore she left the group now led by the destroyer ARASHI, and returned to Truk.

Page 18. Top picture. A close-up of the bomb damage as seen from the flight deck round down. The bridge can be seen forward of the damage. Although it cannot be seen in this photograph, SHOKAKU was by then equipped with a Type 21 air-search radar. Bottom picture. SHOKAKU on her return to Truk Island. Damage to AA guns starboard aft. Guns Nos. 5 and 7 were completely destroyed and all those in the vicinity were killed. With no armor protection for anti-aircraft guns, more than 50 gun-crew from either side of the ship died during this battle.

Page 19. Top picture. Damage to the flight deck shows where the bombs actually hit. All bombs went through the flight deck exploding in the hangar beneath. As a result the deck is swollen and buckled from the blast. One B5N2 torpedo plane is left marooned at the rear! Bottom picture. Two arrester cables can be seen in front of the damage to the wooden flight deck. It wasn't until the building of TAIHO that a Japanese aircraft carrier was

fitted with an armored flight deck. US carriers also had wooden flight decks at this time. Only the British carriers had steel-plated flight decks.

Page 20. A close up photograph of the portside bomb damage to the flight deck. Peering out from the wreckage are the barrels of a 127mm twin AA gun mount (No.8). The ability of bombs to cause major damage to flimsy wooden flight decks is obvious. Although a serious fire was prevented, the damage was extensive. There was also major damage in the hangar beneath, with about 80 aircraft handlers and maintenance crew killed. The heavy cruiser TONE can be seen in the distance.

Page 21. Japanese ships at Eniwetok on 22 October 1943. They are (left to right); CHIKUMA, HAGURO and SHOKAKU. Aircraft are lined up on SHOKAKU's flight deck. Damage from the battle of Santa Cruz was repaired at Yokosuka Navy Yard and completed in March 1943. After that, training was carried out in Japanese waters until July, before sailing to Truk Island. From there SHOKAKU and other ships were used in Operation "Ro-Go", the reinforcement of Rabaul.

Page 22. June 15 1944. The Mobile Fleet is seen heading for the Marianas. From left to right; TAIHO's bow, JUNYO, NAGATO and SHOKAKU or ZUIKAKU. If this is SHOKAKU, it is probably the last picture of her before being sunk four days later by the US submarine CAVALLA during the Battle of the Marianas.

Page 23. ZUIKAKU Section.

Built by Kawasaki Kobe Yard, ZUIKAKU was the second ship in the SHOKAKU Class. Construction began on 25 May 1938. She was launched on 27 November 1939 and completed on 25 September 1941. This picture shows thick black smoke pouring from her funnels during an examination of engine performance. An enclosed 25mm triple gun mount is seen in front and a part of the mast tripod on the right.

Page 24. ZUIKAKU on the day she was completed on 25 September 1941, as she is handed over to the Navy. Sadly, this is the only clear photograph taken of her whole length. The high clipper bow is clearly seen. The many sponsons for anti-aircraft guns and gun directors are seen along the side. Towards the stern the port and starboard radio masts (lowered during landing and take-off operations) can be seen. Also visible is the aircraft handling crane starboard aft.

Page 25. Top picture. ZUIKAKU during working-up in autumn 1941. The white 'smoke' seen here is actually the result of spraying seawater with a powerful smoke pump. This was done to reduce the exhaust temperature. Even so, as this cooled smoke hit the sea, it was still hot enough to produce more steam.

Bottom picture. A B5N2 torpedo plane can be seen during take-off and landing training. CarDiv 5 (Dai 5 Koku Sentai) was built around SHOKAKU and ZUIKAKU with Rear Admiral Chuichi Hara as CO. With the outbreak of war imminent, such training became more arduous. They then joined the Oita Naval Air Group, and began actual battle training.

Page 26. ZUIKAKU in Hitokappu Bay off Kuriles on 22 November 1941. ZUIKAKU was one of the six carriers concentrated in this port for the Hawaii attack operations. Ropes are stretched around the wall of the bridge as part of the battle preparations. A DF loop antenna and the radio mast can be seen on the bridge. Another loop antenna is seen on the deck, in front of the bridge.

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SHOKAKU, ZUIKAKU AND THEIR REFITS IN DRAWINGS

By Seiji Higashi (Drawings by Takao Ishibashi)

#### JAPANESE TREATY CARRIERS

The history of Japanese naval aviation can be traced back to early Taisho era (i.e. 1910s). The idea of carrying aircraft on a ship was first implemented in 1914. Already in September 1914 the first Japanese seaplane carrier WAKAMIYA (by then still officially registered as naval transport WAKAMIYA MARU) participated in maneuvers, thus beating the first British seaplane carrier ARK ROYAL into service by some three months. Similarly, the world's first dedicated aircraft carrier HOSHO was commissioned by IJN in December 1922. Thus in the field of naval aviation Japan was ahead of such major naval powers as the United States and Great Britain and great attention was paid to its development from the very beginning.

Under the terms of the Washington Naval Arms Limitation Treaty of 1922, each nation was permitted to convert some of their half-completed battle cruisers into aircraft carriers.

The Japanese chose the battle cruisers AMAGI and AKAGI for this purpose. On 1 September 1923, the great Tokyo Earthquake struck. AMAGI, on the slips at Yokosuka Navy Yard, was damaged beyond repair. She was later replaced with the battleship KAGA.

Commissioned in 1927/28, AKAGI and KAGA were still conversions based on capital ship hulls. Although the Japanese had pioneered the carrier construction with HOSHO, they still lacked the first-hand experience to build full-size carriers. As with the Royal Navy's HMS COURAGEOUS commissioned earlier, both Japanese conversions were equipped with triple flying-off decks at the bow, which later proved to be a failure.

In comparison with contemporary USS LEXINGTON and USS SARATOGA carrier conversions, the design of AKAGI and KAGA was still clearly lagging one step behind. After the end of WW I, the U.S. had undoubtedly shown more foresight in their carrier building policy than any other nation.

RYUJO was the next Japanese carrier, commissioned in 1933. She was the result of the contemporary (and rather controversial) trend to build larger numbers of smaller carriers. Restricted dimensions notwithstanding, RYUJO was clearly too small to operate with the main fleet.

During the Shanghai incident in 1932, the 1st Koku Sentai (CarDiv 1) with KAGA and HOSHO was deployed to the Chinese coast. This was the first opportunity for the Japanese carriers to prove their worth in battle conditions, as well as to gain invaluable operational experience.

Around this time the impractical triple-deck arrangement on AKAGI and KAGA was abandoned. KAGA and AKAGI were rebuilt by 1935 and 1938 respectively, thus becoming true fleet carriers with a full-length flight deck and island structure.

Meanwhile SORYU (1937) and HIRYU (1939) were completed. This pair can be regarded as the first truly successful medium sized Japanese carriers. As expected they were able to work with the fleet. Nevertheless, compared to contemporary HMS ARK ROYAL and USS YORKTOWN their aircraft-handling facilities were still not modern enough.

SORYU and HIRYU were authorized under the Second Replenishment Program of FY 1934 which accentuated the expansion of naval aviation. In addition to two purpose-built carriers it included two fleet oilers TSURUGIZAKI and TAKASAKI, designed for rapid conversion to carriers (later SHOHO and ZUIHO). The general aim was to achieve parity with the United States naval air arm.

Of course, all aforementioned carriers were conceived in accordance with the tonnage restrictions of the Washington Treaty. It was hoped that by the time of HIRYU's completion in 1937 the restrictions would be lifted, but in January 1936 the Japanese delegation withdrew from the new London Treaty talks. It was decided not to comply with the limitations of both Washington and London Naval Treaties any longer. After 1 January 1937 warship construction could proceed without further constraints.

#### NAVAL GENERAL STAFF'S TENTATIVE CHARACTERISTICS FOR THE SHOKAKU CLASS

To cope with the rapidly changing situation, the existing Plan of National Defense for the Empire and other similar guidelines were revised in June 1936, when it was decided to maintain a constant strength of ten operational carriers. Proceeding from those principles, the new Third Replenishment Program of FY 1937 (a.k.a. "Maru-San" or "Circle Three") authorized not only the construction of two battleships (the YAMATO and MUSASHI), but also two new carriers designated as Nos. 3 and 4. Naval General Staff 's tentative characteristics for the new class were as follows:

Aircraft complement: 18 operational and 2 reserve fighters (A6M2 Type 0); 27 operational and 5 reserve dive-bombers (D3A1 Type 99); 27 operational and 5 reserve torpedo bombers (B5N2 Type 97), with a total of 72 operational and 12 reserve aircraft. Unlike on earlier carriers the reserve planes were not spares but could be assembled and readied for take-off in short time.

Aircraft ordnance: forty-five torpedoes, ninety 800-kilo bombs, three hundred and six 250-kilo bombs, five hundred and forty 60-kilo bombs plus a fuel stowage of 496 tons avgas.

Armament: sixteen 127mm anti-aircraft guns, thirty-six 25mm anti-aircraft guns.

Performance: maximum speed 34 knots, range 9,700 nautical miles at 18 knots.

Armor protection: magazines protected against 800kg bombs dropped from horizontal flight, as well as 203mm shellfire; engine spaces protected against 250kg bombs dropped from dive-bombers and 127mm shellfire.

Thus the new class could carry a total of 84 planes that was still less than AKAGI (91 aircraft) and KAGA (90) but still eleven more than the preceding HIRYU. Compared with contemporary HMS ARK ROYAL (displacement 22,000 ts, 72 aircraft) and USS YORKTOWN (19,800 ts, 85 aircraft--actually more because the U.S. Navy operated aircraft deck parks), the

SHOKAKU class carried approximately the same number of planes but in terms of speed, armament, armor protection and all-round performance they had no equals. The new carriers were not handicapped by treaty limitations and their designers could now make full use of experience gained by the modernization of AKAGI and KAGA, as well as from building the new SORYU class. Nevertheless, the concept of the modern fleet carrier was not yet fully determined and it can be said that the aforementioned specs were an attempt to reach an ideal.

The final specifications for the SHOKAKU class were as follows:

Displacement: 25,675 tons standard, 29,800 tons trials, 32,105 tons deep load.

Length: 257.5m oa, 250.0 m wl, 236.0m pp.

Beam: 26.0m wl.

Depth (from keel to flight deck) 23m; (from waterline to flight deck) 14.15m.

Draft (trials): 8.8m fore, 8.93m aft, 8.87m mean; 9.32m (deep load).

Flight deck length 242.2m oa, width 18m fore, 29m beam, 26m aft.

Number of hangars: 2.

Number of elevators: 3.

Aircraft complement: 84 (see above).

Crew: 1,160.

Defensive armament: sixteen 127mm/40 AA guns (in eight twin mounts);

thirty-six 25mm AA guns (in twelve triple mounts).

Machinery: eight Kampon RO oil-fired boilers supplying steam to four sets of Kampon geared turbines (three cylinders with high/medium/low pressure arrangement) delivering 160,000shp for a maximum speed of 34kt.

Range: 9,700nm at 18kt.

#### GENERAL DESCRIPTION OF THE SHOKAKU CLASS AND THEIR EQUIPMENT

Page 29. Fig. 1--SHOKAKU as commissioned in 1941.

The SHOKAKU hull design was essentially based on that of the preceding HIRYU, although somewhat enlarged. The main difference between SHOKAKU and HIRYU was the reversion to the starboard forward island configuration used on SORYU.

Considering the experience of KAGA's refit and the building of SORYU, the Bureau of Naval Aviation (//Koku// Hombu) pointed out that a starboard forward siting of the island was not satisfactory. Placing a tower superstructure toward the front of the flight deck, where accelerating aircraft did not yet have the necessary take-off speed, was considered too risky and so the Bureau strongly advocated an amidships location. However, relocating the island amidships would have left no room for funnels and therefore it was decided to move the island to the port side. From the viewpoint of stability, having island and funnels on opposite sides was considered an added bonus.

Accordingly, AKAGI was fitted with a portside island mock-up prior to her refit. The new configuration was thoroughly tested during her subsequent voyage from Yokosuka to Sasebo and as far as take-off and landing procedures were concerned, no problems with turbulence were detected. Immediately thereafter portside amidships location was incorporated into AKAGI and HIRYU, resulting in distinctive-looking warships.

During the design of Carrier No. 3 (SHOKAKU) it was once again planned to position the island portside. However, by this time it was discovered that amidships bridge location resulted in unforeseen turbulence extending the landing run. For this reason the Bureau of Naval Aviation withdrew its recommendation and a starboard configuration was incorporated instead. As a result, the new carrier's hangar layout became somewhat misplaced and a hasty redesign was necessary.

SHOKAKU's deck area was approximately equal to that of AKAGI after her refit, but in comparison with the three-tiered AKAGI her flying deck was situated 5.5 meters lower. SHOKAKU's bow and the forward edge of the flight deck were arranged so that in case of a take-off incident the ditching plane would not damage its parent ship. The launching area over the bow was also kept clear of all obstacles. There were three elevators, the largest (forward) one 13m long and 16m wide (i.e. approximately equal to the whole island area). Two other elevators measured 13 by 12 meters each.

As on previous carriers there was a propeller blast deflector screen installed in front of the forward elevator with hinges in eight points. Ten sets of Kure-type arrester wires were located in the area from forward of the aft elevator to forward of the front elevator. In addition it was planned to provide both carriers with 3 fixed and 2 mobile crash barriers but in the end they were fitted with two fixed safety barriers abaft the island. A 7-ton collapsible derrick crane was mounted on the starboard side abaft the aft elevator.

Both upper and lower hangars were each divided into three compartments. The upper hangar was contained within the hull structure. Hangar sides were deliberately left rather thin,

so that in case of an in-hangar explosion the blast could be vented outwards rather than upwards. However, after SHOKAKU had been bombed twice it became clear that the design did not work as expected and the flight deck was still extensively damaged.

The sixteen 127mm/40 AA guns Type 98 were situated in eight twin mounts and four batteries (cf. Fig. 1). Four Type 94 AA directors were located on top of the bridge, two outboard of the island and one on the opposite side. There were 250 127mm AA shells per gun, as well as a ready ammunition reserve of 12 shells. The minimum depression in case of cross-deck firing was 12 degrees. Guns Nos. 5 and 7 (starboard aft) were provided with anti-smoke shields. Thirty-six 25mm Type 96 AA guns were situated in twelve triple mountings, six on each side. Also on each side were three AA directors. As with the 127mm guns, guns Nos. 5 and 7 starboard aft were provided with anti-smoke shields. The starboard 25mm batteries from forward to aft were numbered 1, 3, 5, 7, 9 and 11. Port batteries were numbered 2, 4, 6, 8 and 10 respectively. There were 2,600 25mm AA rounds per gun plus a ready ammunition reserve of 100 rounds.

SHOKAKU had four 110cm searchlights, including three set in flight deck recesses. A 60cm signal light was located on the bridge.

In addition SHOKAKU was equipped with 2 sets of mine-cutting paravanes, as well as 6 depth charge launchers. In the boat stowage space aft were three 12m motor launches, three 12m powerboats, one 8 meter powerboat, one 6m whaleboat, two 9m whaleboats and two 13m landing crafts (a total of 12 boats).

SHOKAKU's radio equipment included twelve transmitters (two long-wave, one long/short-wave and nine short-wave transmitters), twenty-seven receivers (three long-wave, twenty-two long/short-wave and two short-wave), seven wireless radiophones (two long/short-wave, one short-wave and four very-short wave), four DF sets and one all-band-receiver/scanner. In addition, the carrier was equipped with a hydrophone (passive sonar) Type 0 and an underwater DF set.

The crew of SHOKAKU was composed of 75 officers, 56 technical division officers, 71 petty officers and 1,458 lower rates. SHOKAKU's crew was thus somewhat smaller than that of AKAGI and KAGA.

#### MORE POWERFUL MACHINERY THAN YAMATO'S

Like HIRYU, SHOKAKU was provided with a higher forecastle and a bulbous underwater bow. She was completed with an outboard degaussing cable.

As already noted, in comparison with the preceding HIRYU, SHOKAKU's armor protection was considerably improved. 25mm Ducol Steel (DS) steel plates protected her magazines and 132mm New Vickers Non-cemented (NVNC) deck. Belt armor consisted of 16mm NVNC plates. The protection of machinery areas and fuel tanks was also improved. Five watertight compartments and a 30mm holding bulkhead protected boiler rooms. Fuel tank protection included a liquid-filled compartment, which was designed to resist 450kg of explosive (according to other sources her torpedo-protection system was intended to withstand a 200kg charge). Avgas storage tanks were located forward of the No. 1 elevator under the lowest deck, as well as forward of the No. 3 elevator (Fig. 2). AA, torpedo and bomb magazines were located abaft the No. 1 and forward of the No. 3 elevator.

The ordnance for SHOKAKU's air group included 45 Type 91 aerial torpedoes. Nine torpedoes could be handled simultaneously on the torpedo-arming platform. The ship also carried sixty 800kg bombs, sixty 500kg bombs, three hundred-and-twelve 250kg bombs, five hundred-and-twenty-eight 60kg bombs, as well as forty-eight 30kg bombs. There was one hoist for large and one for smaller-caliber bombs.

SHOKAKU was provided with the most powerful machinery available, delivering 160,000shp to four shafts for a speed of 34 knots. During the trials one of the carriers (most likely SHOKAKU) reached 34.4 knots at 161,280shp. Eight boilers were accommodated in eight compartments aligned in two rows and connected to four turbines, which was considered to be an ideal four-shaft arrangement. Cruising turbines enabled speeds up to 26 knots and so it was possible to achieve the necessary combined speed of 13mps for take-offs even in windless conditions. Each turbine could make 300rpm and develop a total of 40,000shp when steaming astern. Steam pressure was 30 kg/sq. centimeter and temperature 350 Centigrade. Each of the four propeller screws had a diameter of 4.2 meters.

SHOKAKU's weight breakdown in trial condition was as follows:

Hull 12,460 tons, decks 2,993 tons, armor 2,160 tons, aircraft handling equipment 1,700 tons, guns and ammunition 647.7 tons, torpedoes and related equipment 142.9 tons, naval equipment 11.2 tons, optical equipment 10.9 tons, electrical equipment 569 tons, radio equipment 30 tons, airplanes and related equipment 894.4 tons, machinery 2,750 tons, fuel oil 3,335 tons, boiler feed water and oil 280 tons, avgas 496 tons, powerboat fuel 8 tons, lubricating oil 87 tons, reserve feed water 105 tons, sea stores 692.4 tons,

reserve stores 325 tons, ballast etc. 60 tons, hydrophone measuring water 4.5 tons, rest 38 tons, total weight during the trials 29,800 tons;

Hull	12,460 tons
Decks	2,993 tons
Armor	2,160 tons
Aircraft handling equipment	1,700 tons
Guns and ammunition	647.7 tons
Torpedoes and related equipment	142.9 tons
Naval equipment	11.2 tons
Optical equipment	10.9 tons
Electrical equipment	569 tons
Radio equipment	30 tons
Airplanes and related equipment	894.4 tons
Machinery	2,750 tons
Fuel oil	3,335 tons
Boiler feed water and oil	280 tons
Avgas	496 tons
Powerboat fuel	8 tons
Lubricating oil	87 tons
Reserve feed water	105 tons
Sea stores	692.4 tons
Reserve stores	325 tons
Ballast etc.	60 tons
Hydrophone measuring water	4.5 tons
Rest	38 tons
Total weight during the trials:	29,800 tons

Carrier No. 3 was eventually named SHOKAKU and No. 4 became ZUIKAKU. SHOKAKU was laid down on 12 December 1937 in Yokosuka Navy Yard and ZUIKAKU on 25 May 1938 in Kawasaki Kobe Yard. SHOKAKU was the third ship of this name in the IJN. The first one was a naval transport active at the time of the Meiji revolution, the second one a carrier designed in 1920, but cancelled shortly thereafter. Thus SHOKAKU was to become the second carrier of this name. ZUIKAKU was the first IJN warship of this name.

SHOKAKU was launched on 1 June and ZUIKAKU on 27 November 1939. They were completed on 8 August and 25 September 1941 correspondingly. The war was imminent and Kawasaki Kobe Yard had to speed up the work on ZUIKAKU, as well as on other ships built in the same yard. As usual for Japan at that time, the construction of two new fleet carriers was kept secret and no data were published about their class or measurements. Nevertheless, based on intelligence reports dating back to 1940 it was known abroad that an "improved version of HIRYU with a length more than 800 feet" had been launched in Yokosuka sometime during the previous year. When ZUIKAKU was launched at Kobe, all that was known was that she "looked like a warship".

#### INCREASED AA SUITE

After the attacks on Pearl Harbor, Rabaul and the Indian Ocean raids the Kido Butai (Carrier Striking Force) returned home in April 1942. SHOKAKU and ZUIKAKU were detached en route to support the invasion of Port Moresby. They fought with the USN in the Battle of the Coral Sea, the first naval battle fought exclusively by aircraft carriers. SHOKAKU received three bomb hits and missed the fateful Battle of Midway due to serious damage. After Midway SHOKAKU and ZUIKAKU remained the only Japanese fleet carriers. Learning from the lessons of Midway, in the course of repairs SHOKAKU was fitted with additional AA guns and radar. In fact she became the first Japanese carrier to mount the brand-new Type 21 air-search radar set mounted on top of the bridge. In order to reduce the fire hazard, more powerful salt-water sprays were installed and paint cover eliminated. The number of flammable objects was also minimized.

SHOKAKU's AA suite layout was increased according to secret Kampon Memo No. 1-27111 (Kampon Kimitsu Dai-1-Go 27111) dated 20 July 1942. On 21 August it was decided to install two 25 mm triple mounts with corresponding directors to both bow and stern. The AA armament was augmented with additional six triple mounts forward and aft of the island.

On 16 August SHOKAKU departed for the Solomons and it is unclear whether her refit was completed by that time. Nevertheless, according to her crew chief notes etc., at least one mount had been added to both bow and stern. No reliable data are available about ZUIKAKU's AA refit and radar equipment but it seems that she was updated similarly.

In October 1942 SHOKAKU was damaged again during the Battle of the Santa Cruz Islands and during subsequent repair her AA suite was increased. She was also fitted with an improved radar set and underwent changes in her air group. SHOKAKU and ZUIKAKU had now become the backbone of the Japanese carrier force and all work on these ships was prioritized. In all likelihood, the same improvements were incorporated into ZUIKAKU. In addition to the six previously installed bow and aft AA mounts, a further 25mm triple mount was fitted at each position, centered and in front, bringing the total number of triple mounts to 20. An additional Type 21 radar set was installed, most likely instead of the searchlight No. 3. In fact, SHOKAKU's entry in 'General Description of IJN Carriers' (Kubo Shuyo Yomokuhyo) dated 3 February 1943 states that she had three searchlights and two radar sets at that time. A memo written by a radar operator stationed at Truk in August 1944 confirms this information.

Another lesson from the Battle of Midway, the number of both fighters and dive-bombers (including scout planes) was increased to 27 operational and 5 reserve planes. To compensate for this, the number of torpedo bombers was reduced to 18 operational and 2 reserve planes so that the total number of embarked planes remained the same. Already before the Battle of Santa Cruz Islands it was decided to increase the number of fighter planes carried on each carrier but as attrition bit deeper, it was hard enough to maintain even the prescribed number of aircraft.

By the time of the operation "A-Go" in June 1944 (the Battle of the Philippine Sea), another ten 25 mm single mounts and a new radar (most likely a Type 13) had been added. Fig. 3 shows ZUIKAKU during that period (minus single mounts).

Page 31. Figure 2. Cross-section of a SHOKAKU class carrier. Dotted lines show the originally proposed position of the island.

- 1) upper hangar;
- 2) lower hangar;
- 3) forward elevator (No.1);
- 4) middle elevator (No. 2);
- 5) aft elevator (No. 3);
- 6) boiler room No. 1;
- 7) boiler room No. 3;
- 8) boiler room No. 5;
- 9) boiler room No. 7;
- 10) forward starboard engine room;
- 11) after starboard engine room;
- 12) avgas tanks;
- 13) elevator well;
- 14) torpedo arming platform;
- 15) forward AA magazine;
- 16) forward bomb magazine;
- 17) after bomb magazine;
- 18) after AA magazine)

Page 32. Fig. 3. ZUIKAKU 1944

#### ADDITIONAL TRIPLE MOUNTS AND AA DIRECTORS

The 25mm caliber Type 96 AA gun mounted on SHOKAKU class carriers was used on all major IJN warships of the period. Based on the French Hotchkiss design it was produced in Japan under license from 1935. Along with the 13.2mm machine gun it can be regarded as the standard Japanese close-range AA weapon. The air-cooled gun's bore was 25 mm and barrel length 2,500 mm (L/100). Muzzle velocity was 900 mps; shells weighed 250g. Top-fed 15-round clips ensured a theoretical firing rate of 220 rounds per minute. Initial twin and triple mounts (weighing 1,100 and 1,800 kgs respectively) were later supplemented by a number of single mounts. The original AA suite of the SHOKAKU class is depicted in Fig. 4. At first only power-operated Type 96 Model 2 triple mounts were used with a maximum elevation +80/-10 degrees. Fire guidance was provided by AA directors Type 95 (ibid.), featuring a Ward-Leonard remote power control system for automatic target indication. Type 95 was fitted with remote power control (RPC) and considered state-of-the-art fire guidance system for its day.

Page 32. Fig. 3. ZUIKAKU in 1944. 25 mm single mounts are not shown.

Page 33. Fig. 4. 25mm triple mount and Type 95 AA director.

The electrical department of the Kure arsenal designed Type 95 AA director and production began at Fuji Denki Seizo K.K. (Fuji Electric Co., Ltd.). The Type 95 was accepted by the IJN in 1936. LPR (Le Prieur-Ed.) type sights enabled the operator to calculate the target speed/distance and to track its course, making vertical/lateral adjustments. Originally there were six directors provided for twelve triple mounts, i.e. one director for two AA batteries. The director's crew included CO, range taker and three talkers. Each gun had a crew chief and three subordinates. Besides the director guidance each AA gun could fire independently using its own LPR optical gun sight.

The 25mm gun had an effective range of 1,500 meters; a maximum range 7,500 meters and a maximum ceiling of 5,250 meters. Ammunition included HE, tracer, HE-incendiary and AP rounds. Usually one tracer was added to each 4 or 5 rounds for visual aid. In addition to ready ammunition lockers there were eight hoists to supply additional ammunition from lower magazines to the gun deck level. To supply the portside No. 2 gun, an automatic ammunition conveyor was rigged to hoist No. 2 (abreast the forward elevator).

Before the outbreak of the war such an AA fit was considered adequate. However, the first air attacks soon proved that modern aircraft could fly two or even three times faster than hitherto expected. LPR readings needed constant updating and AA fire accuracy dropped drastically. AA directors were found to be susceptible to bomb damage and mechanical failures. Although twin and triple mounts could fire independently, they were plagued by excessive smoke and muzzle flash that obstructed aiming. The sharp recoil of multiple mounts prevented smooth tracking of the target's course. For this reason manually operated single mounts were frequently used during the second half of the war due to their more accurate fire. Nonetheless, the 25mm gun remained the main Japanese AA weapon and better guns were not ready until the end of the war.

