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**PROFILE**

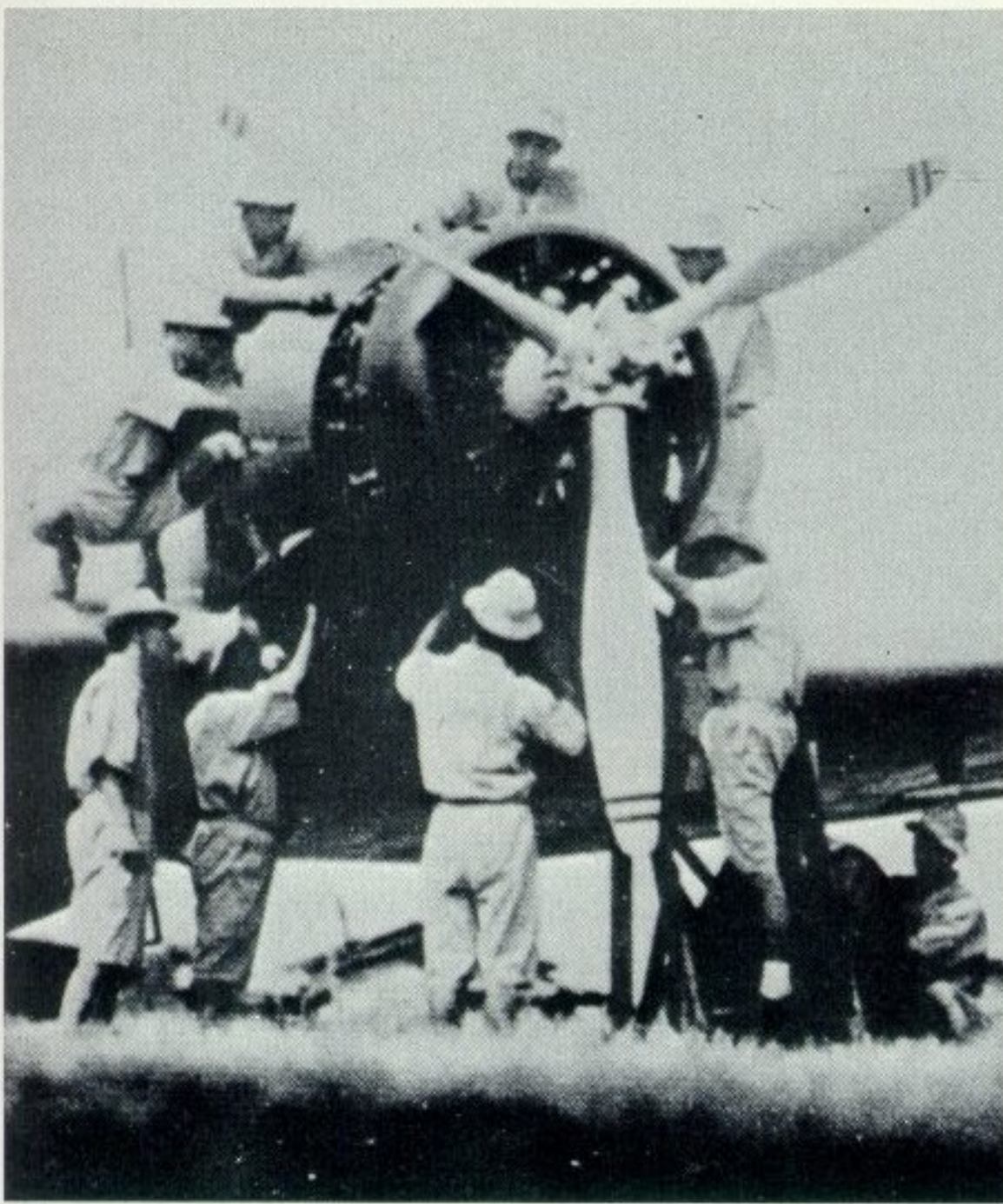
**241**

Aichi D3A ('Val') & Yokosuka D4Y ('Judy')  
Carrier Bombers of the IJNAF

by M. C. Richards and Donald S. Smith







An Imperial Japanese Navy Air Force ground crew services an Aichi D3A1 (later Allied code-named 'Val') belonging to the 12th Combined Naval Air Corps stationed at Han-k'ou (Hankow), central China, in 1940. (Photo: via Yasuho Izawa, Tokyo)

(Right) A Yokosuka D4Y2-C (Allied code: 'Judy') of the IJNAF's 121st Naval Air Corps being made ready during late 1943 or early 1944. Ground crewmen appear to be well-clad indicating more northern climes such as the Japanese home islands. (Photo: via Yasuho Izawa)

## Aichi D3A ('Val') & Yokosuka D4Y ('Judy') Carrier Bombers of the IJNAF

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IN WORLD WAR TWO, the European use of the dive-bomber — and the later widespread discrediting of the *Stuka* — largely overshadowed the considerable successes achieved by the Far East equivalent, the Aichi D3A, in the early stages of the Pacific War, 1941-45. Later, with the mounting Allied pressure, these dive-bombers — the Carrier Bombers of the Imperial Japanese Navy Air Force (IJNAF) — were employed as suicide bombers in the *Kamikaze* role.

This then is the development story and the combat record of the Aichi D3A and its successor the Yokosuka D4Y *Suisei* (Comet). They were the two most important carrier bombers of the IJNAF in the Pacific War.

### BACKGROUND TO D3A DESIGN

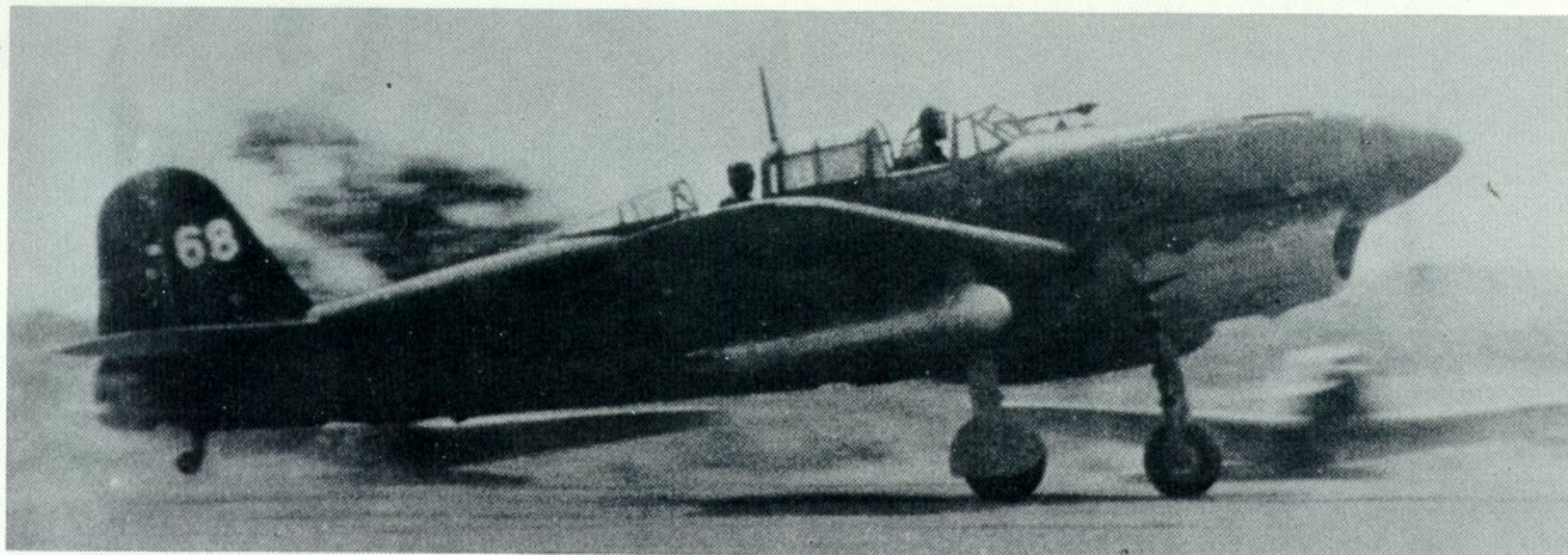
Inspiration for the Aichi D3A is said to have stemmed from the aircraft designers Siegfried and Walter Günter who had joined *Ernst Heinkel Flugzeugwerke GmbH* in 1931. Having produced the tandem-seat He 64 sportsplane, the next Günter design was the He 70 sometimes called the *Blitz* (Lightning). Of mixed construction — metal fuselage

seating four passengers and two crew, and wooden wings — the He 70 was superbly aerodynamically "clean" for the period. With a top speed in excess of 200 m.p.h., the retractable-undercarriage, elliptical-wing monoplane was faster than some front-line fighters. Nearly 300 were manufactured in the six years from the time of the first flight by chief test pilot *Flugkapitän* Junck on December 1, 1932.

Interest from Japanese military circles was not discouraged by Dr Ernst Heinkel who had been selling his products to the IJNAF since 1925. Aichi, in particular, had undertaken licence-negotiation over the years — including the dive-bomber/reconnaissance biplane He 50, from which evolved the D1A1 carrier bomber of the early 1930s. Japanese inter-service relations must have been purely academic in respect of Dr Heinkel because, apparently unbeknown to each other, the Navy and Army managed to negotiate "secret" licensing agreements for production facilities.

Not that the Army could remain in ignorance forever because the Navy purchased an He 70 for test evaluation. The IJNAF flew it under the designation LXHe1 — a Navy experimental type transport. No





A Yokosuka D4Y1 taking-off; note under-wing jettisonable fuel tanks.

(Photo: via Yasuho Izawa)



Following the cease fire at the end of the Pacific War in August 1945, the majority of Japanese combat aircraft – like this D4Y2 – were demobilized by the simple expedient of removing propellers.

(Photo: via Yasuho Izawa)

orders were placed for other examples of the He 70.

Then, in the summer of 1936, the Imperial Japanese Navy issued an 11-Shi Specification for a replacement for the Aichi D1A2 (Allied code name "Susie") carrier bomber biplane. Three companies submitted tenders for the 11-Shi carrier bomber monoplane. Aichi and Nakajima each received contracts to build two prototypes. The third company, Mitsubishi, was omitted by the Navy – wisely as it turned out – because of the pressure of work relating to the development of the A6M1 *Zero-Sen* carrier fighter (*Profile No.129*).

### THE D3A UNDER TEST

The characteristic elliptical wing shape of the He 70 was selected by Tokuhishiro Goake who headed the design team working on Company Project Number AM-17. Unlike the He 70, the Aichi tandem-seat monoplane was to appear with a fixed undercarriage, the designer having opted for the relative advantages of simplicity, ruggedness and lighter weight. Again, unlike the He 70 with its liquid-cooled 630 h.p. BMW VI 12-cylinder Vee inline, the Project No.AM-17 was to have, initially, an air-cooled 710 h.p. Nakajima Hikari 1 single-row, 9-cylinder radial.

A month after completion, flight trials began in January 1938. The first reports were not promising. The prototype was said to be markedly underpowered, directional stability was poor, in tight turns a tendency to snaproll was apparent. When the external wing dive-brakes were applied, vibration set in.

In consequence, the second prototype was drastically – but effectively – modified. A more powerful aero-engine, the 810 h.p. Mitsubishi Kinsei 3 two-row, 14-cylinder radial was installed and, to counter directional stability problems, the fin and rudder areas were increased. Snap-roll tendencies were cured by increasing the wingspan by 0.40 metres (15.75 inches) and changing the outer section aerofoil profile. Also, a different type of dive-brake was fitted.

All these alterations made the second prototype – now designated D3A1 – a vastly improved contestant. Thus, when the comparative trials with the Nakajima D3N1 took place at Kasimagaura, the production contract was awarded to the Aichi D3A1, as the Navy Type 99 Carrier Bomber. Later, the Allies were to code-name the D3A-series as "*Val*".

Six pre-production models were put in hand in March 1939 and the 1,000 h.p. Mitsubishi Kinsei 43 was specified. To accommodate this extra power, the side area was increased by adding a dorsal fillet extending from the base of the fin to a point roughly half way between the fin and the rear cockpit.

Armament had been standardized to include two 7.7-mm. Type 97 machine-guns fitted on the engine cowling and a flexibly-mounted 7.7-mm. Type 92 operated by the second crew member in the rear of the cockpit enclosure. The bomb-load comprised two 60-kg. (132-lb.) bombs on wing racks, plus a single 250-kg. (551-lb.) bomb carried externally beneath the fuselage with the device (common to dive-bombers) consisting of two pivoted arms attached to the bomb



to ensure it would clear the propeller arc when released in a dive.

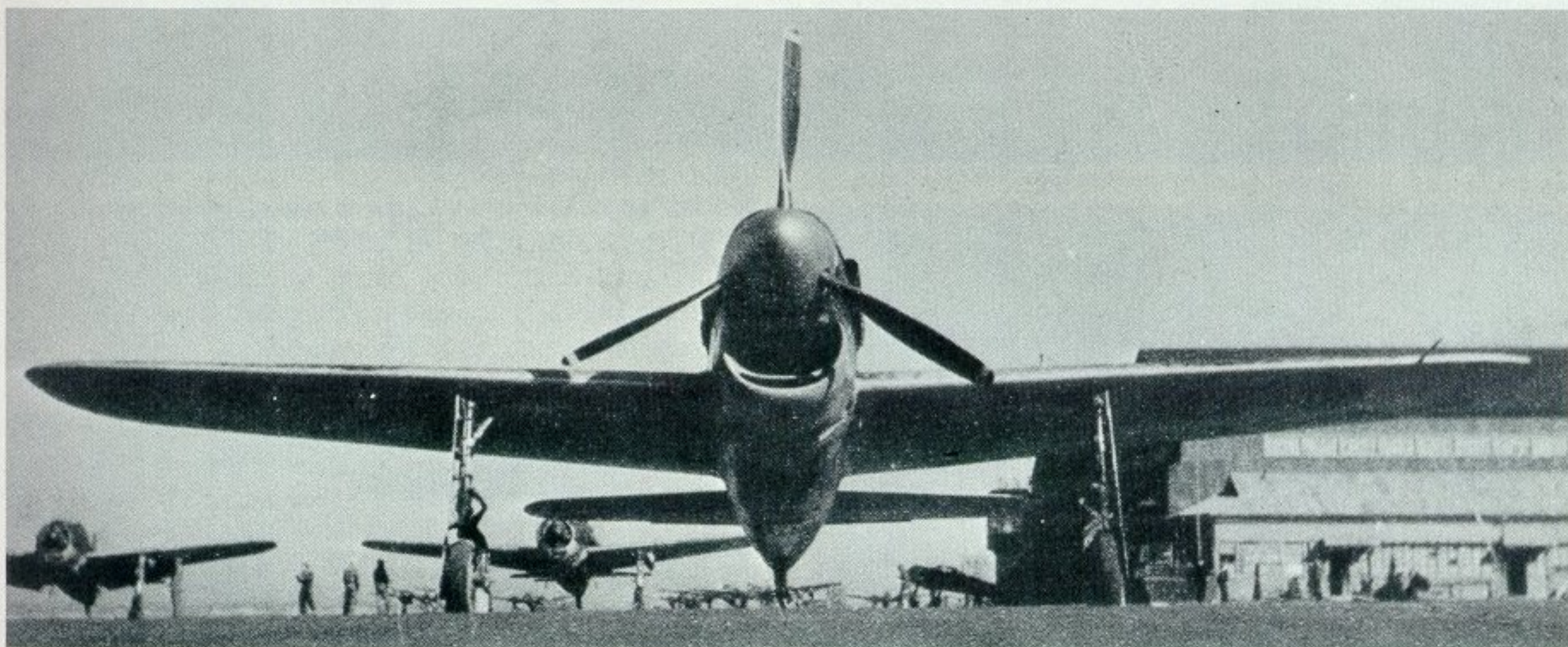
### D4Y – PROPOSALS FOR A D3A SUCCESSOR

In the meantime, although the D3A1 had yet to enter service, inevitably the need arose to consider the design for a potential successor as the pace of aircraft development continued to mount so rapidly. In the spring of 1937, the second Heinkel design to influence Japanese naval dive-bomber development came into the picture, when the IJNAF purchased from Heinkel the He 118 V 4 – the fourth prototype of the newly designed low-wing dive-bomber fitted with a 1,175 h.p. Daimler-Benz DB 601 A liquid-cooled 12-cylinder inverted-Vee inline engine. The He 118 V 4 was shipped to Japan aboard the *Kagu Maru* in February 1937 and flight tested at Yokosuka under the designation DXHel. Its maximum speed of 260 m.p.h. impressed the Japanese authorities. But,

on an early test flight, the DXHel broke-up in the air and was a write-off. Although the IJNAF had previously negotiated a production licence with Heinkel, it was decided instead to design a completely fresh model, based on the general lines of the He 118 but with smaller overall dimensions to make it suitable for operation from the Japanese carriers available.

A design team under Chief Engineer Masao Yamana of the First Naval Air Technical Arsenal at Yokosuka was entrusted with the development of the 13-Shi Carrier Bomber specification calling for a range of 1,200 nautical miles without bombs, or 800 nautical miles with a 250-kg. (551-lb.) bomb load, a maximum speed of 288 knots (332 m.p.h.) and a cruising speed of 230 knots (265 m.p.h.).

