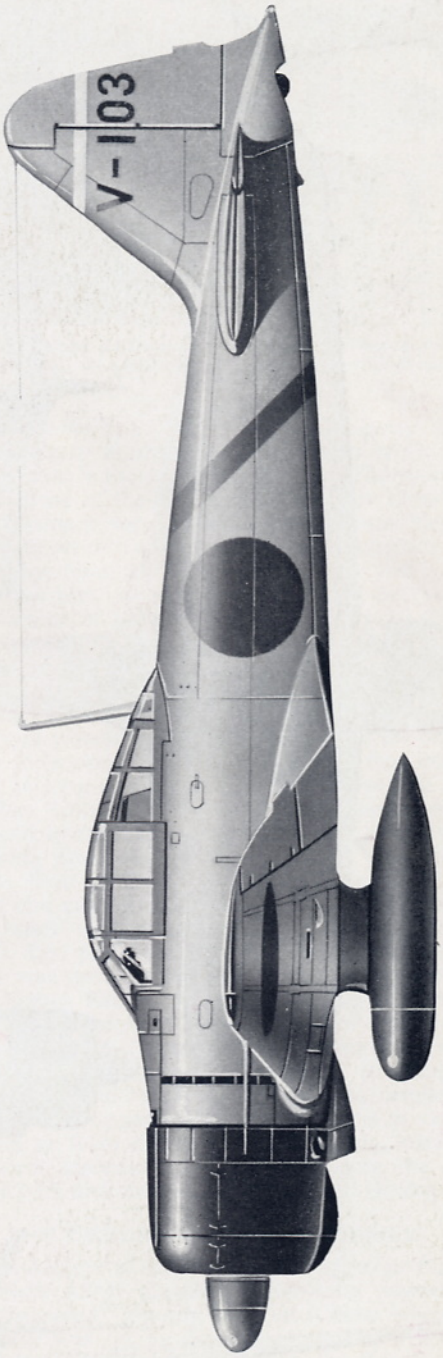
PROFILE PUBLICATIONS

The Mitsubishi A6M2 Zero-Sen



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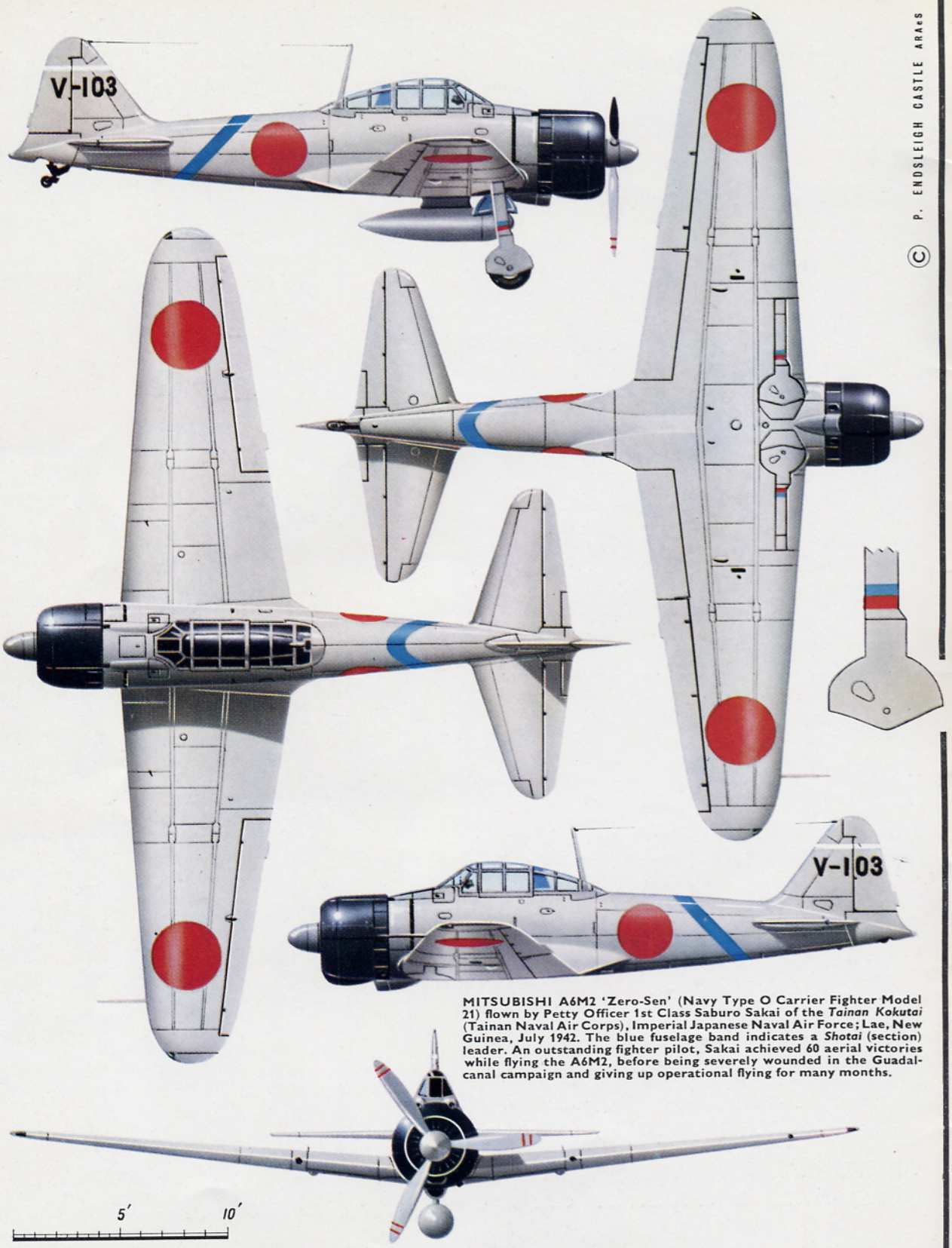
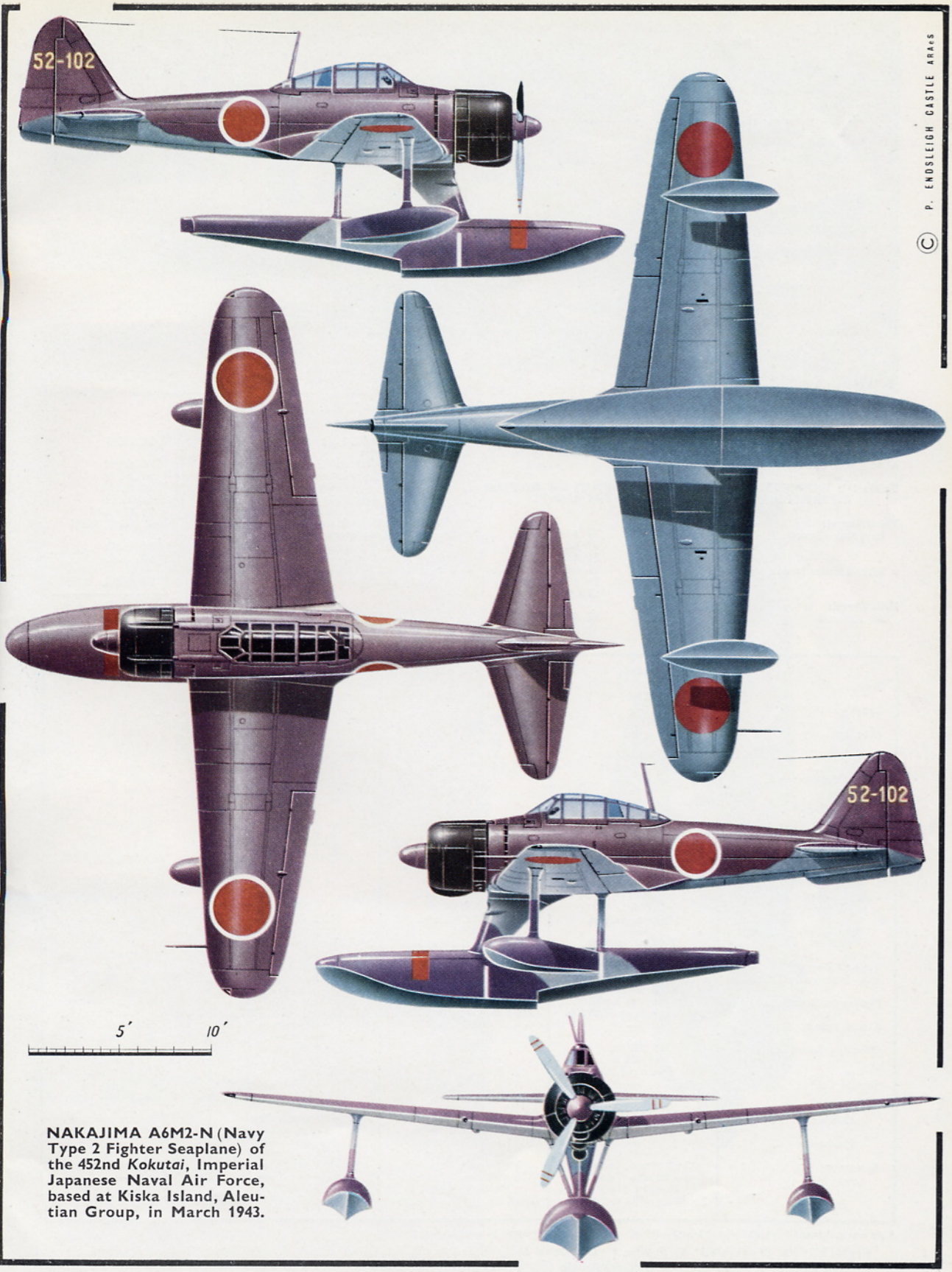


MITSUBISHI A6M2 'Zero-Sen' (Navy Type O Carrier Fighter Model 21) flown by Petty Officer 1st Class Saburo Sakai of the *Tainan Kokutai* (Tainan Naval Air Corps), Imperial Japanese Naval Air Force; Lae, New Guinea, July 1942. The blue fuselage band indicates a *Shotai* (section) leader. An outstanding fighter pilot, Sakai achieved 60 aerial victories while flying the A6M2, before being severely wounded in the Guadalcanal campaign and giving up operational flying for many months.