The U.S. Navy also used 28mm (1.1") quad mounts extensively, but since late 1942 they were replaced with RPC-operated 40 mm and hand-fired 20 mm guns that proved their worth in the intense battles at the end of the war. The IJN lacked an adequate 37 to 40 mm medium-caliber AA weapon. During the Battle of the Philippine Sea on 19 June 1944 USS CAVALLA (SS-244) torpedoed SHOKAKU. Four torpedo hits started a fierce fire in the gasoline tanks and 2.5 hours later at 14.01 she sank 500 nautical miles SW of Saipan. ZUIKAKU was damaged for the very first time but despite a direct bomb hit she retained the ability to fight back. After this battle ZUIKAKU's AA suite was increased still further. During the action off Cape Engaño on 25 October she featured a total of ninety-six 25mm guns after twenty-six guns had been added. Unfortunately, no further details about their installation are yet known.

In addition ZUIKAKU had been equipped with four 28-barrel 120mm AA rocket launchers installed in starboard bow and port quarter locations (cf. Fig. 3 upper view). Photos taken by U.S. pilots during this engagement also confirm their layout. The 120mm rockets produced a formidable launch blast. To prevent injuries, the launching crews had to wear special protective suits and withdrew to a special shelter prior to each launch. During the action off Cape Engaño ZUIKAKU was hit by 8 torpedoes and 7 bombs. This was the end of the "Lucky Carrier".

Pages 34 and 35

AIRCRAFT-HANDLING FACILITIES OF THE SHOKAKU CLASS

By Noriki Suzuki

SHOKAKU class was designed with the benefit of operational experience gained from previous IJN carriers. Of course, the same is true for aircraft-handling facilities used on this class. Here I shall describe in detail, their deck equipment, take-off/landing aids, hangar facilities and aircraft elevators.

#### FLIGHT DECK AND RELATED EQUIPMENT

The flight deck is one of the most remarkable external features of an aircraft carrier. Its development, just like that of the other IJN carriers, followed a rather circuitous route. The first IJN carrier HOSHO was completed with an island but later rebuilt with a flush deck. AKAGI and KAGA featured triple flying-off decks and RYUJO a flush deck, but the first two were later refitted with an island each. Such convoluted development resulted in the regular island structure used on SORYU and HIRYU. SHOKAKU's island was relocated from starboard amidships to a starboard forward position. This decision was not straightforward, but rather a result of prolonged discussions.

For a carrier, the island location determines the location of funnels and much of the flight deck traffic. Let us examine how SHOKAKU class' island and funnel arrangement was determined. Initially the intention was to mount the island structure port amidships and the funnels on the opposite side. In the Bureau of Naval Aviation's (Koku Hombu) opinion, this solution would have facilitated management of flight deck operations. On the other

hand, pilots' experiences on the refitted AKAGI and newly built HIRYU proved that a port amidships location resulted in unwanted turbulence, complicating aircraft landing. After heated discussions the pilots' arguments were accepted and it was decided to site the island structure starboard forward with funnels just abaft it.

The flight deck was 242.22m long and 29.0m wide (29.5m according to other sources). In trial conditions the flight deck was located 14.13 meters above the waterline. A higher flight deck location facilitates take-off and landing procedures, but too high a location results in a huge freeboard and unsatisfactory stability. SHOKAKU's designers tried to keep the flight deck at an elevation of 12 to 13 meters. Actually, with a full load the flight deck's height was 13.7 meters.

Such rigorous planning resulted in good seaworthiness. Shortly before being commissioned, ZUIKAKU was caught by a 26-knot typhoon at sea and her inclinometer registered heavy rolling up to 40 degrees on both sides. Nevertheless she was able to continue her voyage without any problems.

Excluding the elevators, the flight deck (including its forward and aft ends) was covered with wood planking. Longitudinally laid planks were 12 to 15 centimeters wide. The aft end of the flight deck was made of steel and covered with non-skid paint. Such non-skid paint is similar to that currently used to cover Japanese Maritime Self-Defense Force warship passageways. This paint provides a relatively rough surface resembling sandpaper. Wooden strips likewise provided some support as they were provided with pressed steps. Welded metal strips measuring 200 by 16mm provided surer footing. A total of eight expansion joints were fitted to the 242.22m long flight deck to prevent buckling due to wave-generated hull flexing.

#### DECK LANDING AIDS

The IJN began the development of domestic carrier catapults at the time of KAGA's refit. Nevertheless, a usable model was not ready until the end of the war. Initially it was planned to fit the new class with two catapults at the bow but as none were available at the time of fitting-out, the idea was rejected. To launch the new generation of carrier-based aircraft, a minimum wind speed of 13mps was necessary. In order to achieve that speed the carrier had to develop at least 26 knots. This could be achieved even while steaming with cruising turbines only.

The normal launch method was to turn into the wind and steam at maximum speed. A steam vent at the forward end of the bow on the centerline indicated wind direction over the deck. The vent was coupled with infrared heat sensors (their readings were registered on a display at the bridge). Painted on the front section of the flight deck immediately behind the steam vent was a wind direction indicator. This consisted of six white lines radiating from the centerline at 10-degree intervals. On each side of the centerline was a thinner white line that ran the full length of the flight deck right up to the wind direction indicator.

To protect the CAP fighters against wind, a propeller blast screen was installed in front of the forward elevator. Approximately 30 per cent of its surface was covered with perforations. The screen was designed to withstand up to 50mps deck wind and could be raised against a 35mps wind in less than 30 seconds.

To assist in securing aircraft, the deck area was studded with tie-down eye-bolts (flush-mounted when not in use). During the course of the war these tie-downs were also used to secure 25mm single mounts.

To slow down landing aircraft, a range of arresting gear was used. In the case of SHOKAKU class the primary gear consisted of ten sets of Kure Type 4 arrester wires. Type 4 was an improved version of Type 1 designed by the electrical department at Kure Naval Arsenal in 1933 and adopted by the IJN five years later. A Kure Type 5 version was also developed but not used operationally. Type 4 was the only type of arresting wires actually used on this class. Kure Type 4 featured an arresting engine with an induction coil drum below the deck. Each arresting wire was attached to cables spooled around the drum. With the help of a supporting mechanism the wire was stretched across the deck at a prescribed height. When the landing plane caught the wire, the connected drum performed 1.5 revolutions, generating electric energy that was used to stop the plane. The Type 4 could stop a 4-ton aircraft traveling at a speed of 30mps (acceleration 2.0 G's) in less than 40 meters. The released wire could be retrieved in 12 seconds.

To stop a plane missing all arrester wires, crash barriers were used as a last measure. According to "Review of Naval Architecture" (Kaigun Zosen Gijutsu Gaiyo) SHOKAKU class was fitted with three fixed and two mobile crash barriers. However, according to other sources such as "Basic Blueprints and Drawings" (Kihon Keikaku-zu) dated 30 January 1938 (with detailed drawings of island port side and funnels' starboard view) there were only three barriers. In "Warships of the World" (Sekai no Kansen) No. 137, a foldout page depicting both carriers at the time of their completion, shows only two barriers. According to the latter source, there were two barriers of the fixed variety located

abaft the forward elevator. Photos also confirm their siting. No photos depicting other barriers are preserved.

The exact type of crash barriers used on SHOKAKU class is also unknown but considering the time period it may have well been Kusho Type 3. If so it was designed by Kugisho (Yokosuka Naval Air Technical Arsenal). Such a crash barrier consisted of three athwartships steel cables (upper, middle and lower one) supported by poles that could be raised or lowered hydraulically. Kusho Type 3 could stop a 4-ton aircraft traveling at a speed of 15mps (acceleration 4.0 G's) in a distance less than 7 meters. The crash barrier could be raised with the help of compressed air in 2.5 seconds.

The flight deck also carried a number of markings, such as ship identification aids at the bow, landing area indicators near the stern, etc. The identification markings were painted in white on the foredeck port side. SHOKAKU sported a white 'SHI' and ZUIKAKU a 'SU' Katakana letter. The start of the landing area was marked with 12 white and 11 red stripes, fairly conspicuous on the generally plain background of the flight deck. Both carriers were fitted with a sophisticated landing guidance system that could also be used for night landings. To the rear of the flight deck were fixed green datum reference lights and red guiding lights that could be raised or lowered if necessary. During the final approach, the pilot controlled his position and angle of descent by lining up the fixed and movable lights. Usually, between 4 to 6 degrees were considered the optimum descent angle. In addition to landing guide lights, red stern lights and white deck lights were used at night. For night landings the flight deck was illuminated. There were also special signal lights to indicate wind direction and speed.

#### ELEVATORS AND HANGARS

SHOKAKU had three elevators, the first measuring 13 by 16 meters (forward) and the two others (middle and aft) 13 by 12 meters. To speed up the transfer of landed planes from deck to hangarbay, the forward elevator was larger than the others. All elevators ran on electrical power, producing a lot of potentially dangerous sparks. However, despite this and the fact that the carrier was heavily laden with flammable avgas, there were no problems in terms of fire safety.

The main difference between a typical elevator and that of a carrier is that the latter is subjected to constant engine vibration, pitch and roll. For this reason the contact surfaces of elevators and well guide bars were provided with roller buffers. There were two enclosed hangars stretching from bow to stern. The upper hangar was lightly built and supported predominantly by hull girders. Moreover, if a bomb exploded in the hangar, both hanger sides were supposed to vent the blast outward, minimizing damage to the flight deck. In practice such a design proved to be ineffective.

Initially both carriers were supposed to carry an air group consisting of 18 A6M2 fighters, 27 B5N2 torpedo bombers and 27 D3A1 dive-bombers with 2, 5 and 5 reserve planes respectively. With 72 operational and 12 reserve aircraft the total complement was 84 planes. This arrangement meant an increase in the air group in a relatively short time. There is no information about how different aircraft types were stowed in the hangar, but it can be fairly well deduced based on the carrier's general layout. In the upper hangar dive-bombers were stowed in the forward compartment, dive and torpedo bombers in the middle compartment, and torpedo bombers aft. The lower hangar contained fighter planes in the forward compartment, fighters and dive-bombers in the middle compartment, and torpedo bombers aft.

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IJN SHOKAKU TABULAR RECORD OF MOVEMENT

By Yasuo Ochiai

12 December 1937:

Laid down at Yokosuka Navy Yard.

1 June 1939:

Launched.

17 April 1941:

Captain Takaji Jojima is assigned as Commanding Officer.

8 August 1941:

Commissioned in IJN, assigned to Yokosuka Naval District as a special duty ship.

23 August 1941:

Departs Yokosuka on her shakedown voyage to Kyushu.

25 August 1941:  
Arrives at Ariake Bay, Kyushu. Assigned to 1st Air Fleet, CarDiv 5.

6 September 1941:  
Departs Ariake, returns to Yokosuka on 8 September.

4 October 1941:  
Departs Yokosuka.

6 October 1941:  
Arrives at Oita Bay, Kyushu.

12 October 1941:  
Arrives at Saeki Bay.

14 October 1941:  
Arrives at Sukumo, Shikoku.

20 October 1941:  
Departs Terashima Channel.

28 October 1941:  
Arrives at Sasebo Naval Base, Kyushu.

29 October 1941:  
Departs Sasebo.

31 October 1941:  
Arrives at Oita.

2 November 1941:  
Departs Oita.

3 November 1941:  
Arrives at Ariake Bay.

5 November 1941:  
Departs Ariake.

7 November 1941:  
Arrives at Oita.

9 November 1941:  
Departs Oita, arrives at Kure Naval Base the same day.

17 November 1941:  
Departs Kure, arrives at Saeki Bay the same day.

18 November 1941:  
Departs Saeki, arrives at Oita the same day.

19 November 1941:  
Departs Oita for Kuriles, following ZUIKAKU.

22 November 1941:  
Arrives at Hitokappu Bay, Etorofu Island.

26 November 1941:  
Vice Admiral Chuichi Nagumo's Carrier Striking Force departs Hitokappu for Hawaii.

8 December 1941: Attack on Pearl Harbor.  
SHOKAKU launches two strikes. First strike: 26 Val dive-bombers led by Lt.Cdr. Kakuichi Takahashi and 5 Zero fighters led by Lt. Tadashi Kaneko; one dive-bomber is lost. Second strike: 27 Kate torpedo bombers led by Lt. Tatsuo Ichihara; losses: none.

24 December 1941:  
CarDiv 5 returns to Kure Naval Base.

5 January 1942:  
Proceeds from Kure to Hiroshima Bay.

7 January 1942:  
Departs Hiroshima for Truk Naval Base (Carolines; now Chuuk).

14 January 1942:  
Arrives at Truk.

17 January 1942:  
Departs Truk to support the invasion of Rabaul, following ZUIKAKU.

20 January 1942:  
CarDiv 5 launches strike against Rabaul.

21 January 1942:  
CarDiv 5 launches strike against Lae.

29 January 1942:  
CarDiv 5 returns to Truk; SHOKAKU departs for homeland on the same day.

3 February 1942:  
Arrives at Yokosuka.

11 February 1942:  
Proceeds to Tateyama.

12 February 1942:  
Proceeds to Shirako Bay.

14 February 1942:  
Arrives at Mikawa Bay

24 February 1942:  
Departs Mikawa; arrives at Yokosuka same day.

27 February 1942:  
Drydocked at Yokosuka Navy Yard.

4 March 1942:  
Leaves dry dock.

7 March 1942:  
Departs Yokosuka to intercept Vice Admiral W.F. Halsey's TF 16 (ENTERPRISE) after her dawn raid on Minami-Torishima (Marcus) Island. No enemy detected.

16 March 1942:  
Returns to Yokosuka, rejoining ZUIKAKU.

17 March 1942:  
CarDiv 5 departs Yokosuka.

24 March 1942:  
Arrives at Staring Bay, Celebes (now Teluk, Sulawesi) to team up with CarDiv 1.

March 1942:  
Carrier Striking Force (minus KAGA) departs Staring Bay for a sortie into the Indian Ocean via Timor Sea, escorted by fast battleships KONGO, HIEI, HARUNA and KIRISHIMA, heavy cruisers TONE, CHIKUMA, light cruiser ABUKUMA, destroyers and oilers.

5 April 1942:  
SHOKAKU launches 19 Val dive-bombers against Colombo; one lost.

9 April 1942:  
SHOKAKU launches 19 Kate torpedo bombers escorted by 10 Zeros against Trincomalee; one fighter is lost. Later that day launches 18 Val dive-bombers against HMS HERMES to participate in her sinking, scoring 13 hits.

18 April 1942:

CarDiv 5 arrives at Mako, Pescadores (now Ma-kung, P'eng-hu Lieh-tao) for resupply.

19 April 1942:

Departs Mako to participate in operation "MO".

25 April 1942:

Arrives at Truk.

1 May 1942:

Departs Truk.

7 May 1942: Battle of the Coral Sea.

On the first day no enemy carriers are detected. SHOKAKU launches a strike against oiler NEOSHO in error.

8 May 1942:

SHOKAKU launches a strike against Rear Admiral Frank J. Fletcher's TF 17 (USS LEXINGTON and YORKTOWN). SHOKAKU's flight deck is badly damaged by three bombs and she cannot recover her planes any more, but the carrier remains under way.

17 May 1942:

Returns to Kure, having eluded eight U.S. submarines assigned to intercept the "wounded bear".

25 May 1942:

Captain Jojima is relieved by Capt. Masafumi Arima.

16 June 1942:

Enters dry dock at Kure Navy Yard. Repair and refit.

27 June 1942:

Leaves dry dock.

14 July 1942:

SHOKAKU is reassigned to Third Fleet, CarDiv 1 with ZUIKAKU and ZUIHO.

18 July 1942:

Transfers from Kure to Hashirajima.

21 July 1942:

Departs Hashirajima.

31 July 1942:

Returns to Hashirajima.

5 August 1942:

Departs Hashirajima.

8 August 1942:

Arrives at Kure.

14 August 1942:

Departs Kure.

15 August 1942:

Arrives at Hashirajima, rejoining ZUIKAKU.

16 August 1942:

CarDiv 1 (minus ZUIHO) departs Kure for Eastern Solomons with light carrier RYUJO, fast battleships HIEI, KIRISHIMA, heavy cruisers TONE, CHIKUMA, light cruiser NAGARA and destroyers.

24 August 1942: Battle of the Eastern Solomons.

SHOKAKU launches two strikes against Vice Admiral Frank J. Fletcher's TF 61 (USS ENTERPRISE and SARATOGA). First strike: 18 Val dive-bombers and 4 Zero fighters; 10 Vals and 3 Zeros lost in battle, two more planes ditch. Second strike returns without locating the enemy.

28 August 1942:  
SHOKAKU's fighter group is dispatched to Kavieng until 4 September.

5 September 1942:  
Arrives at Truk.

10 September 1942:  
CarDiv 1 departs Truk to operate north of Guadalcanal with Vice Admiral Nagumo's Third Fleet; accompanied by Vice Admiral Nobutake Kondo's Second Fleet.

23 September 1942:  
Returns to Truk.

11 October 1942:  
Third Fleet departs Truk for Guadalcanal with the Second Fleet.

26 October 1942: Battle of Santa Cruz.  
SHOKAKU launches two strikes against Rear Admiral Thomas C. Kinkaid's TF 16 (ENTERPRISE) and Rear Admiral George D. Murray's TF 17 (HORNET). First strike: 10 Kate torpedo bombers led by Lt.Cdr. Shigeharu Murata, and 4 Zeros led by Lt. Hisayoshi Miyajima. Losses: 10 planes, including Lt.Cdr. Murata. Second strike: 19 Val dive-bombers led by Lt.Cdr. Mamoru Seki, and 5 Zero fighters led by Lt. Hideki Shingo. Losses: 10 Vals. 4 bombs hit SHOKAKU amidships; flight deck and several adjacent AA guns are seriously damaged. Large fires break out but carrier remains under way.

28 October 1942:  
Returns to Truk for repairs.

2 November 1942:  
Departs Truk for Yokosuka with heavy cruiser CHIKUMA and destroyers.

6 November 1942:  
Arrives at Yokosuka. Repairs and refit.

8 February 1943:  
Drydocked at Yokosuka Navy Yard for battle damage repairs and refit.

16 February 1943:  
Captain Arima is relieved by Capt. Tametsugu Okada.

28 February 1943:  
Leaves dry dock.

19 March 1943:  
Departs Yokosuka.

21 March 1943:  
Arrives at Tokuyama.

23 March 1943:  
Proceeds to Iwaishima.

27 March 1943:  
Arrives at Kure via Beppu and Tokuyama.

5 April 1943:  
Departs Kure, visits Tokuyama, Beppu and Oita.

25 April 1943:  
Returns to Kure.

14 May 1943:  
Departs Kure to visit Oita, Tokuyama and Oita Bay.

20 May 1943:  
Departs Oita Bay.

21 May 1943:  
Arrives at Yokosuka.

25 May 1943:  
Proceeds to Kisarazu Bight.

29 May 1943:  
Returns to Yokosuka.

31 May 1943:  
Departs Yokosuka for Oita.

2 June 1943:  
Arrives at Kure.

14 June 1943:  
Departs Kure to visit naval bases in western Inland Sea.

6 July 1943:  
Returns to Kure; proceeds to Yashima anchorage, Shikoku, same day.

9 July 1943:  
Departs Yashima for Truk.

15 July 1943:  
Arrives at Truk.

18 September 1943:  
First Fleet Sortie to Eniwetok: CarDiv 1 departs Truk with battleships YAMATO, NAGATO and heavy cruisers TAKAO, ATAGO, MYOKO and HAGURO.

20 September 1943:  
Arrives at Brown Atoll, Eniwetok.

23 September 1943:  
Departs Brown.

25 September 1943:  
Returns to Truk.

17 October 1943:  
Second Fleet Sortie to Eniwetok: CarDiv 1 departs Truk with battleships YAMATO, MUSASHI, FUSO, NAGATO, KONGO, HARUNA, heavy cruisers TAKAO, ATAGO, MAYA, CHOKAI, MOGAMI, SUZUYA, TONE, CHIKUMA, light cruisers AGANO, OYODO and destroyers.

19 October 1943:  
Arrives at Brown.

23 October 1943:  
Departs Brown.

26 October 1943:  
Returns to Truk.

1 November 1943:  
Operation "RO-Go" (reinforcement of Rabaul): SHOKAKU dispatches her air group to Rabaul.

11 November 1943:  
Departs Truk for Yokosuka.

15 November 1943:  
Arrives at Yokosuka.

17 November 1943:  
Captain Okada is relieved by Capt. Hiroshi Matsubara.

26 November 1943:  
Departs Yokosuka for Truk with CHITOSE and destroyers.

1 December 1943:  
Arrives at Truk.

12 December 1943:  
Departs Truk for Yokosuka with battleship YAMATO and destroyers.

17 December 1943:  
Arrives at Yokosuka.

27 December 1943:  
Drydocked at Yokosuka Navy Yard.

6 January 1944:  
Leaves drydock.

17 January 1944:  
Departs Yokosuka.

27 January 1944:  
Arrives at Kure via Tokuyama and Oita Bay.

6 February 1944:  
Departs western Inland Sea for Singapore, rejoining ZUIKAKU.

13 February 1944:  
Arrives at Singapore.

20 February 1944:  
Departs Singapore for Lingga Roads.

31 March 1944:  
Returns to Singapore.

3 April 1944:  
Arrives at Lingga.

12 May 1944:  
Departs Lingga for Tawi Tawi anchorage (Sulu Sea).

15 May 1944:  
Arrives at Tawi Tawi.

13 June 1944:  
Departs Tawi Tawi.

14 June 1944:  
Arrives at Guimaras (Philippines).

15 June 1944:  
Departs Guimaras with Mobile Fleet via Visayan Sea.

19 June 1944:  
Battle of the Philippine Sea. After launching a strike, hit by four torpedoes from USS CAVALLA. Large fires break out, detonating bombs in the hangar. Sunk in position 12-00'N, 137-46'E at 1401. Of 887 crewmembers and 376-men personnel of 601. Kokutai a total of 1,263 perished with their ship.

31 August 1944: Removed from Navy List.

IJN ZUIKAKU TABULAR RECORD OF MOVEMENT  
By Yasuo Ochiai

25 May 1938:  
Laid down at Kawasaki Kobe Yard.

27 November 1939:

Launched.

25 September 1941:

Commissioned in IJN, assigned to Kure Naval Base, 1st Air Fleet, CarDiv 5. CO Captain Ichihei Yokokawa arrives same day and ZUIKAKU departs Kobe.

26 September 1941:

Arrives at Kure.

7 October 1941:

Proceeds from Kure to Oita Bay, Kyushu on the same day to join SHOKAKU.

16 October 1941:

Departs Oita.

17 October 1941:

Proceeds to Saeki.

20 October 1941:

Departs Saeki, arrives at Sukumo on the same day.

24 October 1941:

Departs Sukumo, returns to Saeki same day.

30 October 1941:

Departs Saeki, arrives at Oita Bay same day.

2 November 1941:

Departs Oita.

3 November 1941:

Arrives at Ariake Bay.

5 November 1941:

Departs Ariake.

7 November 1941:

Returns to Oita Bay.

9 November 1941:

Proceeds to Saeki via Kure same day.

16 November 1941:

Arrives at Saeki.

17 November 1941:

Proceeds from Saeki to Oita same day.

18 November 1941:

Departs Oita for Kuriles.

22 November 1941:

Arrives at Hitokappu Bay, Etorofu.

26 November 1941:

Departs Hitokappu for Hawaii.

8 December 1941: Attack on Pearl Harbor.

ZUIKAKU launches two strikes. First strike: 25 Val dive-bombers led by Lt.Cdr. Akira Sakamoto and 6 Zero fighters led by Lt. Masao Sato. Second strike: 27 Kate torpedo bombers led by Lt.Cdr. Shigekazu Shimazaki (second strike leader). Losses during the "Hawaii Operation": none. Damaged aircraft: none.

24 December 1941:

CarDiv 5 returns to Kure.

30 December 1941:

Drydocked at Kure Navy Yard.

3 January 1942:  
Leaves drydock.

5 January 1942:  
ZUIKAKU and SHOKAKU proceed from Kure to Hiroshima Bay.

8 January 1942:  
Departs Hiroshima to support the invasion of Rabaul, following SHOKAKU.

14 January 1942:  
Arrives at Truk//.

16 January 1942:  
Departs Truk.

20 January 1942:  
CarDiv 5 launches strike against Rabaul.

21 January 1942:  
CarDiv 5 launches strike against Lae.

29 January 1942:  
CarDiv 5 returns to Truk.

1 February 1942:  
Departs Truk with AKAGI, KAGA, fast battleships HIEI and KIRISHIMA, heavy cruiser CHIKUMA and destroyers to intercept Vice Admiral William F. Halsey's TF 8 (USS ENTERPRISE) after the attack on Marshall Islands.

8 February 1942:  
Arrives at Palau.

9 February 1942:  
Departs Palau.

13 February 1942:  
Arrives at Yokosuka.

16 February 1942:  
Departs Yokosuka to dispatch air group to Suzuka Kokutai for working up; proceeds to holding position in Mikawa Bay to intercept enemy task force.

17 February 1942:  
Returns to Mikawa Bay.

28 February 1942:  
Picks up air group, departs Mikawa.

2 March 1942:  
Arrives at Kure.

6 March 1942:  
Departs Kure to intercept Vice Admiral W.F. Halsey's TF 16 after her dawn raid on Minami-Torishima Island. No enemy detected.

16 March 1942:  
Returns to Yokosuka for resupply.

17 March 1942:  
CarDiv 5 departs Yokosuka.

24 March 1942:  
Arrives at Staring Bay, Celebes.

26 March 1942:

Carrier Striking Force (minus KAGA) departs Staring Bay for a sortie into the Indian Ocean via Timor Sea.

5 April 1942:

ZUIKAKU launches 19 Val dive-bombers and 9 Zeros against Colombo; 5 Vals lost.

9 April 1942:

ZUIKAKU launches 18 Kate torpedo bombers and 6 fighters against Trincomalee; 2 Zeros lost. Later that day launches 14 Vals against HMS HERMES which participate in her sinking, scoring 13 hits.

18 April 1942:

CarDiv 5 arrives at Mako, Pescadores (now Mako, P'eng-hu Lieh-tao).

19 April 1942:

Departs Mako to support the invasion of Port Moresby.

25 April 1942:

Arrives at Truk.

1 May 1942:

Departs Truk.

7 May 1942: Battle of the Coral Sea.

ZUIKAKU launches 18 Vals and 12 Kates escorted by 9 Zeros against TF 17 (USS LEXINGTON and YORKTOWN). No enemy carriers are located and the strike attacks oiler NEOSHO in error. Night attack is also a failure: enemy carriers are located only after the group has dropped all its torpedoes.

8 May 1942:

The first carrier-versus-carrier battle. ZUIKAKU air group attacks USS YORKTOWN but fails to sink her. ZUIKAKU is not damaged but her air group is severely mauled.

15 May 1942:

Returns to Truk. Four U.S. submarines assigned to intercept her arrive too late.

16 May 1942:

Departs Truk via North Pass, escorted by four destroyers. USS GREENLING trying to intercept the carrier fails to maneuver into firing position.

20 May 1942:

Attacked by USS POLLACK, which fires four torpedoes from 2,000 yards range. All miss.

21 May 1942:

ZUIKAKU returns to Kure, rejoining SHOKAKU.

11 June 1942:

Departs Kure.

14 June 1942:

Proceeds to Hashirajima.

15 June 1942:

Captain Yokokawa is relieved by Capt. Tameki Nomoto. Departs Hashirajima to support the Second Mobile Force participating in the Aleutian operation.

23 June 1942:

Arrives at Ominato.

28 June 1942:

Departs Ominato.

12 July 1942:

Arrives at Oita.

13 July 1942:

Proceeds to Hashirajima.