The engine selected was intended to be the Aichi Atsuta (a licence-built DB 601 A similar to that powering the He 118 V 4). However, this was not ready in time for the prototype and, instead, a DB

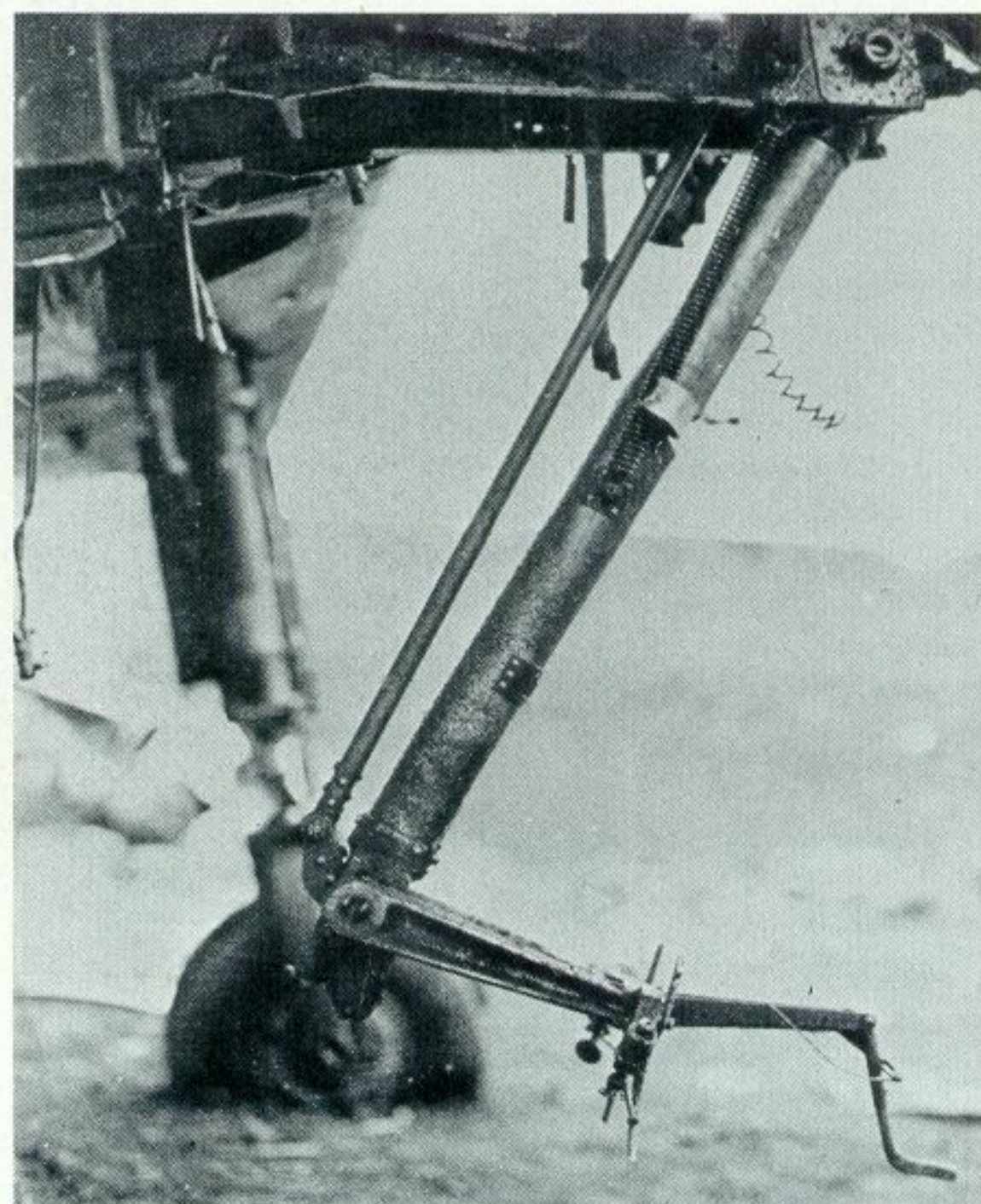
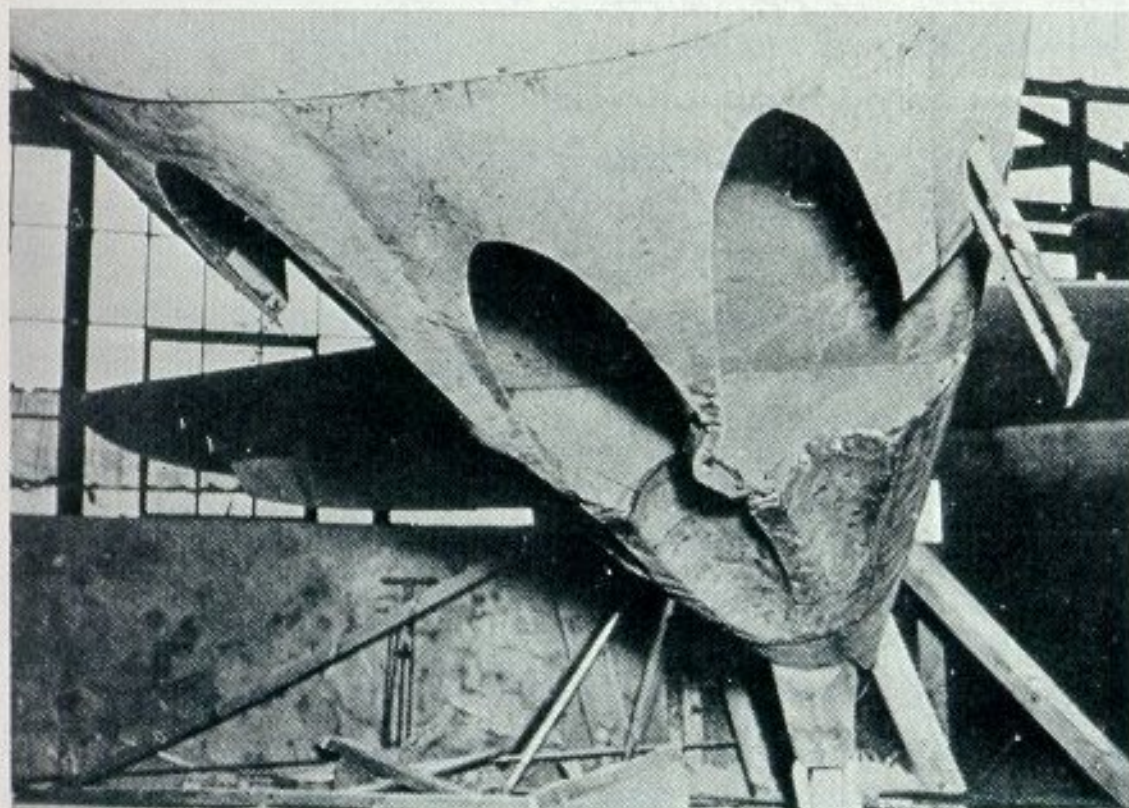


A D4Y1 in head-on view displays the aerodynamically "clean" lines of the Suisei. Also visible are two Kawanishi NIKI-J Shiden (Allied code: 'George II') Navy fighters. (Photo: via Yasuho Izawa)

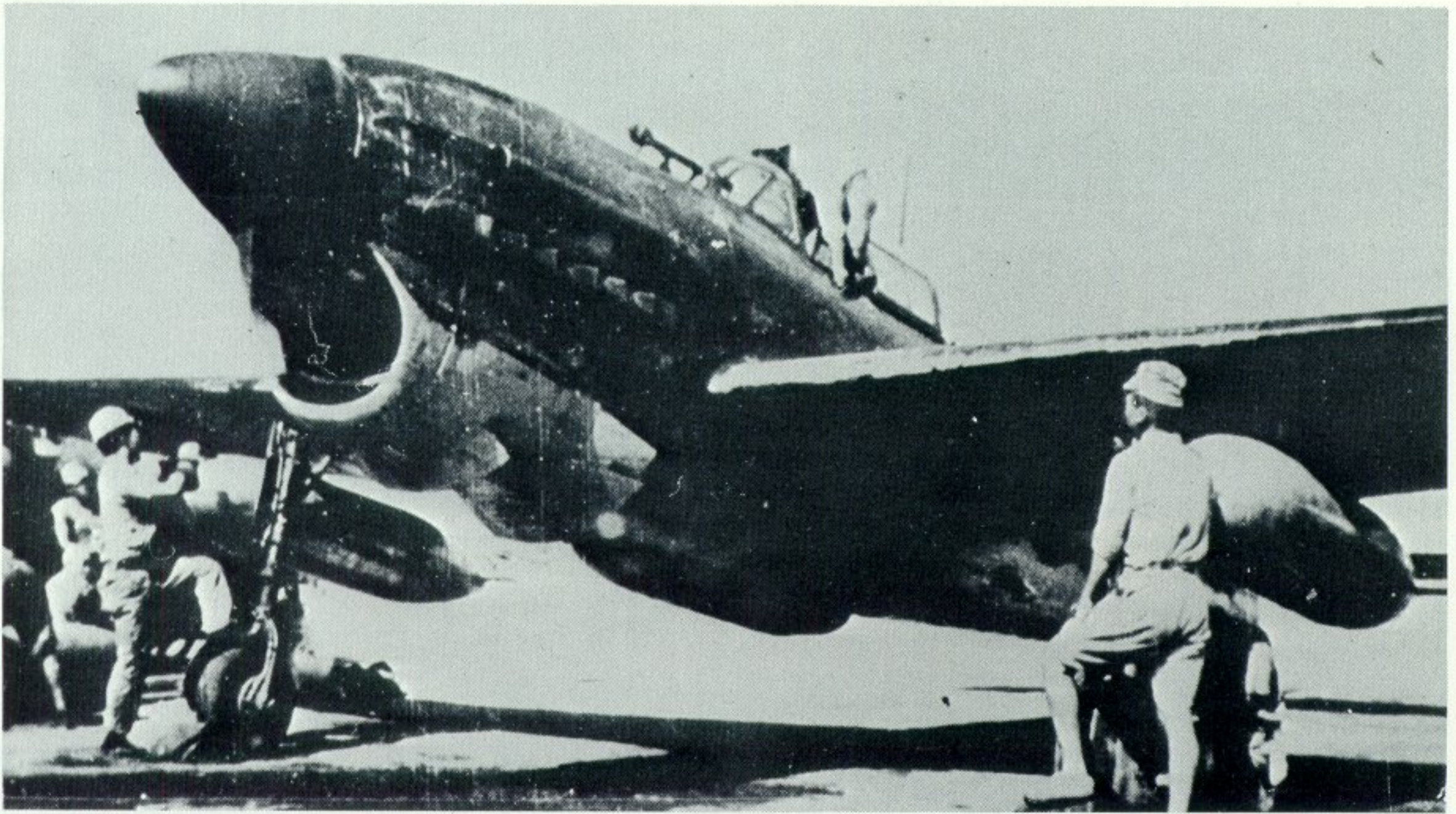
(Right): Close-up view of the bomb attachment strut of the Suisei. (Photo: USA National Archives, ref.80-G-167391)

Late-production D4Y3 and D4Y4 models of the Suisei had this triple housing for RATOG (rocket-assisted take-off gear) jettisonable units. The extra power boost available permitted the D4Y to take-off from the restricted deck space aboard the smaller IJN carriers.

(Photo: National Archives, Ref. 80-G-193475)







A D4Y2 *Suisei* on engine-test prior to take-off. This view shows well the under-wing drop tanks. There appears to be a tank fitted in the bomb bay.  
(Photo: U.S. Navy)



A D4Y1 in flight with under-wing drop tanks fitted. The slotted flaps are shown to advantage.  
(Photo: Real Photographs via Dr. R. J. Francillon)



Two D4Y2 *Suisei* carrier bombers over the Pacific.  
(Photo: Imperial War Museum, ref. K-10402)

600 G was purchased from Germany. The design emerged as a compact, and aerodynamically "clean" aircraft of all-metal construction with a span of only 37 feet 8 $\frac{3}{4}$  inches; thus dispensing with the need for heavy wing-folding mechanism. The undercarriage retracted inwards ahead of the main spar, while the mid-wing location selected enabled a 500-kg. (1,102-lb.) bomb load to be carried internally. The crew of two sat in a long streamlined "glasshouse". Three electrically-operated dive-brakes were fitted under each wing forward of the landing flap. Armament comprised two fixed, forward-firing 7.7-mm. Type 97 machine-guns above the engine and a flexible 7.9-mm. Type 1 in the rear cockpit enclosure.

The prototype, now designated D4Y1 — and later Allied code-named "*Judy*" — was completed in November 1940 and first flew at Yokosuka in December.

### D3A IN PRODUCTION

Meanwhile, full production of the Aichi D3A1 dive-bomber had started in December 1939, and after trials were completed during 1940 aboard the carriers

*Kaga* and *Akagi* the re-equipment of IJNAF units proceeded rapidly. By the time of the Pearl Harbor attack in December 1941, the D3A1 was the mainstay of all the carrier units. However, it had already been used operationally in China and Indo-China some 14 months earlier. The engine selected for these early production models was in some cases the 1,000 h.p. Kinsei 43, and in others it was the 1,070 h.p. Kinsei 44 radial.

### D4A IN TROUBLE

While the success of the Aichi D3A1 was reaching its peak in the late 1941 operations, the Yokosuka D4Y had begun to run into serious trouble. The four further prototypes still with imported DB 600 G engines (which had joined the first one on test) had shown that problems of wing flutter were arising when loaded dive-bombing trials were carried out. This in turn was giving rise to cracks in the wing main spars. In consequence and with reluctance, it was decided that the initial plans for immediate quantity production would have to be shelved until the problem was solved. As a temporary measure to



avoid closing down production lines completely, the decision was taken to modify the basic design and to use those aircraft completed as carrier reconnaissance models with a strict embargo of all dive bombing activities until a solution could be found to eradicate the difficulty.

The problems being encountered with the D4Y development also contributed to the decision to abandon another interesting project. In mid-1942 it had been proposed that a modified D4Y1 – to be named *Keisei* – should be built as a special assault aircraft to be used aboard the 18 giant *I-400* class submarines then under construction. Instead, the decision was then taken to design and construct a completely new aircraft for this purpose, and in consequence the Aichi M6A *Seiran* (Mountain Haze) bearing considerably more than a superficial resemblance to the D4Y *Suisei* in appearance, dimensions and performance, came into being.

### IMPROVED "VAL" – THE D3A2

The failure of the D4Y1 also made it necessary to extend the development of the earlier Aichi D3A and, in June 1942, an improved model – the D3A2 Model 12 was tested with a 1,300 h.p. Kinsei 54. This did not go into production however, but was used as a step in the development of the Navy Type 99 carrier bomber Model 22 which followed in the autumn of 1942. Again fitted with the more powerful Kinsei 54 engine, the most noticeable external changes included the fitting of a propeller spinner and a longer and more tapered rear cockpit section. The fuel tankage was also increased to 1,079 litres to improve range.

D3A production when finally completed included 470 Model 11s followed by 815 Model 22s built by Aichi, plus a further 201 Model 22s built under sub-contract by Showa, starting in December 1942. Aichi production continued until June 1944 and Showa until August 1945.

### D4Y1-C RECONNAISSANCE VERSION

The carrier reconnaissance versions of the Yokosuka design were designated D4Y1-C and fitted with a K-8 camera in the rear fuselage. Production by Aichi began early in 1942, and the 1,200 h.p. Aichi Atsuta 12 inline – finally available – was now fitted to production models.

First operational use of the D4Y1-C came during the carrier battle off Midway when two pre-production D4Y1-Cs were included in the complement of the carrier *Soryu* for service tests. Slow production by Aichi continued and, by March 1943, 25 had been completed. The long-range capability of the D4Y1-C – when fitted with two 330-litre drop tanks – made it popular with its crews; but, as with most Japanese types at this time, insufficient protection for its crew and fuel tanks was a major combat disadvantage.

### SUISEI DIVE-BOMBERS

Not until March 1943 was the D4Y1's wing-flutter problem of the dive-bomber version solved. With new reinforced wing spars it then entered into quantity production by Aichi as the *Suisei* (Comet) Carrier Bomber Model 11. By April 1944, Aichi had completed no fewer than 589 D4Y1s – mostly the dive-bomber version.

As the replacement of the Aichi D3A by the Yokosuka D4Y1 proceeded, the former were



A D4Y2 *Suisei* in "diving" attitude on a captured Pacific island. Such top plan views are comparatively rare. (Photo: via Yasuho Izawa)



A D4Y2 prototype. The tail legend reads: D=Carrier Bomber; Y=Yokosuka as the designers of the aircraft; 2=second Model; and 9=ninth Prototype. The first letter *ko* (like mirror "C") indicates that the aircraft is being tested at the Yokosuka Naval Air Technical Arsenal. (Photo: via Major Robert C. Mikesh)

A D4Y2 in close-up shows to advantage the pilot's external gun sight and one of the two 330-litre under-wing drop tanks. (Photo: via Major Robert C. Mikesh)





relegated to the smaller carriers unsuitable for the *Suisei's* high landing speed, and some moved to land bases. Many were relegated to training units under the designation D3A2-K, and others were expended in *Kamikaze* attacks.

Production of the *Suisei* continued with the Model 21 which had catapult fittings added to enable the aircraft to operate from the smaller carriers – a matter of increasing importance as the total carrier force available was much reduced in size following battle losses.

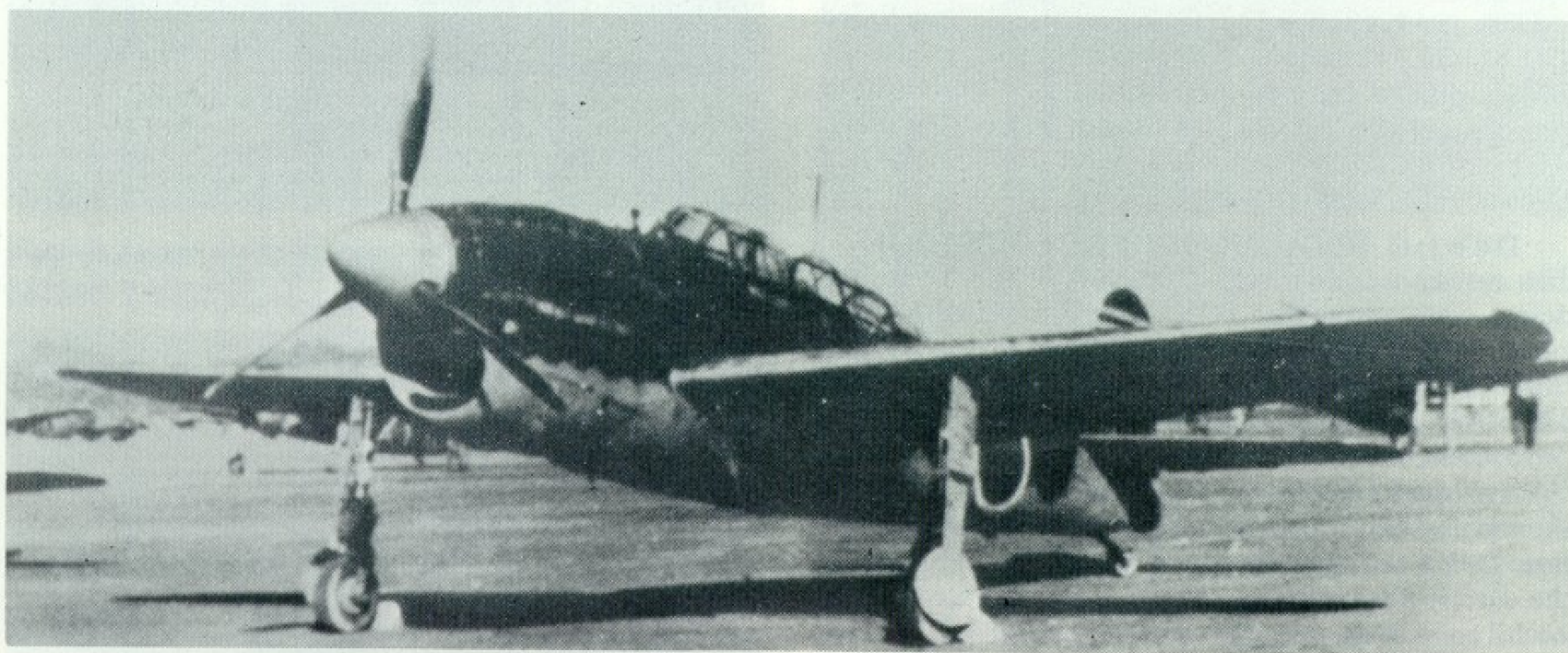
This in turn was followed in October 1944 by the D4Y2 – Model 12 carrier bomber which had the improved 1,400 h.p. Aichi Atsuta 32 engine. A further change was the introduction of a 13-mm. Type 2 machine-gun on a flexible mounting to replace the original 7.92-mm. machine-gun, and this model was

known as the D4Y2a – the Model 12A.

Both these models were also produced with catapult equipment, when they were known as the Model 22 and Model 22A respectively. At the same time, the reconnaissance variants when fitted with the newer engine and machine gun became the Navy Type 2 Carrier Reconnaissance Aircraft Models 12 and 12A (D4Y2-C and D4Y2-Ca).

### A RADIAL FOR SUISEI – THE D4Y3

A major change now came about which was to transform the appearance of the design. For some time there had been concern at the poor reliability record of the Aichi Atsuta engine, and the maintenance difficulties arising with it. The Aichi engineers finally proposed that this could only be solved by replacing it with a different engine, and



*A D4Y2 at Kumamoto's Kengun Air Base, on the Japanese home island of Kyushu, October 15, 1945. In the background is a Nakajima Ki-27 – (Allied code-name "Nate") Army Type 97 Fighter.*

(Photo: via Major Robert C. Mikesh)

*A D4Y1 at an airfield in the Pacific. Tyres appear to have white sidewalls.*

(Photo: via Major Robert C. Mikesh)

*Tail assembly of the Yokosuka D3Y1-K prototype, the spiral laminations of the wooden construction may just be discerned in this view.*

(Photo: National Archives ref. 80-G-193434)





A D4Y3 of the 601st Naval Air Corps, this exceptionally clear view shows to good effect the bulky radial which was installed on the slim fuselage of the *Suisei*.

(Photo: via Yasuho Izawa)

Yokosuka *Suisei* Model 3-3 (D4Y3) of the Hyakurigahara Naval Air Corps.

(Photo: via Yasuho Izawa)



suggested the 1,560 h.p. Mitsubishi MK8P Kinsei 62. This was a big air-cooled 14-cylinder radial and to incorporate so large an engine in the narrow fuselage section of the *Suisei* posed many problems. A close-fitting cowling was designed, but even with this a distinctive 'waist' was apparent where the engine mounting merged into the fuselage. However, drag problems were not serious and while tests showed that pilot visibility especially during take-off and landing had suffered from the change, the overall performance was surprisingly similar. The prospect of improved reliability thus made the alteration well worth while, and the modification was put into production at once as the carrier bomber Model 33 (D4Y3) or Model 33A (D4Y3a) when fitted with the 13-mm. flexibly-mounted machine-gun.

