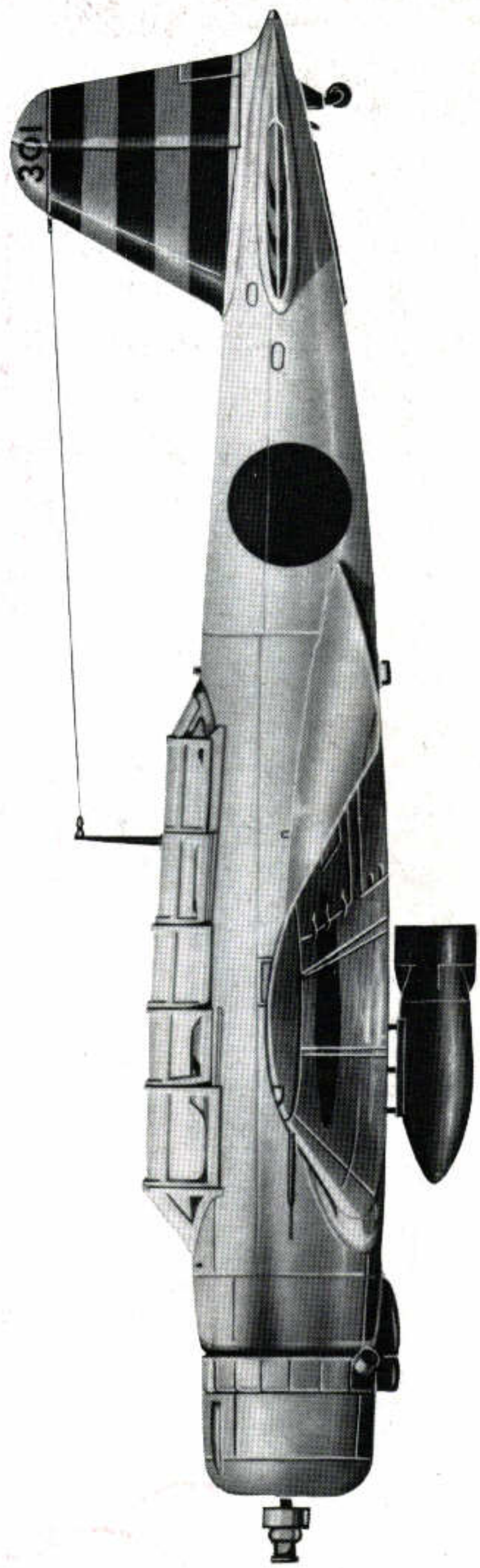
A9

PROFILE PUBLICATIONS

The Nakajima B5N "Kate"



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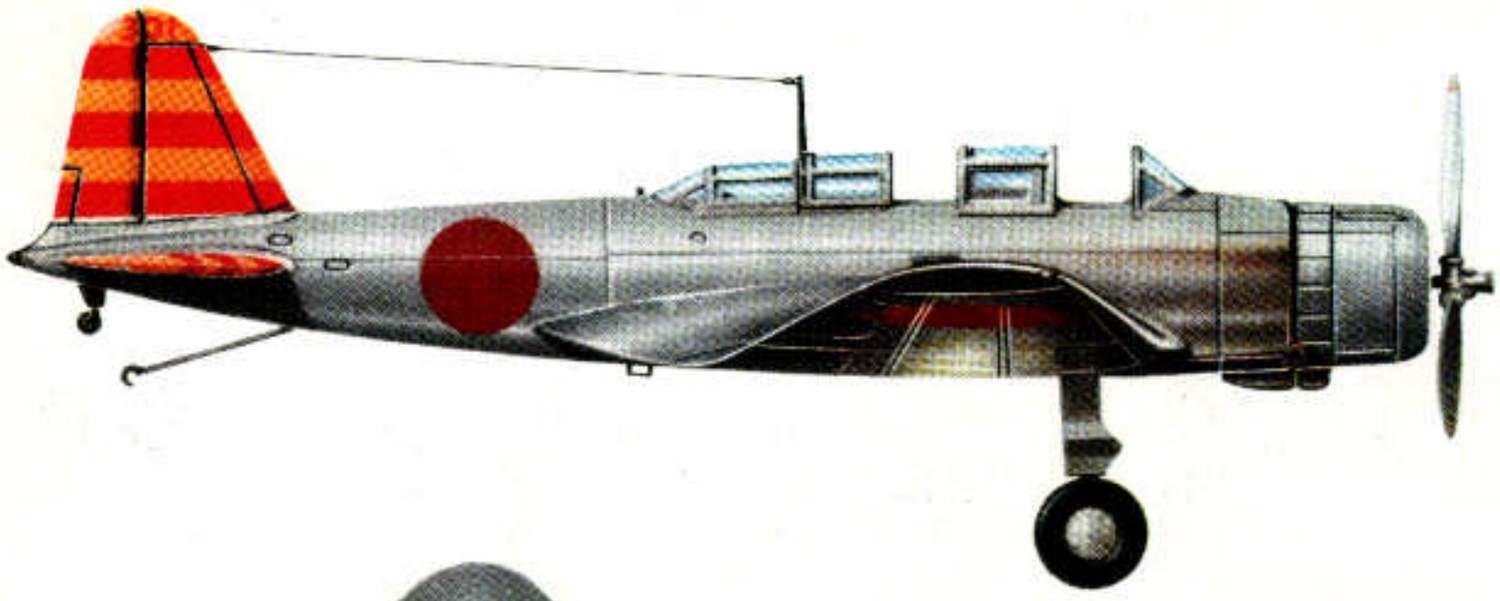

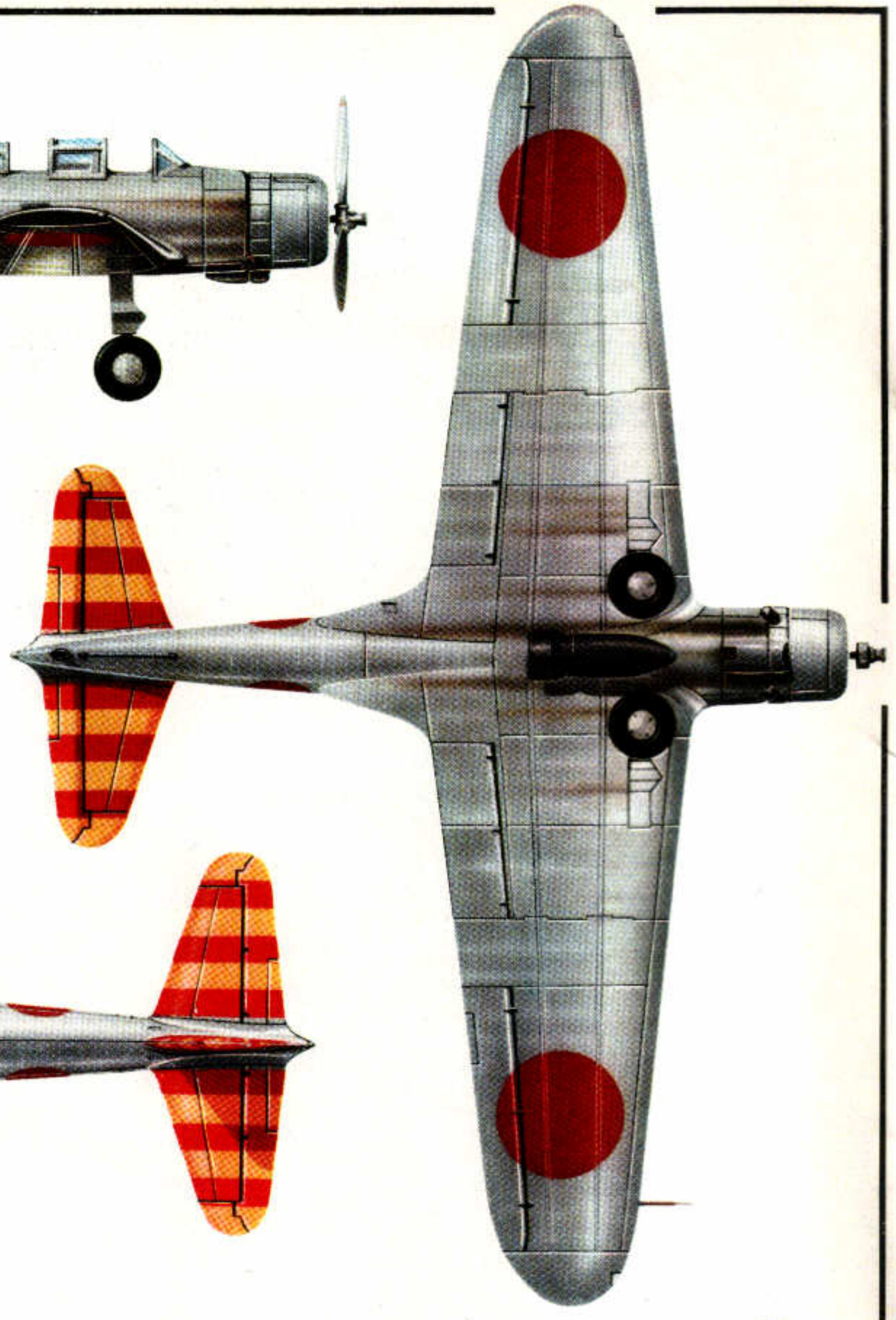

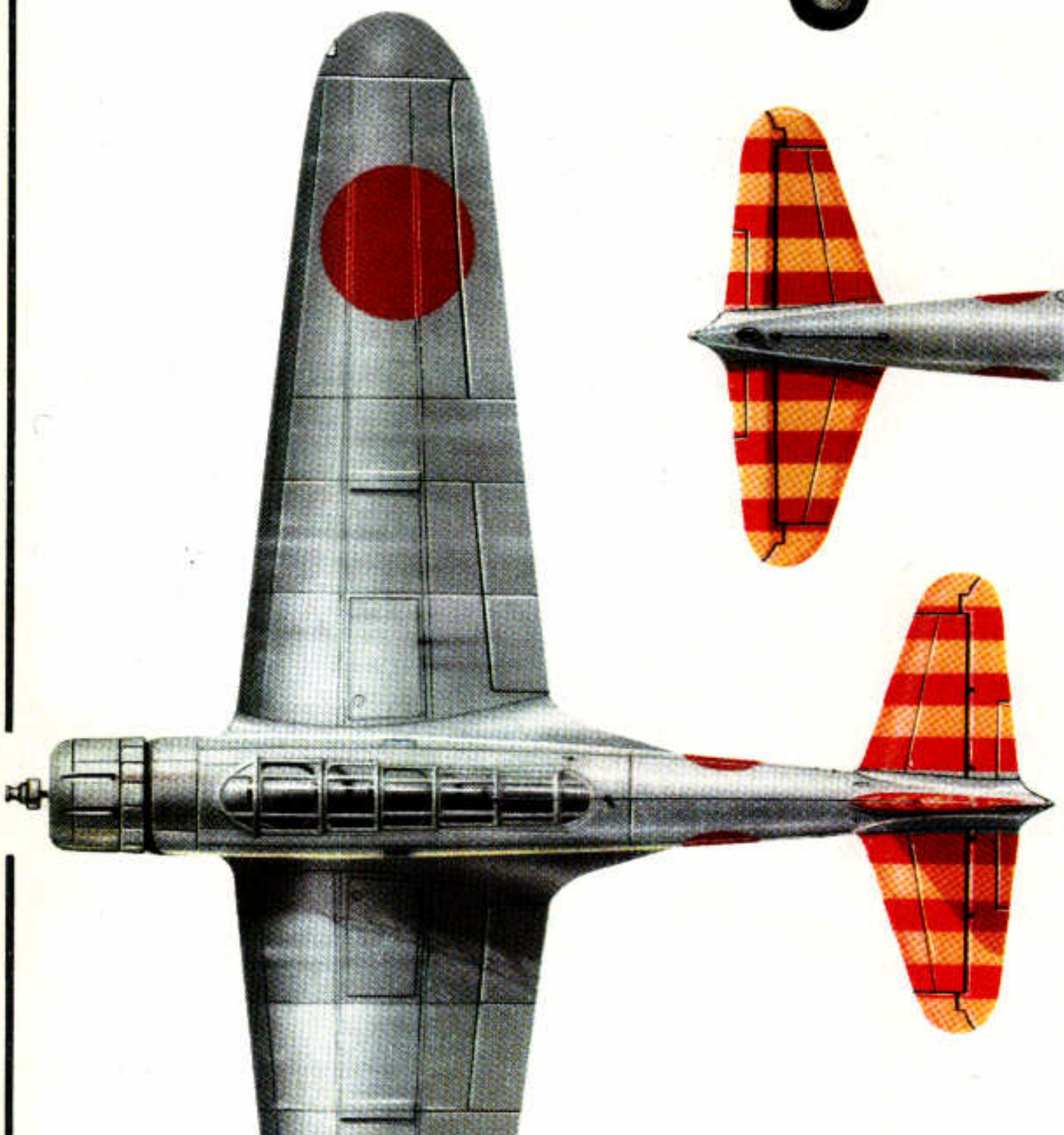

NAKAJIMA B5N2 (Type 97 Model 3) in which Cdr. Mitsuo Fuchida led the first wave of Japanese aircraft to attack Pearl Harbour on 7th December, 1941. Cdr. Fuchida was the General Commander Air of the Imperial Japanese Navy 1st Carrier Division; flying as observer in the second cockpit, he sent out the order to attack at 07.49 hrs.