NAKAJIMA A6M2-N (Navy Type 2 Fighter Seaplane) of the 452nd *Kokutai*, Imperial Japanese Naval Air Force, based at Kiska Island, Aleutian Group, in March 1943.

The Mitsubishi A6M2 Zero-Sen

by Rene J. Francillon, Ph.D.

A Navy Type O Carrier Fighter Model 11, aircraft number 3-182, of the 12th Rengo Kokutai. *This unit was the first to evaluate the Zero in combat, operating from Hankow, China.* (Unless otherwise indicated, all photographs appearing in this *Profile* are supplied from the author's collection).

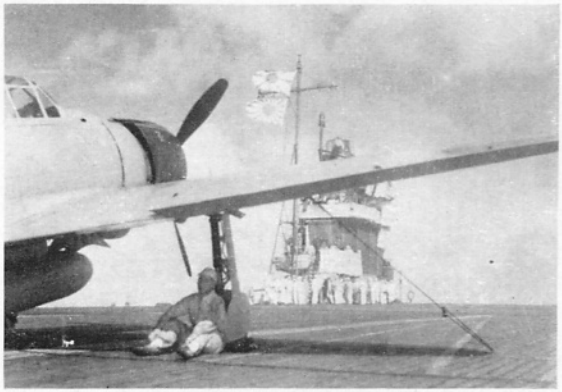
When Japan entered the war with the surprise attack on Pearl Harbour by carrier borne aircraft, the quality of its air forces was considerably underrated by the Western Powers. The belief that the Allies would meet no serious opposition from Japan in the air was the result of a propaganda campaign which had been conducted in the Land of the Rising Sun for many years before the Second World War. Probably no other nation was as security minded as Japan, where the slogan, "Every foreigner is a spy", had resulted in an almost complete lack of up-to-date information coming from that country. Even two years after Japan had entered the war, its most famous aircraft, the Navy Type O Carrier Fighter (Mitsubishi A6M), better known by its code name "Zeke" and still better known as the *Zero*, retained much of the mystery which had surrounded it; and an American aeronautical publication had this to say in 1943: "The quick-zooming, vulnerable Jap *Zero* is a triumph for the world's greatest adapters . . . One type of Mitsubishi "Kinsei" engine, essentially a copy of the U.S. Pratt & Whitney "Wasp" with features of the Wright "Cyclone" and British Bristol "Hercules", is used in many of the *Zeros*. (*Actually this type of engine, long favoured by Jiro Horikoshi, was only used on the two prototypes of the last version of the Zero, the A6M8, produced in November 1944, almost 18 months after the quoted article had been written.—Author*) . . . Workmanship is spotty; some parts are finely finished, others are very crude. The weakest point is the cooling system . . . The propeller is a duplicate of the U.S.-made Hamilton Standard. The air-frame is very similar to the German Heinkel He 113. Most of the other features are standard with many other types of fighter craft now in use".

A captured A6M2 in China; in the background, a Curtiss P-40M of the Air Volunteer Group with the "Flying Tiger" emblem behind the cockpit.

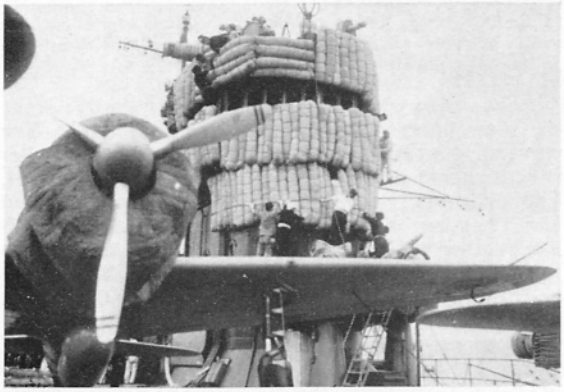
One can only wonder how could we believe the performances of such a hybrid and justify the defeats inflicted on us by this aircraft and its pilots ? First reported in 1940, although without attention being given to this information, by Claire E. Chennault of Flying Tigers fame, the *Zero* came as a rude surprise to the hard pressed Allies trying to contain the onrush of the Nipponese forces throughout the Pacific. Feared as long as Japan had the initiative, the *Zero* was often ridiculed when the Allies gained a qualitative and quantitative advantage over the forces of the Rising Sun. Seemingly invincible, the aircraft won its fame during the first six months of the conflict and ever since has been at the same time the best known and most villified Japanese aircraft. To this day, there are people willing to assert the aircraft was nothing but a second rate copy of the 1935 Hughes Racer, an aircraft having nothing in common with the A6M series but its low-wing design and radial engine. This, and similar assertions, make no sense to the historians who learnt to recognize that the so-called "state of the art" has resulted in similar aircraft appearing at the same time in various countries or from different manufacturers, examples in modern aeronautical history including the F-86 and MiG-15, and the Douglas DC-8 and Boeing 707.

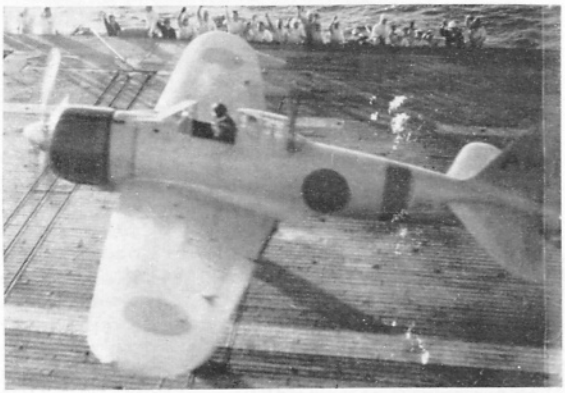
THE ORIGINS OF THE A6M SERIES

The introduction of the Navy Type 96 Carrier Fighter (Mitsubishi A5M, Claude), a low-wing monoplane with "trousered" landing gear, at a time when the U.S. Navy was taking delivery of its first F3F-1, a biplane with retractable gear, and the Royal Navy Fleet Air Arm was still flying the Hawker Nimrod, a 181 m.p.h. biplane fighter with fixed undercarriage, had given a definite advantage to the Imperial Japanese Navy. Intent on preserving their advantage, the Japanese naval staff submitted on 19th May, 1937



Two interesting views of A6M2's on the carrier Akagi *during the "Hawaiian Operation" of December 1941. Note the padded bridge-island of the carrier, and the details of propeller markings and undercarriage structure visible on the aircraft.*
(Photos: via R. Ward)





A Zero taking off from the Akagi *for the attack on Pearl Harbour; the carrier was Vice-Admiral Nagumo's flagship. Note the pilot has raised his seat for better visibility during take-off.* (Photo: via R. Ward)

to Mitsubishi Jukogyo K.K. (Mitsubishi Heavy Industries Co., Ltd.) and Nakajima Hikoki K.K. (Nakajima Aircraft Co., Ltd.) their preliminary specification for a 12-Shi Carrier Fighter (12-Shi indicated that the specification had been issued in 1937, the 12th year of Showa, as the reign of His Imperial Highness Hiro Hito is known). On 7th July, 1937 hostility flared up anew between Japan and China giving a new urgency to the programme and Mitsubishi decided to suspend work on their projected 11-Shi Carrier Dive Bomber, then almost completed, to concentrate on the more urgent fighter design.

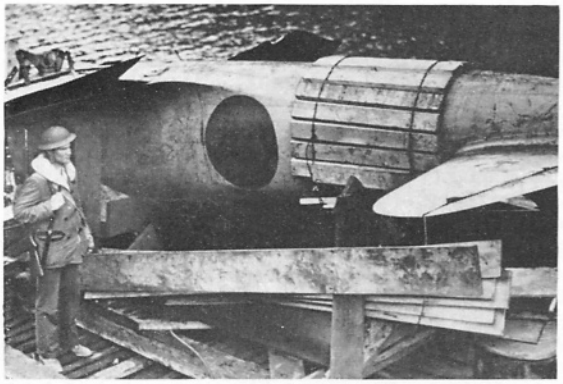
This wrecked A6M2, coded AI-154, was flown at Pearl Harbour by Petty Officer Hirano. It was the first Zero shot down by United States forces in World War 2.
(Photo: U.S. Navy Official)

To work on this project Mitsubishi assigned a team led by Mr. Jiro Horikoshi, (*whose help in the preparation of this Profile is gratefully acknowledged*), and including Messrs. Yoshitoshi Sone and Yoshio Yoshikawa (structure), Shotaro Tanaka and Denichiro Inouye (powerplant), Teruo Tojo (stress analysis), Sadahiko Kato, Takeyoshi Moro and Yoshimi Hatakenaka (landing gear, armament and accessories).

In October 1937, the Imperial Japanese Navy, in the light of combat reports from China, stiffened up its specification and requirements included: (*a*) maximum speed 270 knots (311 m.p.h.) at 4,000 m. (13,125 ft.); (*b*) climbing speed: 3,000 m. (9,840 ft.) in 3 min. 30 sec.; (*c*) endurance: 1·2 to 1·5 hours at normal rated power and 6 to 8 hours at economical cruising speed with drop tanks; (*d*) armament: two 20 mm. cannons and two 7·7 mm. machine guns with provision for two 60 kgs. (132 lb.) bombs; and (*e*) complete radio equipment including direction finder equipment. Performances as well as equipment requirements far exceeded anything previously achieved in Japan and the Nakajima and Mitsubishi design teams faced a most difficult task. Following a technical review held at the Naval Aircraft Establishment at Yokosuka on 17th January, 1938, Nakajima decided to pull out of the competition leaving Jiro Horikoshi and his Mitsubishi team to tackle a seemingly impossible specification.

To meet the exacting performance requirements a powerful engine with minimum weight and diameter had to be selected, and as at the time no suitable liquid cooled inline engine was available in Japan, three 14-cylinder air-cooled radials were evaluated: the 875 h.p. Mitsubishi "Zuisei 13", the 950 h.p. Nakajima "Sakae 12", and the 1,070 h.p. Mitsubishi "Kinsei 46". At first, the "Sakae" did not find much favour with the Mitsubishi team as it was designed by a competitor and Jiro Horikoshi favoured the larger and heavier, but more powerful, "Kinsei". However, due to the Navy's insistence on a power loading not exceeding 5·5 lb./h.p., the "Zuisei 13" was finally retained; but all through the A6M production life Jiro Horikoshi kept insisting on adopting the "Kinsei" his tenacity being vindicated, albeit too late, when 6,300 "Kinsei 62" powered A6M8's were ordered. A constant speed three-blade Sumitomo-Hamilton propeller was also recommended and replaced the two-blade variable pitch propeller favoured by the Imperial Japanese Navy early during flight tests.