The problem of operation from small carriers continued to cause difficulties and in an effort to improve take-off capabilities and reduce the accident level some of the later models were fitted with a modified rear fuselage section incorporating deep grooves to enable three solid propellant rocket units (RATOG – rocket-assisted take-off gear) to be strapped below the fuselage and enhance take-off characteristics.

The radial-powered Model 33s were all built as carrier dive bombers, since by this time the reconnaissance variants of the D4Y had all been supplanted by the later Nakajima C6N1 *Saiun* (Painted Cloud)–also known by the Allied code name "Myrt".

#### NIGHT FIGHTER "JUDY" THE D4Y2-S

A further change in operational use of the D4Y design came about as a result of the increasingly urgent need for night-fighters to engage the large numbers of Boeing B-29 Superfortresses appearing

over the home islands in low-level raids. As a result of this need, the 11th Naval Air Arsenal at Hiro (where some 215 of the D4Y *Suisei* aircraft had been constructed) experimented with the modification of a number of the D4Y2s for use as night-fighters. To lighten the airframe, the bomb racks and carrier equipment were removed and the bomb-bay faired over.

A single 20-mm. Type 99 Model 2 cannon was then fitted in the rear fuselage, firing forwards and upwards at an angle of 30°. This was a method of attack credited largely to the *Luftwaffe* in World War Two, who used the oblique firing guns under the title of *Schrage musik* (jazz music); but it was also pioneered quite independently by the Japanese who fitted such guns as standard armament in at least five of their two-motor night-fighters as well as in a number of single-motor types. The first recorded operational success of a Japanese aircraft fitted with such a weapon was achieved with a Nakajima J1N1-C *Gekko* (Moonlight) – Allied code-named "Irving"– in May 1943, when two USAAF Consolidated B-24 Liberator bombers were destroyed. By coincidence this is in fact the same month and year in which the *Luftwaffe*, using a Dornier Do 217 N, first shot down a British aircraft (over Berlin) with the use of a similarly mounted weapon. In the case of the night-fighter model *Suisei*, this was designated the D4Y2-S *Suisei-E* Night Fighter. In operation, the absence of airborne radar provided a severe restriction on its effectiveness. Equally disadvantageous was the D4Y2-S's nominal capability of low-altitude interception. In consequence, relatively few *Suisei-Es* were completed.

#### BOMBER TRAINER, "VAL" – THE D3Y1-K

Before proceeding to the final sequence in the



development of the D3A and D4Y designs, mention must be made of one other sub-type stemming directly from the use of the earlier Aichi D3A carrier bomber. In November 1943 a ministerial investigation was set up in Japan to encourage the use of non-strategic materials in the aircraft industry with the object of conserving depleted stocks of metals.

It was proposed that for bomber-training purposes, big savings could be made if a modified version of the D3A were to be built incorporating the extensive use of wood in its construction. The Yokosuka Naval Air Arsenal was put in charge of this project and the original designation allotted (the D3A2-K or Navy Type 99 Bomber Trainer Type 12) was then amended to D3Y1-K to denote the change in the designers, while the popular name *Myojo* (Venus) was allotted when construction of the aircraft began in the summer of 1944.

It was then found that the elliptical wing and tail contours which characterized the D3A were too complex to reproduce in wood. In consequence, a complete redesign of these surfaces – incorporating a straight-taper planform – became necessary. The powerplant selected for the D3Y1-K was the same 1,300 h.p. Mitsubishi Kinsei 54 as used in the D3A2. Production had been entrusted to Matsushita, but only three aircraft had been completed by the war's end in August 1945.

#### SPECIAL ATTACKERS: D5Y1 AND D4Y4

The increasing need to design new aircraft and to modify existing ones for the *Kamikaze* (special attack) role became urgent as the progress of the war neared the Japanese home islands and emergency plans were formulated for the preparation of a "last ditch" defence force to hurl against the advancing Allied Fleet.

Of the specially designed types prepared for this use, one was a modified version of the D3Y *Myojo* (Venus) bomber trainer. The cabin design was altered to a single-seat layout and the fixed and spatted undercarriage was modified so as to be jettisonable. The engine was changed to the more powerful 1,560 h.p. Mitsubishi Kinsei 62 and armament comprising

#### Key to colour illustrations

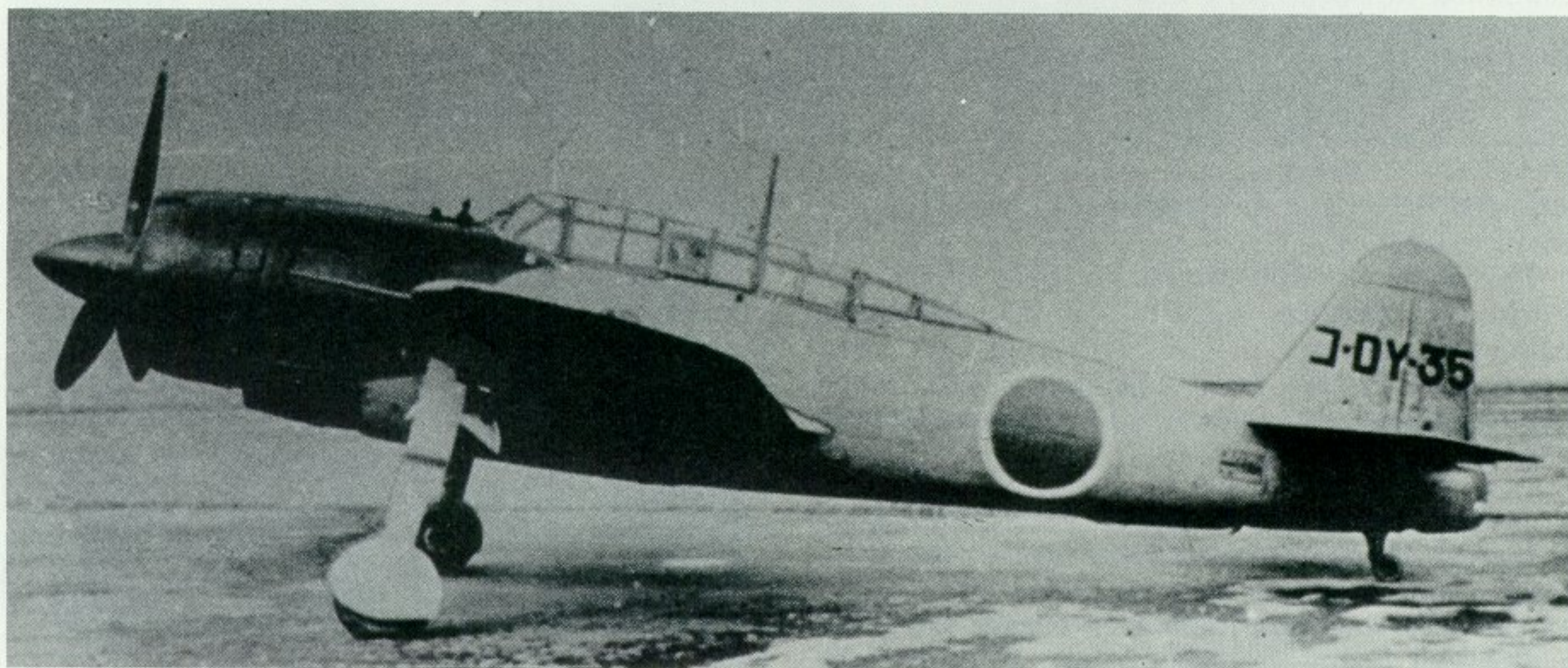
1. 01-065 Yokosuka D4Y2 – *Suisei* (Comet) 701st Naval Air Corps, Philippines late 1944.
2. □ -DY-29 Yokosuka D4Y2 – *Suisei* (Comet) 9th Prototype under test by the Yokosuka Naval Air Arsenal. □ = Ko. short for the Kokujitsusho Test Centre.
3. 57 – A Yokosuka D4Y3 – *Suisei* (Comet) of an unknown Naval Air Corps. Clark Field, Philippines late 1944. This aircraft was subsequently test flown by the US Technical Air Center SW Pacific Area.
4. ☐ = 207 ☐ = Yo Yokosuka D4Y3 – *Suisei* (Comet) of the Yokosuka Naval Air Corps – Atsugi Air Base, Japan 1945.

two 20-mm. Type 99 cannon and a single 800-kg. (1,764-lb.) bomb beneath the fuselage was to be fitted. In this form, the prototype was redesignated the D3Y2-K Special Attacker and, in production form, it was to have been the D5Y1. The plans called for the production of thirty D5Y1s a month, but the war finished before the first prototype was finally completed, so no production ever materialized.

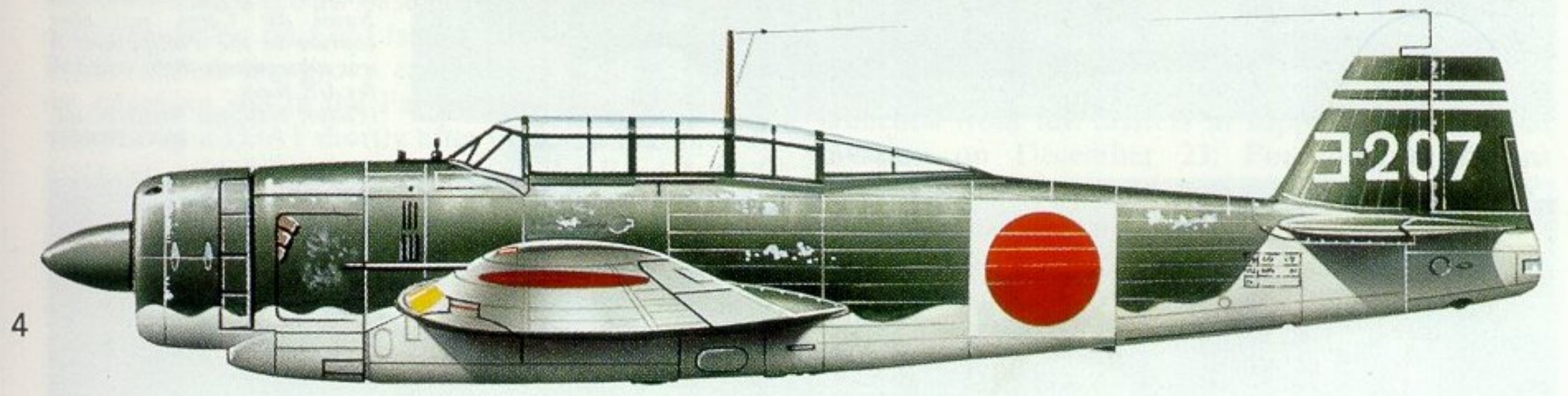
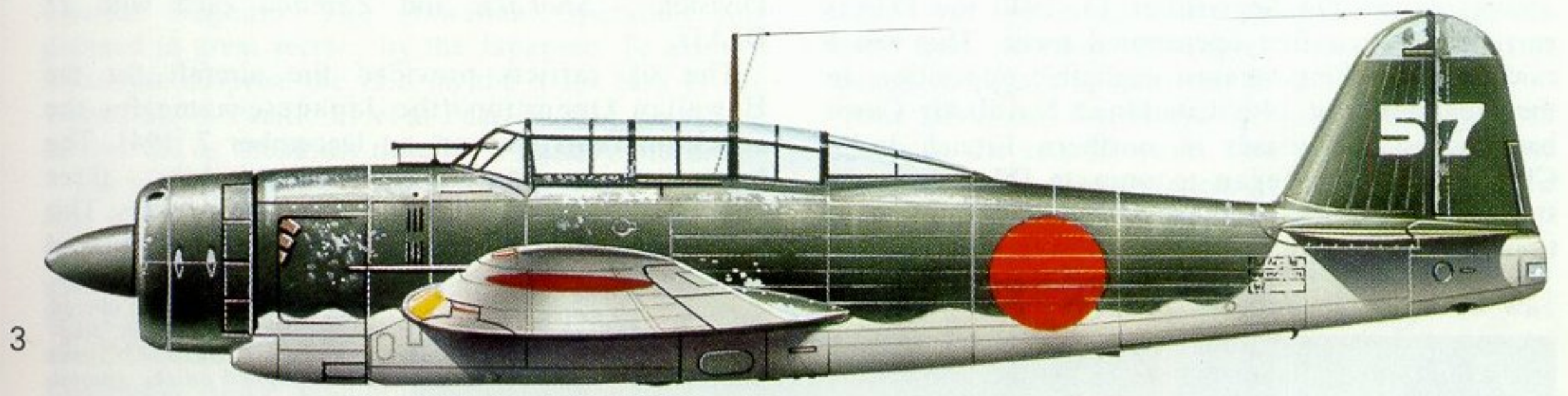
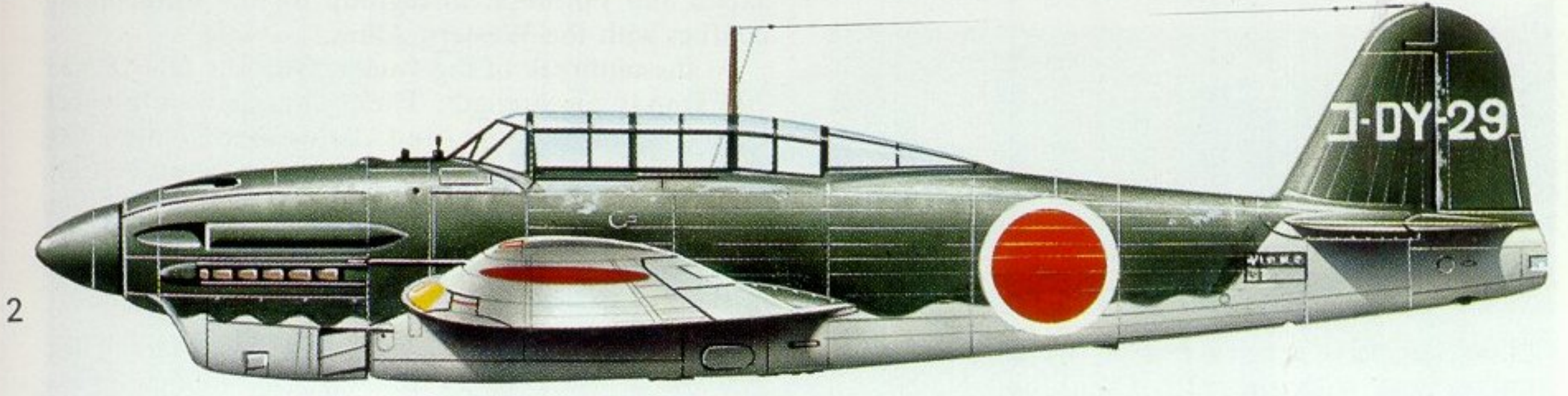
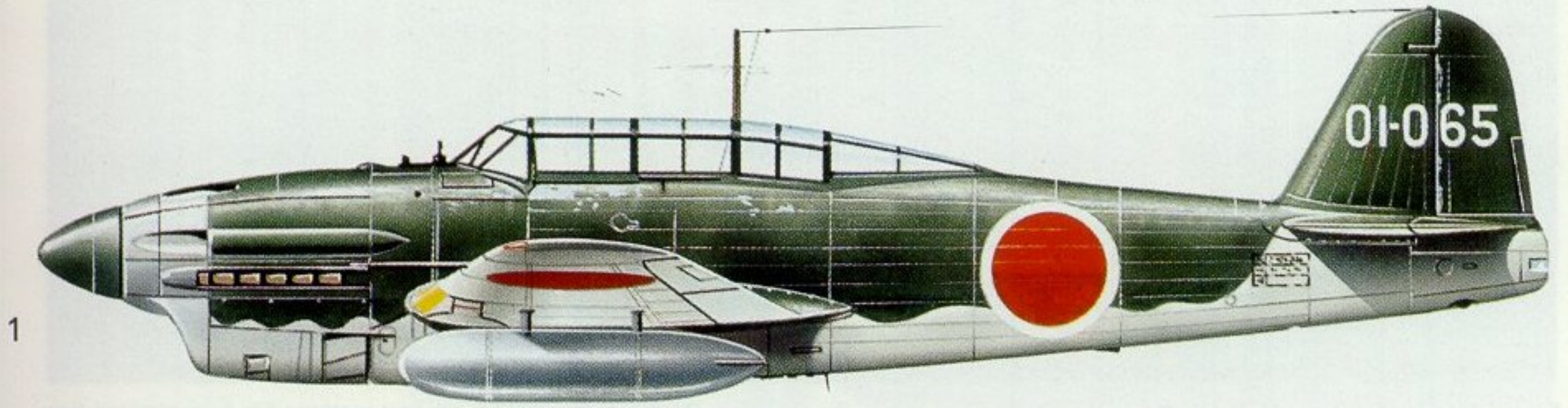
At the same time, modification of the basic design of the D4Y *Suisei* was continuing and again a special version for *Kamikaze* operations was planned. This was designated the D4Y4 and was also a single seat model with the rear cabin faired in. Powered by the Mitsubishi Kinsei 62 radial, it had RATOG and a semi-recessed 800-kg. (1,764-lb.) bomb carried beneath the fuselage. In all, no fewer than 296 of this version were built, starting in February 1945.

Finally came the D4Y5 in which power was provided by the larger 1,825 h.p. Nakajima NK9C Homare 12 – an air-cooled, 18-cylinder two-row radial. This was the first version to be fitted with much-needed armour protection for the crew and with self-sealing fuel tanks. It was due to enter production in late 1945, but the sudden ending of the war prevented its final completion.

