

Mitsubishi ZERO SEN 52" Wing Span Plan.

(Alternative 45" plan included)

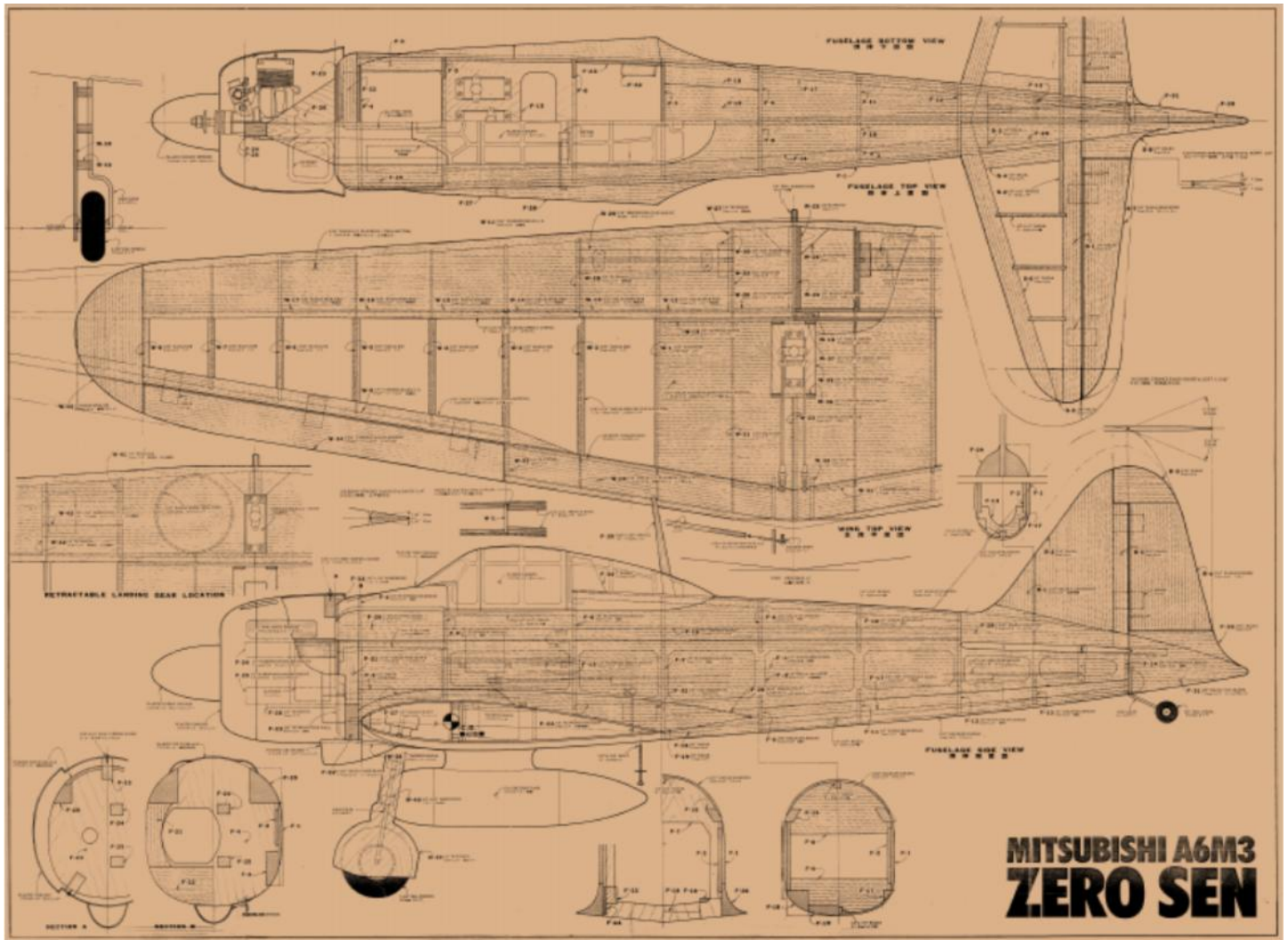


The **Mitsubishi A6M Zero** was a long-range [fighter aircraft](#) operated by the [Imperial Japanese Navy Air Service](#) (IJNAS) from 1940 to 1945. The A6M was designated as the **Mitsubishi Navy Type 0 Carrier Fighter** (零式艦上戦闘機 *rei-shiki-kanjou-sentouki*?), and also designated as the **Mitsubishi A6M Rei-sen** and **Mitsubishi Navy 12-shi Carrier Fighter**. The A6M was usually referred to by the [Allies](#) as the "Zero", from the 'Navy Type 0 Carrier Fighter' designation. The official [Allied reporting name](#) was **Zeke**.

When it was introduced early in [World War II](#), the Zero was considered the most capable carrier-based fighter in the world, combining excellent maneuverability and very long range.^[1] In early combat operations, the Zero gained a legendary reputation as a [dogfighter](#), achieving the outstanding kill ratio of 12 to 1,^[2] but by mid-1942 a combination of new tactics and the introduction of better equipment enabled the Allied pilots to engage the Zero on more equal terms.^[3] The IJNAS also frequently used the type as a land-based fighter. By 1943, inherent design weaknesses and the increasing lack of more powerful [aircraft engines](#) meant that the Zero became less effective against newer enemy fighters that possessed greater firepower, armor, and speed, and approached the Zero's maneuverability. Although the Mitsubishi A6M was outdated by 1944, it was never totally supplanted by the newer Japanese aircraft types. During the final years of the [War in the Pacific](#), the Zero was used in [kamikaze](#) operations.^[4] In the course of the war, more Zeros were built than any other Japanese aircraft.^[5]