20 July 1942:  
Shifts to Kure.

30 July 1942:  
Drydocked at Kure Naval Yard.

12 August 1942:  
Leaves drydock.

16 August 1942:  
Departs Hashirajima.

24 August 1942: Battle of the Eastern Solomons.  
ZUIKAKU launches 9 Val dive-bombers escorted by 6 fighters; all Vals are lost.

5 September 1942:  
Returns to Truk.

10 September 1942:  
Departs Truk to operate north of Guadalcanal with Vice Admiral Nagumo's Third Fleet.

23 September 1942:  
Returns to Truk to support the operations in Guadalcanal area.

11 October 1942:  
Departs Truk for the Eastern Solomons.

26 October 1942: Battle of Santa Cruz.  
ZUIKAKU launches two strikes against Rear Admiral George D. Murray's TF 17 (HORNET) and Rear Admiral Thomas C. Kinkaid's TF 16 (ENTERPRISE). First strike: 21 Val dive-bombers led by Lt. Sadamu Takahashi, and 8 Zero fighters led by Lt. Ayao Shirane; 12 Vals lost. Second strike: 16 Kate torpedo bombers led by Lt. Shigeichiro Imajuku, and 4 fighters led by WO Shigemi Katsuma; 9 Kates and 2 Zeros lost.

30 October 1942:  
Returns to Truk, following SHOKAKU.

4 November 1942:  
Departs Truk for homeland.

9 November 1942:  
Arrives at Kure; remains in western Inland Sea until 27 December. Air training exercises with the battleships MUSASHI, YAMASHIRO and NAGATO.

28 December 1942:  
Arrives at Yokosuka.

31 December 1942:  
Departs Yokosuka with destroyers.

4 January 1943:  
Arrives at Truk.

7 January 1943:  
Departs Truk for homeland with battleship MUTSU, heavy cruiser SUZUYA and destroyers.

12 January 1943:  
Arrives at Oita Bay.

14 January 1943:  
Proceeds to Kure.

17 January 1943:  
Proceeds to Iwakuni Bay.

18 January 1943:  
Departs Iwakuni for Truk.

23 January 1943:

Arrives at Truk to support the evacuation of Japanese troops from Guadalcanal with carriers ZUIHO and JUNYO, heavy cruisers TAKAO, ATAGO, MYOKO, HAGURO, light cruisers NAGARA, AGANO and destroyers.

2 April 1943:

ZUIKAKU's air group is dispatched to Rabaul and Kavieng to participate in operation "RO-Go".

17 April 1943:

Returns to Truk.

3 May 1943:

Departs Truk for homeland.

8 May 1943:

Arrives at Kure, rejoining SHOKAKU.

21 May 1943:

Both carriers proceed to Yokosuka, joining ZUIHO and the light cruisers AGANO and OYODO for a planned counterattack against the Aleutians.

25 May 1943:

Proceeds to Kisarazu.

29 May 1943:

Arrives at Yokosuka.

31 May 1943:

Departs Yokosuka.

2 June 1943:

Arrives at Kure.

11 June 1943:

Drydocked at Kure Navy Yard.

19 June 1943:

Leaves drydock.

21 June 1943:

Captain Nomoto is relieved by Capt. Tomozo Kikuchi.

24 June 1943:

Departs Kure, operates in western Inland Sea.

10 July 1943:

Departs western Inland Sea for Truk, following SHOKAKU.

15 July 1943:

Arrives at Truk.

18 September 1943: First Fleet Sortie to Eniwetok:

Departs Truk for Brown Atoll, Eniwetok.

20 September 1943:

Arrives at Brown.

23 September 1943:

Departs Brown.

25 September 1943:

Returns to Truk.

17 October 1943: Second Fleet Sortie to Eniwetok:

Departs Truk for Brown Atoll.

19 October 1943:

Arrives at Brown.

23 October 1943:  
Departs Brown.

26 October 1943:  
Returns to Truk.

7 December 1943:  
Departs Truk for homeland.

12 December 1943:  
Arrives at Kure.

18 December 1943:  
Captain Kikuchi is relieved by Capt. Takeo Kaizuka.

8 January 1944:  
Drydocked at Kure Navy Yard.

17 January 1944:  
Leaves drydock.

1 February 1944:  
Departs Kure for western Inland Sea.

6 February 1944:  
Departs Sumoto Bay for Singapore.

13 February 1944:  
Arrives at Singapore.

20 February 1944:  
Departs Singapore for homeland.

27 February 1944:  
Arrives at Kure.

5 March 1944:  
Departs Kure for western Inland Sea.

8 March 1944:  
Departs Sumoto for Singapore, joining a task group (fast battleships KONGO, HARUNA, aircraft cruiser MOGAMI and destroyers) for the voyage.

15 March 1944:  
Arrives at Singapore with MOGAMI.

20 March 1944:  
Departs Singapore for Lingga Roads.

25 March 1944:  
Returns to Singapore.

26 March 1944:  
Drydocked at Singapore.

6 May 1944:  
Leaves drydock, departs Singapore same day.

7 May 1944:  
Arrives at Lingga.

12 May 1944:  
Departs Lingga for Tawi Tawi anchorage.

15 May 1944:  
Arrives at Tawi Tawi.

13 June 1944:  
Departs Tawi Tawi.

14 June 1944:  
Arrives at Guimaras (Philippines).

15 June 1944:  
Departs Guimaras for Marianas.

19 June 1944: Battle of the Philippine Sea.

20 June 1944:  
ZUIKAKU becomes the new flagship of Vice Admiral Ozawa. During the evening attack she receives a bomb hit and fire breaks out in hangar, but she remains under way.

22 June 1944:  
Arrives at Nakagusuku Bay, Okinawa.

23 June 1944:  
Departs Nakagusuku for Inland Sea.

24 June 1944:  
Returns to Hashirajima.

14 July 1944:  
Dry docked at Kure Navy Yard.

2 August 1944:  
Leaves dry dock.

10 August 1944:  
Reassigned to Third Fleet, CarDiv 3 with ZUIHO, CHITOSE and CHIYODA.

15 October 1944:  
Captain Takeo Kaizuka is promoted to Rear Admiral.

20 October 1944:  
Departs western Inland Sea for the Philippines as the flagship of Vice Admiral Jisaburo Ozawa.

25 October 1944: Action off Cape Engaño.  
After the third air strike of Vice Admiral Marc A. Mitscher's TF 38 ZUIKAKU hit by seven torpedoes and seventeen torpedoes rolls over to port and sinks at 1414. Of some 1,700-man crew only 970 are rescued.

26 August 1945: Removed from Navy List.

Page 38. ZUIKAKU leaving Japan for the attack on Hawaii on 26 November 1941. Members of the crew are raising one of the bow anchors. Two of the flight deck main supports are visible here. An oiler passes on the right. Sailors in this photo are obviously feeling the effects of the bitterly cold weather. Final departure was delayed for one hour as a result of an accident that left a rope caught up in a propeller.

Page 39. ZUIKAKU leaving Hitokappu Bay on the way to Hawaii (26 November 1941). Zero fighters with engines covered are lined up on the flight deck. SHOKAKU is seen behind her.

Page 40. ZUIKAKU approaches Hawaii. This picture taken from a bridge platform shows the front of the deck on the starboard side. A loop antenna and anti-aircraft guns are visible. The frame set up around the anti-aircraft gun is its gun barrel stop. The carrier directly ahead of ZUIKAKU is KAGA, the second unit of CarDiv 1. Ahead of KAGA steams AKAGI. Another three carriers sail on the port side of the formation.

Page 41. 7 December 1941. A B5N2 (Kate) from ZUIKAKU high above Pearl Harbor. Flames and smoke can be seen billowing from the crippled U.S. battleships. The tail markings show the CarDiv 5, and ZUIKAKU's position within it. Obviously the success of the Hawaii

attack was based on surprise and the sheer power of the Japanese task force. Soon after the battle of Midway, the IJN underwent a major reorganization.

Page 42. 20 January 1942. A Zero fighter takes off from ZUIKAKU for the attack on Rabaul. At this time most Japanese had never heard of Rabaul. It was occupied to prevent it being used by the Allies to launch attacks on Truk. The crew waves off the Zero.

Page 43. Rabaul and New Guinea attack operations carried out on 20-21 January 1942. As this is a B5N2 (Kate) torpedo bomber, it is thought the photograph was taken during the attack on Lae and Salamaua on the 21st.

Page 44. 20 January 1942. Zero fighters prepare to take off for the Rabaul attack. After Hawaii the task force was dispatched to support the Rabaul operation. On this day six A6M2 Zero fighters and nineteen D3A1 (Val) bombers sortied from ZUIKAKU. After this operation, ZUIKAKU and SHOKAKU went on to Eastern New Guinea.

Page 45. Early morning. ZUIKAKU heads for Rabaul on 20 January 1942. Six D3A1 (Val) dive-bombers stand by on her flight deck. The radio masts are lowered in readiness for aircraft taking off. SHOKAKU can be seen just behind these aircraft.

Page 46. March 1942. Nagumo's Carrier Striking Force steams through the Indian Ocean. The view is from ZUIKAKU's front port AA gun position just as the line of ships turns to port. From the front, AKAGI, SORYU, HIRYU, fast battleships HIEI, KIRISHIMA, HARUNA and KONGO, followed by ZUIKAKU.

Page 47. It seems that this picture was taken from the top of ZUIKAKU's bridge, showing her distinctive identification markings on the flight deck. This is a view of the Nagumo's force at its' prime, after the Hawaii operation. Of course, no one realized how quickly its fortune would change.

Page 48. 5 April 1942. Nine Zero fighters and nineteen D3A1 (Val) dive-bombers prepare to take off for a raid on Colombo. They attacked warships in Colombo port and the airport. Five Vals failed to return. The photograph shows the scene on deck as the carrier turns into the wind.

Page 49. Another scene from the Indian Ocean operations. A D3A1 (Val) takes off from ZUIKAKU. There is not much wind and the sea is calm. The steam vent indicating the wind direction is seen blowing on the centerline of the flight deck.

Page 50. An attack group of planes shortly to take part in the Battle of the Coral Sea on 5 May 1942. For several days the planes have been waiting on the flight deck. Zero fighters are in front; D3A1 (Val) dive-bombers are lined up behind them. White sheet covers are draped over the aircraft to protect them from the strong tropical sunlight. Deck crew are seen under the wings, also seeking protection from the burning sun. But with no sun protection for the two planes in front, how ready are they to scramble?

Page 51. ZUIKAKU during the Battle of the Coral Sea on 8 May 1942. A Zero fighter is about to take off. The Japanese had lost the carrier SHOHO the previous day. At 0800 an attack group of 69 aircraft were sent to attack the U.S. carriers. In this picture the white flag drops, signaling the aircraft handlers to remove the wheel chocks and run clear. The tension reaches a climax!

Page 52. Top picture. A D3A1 (Val) Type 99 dive-bomber takes off from ZUIKAKU. The flag reveals that this is the flagship of CarDiv 5, under Rear Admiral Chuichi Hara. Tail markings identify CarDiv 5, and the two white lines around the fuselage show ZUIKAKU's flight group. The line under the tail numbers indicates that this is the flight commander's aircraft.

Bottom picture. The Battle of the Coral Sea. A torpedo-carrying B5N2 (Kate) takes off from ZUIKAKU. Because of the heavy torpedo, such a take-off needs the full length of the flight deck. With the sinking of SHOHO the previous day, the sinking of the LEXINGTON meant that both sides lost a carrier. However SHOKAKU suffered severe bomb damage as well.

Page 53. Another photograph of ZUIKAKU as the flagship of CarDiv 5.

Page 54. ZUIKAKU as flagship of CarDiv 5. After the Battle of Coral Sea, ZUIKAKU eventually returned to Kure on July 14 1942. The crew has gathered to show their appreciation to Rear Admiral Chuichi Hara, who has announced his resignation as ComCarDiv

5. After the battle of Midway, CarDiv 5 was disbanded, and ZUIKAKU was assigned to the Third Fleet, CarDiv 1. ZUIKAKU had a platform in the middle of the signal mast supporting a searchlight. This is a feature not seen on her sister ship SHOKAKU. Also, note the distinctive white color of her AA director seen at this time. The crews' dress seen here is typical for carrier operations in the South Pacific.

Page 55. Top picture. 26 October 1942 - the Battle of Santa Cruz. A B5N2 (Kate) lands to the port side of the flight deck. Arrestor cables can be seen stretched across the flight deck. The next airplane to land follows closely behind. Although ZUIKAKU did not yet have radar, SHOKAKU was equipped with a Type 21 air-search set for the first time. Nevertheless SHOKAKU again suffered severe battle damage while ZUIKAKU again managed to avoid any harm.

Bottom picture. Cleaning the afterdeck of ZUIKAKU. A few peaceful moments during battle. SHOKAKU follows the flagship. The wooden planking of the flight deck can be clearly seen.

Page 56. Is this ZUIKAKU as seen from SHOKAKU when returning to Truk after the Battle of Santa Cruz? There is some doubt about when this photograph was taken. If what can be seen in the foreground is damage to No.6 AA gun position, then this may be SHOKAKU after the above battle. However it is not clear if the guns which would have been fitted to the stern of ZUIKAKU during this period, are present in the picture. In all likelihood this picture shows the two sisters either at Truk Island or even at Staring Bay in late March, 1942.

Page 57. Autumn 1942. A silhouette photograph of ZUIKAKU. AA gun platforms have now been fitted under the front of the flight deck and smoke is seen near the signal mast behind the bridge. The features on the deck seen in the front of the picture indicate that this ship is SHOKAKU around the time of the Battle of Santa Cruz Islands.

Page 58. Top picture. ZUIKAKU and SHOKAKU in the South Pacific sometime in 1943. A heavy cruiser is barely visible behind the two carriers. Following repairs after the battle of Santa Cruz, ZUIKAKU left Kure and arrived at Truk in July 1943. This picture must therefore have been taken after this time.

Bottom picture. This flattop is clearly SHOKAKU: there is no searchlight fitted halfway up the mast, as seen on ZUIKAKU. The picture was taken on Navy Day, 27 May 1943. The figure addressing the crew is thought to be Captain Tametsugu Okada. The Type 21 radar was fitted at Yokosuka in February.

Page 59. ZUIKAKU at Eniwetok on 22 October 1943. At that time, she formed the CarDiv 1 with SHOKAKU and ZUIHO. By then training was finished and they returned to Truk. This picture was taken as they headed for the Marshall Islands. From the left; CHIKUMA, ZUIKAKU, TONE, and HAGURO.

Page 60. Top picture. ZUIKAKU in the Inland Sea, Japan in spring 1944. This image is one frame of a cine-film, shot from a plane just after take-off. A triple AA gun platform can now be seen at the bow, just under the front of the flight deck.

Bottom picture. 24 October 1944. ZUIKAKU as seen during the naval battle off Leyte. She became the flagship of the Ozawa decoy force to enable Kurita's fleet to attack Leyte Bay. This particular photo was taken during the action north of the Philippine Sea. Anti-submarine camouflage has been applied on her sides. This is the last picture of ZUIKAKU before she was attacked by U.S. planes and sunk.

Page 61. Top picture. ZUIKAKU fights at Leyte. Barely visible, a plane has just taken off. At this time ZUIKAKU carried 65 aircraft. These were drawn from various groups to form a 'decoy' flight group and not intended to act as an attack force. Many of these pilots had little experience of carrier landing and take-offs.

Bottom picture. 25 October 1944. The Ozawa fleet off Cape Engaño awaits the American onslaught. ZUIKAKU is in the center. In the front is the destroyer WAKATSUKI. In the distance and to starboard is the light carrier ZUIHO. ZUIKAKU was attacked at 0800 on this day and hit by a torpedo and three bombs during the first assault. She managed to avoid further damage until early afternoon.

Page 62. Top picture. This photo appears to show ZUIKAKU after the first attack. Despite initial bomb damage (note the billowing smoke) she is still maintaining high speed. Note the recently added flight deck camouflage. ZUIKAKU's final AA suite included sixteen 127mm and ninety-six 25mm guns, as well as six 28-barrel 120mm AA rocket launchers.

Bottom picture. After the crippling second attack on ZUIKAKU, ammunition for the AA guns has to be moved up the deck manually from the magazines in preparation for the next attack.

Page 63. Hit by 7 torpedoes and 4 bombs in the third attack, ZUIKAKU lists to port. The order is given to all of the 1,327 members of the crew to gather on the flight deck. As the list increased to 23 degrees, the IJN ensign was lowered. This photograph captures the dramatic scene as the crew gathers on the sloping flight deck to salute the flag.

Page 64. Another very dramatic picture, taken as the whole crew cry "Banzai!" three times! What are each of them be feeling at this moment? After the chaos of battle we are left with a surreal scene; the extremely angled flight deck; the calm and peaceful sea shining in the afternoon sun. This was the moment as ZUIKAKU's short life came to an end. A total of 866 men were rescued.

Page 66.

ORIGINS OF SHIP NAMES.

Soryu, Hiryu and Unryu. The character 'RYU' is common to all these three names. 'RYU' means dragon, the mystical Chinese monster from ancient times.

Soryu means 'Deep Blue Dragon'.

Hiryu means 'High-Flying Dragon'.

Unryu means 'Dragon Flying in a Heavenly Cloud'.

Amagi (actually Amagisan) //belongs to// a group of volcanoes located in Shizuoka prefecture, on the Izu peninsula. The first IJN warships were supposedly built of wood brought from this area.

Katsuragi is a mountain on the border of Osaka and Nara prefectures.

Kasagi (or Kasagi-yama) is a peak in Kyoto prefecture.

Aso (Asosan) volcano on Kyushu has one of the largest calderas in the world.

Ikoma (Ikomayama) is located on the border of Osaka and Nara prefectures.

Taiho--'Magnificent Phoenix'. This name reflects the IJN's high expectations of this particular carrier.

Page 67. This aerial view taken in Spring 1939 shows SORYU during naval exercises with one of her Nakajima B5N1 (Kate) Type 97 torpedo bombers entering the landing pattern. The Kate's wheels are down and tail-hook extended. The wing of the photographer's plane can be seen at bottom left corner. Note that the undercarriage position visual indicator on the wing is up.

Page 68. Top picture. A close-up of SORYU's bow during her fitting-out in Kure Navy Yard No. 3 Dock. The characteristic shape of the bow and the details of its outer plating are clearly visible. White sounding marks can also be seen here. An anchor is partly visible at top right. To save weight, welding had been used extensively instead of riveting in SORYU's construction. After the Fourth Fleet incident the design was revised and outer plating, inner bottom, upper hangar deck, etc. were extensively reinforced.

Bottom picture. SORYU was one of the two treaty carriers ordered under the Second Replenishment Program with her near sister HIRYU. Just when her construction was about to begin, the TOMOZURU incident occurred and the work was delayed until November 1934. The launching ceremony was held on 23 December 1935. This photo was taken on the day before when the dock was already flooded. Note the dragon figurehead at the bow, as well as a large kusudama (decorative ball).

Page 69. Top picture. SORYU's launching ceremony. The kusudama ball has just been broken, showering the ship and spectators with confetti. The carrier flies both a battle flag and a pennant with her name. After the dock has been flooded, the ship is hauled out by tugs, stern first. Two supporting hawsers on both sides are keeping the carrier straight; yard workers holding them are slowly retreating towards the mouth of the dock. A temporary bridge has been erected on the flight deck. At SORYU's bow her chrysanthemum crest shines brightly.

Bottom picture. This photo shows SORYU whilst fitting out in Kure Navy Yard dock at the beginning of 1937. In comparison with the launch photos, the flight deck and AA gun platforms have been added. A 25mm AA gun platform can be seen at the bow, partly hidden

under the flight deck. The aft port sponson is destined for a 127mm AA gun. Note the scaffolding around the hull and the area below the waterline, clearly visible on this photo.

Page 70. This photo was taken in spring 1937, just like the one on the previous page. Apart from armament, the carrier is almost complete now. SORYU and HIRYU had many experimental features, paving the way for future fleet carriers of the Kido Butai. New planes for them were soon ready as well.

Page 71. SORYU was commissioned on 29 December 1937 and left for Yokosuka soon thereafter. This photo shows her running a measured mile in Tateyama Bight on 22 January 1938. During the trials, the 19,000ts carrier made 34.9 knots on 152,000shp despite rough seas (such trials were traditionally held in extreme conditions). Light armor protection notwithstanding, SORYU is generally recognized as the first modern Japanese carrier.

Page 72. This photo shows SORYU's starboard bridge area during her trials in Bungo Suido Channel in November 1937. In comparison with similar British and U.S. vessels, IJN carriers had rather small island structures and the funnel uptakes were often curved downwards. The air defense station is located on top of the compass bridge. A 60cm signal lamp, 1.5m rangefinder and DF loop antenna can be seen clearly. The twin gun mount just in front is 127mm AA gun No. 3 (SORYU had six mounts of this caliber).

Page 73. A Yokosuka B3Y1 Type 92 torpedo biplane is launched from SORYU in December 1937, soon after the carrier was commissioned and assigned to Second Fleet, CarDiv 2. This photo was taken from the bridge. The Type 92 was intended as the successor of Mitsubishi B2M2 Type 89 and accepted by the IJN in August 1932. First embarked on HOSHO and RYUJO, this type was grounded in 1935 because of many technical problems. Nevertheless, the B3Y1 made a spectacular comeback during the Sino-Japanese War in 1937. As SORYU actually never embarked this type, the photo was probably taken during trials.

Page 74. November 1937. SORYU during her sea trials in Bungo Suido Channel. Twin starboard funnels abaft the island and some flight deck details are clearly visible. In order to minimize the turbulence created by stack gasses, the funnel uptakes were curved downwards. Note a bull's-eye abaft, arrester wires (a total of nine sets) over the flight deck, as well as the elevator, offset to starboard.

Page 75. Top picture. SORYU on trials (starboard view). Note the 127mm twin AA mount and radio mast in lowered position. Below the flight deck SORYU had a total of six lower decks (upper/lower hangar decks, middle deck, lower deck, lowest deck and hold deck). Double hangars amidships accommodated 56 operational and 16 reserve aircraft (for a total of 72 planes). SORYU was larger than the preceding RYUJO and thus stabilizers were no longer fitted. Nevertheless, her stability was still rather good.

Bottom. This photo was taken during the sea trials near starboard 127mm AA mount No. 1. The forward 25mm twin gun position is partly visible over the anchor deck but the guns have yet to be fitted. Some four months had passed since the outbreak of the Sino-Japanese War and the situation in Asia was deteriorating rapidly. The brand-new medium carrier was to be commissioned as soon as possible.

Page 76. Top picture. The stern area of SORYU during her full speed trials in Bungo Suido Channel. SORYU left Kure Navy Yard on 11 November 1937 for her shakedown voyage via Hiroshima Bay to Iyo Sea. After that she participated in a series of sea trials. With a displacement of 18,871ts, SORYU developed a maximum speed of 34.898 knots on 152,483shp. The round object suspended from the flight deck is a helm direction indicator. At speeds over 30 knots her flight deck was heeling more than 10 degrees with each turn, making walking on it rather difficult.

Bottom picture. This snapshot was also taken during the trials in Bungo Suido (November 1937). It shows an outboard gallery surrounding the starboard 127mm AA gun sponson brace. On the preceding RYUJO outboard walkways tended to compromise her seaworthiness in rough weather. On SORYU forward walkways were provided with metal grating and after ones with bracketed flooring. This photo depicts the first variety.

Page 77. Another photo taken on SORYU during the trials at Bungo Suido in November 1937 depicts her starboard side abaft the island. Just in front, hanging on davits, is a 9m whaleboat (or 'cutter' in IJN nomenclature-Ed.). This time the view is not obscured by smoke and so curved funnel uptakes with a 25mm twin mount further abaft are clearly visible. On SORYU most faults of the preceding RYUJO were rectified. In order to improve seaworthiness in high seas, galleries and walkways were kept inboard.

Page 78. Top picture. SORYU (in all likelihood just after being commissioned). In fact this was the only photo of SORYU released before the outbreak of the war. According to official Japanese sources her displacement totaled 10,050ts and top speed 30 knots; dimensions and other specs were also somewhat reduced. Note that on this particular photo the island is only partially visible. This may be the reason why Jane's Fighting Ships published a heavily distorted drawing of SORYU, simultaneously crediting her with a restricted air group of 30 to 40 planes. Actually SORYU's standard displacement at the time of her commissioning was 15,900ts and top speed 34.5kts; her air group boasted a total of 72 planes.

Bottom picture. After commissioning, SORYU was assigned to Second Fleet, CarDiv 2 and soon deployed to South China Sea. On this photo CarDiv 2's SORYU (right) and RYUJO (left) are moored off Ise Bay near the famous Ise Shrine in September 1938. At that time SORYU served as the flagship of ComCarDiv 2, Rear Admiral Tomoshige Samejima. Although her air group was exercised for the Chinese mainland campaign, in the event SORYU was diverted to South China Sea again. She was first covering the landing in Bias Bay, then provided aerial support for the invasion of the Guangdong province, the occupation of northern French Indochina and naval blockade of the Chinese coast.

Page 79. CarDiv 2 resting in Tokyo Bay on a calm sea sometime in 1939. SORYU is in the foreground left, RYUJO farther back. This photo was taken from a Nakajima E8N Type 95 (Dave) seaplane, similar to that in foreground. By then SORYU embarked Mitsubishi A5M4 (Claude) fighters, Aichi D1A2 (Susie) biplane dive-bombers and Yokosuka B4Y1 (Jean) torpedo bombers. In anticipation of the Chinese campaign she also received some brand-new Nakajima B5N1 (Kate) monoplane torpedo bombers. SORYU was fitted with a full-length flight deck (217m long and 26m wide). The long shiny objects under her port flight deck are 127mm twin AA gun barrels.

Page 80. SORYU anchored at Sukumo Bay, Shikoku, in late April or early May 1939, photographed from destroyer OBORO. From this angle her island seems to be disproportionately small in comparison with the long sleek hull and SORYU's near sister HIRYU was generally considered to be more impressive looking. Nevertheless, this photo also reveals how smoothly the island blended with the hull of the fast carrier. Note the sunlit twin funnel uptakes, angled downwards.

On the right, the stern of light RYUJO is faintly visible. After the HIRYU was commissioned in July 1939 and assigned to CarDiv 2 in November, RYUJO became a special reserve ship.

Page 81. Top picture. This photo of CarDiv 2 flagship SORYU was taken in Ariake Bay, Kyushu in April 1939, probably from one of her escorting DesDiv 7 destroyers. This one and the photo on page 71 are the only full starboard views of SORYU available. At this angle her island seems to be rather small; in fact, it has been reported that SORYU's compass bridge was even narrower than that of a destroyer. Machinery spaces were located amidships: eight Kampon RO type oil-fired boilers were accommodated in separate compartments, and engines in four adjacent cells.

Bottom picture. CarDiv 2's two carriers resting at anchor in Sukumo Bay either in late April or early May 1939. The carrier anchored to the right is SORYU and to the left, RYUJO. Two aircraft with folded wings parked at SORYU's stern deck are the new Nakajima B5N1 (Kate) torpedo bombers while RYUJO is carrying a mix of Mitsubishi A5M4 (Claude) fighters and Aichi D1A2 (Susie) biplane dive-bombers. Note that in comparison with RYUJO SORYU's fantail is more elevated; she also lacks the traditional aircraft-loading ramp at the rear end of the hangars, which was removed to improve seaworthiness. Note the location of the 127 and 25mm AA guns starboard aft.