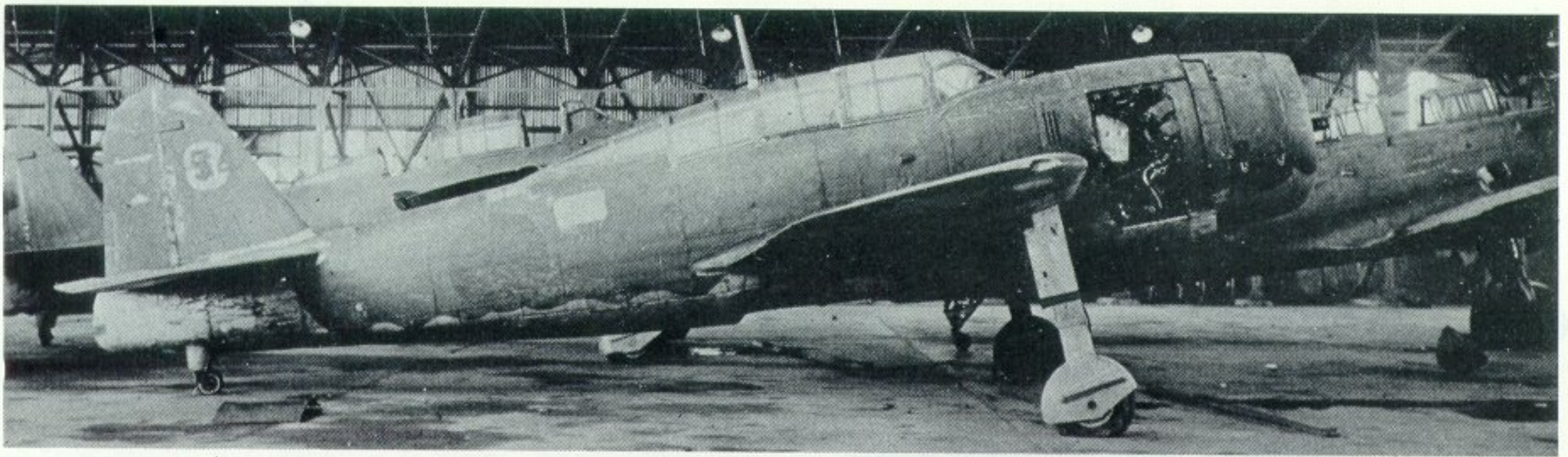
A D4Y3 prototype undergoing testing at the Yokosuka Naval Air Arsenal. The tail legend reads: Ko (mirror "C") = Yokosuka as the Arsenal; D = Carrier Bomber; Y = Yokosuka as the aircraft designers; 3 = third variant; and 5 = fifth prototype. (Photo: via Yasuho Izawa)











Several D4Y3s photographed at the end of the Pacific War, minus the propellers. On the nearest D4Y3, the unit marking has been removed from the fin and rudder; just discernible on the '3' of '73' are the numerals 54. (Photo: via Yasuho Izawa)

A side view of a D4Y3 Suisei Model 3-3 of the 601st Naval Air Corps. (Photo: Heinz J. Nowarra, ref. 3882)



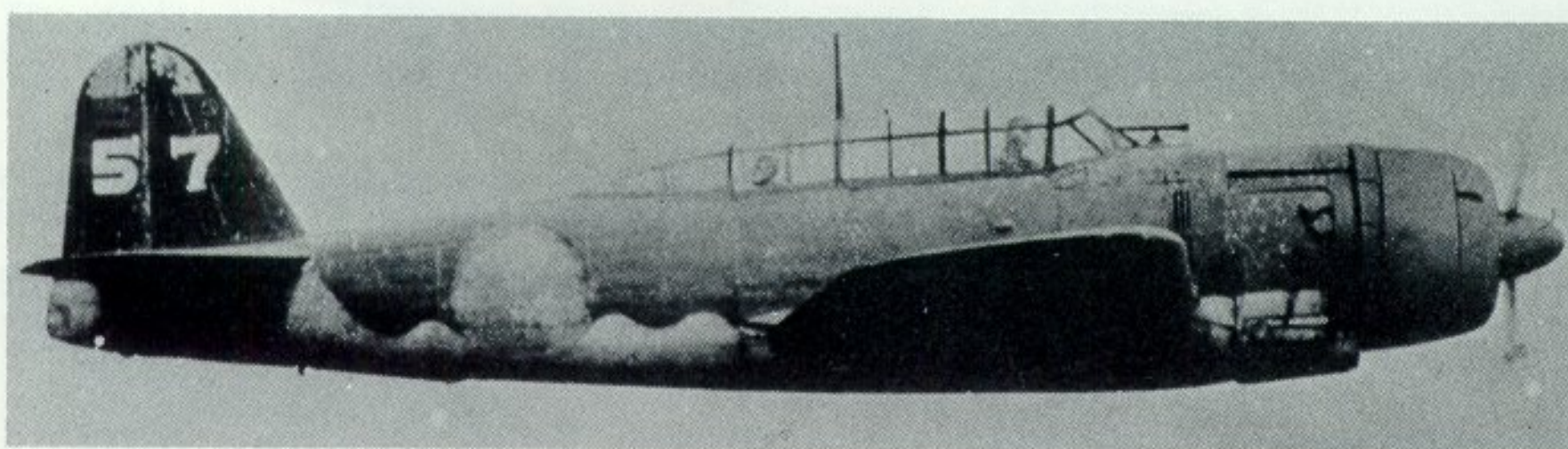
**China.** The first service use of the D3A1 Carrier Bomber was with the 12th Combined Naval Air Corps in September, 1940, over China. The 12th CNAC was a mixed aircraft unit, operating fighters, carrier bombers and attack aircraft, and also land attack planes. On September 13, 1940 the D3A1s carried out their first operational sortie. This was a raid on Chungking, against negligible opposition. In the meantime the 14th Combined Naval Air Corps had moved into bases in northern French Indo-China. This unit began to operate D3A1s against strategic targets in southern China. Further operations continued over China by D3A1s into 1941. In

September 1941, all IJNAF units were recalled to Japan and Formosa, to regroup for the forthcoming conflict with the Western Allies.

At the outbreak of the Pacific War, the IJNAF had 203 D3A1s on strength. These aircraft were divided between carrierborne and land-based units. The carrier units were all on board the six aircraft carriers of the First Line Striking Force. The land-based units formed part of the Second Line Striking Force, and had 68 D3A1s on strength.

**The Hawaiian Operation.** The aircraft carriers of the First Line Striking Force were as follows: First Carrier Division - *Akagi* with 18 D3A1s and *Kaga* with 27 D3A1s. Second Carrier Division - *Hiryu* and *Soryu* each with 18 D3A1s. The Fifth Carrier Division - *Shokaku* and *Zuikaku* each with 27 D3A1s.

The six carriers provided the aircraft for the Hawaiian Operation (the Japanese name for the attack on Pearl Harbor) on December 7, 1941. The carriers were supported by two battleships - three cruisers - nine destroyers and eight fleet tankers. This formidable force was commanded by Vice-Admiral

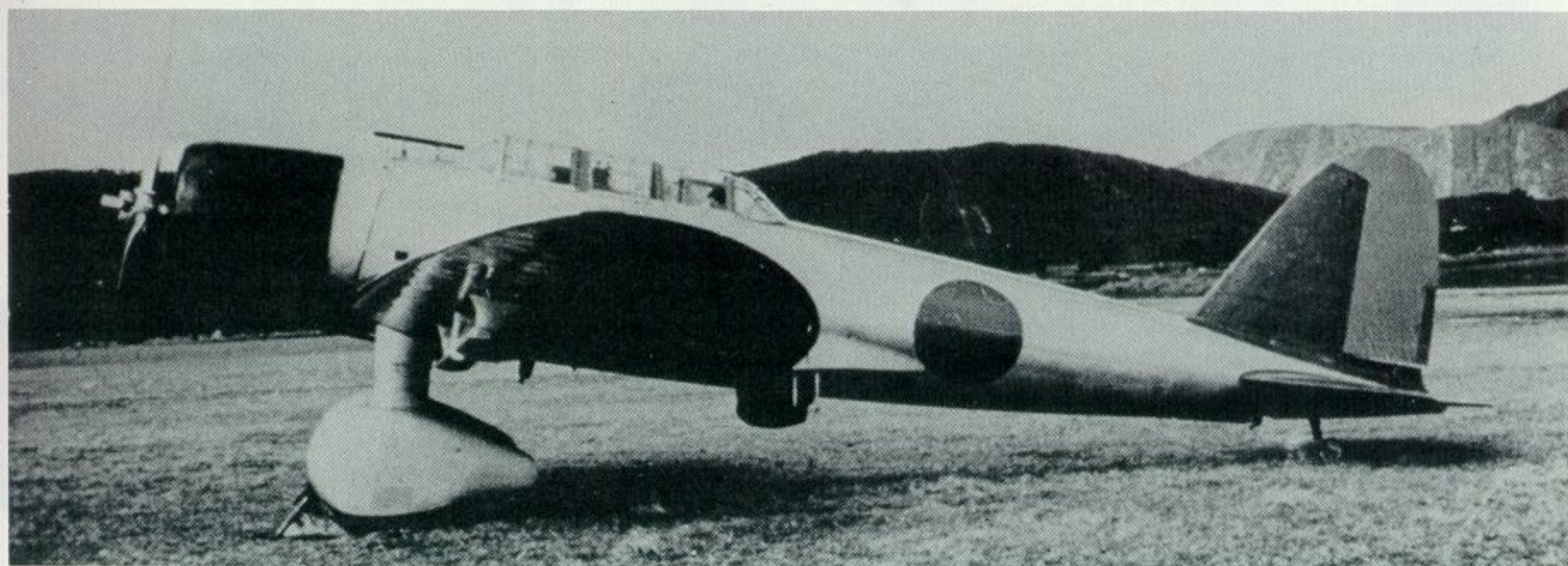
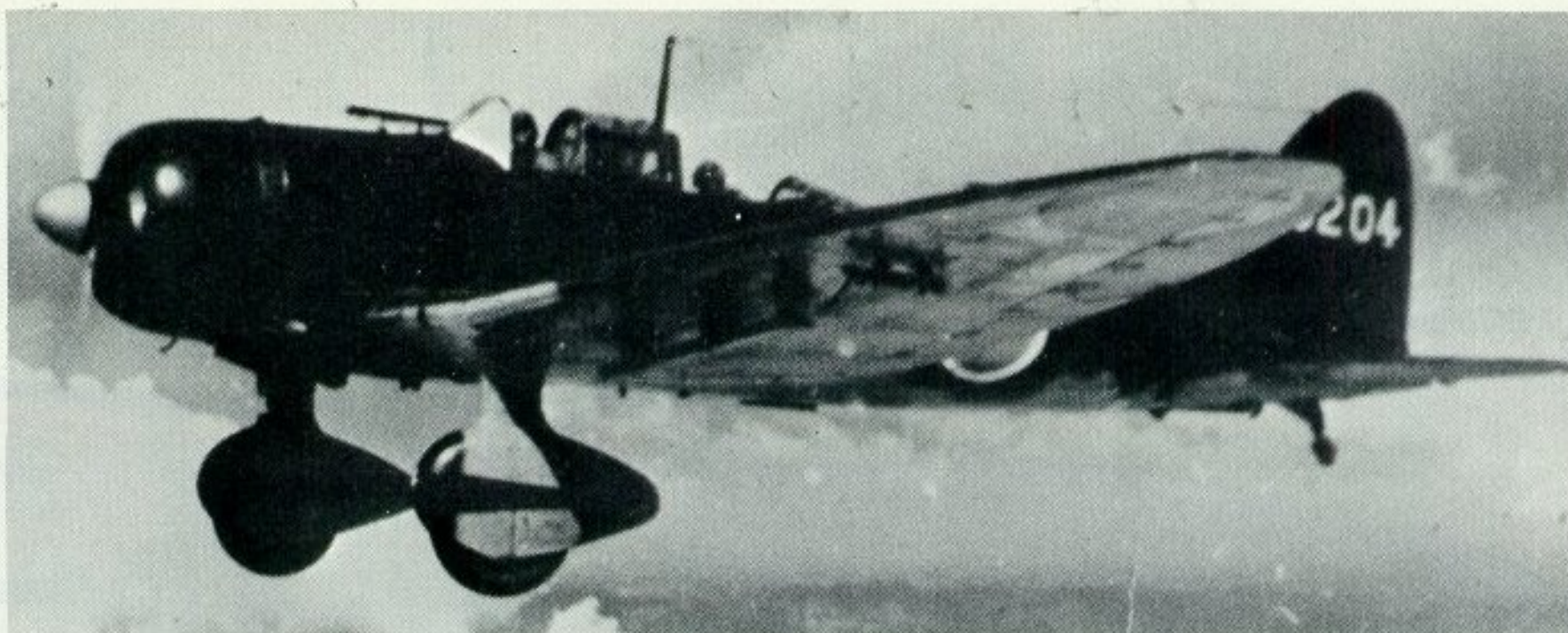


An example of wartime aircraft recognition photographic adaptation. This D4Y3 "57" was photographed on the ground, and then undercarriage removed, two aircrew painted in and the propeller activated. (Photo: Crown Copyright Reserved, ref. 1655) The original "57", of an unknown Naval Air Corps, just after capture in the Philippines; it was subsequently flight-tested by the US Navy. (Photo: National Archives, ref. 80-G-190003)





A D3A2 of the 553rd Naval Air Corps, piloted by Lieutenant H. Abe, flying over southern Kyushu, March 31, 1944. The younger pilots of the IJNAF disliked the D3A2 because of its slow speed and vulnerability. (Below) Second prototype of 11-Shi Experimental Carrier Bomber Aichi AM-17. Note that the dorsal strake to the fin has not yet been fitted. (Photos: Yoichi Tanaka via Yasuho Izawa)



Chuichi Nagumo. The Hawaiian Operation was planned in great secrecy by the Japanese. To achieve maximum surprise the raid on the main base of the United States Pacific Fleet at Pearl Harbor, was to be carried out at breakfast time on a Sunday morning.

The six carriers launched two strike waves – in the first 183 aircraft were launched. This comprised 43 fighters, 89 carrier attack planes—49 as level bombers and 40 torpedo-bombers—and 51 D3A1 carrier bombers. The assigned task of the D3A1s was to neutralise the US air bases on Oahu Island. Lieutenant Akira Sakamoto led 25 D3A1s to attack the Wheeler Air Base, the Japanese believed this to be the control centre for the fighter defence of Oahu.

While Lieutenant Kakuichi Takahashi led 26 D3A1s to attack the air base at Hickam Field, and the seaplane station on Ford Island in the centre of Pearl Harbor. From this group came the first bomb to fall on American soil in the Pacific War. The bomb was released by a D3A1 shortly after 07:55 on that fateful morning, and fell on the ramp at the Ford Island base. It caused little damage, but following D3A1s subsequently wrecked the base.

In the second wave launched one hour and fifteen minutes after the first, were: 35 fighters, 54 carrier attack planes, all operating as level bombers, and 78 D3A1s. Led by Lieutenant Commander Takashige Egusa the assigned task of the D3A1s was to attack the US carriers had they been present that morning. Consequently Egusa's D3A1s concentrated their attacks on the ships which had escaped damage from the first attack wave. Battleships USS *Nevada* and *Pennsylvania* were damaged, destroyers *Cassin* and *Downes* were sunk. The destroyer *Shaw* – in a floating

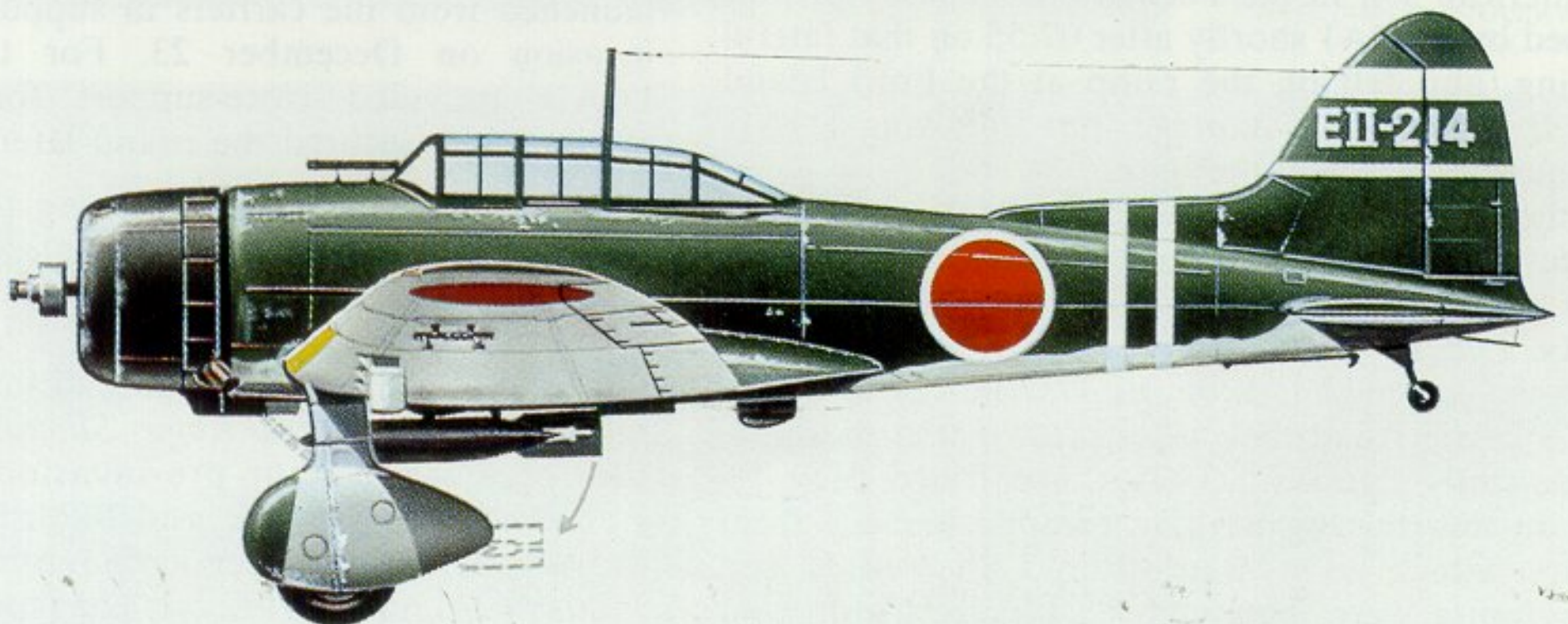
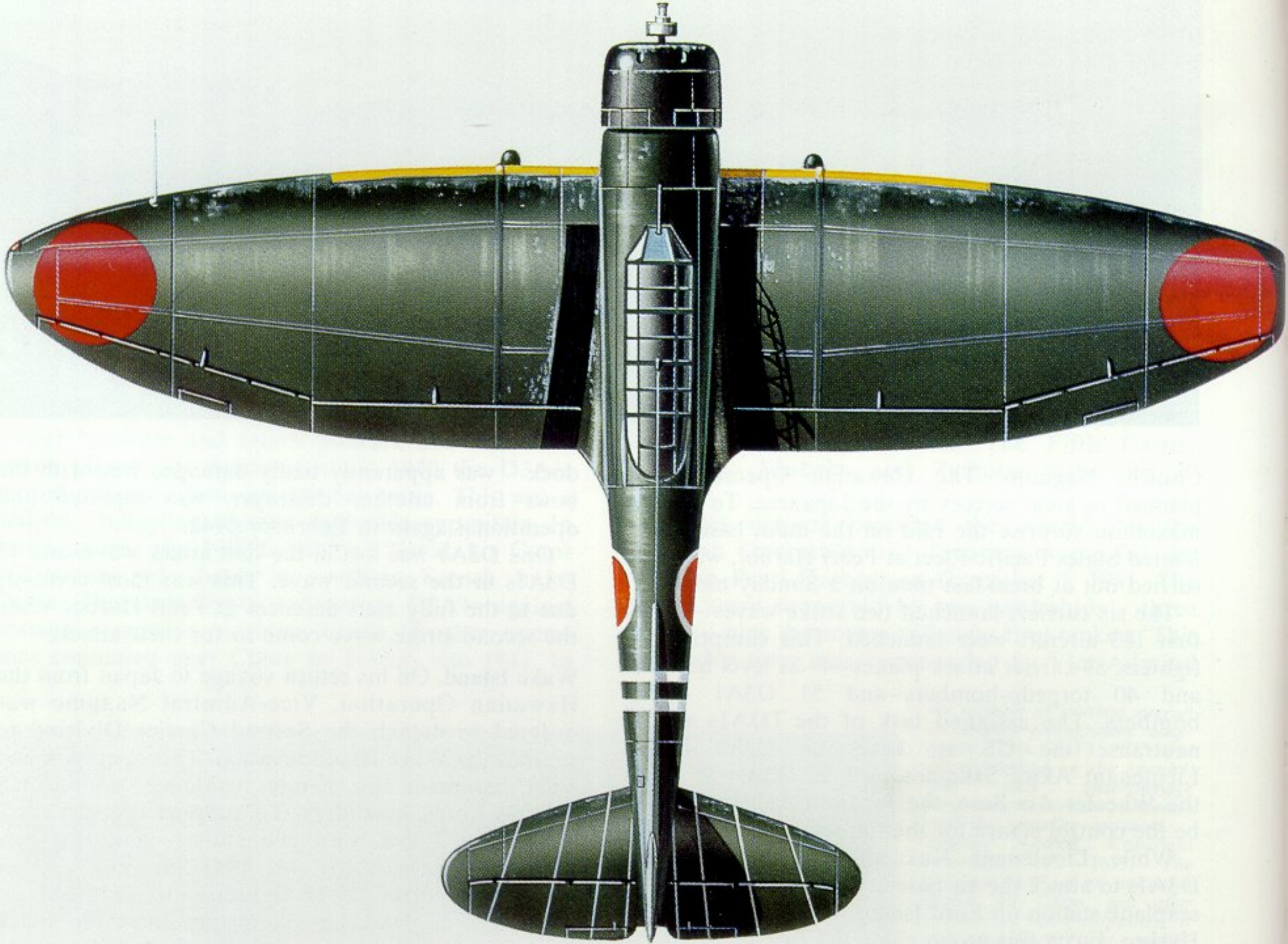
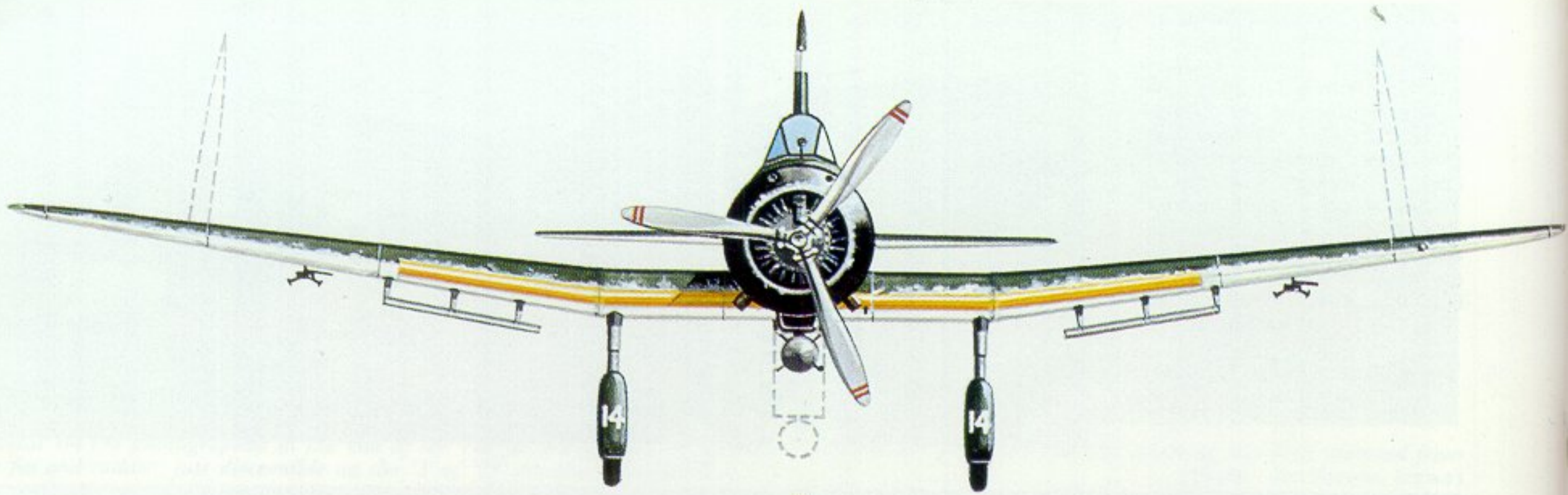
dock – was apparently badly damaged but, with the bows from another destroyer, was repaired and operational again in February 1942.