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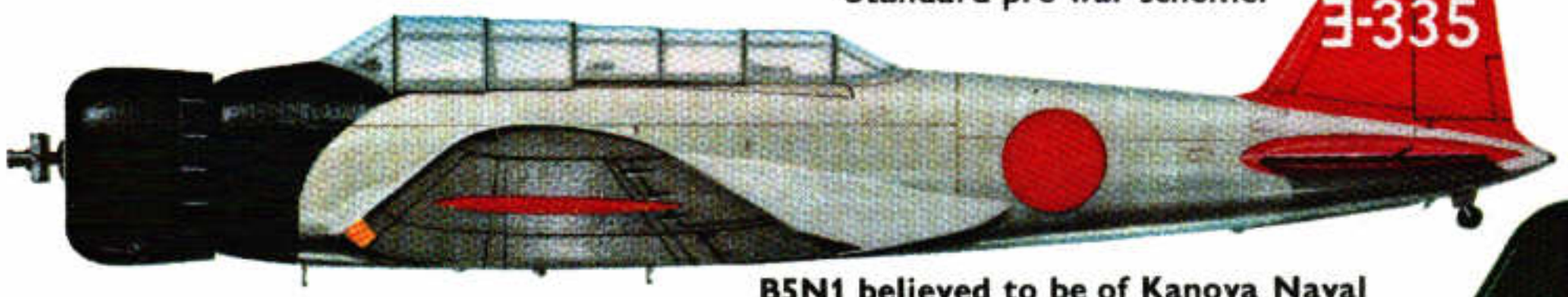
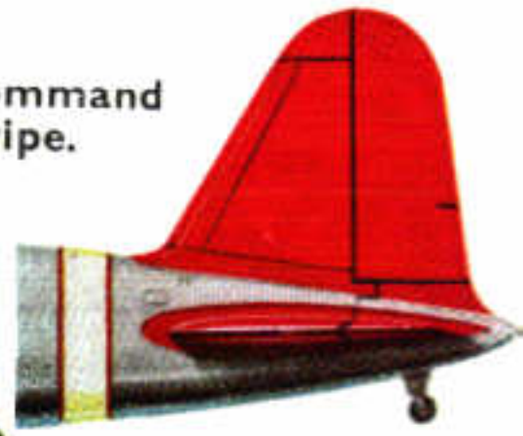
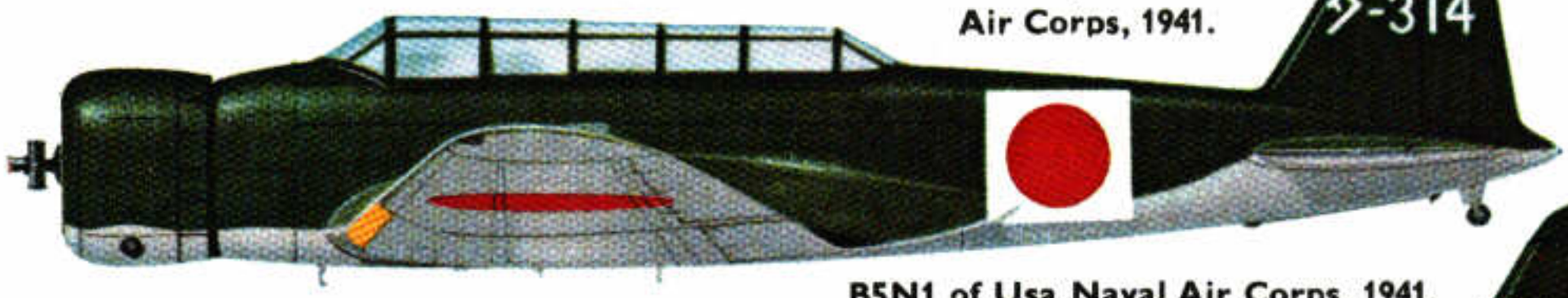
B5N1 of Yokosuka Naval Air Corps, 1939-40.
Standard pre-war scheme.



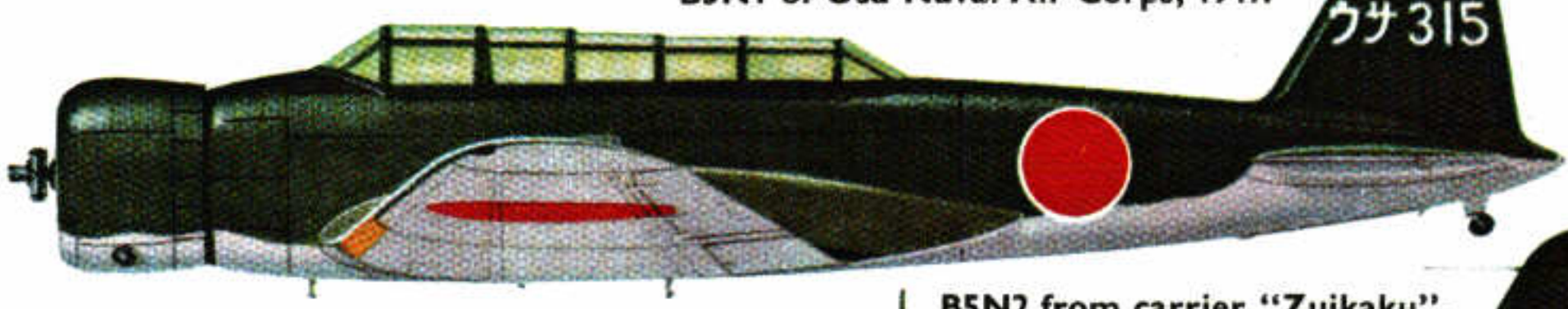
Command stripe.



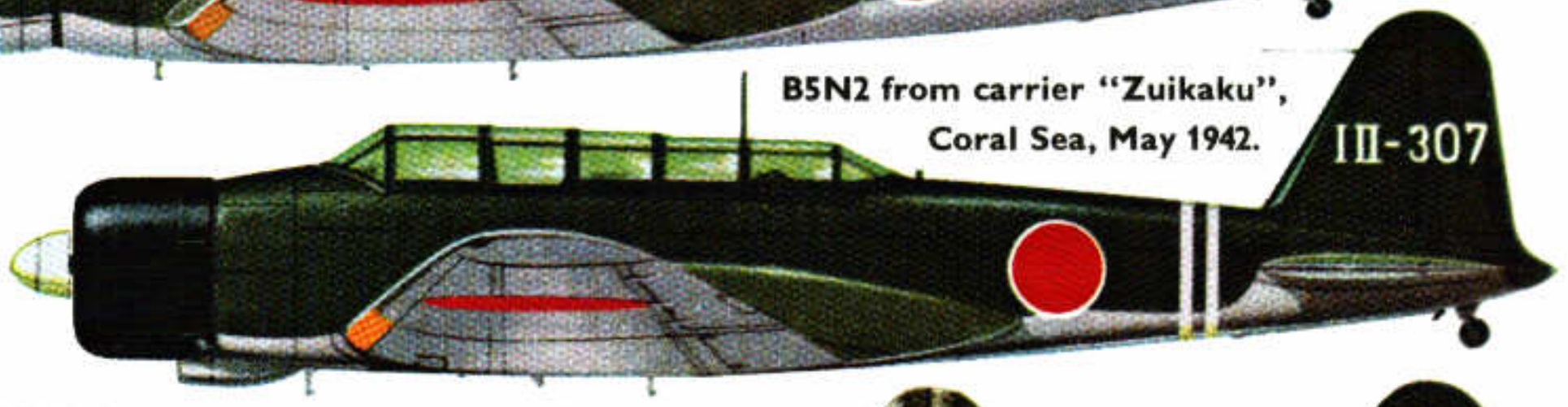
B5N1 believed to be of Kanoya Naval Air Corps, 1941.



B5N1 of Usa Naval Air Corps, 1941.



B5N2 from carrier "Zuikaku", Coral Sea, May 1942.



Carrier "Zuikaku", 1941-42.

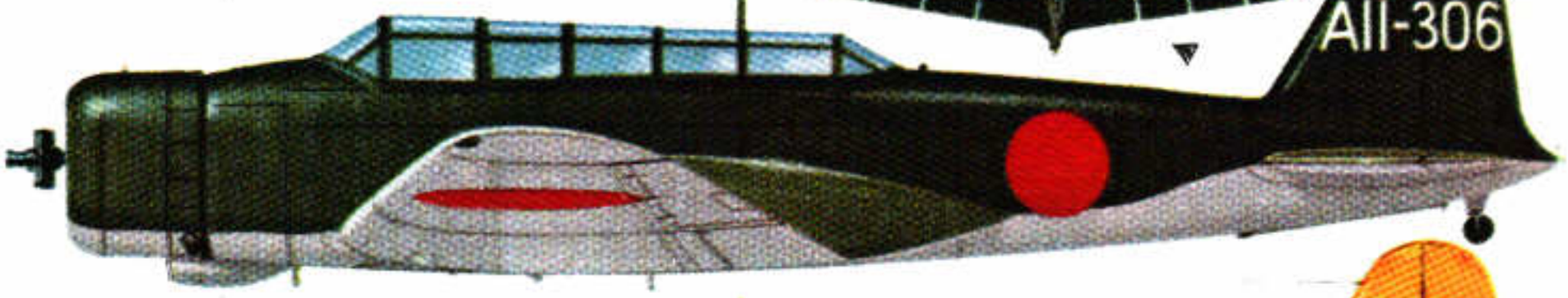
B5N2 from carrier "Akagi", 1941-42; intermediate colour scheme.

Carrier "Ryujo", 1942.

Tailplane detail.

Carrier "Hiryu", 1941-42.

B5N2 from carrier "Kaga", sunk at Midway, June 1942.

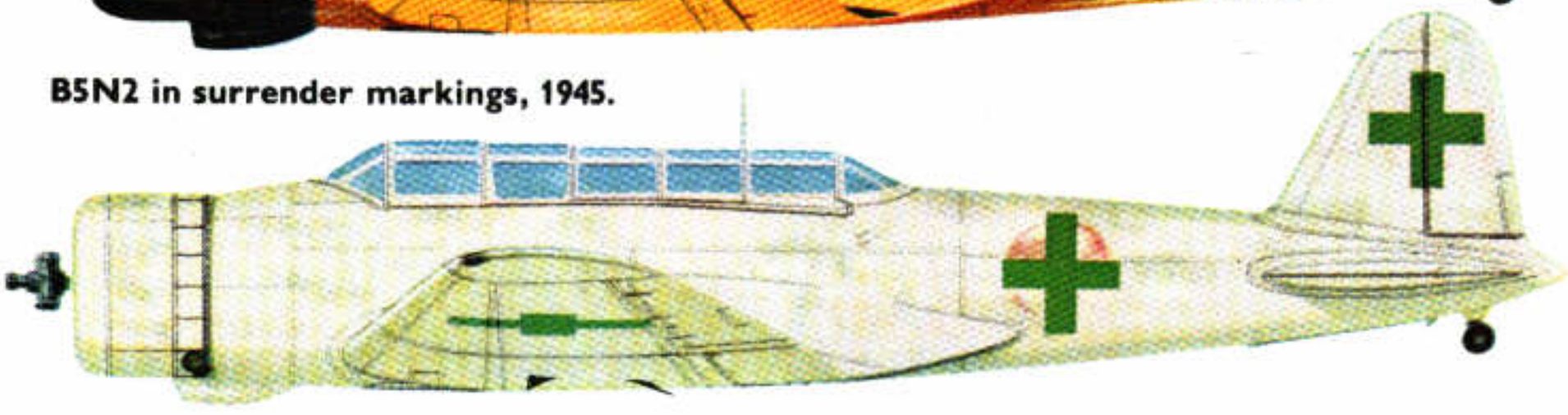


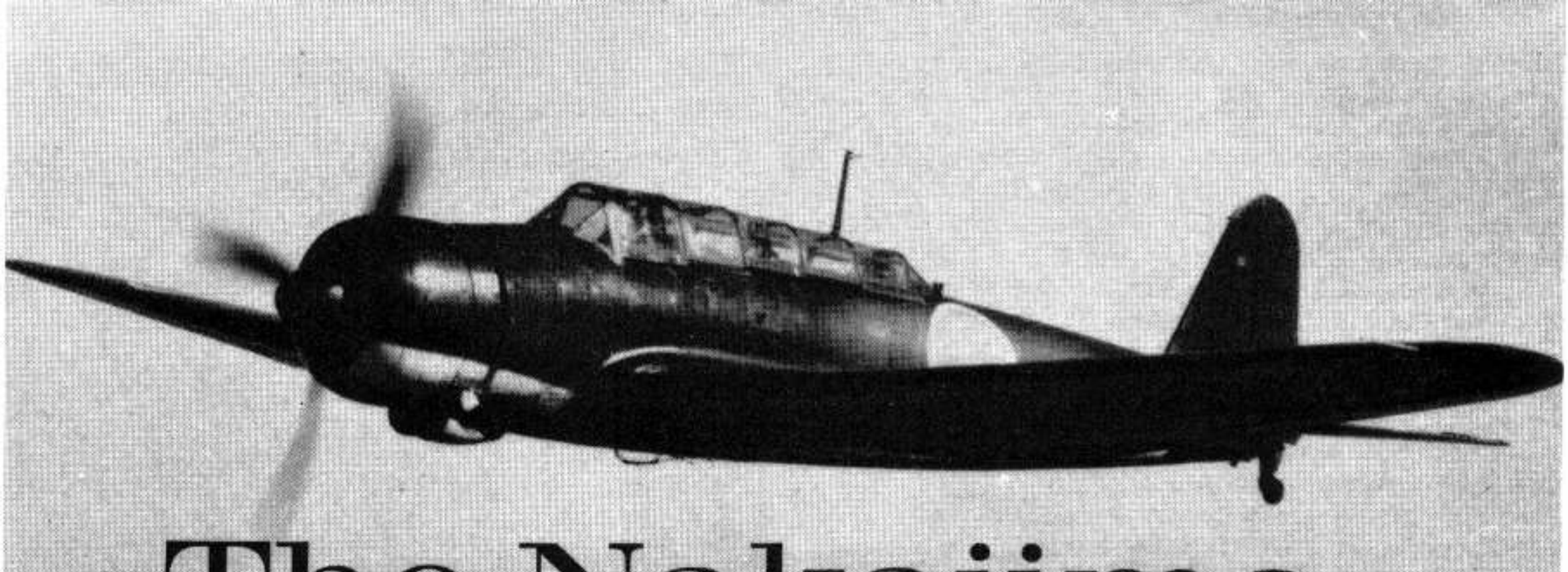
B5N2 from carrier "Soryu", at time of Pearl Harbour, December, 1941.

Wing upper surface detail.

Carrier "Junyo", 1942.

B5N2 in surrender markings, 1945.