Page 82. Top picture. This photo was taken from the vicinity of SORYU's port aft 127mm AA gun, looking forward. Radio masts are in lowered position; the thin horizontal object top right is in all likelihood a wing of a parked aircraft. Farther away steams a heavy cruiser (either CHOKAI or MAYA). While returning from the attack on the Pearl Harbor, SORYU was diverted to support the occupation of Wake in December 1941. After January 1942, CarDiv 2 participated in strikes against Ambon and Port Darwin, later swept the area south Java in search of enemy shipping and raided the Indian Ocean in early April. This photo was evidently taken sometime during the southern campaign.

Bottom picture. SORYU anchored at Staring Bay on 22 February 1942 (photographed from HAGURO). In the background left is KAGA. After the capture of Java CarDiv 2 returned to Staring Bay in anticipation of the raid to the Indian Ocean. This photo clearly shows bridge wind deflector and Type 94 AA director on the top of the island, as well as 25mm twin AA guns under the bow. Ranged on the flight deck are Aichi D3A1 (Val) dive-bombers.

Page 83. Top picture. During the Battle of Midway, SORYU embarked A6M2 Type 0 Zero fighters, Aichi D3A1 (Val) Type 99 dive-bombers and Nakajima B5N2 (Kate) Type 97 torpedo bombers (21 each). Her first (and only) strike on 4 June 1942 was directed against the airfield on Eastern Island. While preparing to launch the second strike, SORYU was attacked by B-17s stationed on Midway. This photo taken from a B-17D shows SORYU frantically trying to evade 500lb bomb hits (note the white splashes). This time SORYU escaped without any damage but soon thereafter she received three fatal hits from SBD Dauntless dive-bombers, which set the whole carrier ablaze.

Bottom picture. As the flagship of Rear Admiral Tamon Yamaguchi's CarDiv 2, SORYU participated in the attack on Pearl Harbor and supported the Second Invasion of Wake before returning to home waters. In early 1942 CarDiv 2 was sent to East Indies, covering the invasion of Ambon and attacking Tjilatjap, as well as Darwin in Australia. During the raid into the Indian Ocean CarDiv 2 attacked Colombo and Trincomalee, sinking HMS HERMES. It was in June in the Battle of Midway when its luck finally ran out. This picture taken on 4 June 1942 shows SORYU maneuvering at high speed again.

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AIRCRAFT-HANDLING FACILITIES OF THE SORYU CLASS.

By Takao Ishibashi

Page 84 caption. A Yokosuka B3Y1 Type 92 torpedo biplane landing on SORYU in December 1937. In this photo several landing aids used on SORYU are clearly visible. Note the middle elevator abaft the plane (which seems to have caught the fourth wire), white centerline marking and steam vent in the foreground. A lowered crash barrier can be seen on the forward deck with an expansion joint just in the middle of two cables.

The lineage of aircraft-handling facilities used on Japanese carriers runs back to the first dedicated IJN carrier HOSHIO. All subsequent flattops from AKAGI to RYUJO served as experiments to gather the necessary know-how. SORYU and HIRYU became the first Japanese carriers equipped with truly effective aircraft-handling facilities.

The most essential aspect of such facilities is the deck landing system. SORYU and HIRYU were fitted with Kure Type 4 arrester wires accepted by the IJN on 20 December 1935. This gear used electric energy to absorb the momentum of landing aircraft. An induction coil drum underneath the deck served as the arresting engine. The ends of each arresting wire were attached to cables spooled around the drum ends. When the wire was caught, revolving drum induced electric energy that was used to bring the plane to a stop. Type 4 could stop a 4-ton aircraft traveling at a speed of 30mps (acceleration 2,0 G's) in less than 40 meters. The released wire was electrically retrieved in 12 seconds. Both carriers were fitted with nine sets of arrester wires, two located forward of the crash barriers and seven aft (three and six on HIRYU). Wires ran 100-150mm above the deck.

SORYU was also the first Japanese carrier equipped with a crash barrier. The first such device was completed in April 1935 as "Kure type aircraft arresting gear". In December 1935 it was accepted by the IJN as Kusho Type 1 crash barrier. SORYU and HIRYU carried an improved version designed as Kusho Type 3. Such a barrier incorporated three steel cables stretched between two supporting poles (middle cable 2.5 meters above the deck). The barrier was raised hydraulically. After a plane had engaged the barrier, supporting poles folded inwards and were then raised again with the help of compressed air. Kusho Type 3 could stop a 4-ton aircraft traveling at a speed of 15mps in less than 7 meters. Both carriers had two fixed crash barriers installed between the foremost and middle elevators. In addition, SORYU carried two and HIRYU three mobile crash barriers. The mobile crash barrier was a simplified version of the fixed device. On SORYU they were located between the forward and middle elevator, HIRYU carried another one in the same area, somewhat abaft.

Both carriers had three elevators (forward, middle and aft). SORYU's forward elevator measured 16m by 11.5m, middle 12m by 11.5m, and aft 10m by 11.5m. HIRYU's elevators were somewhat larger: the forward one measured 16m by 13m, middle 12m by 13m, and aft 13m by 11.8m. The double hangar was divided into three compartments with corresponding bulkheads just forward of each elevator. Upper and lower hangar compartments were roughly equal in size except for the forward lower one, which was marginally shorter. The flight deck was covered with wood planking except its forward and aft ends, which were covered with steel. The port and starboard edges of the flight deck were also made of steel. On SORYU class, flight deck was not the 'strength' deck and to avoid warping it was provided with expansion joints.

Initially planes were loaded on board via a special ramp located at the rear end of the hangars. After the Fourth Fleet incident and other similar accidents this ramp was considered prone to flooding in high seas and removed. Later the aircraft were hoisted directly on deck with the help of a collapsible 4-ton crane mounted alongside the aft elevator (flush with the deck when not in use). Such crane became a characteristic

feature on all subsequent Japanese carriers. A hydraulically raised propeller blast screen was installed on the flight deck in front of the forward elevator. The SORYU class also introduced a sophisticated landing guidance system previously tested on HOSHO and other carriers. This system may be considered a forerunner of the modern mirror optical landing system. The visual landing aid system used on SORYU class consisted of fixed green datum reference lights along the edges of the flight deck just in front of the aft elevator. Further forward were red guiding lights with a raise and lower mechanism. The pilot could correct his glide path while maintaining a 4 to 6 degree descent angle to a centered line formed by red and green lights. Although originally developed for night landings, the same system was later extensively used by day. Further assistance for night landing and take-off was provided by steam vent illumination at the bow and stern lights. Special lights also marked the flight deck centerline. Protruding landing signal platforms and conspicuous "zebra-style" stripes marked the landing area. Amidships on both sides were supports for aircraft recovery nets. Similar nets fore and abaft were provided for the crews of ditching planes. SORYU class introduced these latter features. This new class was well received by the navy and all the abovementioned facilities became standard on later Japanese carriers.

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IJN HIRYU  
TABULAR RECORD OF MOVEMENT  
By Hisashi Date

8 July 1936:  
Laid down at Yokosuka Navy Yard.

16 November 1937:  
Launched.

1 April 1939:  
Captain Ryuzo Takenaka is assigned as Equipping Officer.

5 July 1939:  
Commissioned in IJN, assigned to Sasebo Naval District, Kyushu.

15 November 1939:  
Assigned to Second Fleet, CarDiv 2. Captain Ichihei Yokokawa is assigned as Commanding Officer.

26 March 1940:  
Departs Nakagusuku Bay, Okinawa, to operate in South China Sea with her near sister SORYU.

2 April 1940:  
Arrives at Kirun (now Chi-lung), Taiwan.

1 May 1940:  
Arrives at Sasebo.

9 May 1940:  
Drydocked at Sasebo Navy Yard.

17 May 1940:  
Leaves drydock.

21 May 1940:  
Departs Sasebo.

24 May 1940:  
Arrives at Tateyama.

23 June 1940:  
Proceeds to Mikawa Bay.

25 June 1940:  
Proceeds to Ise Bay.

29 June 1940:  
Proceeds to Yokosuka to join SORYU.

5 July 1940:  
Proceeds to Tateyama.

22 July 1940:  
Returns to Yokosuka.

24 July 1940:  
Departs Yokosuka with SORYU.

29 July 1940:  
Arrives at Hakodate, Hokkaido.

1 August 1940:  
Departs Hakodate.

5 August 1940:  
Arrives at Ise Bay.

8 August 1940:  
Departs Ise.

10 August 1940:  
Arrives at Saeki Bay, Kyushu.

22 August 1940:  
Proceeds to Sukumo Bay, Shikoku.

27 August, 1940:  
Proceeds to Beppu, Kyushu.

31 August 1940:  
Returns to Saeki.

3 September 1940:  
Proceeds to Muroto Bay, Shikoku.

9 September 1940:  
Proceeds to Kure.

14 September 1940:  
Departs Kure.

15 September 1940:  
Arrives at Yokosuka.

17 September 1940:  
Departs Yokosuka to support the invasion of northern French Indochina.

19 September 1940:  
Arrives at Mako, Pescadores.

20 September 1940:  
Departs Mako.

21 September 1940:  
Arrives at Samah (now San-ya), Hainan.

22 September 1940:  
Departs Samah.

28 September 1940:  
Returns to Samah.

29 September 1940:

Departs Samah.

6 October 1940:  
Returns to Yokosuka.

11 October 1940:  
HIRYU and SORYU participate in Imperial Naval Review in Yokohama Bay.

12 October 1940:  
Departs Yokohama.

13 October 1940:  
Arrives at Sasebo.

5 November 1940:  
Drydocked at Sasebo Navy Yard.

15 November 1940:  
Capt. Yokokawa is relieved by Captain Shikazo Yano.

19 November 1940:  
Leaves drydock.

3 December 1940:  
Departs Sasebo for Terashima Channel.

9 December 1940:  
Arrives at Sasebo via Terashima.

14 December 1940:  
Departs Sasebo.

16 December 1940:  
Arrives at Saeki.

4 January 1941:  
Proceeds to Hosojima.

14 January 1941:  
Proceeds to Saeki.

18 January 1941:  
Returns to Hosojima.

21 January 1941:  
Arrives at Kure.

26 January 1941:  
Proceeds to Iwakuni Bay.

1 February 1941:  
Departs Iwakuni to operate in South China Sea with SORYU.

5 February 1941:  
Arrives at Takao (now Kao-hsiung), Taiwan.

22 February 1941:  
Departs Takao.

24 February 1941:  
Arrives at Nakagusuku Bay.

25 February 1941:  
Departs Nakagusuku.

3 March 1941:  
Arrives at Takao.

7 March 1941:  
Departs Takao.

12 March 1941:  
Arrives at Ariake Bay, Kyushu, to join SORYU.

24 March 1941:  
Departs Ariake.

25 March 1941:  
Arrives at Sasebo.

29 March 1941:  
Drydocked at Sasebo Navy Yard.

10 April 1941:  
Assigned to First Air Fleet, CarDiv 2 with SORYU.

16 April 1941:  
Leaves drydock.

26 April 1941:  
Departs Sasebo.

27 April 1941:  
Arrives at Hosojima.

30 April 1941:  
Arrives at Mimizu Bay.

7 May 1941:  
Returns to Hosojima Bay.

20 May 1941:  
Proceeds to Ariake Bay to join SORYU.

25 May 1941:  
Returns to Hosojima Bay.

30 May 1941:  
Proceeds to Beppu.

5 June 1941:  
Returns to Hosojima Bay.

21 June 1941:  
Departs Hosojima.

30 June 1941:  
Arrives at Yokosuka.

10 July 1941:  
CarDiv 2 departs Yokosuka to support the invasion of southern French Indochina.

14 July 1941:  
Arrives at Mako to depart same day.

16 July 1941:  
Arrives at Samah.

25 July 1941:  
Departs Samah.

30 July 1941:  
Arrives at port Cap St. Jacques (now Vung Tau, Vietnam) to depart on the same day.

1 August 1941:  
Returns to Samah to depart on the same day.

7 August 1941:  
Arrives at Sasebo.

11 August 1941:  
Departs Sasebo to operate off Kyushu.

8 September 1941:  
Arrives at Yokosuka. Capt. Yano is relieved by Captain Tomeo Kaku.

1 October 1941:  
Drydocked at Yokosuka Navy Yard.

8 October 1941:  
Leaves drydock.

24 October 1941:  
Departs Yokosuka with SORYU.

26 October 1941:  
Arrives at Kushikino, Kyushu.

1 November 1941:  
Proceeds to Ariake Bay.

4 November 1941:  
Departs Ariake.

7 November 1941:  
Arrives at Kure.

13 November 1941:  
Departs Kure.

16 November 1941:  
Arrives at Saeki.

18 November 1941:  
CarDiv 2 departs Saeki for Kuriles.

22 November 1941:  
Arrives at Hitokappu Bay, Etorofu.

26 November 1941:  
Departs Hitokappu with Mobile Fleet for Hawaii.

7 December 1941: Attack on Pearl Harbor.  
HIRYU launches two strikes. First strike: 18 Kate torpedo bombers led by Lt. Hirata Matsumura and Lt.Cdr. Tadashi Kusumi, 6 Zero fighters led by Lt. Kiyokuma Okajima. Losses: none. Second strike: 18 Val dive-bombers led by Lt. Shun Nakagawa and 9 Zero fighters led by Lt. Sumio Nono. Losses: 4 Vals, one Zero (pilot PO1c Shigenori Nishikaichi crash-lands on Niihau Island, becoming for the next few days the second Japanese POW of the Pacific War after Ens. Kazuo Sakamaki).

21 December 1941:  
CarDiv 2 detached to support the Second Invasion of Wake, launches the first strike against the island.

22 December 1941:  
Next strike against Wake.

23 December 1941:  
End of Wake operation.

29 December 1941:  
Returns to Kure. Overhaul and replenishment.

11 January 1942:

Proceeds to Hashirajima.

12 January 1942:  
CarDiv 2 departs Hashirajima for Palau.

17 January 1942:  
Arrives at Palau.

21 January 1942:  
CarDiv 2 departs Palau, escorted by fast battleship HARUNA, heavy cruiser MAYA and destroyers.

23 January 1942:  
HIRYU and SORYU launch strike against Ambon to support the Kendari landings.

24 January 1942:  
Next strike against Ambon.

25 January 1942:  
Arrives at Davao, Mindanao.

27 January 1942:  
Departs Davao.

28 January 1942:  
Returns to Palau.

15 February 1942:  
Departs Palau with the AKAGI, KAGA, fast battleships HIEI and KIRISHIMA, heavy cruisers TONE and CHIKUMA, light cruiser ABUKUMA and destroyers.

19 February 1942:  
Carrier Striking Force launches a strike against Port Darwin, Australia. HIRYU's Zeros bounce Maj. Floyd Pell's P-40 Kittyhawks ('A' Flight of 33rd Pursuit Squadron). PO Hajime Toyoshima ditches his Zero on Melville Island and becomes the first Japanese POW to be captured on the Australian mainland.

21 February 1942:  
Carrier Striking Force arrives at Staring Bay, Celebes.

25 February 1942:  
Departs Staring to support the invasion of the Netherlands East Indies.

1 March 1942:  
CarDiv 2 supports fleet operations in Java area.

5 March 1942:  
HIRYU and SORYU launch strike against Tjilatjap (now Cilacap), Java.

7 March 1942:  
HIRYU and SORYU launch a strike against Christmas Island.

11 March 1942:  
Returns to Staring Bay.

26 March 1942:  
Departs Staring to participate in the raid to the Indian Ocean.

5 April 1942:  
HIRYU and SORYU participate in strike against Colombo. Later that day CarDiv 2 and AKAGI launch a strike sinking the heavy cruisers HMS CORNWALL and DORSETSHIRE.

9 April 1942:  
HIRYU and SORYU participate in strike against Trincomalee.

22 April 1942:  
Returns to Sasebo.

24 May 1942:  
Proceeds to Hashirajima.

27 May 1942:  
Carrier Striking Force departs Hashirajima to participate in the Battle of Midway, escorted by heavy cruisers TONE and CHIKUMA, light cruiser ABUKUMA and 11 destroyers.

4 June 1942: Battle of Midway.

HIRYU launches 17 torpedo bombers led by Lt. Joichi Tomonaga and 9 Zeros under Lt. Yasuhiro Shigematsu against Sand Island, Midway; 3 Kates are shot down, 2 ditched. HIRYU recovers aircraft from stricken carriers and launches two successive strikes against Rear Admiral Frank J. Fletcher's TF 17 (USS YORKTOWN).

First strike with 18 Val dive-bombers led by Lt. Michio Kobayashi and 6 Zeros led by Lt. Shigematsu damages YORKTOWN with three bombs; losses: 13 Vals, 3 Zeros, one fighter ditched.

Second strike with 10 Kates led by Lt. Tomonaga and Lt. Toshio Hashimoto escorted by 6 Zeros led by Lt. Shigeru Mori scores two torpedo hits. Losses: 5 Kates and 2 Zeros, one fighter ditched.

HIRYU is in turn attacked by Dauntless dive-bombers north of Midway and receives four bomb hits.

5 June 1942:

At 0510 (0210 Tokyo time--Ed.), HIRYU is scuttled by MAKIGUMO at 31-27'N, 179-23'W. CO Kaku and 416 crewmembers are lost (eventually, 35 were taken aboard the seaplane tender USS BALLARD-Ed.).

25 September 1942:  
Removed from Navy List.

IJN SORYU

TABULAR RECORD OF MOVEMENT  
By Hisashi Date

20 November 1934:  
Laid down at Kure Navy Yard.

23 December 1935:  
Launched.

16 August 1937:  
Captain Akitomo Beppu is assigned as Equipping Officer.

1 December 1937:  
Capt. Beppu is relieved by Captain Kimpei Teraoka.

29 December 1937:  
Commissioned in IJN, assigned to Yokosuka Naval District, Second Fleet, CarDiv 2

9 April 1938:  
Departs Terashima Channel to operate in South China Sea.

14 April 1938:  
Arrives at Takao, Taiwan.

8 May 1938:  
Departs Sasebo to operate in East and South China Sea.

4 June 1938:  
Returns to Yokosuka.

9 October 1938:  
Departs Mako to operate in South China Sea.

14 November 1938:

Arrives at Takao.

15 November 1938:  
Captain Teraoka is relieved by Capt. Keizo Uwano.

21 March 1939:  
Departs Sasebo to operate in East China Sea.

2 April 1939:  
Returns to Sasebo.

15 October 1939:  
Captain Uwano is relieved by Captain Sadayoshi Yamada.

31 October 1939:  
Departs Yokosuka to operate in South China Sea.

26 March 1940:  
Departs Nakagusuku Bay, Okinawa, to operate in South China Sea with her near sister HIRYU.

2 April 1940:  
Arrives at Kirun, Taiwan.

1 May 1939:  
Returns to Yokosuka.

29 May 1940:  
Drydocked at Yokosuka Navy Yard.

6 June 1940:  
Leaves drydock.

8 June 1940:  
Proceeds to Tateyama.

22 June 1940:  
Proceeds to Kisarazu.

29 June 1940:  
Returns to Yokosuka.

5 July 1940:  
Proceeds to Tateyama.

22 July 1940:  
Returns to Yokosuka.

24 July 1940:  
Departs Yokosuka.

29 July 1940:  
Arrives at Hakodate, Hokkaido.

1 August 1940:  
Departs Hakodate.

5 August 1940:  
Arrives at Ise Bay.

8 August 1940:  
Departs Ise.

10 August 1940:  
Arrives at Saeki Bay, Kyushu.

22 August 1940:

Proceeds to Sukumo Bay, Shikoku.

27 August 1940:  
Proceeds to Beppu, Kyushu.

2 September 1940:  
Returns to Yokosuka.

13 September 1940:  
Drydocked at Yokosuka Navy Yard.

1 October 1940:  
Leaves drydock.

11 October 1940:  
SORYU and HIRYU participate in Imperial Naval Review in Yokohama Bay.

15 October 1940:  
Capt. Yamada is relieved by Captain Wataru Kamase.

25 November 1940:  
Capt. Kamase is relieved by Captain Kanae Kosaka.

2 December 1940:  
Drydocked at Yokosuka Navy Yard.

9 December 1940:  
Leaves drydock.

17 December 1940:  
Proceeds to Tateyama.

25 December 1940:  
Departs Tateyama.

29 December 1940:  
Arrives at Ariake Bay, Kyushu.

22 January 1941:  
Proceeds to Kure.

26 January 1941:  
Departs Kure, arrives at Iwakuni same day.

1 February 1941:  
Departs Iwakuni to participate in naval maneuvers off Taiwan.

3 February 1941:  
Collision with destroyer YUZUKI.

6 February 1941:  
Enters Sasebo for repairs.

18 February 1941:  
Departs Sasebo.

20 February 1941:  
Arrives at Takao to join HIRYU.

22 February 1941:  
CarDiv 2 departs Takao.

24 February 1941:  
Arrives at Nakagusuku Bay.

26 February 1941:  
Departs Nakagusuku.

3 March 1941:  
Arrives at Takao.

7 March 1941:  
Departs Takao.

11 March 1941:  
Arrives at Ariake Bay.

24 March 1941:  
Departs Ariake.

26 March 1941:  
Returns to Yokosuka.

10 April 1941:  
Assigned to First Air Fleet, CarDiv 2 with HIRYU.

20 April 1941:  
Proceeds to Tateyama.

17 May 1941:  
Departs Tateyama.

20 May 1941:  
Arrives at Ariake Bay to join HIRYU.

21 June 1941:  
Departs Ariake.

30 June 1941:  
Returns to Yokosuka.

10 July 1941:  
Departs Yokosuka to support the invasion of southern French Indochina with HIRYU.

14 July 1941:  
Arrives at Mako to depart same day.

16 July 1941:  
Arrives at Samah, Hainan.

24 July 1941:  
Departs Samah.

30 July 1941:  
Arrives at port Cap St. Jacques to depart same day.

1 August 1941:  
Returns to Samah to depart same day.

7 August 1941:  
Arrives at Sasebo.

11 August 1941:  
Departs Sasebo to operate off Kyushu.

8 September 1941:  
Returns to Yokosuka.

12 September 1941:  
Captain Kiichi Hasegawa (CO of AKAGI) assumes joint command of SORYU.

1 October 1941:  
Drydocked at Yokosuka Navy Yard.

6 October 1941:  
Capt. Hasegawa is relieved by Captain Ryusaku Yanagimoto.

8 October 1941:  
Leaves drydock.

24 October 1941:  
Departs Yokosuka.

26 October 1941:  
Arrives at Kushikino, Kyushu.

1 November 1941:  
Proceeds to Ariake Bay.

4 November 1941:  
Departs Ariake.

7 November 1941:  
Arrives at Kure.

13 November 1941:  
Departs Kure.

16 November 1941:  
Arrives at Saeki.

18 November 1941:  
CarDiv 2 departs Saeki for Kuriles.

22 November 1941:  
Arrives at Hitokappu Bay, Etorofu.

26 November 1941:  
Departs Hitokappu with Mobile Fleet for Hawaii.

7 December 1941: Attack on Pearl Harbor.  
SORYU launches two strikes. First strike: 18 Kate torpedo bombers led by Lt. Tsuyoshi Nagai and Lt. Heijiro Abe, escorted by 8 Zero fighters led by Lt. Masaharu Suganami. Second strike: 18 Val dive-bombers led by Lt.Cdr. Takashige Egusa and 9 fighters led by Lt. Fusata Iida; losses 4 Vals and 3 Zeros, including Lt. Iida.

21 December 1941:  
CarDiv 2 detached to support the //Second Invasion// of Wake, launches the first strike against the island, consisting of 18 dive-bombers and 18 fighters.

22 December 1941:  
Second strike against Wake: 18 Kates and 18 Zeros; losses: 2 Kates.

23 December 1941:  
End of Wake operation.

29 December 1941:  
Returns to Kure. Overhaul and replenishment.

11 January 1942:  
Proceeds to Hashirajima.

12 January 1942:  
CarDiv 2 departs Hashirajima.

17 January 1942:  
Arrives at Palau.

21 January 1942:  
Departs Palau.

23 January 1942:  
SORYU and HIRYU launch strike against Ambon to support the Kendari landings.

24 January 1942:  
Next strike against Ambon.

25 January 1942:  
CarDiv 2 arrives at Davao, Mindanao.

27 January 1942:  
Departs Davao.

28 January 1942:  
Arrives at Palau.

15 February 1942:  
Departs Palau.

19 February 1942:  
SORYU and HIRYU participate in a strike against Port Darwin, Australia.

21 February 1941:  
Carrier Striking Force arrives at Staring Bay, Celebes.

25 February 1942:  
Departs Staring to support the invasion of Java Island.

1 March 1942:  
CarDiv 2 supports fleet operations in Java area. SORYU and AKAGI sink the oiler USS PECOS.

5 March 1942:  
SORYU and HIRYU launch strike against Tjilatjap, Java.

7 March 1942:  
SORYU and HIRYU launch a strike against Christmas Island.

11 March 1942:  
Returns to Staring Bay.

26 March 1942:  
Departs Staring Bay to participate in the raid to the Indian Ocean.

5 April 1942:  
SORYU launches strike against Colombo, Ceylon. Later launches strike against HMS CORNWALL and DORSETSHIRE led by Lt.Cdr. Egusa.

9 April 1942:  
SORYU launches strike against Trincomalee. Later launches strike against HMS HERMES led by Lt.Cdr. Egusa.

22 April 1942:  
Returns to Kure.

27 May 1942: Departs Hashirajima to participate in Battle of Midway.

4 June 1942: Battle of Midway.  
SORYU launches a strike against Eastern Island, Midway, including 18 Kate torpedo bombers led by Lt. Abe and 9 Zero fighters under Lt. Sukanami. Losses: 1 Kate shot down, 2 ditched. Prior to launch of the the second strike, SORYU is attacked by Dauntless dive-bombers and receives three hits, starting large fires which finally explode aerial bombs in magazines. At 1920 (1620 Tokyo time--Ed.) SORYU sinks at 30-42'N, 178-38'W with CO Yanagimoto and 718 crewmembers.

10 August 1942:  
Removed from Navy List.

By Hisashi Date

1 October 1942:

Laid down at Mitsubishi Nagasaki Yard.

15 October 1943:

Launched.

10 August 1944:

Commissioned in IJN, assigned to Yokosuka Naval District, Third Fleet, CarDiv 1. Captain Kamenosuke Yamamori is assigned as Commanding Officer.

23 October 1944:

Capt. Yamamori is relieved by Captain Toshio Miyazaki.

15 November 1944: AMAGI is reassigned to Combined Fleet, CarDiv 1.

1 January 1945:

AMAGI is reassigned to Second Fleet, CarDiv 1

10 February 1945:

CarDiv 1 HQ disbanded. AMAGI is directly subordinated to ComSecond Fleet.

19 March 1945:

During the air raid on Kure, AMAGI receives one bomb hit.

20 April 1945:

AMAGI is reassigned to Kure Naval District, 4th Reserve Unit.

24 July 1945:

Despite heavy camouflage at her new mooring near Mitsukoshima Island, AMAGI receives 3 bomb hits on the flight deck.

28 July 1945:

During the next raid on Kure, a number of near hits damages AMAGI. As a result of progressive flooding she then founders in shallow water.

30 November 1945:

Removed from Navy List.

5 December 1946:

Harima Zosen Yard in Kure begins the scrapping of AMAGI (completed on 11 December 1947).

IJN KATSURAGI

TABULAR RECORD OF MOVEMENT

By Hisashi Date

8 December 1942:

Laid down at Kure Navy Yard.

19 January 1944:

Launched.