A well-known aircraft, as the Allies first saw it; Petty Officer Koga's machine lying in the bleak marshes of Akutan Island, where the luckless pilot attempted to land after the inconclusive Dutch Harbour strike of 3rd June, 1942. Tadayoshi Koga was still hanging dead in his straps five weeks later, when a U.S. Navy scouting party found the Zero and took this photograph.



Koga's Reisen *under guard at Dutch Harbour, awaiting transportation. Virtually intact, it was an invaluable prize for Allied technical intelligence.*

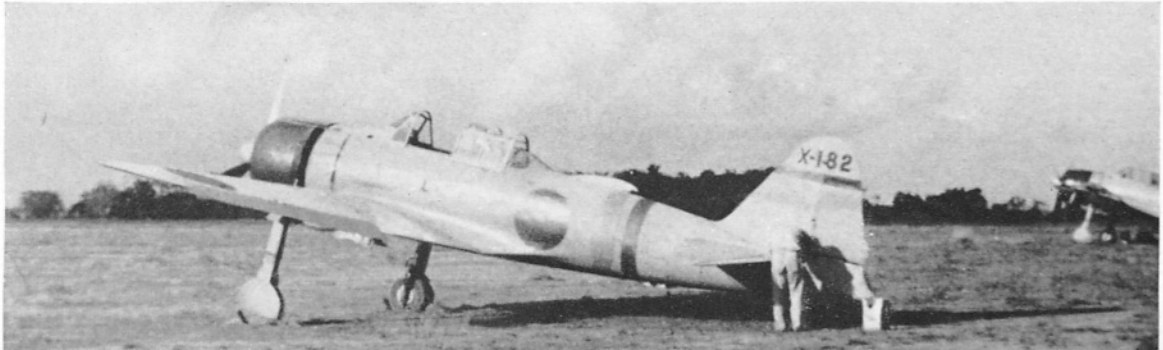
A Model 21 serving with an unidentified advanced training unit.

Careful attention was paid to weight savings and a new special aluminium alloy (E.S.D.), developed by Sumitomo, was adopted. At this point, it should be noted that the absence of pilot's protection and self-sealing tanks, which, particularly towards the end of the war, was to prove the major undoing of the aircraft, was not an oversight or a complete lack of concern for pilot's safety. With only 1,000 h.p. available, this protection could not be incorporated in the design if the armament and performance requirements were to be met. Early in the war, long range operations by fighter aircraft could only be achieved by either sacrificing this much needed item or by using twin-engined aircraft. This latter approach to the range requirement was proved costly when the *Luftwaffe's* Bf 110 had to be escorted by single-engined Bf 109's during the Battle of Britain; whilst the Japanese approach was vindicated by the success achieved by Formosa-based A6M2's operating against the American forces in the Philippines.

PROTOTYPE AIRCRAFT AND SERVICE TESTING

Despite controversies in the Japanese Navy, the cannon armament, monoplane design and enclosed cockpit being unfavourably received by some pilots, the design progressed rapidly and, in April 1938, was approved by the Technical Staff. Eleven months later the first prototype A6M1, officially designated Navy Experimental 12-Shi Carrier Fighter, was completed at Mitsubishi's Nagoya plant and, on 19th March, 1939, it was transferred by ox-drawn cart to the nearest military airfield, the Army's training field at Kagamigahara. At 17:30 hrs. on 1st April, 1939, the A6M1 took off for the first time with the company's test pilot Katsuzo Shima at the controls. Only minor

Known to its crews as the Reisen, *the Navy Type O Carrier Fighter Model 21 was the scourge of the Allies in South East Asia during the great Japanese advances of early 1942. This aircraft, X-182 of the 3rd* Kokutai (*Naval Air Corps*), *was photographed during operations in the Dutch East Indies in that period. Note command bands round fuselage and fin.*



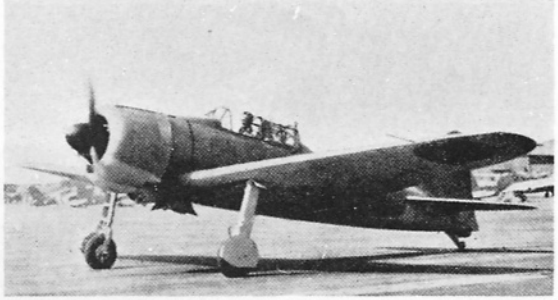
Line-up of A6M2's at Rabaul late in 1942. (Photo: via *Maru*)

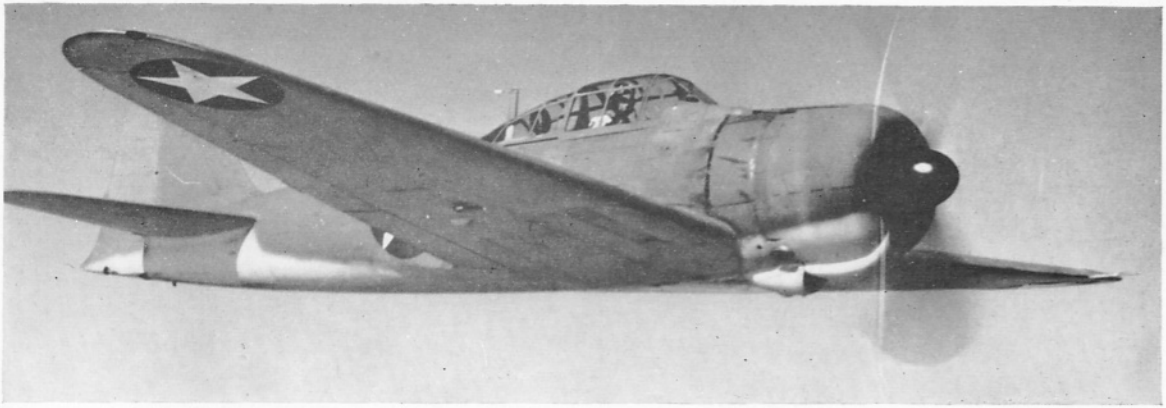
problems were encountered and the most disturbing difficulty, slight vibrations, was eradicated sixteen days later when the two-blade variable pitch propeller was replaced by a three-blade constant speed unit. Maximum speed recorded on 25th April was 265 knots at 3,000 m. (305 m.p.h. at 12,470 ft.), slightly below requirements, and on 1st May Mitsubishi were instructed by the Navy to use the more powerful Nakajima "Sakae 12" on the third prototype (A6M2) and subsequent aircraft to boost the performance. The "Zuisei" powered A6M1 second prototype was flown for the first time on 18th October and soon performed armament trials during which the doubts about the effectiveness of the 20 mm. cannons built by Dai-Nihon Heiki K.K. (Japan Munitions Co., Ltd.) under Oerlikon licence were dispelled. Two months later it was the turn of the third aircraft, the "Sakae" powered prototype of the A6M2 to enter flight trials and all performance and manoeuvrability requirements were exceeded.

During the first months of 1940, flight tests continued intensively to the entire satisfaction of the Imperial Japanese Navy when, on 11th March, 1940, the second A6M1 disintegrated in the air, its pilot losing his life. Despite thorough wind tunnel tests, the cause of the crash could not be ascertained. Nevertheless, production of a pre-production batch continued and the only immediate result of this accident was to delay the combat trials of the aircraft which had been scheduled to start in May 1940 in China. In July the official trials were completed and on the 21st of that month two Hikotais (squadrons), with 15 pre-production A6M2's on hand and led by Lieutenants Saburo Shindo and Tamotsu Yokohama, left Japan for China where they were attached to the 12th Rengo Kokutai (12th Combined Naval Air Corps). The first combat mission on 19th August, 1940, was performed by 12 A6M2's escorting fifty G3M2's on a bombing sortie over Chungking, but no Chinese aircraft were encountered. Following several inconclusive sorties, the Chinese still avoiding combat, the A6M2's drew their first blood on 13th September, 1940 when thirteen aircraft led by Lieutenant Saburo Shindo surprised a force of twenty-seven Chinese Polikarpov I-15's and I-16's. Within minutes all Chinese aircraft had been destroyed without any Japanese losses. Despite increased activities over China and French Indo-China, the A6M2's had not suffered a single loss by the end of the year and claimed to have shot down 59 Chinese aircraft. These successes had attracted the attention of Claire E. Chennault, then a retired U.S. Army Air Corps officer, who was re-organizing the demoralized Chinese Air Force. Chennault tried, to no avail, to warn his former colleagues in the U.S.A. but his reports were promptly and conveniently forgotten.

Back in Japan, on 31st July, 1940, the A6M2 had been officially adopted as a service aircraft under the production designation Navy Type O Carrier Fighter Model II, this designation giving to the aircraft its nickname *Reisen* abbreviation for Rei Sentoki or Zero Fighter. Carrier qualification trials had been successfully conducted aboard the "*Kaga*" and the *Reisen* was quickly delivered to the major front line units in Japan. During early production life several modifications were introduced, the first of these being a reinforcement of the wing spar introduced on the twenty-second A6M2. As the deck elevators of the Imperial Japanese Navy carriers could not accommodate aircraft exceeding 11 m. (36 ft. $1\frac{1}{16}$ in.) in span, the wings of the 65th and subsequent A6M2's were modified, 50 cm. (1 ft. $7\frac{11}{16}$ in.) of each tip folding manually upward, the aircraft being redesignated Navy Type O Carrier Fighter Model 21. The next modification affected the aileron tab balance which was linked to the landing gear retraction mechanism to improve high-speed control by reducing stick forces, this being incorporated on the 192nd A6M2 (Model 21, No. 128).