One D3A1 was lost in the first attack wave, and 15 D3A1s in the second wave. This was most certainly due to the fully alert defences at Pearl Harbor when the second strike wave come in for their attack.

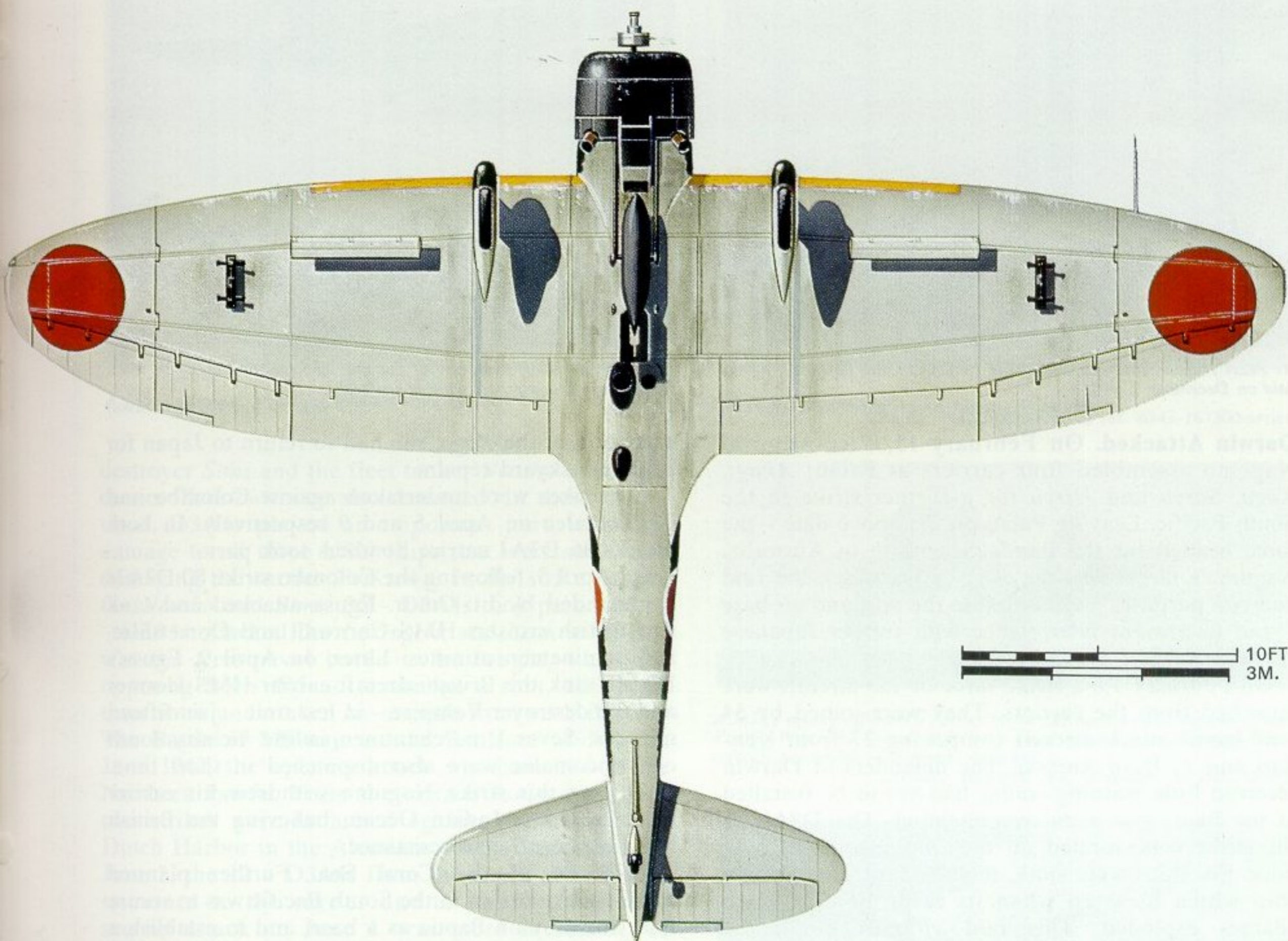
**Wake Island.** On his return voyage to Japan from the Hawaiian Operation, Vice-Admiral Nagumo was ordered to detach the Second Carrier Division to support the Wake Island invasion. This operation had been hampered by heroic resistance by the US Marine Corps defenders. To support the carriers – *Hiryu* and *Soryu* were two cruisers and two destroyers. On December 18, 1941 the two carriers launched a strike of 18 fighters and 18 D3A1s to attack Wake Island. Low cloud prevented the attack from being fully successful. Further strikes were launched from the carriers in support of the second invasion on December 23. For these operations D3A1s provided close-support for the Japanese marines who secured the island later that day.

**Southern Operations.** Following their resounding success on the Hawaiian Operation. The Nagumo carrier force was assigned the task of supporting operations in the South Pacific. Leaving Hiroshima on January 5, 1942, Nagumo had four carriers under his command: *Akagi*, *Kaga*, *Shokaku* and *Zuikaku* the force carried out pre-invasion strikes against Rabaul, Kavieng, Lae and Salamaua. *Hiryu* and *Soryu* operating independently struck at Ambon on January 24 and 25, all carriers reported only slight opposition.

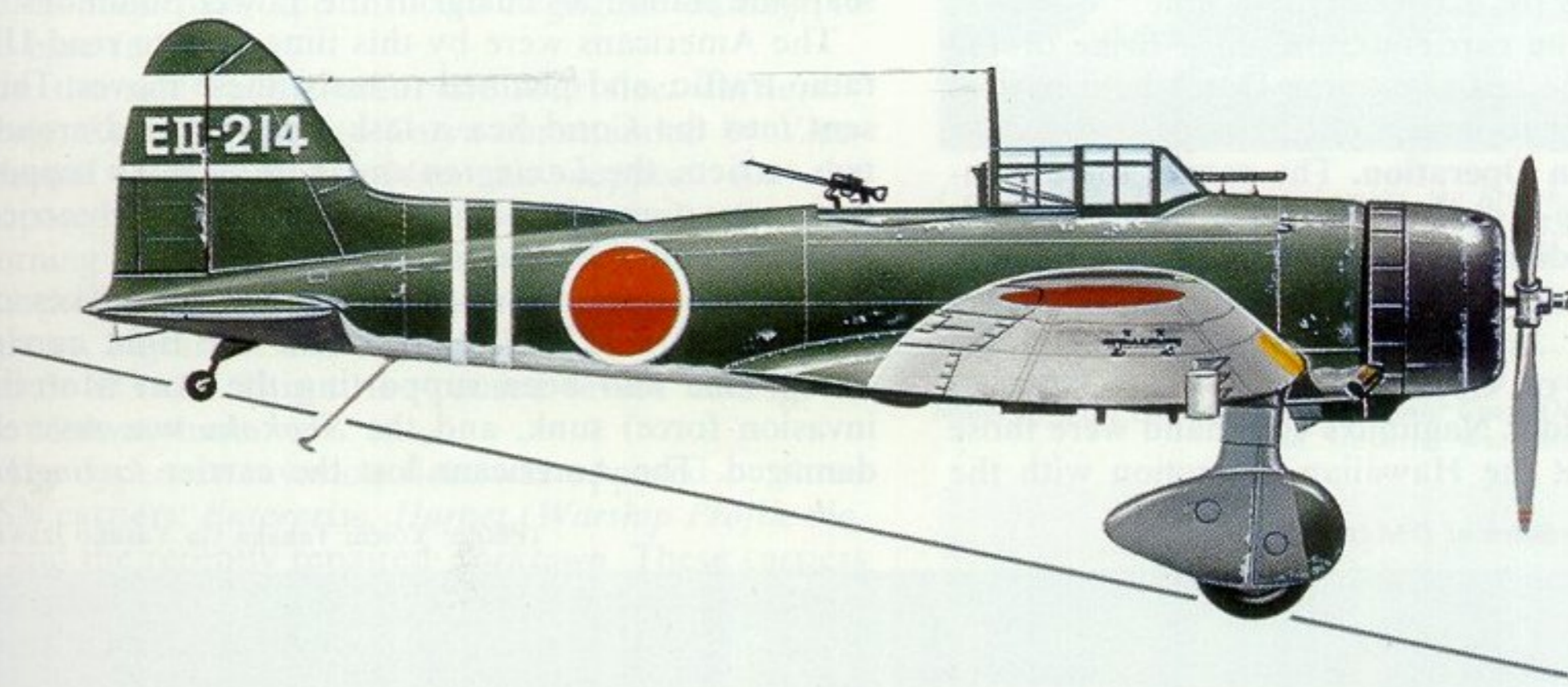








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An Aichi D3A1, Navy Type 99 Carrier Bomber Model 1-1 (Allied code name: "Val") from the Imperial Japanese Navy Fleet carrier *Zuikaku* (complement included 27 D3As). Period was the Battle of Santa Cruz on Monday, October 26, 1942.

*P. Endsleigh Castle, ARAeS. © Profile Publications Ltd*





At Pearl Harbor, this was one of the 15 D3A1s shot down during the raid on December 7, 1941.

(Photo: National Archives ref. 80-G-159151)

**Darwin Attacked.** On February 15, Vice-Admiral Nagumo assembled four carriers at Palau: *Akagi*, *Kaga*, *Soryu* and *Hiryu* for a further strike in the South Pacific. Leaving Palau on the above date – the force headed for the Banda Sea north of Australia. Nagumo's target was the port of Darwin – the raid had two purposes – to neutralise the port and air base – and to prevent interference with further Japanese expansion in the area.

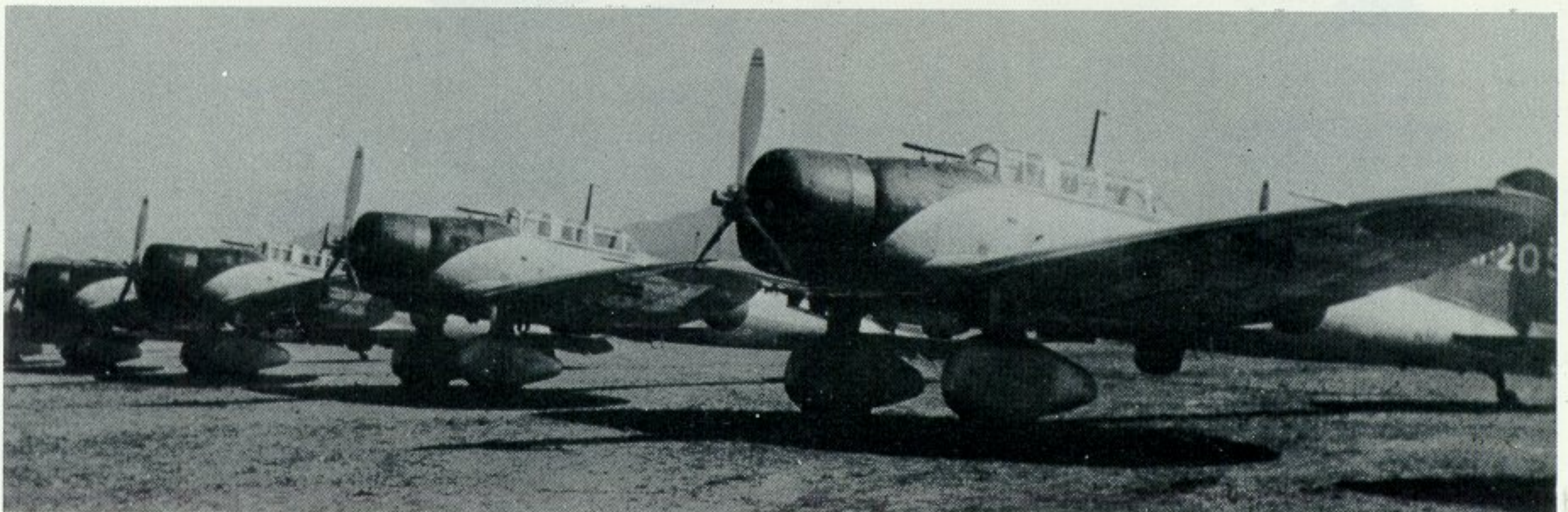
On February 19, a strike force of 188 aircraft were launched from the carriers. They were joined by 54 land-based attack aircraft comprising 27 from Kendari and 27 from Ambon. The defenders of Darwin received little warning—radar had yet to be installed at the base—and were overwhelmed. The D3A1s in the strike concentrated on the shipping in the harbour. Six ships were sunk, including an ammunition ship which blew up when its cargo of 200 depth charges exploded. This raid virtually eliminated Darwin as a base for a considerable time.

On March 3, the carriers launched a strike of 180 aircraft against the last remaining Dutch held base at Tjilatjap, claiming to have sunk 20 ships.

**The Indian Ocean Operation.** The carrier force commanded by Vice-Admiral Nagumo carried out a sortie into the Indian Ocean in late March and early April 1942. The objective was to destroy the British Fleet which the Japanese believed was being assembled at bases on Ceylon.

The carriers under Nagumo's command were those which carried out the Hawaiian Operation with the

A line-up of an early batch of D3A1s.



A D3A2 taking-off from one of the four airfields at Rabaul in 1943. Bomb carried under port wing is noticeable.

(Photo: via Yasuho Izawa)

exception of the *Kaga*, she had to return to Japan for urgent dockyard repairs.

Air strikes were undertaken against Colombo and Trincomalee on April 5 and 9 respectively. In both attacks 36 D3A1 carrier bombers took part.

On April 5, following the Colombo strike 80 D3A1s commanded by Lt. Cmdr. Egusa attacked and sank two British cruisers HMS Cornwall and Dorsetshire, in just nineteen minutes. Later, on April 9, Egusa's D3A1s sank the British aircraft carrier HMS Hermes and the destroyer Vampire – in less time – just fifteen minutes. Several merchantmen in the vicinity south of Trincomalee were also dispatched in short time. Following this strike Nagumo withdrew his carrier force from the Indian Ocean, believing the British had little to offer in resistance.

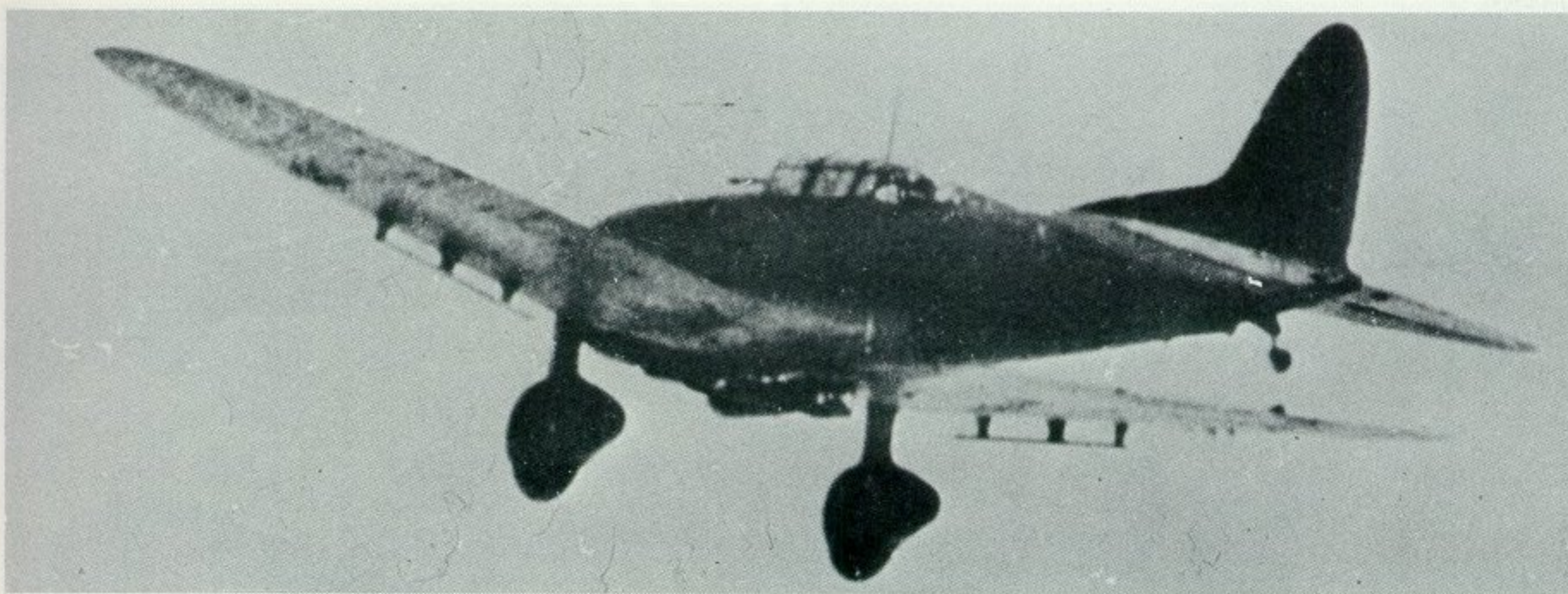
**The Battle of the Coral Sea.** Further planned Japanese expansion in the South Pacific was to secure Port Moresby on Papua as a base, and to establish a seaplane station at Tulagi in the Lower Solomons.

The Americans were by this time able to read IJN radio traffic, and planned to resist these moves. They sent into the Coral Sea a task force centred around two carriers, the *Lexington* and *Yorktown*. To support their operations the Japanese dispatched the carriers *Shokaku* and *Zuikaku* to the area.

The two carrier groups exchanged air strikes on May 7 and 8. The Japanese lost the light carrier *Shoho* (she had been supporting the Port Moresby invasion force) sunk, and the *Shokaku* was severely damaged. The Americans lost the carrier *Lexington*,

(Photo: Yoichi Tanaka via Yasuho Izawa)





A D3A2 outward bound for Guadalcanal, in early 1943, with a 250-kg. bomb under the fuselage.