15 October 1944:

Commissioned in IJN, assigned to Sasebo Naval District; reassigned to Third Fleet, CarDiv 1 same day. Captain Masaharu Kawabata is assigned as Commanding Officer. KATSURAGI proceeds to holding position in western Inland Sea.

15 November 1944:

Reassigned to Combined Fleet, CarDiv 1.

1 January 1945:

Reassigned to Second Fleet, CarDiv 1.

4 February 1945:

Drydocked at Kure Navy Yard for final fitting-out.

10 February 1945:

CarDiv 1 disbanded; KATSURAGI is reassigned to Kure Naval District.

18 March 1945:

Leaves drydock.

19 March 1945:

During the air raid on Kure, KATSURAGI receives a bomb hit to flight deck bow area.

20 April 1945:

Captain Toshio Miyazaki is assigned as Commanding Officer.

24 July 1945:

During the next air raid on Kure, KATSURAGI receives a bomb-hit port amidships.

28 July 1945:

During the next air raid on Kure, KATSURAGI receives two more bomb hits on flight deck. Due to extensive damage she remains immobile until the end of the war.

20 October 1945:

Removed from Navy List. KATSURAGI is later used as repatriation ship for many voyages between Japan and southern regions.

22 December 1946:

KATSURAGI is broken up at Hitachi Sakurajima Yard of Osaka (work completed on 30 November 1947).

IJN KASAGI

TABULAR RECORD OF MOVEMENT.

By Hisashi Date

14 April 1943:

Laid down at Mitsubishi Nagasaki Yard.

19 October 1944:

Launched. Proceeds to Sasebo Navy Yard for final fitting-out.

20 January 1945:

Captain Tamotsu Oishi is assigned as Equipping Officer.

5 March 1945:

Capt. Oishi is relieved by Captain Yujiro Murota.

March 1945:

KASAGI's construction is stopped when she is complete by 84 per cent (i.e. up to the flight deck).

1 April 1945:

Capt. Murota is relieved of his command due to end of works.

15 August 1945:

At the end of the war incomplete at Sasebo.

1 September 1946:

KASAGI's hulk is broken up at Sasebo Sempaku Yard (work completed on 31 December 1947).

IJN ASO

TABULAR RECORD OF MOVEMENT.

By Hisashi Date

8 June 1943:

Laid down at Kure Navy Yard.

1 November 1944:

Launched. The construction is stopped soon thereafter.

July 1945:

ASO's hulk is used as target for 'Sakura-dan' suicide/hollow-charge weapons. After receiving a number of hits she finally founders due to progressive flooding.

15 August 1945:

At the end of the war grounded in Kurahashi-Jima Bight.

21 December 1946:

ASO's hulk is broken up at Harima Zosen Yard in Kure (work completed on 26 April 1947).

IJN IKOMA

TABULAR RECORD OF MOVEMENT. By Hisashi Date

5 July 1943:

Laid down at Kawasaki Kobe Yard.

17 November 1944:

Launched.

15 August 1945:

At the end of the war, the incomplete carrier is moored at Shozu-Jima Island.

4 June 1946:

IKOMA's hulk is broken up at Mii Yard in Tamano (Okayama prefecture). Work completed on 10 March 1947.

Page 88. Top picture. Just like SORYU, HIRYU was ordered under the Second Replenishment Program. HIRYU's design was essentially based on that of her sister but modified in light of the Fourth Fleet incident of 1935. She was laid down at Yokosuka Navy Yard in July 1936. While usually listed as the "near sister" of the SORYU, HIRYU's appearance and hull layout were rather different. Her construction proceeded according to schedule and launching ceremony took place on 16 November 1937. This photo was taken on the same day. The hallmark of Yokosuka Navy Yard, the giant gantry crane is visible in the background. Bottom picture. After her launch HIRYU was fitted out at Koumi pier in Yokosuka. This photo shows her on 20 February 1939. After the Fourth Fleet incident welding was almost totally abandoned in large warship construction in favor of riveting. With flight deck and sponsons fitted, the ship now looks more like a carrier although the aft elevator is still suspended over the deck. Note the smoke streaming from the funnels - the boilers seem to be already working.

Page 89. HIRYU during fitting-out at Koumi pier on 20 May 1939, when half of her acceptance trials were already completed. The rear flight deck and 25mm AA gun foundations are still surrounded by scaffoldings. Note what seems to be a prominent torpedo bulge amidships; in reality this is a part of the outward-canted hull side. Twin 127mm AA guns starboard aft are provided with an anti-smoke shield; radio masts and aircraft handling crane are also installed. The 'man-of-war' in the background is battleship MUTSU.

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ARMOR PROTECTION AND FIRE-PRECAUTION MEASURES ON IJN CARRIERS

By Noriki Suzuki

An aircraft carrier's strength is vested in her air group. At the same time she remains one of the most vulnerable warships. Once even a single bomb penetrates her flight deck, airplanes in the hangars and avgas tanks deeper inside are in grave danger. Even if avgas tanks are not hit directly, a nearby shock may result in an explosion with possibly fatal consequences.

A carrier with armored decks has been since long a dream of many naval designers but stability and other technical considerations delayed the appearance of such a vessel for many years. The first true armored carrier was HMS ILLUSTRIOUS, commissioned in 1940. This innovative vessel featured 76mm armored flight deck supplemented by 32mm hangar deck armor. The first armored Japanese carrier TAIHO was completed in 1944.

In addition to aforementioned hangar deck protection, some IJN carriers were designed so as to vent the in-hangar explosion blast outwards in an attempt to minimize any structural damage to the flight deck. Such a protection scheme was employed on SHOKAKU class and other carriers.

In addition, Japanese carriers were fitted with state-of-the-art fire fighting equipment, such as fire extinguishers, carbon dioxide systems, sprinklers and firewalls, but their effectiveness was limited. Later in the war IJN carriers were equipped with a new type of foam extinguisher using a mixture of soap and seawater.

Avgas storage tanks were accommodated in well-protected compartments below the waterline. Nevertheless they remained susceptible to damage because even a minor hull 'whip' could rupture the tanks and release highly flammable fumes. This was once again demonstrated during the Battle of the Philippine Sea when the torpedoed TAIHO was lost to such an explosion.

Each nation used different methods to reduce fire hazard. On IJN carriers avgas tanks were accommodated in airtight compartments and the surrounding spaces were often ventilated. Nevertheless, even these meticulous safety procedures still failed to prevent the loss of the brand-new TAIHO. After that battle the avgas storage tanks on remaining Japanese carriers were surrounded with a one-meter thick concrete layer. On U.S. carriers seawater was pumped into empty tanks to avoid the formation of such volatile vapors.

Page 90. 28 April 1939. HIRYU at full speed off Tateyama Bight. On this day the weather in Tokyo Bay area was fine and the carrier steaming along Boso coast raised a foam-crested bow wave. During the trials she made 34 knots, proving able to operate together with SORYU. Note that while the sponson-mounted twin 127mm AA guns are already present, the Type 94 AA director on the bridge and the 25mm AA guns has not yet been fitted. Two of the radio masts are in lowered position. There are several photos depicting HIRYU during her trials but this one is generally considered to be one of the finest.

Page 91. Top picture. 28 April 1939. HIRYU running the measured mile. During the trials the carrier made 34.28kts with 152,733shp at 326rpm and a displacement of 20,346ts. The main difference in comparison with SORYU was the port amidships location of the island, proposed by Koku Hombu to simplify the supervision of flight operations. While from the viewpoint of stability the port island was well counterbalanced by starboard funnels, landing trials on similarly fitted AKAGI revealed the disadvantages of such arrangement. On the following SHOKAKU class carriers the island was situated to starboard and so AKAGI and HIRYU remained the only IJN carriers with portside islands.

Bottom picture. One more photo of HIRYU running her trials off Tateyama, this one taken on 21 June 1939. Note the bow wave and starboard funnel uptakes. Both SORYU class carriers were fitted with the same machinery used on SUZUYA and TONE class heavy cruisers. There were eight oil-fired Kampon RO type boilers located in separate compartments and four Kampon geared turbines in adjacent cells, providing an ideal four-shaft arrangement. In contrast with SORYU's fully balanced twin rudder, HIRYU featured a semi-balanced single rudder.

Page 92. Top picture. HIRYU on a high speed run off Tateyama Bight on 21 June 1939. Such heavy smoke streaming from the funnels necessitated anti-smoke shields to be installed on starboard AA guns and corresponding directors. This was another characteristic feature of IJN carriers. HIRYU was considered an almost ideal medium carrier and the wartime UNRYU class was based on the same design. Nevertheless, only the succeeding SHOKAKU class featured full-scale armor protection combined with sufficient range and air group.

Bottom picture. On 11 October 1940 an Imperial Naval Review took place in Yokohama Bay to celebrate the 2,600th anniversary of Emperor Jimmu's enthronement. 98 IJN warships with a total tonnage of 596,060ts were present. After supporting the occupation of northern French Indochina in September, HIRYU returned to Yokosuka via Samah (Hainan) to participate in this event. This photo was taken from heavy cruiser KAKO escorting Emperor Hirohito's battleship HIEI while approaching the remainder of the fleet. The vessels left to right are battleships KONGO, MUTSU and NAGATO, followed by HIRYU. Behind NAGATO SORYU is faintly visible, as well as battleships YAMASHIRO and ISE behind KONGO.

Page 93. Top picture. The Imperial Naval Review. This event celebrating the 2,600th anniversary of Emperor Jimmu's enthronement, remained the last such ceremony for both HIRYU and the Imperial Japanese Navy. Before the outbreak of the Pacific War the only photo of HIRYU released depicted her launch and Imperial Naval Review was the next occasion when the veil of secrecy surrounding the new carrier was lifted. To the joy of all warship fans, on that day many new IJN warships were publicly shown for the first time, including seaplane carriers CHITOSE, CHIYODA and MIZUHO, as well as heavy cruisers TONE and CHIKUMA.

Among the inspecting ships were heavy cruiser TAKAO (flagship of ComSecondFleet Vice Admiral Mineichi Koga), battleship HIEI, heavy cruisers FURUTAKA and KAKO. The ceremony was supervised by Commander-in-Chief of the Combined Fleet Vice Admiral Isoroku Yamamoto (flagship NAGATO). It is quite remarkable that these two photos depicting the ceremony were published despite traditional policy of strict censorship.

Among other warships aligned on the sunlit surface of Yokohama Bay are (front to rear and left to right) battleship KONGO (on one of the photos her sister HARUNA is also partially visible), farther away MUTSU and NAGATO, in next column HIRYU and AKAGI, and in a distance seaplane carrier KOMAHASHI, minelayer KATSURIKI, submarine tenders JINGEI and CHOGEI.

Bottom picture. Operation "A-Go" was launched on 20 May 1944 when Japanese fleet departed with the intention to destroy enemy naval forces in Central Pacific. This photo was taken on 15 June when Vice Admiral Ozawa's Mobile Fleet negotiated San Bernardino Strait. Just in front is aircraft cruiser MOGAMI; behind her CarDiv 1's SHOKAKU, ZUIKAKU (on the right) and TAIHO (in the middle) are soon changing their course. Two carriers further left are apparently CarDiv 2's JUNYO class sisters. Despite considerable distance, TAIHO island shape is clearly visible. Only a few days later USS ALBACORE sank the carrier in her very first battle.

Page 94. Top picture. This photo was evidently taken sometime prior to the Hawaii Operation in November 1941. In the center is HIRYU of CarDiv 2, far left a heavy cruiser of TONE class, on the right a NAGARA class light cruiser and far right another vessel resembling a fleet oiler. The photo carries a 'Top secret' stamp and we can assume that it depicts either the departure of the Carrier Striking Force from Saeki Bay or its buildup at Hitokappu Bay. On this photo the peculiar island location is clearly visible (only HIRYU and refitted AKAGI sported portside amidships islands).

Bottom picture. Vice Admiral Nagumo's Carrier Striking Force assembling in Staring Bay on 22 February 1942. This photo was taken from ATAGO, the flagship of the Southern Expeditionary Fleet. From the left there are heavy cruiser CHIKUMA, SORYU, a NIPPON MARU class fleet oiler, HIRYU and heavy cruiser TAKAO. ATAGO and TAKAO were later assigned to Vice Admiral Nobutake Kondo's Southern Force and other ships to Vice Admiral Chuichi Nagumo's Carrier Striking Force. Together they departed Staring Bay in late February to sweep the area south Java in search of enemy shipping--with considerable success.

Page 95. Nagumo's carriers returning from the raid to the Indian Ocean in April 1942. This photo taken from the battleship KONGO's port aft area sometime after the attacks on Ceylon bases. SORYU is seen steaming directly abaft and HIRYU farther right. All together, five IJN carriers participated in that raid, sinking HMS HERMES, CORNWALL, DORSETSHIRE, two destroyers, 23 merchant ships, downing 33 enemy planes and seriously damaging the ground installations in Colombo and Trincomalee.

Page 96. Top picture. On the morning of 4 June 1942, Kido Butai carriers were spotted by a PBV Catalina and attacked by planes stationed on Midway, arriving in several waves. This photo was taken during the attack of fifteen Boeing B-17s and shows HIRYU maneuvering at high speed, leaving a conspicuous wake. This high-level bomb run was followed by a dive-bomber attack but the carrier was not hit yet. Note the clearly visible deck markings and other landing aids, as well as bomb splashes.

Bottom picture. 5 June 1942. HIRYU blazes during the Battle of Midway. The day before, U.S. dive-bombers managed to surprise AKAGI, KAGA and SORYU, setting all of them afire. The remaining HIRYU managed to launch two counterstrikes single-handedly, inflicting severe damage to USS YORKTOWN. Shortly thereafter she was in turn attacked by enemy dive-bombers, bombed and set ablaze. She was ordered abandoned and torpedoed by escorting destroyer MAKIGUMO. Nevertheless, on the morning of the 5 June, a B4Y1 Type 96 torpedo plane from the light carrier HOSHO spotted her still drifting and made the following photos. On this particular view the damage of three direct bomb hits on forward flight deck is clearly visible.

Page 97. Top picture. Another picture taken by a Yokosuka B4Y1 (Jean) from HOSHO shows HIRYU drifting with perceptible list, engulfed in flames and smoke on the morning of 5 June 1942. Flight deck is heavily damaged and a fragment of its forward port section thrown against the island as a result of an in-hangar explosion. The fact that the carrier remained afloat after four bomb hits indicates that with proper damage control she could still have been saved. Destroyer TANIKAZE was dispatched to scuttle the carrier thereafter but she could not find HIRYU any more.

## MAIN DIFFERENCES BETWEEN SORYU AND HIRYU.

By Haruo Takahashi

The first Japanese medium carriers SORYU and HIRYU were authorized under the Second Replenishment Program. Originally they were designed as identical twins. However after the Fourth Fleet incident and similar accidents, the Bureau of Naval Aviation ordered changes to the second unit. Here follows a short description of differences between the two SORYU class carriers.

In terms of specifications, HIRYU was somewhat larger than her near sister. In comparison with SORYU, HIRYU's displacement was 1,000 tons larger (i.e. 19,000ts), beam (wl) 0.7m wider (22.0m), mean draft 0.1m deeper (7.5m) and the flight deck maximally 1m wider (27m). Although SORYU was 0.2 knots faster (34.5 knots), HIRYU had a 200nm longer range (8,000 nautical miles at 16 knots) while carrying 230 tons of additional fuel oil (a total of 3,630 tons).

The overall appearance and equipment of both carriers were also somewhat different. HIRYU's island structure was located port amidships and one deck higher. To improve seaworthiness in bad weather, her forecastle and fantail were also raised. HIRYU had a single semi-balanced rudder.

SORYU's island was located starboard and nearer to bow; HIRYU's one was moved further aft because it was felt that the forward siting could endanger aircraft during take-off. To improve general stability, funnels were mounted starboard and island to port.

It is interesting to note that the only other carrier sporting portside island was AKAGI (after her refit). All later Japanese carriers had their islands located starboard because it was discovered that portside location resulted in unwanted turbulence complicating the take-off and landing operations. It is a small wonder that all British and U.S. carriers were fitted with starboard islands.

HIRYU's forecastle was raised and situated one deck higher. Due to reduced clearance of lower decks her forecastle was only one meter higher (9m) than SORYU's. Incidentally, HIRYU's fantail was only 0.4m higher than that of SORYU.

Unlike HIRYU, SORYU featured fully balanced twin rudders in an attempt to improve her tactical diameter. This novelty proved to be a mixed blessing since even a slight movement of the helm resulted in rather violent response, which tended to increase the turning radius.

The last improvement incorporated into HIRYU's design was directly inspired by the Fourth Fleet incident. Her outer bottom plating and decks were made of thicker steel than SORYU. Three different frame spaces were used in order to provide additional hull strength.

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SORYU, HIRYU AND UNRYU IN DRAWINGS

By Seiji Higashi Drawings by Takao Ishibashi

SORYU

The first dedicated Japanese carrier HOSHO was followed by the battle cruiser/battleship conversions of AKAGI, KAGA, and light RYUJO.

Under the terms of the Washington Treaty Japan was allowed 60% of the British and American carrier tonnage, i.e. 81,000 tons. The total displacement of four existing Japanese carriers equaled 68,370 standard tons and thus only 12,630 tons remained available as 8,370ts HOSHO was considered an experimental type not included in Treaty limits. Under the terms of the subsequent London Treaty each nation was permitted to equip up to 25% of their allowed cruiser tonnage with landing-on platforms or decks for aircraft. In United States, a hybrid aircraft carrier-cruiser was designed soon thereafter.

In response, a similar vessel designated G-6 (Fig. 1A) was projected in Japan in 1932. While nominally classed as aircraft cruiser, she certainly had the makings of a dedicated aircraft carrier. G6's designated displacement was 17,500ts (trials) with a maximum speed of 36 knots. Defensive armament consisted of six 203mm guns in three twin mounts (central unit in superfiring position). The flight deck would accommodate about 70 aircraft. As a part of the Second Replenishment Program of FY 1934, Naval General Staff decided to split all remaining treaty tonnage between two new carriers based on G-6's design. Their operational requirements were as follows:

Displacement: 10,050 tons (standard).

Defensive armament: five 203mm guns in centerline turrets.

AA armament: twenty 127mm AA guns, 40+ lesser caliber guns.

Air group: 100 aircraft (Over half of these would be carried on the flight deck).

Maximum speed: 36 knots.

Range: 10,000 nautical miles at 18 knots.

According to preliminary plans, the first carrier was supposed to be completed by the end of 1936 and the second by the end of 1937. Nevertheless, it was clear from the very beginning that 10,050 tons of available displacement was not enough to meet all NGS's requirements. For this reason it was decided to scale down the defensive armament to 155mm (in one triple and one twin mounts), AA armament to sixteen 127mm guns (in eight twin mounts) and the air group reduced to 70 planes. This new, reworked project (Fig. 1B) can be regarded as the basic design of SORYU class. According to the new project, all vital parts were assessed as safe against 203mm cruiser and other areas from destroyer shellfire. Nevertheless, compared to contemporary vessels in other navies, the light armor protection incorporated in the new design was clearly insufficient.

Sheet steel for the new carrier named SORYU was ready at the Kure Navy Yard by early 1934. In March of the same year, the TOMOZURU incident occurred and the SORYU project came under close scrutiny. As a result it was decided to revise the whole design once again without changing its basic configuration. After heavy deck guns were deleted, SORYU became a dedicated aircraft carrier. NGS's revised specifications for her were as follows:

Displacement: 18,000 tons (trials).

Air group: 18 operational and 6 reserve fighters, 33 operational and 11 reserve dive-bombers, with a total of 51 operational and 17 reserve aircraft.

Power output: 150,000shp.

Maximum speed: 35 knots.

Range: 7,800nm at 18 knots.

Defensive armament: twelve 127mm AA guns in six twin turrets.

Armor protection: magazines to withstand 203mm gunfire; engine spaces and avgas tanks to withstand destroyer fire.

SORYU was laid down at Kure Navy Yard on 20 November 1934, launched on 23 December 1935 and completed on 29 December 1937, i.e. a year later than anticipated. Her final specifications at the time of commissioning were as follows:

Displacement: 15,900 tons (standard); 18,448 tons (trials).

Length (trials): 227.5m oa, 222.46m wl.

Beam (trials): 21.34m wl.

Draft: 7.475m mean.

Depth (from keel to flight deck): 20.4m; (from waterline to flight deck): 12.88m.

Flight deck length oa 216.9m, width 26m.

Machinery: eight Kampon RO oil-fired boilers supplying steam to four sets of Kampon geared turbines delivering 152,000shp for a designated maximum speed of 34.5 knots.

Range: 7,680nm at 18 knots.

Fuel oil stowage: 3,400 tons.

Air group: 12 operational and 4 reserve Mitsubishi A5M4 Type 96 fighters, 9+3 Nakajima B5N1 Type 97 torpedo bombers, 27+9 Aichi D1A2 Type 96 dive-bombers, 9 Nakajima C3N1 Type 97 scout planes, with a total of 57 operational and 16 reserve aircraft.

Defensive armament: twelve 127mm/40 Type 89 AA guns (in six twin turrets);

Twenty-eight 25mm Type 96 AA guns (in fourteen twin mounts).

Crew: 1,100.

Page 99. Fig. 1A. G-6 aircraft cruiser from 1932.

Page 99. Fig. 1B. Preliminary sketch design of SORYU (1933)Page 100.

SORYU - THE FIRST MODERN JAPANESE CARRIER

Fig. 2 depicts SORYU at the time of her completion.

SORYU was designed as the first purpose-built modern Japanese large carrier. Her clean hull form resembling a heavy cruiser was optimized for high speeds and her full-length flight deck fitted with a small island type superstructure mounted starboard forward. On the same side abaft were two downward tilted funnels.

SORYU had three elevators, forward one measuring 16 by 11.5m, middle 12 by 11.5 and aft one 12 by 11.8 meters. A propeller blast deflector screen was installed in front of the forward elevator. There were nine sets of Kure Type 4 arrester wires, as well as two fixed and two mobile crash barriers.

At launch, SORYU's double hangar was provided with an aircraft-loading ramp astern. Later it was removed and only a 2sq m watertight hatch remained on the flight deck for loading spares etc. A collapsible crane was located portside abreast the aft elevator (flush-mounted when not in use).

As a result of increased size, no stabilizers (as seen on the preceding RYUJO) were fitted. RYUJO had also featured outboard walkways that somewhat compromised her seaworthiness, especially in rough weather when "taking it green" over the flight deck. On SORYU, most galleries were located inboard except some forward catwalks that were provided with metal grating, and some aft with bracketed flooring. This solution improved seaworthiness and all subsequent Japanese carriers were designed with most of their galleries located inboard.

In order to save weight and meet the tonnage restrictions, hull frame spaces were increased to 1,200mm between middle frames and 900mm between the outer frames. To further save weight, welding and light armor were used extensively. However, shortly after construction on SORYU began the Fourth Fleet incident occurred and SORYU's stability figures were again revised. An extensive reinforcement program was applied to outer plating, inner bottom and both hangar decks. Of course, all such steps increased displacement. Among other improvements, the new carrier's forecastle and fantail were raised. As the upper hangar deck on SORYU was not the 'strength' deck, her flight deck was provided with expansion joints.

To provide additional stability, unusually wide bilge keels (up to 1.8m wide) were fitted, extending over one-third of the hull's total length. On several new IJN warships steep lists during sharp maneuvers had been observed. To ensure better handling characteristics, fully balanced inclined twin rudders were adopted on SORYU.

Lower hangar and engine rooms were separated by a deck accommodating repair shops, stores, technical division officers' and petty officers' rooms.

SORYU's machinery was identical to that of the light cruiser SUZUYA. Eight boiler rooms were aligned side by side in two rows to engine rooms in four adjacent compartments. Generator, transformer and communication switchboard rooms were located in front of the boiler rooms. Further forward were bomb magazines, AA magazines and avgas tanks; similar rooms were duplicated aft of the engine rooms.

As for the 127mm AA guns, only gun No. 5 (located starboard abaft the funnels) was provided with an anti-smoke shield. Three 25mm twin guns located in front of the latter had similar shields. Fire control was provided by a pair of Type 91 directors (composed of a rangefinder and plotting table) on each side. Four searchlights were set in flight deck recesses.

#### VICTIM OF BOMBS OR TORPEDOES?

Immediately after her commissioning SORYU was assigned to CarDiv 2 and started to work up her air group. In April 1938 she was operating in the East China Sea, dispatching a part of her air group to Nanking. In October she provided support for the invasion of Guangdong province and returned home in December. In September 1940 SORYU's air group (temporarily stationed on HIRYU) supported the occupation of northern French Indochina. In July 1941 both carriers also supported the occupation of southern French Indochina. But immediately after the end of the operation they were recalled to Japan to prepare for the forthcoming Hawaii Operation.

Leaving Hitokappu Bay on 26 November 1941, SORYU carried 18 B5N2 torpedo bombers, 18 D3A1 dive-bombers and 21 A6M2 fighters (a total of 57 aircraft). Her regular air group at that time included 18 operational and 3 reserve fighters, 18+3 dive-bombers and 18+3 torpedo bombers (a total of 54 operational and 9 reserve aircraft).

In January 1942 she departed with HIRYU to provide air cover during the Dutch India campaign. In February she teamed up with CarDiv 1 at Palau and in April participated in Indian Ocean raid. SORYU returned to home waters on 22 April and departed again on 27 May to participate in the fateful Battle of Midway.

On 4 June around 1025 whilst fighting enemy torpedo bombers, 12 to 13 Dauntless dive-bombers suddenly attacked SORYU. Within two or three seconds she received a total of three bomb hits on the flight deck that set ablaze the aircraft ready for take-off. When the fire reached armed bombs and torpedoes on the hangar deck, the carrier was doomed. Around 1040 her engines stopped.

At 1045 CO Yanagimoto concluded that the situation was hopeless and ordered abandon ship. By 1800 all survivors were taken aboard escorting destroyers HAMAKAZE and ISOKAZE. By 1900 the fires on the carrier seemed to be easing and it was proposed to re-board her. Nevertheless, twelve minutes later SORYU started to list rapidly, sinking at 1915. SORYU went down after drifting ablaze for 8.5 hours, taking 35 officers and 683 men (a total of 718) with her. The exact number of survivors is not known but it can be calculated on the basis of her regular wartime complement of 1,103.

Many older American sources still credit USS NAUTILUS (SS-168) with sinking the crippled SORYU but it is now clear that this submarine attacked KAGA instead.

During the Battle of Midway SORYU embarked in addition to her regular air group two brand-new Yokosuka D4Y1-S Type 2 fast scout planes, as well as three A6M2 Zero fighters of the 6th Kokutai to be stationed on Midway after its capture by the Japanese.

## HIRYU

HIRYU was the second carrier included in the Second Replenishment Program of FY 1934, originally scheduled for completion one year later than her twin sister SORYU. However, experience gained from the refitted KAGA and the newly commissioned SORYU clearly demonstrated the need for further improvements. As a result, HIRYU became a quite different vessel. Among the most notable improvements were raised forecastle and fantail, a strengthened hull, improved armor, a new rudder to improve the turning radius, greater range, a wider flight deck and a portside island structure.

HIRYU was laid down at Yokosuka Navy Yard on 8 July 1936, launched on 16 November 1937 and commissioned on 5 July 1939. More than one and a half years had passed since SORYU's commissioning and thus HIRYU was completed two years later than originally supposed by FY 1937 plans. HIRYU's specifications at the time of her commissioning were as follows (those identical to SORYU are indicated by an asterisk):

Displacement: 17,300 tons (standard); 20,250 tons (trials).