Left: *Koga's aircraft, rebuilt and repainted, as it appeared at Orlando, Florida. Note the manually-folded wing-tips.* Right: *Lt. M. C. Hoffman, U.S. Navy, runs up Koga's aircraft for a flight test at NAS North Island, San Diego, California.*
(Photo: U.S. National Archives)





Another captured A6M2, finished in U.S. Navy non-specular blue-gray, in flight over San Diego. (Photos: U.S. National Archives)

On 17th April, 1941, following a report in which a pilot from the "*Kaga*" had mentioned an apparent weakness in the outer skin of the wings, Lieutenant Shimokawa of the Yokosuka Naval Air Test Centre investigated this condition. In the course of diving tests, the pilot was unable to pull up and crashed in the sea. The cause of the accident was traced to aileron flutter and the aircraft were suitably modified. Soon thereafter, Nakajima Hikoki K.K. was instructed to place the aircraft in production in its Koizumi plant, several hundred A6M2's Model 21 being manufactured by this Company in addition to the 804 A6M2's (64 Model 11's and 740 Model 21's) delivered by the parent Company. Of these, 328 aircraft were in first line service when the war started (see Table I).

WARTIME CARRIER OPERATIONS

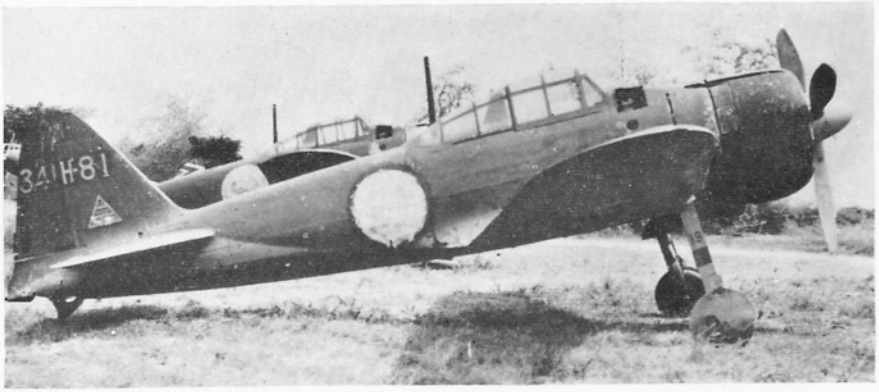
The historical events leading to Japan's decision to enter the war and to the planning of the first operations fall beyond the scope of this *Profile*; however, it should be noted that Adm. Isokoru Yamamoto and his staff had planned the Hawaiian Operation as a surprise attack immediately following the Declaration of War, not as a sneak raid preceding it. Only the inability of the personnel of the Japanese Embassy in Washington, D.C. to decode promptly the message sent by the Japanese Government prevented the Declaration of War preceding the commencement of hostilities.

The Hawaiian Operation, as the attack on Pearl Harbour is known to the Japanese, got underway on 22nd November, 1941 (Japan time) when the aircraft carriers "*Akagi*", "*Kaga*", "*Hiryu*", "*Soryu*", "*Zuikaku*" and "*Shokaku*", the battleships "*Hiei*" and "*Kirishima*", the heavy cruisers "*Tone*" and "*Chikuma*", the light cruiser "*Abukuma*" and nine destroyers of the First Destroyer Squadron assembled in Hitokappu Bay on Etoforu Island under the command of Vice Admiral Chuichi Nagumo. On 26th November (Japan time), the fleet sailed towards its rendezvous with fate, but still ready to turn back if negotiations between Japan and the United States reached a satisfactory issue. Niitaka Yama Nobore—"Climb Mount Niitaka"—the coded combat orders were received on 2nd December and Admiral Nagumo's fleet refuelled at sea. At 06:00 hours on 7th December, the fleet was 200 nautical miles north of Oahu, and the first attack group led by Commander Mitsuo Fuchida left the carriers. The 100 B5N2's, carrying torpedoes and armour piercing bombs, and the 40 D3A1 dive bombers were escorted by 43

A6M2's led by Lieutenant Commander Kakuichi Takahashi. Besides protecting the bombers, the *Zero* fighters were assigned the task of strafing military airfields, anti-aircraft positions and other ground installations. The A6M2 pilots performed their tasks with remarkable success and caused considerable havoc on the ground whilst destroying four U.S. aircraft in the air, the first being a Douglas SBD-2 belonging to VS-6 from the "Enterprise". In the second attack group, totalling 170 aircraft, escort was provided by 36 A6M2's led by Lieutenant Saburo Shindo, who had commanded one of the two A6M2 Hikotais sent to China in July 1940. By the time the second attack group arrived over Oahu, the U.S. forces had had time to reorganize and eight A6M2's were lost (see Table II). In addition 15 D3A1's and 5 B5N2's were lost during the two attacks, but only seven Japanese aircraft were shot down by American fighters, the other twenty-two being destroyed by ground fire.

The next operation by carrier-based A6M2's was during the invasion of Wake Island where an earlier set-back forced the Japanese Command to divert the carriers "*Soryu*" and "*Hiryu*" returning from the Hawaiian Operation (*see Profile No. 53, The Grumman F4F-3 Wildcat.*) Less than two weeks after returning to Japan, Admiral Nagumo's fleet sailed again in support of the assault on New Britain and New Ireland and of other operations in the South Pacific. On 15th February, 1942, this fleet, then including the carriers "*Akagi*", "*Kaga*", "*Soryu*" and "*Hiryu*", attacked Port Darwin, Australia, and the *Zero* fighters destroyed eight Australian aircraft in the air and fifteen on the ground without loss to themselves. Following other operations in the Dutch East Indies, Nagumo's force, minus the "*Kaga*" but reinforced with the "*Shokaku*" and "*Zuikaku*", left for the Indian Ocean on 26th March. During the course of a two-week operation the Japanese carrier-based aircraft sank the cruisers H.M.S. Dorsetshire and H.M.S. Cornwall and the carrier H.M.S. Hermes, and,

(*continued on page 10*)

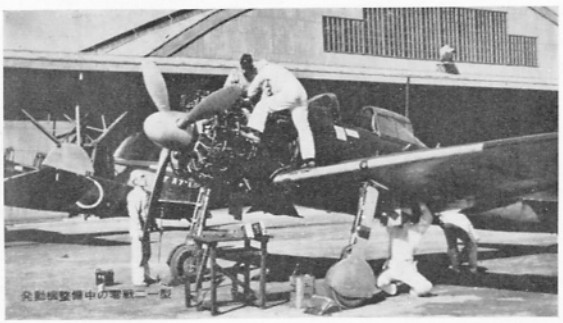


A Reisen *operated as an advanced trainer by the 341st* Kokutai. (Below) *an A6M2, showing temporary mounting of a camera on starboard wing for gunnery training; and* (Bottom) *a maintenance crew working on the Sakae 12 engine of an A6M2 of the* Oita Kokutai.
(Photo: via *Maru*)

on 5th April, 36 A6M2's, whilst escorting 54 D3A1's and 90 B5N2's, shot down 12 Swordfish, 15 Hurricanes and 4 Fulmars for the loss of 18 Japanese aircraft.

So far the *Reisen* had not yet found its master and Japanese confidence ran high. However, the tide in favour of the Allies was beginning to rise and during the Coral Sea battle, on 7th and 8th May, 1942, the Japanese forces including the Fifth Koku Sentai ("*Shokaku*", "*Zuikaku*") and the light carrier "*Shoho*" met the American fleet commanded by Admiral Fletcher with the carriers "Yorktown" and "Lexington". During the two-day battle the A6M2's failed to master the F4F-4's and the Japanese lost the carrier "*Shoho*". Both sides had one combat carrier ("Yorktown" and "Shokaku") seriously damaged but, whilst the U.S. succeeded in repairing the "Yorktown" in time to participate in the battle of Midway, the Japanese had to send the crippled Fifth Koku Sentai back to the Home Islands.

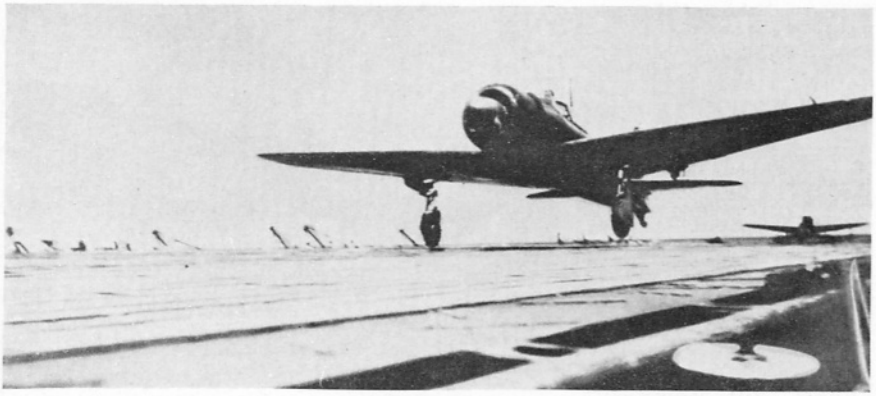
Four weeks later, on 3rd and 4th June, the Imperial Japanese Navy attempted invading Midway and for the first time the *Reisen* suffered a crushing defeat. The battle had started favourably for the A6M2's which had successfully defended their carriers against attacks by U.S. land and carrier based aircraft, had seriously mauled the Midway-based U.S.M.C. fighter aircraft, and had slaughtered the lumbering Douglas TBD-1's of the "Enterprise", "Yorktown" and "Hornet"; but, at 10:24 hours on 4th June, shortly after the TBD-1's gallant attack, they were caught whilst refuelling and rearming by the Douglas SBD-2's and -3's of the American carriers. In the ensuing combat "*Kaga*", "*Akagi*" and "*Soryu*" were sunk. Later in the day, not before her aircraft had fatally crippled the "Yorktown", "*Hiryu*" was set afire. An unfortunate set of circumstances, Admiral Nagumo's hesitancy and the bravery of Admiral Fletcher's pilots combined to defeat the A6M2's and to turn the tide of the war. On the same day, a diversionary attack on Dutch Harbour, Alaska, led by Rear Admiral Kakuda's Second Koku Sentai (aircraft carriers "*Ryujo*" and "*Junyo*") was more successful; but an A6M2 flown by Petty Officer Tadayoshi Koga was damaged and had to attempt an emergency landing on Akutan Island. Sighting a flat and clear area, but failing to recognize it as a marsh, Petty Officer Koga opened his canopy, raised his seat to see over his windshield and lowered his undercarriage. Immediately after the wheels touched the ground, the aircraft flipped over on its back and Koga was killed. Spotted by American forces a few days after, the aircraft was salvaged and transported to NAS



North Island, San Diego, in August 1942. Following repair the aircraft was tested initially at San Diego, starting late in September, by Lieutenant M. C. Hoffman and Lieutenant Commander Sanders from the Flight Test Section of NAS Anacostia. These tests provided the Allies with their first comprehensive information on the *Reisen*.