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Design and development

The [Mitsubishi A5M](#) fighter was just entering service in early 1937, when the [Imperial Japanese Navy](#) started looking for its eventual replacement. In May they issued specification 12-Shi for a new carrier-based fighter, sending it to [Nakajima](#) and [Mitsubishi](#). Both firms started preliminary design work while they awaited more definitive requirements to be handed over in a few months.

Based on the experiences of the A5M in China, the Navy sent out updated requirements in October calling for a speed of 370 mph and a climb to 3,000 m (9,840 ft) in 3.5 min. With [drop tanks](#), they wanted an endurance of two hours at normal power, or six to eight hours at economical cruising speed. Armament was to consist of two 20 mm [cannons](#), two 7.7 mm (.303 in) [machine guns](#) and two 30 kg (70 lb) or 60 kg (130 lb) [bombs](#). A complete radio set was to be mounted in all aircraft, along with a [radio direction finder](#) for long-range navigation. The maneuverability was to be at least equal to that of the A5M, while the wing span had to be less than 12 m (39 ft) to allow for use on aircraft carriers. All this was to be achieved with available engines, a significant design limitation. (The Zero's power plant seldom reached 1,000 horsepower (750 kW) in any of its variants).

Nakajima's team considered the new requirements unachievable and pulled out of the competition in January. Mitsubishi's chief designer, [Jiro Horikoshi](#), felt that the requirements could be met, but only if the aircraft could