Length (trials): 227.35m oa; 222.93m wl.

Beam (trials): 22.042m wl.

Draft: 7.84m mean.

Depth (from keel to flight deck): 20.5m; (from waterline to flight deck): 12.57m.

Flight deck length: 216.9m\*; width: 27.0m max.

Machinery: eight Kampon RO oil-fired boilers\* supplying steam to four sets of Kampon geared turbines\* delivering 153,000shp for a designated maximum speed of 34.3 knots.

Range: 7,670nm at 18 knots.

Fuel oil stowage: 3,750 tons (full load).

Air group: 12 operational and 4 reserve A5M4 Type 96 fighters, 9+3 B5N1 Type 97 torpedo bombers, 27+9 D1A2 Type 96 dive-bombers, 9 C3N1 Type 97 scout bombers, with a total of 57 operational and 16 reserve aircraft\*.

Defensive armament: twelve 127mm/40 Type 89 AA guns (in six twin turrets)\*;

Thirty-one 25mm Type 96 AA guns (in seven triple and five twin mounts).

Crew: 1,101.

Page102. Fig. 3 shows HIRYU at the time of her commissioning.

HIRYU's flight deck length was equal to that of SORYU but as the tests with the refitted KAGA revealed, a 26m wide flight deck was too narrow, if a regular island was to be fitted. The Bureau of Naval Aviation insisted on a minimum width of 27m; as a result the hull's beam was to be increased also.

As on the refitted KAGA, SORYU's island was located starboard forward. Considering the experiences with KAGA, the Bureau strongly advocated an amidships island location for all future IJN carriers. The reasons were twofold. Firstly it was felt that the new generation of larger carrier-based aircraft would need longer take-off runs and a protruding island may well present an obstacle. Secondly it was also hoped that the new deck landing aids would make the landing runs shorter than take-offs and an amidships location would be an ideal place to supervise such flight deck operations.

As HIRYU had her funnels in a starboard amidships location, it was decided to move the island to the opposite side. HIRYU became the very first dedicated carrier to sport the unprecedented port island. From the viewpoint of stability, her port island was a good counterbalance to her starboard funnels. Somewhat later the landing trials on a refitted AKAGI revealed the existence of unwanted turbulence caused by this novel arrangement. By this time HIRYU's construction was too far advanced to make any substantial changes but on the subsequent SHOKAKU the island was relocated to a starboard forward position. To supervise the flight deck operations more effectively, HIRYU's bridge was additionally elevated by one deck level.

## A WIDER FLIGHT DECK

Like SORYU, HIRYU was provided with three (but somewhat larger) elevators measuring 13m by 16m (forward), 13m by 12m (middle) and 11.8m by 13m (aft). HIRYU featured a similar propeller blast screen and three mobile crash barriers (i.e. one more than on SORYU).

HIRYU also had a double hangar with a layout similar to SORYU. In addition to two bomb hoists there were two radio masts on each side abaft, lowered to a horizontal position

during flying operations. HIRYU's air group composition has been described before. It should be added that her striking power was now vested in dive-bombers.

As already mentioned, HIRYU's flight deck was one meter wider. Her hull design was similar to SORYU's but increased top weight would have affected her stability and deeper draft her speed. In addition, the experience gained from the building of SORYU demonstrated the need for a stronger hull and so redesigning was necessary.

The new hull had the same total and waterline length as SORYU, but her waterline beam was increased by 0.7m and medium draft by 365mm. As a result, HIRYU's metacentric height rose to 1.81m (SORYU's GM was 1.524m). Range of stability rose by 4.4 degrees to 109.6 degrees. To compensate for increased draft, a higher freeboard became necessary. HIRYU's forecastle was raised by one deck and her upper hangar deck doubled as anchor deck. As the lower hangar clearance was restricted simultaneously, the actual gain was only one meter and freeboard was 9 meters high. 0.4m similarly raised HIRYU's fantail. Flight deck height in trial conditions was 12.88m on SORYU and 12.57m on HIRYU.

Another significant improvement inspired by SORYU's design was a stronger hull with strengthened decks and bottom outer plating. Due to these measures HIRYU's center of gravity was also lowered. The protection of bomb magazines against shellfire was also substantially improved. To provide additional strength, three different frame spaces were used: 600mm between outer frames, 1,200mm between middle frames and 900mm in other areas. The Fourth Fleet incident had clearly demonstrated the structural problems resulting from excessive use of welding in the warship construction. On HIRYU, riveting was used in all stressed areas instead.

The inner compartmentalization and layout of HIRYU was essentially similar to SORYU's with no notable differences. Machinery design was also similar with 1,000shp increase in power and somewhat improved cruising turbines. Boilers and their layout were identical to those used on SORYU.

As the original design of HIRYU included 1,000ts increase in displacement (under trial conditions), 0.5-knot speed loss was considered acceptable. In reality displacement increased by 1,800 tons, resulting in only 0.2-knot loss. It was also planned to increase HIRYU's range by additional 200 nautical miles. Original particulars specified a range of 8,000nm at 18 knots but although fuel stowage was increased by 350 tons (to 3,750ts), HIRYU's actual range was inferior to that of her predecessor.

HIRYU also featured a semi-balanced rudder with an improved shape. During her trials it was discovered that even a slight helm movement could result in an increased turning radius. SORYU had a fully balanced twin rudder that performed well enough but the decision to use a new design was probably made on the basis of poor handling on some HATSUHARU class destroyers (such as ARIAKE) equipped with the same type of rudder.

HIRYU's AA suite was similar to SORYU's but now two 127mm turrets were sited forward of the funnels and one abaft. Unlike her predecessor, HIRYU was fitted with new Type 94 AA directors. She was also the very first IJN carrier armed with 25mm triple mounts (mixed with twin units).

There were five Type 95 directors for 25mm mounts, one for each battery (one at the bow and two on each side). In addition, there was a 127mm Type 3 loading device carried on the fantail under the flight deck round down.

In a two-tiered boat stowage space aft HIRYU carried two 13m landing crafts, two 13m motor launches, three 12m motor launches, two 9m whaleboats, one 8m powerboat and one 6m whaleboat (a total of 11 boats). A boat-handling crane was also provided on the lower hangar deck level.

#### HIRYU AT MIDWAY

After commissioning HIRYU was assigned to CarDiv 2 with SORYU and participated with her in aforementioned campaigns. On the morning of 4 June 1942, Vice Admiral Chuichi Nagumo's Carrier Striking Force was caught unawares by U.S. dive-bombers off Midway. Three carriers were set ablaze but HIRYU sailing farther north was not damaged. Soon thereafter she launched two successive strikes, inflicting severe damage on USS YORKTOWN. At 1703 SBD Dauntless dive-bombers in turn attacked HIRYU. In quick succession she received a total of four bomb hits on the forward flight deck, so that the forward elevator was thrown against the island and the roof of the hangar blown out.

As HIRYU had fewer planes aboard than the three other carriers it was hoped to save her despite the raging fires. After all power was lost, CO Kaku ordered abandon ship at 0315. Survivors were taken aboard escorting destroyers but some 416 sailors were lost.

HIRYU's wartime complement was 1,103 but at the time she also had 23 CarDiv 2 staff officers on board and the actual figure is still unclear. After the survivors were removed, MAKIGUMO launched two torpedoes at HIRYU of which one actually hit. MAKIGUMO withdrew soon after. Next morning one of HOSHO's planes spotted the stricken carrier still afloat, as well as some survivors still on board. The destroyer TANIKAZE was sent

to rescue survivors but failed to find the carrier, which evidently sank during the afternoon. Some 70 engineers and machinists who were trapped in the engine rooms of the sinking carrier managed to escape on a cutter prior to HIRYU's demise. Fifteen days later 34 of them were taken aboard an American warship.

#### UNRYU

In order to maintain parity with United States naval air arm, the Fourth Naval Replenishment Program of FY 1939 authorized the construction of a new fleet carrier named TAIHO. The Third Vinson Plan (i.e. Fleet Expansion Bill) passed in 1940 authorized already three new carriers and in response the Fifth Replenishment Program was hastily drawn up in Japan.

At this time the Third and Fourth Replenishment Programs were still under implementation and it was planned to launch the Fifth Replenishment Program not earlier than in 1942. Meanwhile the Two-Ocean Navy Bill proposed by CNO Admiral Harold R. Stark was approved in United States. In response, the Naval General Staff decided to drop the Fifth Replenishment Program in favor of the Sixth Replenishment Program before the former ever materialized.

In NGS's opinion, the Fourth Replenishment Program had still enabled to maintain the parity in carriers but in light of ever-increasing U.S. naval expansion plans it was decided to compensate for the lack of new carriers with construction of easily convertible auxiliary vessels and large transports which started in late 1939.

According to original Fifth Naval Replenishment Program three improved TAIHO class fleet carriers were to be completed. In a later program they were substituted with a single medium carrier based on HIRYU's design. In the event the Sixth Replenishment Program was recast as Wartime Emergency Replenishment Program after the decision to start the war was made in November 1941. The new program included one medium carrier designed as No. 302, which was eventually named UNRYU. She remained the last fleet carrier designed before the outbreak of the Pacific War.

UNRYU's design started as the medium carrier included in the Fifth Replenishment Program. Considering the impending war and the need to shorten the building time it was decided to base it on the preceding HIRYU. Nevertheless, as a result of many additional changes the construction was delayed. UNRYU herself was completed soon after the Battle of Midway at Yokosuka Navy Yard on 1 August 1942. As a result of many improvements UNRYU became a quite different vessel, more closely resembling SORYU. Her specifications as completed were as follows:

Displacement: 17,480 tons standard, 20,450 tons trials.

Length: 227.35m oa, 223.0m wl.

Beam: 22.0m wl.

Draft: 7.86m mean.

Flight deck length 216.9m, width 27.0m maximum.

Depth (from waterline to flight deck): 12.68m trials.

Machinery: eight Kampon RO oil-fired boilers supplying steam to four sets of Kampon geared turbines delivering 152,000shp for a maximum speed of 34 knots.

Range: 8,000nm at 18 knots.

Fuel oil stowage: 3,750 tons (full load).

Air group (final design): 18 operational and 2 reserve fighters, 27 dive-bombers and 6 scout planes with a total of 51 operational and 2 reserve aircraft.

Defensive armament: twelve 127mm/40 Type 89 AA guns (in six twin turrets);

Ninety-three 25mm Type 96 AA guns (in twenty-one triple and thirty single mounts).

Crew: 1,556.

Page105. Fig. 4. UNRYU's three-view plan at the time of her completion.

#### INCORPORATED WAR EXPERIENCE

Among most notable improvements over HIRYU were the relocated island, two larger elevators instead of the original three, an improved rudder and upgraded AA suite. Hull and flight deck were identical to those of HIRYU.

Since landing trials on IJN carriers with port amidships island (HIRYU and AKAGI) had revealed the existence of unwanted turbulence, the preceding SHOKAKU class was fitted with a starboard island. UNRYU's island was marginally larger than HIRYU's. The flight deck on both carriers was of equal size but UNRYU had only two elevators, forward and aft. To accommodate the new generation of carrier-based aircraft, both elevators were somewhat larger (forward one measuring 14m by 14m and aft one 14m by 13.6 m). Originally it was planned to install nine sets of Kure Type 9 arrester wires but eventually twelve sets of Kusho Type 4 were used instead to cope with newer, larger and faster aircraft.

Likewise it was proposed to install two fixed and three mobile crash barriers Kusho Type 3 Mk. 10 but only three sets were installed.

A propeller blast deflector screen was installed in front of the forward elevator and a collapsible aircraft handling crane starboard abreast the aft elevator, just like on UNRYU's predecessors. Of three planned searchlights in flight deck recesses, only two were eventually installed as one was replaced with a Type 21 air-search radar located port abaft.

Hoists for large and smaller bombs were located forward and aft. UNRYU's aircraft ordnance included seventy-two 800-kilo bombs, two hundred and forty 250kg, three hundred and sixty 60kg, one hundred and forty-four 30 kg bombs and thirty-six aerial torpedoes Type 91 Mod. 6, whereby six torpedoes could be handled simultaneously.

UNRYU's intended air group included 12 operational and 3 reserve A6M2 fighters, 27+3 D3A2 dive-bombers and 18+2 B5N2 torpedo bombers with a total of 57 operational and 8 reserve aircraft. Later the air group was reduced and upgraded with modern Reppu, Saiun and Ryusei types, whereby six scout planes were carried on deck.

UNRYU featured a double hangar; upper one was divided into four and lower into three compartments. New type foam extinguishers were installed on hangar sides, which in comparison with previous carbon dioxide extinguishers proved to be more effective. Two per cent of soap water solution was added to the foam mixture as stabilizer. This was one of the lessons of the Battle of Midway.

Machinery spaces' armor protection was similar to that of HIRYU but incorporating war experience, engine room air intakes were relocated to both sides and avgas storage spaces surrounding the gasoline tanks filled with concrete. Both steering and steering gear rooms were better armored and hangar ventilation improved. To reduce the fire hazard further, fire-resistant paint was used and easily flammable materials (such as linoleum) eliminated.

To increase stability in damaged conditions, side openings and portholes were reduced to a minimum. The semi-balanced rudder used on HIRYU had resulted in excessive response to helm and UNRYU featured outward inclined fully balanced twin rudders instead like SORYU.

UNRYU's AA suite layout was similar to that of HIRYU but the 127mm AA gun No. 5 starboard abaft evidently lacked the anti-smoke shield. Her planned AA suite included thirty-one 25mm AA guns (in nine triple and two twin mounts), later changed to thirteen triple mounts. The final suite with ninety-three 25mm AA guns (in twenty-one triple and thirty single mounts) was even stronger.

As seen in the drawings, the 25mm guns that were added later were accommodated in angular mounts with simplified design. Despite an increased AA suite the originally planned number of AA directors remained the same. Of five Type 94 directors two were installed port amidships and abreast the island. The latter set was originally intended for installation atop the island but its place was taken by a Type 21 air search set. UNRYU's radar suite included another Type 21 set in a flight deck recess port abaft and one Type 13 on the foretop. During a later refit another Type 13 set was installed, as well as radio masts abaft. In addition she was fitted with 28-barrel 120mm AA rocket launchers. According to some sources, three launchers were fitted to each side of the bow but this was evidently done as a refit after her commissioning.

In a two-tiered boat stowage space aft, UNRYU carried two 13m landing crafts, three 13m motor launches, two 12m motor launches and one 8-meter powerboat. There were also two 9m whaleboats located elsewhere.

UNRYU was launched on 25 September 1943 and commissioned on 6 August 1944. After the disastrous Battle of the Philippine Sea no air groups were available and UNRYU spent almost the whole time with her sister AMAGI, which was completed at the same time. Together they formed CarDiv 1, which was expected to be ready for combat by the end of 1944.

However, before completing their training all available aircrews were withdrawn for the operation Sho-Go (Battle of Leyte Gulf) where they were finally decimated. In late September, without embarking a full-size air group, UNRYU was sent to a holding position in Kure area.

In December 1944 it was decided to dispatch UNRYU to Philippines with an emergency transport mission. She departed Kure on 17 December for Manila, carrying troops and Ohka rocket bombs. Two days later on 19 December, UNRYU was attacked by USS REDFISH (SS-395) in East China Sea and received two torpedo hits. Her magazines exploded and 23 minutes after the attack UNRYU sank. Her short career had lasted only four months.

Page106. Fig. 5. KATSURAGI in 1945.

#### FIVE CARRIERS OF THE FIFTH (EMERGENCY) REPLENISHMENT PROGRAM

As already explained, the original Fifth Replenishment Program of 1942 was recast after the Battle of Midway as Fifth (Emergency) Replenishment Program (aka 'Kai-Marugo'),

which emphasized the rapid replacement of the lost carrier strength. As a rather belated measure, orders were placed for 15 medium carriers of UNRYU class (Nos. 5001-5015) and 5 fleet carriers of improved TAIHO class (Nos. 5021-5025). In the event, only five carriers of the UNRYU class (AMAGI, KATSURAGI, KASAGI, ASO and IKOMA) were laid down. All remaining vessels were either incomplete by the end of the war or cancelled before being laid down.

Due to wartime shortages the units of the UNRYU class featured a number of differences, the most notable one being different machinery. AMAGI and KASAGI were fitted with machinery originally intended for improved SUZUYA class heavy cruisers Nos. 300-301. KATSURAGI and ASO received twin sets of KAGERO class destroyer power plants instead; as the latter developed only 104,000shp, their maximum speed dropped to 32 knots.

In addition, CNC (Copper Non-Cemented) steel used for deck and belt armor was replaced with high tensile Ducol steel. It was also planned to fit IKOMA with new improved bomb hoists, as well as a new electrical system using 440V alternating current.

Eventually only AMAGI and KATSURAGI were ever completed. While KASAGI, ASO and IKOMA were launched; their construction was stopped (KASAGI for example, was nearly 80% complete when her construction was stopped in April 1945). In case of ASO and IKOMA, construction was stopped shortly after launch.

Fig. 5 shows KATSURAGI in 1945. She was one of the latter units featuring destroyer machinery and a standard displacement of 17,150 tons. In comparison with UNRYU (20,100ts on trials) she displaced less and her medium draft was also shallower (7.76m). In terms of hull design there were no differences but KATSURAGI featured a different after part of the island. It is known that at the time of commissioning she had the same Type 21 air and surface search radar fitted at the top of the island, which was later replaced with the more advanced Type 22. The exact time of this refit is not known, but most likely it occurred sometime between late 1944 and early 1945.

In terms of armament there were no differences -- both KATSURAGI and UNRYU were completed with twenty-one 25mm triple mounts. The exact number of single mounts installed on KATSURAGI has never been established but it must have been around thirty. According to one source, she had only twenty-two single mounts but these data still need confirmation. At the time of commissioning, both carriers had six bow-mounted 28-barrel 120mm AA rocket launchers. To simplify construction, some 25mm gun and AA director mountings were of simplified angular design. KASAGI featured hexagonal funnels for the same reason. There are no reliable data about the refitted 25mm AA guns but in photos taken during the raids on Kure and after the war there appear to have been at least twenty-one twin mounts.

Early in 1945 KATSURAGI was camouflaged at her mooring to avoid air attacks. All her armament except 127mm AA guns was removed. In all likelihood later she was stripped of the latter as well.

AMAGI was damaged in air raids on 24 and 28 July, capsized and grounded in shallow water. She was raised after the war and then scrapped. KATSURAGI's flight deck was so badly damaged in air attacks that she could not be used operationally. Before being scrapped she served as repatriation ship.

Three remaining carriers were cancelled and also scrapped post-war. The sole exception was ASO, expended as target hulk for hollow charge suicide weapons in July 1945.

All in all it must be said that UNRYU and her sisters were the only Japanese fleet carriers built during the war. By the time of their completion neither suitable planes nor aircrews were available any longer. As a result the UNRYU class failed to contribute to the Japanese war effort in any significant way. Had this class appeared at least a year earlier, the situation could have been different.

#### UNRYU class carriers of the Fifth (Emergency) Replenishment Program (table)

Name	Hull No.	Builder	Laid down	Launched	Commissioned	Status
AMAGI	5001	Mitsubishi Nagasaki Yard	1 October 1942	15 October 1943	10 August 1944	Heavily damaged in Kure.
KATSURAGI	5003	Kure Navy Yard	8 December 1942	19 January 1944	15 October 1944	Heavily damaged in Kure.
KASAGI	5004	Mitsubishi Nagasaki Yard (hull)	14 April 1943	19 October 1944		Construction stopped on 1 April 1945 while fitted out at Sasebo
ASO	5006	Kure Navy Yard	8 June 1943	1 November 1944	-	Construction stopped on 9 November 1944
IKOMA	5007	Kawasaki Yard Kobe	5 July 1943	17 November 1944	-	Construction stopped on 9 November 1945

P 107 UNRYU

Unryu was planned in the wartime navy shipbuilding program of 1941 as ship No.302. Hurriedly completed, her design almost repeated that of HIRYU. Therefore UNRYU was also known as "Improved HIRYU type (KAI-HIRYU)". HIRYU's port side island bridge was regarded as unsatisfactory and so UNRYU adopted a SORYU type island, sited starboard and forward. The rudder was also changed from HIRYU's semi-balanced single rudder to SORYU's twin rudders. The number of lifts decreased from HIRYU's three to two in order to shorten construction time. This photo was taken on 16 July 1944, when she departed YOKOSUKA for sea trials. A Type 21 radar is visible on the bridge. She was painted in two-tone green (Type 2 Hull Color in IJN nomenclature). The same distinct dark and bright pattern was used as anti-submarine scheme on Japanese merchants. UNRYU was completed on 6 August 1944, but was sunk on 19 December in East China Sea by USS REDFISH (SS-395).

IJN UNRYU  
TABULAR RECORD OF MOVEMENT  
By Hisashi Date

1 August 1942:  
Laid down at Yokosuka Navy Yard.

25 September 1943:  
Launched.

15 April 1944:  
Captain Kaname Konishi is assigned as Equipping Officer.

6 August 1944:  
Commissioned in IJN, assigned to Sasebo Naval District; Third Fleet, CarDiv 1. Captain Konishi is nominated the CO same day.

10 August 1944:  
Departs Yokosuka for trials; returns next day.

18 August 1944:  
Departs Yokosuka; returns on 6 September.

10 September 1944:  
Departs Yokosuka; returns on 21 September.

26 September 1944:  
Departs Yokosuka for Kure.

27 September 1944:  
Arrives at Kure.

30 September 1944:  
Departs Kure; returns on 16 October.

28 October 1944:  
Departs Kure; returns on 30 October.

6 November 1944:  
Departs Kure; returns on 12 November.

15 November 1944:  
UNRYU is reassigned to Combined Fleet, CarDiv 1.

27 November 1944:  
Proceeds to Gunchu Bight.

10 December 1944:  
Returns from Gunchu to Kure.

17 December 1944:

Departs Kure for an emergency transport mission to Manila, Philippines.

19 December 1944:

At 1635 in East China Sea (230 nm NW from Miyako Islands) UNRYU receives a torpedo-hit starboard under the bridge from USS REDFISH, leaving her dead in the water. Ten minutes later the second torpedo hits forward of the bridge; succeeding explosions detonate the Ohka rocket bombs stored on the lower hangar deck. A few minutes later UNRYU settles sharply by bow and CO Konishi gives the order to abandon ship. At 1657 the carrier sinks, bow first, taking Capt. Konishi, 1,240 crewmembers and many passengers with her.

20 February 1945:

Removed from Navy List.

Page 108. Top picture. AMAGI (aka Hull No.5001) was to become the first unit of 15-strong UNRYU class carriers authorized under the Fifth Naval Replenishment Program. She was completed by Mitsubishi Nagasaki Yard in August 1944 and assigned to CarDiv 1. After some short trips to western part of Inland Sea AMAGI was heavily camouflaged and moored at the roadstead of Kure near Mitsukoshima Island. During the air raid on 19 March 1945 she received a bomb hit. On 24 July AMAGI was hit by 3 bombs and damaged by some near misses. She was flooded and toppled onto her side remaining in such condition until the end of the war. This photo was taken during the Kure air raid on 19 March and shows an UNRYU class carrier under attack (either AMAGI or KATSURAGI). Below is an escaping sub.

Bottom picture. 21 June 1946 at Mitsukoshima Island off Kure. Looking from aft and starboard, AMAGI is seen lying on her port side. This photo shows the aft section of the flight deck, AA gun platforms and sponsons. The propeller screws, shafts and part of the bilge keel are also well visible. The third gun platform from the left (larger and more circular), is for the 127mm twin AA gun. The other aft platforms are for 25mm triple AA guns. Two large dark objects further along the hull are funnel stacks.

Page 109. Top picture. AMAGI damaged and half-submerged. The flight deck has been severely damaged and a collapsible radio mast is bent - a rather sad view. This photo was taken after the war, so all armament has been removed, but a Type 13 radar is still visible on the main mast. The black hole in the flight deck below the bridge is the 14m wide forward elevator well. Amagi was not seriously damaged during the air raid of 28 July, but several bombs exploding nearby holed her hull. Slow flooding from these small holes caused her to roll onto her port side.

Bottom picture. The flooded and half capsized AMAGI looking from aft. The beach to the right is Mitsukoshima Island and on the left is Kurahashi-Jima Island. In February 1945 First Carrier Division was disbanded and in April AMAGI was re-ranked as 4th Reserve ship. She had no proper crew and was moored at Mitsukoshima Is. beach. A camouflage net was laid between beach and ship. On both the net and flight deck, tree branches were arranged for camouflage. But all this was in vain. AMAGI was found by US attack planes and bombed again. She was built as a matter of urgency after the Midway sea battle, but never contributed to the war effort.

Pages 110 and 111. The salvage of AMAGI began on 5 December 1946. The first problem was to right the capsized flattop whose hull weighed 16,000 tons alone. The huge carrier lay with a 61-degree list. The bow had dug into the sea bottom while the stern was beached on the rocks of Mitsukoshima Island, quite close to the nearest jetty. The work began with reducing the list to 35 degrees. However, AMAGI could not be righted fully as her aft section was already on land.

Water was pumped out to decrease draft. This required countless holes to be covered; there were open lift wells, bomb damage, funnels, bomb/torpedo lifts, hatchways and portholes. Over 400 sq. meters had to be patched over.

As the flight deck was not watertight either, the whole 600ts upper structure had to be removed, using dynamite. In order to float the forward section submerged in 20m of water, twelve 100-ton floatation tanks were attached to this area. A high-capacity pump was then deployed, capable of shifting 7,000 tons of water per hour. This work was done in four stages. The pump ran continuously for twelve days and nights during the last stage. Finally, on 31 July 1947 the AMAGI was refloated again.

Pages 110 and 111 show more details of the salvage operation. This major task needed almost all floatation tanks, salvage pontoons, ballast tanks, water pumps and scaffolding available in the Kure area. The salvage of such a giant ship had not been attempted since the war. When the Italian liner S.S. CONTE VERDE (19,876 GRT) was scuttled by her own crew at Shanghai, off Bund, she had been salvaged by the IJN Naval Salvage Unit.

In the Kure area, the salvage of AMAGI and the light cruiser OYODO proved to be the most difficult enterprises. To rescue these ships, many salvage pontoons were needed. These pontoons were built from the sheet metal of previously scrapped IJN ships. One of them was converted from the full hull of a 2nd-class fast naval transport (i.e. T.101 class LST-Ed.). The Kure branch of Harima Zosen Yard undertook the salvage and scrapping of AMAGI. The difficult work continued day and night despite the post-war shortage of materials and equipment. In the left lower photo, the flight deck had already been removed using dynamite. The huge hole is the aft elevator well.

Page 112. Top picture. In order to salvage the AMAGI, empty pontoons were attached to her port side and water-filled ones to the starboard side. At low tide, the sea bottom directly beneath the hull was removed. Other salvage techniques were also employed. This was the biggest salvage effort yet undertaken by the Japanese. Harima Zosen Yard of Kure specially manufactured most salvage pontoons.

Bottom picture. To remove the flight deck, bridge and other structures, this huge crane barge proved invaluable.

Page 114. Top picture. KATSURAGI's port amidships area. This photo and the bottom one clearly show her portside details. As a result of wartime shortages, AA guns were accommodated in angular mountings with a simplified design. The first two sponsons mounted 25mm triple guns, the third (and somewhat lower) one a 127mm twin mount. An emergency rudder is suspended from the nearest sponson. Note the clipped radio masts, now permanently fixed in upright position.

