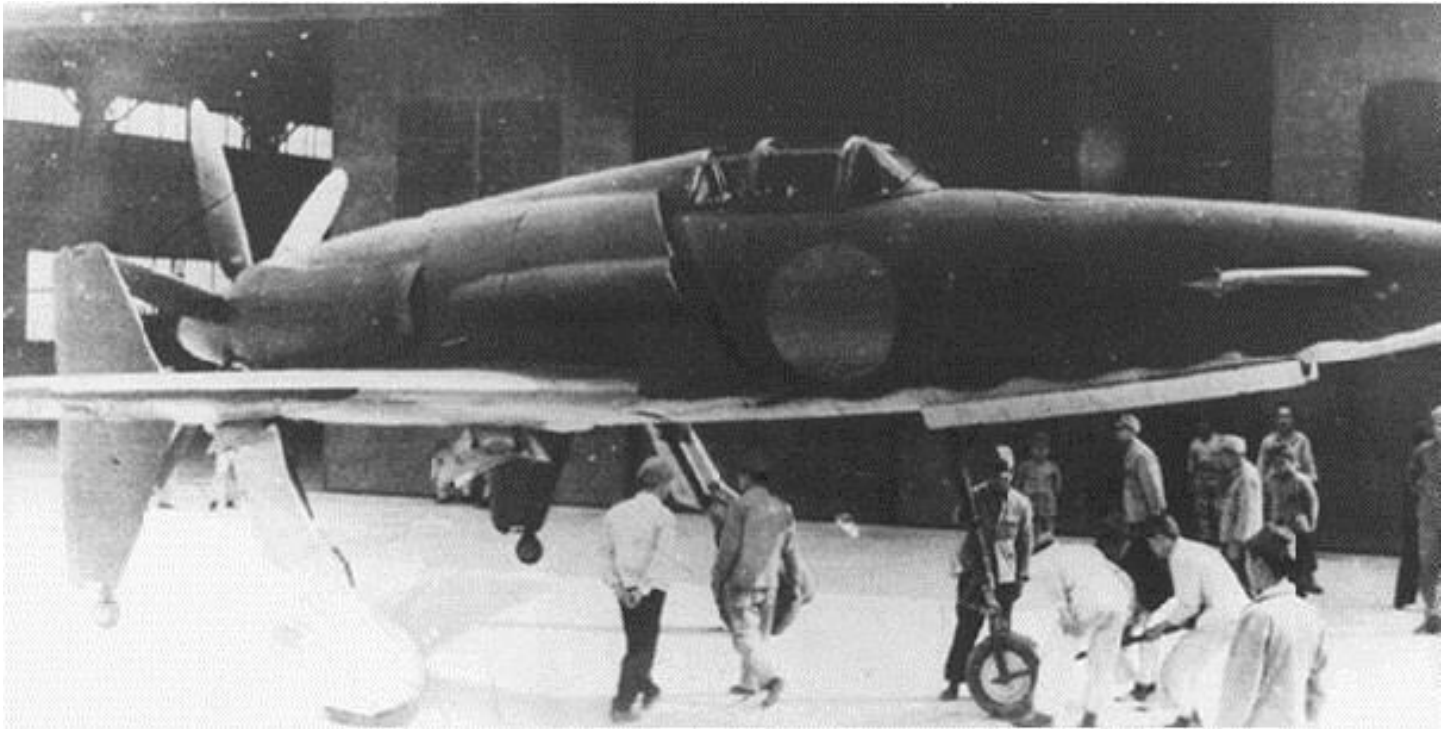
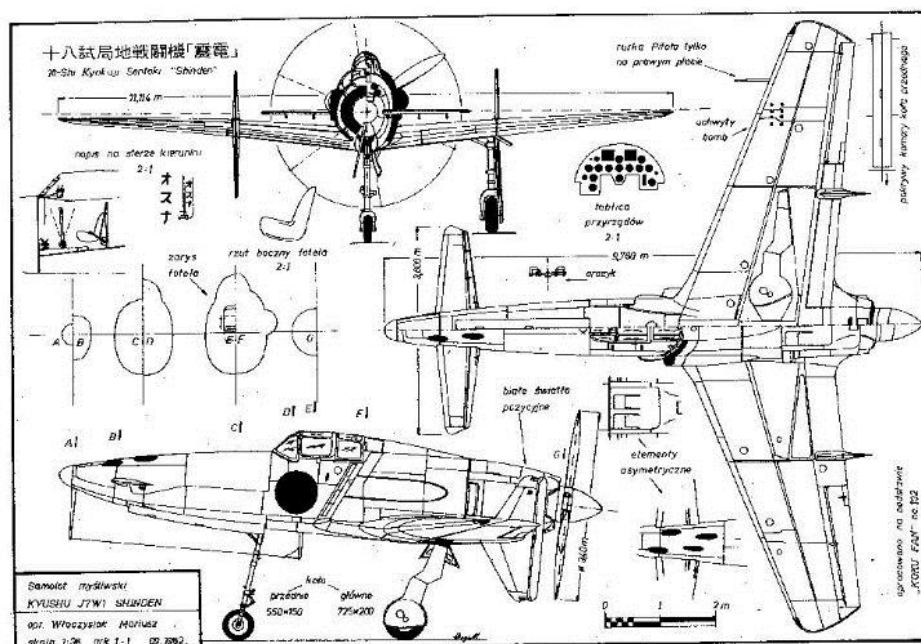