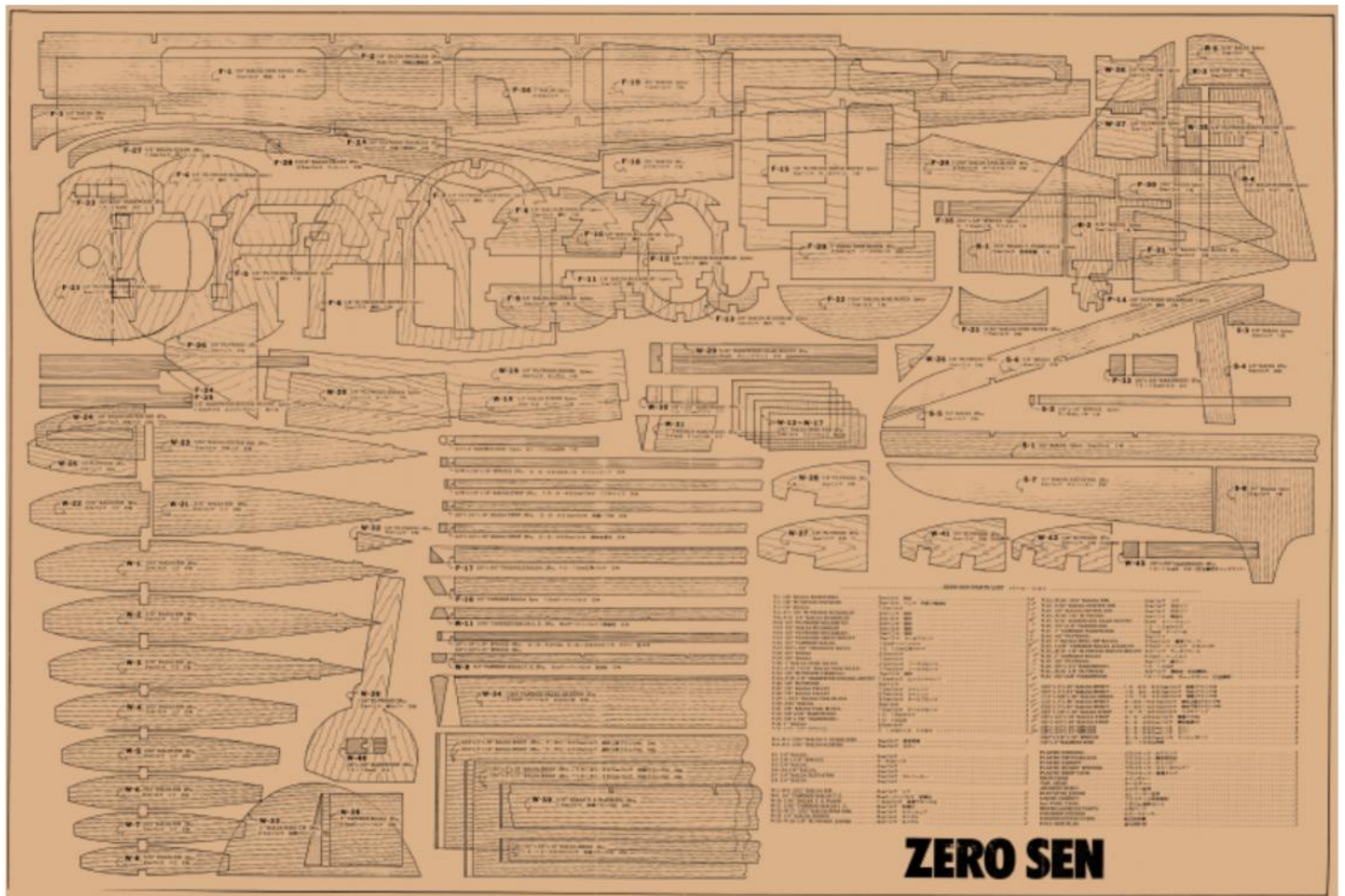
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be made as light as possible. Every possible weight-saving measure was incorporated into the design. Most of the aircraft was built of a new top-secret [7075 aluminium alloy](#) developed by [Sumitomo Metal Industries](#) in

1936. Called Extra Super [Duralumin](#) (ESD), it was lighter and stronger than other alloys (e.g. 24S alloy) used at the time, but was more brittle and prone to corrosion^[6] (it was painted with an anti-corrosion lacquer as a

countermeasure). No [armor](#) was provided for the pilot, engine or other critical points of the aircraft, and [self-sealing fuel tanks](#), which were becoming common at the time, were not used. This made the Zero lighter and more agile than most other aircraft at the start of the war, but also made it prone to catching fire and exploding when struck by enemy rounds.