The Nakajima B5N "Kate"

by Dr. M. F. Hawkins

Fine study of a B5N2 in flight; this variant differed from the initial production model in being powered by the Nakajima Sakae engine of 1,000 h.p., in place of the B5N1's 770 h.p. Hikari 3. (Photo: René J. Francillon Collection. Unless otherwise indicated, all photos in this *Profile* were supplied from the author's collection).

On 7th December 1941, the Western world was reminded sharply of the oldest rule of warfare—"Never underestimate the enemy". The forces of Imperial Japan, dismissed for decades as obsolete and faintly humorous, were launched on a series of whirlwind victories which engulfed a quarter of the globe in a matter of months; it was nearly four years before the Allies could claw their way to victory, four years of savagery unparalleled in recorded history. In the end only the unleashing of a totally new and totally horrible weapon restored peace; and in that final bitter victory many people tended to forget that the conventional forces of Japan still held vast tracts of Asia up to the moment of surrender, territory which the conventional forces of the West had been unable to recapture in four long years.

The weapon which spearheaded the Japanese conquests was her Naval Air Force; and it is perhaps relevant to consider the growth of that weapon as a background to the history of the Nakajima B5N, the aircraft from which the order to attack Pearl Harbour was given, and thus the aircraft which may be said to have launched the whole Pacific war at 07.49 hours on that December morning 25 years ago.

THE I.J.N.A.F. AND THE 10-SHI SPECIFICATIONS

In September 1914 the Imperial Japanese Naval Air Service carried out its first war operations when the seaplane tender *Wakamiya Maru* sailed to Kiaochow Bay in China, with four Maurice Farman floatplanes, for operations against the German Navy. These operations included reconnaissance flights and an attempt at bombing. As a result of these, and other, actions, German possessions in the Marshall and Caroline Islands were given to Japan at the end of the war: a gift that was to have great importance twenty years later.

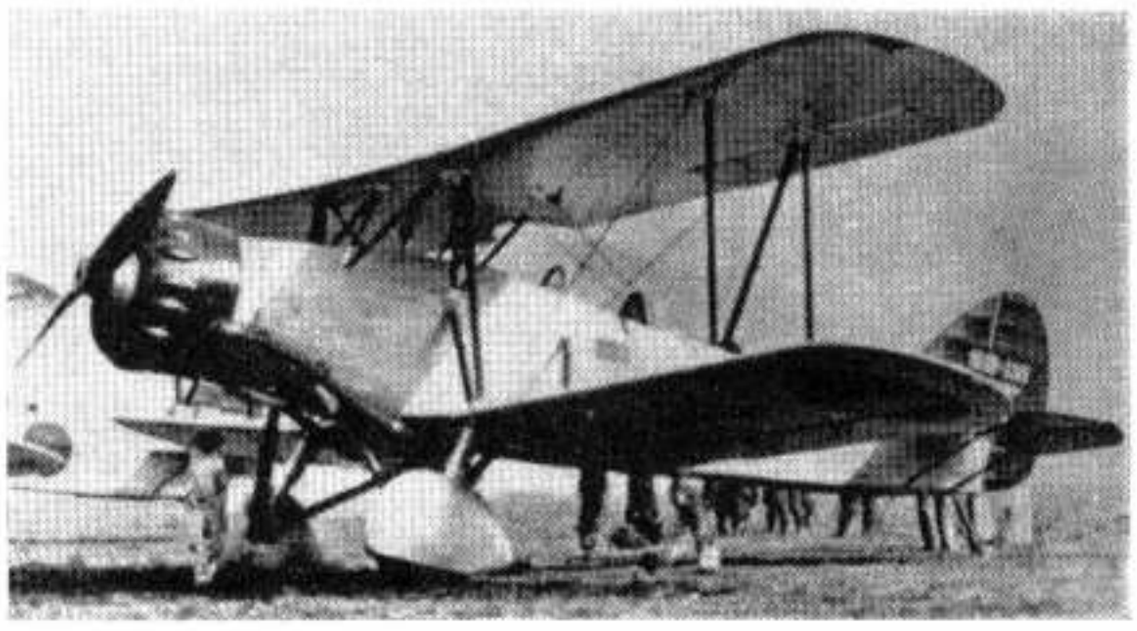
Author and publishers wish to express their gratitude to Mitsuo Fuchida for his assistance in the preparation of the illustration on the opposite page.

At the end of the First World War the Japanese Navy decided that America was the main potential enemy, whereas the Army considered Russia the most likely adversary. As there was little co-operation between the two, and as both the Army and the Navy regarded their air forces only as extensions of the striking power of their main forces, it is not surprising that in the interwar period Army aircraft were developed with a view to land warfare against the Russians, while Naval aircraft were designed for a sea war against the United States.

The early Japanese aircraft were mainly imported, but in 1918 Lt. Chikuhei Nakajima resigned from the Navy to set up his own aircraft firm, together with Seibei Kawanishi, at Ota in the Gumma Prefecture. In a year, however, disagreements developed, and Kawanishi left to form his own company, whilst Nakajima continued to build foreign aircraft under licence and design his own entries for competitions sponsored by both Army and Navy for their aircraft requirements.

In 1921 Capt. Sempill led a team of 30 British instructors to form the nucleus of the new Naval Air Force, and Mr. Herbert Smith, previously with the

The "Kate's" predecessor as standard torpedo bomber of the I.J.N.A.F.; the Yokosuka B4Y "Jean", which came into service in 1936, is roughly comparable to the Royal Navy's Fairey Swordfish.



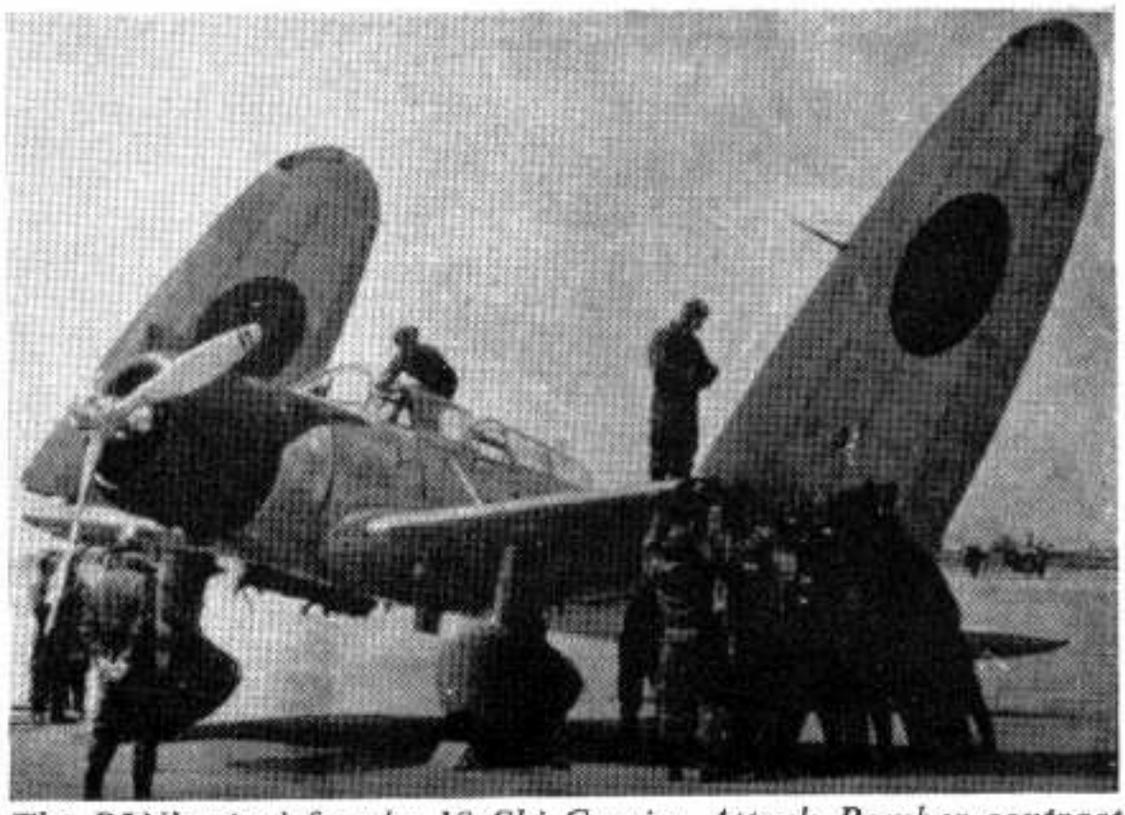
Sopwith company, led the Mitsubishi design team, being responsible for the Type 10 series of shipboard fighters, bombers and torpedo aircraft.

The first Japanese aircraft carrier entered service in 1923. This was the *Hosho*, although at this time, the hey-day of the battleship, few saw much future for the carrier. An exception was Capt. Yamamoto, C.O. of the Kasumigaura Naval Pilot School, who predicted that the carrier would be the most important ship in future naval warfare.

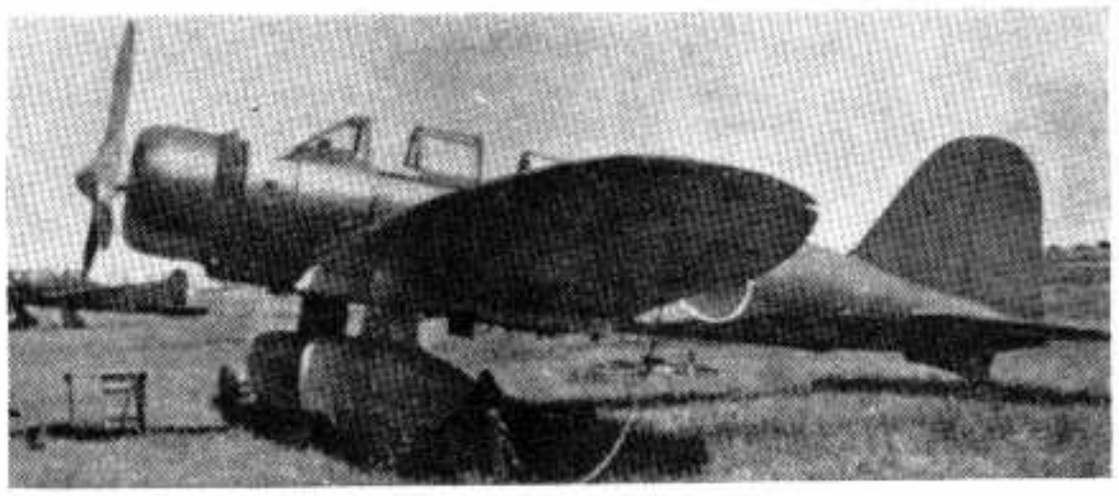
During the late 1920's development was slow and the Imperial Naval Air Service tended to be regarded as an eccentric and rather unnecessary part of the fleet. The planes were inefficient, and new models, produced by Japanese design teams with assistance from foreign advisers such as Dr. Vogt with Kawasaki, and Mr. Petty of Blackburns with Mitsubishi, showed only slight improvement over the aircraft that they were to replace. All the time, however, the Japanese designers were gaining experience from building planes under licence and developing their own. They also followed a policy of buying examples of contemporary foreign aircraft to test alongside their own designs, and copy any features that they felt might improve their own aircraft. As a result of this policy the story went round the Western world that Japanese aircraft were inferior copies of Western types. This story suited the Imperial Navy well and they did nothing to discourage it until 7th December, 1941.

In the early 1930's, Capt. Yamamoto, having returned from a spell at the Embassy in Washington, and now promoted Vice Admiral, became Chief of the Technical Bureau of Naval Aviation and set about the development of aircraft suitable for a Pacific naval war. The result was the rapid development of a series of highly efficient naval aircraft, culminating in 1941 with the largest and most powerful naval air force in the world. The development of fighters proceeded through the 9-Shi carrier fighter to the A5M4 (Claude) which was widely used in China; and then the Zero. (*See Profile 129, The Mitsubishi A6M2.*)

Dive bomber development produced the Navy Type 99 Carrier Dive Bomber (Aichi D3A, Val) and Admiral Yamamoto's plan for a land based long range naval bomber resulted in the Navy Type 96 Attack Bomber (Mitsubishi G3M, Nell) and later the Navy Type 1 Attack Bomber (Mitsubishi G4M, Betty) which sank H.M.S. Prince of Wales and H.M.S. Repulse when they thought themselves far out of range of land based air attack.



The B5N's rival for the 10-Shi Carrier Attack Bomber contract was the Mitsubishi Type 97 Model 2, B5M. It was more conservative in design than the Nakajima, and wing folding was manual, as demonstrated in this photograph.