Kyushu J7W1 Shinden

Au sein du Kaigun Koku Gijitsu Sho (*en abrégé Kugisho : Arsenal Technique d'Aéronautique Navale*) de Yokosuka, une équipe de techniciens dirigée par le capitaine Masaoki Tsuruno procéda en avril 1943 à l'étude d'un appareil révolutionnaire pour le compte de la Marine Impériale. L'engin, de configuration « canard », c'est à dire avec l'aile et le moteur à l'arrière et l'empennage à l'avant, devait être supérieur à tous les autres avions existants, amis comme adverses, et capable d'anéantir les B-29 Superfortress américains, hantise des Japonais.



Le futur intercepteur devait être motorisé avec un turboréacteur et, pour vérifier la validité de sa conception, le capitaine Tsuruno fit construire par le Kugisho trois planeurs « canard » entièrement en bois, les Yokosuka MXY 6, dont l'un d'eux fut équipé d'un petit moteur à 4 cylindres. Les essais, effectués fin 1943, furent satisfaisants et même prometteurs au point que le haut commandement ordonna aussitôt la construction de prototypes de l'appareil définitif, avec toutefois une directive incontournable dans l'immédiat : la motorisation serait classique, à pistons et hélice, les turboréacteurs ayant du retard dans la mise au point, les délais de livraison et manquant de fiabilité.



La Marine Impériale confia la construction du nouvel appareil à la firme Kyushu en juin 1944 en lui adjoignant les meilleurs techniciens dont, bien sûr, le concepteur Masaoki Tsuruno, et dix mois plus tard, en avril 1945, deux prototypes étaient prêts pour les essais. L'engin était un monoplane à aile basse entièrement métallique à train d'atterrissage tricyle escamotable, avec un moteur radial à 18 cylindres refroidi par air à l'arrière entraînant une hélice à 6 pales de grand diamètre. Il était armé de quatre canons de 30 mm à tir rapide (*450 coups/minute*) logés dans le nez et pouvait emporter 120 Kg de bombes. Fait unique, et le temps pressant, la marine l'agréa avec enthousiasme sous la désignation **J7W1 Shinden** (*Foudre magnifique*) et ordonna la construction en série avant même les essais en vol, avec une production prévisionnelle de 30 exemplaires pour Kyushu et 120 pour Nakajima. L'étude du successeur à turboréacteur Ne-130 de 900 Kgp (**J7W2**) fut relancée. Pendant ce temps, son homologue adverse moins au point, le Curtiss-Wright XP-55 Ascender, était abandonné après 3 prototypes très décevants.



À cause de difficultés d'approvisionnement, le **Shinden** ne vola pour la première fois que le 3 août 1945 avec le capitaine Tsuruno aux commandes. Le puissant moteur entraînant la grande hélice à 6 pales provoquait un tel effet de couple au décollage que l'appareil « embarquait » fortement à droite et faisait l'objet d'importantes vibrations. Pendant les 45 mn d'essais en vol, le pilote conserva le train d'atterrissage en position sortie.