(Photo: National Archives ref. 80-G-167300-series)

destroyer *Sims* and the fleet tanker *Neosho* sunk. The carrier *Yorktown* was also damaged. In these operations, D3A1s played an important part, inflicting damage to all three USN ships that were sunk, and damaging the carrier *Yorktown*. In the strike against the *Neosho* and *Sims* 36 – D3A1s took part, and 33 – D3A1s attacked the *Lexington* and *Yorktown*. This was the first naval battle to be fought, when the opposing fleets did not exchange a shot, all operations were undertaken by aircraft from each fleet.

**The Battle of Midway.** At the Battle of Midway in June 1942, the opening attack was launched in the Northern Pacific. From the carriers *Junyo* and *Ryujo* two strikes were launched against the US base at Dutch Harbor in the Aleutians. In the first attack on June 3, the 12 – D3A1s from the *Junyo* were forced to return to the carrier due to bad weather. The second attack on June 4, was more successful, 11 D3A1s took part, and inflicted negligible damage to the base facilities.

In the mid-Pacific area, the four fleet carriers – *Akagi*, *Kaga*, *Hiryu* and *Soryu* commanded by Vice-Admiral Nagumo provided air support for the proposed invasion of the Midway atoll. On the morning of June 4, a strike of 108 aircraft was launched from the four carriers. This comprised: 36 fighters, 36 carrier attack planes, all as level bombers and 36 D3A1s. This strike caused severe damage to the Midway base.

The Japanese invasion fleet was opposed by three USN carriers, *Enterprise*, *Hornet* (*Warship Profile No. 3*) and the recently repaired *Yorktown*. These carriers were shadowed by a D4Y1-C Type 2 Reconnaissance Plane, making its operational debut in IJNAF service. This aircraft came from the carrier *Soryu*. On his return the pilot found the *Soryu* on fire resulting from attacks by US carrier planes. The *Hiryu* being undamaged so the pilot landed on her flight deck. From his report the Japanese were surprised to find that they were opposed by three USN carriers.

The *Hiryu* launched an immediate attack comprising six fighters and 18 D3A1s. This force attacked the USS *Yorktown*, which was operating apart from the other two carriers. The D3A1s lost eight of their number before they could reach the US carrier. This included the strike leader, Lieutenant



A D3A1 taking-off from a carrier of the IJN in the early months of the Pacific War. The overall light grey paint scheme is in evidence. This aircraft has under-wing bombs attached.

(Photo: Imperial War Museum, ref. MU 1839)

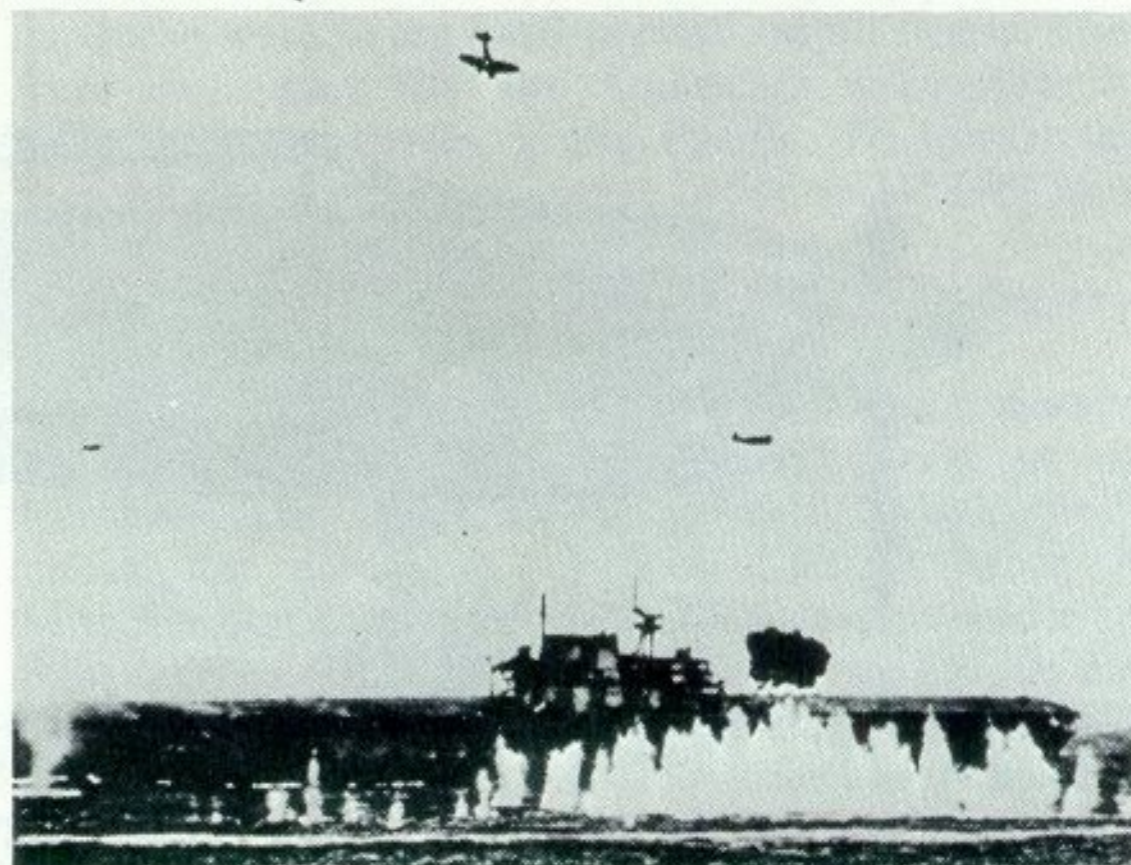


A victim of the D3A1 carrier bomber, the British aircraft carrier HMS Hermes going down off Ceylon on April 9, 1942.

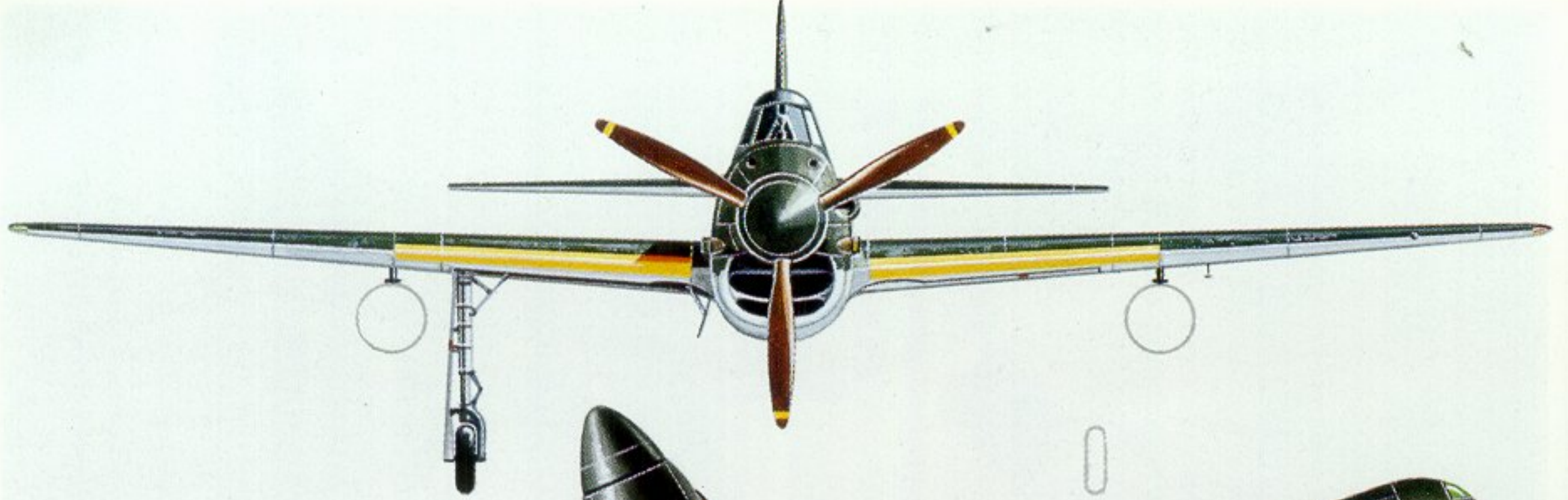
(Photo: Imperial War Museum, ref. MU 1839)

Lieutenant Commander Seki, IJNAF, about to crash his D3A1 on the bridge of USS Hornet, Battle of Santa Cruz, October 26, 1942.

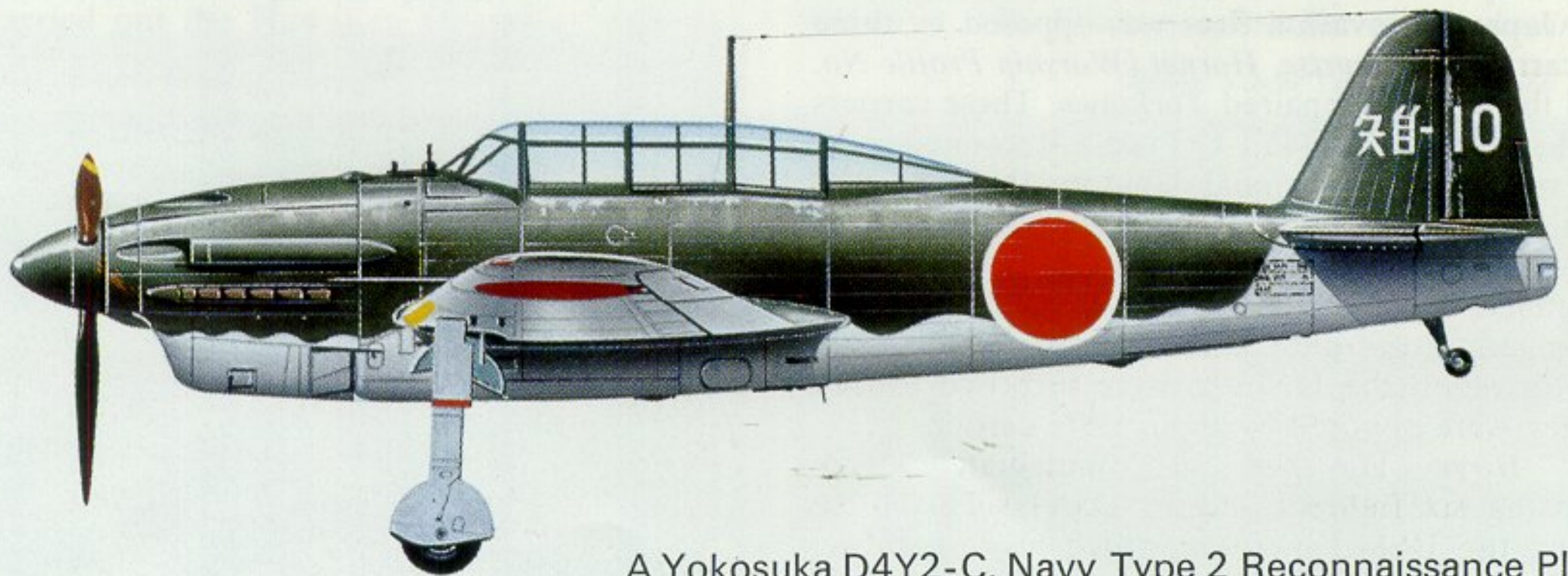
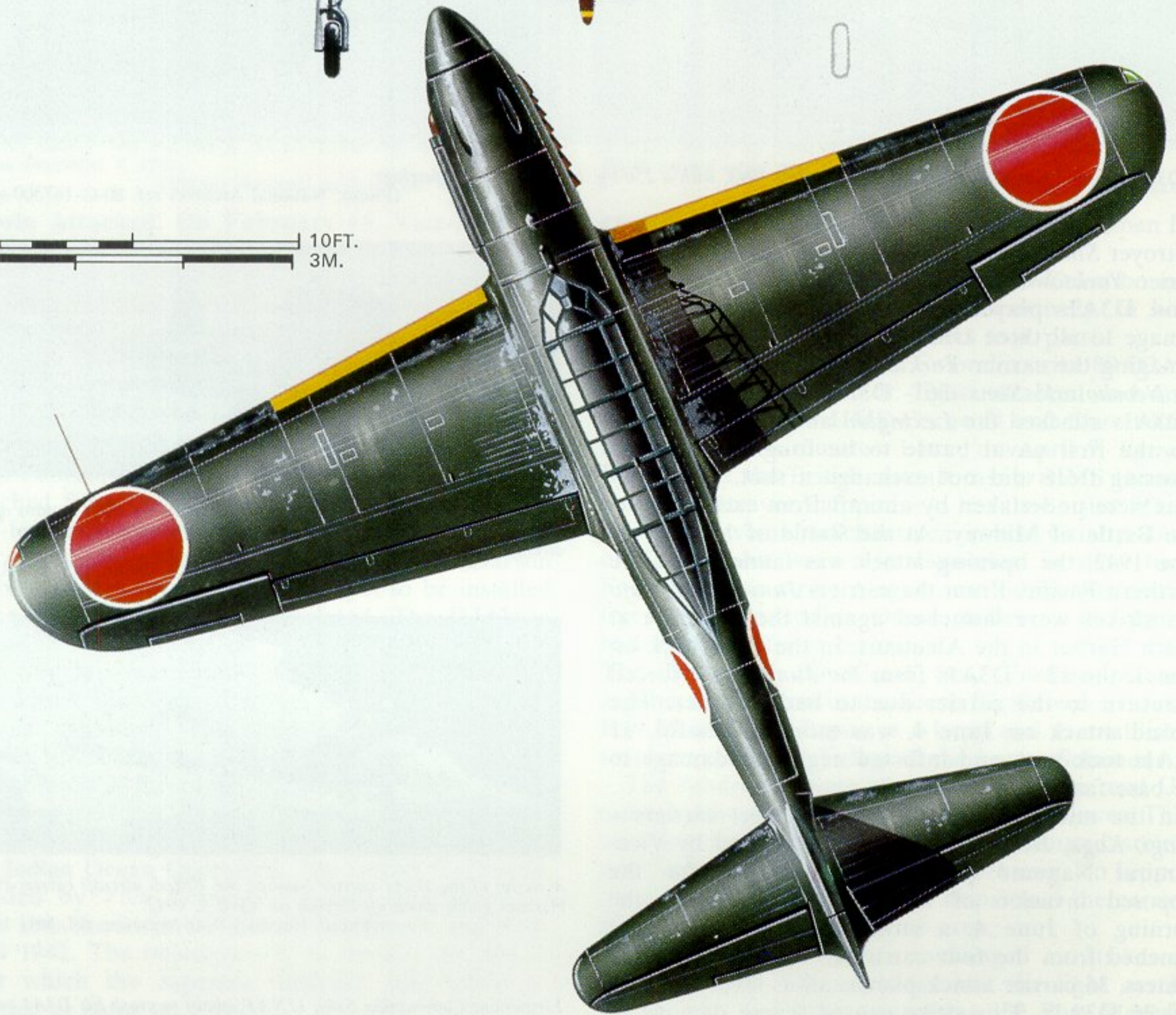
(Photo: Imperial War Museum, ref. HU 3406)







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A Yokosuka D4Y2-C, Navy Type 2 Reconnaissance Plane, Model 1-2 (Allied code name: "Judy") of the 121st Naval Air Corps, Marianas, June 1944.





An extraordinarily sharp action photograph of a D4Y3 ("Judy 33") Kamikaze attacker about to crash on the US Navy aircraft carrier USS Essex (CV-9) off the Philippines on November 25, 1944. (Photo: National Archives ref. 80-G-270648)

Kobayashi an experienced carrier bomber pilot of the IJNAF. The remaining D3A1s escaped the attention of the defending Wildcat fighters (*Aircraft Profile No. 53.*) and pressed home their attack. They secured three hits on the *Yorktown*. Only three fighters and five D3A1s returned to the *Hiryu*. The *Yorktown* was later attacked by another *Hiryu* group, consisting of fighters and torpedo-bombers. From the damage sustained in this attack *Yorktown* was stopped and in a subsequent submarine torpedoing by the *I-168* the *Yorktown* finally sunk.

**The Battle of the Eastern Solomons.** On August 7, 1942 the Americans landed on the island of Guadalcanal in the Solomons. The Japanese resisted this invasion with all available aircraft and ships. One vital factor in their defensive strategy was the supply and reinforcement of their garrison on Guadalcanal. To cover a supply run late in August 1942, the IJN employed several groups of warships. On August 24 an IJN force centred around the two fleet carriers, *Shokaku* and *Zuikaku* was operating off the Solomons. Ahead of this group, and operating independently was the light carrier *Ryujo*. Opposing the IJN ships the US Navy had Task Force 61, centred on three carriers *Enterprise*, *Saratoga* and *Wasp*.

In the following engagement which was known as the Battle of the Eastern Solomons, the IJN lost the light carrier *Ryujo* to US carrier aircraft strikes. The Japanese launched two strikes against the US carriers. The first strike wave included 33 D3A1s, and the second included 18 D3A1s. Only the first wave found the US carriers, and concentrated their attacks on the *Enterprise*, scoring three hits. The increased anti-aircraft defences of the US ships resulted in the loss of many D3A1s in this attack. The second strike wave failed to find the US ships and returned to their carriers, after jettisoning their bombs into the sea.

**The Battle of Santa Cruz.** Late in October 1942, the US Navy were operating two task forces in the seas off the Solomons. Task Force 16 with carrier *Enterprise* (recently repaired) and Task Force 17 with carrier *Hornet* (Warship Profile No. 3). On October

24, the forces combined. A report from a PBY flying boat (Profile No. 183) reported a Japanese naval force moving south, this included three carriers. The carriers were the *Shokaku*, *Zuikaku* and *Zuiho*, and in the rear of this group was another carrier the *Junyo*. This was the opening move in an engagement known as the Battle of Santa Cruz.

Early on October 26, the Japanese launched an aircraft strike against the US carriers, this included 22 D3A1s. Shortly after a second strike was launched and included 20 D3A1s. When the first strike wave arrived over the US carriers only the *Hornet* was in view, and took the full brunt of the assault. The D3A1s scored a number of hits. Their leader Lt. Cmdr. Seki his plane badly damaged, deliberately crashed his D3A1 onto the island bridge of the *Hornet*. The two 60 kg. wing bombs exploded, but the 250 kg. bomb was a dud. The *Hornet* took three further bombs and four torpedoes.

The second Japanese strike attacked the *Enterprise* the D3A1s scored two hits and one near miss. A further strike from the *Junyo* included 18 D3A1s found the US Fleet, but missed the *Enterprise*, but scored hits on the USS *South Dakota* and *San Juan*. A second strike wave from the *Junyo* attacked the now crippled *Hornet* securing only one hit. The *Hornet* was to sink later that day.

**The Battle of the Philippine Sea.** By May 1944 the Japanese were being hard pressed on all fronts. They were also aware that the Americans were planning more strategic moves in the Pacific. To thwart this they mounted an operational order to all IJN units known as 'Operation A-Go'.

This would provide maximum effort to the area threatened.

On June 11, 1944, the US Navy mounted a massive air attack on Saipan, Tinian and Guam in the Marianas. This attack was delivered by Task Force 58 under the command of Vice-Admiral Marc A. Mitscher and comprised seven fleet carriers and eight light carriers. The US Marines landed on Saipan and established a beach-head. Following this the IJN activated 'Operation A-Go'. To resist the Americans in the Marianas the IJN assembled nine carriers as



follows: First Carrier Division, fleet carriers, *Shokaku*, *Taiho*, and *Zuikaku*, included in their aircraft complement were 81 *Suisei* carrier bombers, and nine D4Y2-C reconnaissance planes. The Second Carrier Division, fleet carriers *Hiyo*, *Junyo* and the light carrier *Ryuho*, their aircraft complement included 27 D3A2 carrier bombers and nine D4Y2-C reconnaissance planes. The Third Carrier Division, light carriers, *Chitose*, *Chiyoda* and *Zuiho* had no carrier bombers on board, only fighters, fighter-bombers and carrier attack planes. The Japanese Fleet commander was Vice-Admiral Jisaburo Ozawa.

Early on the morning of June 19, the massive US Fleet was located by Japanese search planes, which included 11 D4Y2-C reconnaissance planes.