Following their defeat at Midway, the Japanese reorganized their front line units around the remaining six aircraft carriers (see Table III). On 26th October, 1942, the carrier-based A6M2's fought their last major battle before being superseded by a newer, more powerful version of the *Reisen*, the A6M3. On that day, the Battle of Santa Cruz was fought between Japanese forces centered around the carriers "*Shokaku*", "*Zuikaku*", "*Zuiho*" and "*Junyo*" and a U.S. Navy Task Force comprising the carriers "Hornet" and "Enterprise". All day the battle was fiercely fought and at dusk the U.S. had lost the "Hornet" and the "Enterprise" was no longer able to launch her aircraft, whilst the Imperial Japanese Navy had lost the "*Zuiho*" (sunk) and the "*Shokaku*" (in need of major repairs). Although still possessing two carriers with 40 B5N2's and D3A2's and 44 A6M2's, Admiral Nagumo, who had lost his aggres-

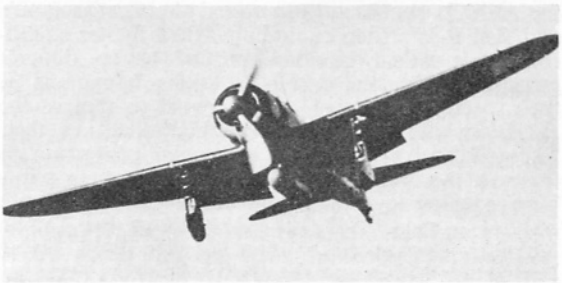
An A6M2, with two 60 kg. bombs just visible under the wings, takes off from an Imperial Japanese Navy carrier. (Below) *a Zero in final approach with flaps and undercarriage down and locked.*



siveness following his defeat at Midway and who had to refuel his carriers, decided to break off. Thus ended the carrier operations of the A6M2's, just at a time when the Imperial Japanese Navy had its last chance to win a major victory over the U.S. Navy.

LAND BASED OPERATIONS

The history of the first year of operations by land-based A6M2's was as rich in success as that of their carrier-based partners, and like them they achieved considerable success during eight consecutive months. In their initial plans for attacking the American forces in the Philippines, the Japanese relied on using a small force of A6M2's based aboard the light carriers "*Ryujo*", "*Zuiho*" and "*Kasuga Maru*". However, only 75 A6M2's could have been deployed, a number thought insufficient to defeat rapidly the American forces, and it was decided to train the pilots to obtain the maximum range from their aircraft and thus be able to operate from bases in southern Formosa. In the process, pilots such as Petty Officer Saburo Sakai succeeded in reducing fuel consumption from 21 to 18 gallons per hour and in increasing endurance to twelve hours at a time when a four-hour flight was exceptional for a Spitfire or a Bf 109. Taking full advantage of the remarkable endurance of their aircraft, the pilots of the Tainan Kokutai and 3rd Kokutai brought havoc to the Philippines; on the first day of the war 54 G4M1's of the First Kokutai and 54 G3M2's of the Takao Kokutai escorted by 34 A6M2's of the Tainan Kokutai and 50 A6M2's of the 3rd Kokutai had destroyed an estimated fifteen U.S. aircraft in the air and fifty aircraft on the ground. The first U.S. aircraft shot down in the Philippines was a Curtiss P-40 which, on 7th December, fell to the guns of a *Reisen* flown by Petty Officer Saburo Sakai who, two days later, shot down the first Boeing B-17. By 13th December, the U.S. air forces had been virtually annihilated and the



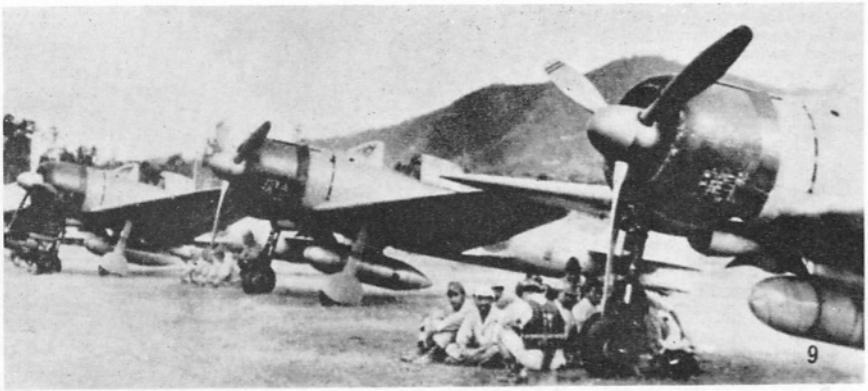
A6M2s reverted to strafing and ground support missions.

Soon thereafter, the Tainan Kokutai turned its attention to the Dutch East Indies, proceeding via Borneo whilst a little later the 3rd Kokutai moved south via Celebes. In a campaign lasting less than three months, the two Japanese units which never mustered more than 200 A6M2's defeated Allied forces with some 550 aircraft including 50 Brewster Buffaloes, 24 Curtiss-Wright CW-21B "Interceptors", 20 Curtiss Hawk 75A-7s and 48 Hawker Hurricanes of the Air Division of the Royal Netherlands Indies Army; some forty U.S.A.A.F. Curtiss P-40's; and 33 Hawker Hurricanes and a few Brewster Buffaloes of the R.A.F. Despite the gallant conduct of Allied pilots, their motley collection of obsolescent fighters were no match for the *Reisens*, whose pilots benefited from the possibility of concentrating their attacks on points of their choice whilst the defenders had to spread their forces over a vast area; and on 8th March, 1942 the Dutch were forced to capitulate.

Following this new victory, the Nipponese forces turned their attention towards New Guinea and the British possessions in the Solomons. Although suffering a setback during the battle of Coral Sea,

An A6M2-N "Rufe" in a South Pacific lagoon; these floatplane fighters were actually used for bomber interception during the closing stages of the war, operating from Lake Biwa against the huge U.S.A.F. daylight raids despite their complete inferiority to contemporary American fighters.

Reisens *of the 3rd Kokutai during the Philippine operations of early 1942.*



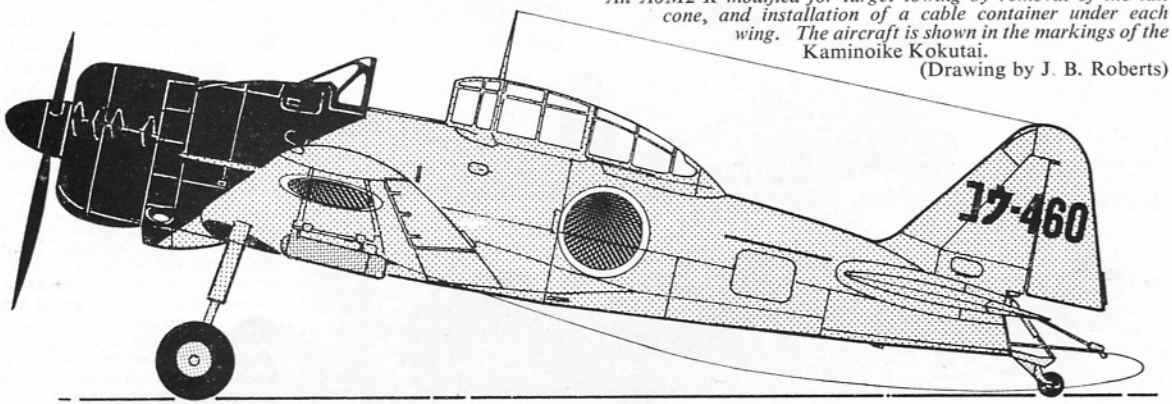
the Japanese enjoyed considerable success in New Guinea against Allied forces based around Port Moresby. The rôle of the *Reisen* in this campaign has been vividly depicted by Petty Officer Sakai in his autobiography '*Samurai*'. During this campaign the A6M2's consistently mastered the Curtiss P-40's and Bell P-39's then equipping Allied fighter squadrons; but Allied bombers proved to be difficult targets, the Martin B-26B-2's taking advantage of their speed at low level, almost equal to that of the *Reisen*, whilst the Boeing B-17E's relied on their heavy defensive armament and good protection to frustrate the Japanese pilots. However, these pilots were learning to deal with their powerful foes and, on 2nd August, 1942, nine A6M2's of the Tainan Kokutai intercepted a force of five B-17 Flying Fortresses. Within minutes, the five bombers were shot down, as well as three P-39's which had attempted to help them, whilst the Japanese lost only one aircraft and its pilot.