Les [bombardements atomiques des 6 et 9 août](#), puis la capitulation du 15 août 1945 mirent un terme à l'histoire du **J7W**. Le concepteur-pilote estima qu'après quelques améliorations, le Shinden serait devenu un formidable appareil ; les Américains, qui l'acheminèrent par bateau aux États-Unis pour l'étudier, reconnurent avoir heureusement échappé à un très redoutable adversaire.

Source : <https://www.avionslegendaires.net/avion-militaire/kyushu-j7w-shinden/>

Version anglaise

Masayoshi Tsuruno (also spelled Masaoki) was a member of the Imperial Japanese Navy's (IJN) Aviation Research Department. Around 1940, Tsuruno first began to investigate designs of a pusher aircraft with a canard layout. Tsuruno's research led him to believe that such a configuration would enable an aircraft to achieve a very high level of performance. In addition, the basic configuration could be easily adapted to turbojet power if such an engine became available.



Kyushu J7W1 Shinden was an unorthodox fighter designed to intercept US bombers at high speed and high altitude. Although just two were completed, it was the only canard aircraft ordered into production during World War II. Exhaust from two cylinders flowed out the two ejector slits atop the engine cowling.

In early 1943, the IJN issued 18-Shi Otsu specification calling for a land-based fighter capable of intercepting enemy bombers. The aircraft should achieve 460 mph (740 km/h) at 28,543 ft (8,700 m), reach 26,247 ft (8,000 m) in 10.5 minutes, have a service ceiling of 39,370 ft (12,000 m), and carry four 30 mm cannons. Tsuruno worked up a design for such an aircraft and submitted it to the IJN. The IJN liked the design but was hesitant to move forward with the radical, untested configuration. Tsuruno was able to work with the First Naval Air Technical Depot (*Dai-Ichi Kaigun Koku Gijitsusho*) at Yokosuka to develop a proof of concept, designated MXY6.

The Yokosuka MXY6 was a glider of all wooden construction possessing a canard layout with fixed tricycle landing gear. The aircraft featured a foreplane with elevators mounted to its nose for pitch control. The swept wings were mounted to the rear fuselage, and each wing had a vertical stabilizer with a rudder mounted near its mid-point. Three of the gliders were built by Chigasaki Industry Ltd (*Chigasaki Seizo KK*). Piloted by Tsuruno, the MXY6's first flight was made in January 1944. Later, one of the gliders was fitted with a 22 hp (16 kW) Nippon Hainenki Semi 11 [Ha-90] engine turning a wooden, fixed-pitch, two-blade propeller. The engine was not intended make the MXY6 fully operational under its own power, but it would enable the aircraft to sustain flight and prolong its glide. The MXY6's flight tests indicated that Tsuruno's design was sound. The aircraft handled well at low speeds and resisted stalling. Based on the positive preliminary tests of the MXY6, the IJN decided to proceed with Tsuruno's 18-Shi Otsu design in February 1944. The aircraft would be built by the Kyushu Airplane Company (*Kyushu Hikoki KK*), and it was designated J7W1 *Shinden* (Magnificent Lightning).



One of the Yokosuka MXY6 gliders that survived to the end of the war and was found by US forces. The glider validated the basic configuration that was later applied to the J7W1.

Kyushu Airplane Company was founded in October 1943 as a subsidiary of the Watanabe Iron Works Ltd (*Watanabe Tekkosho KK*). Kyushu was selected as the manufacturer because it had both workers and production facilities that were available. Kyushu had no experience designing high-performance fighter aircraft, but the company would be aided by Tsuruno and the First Naval Air Technical Depot. An official order for the J7W1 was issued in June 1944, with the prototype's first flight expected in January 1945.

The Kyushu J7W1 Shinden used the same layout as the MXY6, having a canard configuration with a swept, rear-mounted wing and tricycle undercarriage. The aircraft consisted of an aluminum airframe covered by aluminum panels, forming a monocoque structure. Depending on location, the panels were either flush riveted or spot welded in place. The control surfaces were skinned with aluminum. The foreplane had two spars and was mounted to the extreme nose of the aircraft at a one-degree angle of incidence. A leading-edge slat was deployed with the flaps. On the foreplane's trailing edge was a two-section flap. The first section acted as a traditional flap that extended 26 degrees. The second section on the trailing edge acted as an elevator.