With its low-wing [cantilever monoplane](#) layout, retractable, wide-set [landing gear](#) and enclosed cockpit, the Zero was one of the most modern aircraft in the world at the time of its introduction. It had a fairly high-lift, low-speed wing with a very low [wing loading](#). This, combined with its light weight, resulted in a very low [stalling speed](#) of well below 60 kn (110 km/h; 69 mph). This was the main reason for its phenomenal maneuverability, allowing it to out-turn any Allied fighter of the time. Early models were fitted with [servo tabs](#) on the [ailerons](#) after pilots complained control forces became too heavy at speeds above 300 km/hr. They were discontinued on later models after it was found that the lightened control forces were causing pilots to overstress the wings during vigorous maneuvers.^[7]

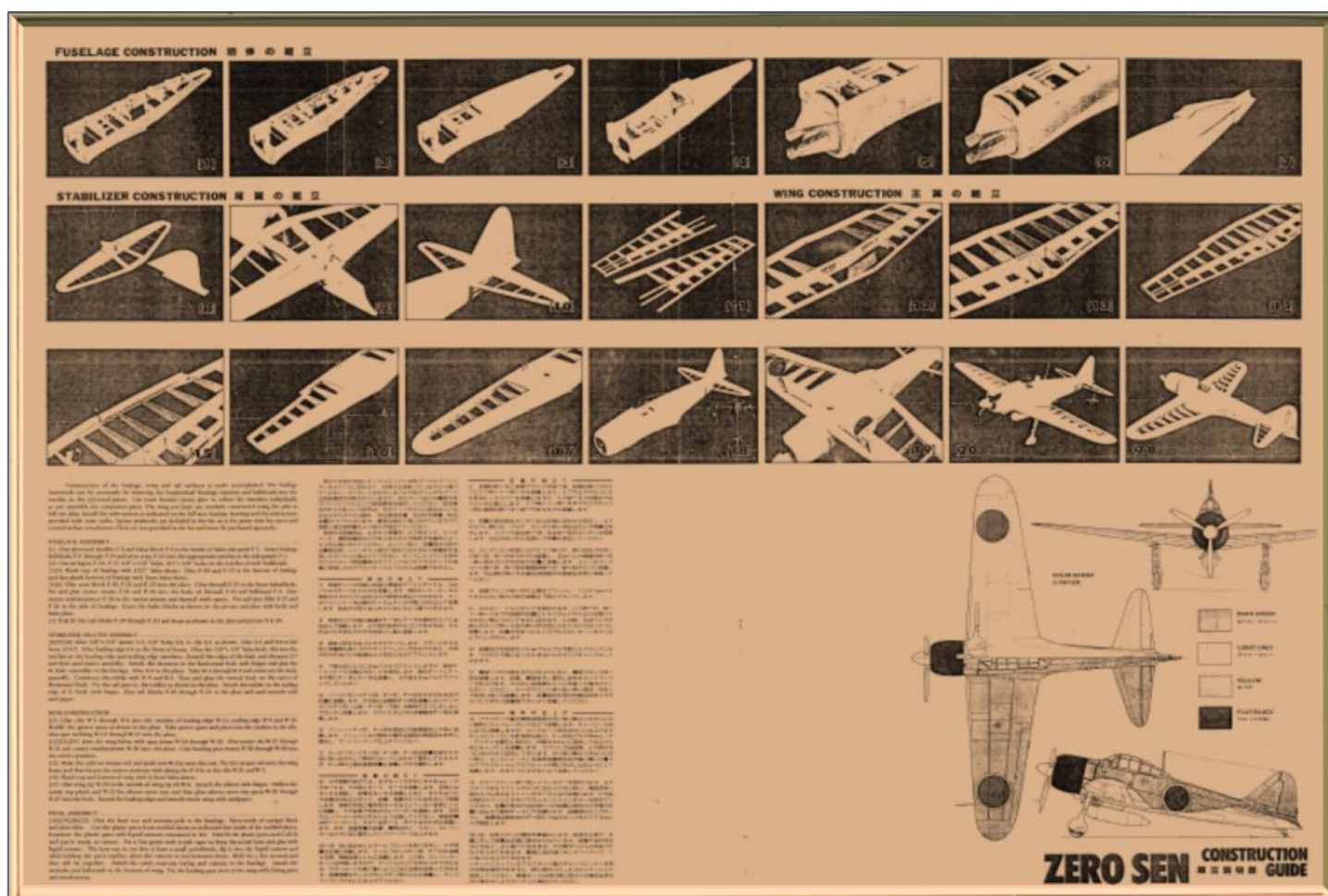
It has been claimed that the Zero's design showed clear influence from American fighter planes and components exported to Japan in the 1930s, and in particular the [Vought V-143](#) fighter. [Chance Vought](#) had sold the prototype for this aircraft and its plans to Japan in 1937. Eugene Wilson, President of Vought, claimed