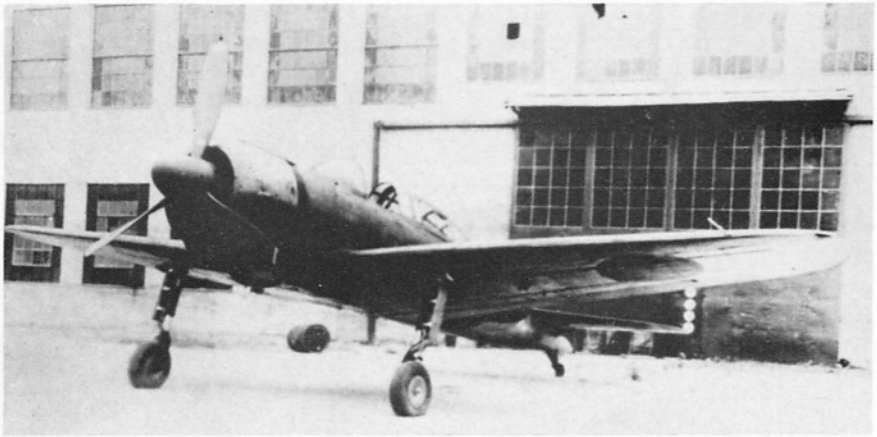
The pilots of the Tainan Kokutai had little time to celebrate their victory as, on 8th August, they were called to repel an American landing force which had attacked Guadalcanal in the Solomons. Flying from Rabaul, 870 miles from Guadalcanal, eighteen A6M2's attempted to disrupt the landing operations. They were met by the F4F-4's of Task Force 63 and during the ensuing ferocious combats the *Reisens* failed to gain the mastery of the air. Petty Officer Saburo Sakai, after shooting down an F4F-4 and an SBD-3, this last being his 60th victory, attempted to attack from below what he thought were eight Wildcats . . . they were TBF-1 Avengers and the Japanese ace was caught in the concentrated fire of eight ·30 in. machine guns manned by the ventral gunners of the American torpedo bombers. His aircraft seriously damaged, his vision impaired by his wounds, Sakai succeeded in flying back to Rabaul. In the following weeks, the Japanese attempted in vain to push back the American forces. Failing to succeed, they were soon battered by the bombers based on the newly built Henderson Field and an ever increasing number of modern U.S. fighter aircraft wrested from the A6M2's the mastery of the air. As the A6M3 version of the *Reisen* became available it quickly replaced the A6M2's in front line units, the older aircraft being still operated in Japan and Formosa as an advanced trainer until the closing stage of the war when many were quickly expended in *kamikaze* operations.

FLOATPLANE FIGHTER

When Japan entered the war, one of the major weaknesses of its Armed Forces was the Corps of Engineers, which was too small and poorly equipped to quickly build airfields in newly conquered territories. To offset this weakness and to take full advantage of the unique geographical characteristics of the area in which they were called to fight, the Imperial Japanese Navy showed considerable interest in the development of a modern floatplane fighter. As the design and production of a completely new type, eventually to appear as the Kawanishi NIK1 "*Kyofu*" (Rex) was going to take a long time, the Japanese Naval Staff instructed Nakajima to develop a floatplane version of the *Reisen*. Under the leadership of Engineers Niitake and Tajima, Nakajima Hikoki K.K. initiated the development of this aircraft in early 1941. The A6M2 Model 11, with its fixed wings, was used as a basis and the following modifications were made: (1) main and tail landing gear removed and wells faired over; (2) mounting of a large ventral float by means of a forward sloping pylon and an aft V-strut; (3) mounting of two stabilising cantilever floats attached to the wing main spar; (4) enlarged rudder and addition of a small ventral fin to offset the increased side area; (5) replacement of the ventral

An A6M2-K modified for target towing by removal of the tail cone, and installation of a cable container under each wing. The aircraft is shown in the markings of the Kaminoike Kokutai.
(Drawing by J. B. Roberts)





An A6M2-K two-seat advanced trainer in factory finish.

drop tank by an auxiliary tank in the ventral float. Work progressed rapidly and, on 8th December, 1941 (Japan time), the first day of the war, the prototype made its first flight. Production started soon thereafter but the type was officially adopted in July, 1942, as the Navy Type 2 Floatplane Fighter Model 11.

The A6M2-N's were rushed to the Solomons where the twelve aircraft of the Yokohama Kokutai, operating from Tulagi, were caught in the raids preceding the American landing on Guadalcanal. Although inflicting serious damage to B-17's of the 11th Group, these A6M2-N's were soon destroyed. The aircraft met with more success in the Aleutians where, on occasions, they were able to shoot down adversaries as redoubtable as the P-38; the A6M2-N, coded Rufe, earned the respect of Allied airmen. As the war went on, the A6M2-N's were met all over the Pacific theatre and, despite their obsolescence, they were still used as interceptors at the end of the war when they operated in defence of Central Honshu from Lake Biwa.

Despite the drag of the float installation and its engine delivering only a maximum of 950 h.p., the A6M2-N was quite fast and its manoeuvrability was still superior to that of most Allied single-seat fighters. A total of 327 A6M2-N's were built by Nakajima in their Koizumi plant between December 1941 and September 1943.

TWO-SEAT TRAINER VERSION

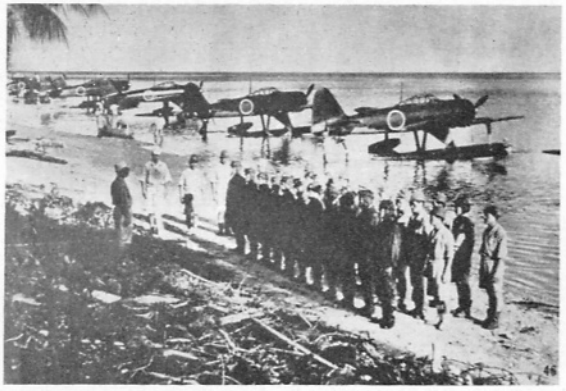
Early in 1942, foreseeing the need to accelerate its pilot training programme, the Imperial Japanese Navy instructed its technical staff at the Dai-Nijuni Kaigun Kokusho (21st Naval Air Arsenal) at Omura, near Sasebo, to develop a high-performance two-seat trainer filling the gap existing between the Navy Type 93 Intermediate Trainer, a two-seat biplane with fixed landing gear and open cockpits, and the single-seat Navy Type O Carrier Fighter. The 21st Naval Air Arsenal had just produced the A5M4-K, a two-seat version of the Navy Type 96 Carrier Fighter, and it was decided to realize a similar conversion of the A6M2 under a 17-Shi specification. Modifications included the fitting of a two-seat cockpit, student pilot forward and instructor behind, the elimination of the fuselage petrol tank and of the two 20 mm. wing cannons to conserve weight, the fitting of small horizontal fins on the side of the fuselage ahead of the stabilizer, and the elimination of the main wheel fairings. The modification was successful and 236 A6M2-K's were built, starting in November 1943, by the 21st Naval Air Arsenal, a further 272 aircraft of this type being built from May 1944 at Hitachi.

The A6M2-K's were extensively operated in Japan and Formosa and besides their primary mission as advanced trainer they were operated on target towing missions and *kamikaze* attacks.

CONCLUSION

Construction details being virtually identical for all versions of the *Reisen*, a technical description of the aircraft as well as a detailed analysis of its flying characteristics will be included in a *Profile* on the Mitsubishi A6M3 to be published next year.

In December 1942, after one year of hostilities, Admiral Yamamoto could see that the fighting will of the Allies had not been weakened and that they were not prepared to negotiate as he had hoped they might. Knowing that his country was facing a long and hard war, he realigned his forces to take full advantage of the new territories occupied by Japan



Rare photograph of the A6M2-N's and crews of the Yokohama Kokutai, *based at Tulagi in the summer of 1942.*
(Photo: via *Maru*)

A6M2-K attached to the Tainan Kokutai *in late 1944. Note the* kana *tail markings adopted when the unit returned to the Home Islands.*

An A6M2 (foreground) and an A6M5 "Zero 52" tested by British forces in South East Asia. Note that the A6M2 has been fitted with long-barrel Type 99 Model 2 20 mm. cannon in the wings. Both machines have been hastily marked with the codes of the Allied Technical Air Intelligence Unit, S-E. Asia.

as a buffer between the Allied forces and the Japanese Homeland. In his plan later versions of the *Reisen* were to play a major rôle, but the early A6M2's were diverted to second line and training operations after having so effectively contributed to the offensive operations during the first twelve months of the Pacific War.

The author and the publishers wish to acknowledge their gratitude to Mr. Jiro Horikoshi of Mitsubishi Jukogyo K.K.; to Mr. Susumu Nishiura of the Japanese Defence Agency; to Miss Elretta Sudsbury, Captain F. Kent Loomis and Lieutenant Orel C. Dugger of the U.S. Navy; to Miss Marguerite K. Kennedy, and Messrs. Frank C. Myers and Royal D. Frey of the U.S. Air Force; Mr. Jos. F. Consiglio of Malta; and to Aireview Magazine of Tokyo, Japan, for assistance in the preparation of this Profile.

Table I: IMPERIAL JAPANESE NAVY ORDER OF BATTLE OPERATIONAL FIRST LINE FIGHTER UNITS
7th December, 1941

First Koku Kantai:	
First Koku Sentai: Akagi (AI-1 . .)	18 A6M2
Kaga (AII-1 . .)	18 A6M2
Second Koku Sentai: Soryu (BI-1 . .)	18 A6M2
Hiryu (BII-1 . .)	18 A6M2
Third Koku Sentai: Hosho (CI-1 . .)	11 A5M4
Zuiho (CII-1 . .)	16 A5M4
Fourth Koku Sentai: Ryujo (DI-1 . .)	22 A5M4
Shoho (DII-1 . .)	None
Kasuga Maru (DIII-1 . .)	None
Fifth Koku Sentai: Zuikaku (EI-1 . .)	18 A6M2
Shokaku (EII-1 . .)	18 A6M2
Eleventh Koku Kantai:	
22nd Koku Sentai: Genzan Kokutai (G-1 . .)	36 A6M2
23rd Koku Sentai: Tainan Kokutai (V-1 . .)	92 A6M2
3rd Kokutai (X-1 . .)	92 A6M2
TOTAL	328 A6M2 and 49 A5M4