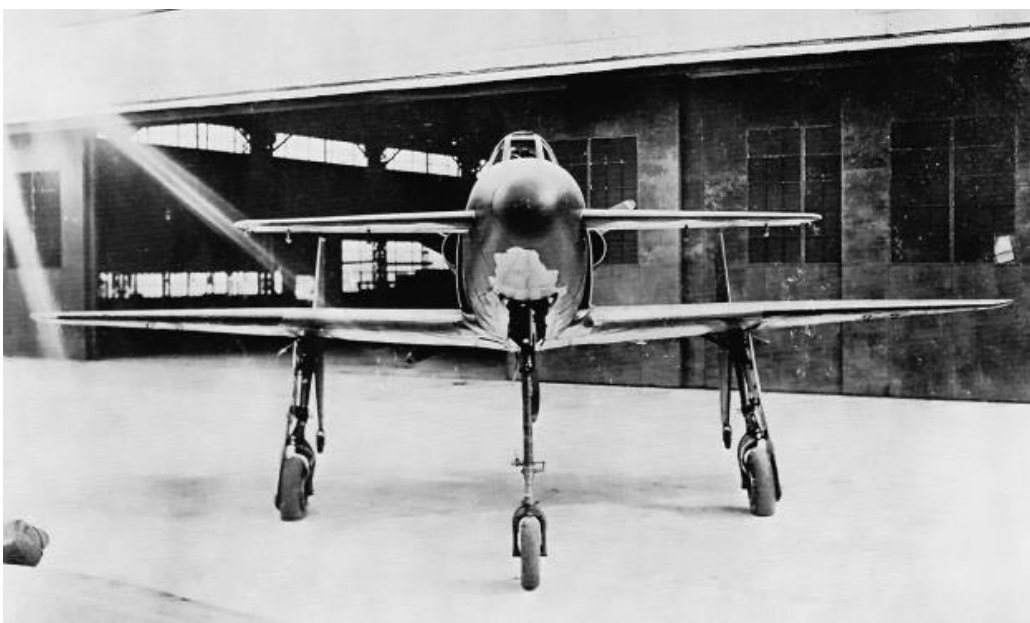
Mounted in the fuselage between the foreplanes were four 30 mm Type 5 cannons, each with 60 rounds per gun. Each cannon was 7 ft 2 in (2.19 m) long and weighed 154 lb (70 kg). The cannons were slightly staggered to allow for clearance of their respective feed belts and keep the fuselage as narrow as possible. A compartment under the cannons collected the spent shell casings because of concerns that they would strike the propeller if they were ejected from the aircraft. Two 7.9 mm machine guns with 75 rounds per gun were planned for the very front of the nose and could be used for either training or target ranging. As ranging guns, they would help ensure that the cannon shells hit the intended target and not waste the limited ammunition supply. No armament was fitted to the prototype, and ballast weight was used to simulate the cannons.



The wheels under the vertical stabilizers were added after the aircraft's first flight attempt ended with bent propeller blades. Note the long landing gear's relatively short wheel base.

Behind the cannons was the single-seat cockpit, which was covered by a rearward-sliding glazed canopy. The pilot was protected by 2.76 in (70 mm) of armored glass in the front windscreen and a .63 in (16 mm) bulkhead by the cannons. Passageways ran on both sides of the aircraft between the cockpit and outer skin. Flight controls, hydraulic lines, and wiring ran in these passageways, which were accessible via removable outer skin panels. Under and slightly behind the cockpit was a 106-gallon (400-L) self-sealing fuel tank made of .87 in (22 mm) thick rubber.