Bottom picture. KATSURAGI moored at Mitsukoshima Island near Kure on 9 October 1945. During three air raids KATSURAGI received four direct bomb hits and one near miss. As a result she could not operate aircraft any longer but could still get under way. Note the buckled flight deck section abaft the island - the result of damage received on 28 July. A Type 21 air-search radar antenna is clearly visible in this photo.

Page 115. Top picture. KATSURAGI during her acceptance trials. KATSURAGI was commissioned as the second carrier ordered under the Fifth (Emergency) Replenishment Program on 15 October 1944. Built in Kure, her standard displacement was 17,150 tons. Due to wartime shortages she received twin sets of KAGERO class destroyer power plants with a total output of 104,000shp (48,000shp less than on UNRYU). Speed was reduced by 2 knots to 32 knots. KATSURAGI's intended air group included 64 planes (57 operational and 7 reserve).

Bottom picture. The flight and upper hangar deck of the bombed KATSURAGI. KATSURAGI was damaged in air attacks on 19 March, 24 and 28 July; this photo was taken after the last raid when two 1,000-pounders penetrated the flight deck abaft the forward elevator, exploding on the upper hangar deck. As a result of the explosions, a large section of the flight deck was blown away. Visible on the signal mast is a Type 13 air-search radar antenna.

Page 116. Top picture. KATSURAGI (No. 5003) was one of the fifteen UNRYU class carriers ordered under the Fifth (Emergency) Replenishment Program of 1942. She was laid down at Kure Navy Yard in December 1942. After commissioning in October 1944 she was assigned to CarDiv 1 and underwent battle training in western Inland Sea. During three air raids in March and July 1945 she received three hits and was moored off Mitsukoshima Island until the end of the war, despite being capable of raising steam. This post-war photo shows the results of a near miss--a bulging flight deck abaft the island.

Bottom picture. When the war ended, KATSURAGI started a new career as a repatriation ship. Her damaged flight deck was repaired and some of the hangars and crew's quarters converted to accommodate up to 3,000 passengers. In January 1946 she departed Kure for Wewak, later making similar trips to Torokina, Nauru, etc. This photo was taken after KATSURAGI's return from Rabaul-Torokina area in Kurihama Bight in April 1946.

Page 117. Top picture. KATSURAGI was the largest surviving IJN 'man-of-war' that could carry passengers. She was removed from Navy List in October 1945 and refitted as a repatriation ship at the former Kure Navy Yard thereafter. This photo was taken during her rebuilding; note the flight deck damage received on 24 July 1945. Incorporating the war experience, KATSURAGI featured a substantially increased AA suite including twelve 127mm AA guns (in six twin mounts), eighty-nine 25mm guns (in twenty-two triple and twenty-three single mounts), as well as six 28-barrel 120mm rocket launchers. As can be seen here, all AA armament has been removed.

Bottom picture. This photo shows KATSURAGI at Osaka where she was eventually scrapped. Between January and November 1946 she made several voyages to Wewak, Torokina, Rabaul, Saigon, Cap St. Jacques, Redang, Medan, Singapore and Bangkok, carrying home innumerable

repatriates. While returning from the Philippines, KATSURAGI was caught by a sudden gale and lost her boiler water as a result of more than 30-degree list.

Page 118. Top picture. KATSURAGI moored in Osaka Harbor shortly before being scrapped at Hitachi Sakurajima Yard. The strange structures on the flight deck are in reality makeshift passenger cabins and ventilation intakes. At this time the former carrier was painted green while the waterline area was gray. A Hinomaru (Rising Sun) flag and the ship's name in Latin letters were carried on both hull sides. A Type 22 radar set is still visible on the bridge. KATSURAGI was one of the carriers fitted with KAGERO class destroyer machinery and therefore her speed was reduced to 32 knots.

Bottom picture. Starboard forward view of KATSURAGI after her arrival at Osaka Harbor. KATSURAGI was the largest ship among some 150 former IJN naval units used as repatriation ships. Curiously enough, she never got a chance to depart home waters during the war but made many long trips to overseas post-war. After December 1946 she was moored at Sasebo for a while.

Page 119. Top picture. KATSURAGI was scrapped at Hitachi Sakurajima Yard after 22 December 1946. On this photo the work has proceeded quite far and both flight deck and island structure have already been removed. The rectangular structures near the bow and amidships are elevators. Three girders at the stern once supported the flight deck. Note the bow and stern anchors.

Middle picture. KATSURAGI on 27 March 1947. In comparison with the upper view the works have proceeded even farther (note the elevator well truss works). The light carrier HOSHO was broken up almost at the same time at the same yard. This very first dedicated aircraft carrier also served as a repatriation ship and it is somehow symbolic that they were scrapped at the same place.

Bottom picture. KATSURAGI on 30 August 1947. The upper works are almost entirely gone and now the hull below the lower deck is visible. The crane in the background is used to build a new ship. When one ship dies, another is born. Some three months later, on 30 November 1947 the work was completed, resulting in 11,000ts of scrap metal. Since KATSURAGI was completed in October 1944, her career lasted almost three years.

Page 120. Top picture. KASAGI was laid down as the fourth unit (No. 5004) of the UNRYU class at the Mitsubishi Nagasaki Yard in April 1943, launched in October 1944 and then transferred to Sasebo Navy Yard for fitting-out. As a result of the ever-worsening military situation, her construction was suspended on 1 April 1945. The incomplete carrier was towed to Ikeda Bay off Shozu-Jima Island, being 84 per cent complete by the end of the war. This photo taken by U.S. occupation forces on 2 November 1945 shows KASAGI moored at Ebisu Bay off Sasebo. While the machinery is already installed, the elevators, AA guns and signal mast abaft the island are still missing. A wooden structure on the flight deck served as the temporary navigation bridge.

Bottom picture. KASAGI in the former Sasebo Navy Yard Drydock No. 7. In this view bow details and general layout of the carrier are clearly visible. Note the flight deck and starboard island. At the bow is a Type 95 AA director for sponson-mounted 25mm triple guns; a Type 94 AA director is located abreast the island.

Page 121. Top picture. KASAGI was broken up at Sasebo Sempaku Yard after 1 September 1946. In this photo the after part of her flight deck is already gone. Moored left and further away is another incomplete carrier, the IBUKI (converted from a heavy cruiser with the same name). Unlike KASAGI, the smaller IBUKI had only one hangar. Of her 27-strong air group, 10 planes were to be carried on deck. KASAGI had a double hangar and would embark a total of 64 aircraft, including 11 parked on flight deck.

Bottom picture. Stern view of KASAGI at the time of her scrapping. The rectangular object suspended port aft is an emergency rudder. Some of the upper hangar structure is still visible in amidships area. Three 25mm triple mounts at the stern were to be provided with a Type 95 AA director installed under the bow. While designed as an improved version of HIRYU, the units of the UNRYU class featured many design compromises as a result of wartime shortages. Only the AA suite was considerably improved--each carrier was armed with up to ninety-six 25mm AA guns, not to mention other weapons.

Page 122. KASAGI (right) and IBUKI (left) while being scrapped at Sasebo. By now the work has proceeded to middle deck. Lower hangar structure is visible amidships; note the forward elevator and additional half-hangar located ahead of it, as well as the rectangular engine rooms in the foreground. On previous IJN carriers all boiler and engine room air intakes were located on the opposite side of the funnels as a rule. During the Battle of Midway this solution proved to be a design fault: once the forward part of a carrier was set on fire, the blaze was then sucked into machinery spaces, effectively suffocating everyone there and rendering the whole ship unnavigable. On UNRYU

class air intakes were relocated to both sides, making it possible to use the fans of the undamaged side for ventilation if necessary.

Page 123. Top picture. KASAGI (left) and IBUKI (right) moored side-by-side. KASAGI had seven decks in all: flight deck, upper hangar deck, upper deck, middle deck (the latter doubled as lower hangar deck), lower deck, lowermost deck and hold deck. On this photo the upper deck is already exposed. Two bulges on both sides abaft are boat stowage spaces for 12m motor launches. The circular hole in the same area was intended for towing. The rectangular structure port amidships was a part of crew's quarters; on the right side some of the lower hangar can still be seen.

Bottom picture. KASAGI in drydock No. 7 on 22 September 1947. This particular view reveals the details of her machinery layout. On UNRYU class carriers four turbines were accommodated in separate compartments and eight boilers in their respective boiler rooms, providing for an ideal four-shaft arrangement. The four adjacent rooms in the amidships area are engine rooms, followed by eight boiler rooms aligned in two rows. The carrier on the left seems to be JUNYO. KASAGI's scrapping was completed on 31 December 1947, resulting in 10,280ts of scrap metal.

Page 124. Top picture. ASO was the fifth unit (No. 5006) of the UNRYU class, ordered under the Fifth (Emergency) Replenishment Program. Her keel was laid on the slip No. 3 at the Kure Navy Yard in June 1943 and she was launched on 1 November 1944; construction was stopped on 9 November when the carrier was 60 per cent complete. Since July 1945 she was used as a target to explore the efficiency of 'Sakura-dan' suicide weapons. Despite many hits the structural damage to her hull remained relatively minor and ASO foundered due to resultant progressive flooding. The photo shows her just after raising.

Bottom picture. ASO was salvaged by Harima Zosen Yard and dry-docked at Kure. Being incomplete when sunk, her hull needed some additional strengthening. ASO was damaged not only by hollow charge blasts but also from countless hits during air attacks and strafing. Elevators included, her surface hull area totaled approximately 380 sq. meters. Four large and many minor holes were found in outer plating, the largest one measuring 13 by 7 meters. This photo was taken on 20 December 1946 when the carrier was successfully refloated.

Page 125. Top picture. After raising ASO's hull was towed to former Kure Navy Yard and broken up after 21 December 1946. This photo shows her fore section with the boiler room roof exposed. Note the protruding funnels starboard and the forward elevator well. Like KASAGI, ASO received 104,000shp destroyer machinery for a designated speed of 32 knots. Incorporating the war experience, UNRYU class introduced alternating boiler and engine rooms.

Middle picture. A dry-docked ASO while being scrapped at Kure. After the upper hangar deck has been removed, the lower hangar deck is now visible. Note the Admiral and Captain's cabins, as well as staff rooms in the bow area. ASO was broken up by 26 April 1947, resulting in 7,853ts of scrap metal. It is rather poignant that ASO was scrapped at the same yard where she was built. After the light cruiser OYODO was launched at the Kure Navy Yard in 1942, all available resources of the yard were devoted to building two light carriers, ASO and IBUKI. In the event neither of them was ready on time.

Bottom picture. IKOMA was laid down as the sixth carrier of the UNRYU class at Kawasaki Kobe Yard in July 1943 and launched on 17 November 1944. Like ASO, she was 60 per cent complete when the construction was stopped and the hull towed to Ikeda Bay off Shozujima Island in early April 1945, remaining there until the end of the war. This photo taken by U.S. occupation forces on 23 May 1946 shows her curious "double camouflage". As a result of wartime confusion, the original scheme was evidently painted over later because it did not extend to the actual waterline. Note the conspicuous funnel uptakes amidships. IKOMA was broken up at Mii Yard of Tamano between 4 June 1946 and 10 March 1947.

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THE STATE AND ART OF TAIHO

By Seiji Higashi Drawings by Takao Ishibashi

THE FOURTH REPLENISHMENT PROGRAM AND CARRIER NO. 130

The Fourth Naval Replenishment Program of FY 1939 (aka "Maru-Yon") was intended as the Japanese response to Second Vinson Plan (i.e. the Vinson Naval Expansion Act passed in May 1938--Ed.), as well as other recent American naval expansion programs. In the event it remained the last peacetime naval program implemented before the outbreak of the Pacific War.

At that time both YAMATO class battleships and SHOKAKU class fleet carriers authorized under the Third Replenishment Program of FY 1937 were still under construction. Since the outbreak of the China Incident (Sino-Japanese War) the Imperial Army had been given priority in receiving materiel and supplies. Despite the strained political situation Naval General Staff could not ignore the U.S. naval expansion any longer. It was clear that in overall strength the IJN was grossly outnumbered, but in the area of naval aviation the general aim was still to maintain parity with the stronger opponent. The 74th Imperial Conference convened on 26 December 1938 approved the building of 83 naval vessels included in the new program. In addition to two battleships (SHINANO and No. 111), the Fourth Replenishment Program authorized the construction of a new fleet carrier. A memo addressed to the Treasury explained her need as follows:

- 1) In recent years all major naval powers including the United States have increased their respective naval air arms significantly. Progress in this area has been rapid enough, so that in a decisive battle attack by carrier-based aircraft may turn out to be the decisive factor. For the above reasons the present design should be given top priority;
- 2) In contrast to this single carrier, the new American Vinson Plan authorizes the building of two 20,000 tons fleet carriers. Thus even the addition of a new carrier cannot compensate for our increasing shortfall in this field.

At the time IJN had six fleet carriers, including AKAGI, KAGA, SORYU, HIRYU, SHOKAKU and ZUIKAKU (the latter two still under construction). The U.S. Navy had USS LEXINGTON (CV-2), SARATOGA (CV-3), RANGER (CV-4), YORKTOWN (CV-5) and ENTERPRISE (CV-6) with USS WASP (CV-7) under construction. In addition, the construction of USS HORNET (CV-8) authorized under the Vinson Plan was just about to begin, so that at least numerically both fleets were on equal terms.

The IJN had already given up the idea of having a battle line equal to that of the U.S. Navy and instead attempted to ensure a measure of qualitative superiority based on the new YAMATO class. In terms of naval aviation the general aim was to maintain numerical parity with the Americans. Since only one fleet carrier was to be built according to the Second Vinson Plan, at least numerically both rivals maintained the status quo.

The new IJN carrier No. 130 authorized under the Fourth Replenishment Program was eventually named TAIHO. The ship's characteristics accompanying her order stated a displacement of 28,500 tons, maximum speed of 35 knots, defensive armament consisting of six 155mm guns, sixteen 100mm AA guns and thirty-six 25mm AA guns, as well as an air group of 96 operational and 30 reserve aircraft. The cost of her building was estimated at 105,318,000 yen. While the above specs were still intended to impress the Treasury, TAIHO's original design included 30,360ts displacement, maximum speed of 33 knots, range of 10,000nm at 18 knots, armament of twelve 100mm AA guns and an air group of only 52 planes. The new carrier was initially scheduled for completion at Kawasaki Jukogyo Yard by 1943. As her design started belatedly in late 1939, TAIHO was laid down on 10 July 1941, to be completed by June 1944.

#### ARMORED DECK

Unlike her predecessors, TAIHO was designed to operate close to enemy task forces in order to increase the range of her aircraft. Under such tactical premise she was liable to increased battle damage. To contend with potential damage and still retain the ability to launch aircraft, an armored flight deck and vitals became a prerequisite. In comparison with earlier IJN carriers, TAIHO's air group was reduced in size and included mostly fighters and dive-bombers.

Initially, TAIHO was designed with a displacement of 33,800ts (trials); based on war experience, more sophisticated fire-fighting equipment and additional AA guns were added, increasing the final displacement by 400ts (to 34,200ts). TAIHO became the heaviest purpose-built IJN aircraft carrier yet built; her size was also somewhat larger than that of the preceding SHOKAKU.

To keep the center of gravity as low as possible, the hull had a rather shallow freeboard. She featured one deck less than SHOKAKU. As the freeboard was lower, her hull was extended upward and cleanly faired into the extended flight deck. To improve seaworthiness, TAIHO featured a fully enclosed hurricane bow that also encased the anchor deck.

Such bow design had been previously used on British carriers and in particular on the first armored carrier HMS ILLUSTRIOUS commissioned several years earlier. Many sources attribute the introduction of hurricane bow on TAIHO to British influence. The overall length of her flight deck was 257.5m, width 18m fore, 30m amidships and 27m aft. Near the

island her flight deck was 29m wide. To counterbalance the starboard island, the flight deck centerline was offset to port by 2m in its after (round down) section.

TAIHO was the first purpose-built Japanese carrier to feature a new island design incorporating the funnel. In fact it was of the same type as the island used on JUNYO class escort carriers. TAIHO's 17m high funnel was tilted outboard at 26 degrees.

As TAIHO's freeboard in the amidships area was lower than on SHOKAKU class and approximately equaling that of HIRYU, a traditional downward-tilted funnel would have caused stability problems. Moreover, in case of a heavy list tilted funnel would become prone to flooding. For this reason, the adoption of a less tilted funnel on a heavily armored carrier was a logical choice.

Nevertheless, this novel development became the subject of much debate. It was theorized that a protruding funnel above the flight deck could endanger night starts and landings, not to mention its hot gasses resulting in increased turbulence. All such considerations were ignored for the sake of better stability. After wind-tunnel tests of a 1/100 superstructure mock-up at Yokosuka Naval Air Technical Arsenal it was finally decided in favor of the new design. As most of the technical problems had already been solved on preceding JUNYO class, the result proved to be a success.

TAIHO's compass bridge was protected with 25mm DS splinter armor and her steering room enclosed in a 40mm CNC steel cylinder able to withstand 152mm Common shell hits (the same protection scheme as used on AGANO class light cruisers). The upper part of the compass bridge doubled as air defense station.

Unlike on SHOKAKU there were only two elevators measuring 13.6m by 14m (forward) and 14m by 14m (aft). The elevators were located approximately 150m apart; the 20m wide flight deck area between them was protected with 20mm DS plates over a 75mm CNC deck to enable to withstand 500kg bombs dropped from dive-bombers.

The elevators were protected by a double layer of 25mm DS plates and weighed nearly 100 tons, but this increase did not compromise their speed in any way.

The aircraft-handling facilities used on TAIHO originally included a propeller blast deflector screen to be installed ahead of the forward elevator but this plan was rejected early on to simplify construction. Similarly it was planned to fit TAIHO with catapults at the forward end of the flight deck but as none were available, this idea was also rejected. The fourteen sets of arrester wires used on TAIHO were originally intended to be of the latest Kure Type 10 design, but later changed to Kusho Type 4. There were also three fixed Kusho type crash barriers.

TAIHO's upper hangar was 18 and the lower 17 meters wide. With the help of firewalls the upper hangar could be instantly divided into five and the lower into four compartments. Firewalls facing the elevators were constructed with especially thick 7mm DS plates. The upper hangar roof and main hull girders supporting the flight deck were reinforced with 10mm DS plates. The latter were laid so as to lessen damage to the flight deck from an in-hangar bomb explosion. To vent the blast outside, hangar sides made of 25mm DS splinter armor were provided with 1.5 by 0.7m wide side openings and the latter covered with 25mm DS shutters.

#### PROTECTION AGAINST BOMBS AND TORPEDOES

Originally TAIHO's air group was fixed at 18 operational and 6 reserve A5M4 Type 96 (Claude) fighters, 18+6 D3A2 Type 99 (Val) dive-bombers and 27+3 B5N2 (Kate) torpedo bombers with a total of 63 operational and 15 reserve planes. The intended complement was soon updated with newer types including 18+1 Mitsubishi A7M1 Reppu (Sam) fighters, 36 Aichi B7A1 Ryusei (Grace) torpedo bombers and 6 Nakajima C6N1 Saiun (Myrt) fast scout planes, whereby 13 aircraft (7 Ryuseis and all Saiuns) were carried on deck. As none of the new types was available in time, TAIHO embarked an air group including A6M Zeros, D3A dive-bombers, B6N Tenzan (Jill) torpedo bombers and D4Y Suisei (Judy) dive-bombers.

Crew's quarters were located on the hangar deck, forward and abaft. Lower hangar deck protecting repair shops etc. was made of 16mm steel.

Eight boilers were accommodated in separate compartments in two rows of four on each side. Engine rooms were located in four adjacent cells, just like on SHOKAKU.

TAIHO's engines developed 160,000shp for 33.3 knots; range at 18 knots was 10,000 nautical miles. Compared with SHOKAKU, TAIHO was one knot slower but boasted a longer range.

Just like SHOKAKU, TAIHO was fitted with an underwater bulbous bow and two semi-balanced rudders (main and auxiliary ones).

In front of the boiler rooms were generator and main electrical and communications switchboard rooms. Further forwards were bomb and AA magazines, a 25mm AA gun magazine and avgas tanks. The same rooms were duplicated abaft the engine rooms. Thanks to her heavy armor protection TAIHO was also able to operate as a support carrier. For this purpose she carried double supplies of bombs and avgas (1,000 tons of the latter).

TAIHO's aircraft ordnance included ninety 800-kilo bombs, four hundred and sixty-eight 250kg bombs, the same number of 60kg bombs, one hundred and forty-four 30kg bombs, as well as forty-five aerial torpedoes Type 91 Mod. 6, of which nine could be handled simultaneously. Only SHINANO carried more supplies.

Horizontal armor on flight deck was designed to withstand 500kg bombs dropped by dive-bombers. Engine rooms and avgas tanks were calculated safe against 800kg AP bombs dropped from 3,000m altitude at level flight. AA and bomb magazines were theoretically safe against 1,000kg AP bombs dropped under similar conditions. Vertical armor protecting the magazines was designed to withstand 203mm AP shells fired from a distance of 12-20,000 meters. Engine spaces and avgas tanks were protected against 152mm destroyer shellfire.

All magazines were protected by 75mm armored deck and 165mm vertical armor. Underwater protection system was designed to withstand up to 300kg charges. A 22mm DS double torpedo bulkhead located 3 meters behind the outer plating amidships protected vital areas. One-meter wide fuel oil tanks surrounded avgas tanks with an additional air space between them. Bulkheads separating the machinery spaces were additionally strengthened with armor plating, making a total of five protective layers. The carrier had a triple bottom beneath all bomb magazines and avgas storage areas.

TAIHO was armed with new 100mm/65 Type 98 AA guns located in six twin mounts along each side. The same type was used on AKIZUKI class destroyers but TAIHO's guns were situated in open turrets.

A pair of Type 94 AA directors provided fire control. These were mounted forward of the island (starboard) and on a separate port sponson amidships. TAIHO's original design featured twenty-four 25mm AA guns in eight triple mounts, but their total number was soon increased to fourteen. Considering the lessons of carrier battles in the Pacific, the final AA suite was upgraded to seventeen triple mounts. Eight corresponding directors were mounted on sponsons on each side and aft.

Although TAIHO's original design did not include a radar, two Type 21 air-search sets were installed on her bridge and aft of the island. Of four 110cm searchlights, three were set in flight deck recesses and one fixed on the bridge.

Radio equipment included 12 transmitters (two long-wave, one long/short wave and nine short-wave), as well as 28 receivers. Two radio masts installed on each side abaft were lowered during flying operations. A four-ton aircraft handling crane was located starboard, abreast the aft elevator. Bomb hoists for large and small calibers were located forward and astern.

The final specifications for TAIHO were as follows:

Displacement: 29,300 tons standard, 34,200 tons trials.

Length: 260.6m oa, 253m wl (trials).

Beam: 27.7m (trials).

Draft: 9.59m mean.

Depth (from keel to flight deck): 22.1m; (from waterline to flight deck: 12.51m.

Flight deck length 257.5m, width 18m fore, 30m amidships, 27m aft.

Machinery: eight Kampon RO oil-fired boilers supplying steam to four sets of Kampon geared turbines delivering 160,000shp for a maximum speed of 33.3 knots.

Range: 10,000nm at 18kn.

Fuel oil stowage: 5,700 tons.

Air group (final design): 18 operational and one reserve A7M Reppu fighters, 36 B6N Tenzan torpedo bombers, 6 C6N Saiun fast scout planes with a total of 60 operational and one reserve aircraft.

Defensive armament: twelve 100mm/65 Type 98 AA guns (in six twin mounts);

Fifty-one 25mm Type 96 AA guns (in seventeen triple mounts).

Radar equipment: two Type 21 air-search sets.

Number of searchlights: four 110cm sets.

Crew: 1,751.

Page 128. Fig. 1 shows TAIHO as completed.

#### EXPLOSIONS IN THE HANGAR

TAIHO's construction was soon accelerated to cope with growing losses in the Pacific. She was launched on 7 April 1943 and commissioned on 7 March 1944, i.e. some three months earlier than originally scheduled.

After commissioning and brief working up of her air group (lasting approximately one month), TAIHO was assigned to the newly established Air Fleet 1. With SHOKAKU and ZUIKAKU she formed CarDiv 1, simultaneously serving as the flagship of ComFirstAirFleet Vice Admiral Jisaburo Ozawa.

Air Fleet 1 comprised nine fleet and escort carriers with some 450 aircraft. At least numerically it was the mightiest Japanese Mobile Fleet since the beginning of the Pacific

War. At that time TAIHO embarked 27 A6M5 fighters, 18 B6N2 Tenzan torpedo bombers, 27 dive-bombers (both D4Y2/3 Suisais and D3A2s) and three D4Y1-C scout planes for a total of 75 aircraft. In addition, twenty additional 25mm single mounts had been fitted by this time.

In June 1944 TAIHO departed for the "A-Go" operation (the Battle of the Philippine Sea). On 19 June shortly after launching her first strike, she received a torpedo hit from USS ALBACORE (SS-218) to starboard right under the bridge. The damage was relatively minor as TAIHO remained under way and was able to continue flight operations. Nevertheless, the shock had ruptured an armor deck joint over the forward avgas and oil storage. Soon the enclosed hangar was permeated with volatile vapors.

Damage-control officers attempted to ventilate the hangar bay. Unfortunately, the shock had also jammed the forward elevator located above the avgas tanks, carrying a second strike A6M5 fighter halfway up. Prior to the launch of the next strike its well was covered with jury-rigged planks and timber.

Due to poor ventilation the fumes spread further. Six hours after the torpedo hit (at 1432) a massive explosion ripped through the hangar deck. The whole flight deck blew out and TAIHO was soon engulfed in flames. The engines stopped and after several bombs went off, she tilted sharply to port and sank around 1628. It was a ominously symbolic that this carrier which had promised so much for the whole IJN, was sunk in her first battle, only shortly before another disastrous defeat.

Avgas explosions on carriers had been a clear and present danger already before the loss of the USS LEXINGTON in the Battle of Coral Sea. The IJN had anticipated this kind of damage. Although theoretically TAIHO's design was safe in this respect, Japanese damage-control procedures proved to be inferior to contemporary Royal Navy and U.S. Navy practices.

After the Battle of the Philippine Sea additional (but already belated) protective measures were taken on all existing and yet to be completed IJN carriers. Hangar deck ventilation was improved and the spaces surrounding avgas tanks were filled with concrete.

Page 130. Top picture. TAIHO was completed in March 1944 and immediately allocated to CarDiv 1 (Dai-1 Koku Sentai). After shakedown training in the western Inland Sea, she took part in the Battle of Philippine Sea as the flagship of the First Carrier Striking Force (Dai-1 Kido Butai). This aerial photo of TAIHO at anchor was taken in March 1944 at Tawi Tawi. It is one of the few photos that show a detailed image of TAIHO. With a life of only three months, photos of TAIHO are very rare. After her loss in the operation "A-Go" in June 1944, all records of her plans and construction were lost, along with all official photos of her completion and sea trials.

Lower picture. During the FY 1939, the IJN approved the 'Maru-Yon' (Circle Four) shipbuilding plan, which contained one aircraft carrier larger than SHOKAKU class. Later she was named TAIHO. Her main feature was an armored flight deck, as by now the wooden flight deck was considered a fatal weakness of aircraft carriers. The flight deck armor was designed to withstand the impact from a 500kg bomb. TAIHO also had several new design features including an enclosed style bow. Her island bridge (with slanting funnel) was built almost clear of the flight deck. After her keel was laid in July 1941 at Kawasaki Kobe Yard, building work was accelerated. This photo is a model of her made by Kawasaki Heavy Industries after the war.