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that when shown a captured Zero in 1943, he found that "There on the floor was the Vought V 142 [sic] or just the spitting image of it, Japanese-made," while the "power-plant installation was distinctly Chance Vought, the wheel stowage into the wing roots came from Northrop, and the Japanese designers had even copied the Navy inspection stamp from Pratt & Whitney type parts."^[8] While the sale of the V-143 was fully legal,^{[8][9]} Wilson later acknowledged^[8] the conflicts of interest that can arise whenever military technology is exported. In fact,

there was no significant relationship between the V-143 (which was an unsuccessful design that had been rejected by the US Army Air Corps and several export customers) and the Zero, with only a superficial similarity in layout. Allegations about the Zero being a copy have been mostly discredited.



Name

The A6M is universally known as the **Zero** from its Japanese Navy [type designation](#), Type 0 Carrier Fighter (*Rei shiki Kanj sent ki*, 零式艦上戦闘機), taken from the last digit of the [Imperial year](#) 2600 (1940), when it entered service. In Japan it was unofficially referred to as both **Rei-sen** and **Zero-sen**; Japanese pilots most commonly called it **Zero-sen**.^{[N 1] [11]}

In the official designation "A6M" the "A" signified a [carrier-based](#) fighter, "6" meant it was sixth such model built for the Imperial Navy, and "M" indicated the manufacturer, [Mitsubishi](#).

The official Allied code name was "**Zeke**", in keeping with the practice of giving male names to Japanese fighters, female names to [bombers](#), bird names to [gliders](#), and tree names to [trainers](#). "Zeke" was part of the first batch of "hillbilly" code names assigned by Captain Frank T. McCoy of Tennessee, who wanted quick,

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distinctive, easy to remember names. When in 1942 the Allied code for Japanese aircraft was introduced, he logically chose "Zeke" for the "Zero." Later, two variants of the fighter received their own code names: the [Nakajima A6M2-N](#) ([floatplane](#) version of the Zero) was called **Rufe** and the A6M3-32 variant was initially

called **Hap**. After objections from General ["Hap" Arnold](#), commander of the [USAAF](#), the name was changed to **Hamp**.

Operational history



The first Zeros (pre-series A6M2) went into operation in July 1940.^[12] On 13 September 1940, the Zeros scored their first air-to-air victories when 13 A6M2s led by Lieutenant Saburo Shindo attacked 27 Soviet-built [Polikarpov I-15s](#) and I-16s of the Chinese Nationalist Air Force, shooting down all the fighters without loss to themselves. By the time they were redeployed a year later, the Zeros had shot down 99 Chinese aircraft^[13] (266 according to other sources).^[12]

At the time of the [attack on Pearl Harbor](#) 420 Zeros were active in the Pacific. The carrier-borne Model 21 was the type encountered by the Americans. Its tremendous range of over 2,600 km (1,600 mi) allowed it to range farther from its carrier than expected, appearing over distant battlefronts and giving Allied commanders the impression that there were several times as many Zeros as actually existed.^[14]

The Zero quickly gained a fearsome reputation. Thanks to a combination of excellent maneuverability and firepower, it easily disposed of the motley collection of Allied aircraft sent against it in the Pacific in 1941. It proved a difficult opponent even for the [Supermarine Spitfire](#). Although not as fast as the British fighter, the Mitsubishi fighter could out-turn the Spitfire with ease, could sustain a climb at a very steep angle, and could stay in the air for three times as long.^[15]