The US Fifth Fleet Commander, Admiral Raymond A. Spruance who was responsible for the overall operation in the Marianas knew the Japanese fleet was at sea and heading towards his position. He was also uncertain of their position, and also he was reluctant to uncover the beach-head on Saipan to a possible Japanese outflanking move. These two decisions were to decide the out-come of the forthcoming engagement known as the Battle of the Philippine Sea. When the two fleets were some 370 nautical miles apart, Vice-Admiral Ozawa knew that his aircraft had the necessary range to attack the US ships, but that the US carrier aircraft could not undertake an attack against the IJN ships at that range. Following the reports of his search aircraft Ozawa in the next four hours from 0830 that morning, four air strikes were launched from the Japanese carriers. The aircrew had been briefed that if they were unable to return to their carriers through lack of fuel, they were to land at the airfields on Guam and Rota islands.

The second strike wave launched from the IJN carriers included 36 *Suisei* and D3A2 carrier bombers.

The Japanese air strikes were met by intercepting US carrier fighters up to 50 miles from their carriers. These fighters were not the slow Wildcat fighters encountered by the Japanese early in the Pacific War, but a fast, hard-hitting fighter, the Hellcat. There were over 450 such fighters waiting for the Japanese aircraft. A large number of Japanese aircraft fell to the guns of these formidable fighters, only the battleship USS *South Dakota* sustained any damage at that time.

The third and fourth strike waves were directed north and south of the US Fleet. Only a small

number found the American ships. Most of the aircraft in these strikes headed for Guam and Rota Islands. Only to find standing patrols of more F6F Hellcat fighters waiting for them. Many were shot down as they tried to land at the airfields on these islands.

In the two-day actions of June 19 and 20, the IJNAF lost some 400 aircraft – no fewer than 338 on June 19 alone – while US Navy suffered 100 operational losses and 44 lost in action. Little wonder then that the Americans were quick to dub this massive engagement as “*The Marianas Turkey Shoot*”.

Shortly after launching the aircraft in the second strike, the flagship of Vice-Admiral Ozawa the carrier *Taiho* was struck by a torpedo from the USS *Albacore* (SS-218). From the damage to the carrier's Avgas (aviation spirit) stores, resultant explosions sealed the fate of *Taiho*. Ozawa transferred to the cruiser *Haguro* to continue the battle.

Four hours later the carrier *Shokaku* was hit by three torpedoes from the USS *Cavalla* (SS-244) and she sank shortly afterwards.

Next day was devoted by the Japanese to ships' fuelling preparatory to withdrawal. They were caught by a pre-dusk strike and the carrier *Hiyo* was hit and soon afterwards sank. Other carriers and two Fleet oilers were sunk. Vice-Admiral Ozawa ordered his remaining ships to retire. On board the surviving carriers only a pathetic remnant of aircraft remained – a mere 25 fighters, 18 carrier attack planes and two carrier bombers. The Americans lost 26 aircraft in the whole engagement. But, of Mitscher's protective “umbrella” of Hellcats, 50 per cent were lost because the pre-dusk attack resulted in the fighters having to land-on after nightfall.

**The Last Sea Battle – Leyte Gulf.** After the loss of the Marianas to the Americans, the Japanese could not forecast where the next blow would fall. They prepared three plans to meet any possible invasion against their remaining empire. The first *SHO-1* – provided for the defence of the Philippines, *SHO-2* – was for the defence of Formosa and/or Okinawa, and *SHO-3* was made for the defence of the Japanese home islands.

Early in October 1944, US Navy Task Force 38, with nine Fleet carriers and eight Light carriers, began a series of heavy air strikes against the Japanese. Luzon, Okinawa and Formosa were raided in quick succession. This being to keep the Japanese from suspecting where the next strategic invasion would be coming.

A line-up of D3A2s at the Misawa Air Base, in Japan's northern Honshu, at the end of the Pacific War; photograph taken on October 20, 1945. (Photo: via Major Robert C. Mikesh)



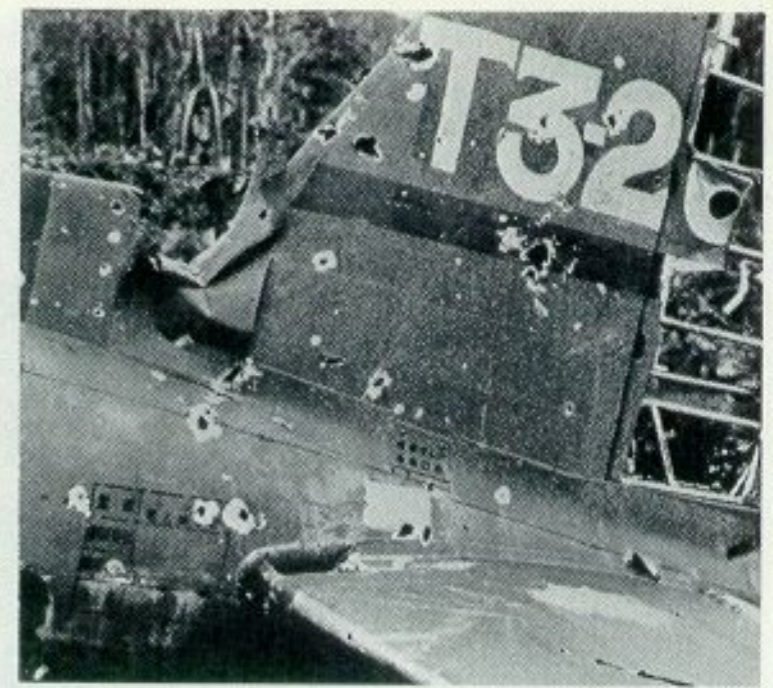




A close-up of the fixed undercarriage and dive-brake of the D3A1 carrier bomber.

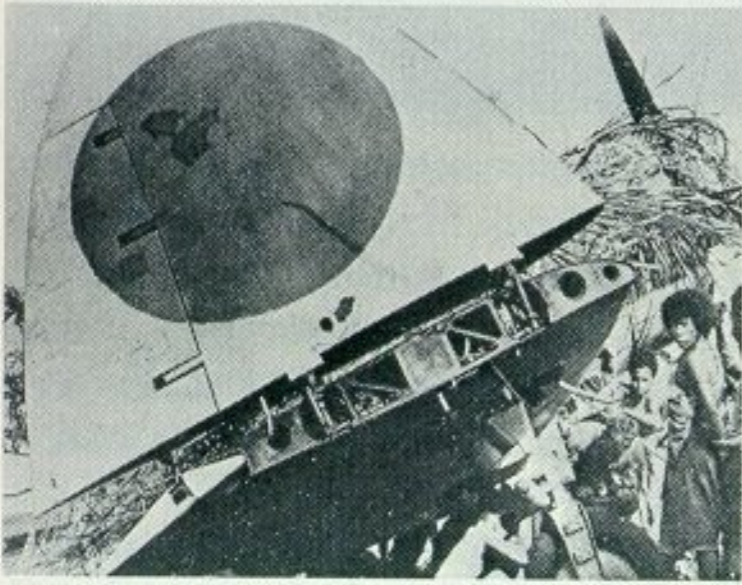


The manufacturers' identity panel from a D3A1 shot down at Deba, Papua, New Guinea on September 3, 1942. Reads: top line, Type 99 Carrier Bomber; second line, serial number 3114; third line, date of manufacture, December 5, 1940.



A well shot-up tail assembly of a D3A2 of the 582nd Naval Air Corps, at Munda air base, New Georgia.

The manufacturers' identity panel is visible just forward of the tailplane.



Wing tip folding detail of D3A1 (upper) and D3A2 (lower). The latter, at the Atsugi Air Base, Japan, on September 5, 1945, seems to have port aileron from another aircraft.



A damaged tail section of a D3A1 the white stripes on the tailplane are angles of fire for the rear gunner.



The tail of a D3A1 of the 2nd Naval Air Corps forced down on the beach at Deba, Papua, New Guinea on September 3, 1942.



A close up of the tail-wheel and deck arrester hook of a D3A1 of the 2nd Naval Air Corps. (All photos: via Major Robert C. Mikesh)

To counter the strikes by Task Force 38, the air fleet commander on Formosa, Admiral Toyada, employed aircraft under training for the IJN aircraft carriers under Vice-Admiral Ozawa's command. These aircraft sustained heavy losses, and in consequence when it became necessary to counter the Americans under the overall *SHO* plan, Ozawa had only a handful of aircraft for his carriers.

The Japanese received some advance warning of the American invasion of the island of Leyte in the Philippines, and they activated *Operation SHO-1* on October 17, 1944 the day the US Army established its first beach-head.

The role of the carriers under the command of Vice-Admiral Ozawa was merely that of a decoy force. Their assigned task was to lure the main body of the US Fleet guarding the Leyte invasion armada away, so that they could be attacked by IJN surface vessels coming from bases on Borneo.

Under his command Ozawa had four carriers - the Fleet carrier *Zuikaku* with 60 aircraft, including eight *Suisei* carrier bombers; and three Light carriers *Chiyoda*, *Chitose* and *Zuiho*, the total aircraft complement of these three carriers was only 48 aircraft, mostly fighters and fighter-bombers. Because of the drain on combat-hardened crews, those manning the aircraft were, in the main, very

inexperienced and had been afforded little training in carrier operations.

Leaving Japan on October 20, the force headed for the Philippines. At 11:15 on October 24, a scout (reconnaissance) aircraft reported to Admiral Ozawa that there were US ships some 160 nautical miles ahead. The admiral immediately launched a strike, comprising 30 fighters, 19 fighter-bombers, four carrier attack planes and five *Suisei* carrier bombers. This strike wave was intercepted by Hellcats some 30 miles from the US ships. After losing a number to the Hellcats the remainder flew on to Clark Field, in the Philippines, without attacking the US ships. A second strike from the *Zuikaku* did attack the US ships, damaging two carriers. These aircraft also flew on to the Clark Field, with the exception of three aircraft which had become separated from the rest of the formation.

The following morning Ozawa dispatched all the fighter-bombers and bomber aircraft from the carriers to air bases in the Philippines - leaving only 13 fighters to defend his four carriers. Shortly afterwards, the Japanese ships were subjected to massive strikes by US carrier aircraft. When the Fleet carrier *Zuikaku* began to sink at 14:15, Vice-Admiral Ozawa refused to leave the bridge. He was forcibly removed by some of his colleagues to the destroyer *Wakatsuki*.





A 11-Shi Experimental Carrier Bomber prototype. Aichi AM-17.

(Photo: via Major Robert C. Mikesh)

Eventually the remaining three carriers succumbed to the US carrier aircraft strikes. The last carrier to sink was the *Chiyoda* – which the Japanese tried to tow away badly damaged. However, she was sunk by gunfire from US cruisers who had caught up with Ozawa's decoy force.

With the loss of the four carriers at Leyte Gulf marked the end of carrier operations undertaken by the Imperial Japanese Navy in the Pacific War.

#### LAND-BASED OPERATIONS

On December 7, 1941 the IJNAF had 68 D3A1 carrier bombers serving with land-based units. These units formed part of the Second Line Striking Force, and were all based in the Japanese home islands.

Two land-based naval air corps operating D3A1s were formed on February 1, 1942, for co-operation with the Japanese army. The 31st NAC in the Philippines, this unit provided support for army operations against Bataan and Corregidor. The 33rd NAC was formed at Saeki in Japan and arrived at Macassar, s.w. Celebes, on March 2, 1942 for operations in the Netherlands East Indies – assisting in the capture of the island of Java.

**The Struggle for Guadalcanal.** By August 1942, the main centre of operations in the South Pacific for the IJNAF was Rabaul, on New Britain. From this base the IJNAF mounted its counter-offensive against the Americans on Guadalcanal. By direct flight the distance from Rabaul to Guadalcanal was 550 nautical miles. This proved to be beyond the fuel endurance of the D3A1 carrier bomber. But the situation demanded that these aircraft were dispatched on missions to Guadalcanal. In the first weeks of the campaign, 18 D3A1s were splashed down in the sea, due to running out of fuel on the homeward flight. The situation was eased in September with the opening of Buin air base on Bougainville Island in the Solomons.

The Japanese finally withdrew from Guadalcanal in February 1943. They gained little respite from this move, the Americans started to advance up the Solomon island chain, towards the main Japanese base at Rabaul.

**Operation I-Go.** In attempt to blunt the growing Allied air power in the Solomons area the IJNAF

instituted *Operation I-Go*. This provided maximum air attacks all over the area against Allied air bases. Admiral Isoroku Yamamoto, the C-in-C of the Combined Fleet assumed personal command of the operation from Rabaul. In addition to the land-based air flotillas at Rabaul and nearby air bases, the aircraft of the 1st and 2nd Carrier Divisions were brought ashore to assist in the operation.

The *Operation I-Go* was launched on April 7, 1943 and lasted four days. The Japanese employed 350 aircraft, including D3A1 carrier bombers. The returning Japanese aircrew were over-optimistic in their reports of Allied aircraft destroyed. Following these reports Admiral Yamamoto declared the operation closed. The total IJNAF losses were 49 aircraft, and many damaged. In consequence the 1st and 2nd Carrier Divisions had to return to Japan for retraining and new equipment.

The Japanese subsequently departed from the Rabaul on February 20, 1944, after losing many IJNAF aircraft in a vain attempt to retain the base in the preceding months. The aircraft which had been based at Rabaul were flown out to reinforce the important IJN base at Truk atoll, in the Caroline Islands.

**Suisei operational debut.** On February 17-18, 1944 US Task Force 58 carried out a massive air strike against the Japanese naval bastion on the Truk atoll. This raid marked the operational debut of the *Suisei* carrier bomber. A number of these aircraft attacked the US Fleet; including the USS *Lexington* (CV-16), which narrowly escaped damage from a torpedo dropped by a B5N (“*Kate*”). Further carrier raids were mounted against, Luzon, Okinawa and Formosa. From Formosa the IJNAF employed carrier aircraft under training for attacks on the US Fleet. These aircraft suffered heavy losses, so that the remaining carriers of the IJN were almost without such aircraft for the forthcoming battle at Leyte Gulf.

**Admiral Arima's sacrifice.** On October 15, 1944 a large US Fleet was operating off the coast of Luzon in the Philippines. A strike wave was quickly assembled at Nichols Field to attack the US ships. The wave comprised 16 *Zero-Sen* fighters, and 13 *Suisei* carrier bombers. The aircraft came from the 26th Air Flotilla. To the surprise of everyone on the base, the



flotilla commander, Rear-Admiral Masafumi Arima appeared, dressed in flight gear. Although it was a strict rule in the IJNAF that flag officers were not to undertake operational missions, Admiral Arima announced he would lead the sortie. He had removed all rank insignia from his uniform, and had even scratched his name from his binoculars. Brushing aside all protests he took his place in the lead *Suisei* carrier bomber.

The US Fleet sought was Task Group 38.4, from which a formidable Hellcat group came up to intercept the Japanese aircraft. The F6Fs shot down most of the attacking group, but Admiral Arima's *Suisei* hid in the clouds until a favourable moment for an attack occurred. The *Suisei* dived at the carrier USS *Franklin* (CV-13), and was brought down by gunfire some 100 feet from the ship, a wing from the "Judy" landed on the flight deck causing minor damage. Undoubtedly Admiral Arima was making a suicide attack on *Franklin*.

**The Kamikaze Attacks.** To support the *SHO-1* Operation the land based units of the IJNAF based on the Philippines carried out suicide attacks on the US carriers supporting the Leyte invasion. Although the *Zero-Sen* fighter (*Aircraft Profile No. 236*) was the principal aircraft employed, the *Suisei* carrier bomber was also suitable for these operations because of its small size and high speed. These operations became known as *Kamikaze* attacks, which translated mean "Divine Wind".

On the forenoon of October 21, undetected, a pair of D4Ys broke through low cloud over Task Group 38.3. One "Judy" hit the Light carrier *Princeton* (CVL-23) with a 250-kg. bomb. The other D4Y missed but both *Suisei* carrier bombers escaped. The luckless carrier burned for seven hours and then had to be scuttled after a series of crippling internal explosions. The USS *Princeton* went down some 83 miles e.n.e. of Pollilo Island, off Luzon in the Philippines.

On October 26, 1944 a *Kamikaze* force of *Zero-Sens* were to attack a group of US escort carriers off Leyte. They were able to press home their attack with some success, due to the fact that the carrier group were fighting a conventional attack by 12 *Suisei* carrier bombers as they came in. The USS *Suwannee* (CVE-27) was damaged in this attack.

Later in the campaign on November 25, 1944, a

dusk *Kamikaze* attack was launched on US Task Force 38 off Luzon. Eight *Zero-Sens* and two *Suiseis* took part. Three Fleet carriers were hit, *Hancock* (CV-19), *Essex* (CV-9) and *Intrepid* (CV-11). Light carriers *Cabot* (CVL-28) and *Independence* (CVL-22) were severely damaged and set on fire. However no carriers were lost.

**Kamikaze Tactics.** There were two methods of *Kamikaze* attacks employed at this time. The first the High Altitude Approach. The attack aircraft came in to the target area at 6,000 to 7,000 metres, and on sighting the target the plane was dived at an angle of 20°, picking up speed. At 1,000 to 2,000 metres the angle of dive was increased to between 45-55° until impact was made.

The second method was the Low Altitude Approach. To avoid radar detection, the attack aircraft came in at a height of 10-15 metres above the sea. On sighting the target, the pilot would pull up to some 400-500 metres, and then dive steeply onto the selected target ship.

**Ensign Iguchi's lone attack.** On December 13, 1944, the largest *Kamikaze* strike from the Philippines was mounted. Following reports of US shipping in the Surigao Strait, the air base at Mabalacat mounted a *Kamikaze* strike wave. Detailed for this role were 26 aircraft, including three *Suisei* carrier bombers. One *Suisei* was piloted by 2nd Class Petty Officer Takeji Takebe, whose observer was the group leader, Ensign Yonosuke Iguchi. Bad weather prevented the attack from being mounted. Only Ensign Iguchi's aircraft carried on with the attack. His last radio message was at 12:37 when reported he was diving on the enemy. There were no reports of damage to any US shipping on that date.

**Kamikazes on Formosa.** Following the Japanese withdrawal of IJNAF units in early 1945 from the Philippines, the formation of *Kamikaze* units on Formosa took place. On January 21, 1945 a US Task Force was reported south of Formosa. A strike wave of 17 aircraft was launched, including six *Suisei* carrier bombers, all operating in the *Kamikaze* role. The Japanese were intercepted by the inevitable F6F Hellcats, but a number pressed home their attacks. The carriers *Ticonderoga* (CV-14), *Langley* (CVL-27) and destroyer *Maddox* (DD-731) all sustained damage.

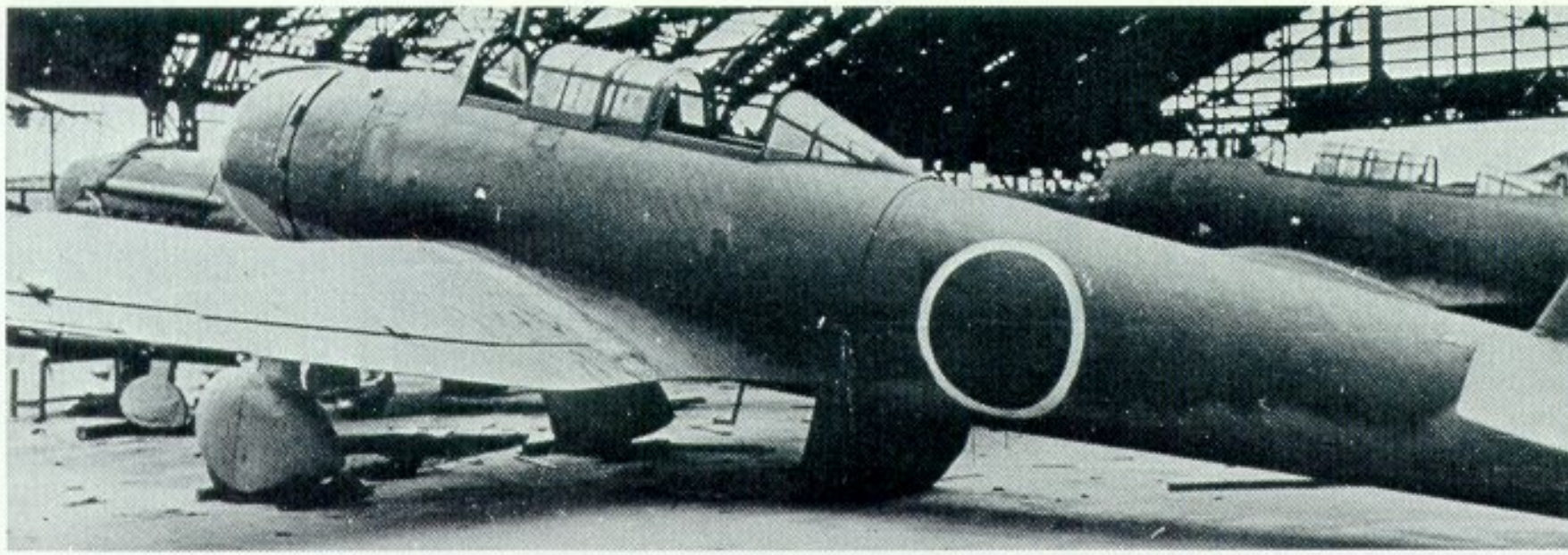
**Kamikazes at Iwo Jima.** On February 19, 1945 the US

A captured D3A2 minus wheel spats and spinner.