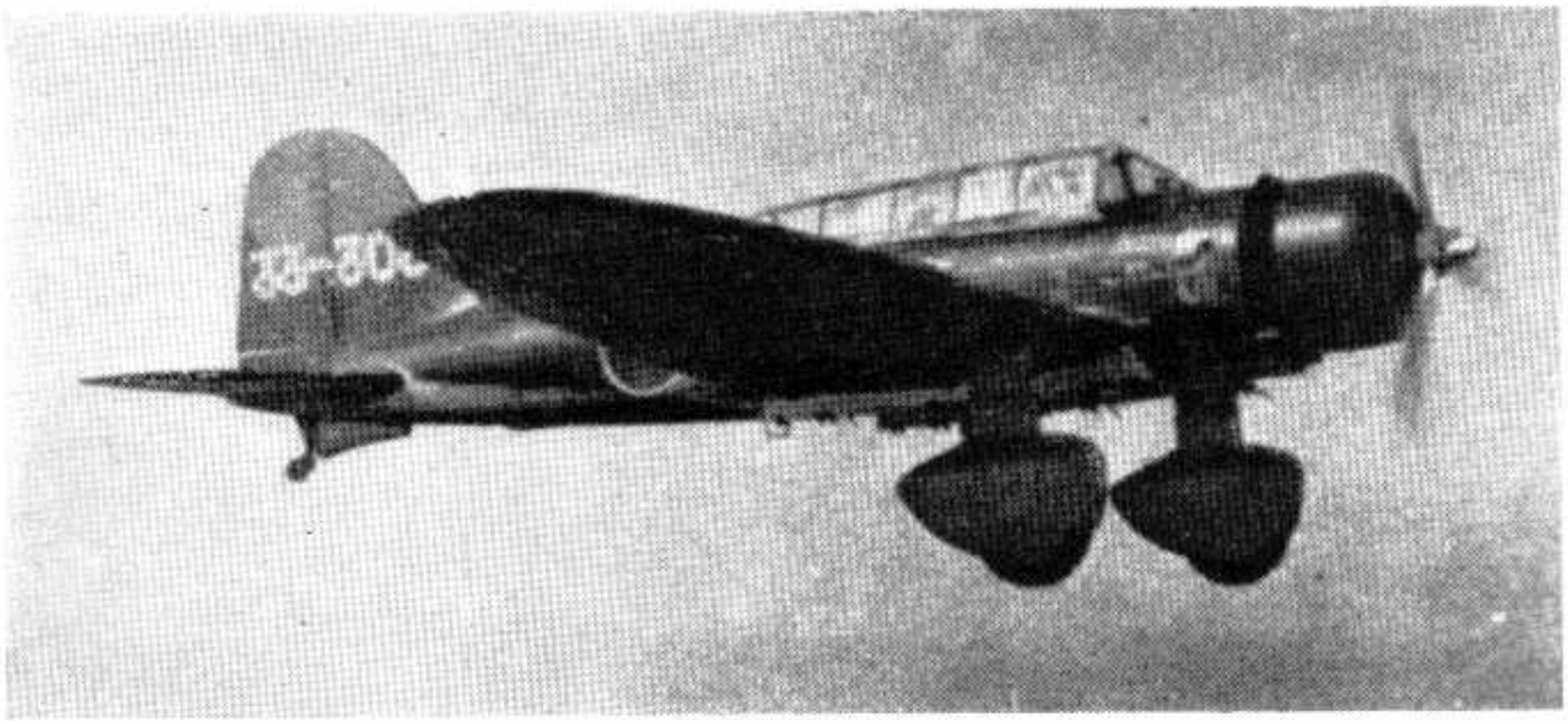
The common features of the B5M and the A5M "Claude" are apparent; a fixed spatted undercarriage and an eliptical wing.

In the field of torpedo bombers, or Carrier Based Attack Bombers, the unreliable Navy Type 89 Carrier Attack Bomber (Mitsubishi B2M) was replaced in 1936 by the Navy Type 96 Carrier Attack Bomber (Yokosuka B4Y, Jean). This was a biplane with a speed of 172 m.p.h. and a range of 978 miles, both quite good for the time. Two hundred of these aircraft were built.

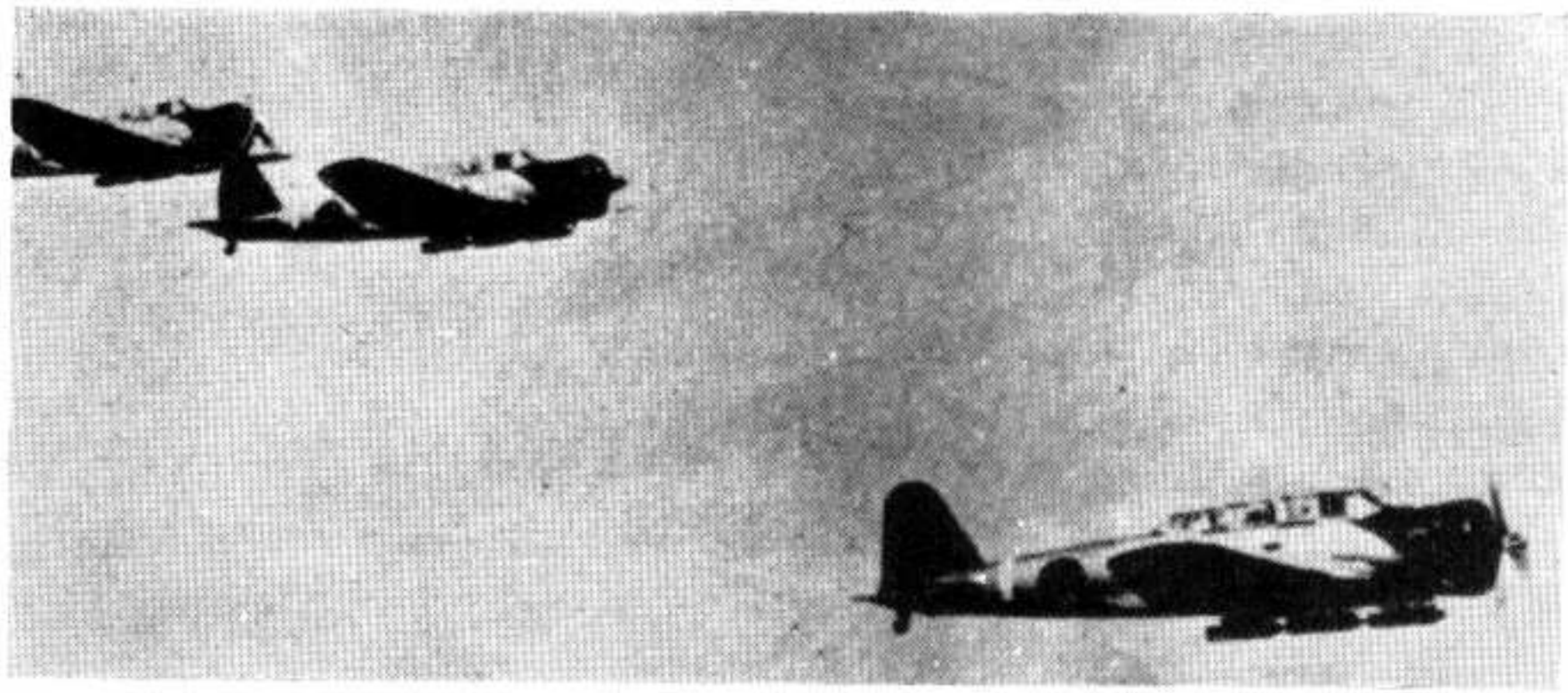
In 1935, however, a 10-Shi specification had been issued, calling for a radical new approach to torpedo bomber design. A plane was required with a performance far in advance of anything previously developed. Both Mitsubishi and Nakajima decided to compete for the contract.

DEVELOPMENT OF THE TYPE 97 ATTACK BOMBER

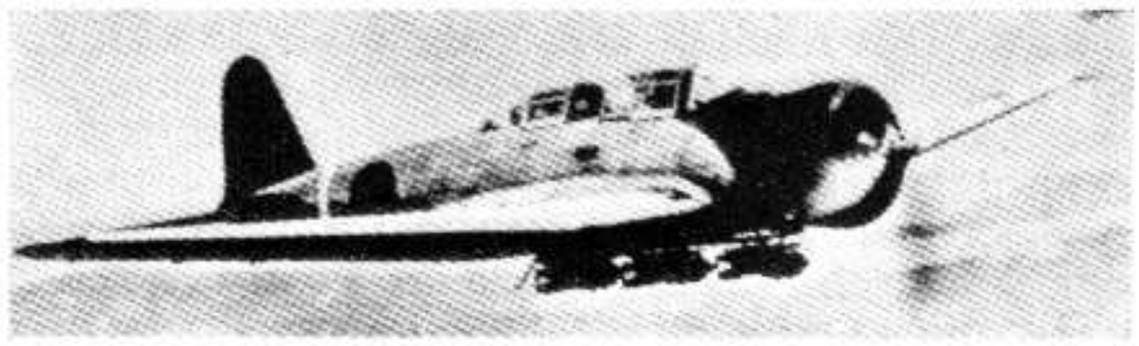
The 10-Shi Carrier Attack Bomber specification called for a speed of at least 205 m.p.h. and an all round increase in performance that could not be met by a biplane design. In 1935, Jiro Horikoshi's 9-Shi Fighter, later developed into the Mitsubishi A5M, Navy Type 96 Carrier Fighter (Claude), had made its



The Mitsubishi B5M was produced in small numbers in parallel with the B5N; designated "Kate" by the Allies in common with its more widely-used Nakajima counterpart, it saw service with the I.J.N.A.F. from late 1937 onwards.



A formation of B5N1's with multiple under-fuselage bomb-racks. The "Kate's" operational debut came in 1938, when numbers of these aircraft were used as land-based bombers to support the Japanese Army in the Hankow sector of China.



The colour scheme employed by early B5N1's included bare-metal fuselage and wing surfaces and a black engine cowling. Tail surfaces were painted red. Note bomb detail.

first flights, and with a speed of 279 m.p.h. at 10,000 ft. had shown the possibilities of the monoplane. Difficulty was encountered with "floating" in the final stages of the landing approach, which could be a great disadvantage in a carrier aircraft, where accuracy of landing was vital, but it was thought that this could be cured by the use of flaps, considered an innovation at the time, although early forms had been used during the First World War.

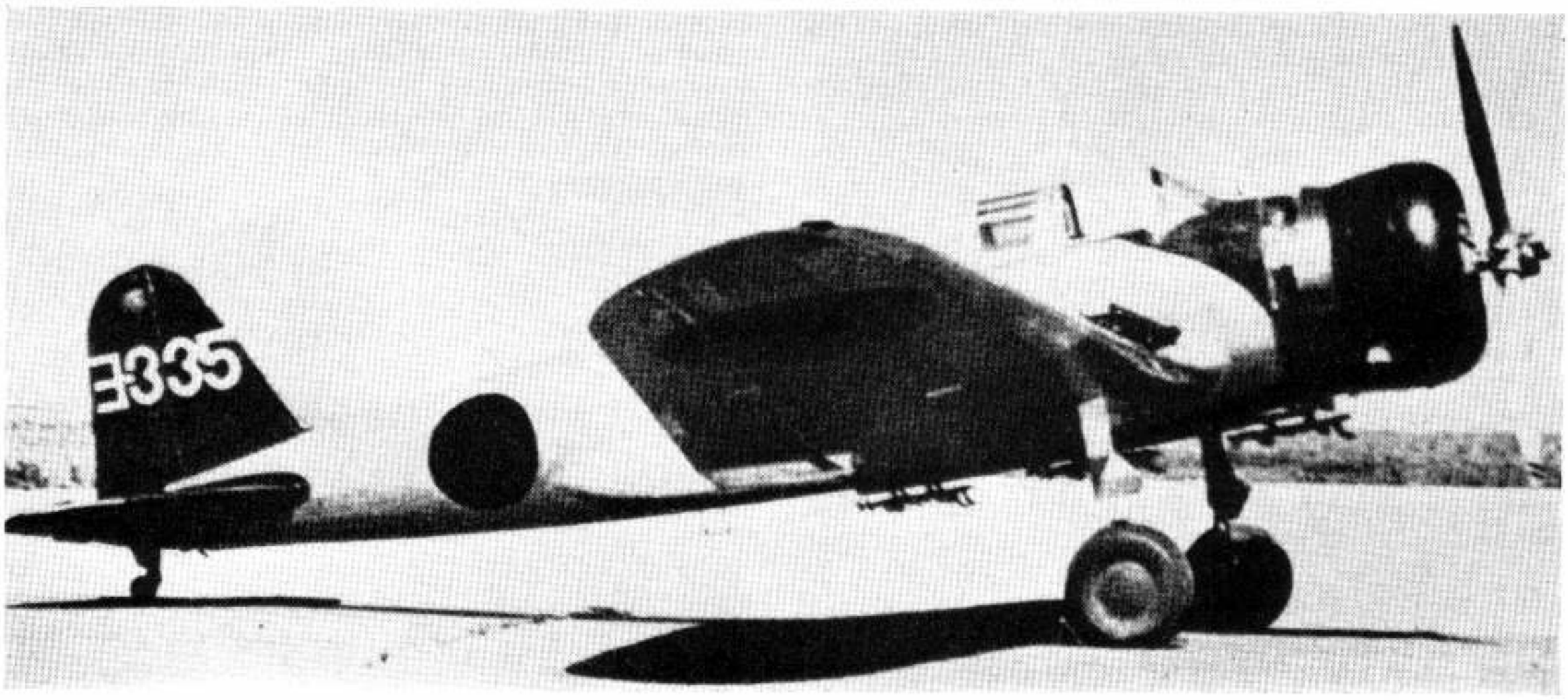
A great deal of assistance was given to the design team at Mitsubishi by the study of a Northrop 5A bomber, imported from the United States in 1935. This aircraft incorporated the work on flaps done by N.A.C.A. in 1933, and was very advanced for its time. Its design was developed, in America, by the adoption of a retracting undercarriage and a more powerful engine, into the Northrop A-17 series of light bombers, some of which were used by the R.A.F. in World War II (Northrop Nomad). Douglas also acquired design details, following financial difficulties in the Northrop firm, and used it as a basis for the design of their TBD Devastator and SBD Dauntless carrier aircraft for the U.S. Navy. Horikoshi considers that this aircraft was the most useful to them, of the many that the Japanese imported during the 1930's.