Soon, however, Allied pilots developed tactics to cope with the Zero. Due to its extreme agility, engaging in a traditional, turning dogfight with a Zero was likely to be fatal. It was better to roar down from above in a high-speed pass, fire a quick burst, then zoom back up to altitude. (A short burst of fire from heavy machine guns or cannon was often enough to bring down the fragile Zero.) Such "boom-and-zoom" tactics were used successfully in the [China Burma India Theater](#) (CBI) by the ["Flying Tigers"](#) of the American Volunteer Group (AVG) against similarly maneuverable Japanese Army aircraft such as the [Nakajima Ki-27](#) and [Ki-43](#). AVG pilots were trained to exploit the advantages of their [P-40s](#), which were very sturdy, heavily armed, generally faster in a dive and level flight at low altitude, with a good rate of roll.^[16]

Another important maneuver was Lieutenant Commander [John S. "Jimmy" Thach's](#) ["Thach Weave"](#), in which two fighters would fly about 60 m (200 ft) apart. If a Zero latched onto the tail of one of the fighters, the two aircraft would turn toward each other. If the Zero followed his original target through the turn, he would come into a position to be fired on by the target's wingman. This tactic was first used to good effect during the Battle

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of Midway, and later over the [Solomon Islands](#). Many highly experienced Japanese aviators were lost in combat, resulting in a progressive decline in the quality of the opponents faced by Allied pilots, which became a significant factor in Allied successes. Unexpected heavy losses of these irreplaceable pilots at the battles of the [Coral Sea](#) and [Midway](#) dealt the Japanese carrier air force a blow from which it never fully recovered^[citation needed].



In contrast, Allied fighters were designed with ruggedness and pilot protection in mind.^[17] The Japanese ace Saburo Sakai described how the resilience of early Grumman aircraft was a factor in preventing the Zero from attaining total domination:

I had full confidence in my ability to destroy the [Grumman](#) and decided to finish off the enemy fighter with only my 7.7 mm machine guns. I turned the 20mm cannon switch to the 'off' position, and closed in. For some strange reason, even after I had poured about five or six hundred rounds of ammunition directly into the Grumman, the airplane did not fall, but kept on flying! I thought this very odd—it had never happened before—and closed the distance between the two airplanes until I could almost reach out and touch the Grumman. To my surprise, the Grumman's rudder and tail were torn to shreds, looking like an old torn piece of rag. With his plane in such condition, no wonder the pilot was unable to continue fighting! A Zero which had taken that many bullets would have been a ball of fire by now.^[18]

When the powerful [Lockheed P-38 Lightning](#), [Grumman F6F Hellcat](#) and [Vought F4U Corsair](#) appeared in the Pacific theater, the A6M, with its low-powered engine, was hard-pressed to remain competitive. In combat with an F6F or F4U, the only positive thing that could be said of the Zero at this stage of the war was that in the hands of a skillful pilot it could maneuver as well as most of its opponents.^[14] Nonetheless, in competent hands the Zero could still be deadly.

Due to shortages of high-powered aviation engines and problems with planned successor models, the Zero remained in production until 1945, with over 11,000 of all variants produced. It is said that Zeros destroyed at least 1,550 American aircraft during the course of the war.^[citation needed]