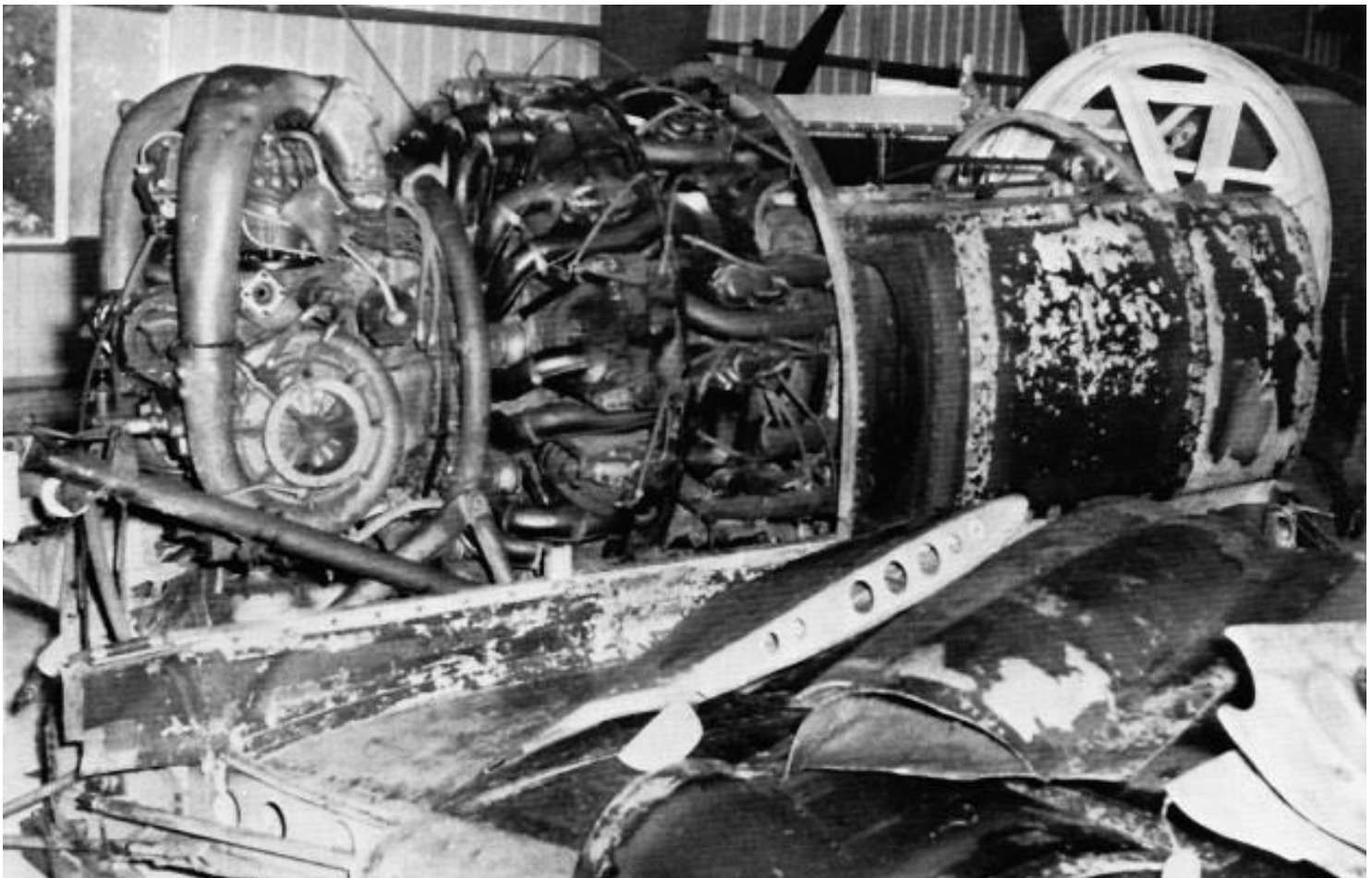
Directly behind the cockpit was a 44-gallon (165-L) oil tank, followed by a [Mitsubishi \[Ha-43\] 42 \(IJN designation MK9D\) engine](#). The [Ha-43] was a two-row, 18-cylinder, air-cooled engine. The [Ha-43] 42 had two-stage supercharging, with the first stage made up by a pair of transversely-mounted centrifugal impellers, one on each side of the engine. The shaft of these impellers was joined to the engine by a continuously variable coupling. The output from each of the first stage impellers joined together as they fed the second stage, two-speed supercharger mounted to the rear of the engine and geared to the crankshaft. As installed in the J7W1, the engine produced 2,030 hp (1,514 kW) at 2,900 rpm with 9.7 psi (.67 bar) of boost for takeoff. Military power at 2,800 rpm and 5.8 psi (.40 bar) of boost was 1,850 hp (1,380 kW) at 6,562 ft (2,000 m) in low gear and 1,660 hp (1,238 kW) at 27,559 ft (8,400 m) in high gear.



The prototype was unarmed, but four 30 mm cannons, each capable of firing 500 rounds per minute, were to be mounted in the nose. The projectile from each 30 mm shell weighed 12.3 oz / 5,401 grains (350 g).