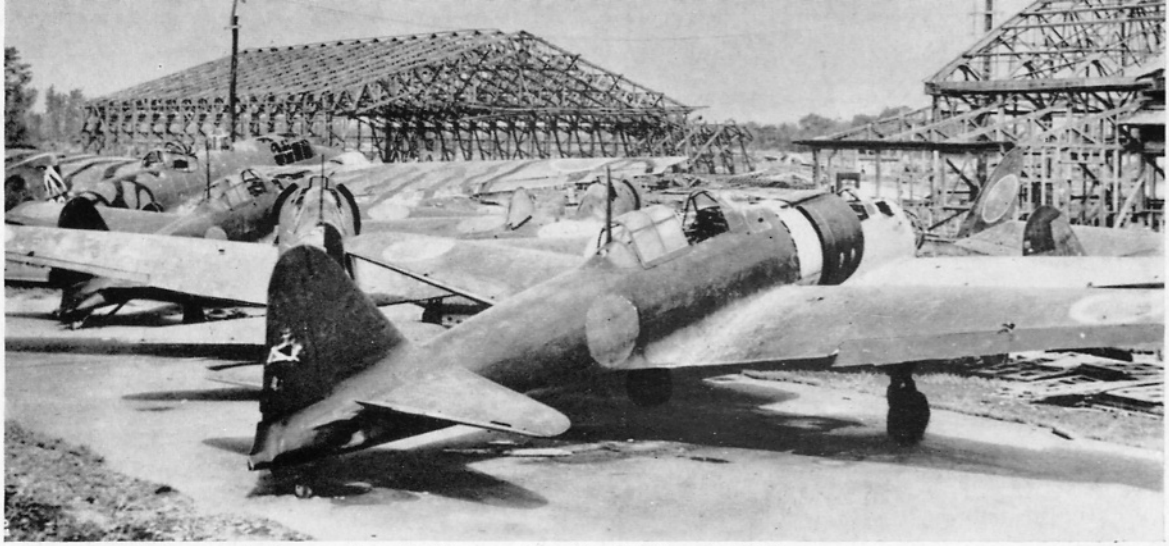
Second Line Fighter Units included the Yokosuka, Oita, Omura, Sasebo and Ominato Kokutais with a total of 144 A5M4's.
English equivalents of unit names
Koku Kantai=Air Fleet; Koku Sentai=Carrier Division, or Kokutai=Naval Air Corps; Air Flotilla;

The A6M2-N. *For reasons of space, it has not been possible to include side-view paintings of the A6M2-N floatplane fighter. In addition to that illustrated in the five-view, the following colour schemes were observed: (1) An aircraft at Attu Island in October 1942 was finished sky-grey all over with black cowling, red stripe on upper half of float in line with airscrew, and black fin code 0-105. Float undersides were blue-grey. (2) An aircraft of the Otsu Kokutai at Lake Biwa in January 1944 had dark green upper surfaces (incl. floats), light grey undersurfaces (incl. floats), two thin red belly stripes near the tail, black cowling, yellow leading-edge strip, broad red stripe with white trim on top of float in line with airscrew, and tail code in white. This consisted of two characters followed by -176. The first character was identical with the first character of the Oitu Kokutai code (see side-views); the second was identical to the only character of the Tsukuba Kokutai (see side-views).*

Table II: JAPANESE FIGHTER LOSSES DURING THE HAWAIIAN OPERATION
7th December, 1941

Pilot	Aircraft Carrier	Time	Remarks
Petty Officer (1stClass) Takeshi Hirano	Akagi	1st wave	Aircraft tail number AI-154.
Petty Officer (2nd Class) Shinnoshin Hirano	Kaga	2nd wave	
Petty Officer (2nd Class) Toru Hata	Kaga	2nd wave	
Petty Officer (1st Class) Tomio Inanaga	Kaga	2nd wave	
Petty Officer (1st Class) Ipei Goshima	Kaga	2nd wave	
Lieutenant Fusata Iida	Soryu	2nd wave	Crashed his aircraft on Kanehoe airfield when unable to return to his carrier following battle damage.
Petty Officer (1st Class) Takeshi Atsumi	Soryu	2nd wave	
Petty Officer(2nd Class) Saburo Ishii	Soryu	2nd wave	
Petty Officer (1st Class) Shigenori Nishikaishi	Hiryu	2nd wave	Crash landed on Niihau Island; pilot killed by natives on 8th December.

SOURCE Mr. Susumu Nishiura, Japanese Defence Agency.



Reisens *await their turn to be burnt at the end of the war, alongside a G3M2 and a D3A2.*

The letters and numbers in parenthesis which follow the unit's name represent the tail markings of the aircraft, i.e. an A6M2 of the carrier "*Akagi*" carried a tail number starting with AI-1 . . such as AI-101, AI-105, etc. See colour illustrations.

Table III: IMPERIAL JAPANESE NAVY ORDER OF BATTLE OPERATIONAL FIRST LINE FIGHTER UNITS
14th July, 1942

Third Kantai:	
First Koku Sentai: Shokaku (EI-1 . .)	27 A6M2
Zuikaku (EII-1 . .)	27 A6M2
Zuiho (EIII-1 . .)	21 A6M2
Second Koku Sentai: Hiyo (DI-1 . .)	21 A6M2
Junyo (DII-1 . .)	21 A6M2
Ryujo (DIII-1 . .)	24 A6M2
Fifth Kantai:	
5th Kokutai	12 A6M2-N
Eighth Kantai:	
2nd Kokutai (Q-1 . .)	16 A6M3
Eleventh Kantai:	
22nd Koku Sentai: Genzan Kokutai (G-1 . .)	36 A6M2
24th Koku Sentai: Chitose Kokutai (S-1 . .)	36 A6M2
1st Kokutai W-1 . .)	36 A6M2
25th Koku Sentai: Tainan Kokutai (V-1 . .)	60 A6M2
Yokohama Kokutai	12 A6M2-N
26th Koku Sentai: 6th Kokutai (U-1 . .)	60 A6M2/A6M3
Southwest Area Kantai:	
21st Koku Sentai: Kanoya Kokutai (K-1 . .)	36 A6M2
23rd Koku Sentai: 3rd Kokutai (X-1 . .)	60 A6M2
Rengo Kantai (Detachment):	
Third Koku Sentai: Kasuga Maru (CII-1 . .)	11 A6M2
TOTAL	492 A6M2 & A6M3 and 24 A6M2-N

SPECIFICATIONS

	A6M1	A6M2 (Model 21)	A6M2-N	A6M2-K
Span	12·0 m. 39 ft. $4\frac{7}{16}$ in.	12.0 m. 39 ft. $4\frac{7}{16}$ in.	12·0 m. 39 ft. $4\frac{7}{16}$ in.	12·0 m. 39 ft. $4\frac{7}{16}$ in.
Length	—	9·06 m. 29 ft. $8\frac{11}{16}$ in.	10·10 m. 33 ft. $1\frac{3}{8}$ in.	9·15 m. 30 ft. $0\frac{1}{4}$ in.
Height	—	3·05 m. 10 ft. $0\frac{1}{16}$ in.	4·30 m. 14 ft. $1\frac{7}{16}$ in.	3·535 m. 11 ft. $7\frac{3}{16}$ in.
Wing Area	22·44 sq. m. 241·541 sq. ft.	22·44 sq. m. 241·541 sq. ft.	22·44 sq. m. 241·541 sq. ft.	22·44 sq. m. 241·541 sq. ft.
Empty Weight	1,652 kg. 3,642 lb.	1,680 kg. 3,704 lb.	1,921 kg. 4,235 lb.	1,819 kg. 4,010 lb.
Loaded Weight	2,343 kg. 5,165 lb.	2,410 kg. 5,313 lb.	2,460 kg. 5,423 lb.	2,334 kg. 5,146 lb.
Maximum Weight	—	2,796 kg. 6,164 lb.	2,880 kg. 6,349 lb.	2,627 kg. 5,792 lb.
Wing Loading*	104·4 kg./sq. m. 21·4 lb./sq. ft.	107·4 kg./sq. m. 22·0 lb./sq. ft.	109·7 kg./sq. m. 22·5 lb./sq. ft.	104·0 kg./sq. m. 21·3 lb./sq. ft.
Power Loading*	3·0 kg./h.p. 6·61 lb./h.p.	2·51 kg./h.p. 5·51 lb./h.p.	2·60 kg./h.p. 5·73 lb./h.p.	2·48 kg./h.p. 5·47 lb./h.p.
Fuel Capacity:				
Internal	518 l. 114 Imp. gallons	518 l. 114 Imp. gallons	518 l. 114 Imp. gallons	380 l. 83·6 Imp. gallons
Drop tank	330 l. 72·6 Imp. gallons	330 l. 72·6 Imp. gallons	325 l. ** 71·5 Imp. gallons	—
Engine	Zuisei 13	Sakae 12	Sakae 12	Sakae 12
Take-off Rating	780 h.p.	940 h.p.	940 h.p.	940 h.p.
War Emergency Rating	875 h.p. at 3,600 m. 975 h.p. at 11,810 ft.	950 h.p. at 4,200 m. 950 h.p. at 13,780 ft.	950 h.p. at 4,200 m. 950 h.p. at 13,780 ft.	950 h.p. at 4,200 m. 950 h.p. at 13,780 ft.
Maximum Speed	275 knots at 3,600 m. 316·5 m.p.h. at 11,810 ft.	288 knots at 4,550 m. 331·5 m.p.h. at 14,930 ft.	235 knots at 5,000 m. 270·5 m.p.h. at 16,405 ft.	476 km/h. at 4,000 m. 296 m.p.h. at 13,125 ft.
Cruise Speed	—	180 knots 207 m.p.h.	160 knots 184 m.p.h.	345 km/h. 214 m.p.h.
Climbing Speed	5,000 m. 16,405 ft.	6,000 m. 19,685 ft.	5,000 m. 16,405 ft.	6,000 m. 19,685 ft.
in	5 min. 15 sec.	7 min. 27 sec.	6 min. 43 sec.	7 min. 56 sec.
Service Ceiling	—	10,000 m. 32,810 ft.	10,000 m. 32,810 ft.	10,180 m. 33,400 ft.
Range:				
Normal	—	1,010 naut. miles 1,160 st. miles	620 naut. miles 714 st. miles	745 naut. miles 860 st. miles
Maximum	—	1,675 naut. miles 1,930 st. miles	962 naut. miles 1,107 st. miles	—
Armament	2×7·7 mm. Type 97 2×20 mm. Type 99 Model 1 Mark 3 2×60 kg. (132 lb.) bombs	2×7·7 mm. Type 97 2×20 mm. Type 99 Model 1 Mark 3 2×60 kg. (132 lb.) bombs	2×7·7 mm. Type 97 2×20 mm. Type 99 Model 1 Mark 3 2×60 kg. (132 lb.) bombs	2×7·7 mm. Type 97 — — 2×60 kg. (132 lb.) bombs

* At normal loaded weight and take-off rating. ** Auxiliary tank in central float.