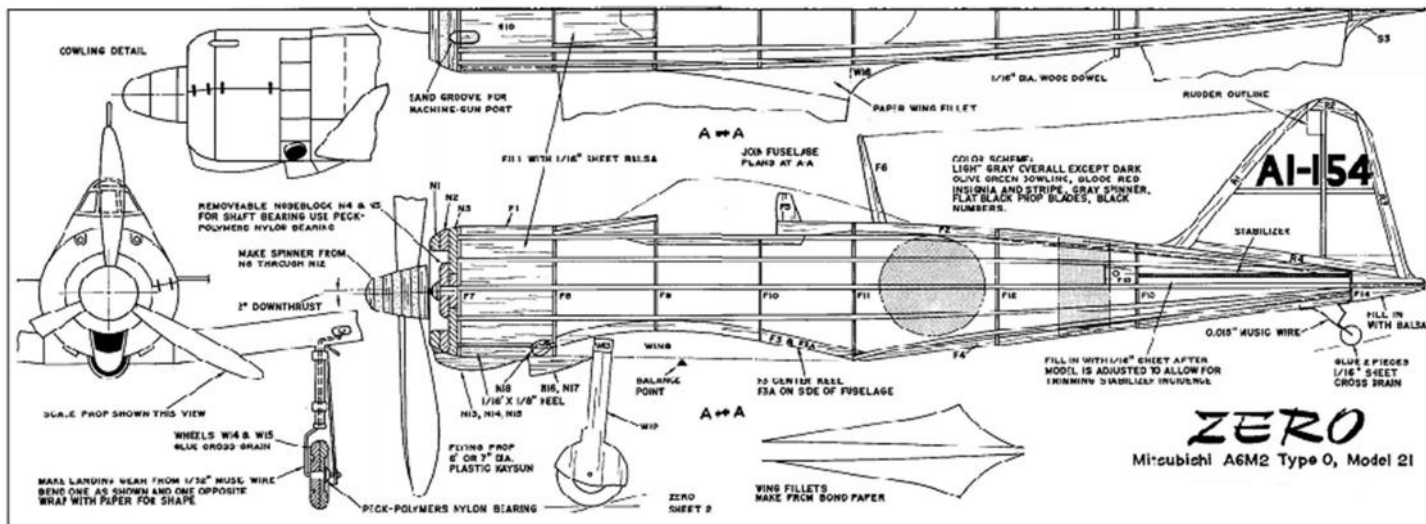
Allied opinions

The American military discovered many of the A6M's unique attributes when they recovered a largely intact specimen on [Akutan Island](#) in the [Aleutians](#) (which was called the [Akutan Zero](#)). During an air raid over Dutch Harbor on 4 June 1942, one A6M fighter was hit by ground fire. Losing oil, Flight Petty Officer Tadayoshi Koga attempted an emergency landing on Akutan Island about 20 miles northeast of Dutch Harbor, but his Zero

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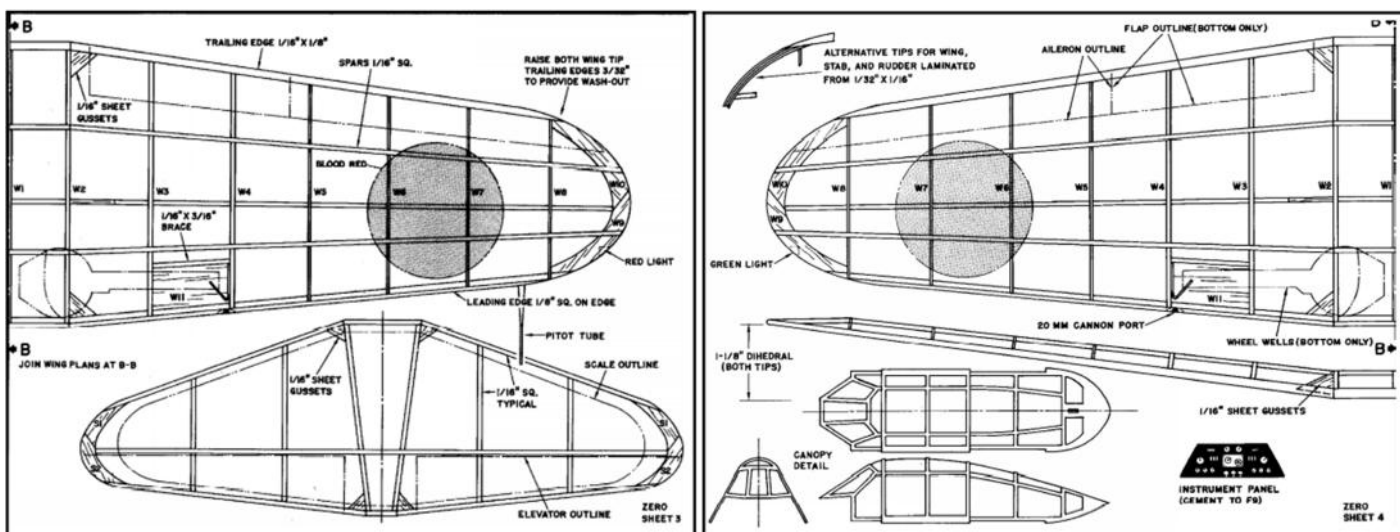
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flipped over in soft ground in a sudden crash landing. Koga died instantly of head injuries, but the relatively undamaged fighter was found over a month later by an American salvage team and shipped to [Naval Air Station North Island](#) where testing flights of the repaired A6M revealed not only its strengths, but also its deficiencies in design and performance. [\[17\]\[19\]](#)