The engine was mounted in the center of the fuselage and atop the wingbox. An extension shaft approximately 29.5 in (750 mm) long extended back from the engine to a remote propeller reduction gear box. The extension shaft passed through an extended housing that was mounted between the engine and the propeller gear reduction. The gear reduction turned the propeller at .412 times crankshaft speed and also drove a 12-blade cooling fan that was 2 ft 11 in (900 mm) in diameter. A screen was placed in front of the fan to prevent any debris from exiting the rear of the aircraft and hitting either the fan or propeller. Mounted to the propeller shaft was a 11 ft 2 in (3.40 m) diameter, metal, six-blade, constant-speed, VDM (*Vereinigte Deutsche Metallwerke*)-type propeller built by Sumitomo Metal Industries Ltd, Propeller Division (*Sumitomo Kinzoku Kogyo KK, Puopera Seizosho*). The propeller had approximately 29 in (740 mm) of ground clearance with the aircraft resting on all of its landing gear. If bailing out of the aircraft was needed, the pilot could detonate an explosive cord that would sever the propeller and gear reduction.

Cooling air for the [Ha-43] engine was taken in via an oblique inlet mounted on each side of the fuselage just behind the cockpit. Flaps at the inlet's opening were raised to decrease the flow of cooling air to the engine. Cooling air entered the inlets, passed through the fins on the engine's cylinders, traveled along the outside of the extension shaft housing, passed through the cooling fan, and exited around the spinner or an outlet under the rear of the aircraft. Two intakes, one on each side of the aircraft, were mounted to the cooling inlet. These intakes ducted induction air through the cooling air duct and directly into the transversely mounted superchargers.



The [Mitsubishi \[Ha-43\] 42 engine](#) installed in the J7W1 as seen post-war. The front of the aircraft is on the left. One of the two transversely-mounted, first-stage superchargers can be seen left of the engine. The oil cooler duct is in place and blocking the view of the extension shaft to the right of the engine. On the wing is the middle panel of the supercharger's inlet scoop.

On each side of the fuselage directly behind the induction scoop was an inlet for an oil cooler. For each of the two oil coolers, after air passed through the cooler, it was mixed with the exhaust of four cylinders and ejected out a slit on the side of the fuselage just before the spinner. The ejector exhaust was used to help draw air through the oil coolers. The same philosophy applied to the exhaust from six cylinders on the bottom of the engine. These were ducted into an augments that helped draw cooling air through the cowling and out an outlet under the spinner. The exhaust from the remaining four cylinders, which were located on the top of the engine, exited via two outlets arranged atop the cowling to generate thrust.

The leading edge of the J7W1's wing was swept back 20 degrees, and the trailing edge was swept back six degrees. The wings were mounted with no incidence angle. The inner wing from the wingbox to the rudder had 2.5 degrees of dihedral, and the outer wing from the rudder to the tip had zero dihedral. The structure of each wing was formed with three spars. The front spar ran along the wing's leading edge. The center, main spar was swept back 14.5 degrees and ran in front of the main landing gear wells. A rear spar was swept forward 3.5 degrees and ran from the wingbox to just behind the main gear mount. A vertical stabilizer extended above and below the rear spar. The vertical stabilizer was mounted at approximately the midpoint of each wing and extended past the wing's trailing edge. Initially, nothing was mounted under the vertical stabilizers, but a wheel was later added under each stabilizer to prevent propeller ground strikes. A rudder ran the entire 7 ft 3 in (2.20 m) height of each vertical stabilizer. Each wing housed a 53-gallon (200-L) fuel tank and a 20-gallon (75-L) anti-detonation fluid (water/methanol) tank for injection into the engine. Split flaps were positioned along the trailing edge of the wing between the vertical stabilizer and the fuselage. The flaps on the main wing extended 20 degrees. Two hardpoints under each outer wing could accommodate 66 or 132 lb (30 or 60 kg) bombs.



Rear view of the J7W1 showing its six-blade propeller and the engine's 12-blade cooling fan in the rear of the cowling. The exhaust augments outlet can be seen on the bottom of the cowling. Note the rudders extending the entire height of the vertical stabilizers.