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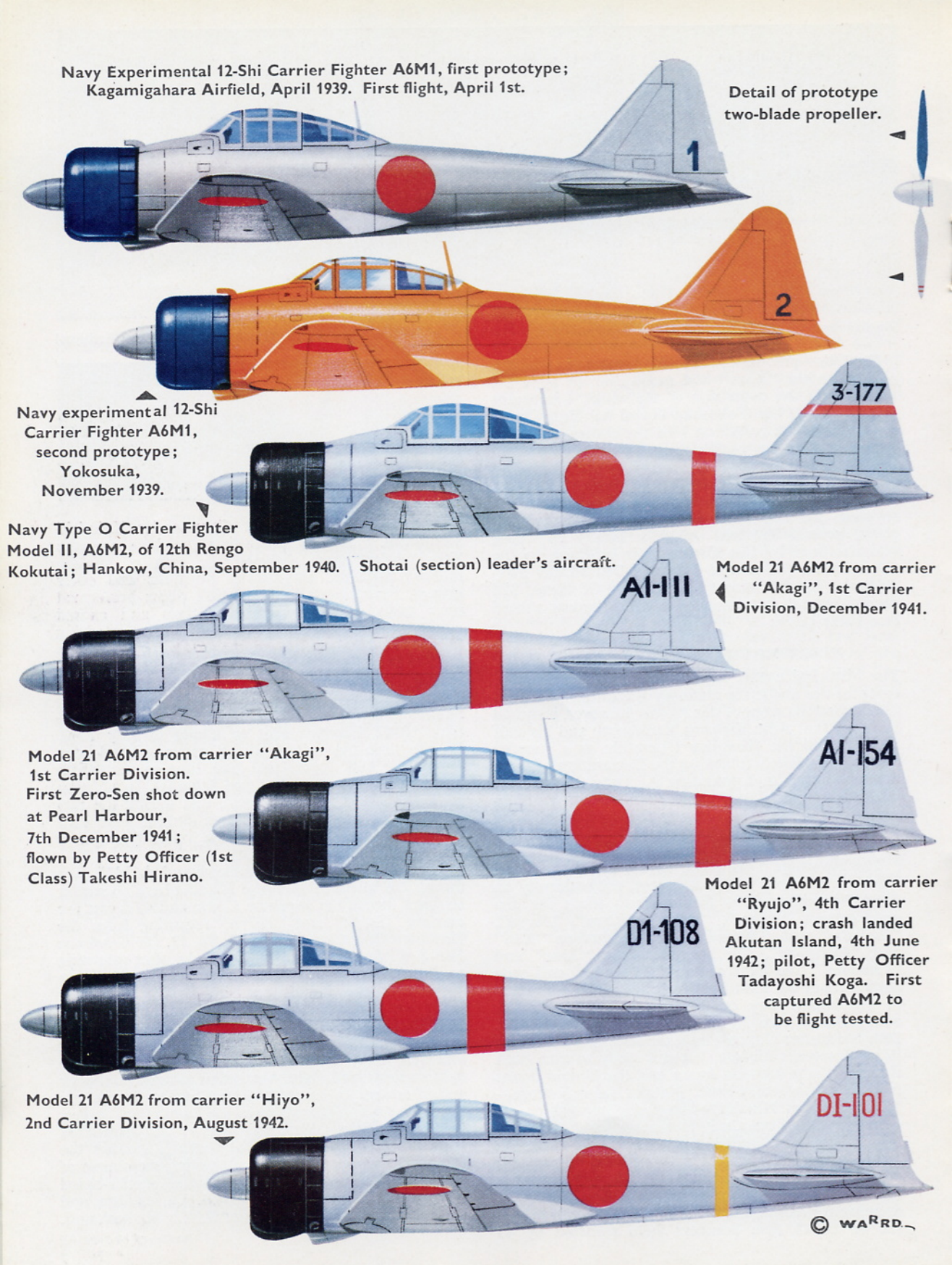
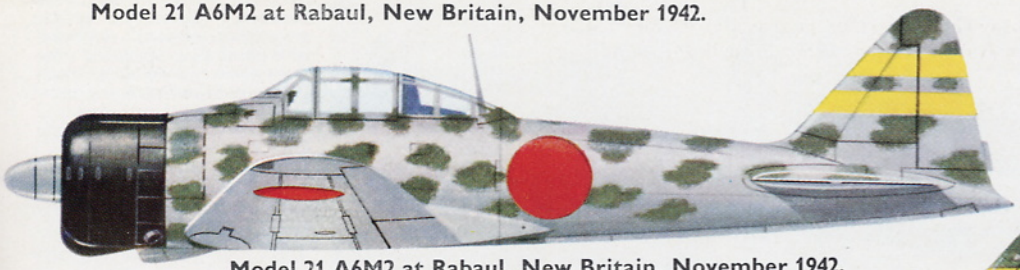
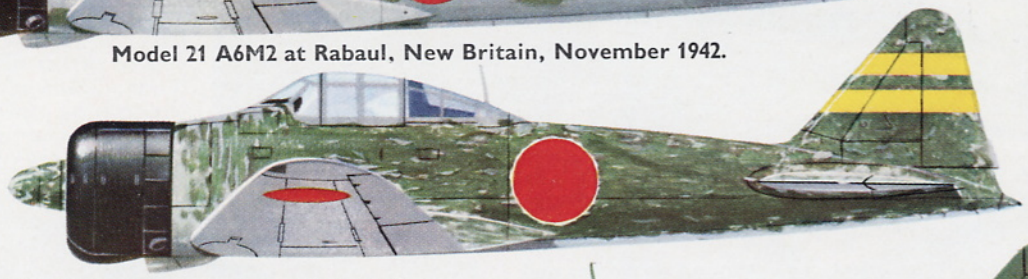

Navy Experimental 12-Shi Carrier Fighter A6M1, first prototype; Kagamigahara Airfield, April 1939. First flight, April 1st.
Detail of prototype two-blade propeller.
1
2
Navy experimental 12-Shi Carrier Fighter A6M1, second prototype; Yokosuka, November 1939.
3-177
Navy Type O Carrier Fighter Model II, A6M2, of 12th Rengo Kokutai; Hankow, China, September 1940.
Shotai (section) leader's aircraft.
Model 21 A6M2 from carrier "Akagi", 1st Carrier Division, December 1941.
AI-111
Model 21 A6M2 from carrier "Akagi", 1st Carrier Division. First Zero-Sen shot down at Pearl Harbour, 7th December 1941; flown by Petty Officer (1st Class) Takeshi Hirano.
AI-154
Model 21 A6M2 from carrier "Ryujo", 4th Carrier Division; crash landed Akutan Island, 4th June 1942; pilot, Petty Officer Tadayoshi Koga. First captured A6M2 to be flight tested.
D1-108
Model 21 A6M2 from carrier "Hiyo", 2nd Carrier Division, August 1942.
DI-101
© WARD

Model 21 A6M2 at Rabaul, New Britain, November 1942.

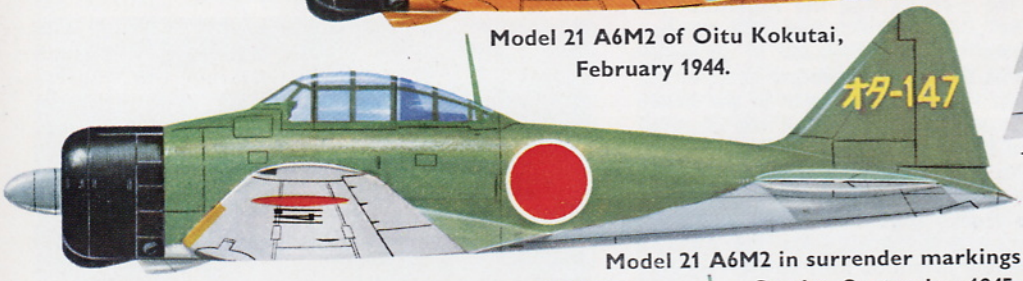


Model 21 A6M2 at Rabaul, New Britain, November 1942.



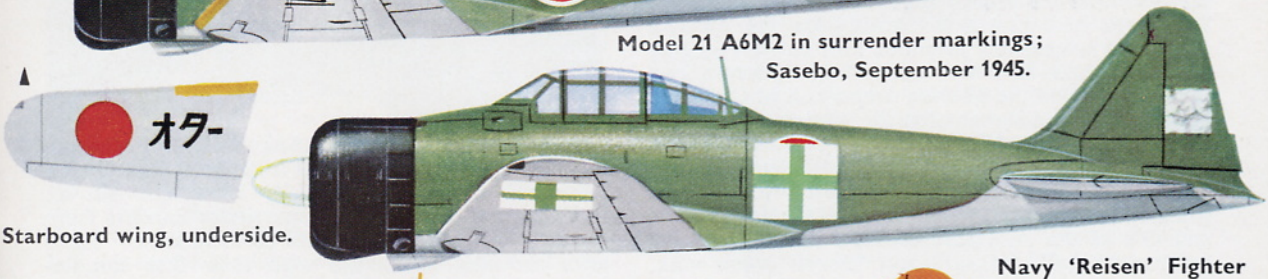
Model 21 A6M2 of Tsukuba Kokutai, October 1943. This Naval Air Corps operated as an Operational Training Unit.

Model 21 A6M2 of Oitu Kokutai, February 1944.



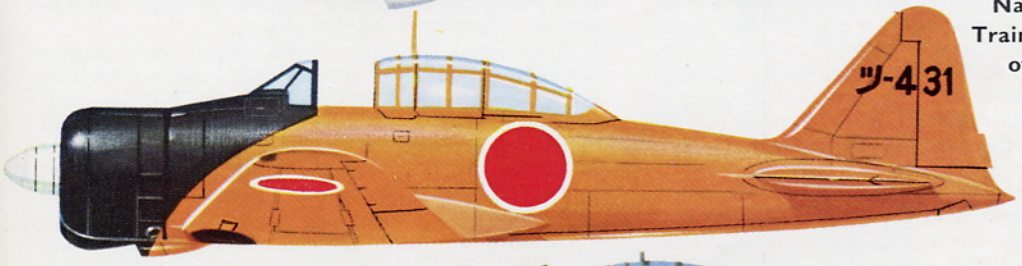
Port wing, underside.

Model 21 A6M2 in surrender markings; Sasebo, September 1945.



Starboard wing, underside.

Navy 'Reisen' Fighter Trainer Model II, A6M2-K, of Tsukuba Kokutai; January 1944.



Model II A6M2-K of Genzan Kokutai, July 1944.