After Midway the IJN initiated the Fifth (Emergency) Replenishment Program (aka 'Kai-Maru-Go'). This plan proposed five large aircraft carriers (Nos. 5021-5025). These carriers were to be revised versions of TAIHO. By spring 1943 the design was ready and by that autumn, detailed drawings were completed. However as the war situation for Japan deteriorated, no keel was laid and all plans for these ships were abandoned.

These proposed carriers would have included some different features. For example, TAIHO had two less sets of AA cannon than the SHOKAKU class, so the next TAIHO-class was planned to have 8 sets of AA guns. A revised armor belt would withstand a 350kg torpedo explosion. Even more so than TAIHO the island bridge structure would be set completely clear of the flight deck.

Bucket chain hoists for bombs and torpedoes were electrically driven and designed to bring the ordnance from the magazines directly to the upper deck. As a result of these new features, displacement was to be increased by 1,600 tons. Total length, breadth and draft were changed a little. Main engine plant and aircraft carrying capacity would not be changed.

By the time TAIHO appeared in 1944 IJN air power was severely weakened. Most of the remaining skilled pilots from the start of the war had been lost in several disastrous land-based air attack operations in 1943. Many new pilots were hastily and inadequately trained. Even though the number of carriers was greater than at any other time, the ability to strike the enemy effectively was far less than the initial stage of the war.

Conversely the U.S. Navy had more than enough pilots who, although not trained to the same degree as earlier IJN pilots, were well trained. The U.S. also had many newly designed carriers, particularly the ESSEX class. Every IJN countermeasure against the well-equipped U.S. Task Forces was therefore too late. Even the TAIHO appeared too late. If she had been available earlier along with SHOKAKU class, her armored flight deck may well have shown its' value. In this article TAIHO's aircraft types and numbers are sourced from Navy confidential report "IJN Carrier General Features Table" (Ko-41) dated 3 February 1943.

Page 131. Top picture. This is similar to the photo opposite. Top left is a SHOKAKU-class carrier and to it's right is the battleship NAGATO. It seems that this image was cut from the same film negative captured at Tinian. This photo was included in an IJN Warships Identification booklet issued by the Office of Naval Intelligence in October 1944 and described as "Bigger size island bridge and overall length flight deck is unlike any other Japanese carrier". TAIHO remained the largest purpose-built Japanese carrier. On the flight deck can be seen the new Nakajima B6N Tenzan (Jill) torpedo bomber. Bottom picture. TAIHO at Tawi Tawi in March 1944. Behind her is a SHOKAKU-class carrier. TAIHO had one deck less than SHOKAKU and lower freeboard. To minimise the impact of high waves and wind pressure, the bow encompassed the hull's side plates and flight deck like HMS ILLUSTRIOUS's 'hurricane bow'. There appear to be two Type 21 radars atop and aft on the bridge structure. Because of the low height of the flight deck, her smoke stack was set upright and slanted outwards at 26 degrees to prevent turbulence and keep smoke off the flight deck. These features were tested in wind tunnel experiments and then tried on JUNYO class carriers for assessment.

Page 132. TAIHO seen from starboard above. Taken at about the same time as the previous one, this official U.S. Navy photo may also have been taken at Tawi Tawi. Instead of wood, TAIHO's flight deck received a "latex" cover. She featured a starboard island and funnel. In order to compensate for weight imbalance, the centerline of the flight deck was offset two meters to port abaft the island. Note the raised radio masts and collapsible aircraft handling crane starboard, abreast the aft elevator. TAIHO was armed with new 100mm AA guns located in three twin mounts along each side.

#### NEVER BUILT 'NEXT' - TAIHO CLASS CARRIERS

By Noriki Suzuki

IJN carriers were very successful in the early stages of the war but were defeated in June 1942 at Midway, when four carriers were lost. So serious was the loss that the IJN modified its wartime supply plan 'Maru-Go' (Circle Five) to 'Kai-Maru-Go' (Revised Circle Five), intending to reinforce its air strike capability. The "Next-TAIHO class carriers" were a part of that plan. TAIHO was the only carrier included in 'Maru-Yon' (Circle Four) shipbuilding plan, featuring heavy armor, quite untypical for traditional IJN carriers. The 'Next-TAIHO' class carrier was to be a larger, advanced version of TAIHO. TAIHO's displacement was 34,200 tons (trials); 'Next-TAIHO' was to be 35,800 tons and 4 meters longer. TAIHO's flight deck length was 257.5 meters and 'Next-TAIHO' 261.5 meters. TAIHO had six 100mm twin AA guns Type 98; 'Next-TAIHO' was designed to have eight Type 98s as suggested by TAIHO gun crews.

Another improvement was the revised anti-torpedo protection. Recognizing the development of enemy torpedo power, 'Next-TAIHO' had a well-designed under-water protection structure, enough to withstand a 350kg torpedo explosion. Again learning from Midway the electrically powered bucket chain hoists for bombs and torpedoes, connected flight deck and magazine directly. According to Revised Circle Five plan, the 'Next-TAIHO' was designed under basic design G-15. The plan was to build five of these ships, numbered 5021 to 5025 at the following shipyards:

No.5021 at Kure Navy Yard  
No.5022 at Kawasaki Kobe Yard//  
No.5023 at Mitsubishi Nagasaki Yard//  
No.5024 at Yokosuka Navy Yard  
No.5025 at Kure Navy Yard.

However, the war situation prohibited building such high-quality giant flattops that needed too much tooling. Mass-produced medium carriers, with lesser attack capability but needing less building work were required. Therefore IJN authorities decided to build the UNRYU class prior to 'next-TAIHO' according to the same Revised Circle Five plan. UNRYU's design was based on HIRYU but featured some improvements. With the worsening war situation, the shortage of materials prevented any ship keel lay and abandoned their building.

Page132. Drawing

- (1) 25mm triple AA gun No. 10
- (2) Storeroom
- (3) No.6 boiler uptake
- (4) Passageway
- (5) Crew's quarters
- (6) Fuel oil tank
- (7) Water-tight compartment
- (8) Upper hangar (compartment No. 3)
- (9) Lower hangar (compartment No. 2)
- (10) Boiler No. 6
- (11) Boiler No. 5
- (12) Reserve fresh water tank
- (13) Funnel uptakes
- (14) Damage control appliances storeroom

Ship No.5021 TAIHO-class amidships section (frame No. 125)  
(looking forward; thicker lines show heavier armor)

Page 133. Top picture. A rather poor photo of TAIHO taken from higher up and well behind her. The 257.5-meter armored flight deck reaching the bow was the longest ever installed on an IJN carrier. Both elevators seem to be lowered at the moment. The flight deck between elevators consisted of 20mm DS armor as a lower layer and 75mm CNC armor formed the upper layer. Elevators were smaller than those on SHOKAKU class carriers, but plated with two-ply 25mm DS armor they weighed about 100 tons each.

Bottom picture. The vanguard of the First Carrier Striking Force commanded by Vice Admiral Ozawa steams to anchorage at Lingga, south of Singapore on 1 May 1944. This photo was taken from the heavy AA cruiser MAYA. Left to right, heavy cruisers ATAGO, TAKAO, CHOKAI, light cruiser NOSHIRO (flagship of DesRon 2) and TAIHO (possibly JUNYO, considering the shape of the funnel). TAIHO was the flagship of both the First Carrier Striking Force and the whole Third Fleet.

Page 134. On 20 May 1944 the Operation 'A-GO' was launched with the intention to intercept and destroy enemy forces in the central Pacific. This photo was taken on 15 June 1944 in San Bernardino Strait (between Luzon and Samar islands in the Philippines). Vice Admiral Ozawa's central fleet steamed around the northern tip of Samar Island into open ocean.

In front center is the aircraft cruiser MOGAMI and behind her the column of CarDiv 1, - right two carriers are SHOKAKU class and next at center is TAIHO, followed by CarDiv 2 left side, - JUNYO class carrier - each carrier is about to make a right turn. TAIHO's island type bridge is still distinctive despite such a distance view. TAIHO had the fate to be sunk by USS ALBACORE four days later in her first battle.

IJN TAIHO

TABULAR RECORD OF MOVEMENT

By Hisashi Date

10 July 1941:

Laid down at Kawasaki Jukogyo K.K. Kobe Yard.

7 April 1943:

Launched.

15 August 1943:

Captain Michio Sumikawa is assigned as Equipping Officer.

23 December 1943:

Capt. Sumikawa is relieved by Captain Tomozo Kikuchi.

7 March 1944:

Commissioned in IJN, assigned to Maizuru Naval District, Third Fleet, CarDiv 1. Capt. Tomozo Kikuchi is assigned as Commanding Officer.

12 March 1944:

Departs Kure for Yashima Bight, Shikoku; arrives same day.

13 March 1944:

Departs Yashima; arrives at Tokuyama same day.

18 March 1944:

Departs Tokuyama; arrives at Tsurishima Bight same day.

19 March 1944:

Departs Tsurishima and// returns to Kure same day.

24 March 1944:

Departs Kure; arrives at Iwakuni Bight same day.

27 March 1944:

Departs Iwakuni; arrives at Hiragori Channel same day.

28 March 1944:

Departs Hiragori for a convoy escort mission with DesDiv 61 destroyers.

4 April 1944:

Arrives at Singapore.

6 April 1944:

Transfers to Lingga Roads; assumes standby alert.

15 April 1944:

TAIHO is appointed the flagship of the Third Fleet.

12 May 1944:

Departs Lingga with the First Mobile Fleet, First Carrier Striking Force.

16 May 1944:

Arrives at Tawi Tawi anchorage (Sulu Sea).

13 June 1944:

Mobile Fleet departs Tawi Tawi.

14 June 1944:

Arrives at Guimaras (Philippines).

15 June 1944:

Mobile Fleet departs Guimaras.

19 June 1944:

During the Battle of the Philippine Sea, USS ALBACORE (SS-218) torpedoes TAIHO. After a single hit the hangar bay is permeated with volatile vapors from a ruptured avgas tank. At 1432 a massive explosion follows and at 1628 the carrier sinks in at 12-05'N, 128-12'E, taking some 660 crewmembers with her.

26 August 1945:

Removed from Navy List.

APPENDIX 1.

IJN TAIHO: Tabular Record of Movement" reprinted by permission of the Author, Colonel Robert D. Hackett, USAF (Ret). Copyright 1997-2001.15 August 1943:  
At Kawasaki Shipbuilding, Kobe. Captain Sumikawa Michio (former CO of CV HIYO) is assigned as the Equipping Officer.

23 December 1943:

Captain Sumikawa is relieved by Captain Kikuchi Tomozo (former CO of CV ZUIKAKU) as the Equipping Officer.

7 March 1944: Initial Command Structure:

Completed as the TAIHO ("Great Phoenix"). Commissioned in the IJN. Captain Kikuchi is assigned as the Commanding Officer. The TAIHO is assigned to the Maizuru Naval District in CarDiv 1 of the Third Fleet.

12 March 1944:

Departs Kure and arrives at Yashima anchorage, Shikoku.

13 March 1944:

Departs Yashima and arrives at Tokuyama. Takes on fuel oil.

18 March 1944:

Departs Tokuyama and arrives at Tsurishima Bight.

19 March 1944:

Departs Tsurishima and arrives at Kure.

24 March 1944:

Departs Kure and arrives at Iwakuni. Embarks the 601st Naval Air Group's Hikotai 311 with 27 A6M "Zeke" fighters, 30 D4Y "Judy" dive-bombers and 18 B6N "Jill" torpedo-bombers.

27 March 1944:

Departs Iwakuni and arrives at the Kure area.

28 March 1944:

Departs Kure in a convoy escort mission. Later, departs the Inland Sea with DesDiv 61's HATSUZUKI and the WAKATSUKI.

3 April 1944:

West Coast of Borneo. The USS HAKE (SS-256) in the Singapore-Manila traffic lane sights the TAIHO and her two destroyers. The group is making 22 knots  
- too fast for the submarine to get into position for an attack.

4 April 1944:

Arrives at Singapore.

6 April 1944:

Departs Singapore and arrives at Lingga Roads. The TAIHO assumes standby alert.

15 April 1944:

The Commander of the First Mobile Fleet, Vice Admiral Ozawa Jisaburo (former CO of BB HARUNA), hoists his flag aboard the TAIHO

6 April-12 May 1944:

Aircrew takeoff and landing exercises.

12-15 May 1944:

Departs Lingga for the Tawi Tawi anchorage with the First Mobile Fleet, First Carrier Striking Force, Force "A": Car Div 1: TAIHO, SHOKAKU, ZUIKAKU, CruDiv 5: MYOKO, HAGURO, DesRon 10: light cruiser YAHAGI with DesDiv 4's ASAGUMO, DesDiv 17' s ISOKAZE, URAKAZE and DesDiv 61's AKIZUKI, SHIMOTSUKI, HATSUYUKI and the WAKATSUKI.

12 May 1944:

Departs Lingga with the Mobile Fleet.

13 May 1944:

0800: Off the West Coast of Borneo. The USS LAPON (SS-260) spots the Mobile Fleet.

14 May 1944:

1100: 40 miles NW of Tawi Tawi. The Mobile Fleet is spotted by the USS BONEFISH (SS-223) and reported that night to ComSoWesSubPac.

16 May 1944:

The Mobile Fleet arrives at the Tawi Tawi anchorage in the Sulu Sea. The BONEFISH, lying off shore, again sights the fleet. That night, she provides a detailed report of the fleet's composition.

16 May-13 June 1944:

At Tawi Tawi. Training duties.

13 June:

Departs Tawi Tawi with the Mobile Fleet to oppose the U.S. Fifth Fleet in a "decisive battle" off Saipan. Force "A" sorties with Force "B": CarDiv 2: JUNYO, HIYO, RYUHO; battleship NAGATO, cruiser MOGAMI, DesDiv 4's MICHISHIO, NOWAKI, YAMAGUMO, DesDiv 27's AKASHIMO, HAYASHIO, HAMAKAZE, SHIGURE, SAMIDARE.

The Mobile Fleet is sighted and later reported as departing Tawi Tawi by the USS REDFIN (SS-272)

During aircraft recovery operations, an inexperienced pilot makes a bad approach on the TAIHO. His Nakajima B6N1 Tenzan "Jill" attack bomber jumps the arresting barrier and crashes into parked aircraft. The Jill bursts into flames and the fire destroys it and two Mitsubishi A6M5 Reisen "Zekes", two Yokosuka D4Y1 Suisei "Judy" dive-bombers and another "Jill" on the flight deck.

14 June 1944:

At Guimaras, Philippines. Refuels with the Main Body from the 2nd Supply Force's oilers GENYO MARU and the AZUSA MARU.

15 June 1944:

0800: The Mobile Fleet departs Guimaras through the Visayan Sea and the San Bernardino Strait into the Philippine Sea headed towards Saipan.

1622: The Mobile Fleet is spotted by the USS FLYING FISH (SS-229) in the San Bernardino Strait and reported that evening.

2230: The Philippine Sea. The 2nd Supply Force oilers GENYO MARU, AZUSA MARU escorted by DesDiv 17's YUKIKAZE and DesDiv 30's UZUKI are sighted by the LtCdr Herman J. Kossler in the USS CAVALLA (SS-244). Kossler is enroute to the San Bernardino Strait to relieve the FLYING FISH.

16 June 1944:

0545: The CAVALLA reports sighting the Supply Force to ComSubPac.

1650: Vice Admiral Ugaki Matome's (former CO of BB HYUGA) aborted Operation "Kon" Task Force from Batjan joins Ozawa's force. Forces "A" and "B" deploy 100 miles behind the Force "C" Vanguard: CarDiv 3: CHITOSE, CHIYODA, ZUIHO, BatDiv 1: YAMATO, MUSASHI, BatDiv 3: HARUNA, KONGO, CruDiv 4: ATAGO, TAKAO, MAYA, CHOKAI, CruDiv 7: KUMANO, SUZUYA, CHIKUMA, TONE, DesRon 2: light cruiser NOSHIRO, DesDiv 31's ASASHIMO, KISHINAMI, OKINAMI and DesDiv 32's FUJINAMI, HAMAKAZE, SHIMAKAZE and the TAMANAMI.

17 June 1944:

2015: The Mobile Fleet itself is sighted by the CAVALLA in the Philippine Sea.

2225: In the dark, the CAVALLA surfaces, makes her contact report and then shadows the fleet.

18 June 1944:

0600: Ozawa orders the launch of 14 Type 97 Nakajima B5N2 "Kate" and two Aichi E13A1 "Jake" long range reconnaissance seaplanes to search out to 425 miles ahead for U.S. carriers.

0630: The CAVALLA loses contact with the Mobile Fleet.

0800: Ozawa's aircraft sight two enemy planes.

1200: Ozawa launches 13 D4Y1 "Judy" dive-bombers and two "Jake" seaplanes to search for the Fifth Fleet.

Aboard his flagship, the USS LEXINGTON (CV-16), the Commander of Task Force 58, Vice Admiral (later Admiral) Marc A. Mitscher (former CO of CV HORNET) and his staff formulate attack plans based on the CAVALLA's sighting reports.

Mitscher opts for a strike in the late afternoon to be followed by a night surface action.

Vice Admiral Willis A. Lee, in the battleship USS WASHINGTON (BB-56), demurs citing his ships' lack of training in night fleet tactics. Moreover, in a controversial but prudent decision, the Commander, Fifth Fleet, Admiral Raymond A. Spruance, aboard his flagship, the cruiser USS INDIANAPOLIS (CA-35) decides that rather than launch an attack, the fleet will retire eastward towards Saipan that night to protect the Marine invasion forces.

1514: Ozawa's search planes report sighting an "enemy task force, including carriers."

1600: Another search plane confirms sighting enemy ships, with carriers, on a westerly course.

1637: Rear Admiral Obayashi Sueo's (former CO of BB HYUGA) CarDiv 3: CHITOSE, CHIYODA and the ZUIHO begins launching aircraft to attack the ships reported at 1514.

Obayashi launches 21 aircraft from the CHIYODA before he receives a signal from Admiral Ozawa that the Mobile Fleet will not attack until the next day. Obayashi is forced to recall his strike. CarDiv 3 trails behind, recovering its planes, while the TAIHO and the rest of the Mobile Fleet steam ahead on course 200 degrees.

1900: Captain Kikuchi brings the TAIHO about to course 140 degrees and slows speed to 16 knots as do the other ships of the Mobile Fleet.

2100: Aboard the TAIHO's flag bridge, Admiral Ozawa orders his Mobile Fleet to split. Force "C" Vanguard proceeds due east. The TAIHO and Forces "A", "B" proceed southward on course 190 degrees.

19 June 1944: Operation A-Go - The Battle of the Philippine Sea:

0300: Captain Kikuchi brings the TAIHO to northeasterly heading on course 050 degrees and increases speed to 20 knots as do the other ships of the Mobile Fleet.

0430: Ozawa orders his Vanguard Force "C" battleships and cruisers to catapult 16 Aichi E13A1 "Jake" long range reconnaissance seaplanes. They are to search 350 miles ahead for U.S. carriers.

0515: Force "B's" CarDiv 3 launches 13 "Kates" and Force "C's" cruiser CHICKUMA catapults another "Jake" aircraft to search 300 miles ahead.

0530: Force "A's" SHOKAKU of Ozawa's CarDiv 1 launches 11 "Judy" dive-bombers and the cruiser MOGAMI of Force "B" catapults two "Jakes" to search 560 miles ahead.

0730: Ozawa receives an enemy sighting report from a "Jake" crew of 2 carriers, 4 battleships and 10 other ships 160 miles west of Saipan.

0734: Ozawa receives an enemy sighting report from another "Jake" crew of four battleships and 10 other ships 160 miles west of Saipan. This crew quickly reports also seeing four carriers.

0750: Force "A" is sighted by LtCdr James W. Blanchard's USS ALBACORE (SS-218) running on the surface. Blanchard goes to "Battle Stations Submerged" and begins an approach on a distant ship that he identifies as an enemy fleet carrier.

Midway into his approach, Blanchard shifts his attack to another ship that he identifies as a "SHOKAKU-class" carrier. The new target at 9,000 yards is much closer and heading southeast on a 140 degree track directly towards the ALBACORE at 27 knots.

0800: CarDiv 3's CHITOSE launches two "Kate" attack planes as pathfinder aircraft.

0825: On his own initiative, Rear Admiral Obayashi launches a strike of 16 "Zeke" fighters, 45 "Zeke" fighter-bombers and eight "Jill" torpedo planes of CarDiv 3's 653rd Naval Air Group against Spruance's fleet.

0856: The TAIHO, SHOKAKU and the ZUIKAKU begin launching Ozawa's own Car Div 1's first strike. Led by the 601st Naval Air Group's LtCdr Tarui Akira, the strike consists of 27 "Jills", 53 "Judys" and 48 "Zeke" fighters.

0910: Blanchard is just about to fire at the TAIHO when the white "solution" light generated by his Torpedo Data Computer (TDC) goes out! He checks fire. The TAIHO is going by at 27 knots! There is no time for calculating a manual solution, so Blanchard fires his steam torpedoes by "eye", correcting each by watching the wakes of the ones fired. He fires four Mark 23s and two Mark 14-3As at 2,000 yards range. He sees that most of his torpedoes will pass astern of the carrier and compensates for the next ones that he fires.

0911: Flight WO Sakio Komatsu orbiting the TAIHO in a "Judy" spots the wakes and dives in the path of the oncoming torpedoes. His plane hits and explodes one, but the TAIHO is still hit by one torpedo on the starboard side in the vicinity of frame No. 54. The forward elevator carrying an A6M5 "Zeke" drops about six feet from the full "up" position and jams, her aviation fuel tanks rupture and a small fire breaks out, but the TAIHO continues on course at 21 knots.

The TAIHO does not take on a list and her crew planks over the forward elevator. Damage control parties fight the fire and the fuel leaks, but the ship's hangar spaces fill with vapors and smoke. An officer orders all the ventilation fans turned on to disperse the fumes, but this action spreads the gasoline and fuel oil vapors throughout the lower part of the ship.

0920: Aboard Force "C" Vanguard's battleship YAMATO, steaming about 100 miles ahead of CarDiv 1, lookouts spot aircraft approaching. Unknown to Force "C", this is the 601st Naval Air Group's fighter unit from the TAIHO, SHOKAKU and the ZUIKAKU. Force "C" has not been informed of any friendly overflight, so the cruiser TAKAO fires four starshells meaning, "identify yourself". No reply is received and the planes keep approaching. When the range is down to 16,400 yards, Vice Admiral Kurita orders all ships to execute a turn to port and simultaneously open fire. One or two "Zekes" are shot down and four others so damaged that they must return to their carrier.

1000: Rear Admiral Joshima Takaji's Car Div 2: JUNYO, HIYO and the RYUHO launches 15 "Zeke" fighters, 25 "Zeke" fighter-bombers and seven "Jills" of the 652nd Naval Air Group.

1030: Force "B's" Car Div 2 launches another strike of 30 "Zeke" fighters, 10 "Zeke" fighter-bombers, nine "Judys" and six "Jills". Force "A's" ZUIKAKU of CarDiv 1 contributes four "Zekes" and four "Jills" to Joshima's strike force.

Force "A" with the ZUIKAKU in the lead, followed by the TAIHO and the SHOKAKU continue on course towards Saipan.

1152: LtCdr Kossler, submerged in the CAVALLA, sights the SHOKAKU, the light cruiser YAHAGI, a heavy cruiser and a destroyer off his port bow. The SHOKAKU, making 25 knots, is recovering her reconnaissance aircraft. Kossler begins his approach.

1218: At a range of 1,200 yards, Kossler fires six steam torpedoes at the SHOKAKU's starboard side. Four torpedoes hit and start a fire. Gasoline and fuel oil tanks are ruptured and fumes seep throughout the carrier. The destroyer URAKAZE unsuccessfully counterattacks the CAVALLA with depth charges for several hours.

1501: A huge explosion racks the SHOKAKU, probably caused by a bomb magazine detonation. Fires rage throughout the ship. She slows, drops out of formation and settles rapidly by the bow. Water flows over the flight deck and spills through the open Number 1 elevator into the hanger. The SHOKAKU, veteran of Pearl Harbor, rolls over to starboard and sinks by the bow with nine aircraft and most of her crew.

1532: Aboard Vice Admiral Ozawa's flagship, the TAIHO, an enormous internal explosion fueled by volatile vapors blows out her sides and bottom and splits the armored flight deck. The blast kills most of the crewmembers below decks.

1606: A lifeboat takes Ozawa and his staff to the destroyer WAKATSUKI. One staff member carries the Emperor's portrait to safety. Later, Ozawa is transferred to the cruiser HAGURO from which he resumes command of the Mobile Fleet.

During the day's air battles, Ozawa launches 374 sorties and loses 294 planes in the "Great Marianas Turkey Shoot." For these losses, the Japanese inflict only negligible damage to the carriers USS BUNKER HILL (CV-17), WASP (CV-18) and the battleship INDIANA (BB-58). The Americans lose 31 aircraft to all causes.

1828: Sunk: The TAIHO heels over to starboard, capsizes and sinks with 13 aircraft aboard at 12-24 N, 137-04 E. 660 crewmen are killed of the 1,751 aboard. The destroyer AKIZUKI assists the survivors, including Captain Kikuchi. On 15 October 1944, he is promoted to Rear Admiral and is reassigned as Chief of Staff of Vice Admiral Fukudome Shigeru's 2nd Air Fleet in Formosa.

In the following days, Task Force 58 sinks the carrier HIYO and the fleet oiler GENYO MARU and damages the carriers ZUIKAKU, JUNYO, CHIYODA and the RYUHO, the battleship HARUNA and the cruiser MAYA. Admiral Ozawa and his Mobile Fleet retreat to Japan.

26 August 1945:  
Removed from Navy List.

#### APPENDIX 2.

IJN aircraft mentioned in the text.

Manufacturer, short designation	Type, Model number	Description	Allied code name
Mitsubishi A5M4	Type 99 Model 4	monoplane fighter	Claude
“ A6M2	Type 0 Model 21	“ “	Zeke, ‘Navy Nought’
“ A6M3	Type 0 Model 32	“ “	Hap, Hamp, Zeke 32
“ A6M5	Type 0 Model 52	“ “	Zeke
“ A7M2	Reppu Model 22	“ “ (not used operationally)	Sam
Yokosuka B3Y1	Type 92	torpedo biplane	-
“ B4Y1	Type 96 Model	torpedo bomber	Jean
Nakajima B5N1	Type 97 Model 11	torpedo bomber	Kate
“ B5N2	Type 97 Model 12	“ “	“
“ B6N1	Tenzan Model 11	“ “	Jill
“ B6N2	Tenzan Model 12	“ “	“
Aichi B7A2	Ryusei	torpedo bomber	Grace
Nakajima C3N1	Type 97	scout monoplane (not used operationally)	-
Nakajima C6N1	Saiun Model 11	fast scout	Myrt
Aichi D1A2	Type 96	biplane dive-bomber	Susie
“ D3A1	Type 99 Model 11	“	Val
“ D3A2	Type 99 Model 22	“	“
Yokosuka D4Y1-C	Type 2 Model 11	fast scout	Judy
“ D4Y2	Suisei Model 12	dive-bomber	“
“ D4Y3	Suisei Model 33	“	“
Nakajima E8N1	Type 95 Model 11	reconnaissance floatplane (biplane)	Dave