(Photo: via Major Robert C. Mikesh)





Two examples of the wooden-construction D3Y1-K prototypes discovered in a hangar at Yokosuka by U.S. Forces at the end of the Pacific War. (Photo: National Archives ref. 80-G-193472)

Marine Corps began the invasion of Iwo Jima. In anticipation of this move the 601st NAC at the Katori air base in Japan formed a *Kamikaze* corps to attack the US Fleet. On February 21, 1945 some 32 aircraft left Katori for Iwo Jima. Included were 12 *Suisei* carrier bombers. Refuelling en route at Hachijo Jima, the group launched its *Kamikaze* strike at dusk. Maximum surprise was achieved. Three aircraft hit the carrier USS *Saratoga* (CV-3) causing severe damage. Two more hit the *Bismarck Sea* (CVE-95) which subsequently blew up, and sank. The *Lunga Point* (CVE-94) escaped serious damage. A G4M ("Betty") hit the flight deck at a shallow angle and skidded overboard, blowing up at the ship's waterline. A separate attack resulted, the net cargo ship *Keokuk* (AKN-4) and Tank landing ships LST-477 and LST-809 being hit.

**Japan raided by US Carrier Aircraft.** In March 1945, as a prelude to the invasion of Okinawa the Americans launched massive carrier aircraft raids against the Japan home islands. On March 18, some 50 *Kamikazes* attacked the US Fleet. Carriers USS *Enterprise* (CV-6) and *Franklin* (CV-13) received light damage. Next day the *Kamikazes* struck again, and included 20 *Suisei* carrier bombers. Carriers *Essex* (CV-9), *Wasp* (CV-18) and *Franklin* again, were hit. The *Franklin* sustained severe damage, two *Kamikazes* went through the flight deck and blew up on the hangar deck, causing more explosions and severe fires, over 700 crew were killed. The *Franklin* withdrew to the USA for extensive dockyard repairs.

**The Okinawa Campaign.** The American landings on Okinawa on April 1, 1945 prompted severe Japanese reaction. This included massive *Kamikaze* raids on the US Fleet supporting the invasion. The officer responsible for the operations was Vice-Admiral Matome Ugaki. The operations were known to the Japanese as *Kikusui* operations. The attacks were mounted from the island of Kyushu, with Admiral Ugaki's headquarters at the Kanoya air base.

From March 11, 1945, to the end of June, almost 1,700 Navy and Army aircraft made *Kamikaze* attacks against the US Fleet positioned around Okinawa. After the eventual capture of Okinawa by the Americans it was obvious to the Japanese that the invasion of the Japanese home islands was the next operation on the Allied schedule. So they husbanded all available aircraft to resist this invasion.

**The Last Kamikaze Sortie.** The two mushroom clouds of atomic bombs over Hiroshima on August 6, and Nagasaki on August 9, rendered the use of the surviving Japanese aircraft unnecessary. On August 15, Emperor Hirohito broadcast to the Japanese

people, confirmation of the acceptance of the Allied surrender demands. At the Oita air base on Kyushu, the broadcast was heard by Admiral Ugaki. He then announced that he would personally lead a *Kamikaze* strike on the US Fleet at Okinawa. Eleven *Suisei* carrier bombers were prepared for the sortie. Admiral Ugaki took his place in flight leader's aircraft, Lieutenant Nakatsuru being the pilot. His observer, not wishing to be left behind, squeezed in beside the admiral. The 11 aircraft took off and headed for Okinawa. At 19:24, the last radio transmission reported that they were diving onto the enemy ships. There were no reports received of any Allied ships being hit by *Kamikaze* attackers on that date.

This then concluded the operations in the Pacific War by the aircraft of the IJNAF. The two carrier bombers described were in the fore-front of all IJNAF operations in the Pacific War, from the resounding successes in the first months to the desperation of the *Kamikaze* suicide operations. The D3A1 was employed in the main as an anti-shipping weapon and had some spectacular successes in this role. By the time the D4Y *Suisei* entered service the IJN were on the defensive. In consequence the aircraft suffered severe losses. A large number was expended in *Kamikaze* strikes; a sure sign of the desperation by the Japanese to avoid the inevitable defeat, which came in August 1945.

**Series Editor: CHARLES W. CAIN**

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Bibliography has come from many sources with the following representing the main selection: (Periodicals) Japan's Aireview and Koku Fan, and Britain's Air Pictorial; (Books) Zero by Okumiya, Horikoshi and Caiden (Cassell); Encyclopedia of Japanese Aircraft, Vol.II; Divine Wind by Inoguchi, Nakajima and Pineau (Hutchinson); Wings of Neptune by D. MacIntyre (Peter Davies) and, in addition to various T.A.I.C. Reports, The End of the Imperial Japanese Navy by Masanori Ito (Weidenfeld and Nicolson).



## D3A PRODUCTION SCHEDULES\*

### Aichi Kokuki K.K., at Funakata Plant, Nagoya

Date	Qty	Remarks
1937-38	2	11-Shi Carrier Bomber prototypes
1939	6	Preproduction D3A1 for IJNAF evaluation
December 1939 to August 1942	470	Production D3A1 Model 1-1
June 1942	1	D3A2 Model 2-2 prototype
August 1942 to June 1944	815	production D3A2 Model 2-2
Total	1,294	

### Showa Hikoki Kogyo K.K., at Tokyo Plant

December 1942 to August 1945	201	D3A2 Model 1-2 Carrier Bomber
Total production	1,495	

\*Excluding the Yokosuka D3Y series, Myojo Carrier Bomber: Two prototype D3Y1-Ks built July-August 1944 at First Naval Air Technical Arsenal, Yokosuka; and three production D3Y1-Ks constructed in summer of 1945 at the Matsushita Koko Kogyo K.K.

## D4Y PRODUCTION SCHEDULES

### First Naval Air Technical Arsenal, Yokosuka

Date	Qty	Remarks
1940-41	5	13-Shi Carrier Bomber

### Aichi Kokuki K.K., at Eitoku Plant, Nagoya

Spring 1942	6	D4Y1 preproduction batch for IJNAF evaluation
October 1942 to April 1944	660	D4Y1 and D4Y1-C production
April 1944 to August 1944	320	D4Y2 and D4Y2-C production
May 1944 to February 1945	536	D4Y3 production
February 1945 to August 1945	296	D4Y4 production
Total	1,818	

### Eleventh Naval Air Arsenal, Hiro

April 1944 to July 1945	215	D4Y1, D4Y2 and D4Y3 production batch.
Total	215	
Grand total	2,038	

## TECHNICAL SPECIFICATIONS:

### AICHI TYPE 99 NAVY CARRIER BOMBER, MODEL 2-2

#### Description

Single-motor carrierborne or land-based dive-bomber.

#### Accommodation

Tandem crew of two; pilot and radio-operator-gunner.

#### Powerplant

One Mitsubishi Kinsei Model 54 air-cooled 14-cylinder two-row radial, with a two-stage supercharger. Ratings: 1,300 h.p. for take-off; 1,200 h.p. at 3,000 m. (9,845 ft.); and 1,100 h.p. at 6,000 m (20,340 ft.)

#### Propeller

Hamilton-Sumitomo (U.S. licence-built Hamilton Standard) constant-speed, controllable-pitch metal type of 3.20 m. (10 ft. 6 in.) diameter.

#### Dimensions

Span, 14,365 m. (47 ft. 2 in.); length 10,195 m. (33 ft. 5 $\frac{3}{8}$  in.); height, 3,847 m. (12 ft. 7 $\frac{1}{2}$  in.); wing area, 34,90 m<sup>2</sup> (375.66 ft.<sup>2</sup>).

#### Weights

Empty, 2,570 kg. (5,666 lb.); loaded, 3,800 kg. (8,378 lb.); maximum all-up 4,122 kg. (9,100 lb.), loadings, wing, 108.9 kg/m<sup>2</sup>. (22.3 lb/ft<sup>2</sup>); power, 2.92 kg/h.p. (6.4 lb/h.p.).

#### Performance

Maximum speed, 232 knots at 6,200 m. (267 m.p.h. at 20,340 ft.); cruising, 160 kt. at 3,000 m. (184 m.p.h. at 9,845 ft.). Climb to 3,000 m. (9,845 ft.) in 5 min. 48 sec., and to 5,000 (16,400 ft.) in 10 min. 20 sec. Service ceiling, 10,880 m. (35,600 ft.). Range, 730 nautical miles (840 miles). Landing speed, 66 knots (76.5 m.p.h.)

#### Fuel capacity

Internal 1,079 litres (235 Imperial gallons) in five unprotected fuel tanks; two in each wing, one under pilot's seat, all containing 92 octane petrol. In starboard wing root, a small fuel tank (100 octane) for take off; 58 litre (25.8 Imp. gal.) One 60 litre (13.2 Imp. gal.) unprotected oil tank behind the engine.

#### Armament

Two fixed 7.7-mm. Type 97 machine-guns in upper fuselage synchronized to fire through the propeller disc, each with 791 rounds per gun. One flexible Type 92 machine-gun in rear cockpit with six drums (97 rounds each) of ammunition.

#### Bomb load

One 250-kg. (551-lb.) bomb under the fuselage held on an arm to swing it clear of the propeller in a dive. Two 60-kg (132-lb.) bombs, one each on a rack under mainplane outboard of the dive-brakes.

#### Radio equipment

One Type 96 Flying Model 2 Transmitter and Receiver.

#### Construction

All-metal airframe, with fabric-covered control surfaces. No armour or fuel tank protection. External dive-brakes fitted under each wing, hydraulically operated in the fully opened position, spring return mechanism. Fixed mainwheel undercarriage and tailwheel. Retractable deck arrester hook just forward of the tailwheel. The outer panel of the wings fold upwards for carrier stowage, 1.82 m. (6 ft.) in length, operated by a hand-crank which folded into the under surface of the wing. Two flotation bags of rubberized fabric fitted in each wing root.

### YOKOSUKA D4Y2 SUISEI CARRIER BOMBER, MODEL 1-2.

#### Description

Single-motor carrierborne or land-based dive-bomber.

#### Accommodation

Tandem crew of two; pilot and radio-operator-gunner.

#### Powerplant

One Aichi Atsuta Model 32 AE1P liquid-cooled 12-cylinder inverted-Vee in line with a two-stage supercharger. Ratings: 1,400 h.p. for take-off; 1,340 h.p. at 1,700 m. (5,600 ft); 1,280 h.p. at 5,000 m. (16,400 ft.)

#### Propeller

Hamilton-Sumitomo (U.S. licence-built Hamilton Standard) constant-speed, controllable-pitch, metal type of 3.20 m. (10 ft. 6 in.) diameter.

#### Dimensions

Span, 11,50 m. (37 ft. 8 $\frac{3}{4}$  in.); length, 10,22 m. (33 ft. 6 $\frac{3}{8}$  in.); height, 3,75 m. (12 ft. 3 $\frac{1}{4}$  in.); wing area, 23,6 m<sup>2</sup>. (254.027 ft.<sup>2</sup>).

#### Weights

Empty, 2,550 kg. (5,700 lb.); loaded, 3,750 kg. (8,276 lb.); maximum all-up, 4,623 kg. (10,192 lb.), loadings, wing, 158.6 kg/m<sup>2</sup> (32.6 lb/ft<sup>2</sup>); power, 2.4 kg/h.p. (5.3 lb/h.p.).

#### Performance

Maximum speed, 313 knots at 5,250 m. (360 m.p.h. at 17,225 ft.); cruising, 230 kt. at 3,000 m. (265 m.p.h. at 9,850 ft.). Climb to 3,000 m. (9,850 ft.) in 4 min. 36 sec., and to 5,000 m. (16,400 ft.) in 7 min. 40 sec. Service ceiling, 10,720 m. (35,200 ft.). Range, 790 nautical miles (909 miles); maximum 1,945 nautical miles. (2,239 miles) Landing speed, 78.5 knots. (92 m.p.h.)

#### Fuel capacity

Internal 1,070 litres (237 Imp. gal.) in five unprotected fuel tanks; two in each wing and one under the pilot's seat. Externally, two 330-litre (72.6-imp. gal.) drop tanks could be carried; one under each wing. One unprotected oil tank with 73 litres (16.1 Imp. gal.) behind the engine.

#### Armament

Two fixed 7.7-mm. Type 97 machine-guns in the upper motor cowling, synchronized to fire through the propeller disc, each with 791 rounds per gun. A flexible 7.92-mm. Type 1 (or a 13-mm. Type 2 for A variants) machine-gun in rear cockpit.

#### Bomb load

Up to 500 kg. (1,102 lb.) could be carried in an internal bomb bay. Two 30-kg. (66-lb.) bombs additionally on external racks; one under each mainplane. The Type 2 Reconnaissance version had a K-8 camera installed under the gunner's compartment, this could be fitted with either a 25-cm. or 50-cm. lens.

#### Radio equipment

One Type 1 Flying Model 3 Transmitter and Receiver. Also, on some D4Y2s, a Type 1 Flying Model 3 Radio Homing and Direction Finder could be installed.

#### Construction

All-metal airframe, with fabric-covered control surfaces. On the D4Y2, extensive use made of electrically-operated actuating equipment; the inwards-retracting main undercarriage, the flaps and the dive-brakes, were all electrically operated. The dive-brakes were hinged on the rear wing spar, and folded flush. The deck arrester hook retracted just forward of the tailwheel. Mainplane had no wing-folding facility; there was just sufficient span to clear elevators (aircraft lifts) on IJN carriers. No armour or fuel tank protection was installed on this aircraft.



**SPECIFICATION DETAILS OF AICHI D3A1-D3A2 & YOKOSUKA D3Y1-K-D3Y2-K ('VAL')**

Navy short designation		---	D3A1	D3A2	D3Y1-K	D3Y2-K
Navy model number and name		11-Shi Experimental	Model 1-1	Model 2-2	Model 2-2	Model 2-3 Myojo-Kai
Span	metres feet & inches	14,50 47' 7¼"		14,365 47' 2"		14,00 45' 11 <sup>3</sup> / <sub>16</sub> "
Length	metres feet & inches	9,86 32' 4¾"		10,195 33' 5 <sup>3</sup> / <sub>8</sub> "	11,215 36' 9½"	11,515 37' 9 <sup>3</sup> / <sub>8</sub> "
Motor	N-Nakajima M-Mitsubishi	N. Hikari 1* M. Kinsei 3	M. Kinsei Model 43	M. Kinsei Model 54	M. Kinsei Model 54	M. Kinsei Model 62
Horsepower @ rated altitude	metres feet	800@3.500 @11,485	990@2.800 @9,185		1,200@3.000 @9,845	1,340@2.100 @6,890
Weights Empty Loaded	kilogrammes (pounds) kilogrammes (pounds)	2.050 (4,554) 3.400 (7,503)	2.048 (5,309) 3.650 (8,047)	2.570 (5,666) 3.800 (8,378)	3.200 (7,055) 4.200 (9,259)	3.050 (6,724) 4.630 (10,207)
Maximum speed @ rated altitude	knots/metres m.p.h./feet	213/3.000 245/9,845	209/3.000 240/9,845	232/6.200 267/20,340	243/6.200 280/20,340	254/5.000 292/16,405
Service ceiling	metres/feet	6.000/19,685	9.300/30,050	10.500/34,450	---	9.250/30,350
Range	nautical miles/miles	-/---	795/915	730/840	961/1,100	949/1,090
Armament	machine-guns cannon	(F)-2 x 7,7 mm (R) 1 x 7,7 mm ---	(F) 2 x 7,7 mm (R) 1 x 7,7 mm ---	(F) 2 x 7,7 mm (R) 1 x 7,7 mm ---	--- --- (F) 2 x 20 mm	--- --- (F) 2 x 20 mm
Bomb load	Fuselage Wings	1 x 250 kg x 551 lb 2 x 60 kg x 132 lb	1 x 250 kg x 551 lb 2 x 60 kg x 132 lb	1 x 250 kg x 551 lb 2 x 60 kg x 132 lb.	1 x 500/800 kg x 1,102/ 1,764 lb Nil	1 x 500/800 kg x 1,102/ 1,764 lb. Nil
Crew		Two	Two	Two	Two	One

\*First prototype only (F) Fuselage forward (R) Rear flexible

**SPECIFICATION DETAILS OF YOKOSUKA D4Y1 to D4Y4 SUISEI ('JUDY')**

Navy short designation		D4Y1-C	D4Y1	D4Y2	D4Y3	D4Y4
Navy model number and name		Type 2 Carrier Reconnaissance - Model 1-1	Suisei Model 1-1	Suisei Model 1-2	Suisei Model 3-3	Suisei Model 4-3
Span	metres/ feet & inches	---	---	11,50 37' 8¾"	---	---
Length	metres/ feet & inches	---	---	10,22 33' 6 <sup>3</sup> / <sub>8</sub> "	---	---
Motor	A-Aichi M-Mitsubishi	A. Atsuta Model 12	A. Atsuta Model 12	A. Atsuta Model 32	M. Kinsei Model 62	M. Kinsei Model 62
Horsepower @ rated altitude	metres feet	1,010@1.500 @4,920	1,010@1.500 @4,920	1,340@1.700 @5,580	1,340@2.100 @6,890	1,340@2.100 @6,890
Weights Empty Loaded	kilogrammes (pounds) kilogrammes (pounds)	2.440 (5,379) 3.650 (8,047)	2.440 (5,379) 3.650 (8,047)	2.635 (5,809) 3.835 (8,455)	2.501 (5,514) 3.754 (8,276)	2.635 (5,809) 4.542 (10,013)
Maximum speed @ rated altitude	knots/metres m.p.h./feet	288/3.000 332/9,845	298/4.750 343/15,585	313/5.250 360/17,225	310/6.050 357/19,850	304/5.900 350/19,355
Service ceiling	metres/feet	9.000/29,500	9.900/32,480	10.700/35,105	10.500/34,450	8.450/27,725
Range	nautical miles/miles	820/944	850/978	820/944	820/944	890/1,024
Armament	machine-guns	(F) 2 x 7,7-mm. (R) 1 x 7,92-mm.	(F) 2 x 7,7-mm. (R) 1 x 7,92-mm.	(F) 2 x 7,7-mm. (R) 1 x 7,92-mm. or 1 x 13-mm.	(F) 2 x 7,7-mm. (R) 1 x 7,92-mm. or 1 x 13-mm.	(F) 2 x 7,7-mm. (R) ---
Bomb load	Fuselage Wings	Nil Nil	1 x 250/500-kg. x 551/1,102-lb. 2 x 30-kg. x 66-lb.	1 x 250/500-kg. x 551/1,102-lb. 2 x 30-kg. x 66-lb.	1 x 250/500-kg. x 551/1,102-lb. 2 x 30-kg. x 66-lb.	1 x 800-kg. x 1,764-lb. Nil
Crew		Two	Two	Two	Two	One

(F) Fuselage forward (R) Rear flexible