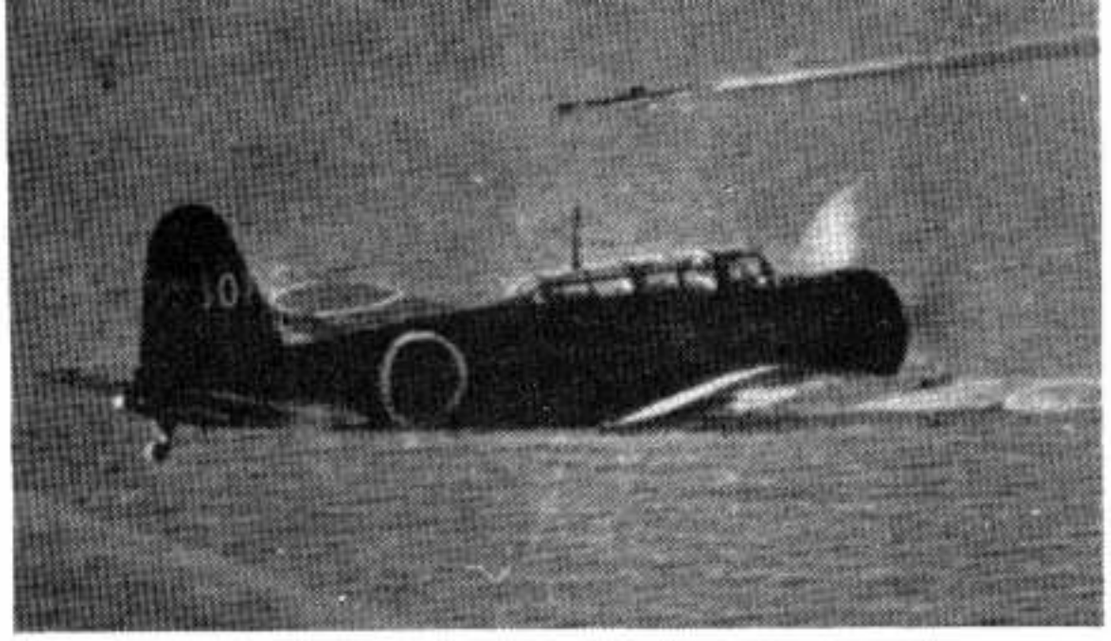
The Nakajima design, powered by a 840 h.p. Nakajima Hikari 2 radial motor in an N.A.C.A. drag reducing cowling, incorporated many new technical features. It was fitted with an hydraulic retracting undercarriage, one of the first to be fitted to a Japanese aircraft. The design of the undercarriage was based, logically enough, on that fitted to later versions of the Northrop A-17, but being the first attempt by the Japanese at an hydraulic system of this sort, it is not surprising that difficulties were met during trials. These were overcome however, and the experience gained used in the design of the undercarriage of the 12-Shi Carrier Fighter, later the Zero.

It was necessary to fold the wings for stowage in the carrier hangers, and in order to take up as little space as possible, the hinge points were arranged so that the wing tips overlapped each other, when folded over the cockpit. Hydraulic jacks were installed in the wing to carry out the folding under power. Fowler flaps which slid backwards and down to extend the wing trailing edge were another inovation on the prototype, as was the three blade, variable pitch airscrew.

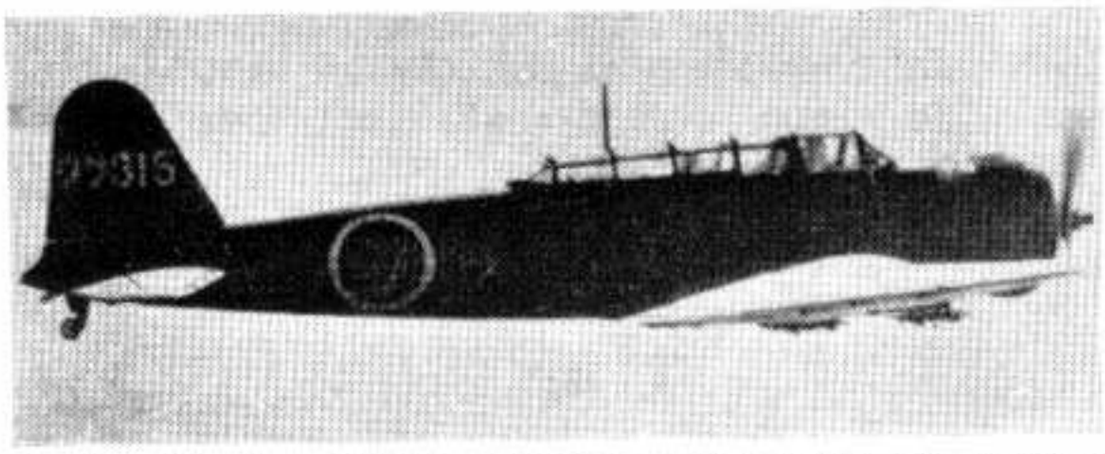
The prototype made its first flight in January 1937, and achieved a speed of nearly 230 m.p.h. During subsequent testing, the wing fold mechanism was found to give trouble, particularly in windy conditions;

Close-up of a B5N1 of the Yokosuka Kokutai, *in pre-1941 colour scheme. The "reversed E" character is pronounced "Yo", for Yokosuka.*

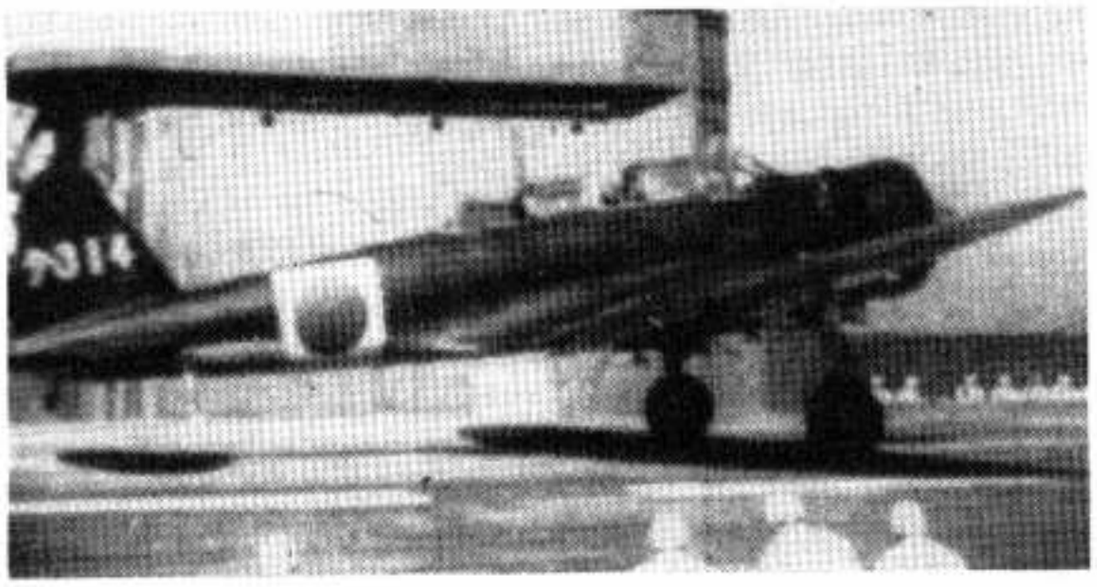




Finished in the later colour scheme of dark green and pale grey, this B5N1 carries the tail code of the force based on Usa. In the background, a Japanese submarine travelling on the surface.



Another Usa-based B5N1, with empty bomb racks. The tail code indicates the individual aircraft (15) of the Attack Bomber class (3) of the Usa Naval Air Corps (indicated by the first two Japanese characters).



An aircraft of the Kure Kokutai *landing on a carrier flight deck.*

and as these are normal on a carrier deck, a manual folding system, utilising a lever inserted by a crewman in the lower surface of the outer wing panel, replaced the hydraulics. The Fowler flap mechanism also gave difficulties, and it was decided to replace this by a simpler arrangement in which the whole trailing edge section hinged downwards.

The variable pitch airscrew was replaced by a constant speed unit, and from the second aircraft onwards integral fuel tanks were installed in the wing centre section, whilst the engine type was a 770 h.p. Hikari 3. A variety of detachable racks was developed to enable the aircraft to carry a selection of bombs or a torpedo, and these could be removed and changed quickly by the ground crew.

The pilot was seated in the front cockpit, with a poor view forwards in the tail down position. As a good view is essential for carrier operation, his seat could be raised for landing and take off so that his eyes were level with the top of the windscreen frame. Simple blind flying instrumentation was carried. The observer/navigator/bomb-aimer sat in the second cockpit facing forward and had a small window in each fuselage side to enable him to see the fuel contents gauge on the top of the centre section fuel tanks. For bomb aiming he opened small doors in the floor, offset to the left of the stores carried under the fuselage. The wireless operator/rear gunner sat in the rear with his machine gun normally stowed inside the fuselage. Early radio sets were of the low frequency type and used a long trailing aerial.

Crew communication was by speaking tube, and no oxygen was usually carried. The crew normally wore a bulky, kapok filled life jacket of most inefficient design.

In this form the B5N1 entered service with the Navy in 1937 as the standard carrier borne torpedo and level bomber, which it was to remain until 1944. It was known as the Navy Type 97 Model 1 Carrier Attack Bomber.

The Mitsubishi 10-Shi design was similar in layout to the Nakajima product, but was more conservative in its technical approach. The wing was eliptical, possibly as a result of the success achieved with this form in the Type 97 Fighter, but the undercarriage was fixed and spatted, and wing folding was manual from the start. The motor was a Mitsubishi Kinsei of 1,000 h.p. which gave it a better take off performance than the Nakajima design, and a top speed of 235 m.p.h. as opposed to the 229 m.p.h. of the service B5N1.

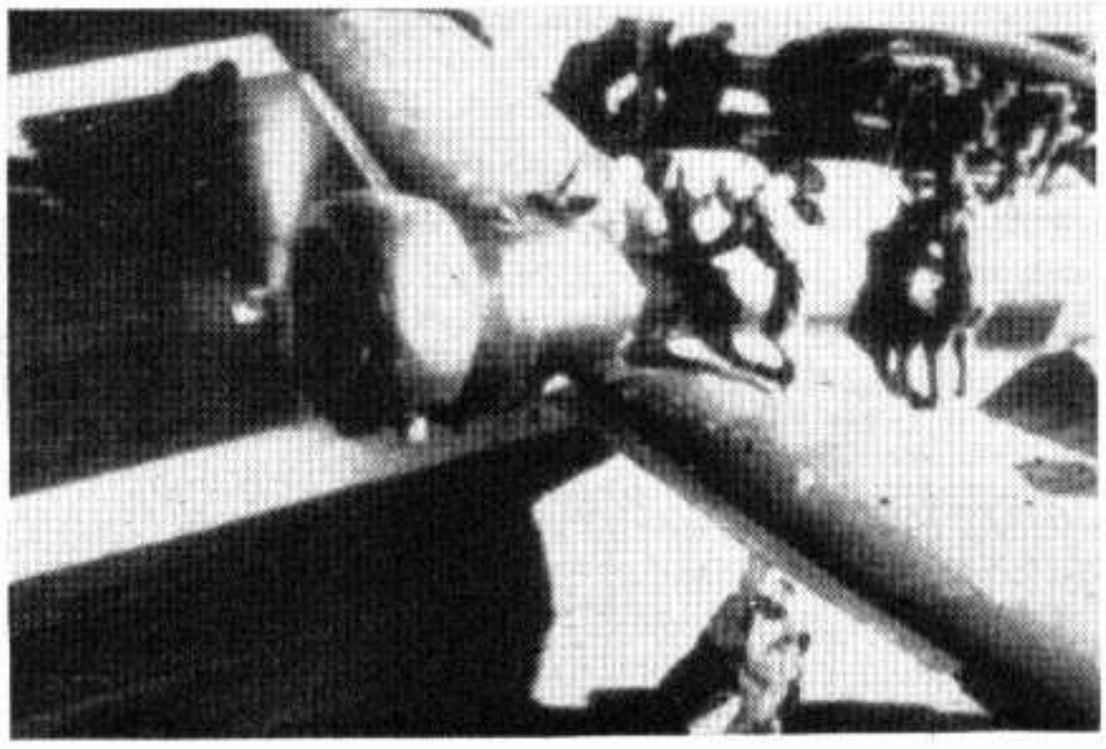
It was decided that this aircraft would also be produced for service and 125 were built during 1937. They entered service as the Navy Type 97 Model 2 Carrier Attack Bomber (B5M1), and during the war were also referred to by the code name "Kate".

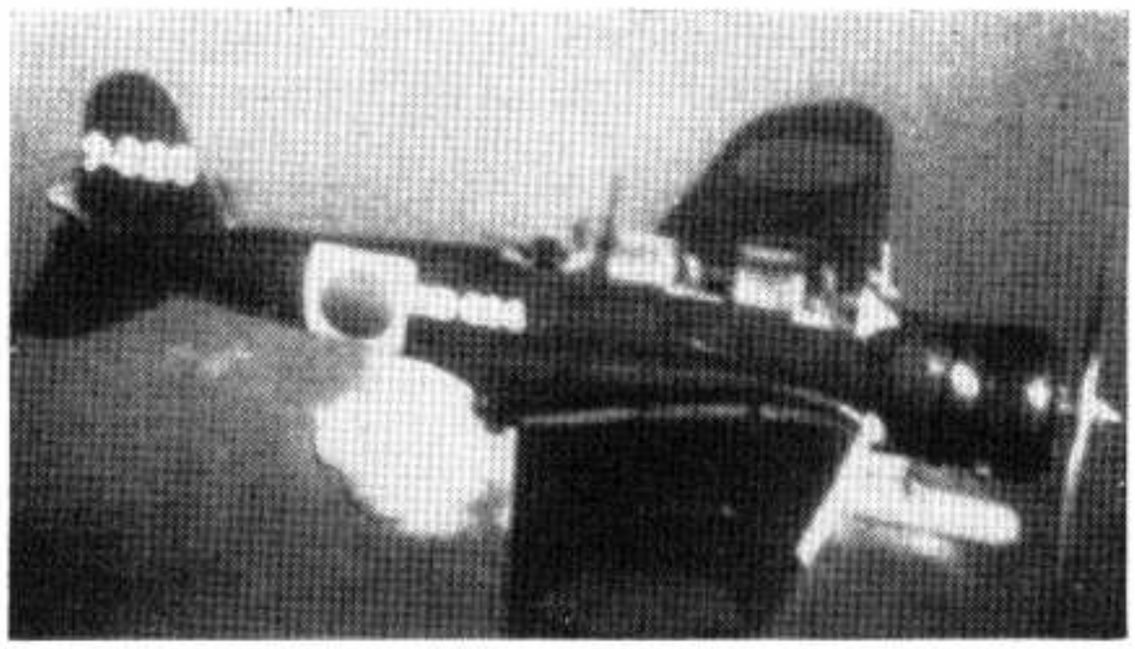
In spite of the good performance of this aircraft, it was the Nakajima design that was chosen for large scale production and as standard equipment for the carriers. The reasons for this decision seem to lie in the greater development potential resulting from the advanced technical features of the B5N1, and the fact that at the time, the Mitsubishi design staff were trying to cope with modifications to the Navy Type 96 Carrier Fighter, designing a new dive bomber for the 11-Shi specification, which was eventually won by Aichi with the D3A (Val), and preliminary work on the 12-Shi Fighter, which was quite enough for them to go on with.