54" plan

The experts who evaluated the captured Zero found that the plane weighed 5,200 pounds fully loaded, half the weight of the standard United States Navy fighter. It was "built like a fine watch"; the Zero was constructed with [flush rivets](#), and even the guns were flush with the wings. The instrument panel was a "marvel of simplicity ... with no superfluties to distract [the pilot]." What most impressed the experts was that the Zero's fuselage and wings were constructed in one piece, unlike the American method that built them separately and joined the two parts together. The Japanese method was much slower, but resulted in a very strong structure and improved close maneuverability.



54" plan

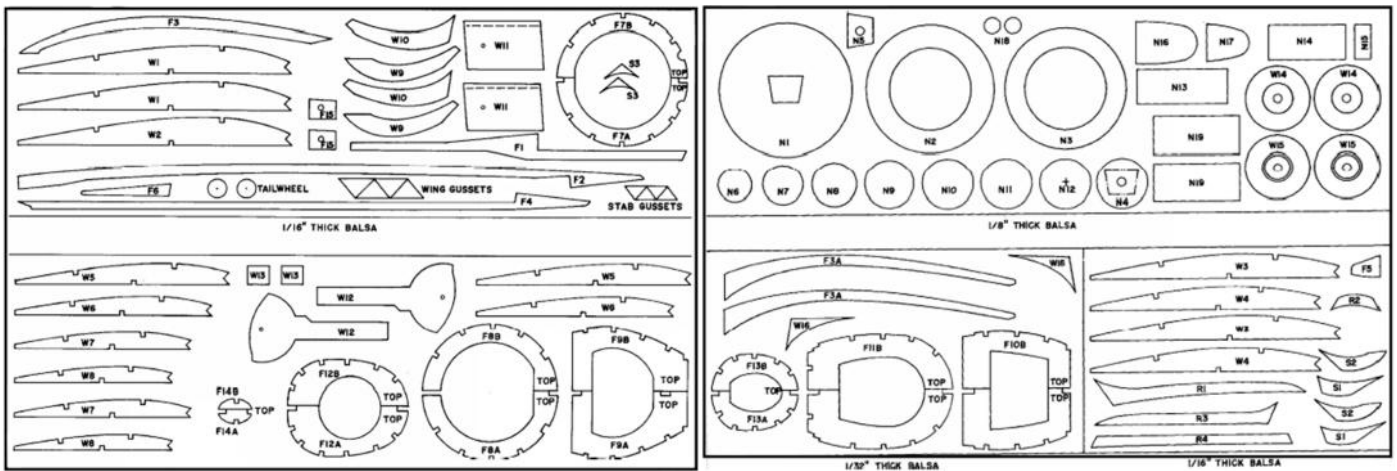
Captain [Eric Brown](#), the Chief Naval Test Pilot of the Royal Navy, recalled being impressed by the Zero during tests of captured aircraft. "I don't think I have ever flown a fighter that could match the rate of turn of the Zero.

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The Zero had ruled the roost totally and was the finest fighter in the world until mid-1943.^[2] American test pilots found that the Zero's controls were "very light" at 200 miles per hour, but stiffened at faster speeds

(above 216 MPH) to safeguard against wing failure.^[20] The Zero could not keep up with Allied aircraft in high speed maneuvers, and its low "never exceed speed" made it vulnerable in a dive. While stable on the ground despite its light weight, the aircraft was designed purely for the attack role, emphasizing long range, maneuverability, and firepower at the expense of protection of its pilot. Most had neither [self-sealing tanks](#) nor armor plating



54" plan