The Navy Type 97 Model 2 Carrier Attack Bombers (B5M1) were used only for anti submarine patrols from Southern China and Hainan.

Once in service, work continued on the Nakajima B5N1, as with any military aircraft, to improve the performance, and in December 1939, a new model (B5N2) appeared, fitted with a Nakajima Sakae two row radial motor of 1,000 h.p. in a smaller cowling.

Thought to be a view of the same B5N1 from Kure, photographed on the deck of the carrier Akagi.





A poor photograph of the 20th Attack Bomber of the Kure Naval Air Corps in flight; note, however, the torpedo mounted under the fuselage and the rear machine gun swung up into operating position; this was normally stowed inside the fuselage decking behind the rear cockpit.

The only other obvious airframe change was the fitting of an aerial post above the rear cockpit. This new version was initially known as the Navy Type 97 Model 3 Carrier Attack Bomber but later re-designated Navy Type 97 Model 12 Carrier Attack Bomber in compliance with the new Model designation system. By the outbreak of war in December 1941 it was replacing the earlier B5N1 with the operational squadrons, although both types took part in the Pearl Harbour attack. Some of the B5N1 aircraft were converted for use as trainers and became known as B5N1-K.

It is interesting to compare the Japanese equipment with that of other navies. The trio, A6M2 (Zero), D3A1 (Val) and B5N2 (Kate) corresponded very closely to the contemporary U.S. Navy equipment of F4F-3 Wildcat, SBD-3 Dauntless and TBD-1 Devastator; although, with the possible exception of the Dauntless, the Japanese aircraft had performance advantage. The Fleet Air Arm, after years of penny-pinching neglect, was hopelessly outclassed with the Fulmar, the Skua and the Swordfish, which for all its magnificent achievements, could not hope to survive in the Pacific war. It is also interesting that by 1943 the Americans were introducing the F6F Hellcat, the SB2C Helldiver, and the TBF Avenger to even the balance, but the Zero was never replaced and the B5N2's, now very slow and vulnerable, remained in front line service until the summer of 1944.

Work on a replacement for the B5N2 at Nakajima resulted in the B6N1 *Tenzan* (Heavenly Mountain) being ready for testing in March 1942. It was powered by the large Nakajima Mamori motor of 1,870 h.p. Vibration troubles with this engine forced a change to the Mitsubishi Kasei and the B6N2, code named "Jill", did not enter service until the disastrous (for the Japanese) battles of the Marianas in June 1944. With the battle of the Philippine Sea that followed, the Japanese carrier fleet suffered its final crushing defeat and remaining carrier planes were then used from land bases only.

Some remaining B5N2's were fitted with Air to Surface Vessel radar, with aerials along the wing leading edge and along the fuselage sides, and used for anti-submarine patrols. Other B5N2's were fitted with a magnetic airborne-submarine detection device known as *Jikitanchiki* but results were poor unless the aircraft flew at a mere 30 to 40 feet above the surface. Armament consisted of standard 150 lb. or 625 lb. bombs equipped with delayed-action time fuses which could be set to explode the charge at a predetermined depth. Battle weary B5N2's were also used for glider and target towing until the end of the war.

A total of over 1,200 Nakajima Type 97 Carrier Based Attack Aircraft was produced.

THE B5N AT WAR

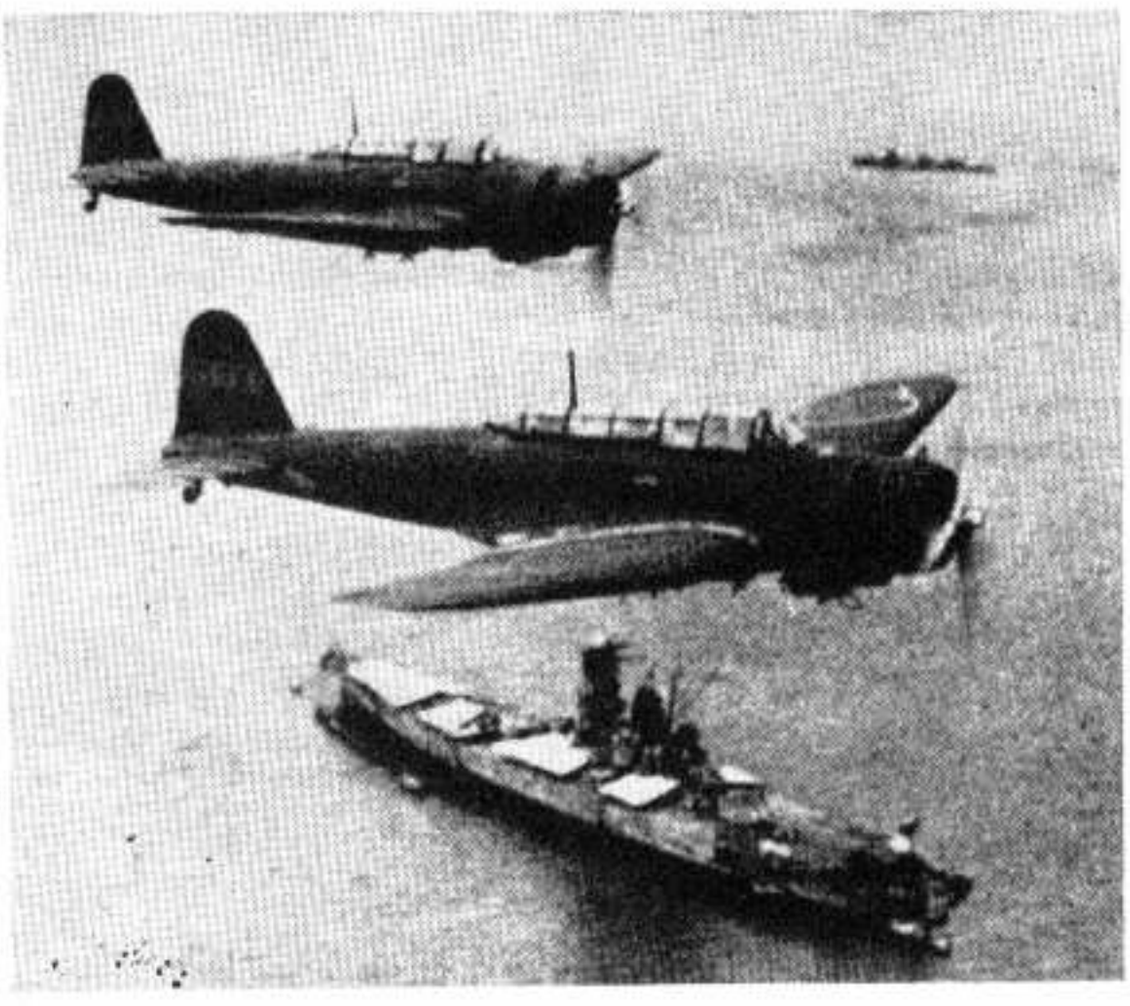
The operational debut of the Navy Type 97 Carrier Attack Bomber occurred in late 1938 when they were used as land based aircraft for close support of the Army in the Hankow region of China.

In the autumn of 1940, by arrangement with the Vichy Government, Japanese forces moved into French Indo China and a small number of B5N1's operated from the French airfields to bomb Chiang-Kai-Shek's forces in the South of China.

In November 1940, 21 Swordfish sank three Italian battleships in harbour at Taranto. The Naval Attaché at the Japanese Embassy in London at this time was Cdr. Minoru Genda, who was later called upon by Adml. Yamamoto to do the staff planning for a surprise attack on Pearl Harbour, as being the best method of disposing of the American fleet, should war with the United States become inevitable. Because of the problems of attacking ships in harbour, the Navy Type 97 Attack Bombers had to be equipped with special torpedoes fitted with wooden fins to enable them to run in shallow water, and as no armour piercing bombs were available, 16 inch naval shells were adapted by fitting tail fins, each making 800 kg. bombs for the B5N2's to carry in level bombing attacks.

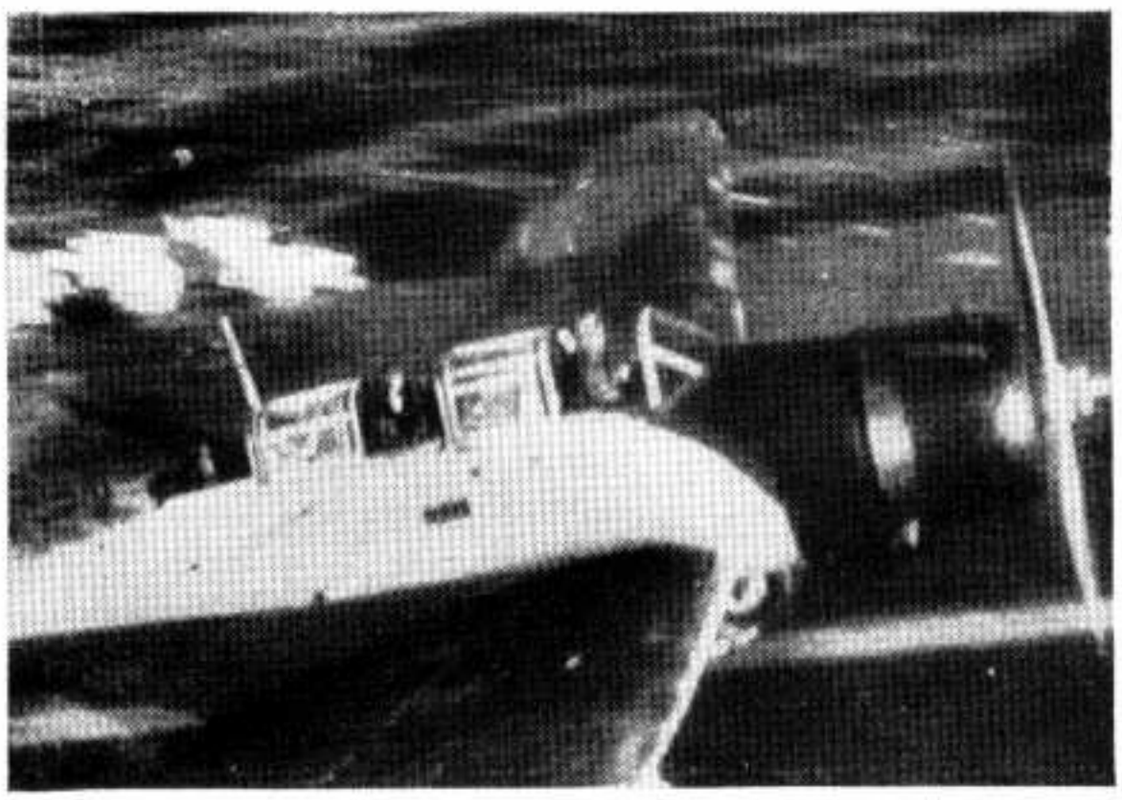
After practising in a bay in Southern Kyushu, the strike force embarked on the six carriers, *Akagi*, *Kaga*, *Hiryu*, *Soryu*, *Zuikaku* and *Shokaku*. The force, under the command of Adml. Nagumo left Japan and sailed to Tankan Bay in the Kuriles, between Japan and Alaska. On 26th November, 1941 the fleet sailed for the Hawaiian Islands, and while it was still dark on the morning of 7th December, 1941 the striking force of 353 aircraft left the carriers for Pearl Harbour on Oahu. The first wave was led by the General Commander Air, 1st Carrier Division, Cdr. Mitsuo Fuchida, in a Navy Type 97 Carrier Attack Bomber carrying an 800 kg. bomb. There were 50 such level bombers in this wave, also 40 Navy Type 97 Carrier Attack Bombers with torpedoes led by Lt./Cdr. Shigeharu Murata. At 07.49 hrs. Cdr. Fuchida sent the signal for his force to attack

Two B5N2's over the battleship Yamato.



Pilot in the cockpit of a "Kate"; note the kapok life jacket, a device of remarkable inefficiency.

A B5N2 taking off from the Akagi *and (below) a poor photograph purporting to show an aircraft on the* Akagi *immediately prior to the Pearl Harbour attack. The publishers have been unable to substantiate beyond doubt the colour schemes of these aircraft; it is thought that camouflage in brown and green was "blotched" on the wings, the fuselages of some machines being painted yellow. It was more often observed that dark green paint was roughly brushed on in patches over the original bare-metal wings, and the fuselages of some aircraft left in the earlier finish.*



and the war in the Pacific had begun. It was in fact preceded by the war in Malaya, which had started an hour or so earlier with the landings at Khota Baru, but no news of this had reached Pearl Harbour and the attack was a complete surprise. The second wave contained 54 Navy Type 97 Carrier Attack Bombers operating as level bombers, and the operation was completed by 8.30 a.m. Only five B5N2's were lost in the attack, which crippled the battleship strength of the Americans, but significantly, failed to catch the carriers "Enterprise" and "Lexington", which were out of port at the time. The high standard of crew training was shown by the 90% direct hits scored by the torpedo aircraft and 27% by the level bombers. The Nagumo force then retired, but *Hiryu* and *Soryu* took part in the invasion of Wake Island on 16th December.

In the early part of 1942 Nagumo's carriers went on what can only be described as a rampage through the Dutch East Indies, with raids against ground installations and Port Darwin. They sailed on to Ceylon, where, in spite of opposition from R.A.F. Hurricanes, Colombo and Trincomalee were bombed and H.M.S. Hermes, H.M.S. Dorsetshire and H.M.S. Cornwall sunk. In all these attacks the bombing was shared by Navy Type 97 Carrier Attack Bombers and Navy Type 99 Carrier Dive Bombers.

On the 5th, 6th and 7th of May 1942, the first great carrier versus carrier battle took place in the Coral Sea when *Zuikaku*, *Shokaku* and *Shoho*, operating in support of the invasion of Port Moresby, were opposed by "Lexington" and "Yorktown". "Lexington" and *Shoho* were sunk but the seaborne invasion was prevented.

FROM MIDWAY TO THE MARIANAS

Up to now, the Imperial Navy had operated almost without effective opposition and confidence was high that the next great blow, the invasion of Midway, would be a success. Besides capturing the island, the stepping stone to the Hawaiian Islands, it was hoped to bring to battle and defeat the American carriers, clearing the way for naval and air bombardment of the West coast of America itself.

As a feint, the carriers *Ryujo* and *Junyo* were to strike at the Aleutian Islands whilst *Akagi*, *Kaga*, *Soryu*, and *Hiryu*, followed by seven battleships and many cruisers were to strike at Midway and the American carriers. On paper, an easy victory over the two American carriers was expected. In fact, the Americans were able to read the Japanese code, and had three carriers, "Hornet", "Enterprise", and the rapidly repaired "Yorktown", which they were able to place, knowing where and when the blow would fall.

On the 5th June 1942, early in the morning, two waves of bombers, each containing 36 Navy Type 97 Attack Bombers struck at Midway shore installations. Attacks by American shore and carrier based aircraft were easily beaten off by the Japanese. They then prepared to launch a strike at the American carriers, but at 10.25 a.m. Dauntless dive bombers from "Enterprise" got through their defences and by the end of the day all four Japanese carriers were sunk for the loss of "Yorktown" by the Americans. The Japanese retired from this crushing defeat; and more important than the loss of planes and ships was the loss of over 50% of their trained aircrew. They were never adequately replaced.

The focus of battle then shifted to the Solomons with the carrier battle of the Eastern Solomons in September, and of Santa Cruz in October associated with the invasion of Guadalcanal. After this the Japanese carriers were so badly damaged, and short of both planes and trained aircrew, that they were forced to retreat to Truk to recuperate. No further carrier battles took place during 1943, but some B5N2's were used from land bases such as Buin and Kolombangara in the Solomons, in attacks against the slowly but inexorably advancing Americans.

By 1944 the U.S. Navy had not only a quantitative advantage with many new carriers, but a qualitative advantage as well, with new aircraft such as the Hellcat and Corsair, developed with the advantages

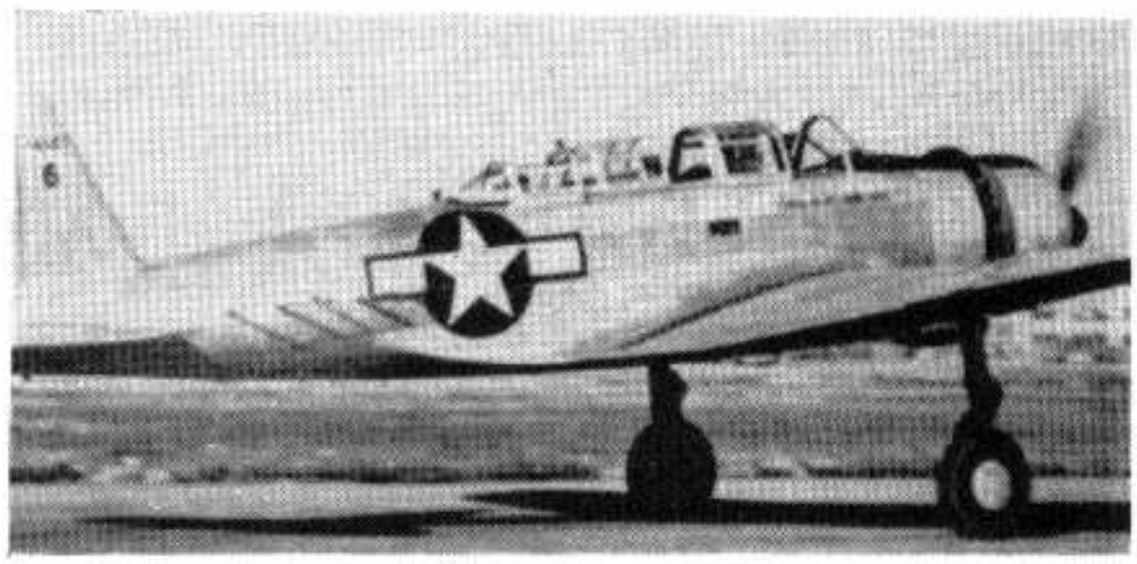
The Nakajima B6N1 Tenzan *replaced the B5N2, first seeing combat in the Marianas in June 1944. Note bomb racks.*

gained from study of captured Japanese planes. In June, the U.S. Navy attacked the Marianas. The initial attack was withstood by land based aircraft, but in an attempt to force a decisive battle nine Japanese carriers were thrown into the Battle of the Philippine Sea on 19th June. By now, the Navy Type 97 Carrier Attack Bombers were being replaced by the *Tenzan*, but only twelve were involved in this battle, which was certainly decisive as the Japanese lost about 1,600 planes and three carriers. As a result of the complete failure of conventional attacks on the American fleet, the first *kamikaze* suicide unit was formed in the Philippines in October 1944 and took part in the Battle of Leyte Gulf.

With the battles for Iwo Jima and Okinawa in February and April 1945, suicide attacks were widely employed. The Navy Type O Carrier Fighter (Zero) was the plane most used for "special attacks" but in company with practically every other type of Japanese aircraft, some of the Navy Type 97 Carrier Attack Bombers were used in suicide attacks off Okinawa. The Japanese carriers never recovered from their defeat off the Marianas and did not fight again before the end of the war, on 15th August, 1945.

THE B5N DESCRIBED

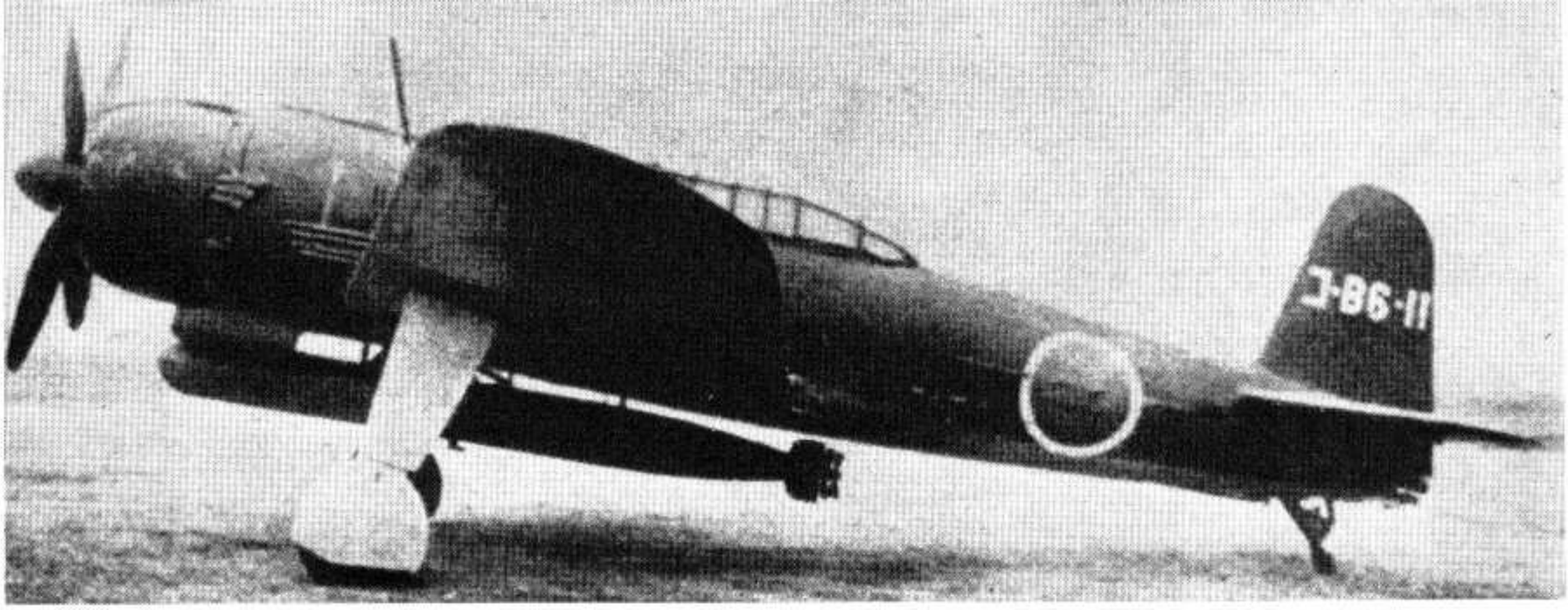
Manufacturer. Nakajima Hikoki Kabushiki Kaisha (Nakajima Aircraft Co. Ltd.) of Ota, Gumma Prefecture, Japan. Some were built by Aichi at Nagoya.
Wing. The two spar wing was arranged to fold manually, right wing first, outboard of the dihedral break, so that the right wingtip lay below the left above the cockpit and was supported by jury struts to the fuselage. Slotted flaps were provided, out to the folding point of the wings, with fabric covered Frise type ailerons outboard of this. Integral fuel tanks, incorporating wing upper and lower skin, were dropped in between the main and rear spar of the centre section, and fastened by a hinge arrangement along the edges.
Undercarriage. Inward retracting, hydraulically operated mainwheel units, mounted on the front spar. Each leg oleo sprung, and stabilized by torque links mounted in front of the leg. On retraction, the wheels were left uncovered. The tailwheel was of fixed, castoring type. A retractable sting type arrestor hook was mounted forward of the tailwheel.
Fuselage. Metal, semi-monocoque construction with a tubular engine mount. Three crew positions, with the rear one only facing aft. A pair of small folding doors in the floor of the second position, opened through the left wing root lower surface for visual bomb aiming. Early B5N1 aircraft had a lead out for a trailing aerial in the right side of the fuselage, behind the wing fairing, but later aircraft had an aerial from a post on top of the rear cockpit to the



A captured B5N2 with Air to Surface Vessel radar, one of several used for anti-submarine operations, under test in the United States.

Torpedo-armed B5N2 taking off; note condensation from wing-flaps and airscrew.

A B5N2 over the fires of Pearl Harbour; 7th December, 1941. The first attack wave at Pearl included 50 "Kate's" in the level-bombing role, and 40 torpedo-armed aircraft. The second wave included 54 level-bombers. Only five of these B5N's were lost during the operation; a high standard of accuracy was recorded by the pilots.



The Tenzan ("*Heavenly Mountain*"), *known to the Allies as "Jill", was used as a land-based bomber after the Battle of the Philippine Sea finally destroyed the Japanese carrier force. This B6N2 has A.S.V. radar, and served with the Air Technical Arsenal at Yokosuka (the first tail character indicates "Ko", for* Koku Gijutsu Sho, *Air Technical Arsenal).*

top of the fin.

Tail. Metal structure with fabric covered control surfaces, and trim tabs on both elevators and rudder.

Armament. One 7·7 mm. Type 92 machine gun in the rear cockpit, normally carried stowed in the fuselage.

Alternative bomb or torpedo racks could be fitted to carry:—

6 × 60 kg (130 lb.) bombs, 3 × 250 kg (550 lb.) bombs, or one 800 kg (1,760 lb.) torpedo. The torpedo was carried offset to the right of the fuselage centre line.

COLOUR SCHEME NOTES

Experimental aircraft were commonly painted orange with red trim on the cowling, but no photographs of the prototype have been located.

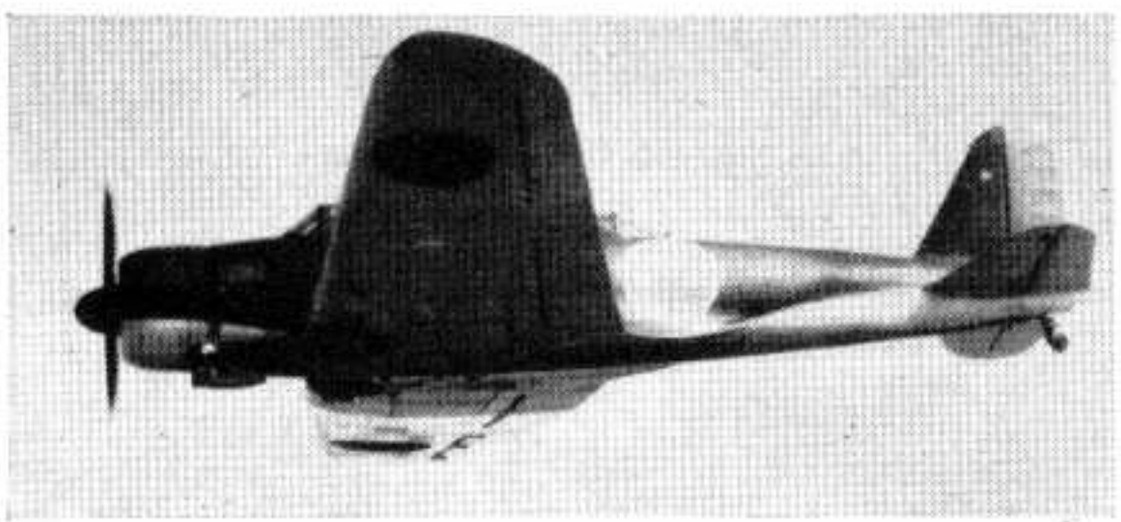
In the late 1930's, service aircraft were usually silver, with black cowling and front fuselage decking. The tail was red with a *Kana* symbol designating base or carrier on the fin or rudder, and followed by a three figure number. Some aircraft carried a yellow stripe on the inboard wing leading edge, and a narrow band, usually white or red, around the rear fuselage, to signify Flight or Group Leader's aircraft.

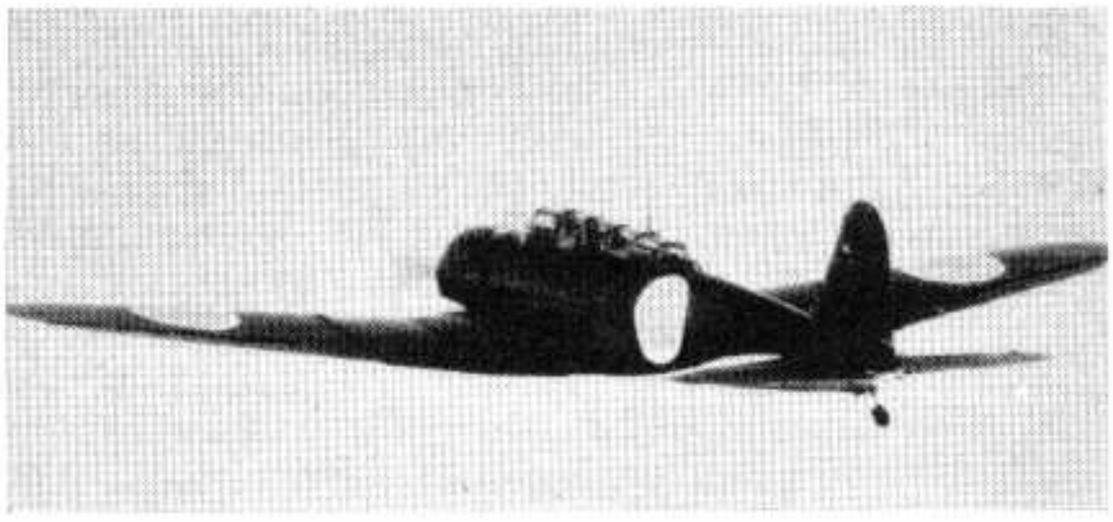
Both B5N1 and B5N2 aircraft carried this scheme, although accurate details are difficult to locate, as unit markings were frequently removed by the censor from the aircraft tail on photographic negatives.

The *Hinomaru*, the national marking, was a plain blood red disc.

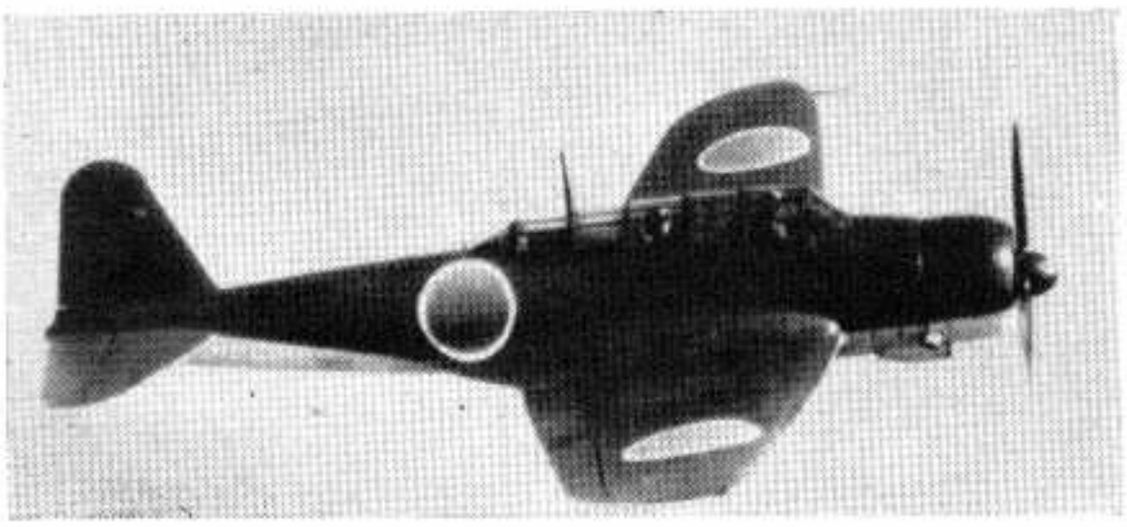
In 1941, camouflage was introduced, consisting of dark green, prepared by mixing four parts of sea green with one part of olive drab, on the upper surfaces, and pale blue-grey on the under surfaces. A yellow stripe on the inner leading edge was now standard and white radiating bars on the upper surfaces of the tail were sometimes carried as an "aim off" mark for the rear gunner. The *Hinomaru* was usually surrounded by a narrow white ring on the upper wing and fuselage, but some B5N1's had a white square on the fuselage only. In late 1941 the *Kana* symbol on the tail was replaced by a two letter code designating base or carrier, e.g. AI for *Akagi*, and in 1942, this was again replaced by an all numerical code.

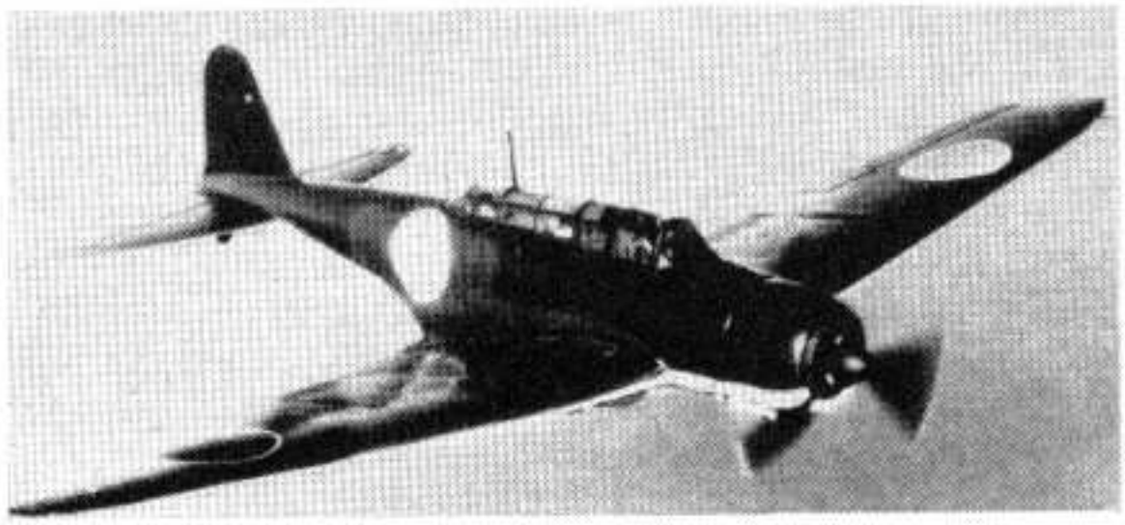
At the time of the Pearl Harbour attack, a mixture of colour schemes was in use and Capt. Fuchida

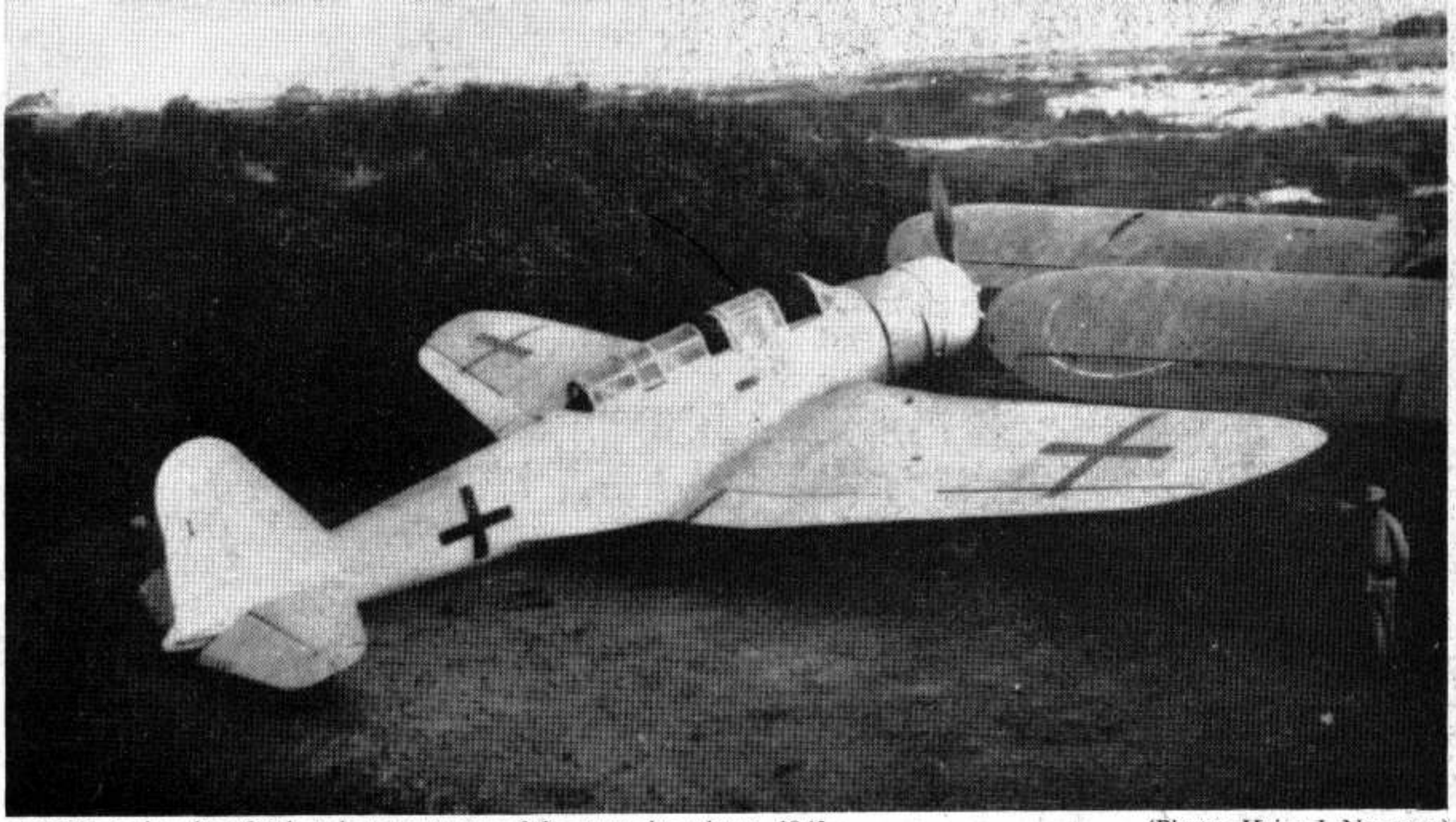




Various angle views of the B5N2 in flight; although re-painted in spurious Japanese markings after capture and transport to the United States, this machine does show to advantage the general structural configuration of the "Kate".
(These, and the photograph at the head of p.3 are U.S. Navy photos supplied by courtesy of Dr. René J. Francillon, Ph.D.).







A B5N2 in the white finish and green crosses of the surrender scheme, 1945. (Photo: Heinz J. Nowarra)

states that some aircraft were camouflaged with green, brown and yellow; his own aircraft is illustrated on p.2 of this *Profile*.

At the end of the war, the Allies decreed that all aircraft should be painted white, and marked with green crosses, and at least one B5N2 was painted this way, though probably not flown.

At least one aircraft was taken to the United States for Test Flying, and this aircraft, fitted with A.S.V. radar, was silver, with a matt black decking to the nose. It carried U.S. markings and the initials of the Technical Air Intelligence Unit on the fin.

DIMENSIONS AND PERFORMANCE

Span: 50 ft. 11 ins.
Length: 33 ft. 10 ins.
Height: 12 ft. 2 ins.
Wing Area: 412 sq. ft.

Weight:	Empty.	Loaded.	Overload.
B5N1.	4,630 lbs.	8,020 lbs.	8,850 lbs.
B5N2.	4,830 lbs.	8,360 lbs.	9,020 lbs.

Fuel:	Petrol.	Oil.
B5N1.	253 gallons.	19·8 gallons.
B5N2.	255 gallons.	17·6 gallons.

Propeller: Three blade constant speed.
Diameter. B5N1, 10 ft. 9 ins. B5N2, 10 ft. 6 ins.
Engine:
B5N1. Hikari 3. 770 h.p. (take-off); 840 h.p. at 8,200 ft.
B5N2. Sakae II. 1,000 h.p. (take-off); 970 h.p. at 9,840 ft.

Performance:	B5N1	B5N2
Max. speed	229 m.p.h. at 6,550 ft.	235 m.p.h. at 9,850 ft.
Cruising speed ...	156 m.p.h. at 3,280 ft.	164 m.p.h. at 9,850 ft.
Landing speed ...	72 m.p.h.	72 m.p.h.
Climb	7 mins. 50 secs. to 9,850 ft.	7 mins. 40 secs. to 9,850 ft.
Service Ceiling ...	24,300 ft.	25,200 ft.
Range (Maximum)	1,414 miles.	1,238 miles.
(Normal) ...	679 miles.	634 miles.

SERVICE DISPOSITION OF TYPE 97 CARRIER ATTACK BOMBER

December 1941
Combined Fleet
First Air Fleet.
Carrier Division 1. *Akagi*, *Kaga*, 27 each.
Carrier Division 2. *Soryu*, *Hiryu*, 18 each.
Carrier Division 4. *Ryujo*, 18.
Carrier Division 5. *Shokaku*, *Zuikaku*. 27 each.
Shore Based Naval Units.
Yokosuka Air Corps, 36.
Suzuka Air Corps. Small number of B5N1-K trainers.
Other Naval second line units with small numbers of Type 97's were:—
Tatayama, Oita, Usa, Omura and Ominato.
A total of 194 Type 97's were available to the Combined Fleet, of which 162 were deployed on the carriers.

June 1942 (Midway Operation).
Carrier Group.
Carrier Division 1. *Akagi*, 21. *Kaga*, 30.
Carrier Division 2. *Hiryu*, 21. *Soryu*, 21.
Main Force (Battleships etc.).
Hosho, 8.
Invasion Force (including transports).
Zuiho, 12.
Northern Force (Aleutians).
Ryujo, 21. *Junyo*, 21.
Land Based Force.
Chitose Air Group, (Kwajelein) 36.
1st Air Group, (Aur and Wotje) 36.

July 1942 (After Midway).
Third Fleet
Carrier Division 1. *Shokaku*, *Zuikaku*, 18 each. *Zuiho*, 16.
Carrier Division 2. *Junyo*, 9.
Reserve. *Hiyo*, *Ryujo*, 9 each. *Unyo*, 14.
Eighth Fleet.
Second Air Corps, 16.
Malaya Area Fleet.
40th Air Corps, 12.
Dutch East Indies.
33rd Air Corps, 8.
Total Type 97's in first line force, 141.

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