When deployed, the legs of the main gear were angled forward more than the nose gear. This effectively extended the nose gear and caused the aircraft to sit five-degrees nose-high while on the ground. This stance minimized the rotation needed to achieve liftoff, which is very important in the pusher aircraft. The main gear was mounted forward of the vertical stabilizers. The swiveling but non-steerable nose gear retracted forward, and the main gear retracted inward. Gear retraction and extension were powered hydraulically. At approximately 5 ft 11 in (1.8 m) long, the landing gear was quite tall to allow clearance for the propeller. The gear had a fairly wide track of 15 ft (4.56 m), but the wheelbase was short at only 10 ft 2 in (3.11 m). The short wheelbase combined with the tall gear legs and the aircraft's high center of gravity could have given the J7W1 undesirable ground handling characteristics.

The J7W1 had a 36 ft 5 in (11.11 m) wingspan, was 32 ft (9.76 m) long, and was 12 ft 10 in (3.92 m) tall. The aircraft had a top speed of 466 mph (750 km/h) at 28,543 ft (8,700 m), a cruising speed of 276 mph (444 km/h), and a stalling speed of 107 mph (172 km/h). The J7W1 could climb to 26,247 ft (8,000 m) in 10 minutes and 40 seconds and had a 39,370 ft (12,000 m) service ceiling. The aircraft had an empty weight of 7,639 lb (3,465 kg), a normal weight of 10,864 lb (4,928 kg), and a maximum weight of 11,526 lb (5,228 kg). Cruising at 9,843 ft (3,000 m) gave the J7W1 a 528-mile (850-km) range. The aircraft was stressed for a maximum speed of 575 mph (926 km/h) and 7 Gs.



The various ducts on the side of the J7W1 are illustrated in this image. The flaps to reduce cooling air can be seen just before the oblique inlet on the side of the aircraft. The smaller scoop that fed air into the supercharger is mounted to the outside of the cooling air inlet. The oil cooler inlet can be seen just behind the tapered fairing for the induction scoop.

While the prototype was still under construction, the IJN ordered the J7W1 into production in May 1944 to counter the imminent threat of American bombing raids with the Boeing B-29 Superfortress. Ultimately, the production schedule called for Kyushu to produce 30 aircraft per month, and the Nakajima Aircraft Company, Ltd (*Nakajima Hikoki KK*) would build 120 units per month.

In June 1944, the United States Army Air Force began conducting bombing raids against Japan using the B-29. To intercept these bombers and disrupt these raids were the exact purposes for which the J7W1 was designed. In September 1944, a mockup of the J7W1 was inspected by the IJN, and wind tunnel tests of a scale model had yielded positive results.

The J7W1 was built at Kyushu's Zasshonokuma Plant, near Fukuoka city. The airframe was nearing completion in January 1945, when the first flight was originally scheduled to be conducted. Bombing raids delayed delivery of the [Ha-43] 42 engine, which finally arrived in April. The J7W1 was finally completed on 10 June and was subsequently disassembled and moved to Mushiroda Airfield (now Fukuoka Airport) in Fukuoka city on 15 June. Reassembled, the aircraft was inspected on 19 June, but bombing raids caused some delays. Ground tests were soon conducted and indicated a tendency for the engine to overheat due to a lack of cooling airflow. Tsuruno attempted the first flight in July, but as the J7W1 began to take flight, the engine's torque induced a roll to the right. The aircraft's nose went high and caused the propeller tips to strike the ground, bending the tips back.



Following World War II, the J7W1 was repaired and then painted before the aircraft was shipped to the United States. The new panels are easily seen in this image prior to the aircraft being repainted. Note that there is no cockpit glass.

The J7W1 was repaired, and the second prototype's propeller was installed. A tailwheel from a Kyushu K11W *Shiragiku* (White Chrysanthemum) trainer was added under each vertical stabilizer so that during an over-rotation, a propeller strike would not occur again. Yoshitaka Miyaishi took over the flight tests and started over with ground runs to assess the aircraft's handling. The J7W1 made its first flight on 3 August 1945. Liftoff occurred at 126 mph (204 km/h), and the aircraft was not flown above 1,312 ft (400 m). The speed did not exceed 161 mph (259 km/h), and the flight lasted under 15 minutes, with the aircraft landing at 115 mph (185 km/h).

The J7W1's tendency to roll to the right persisted and needed much left aileron input to correct, but the aircraft behaved reasonably well otherwise. Two further flights were made on 6 and 8 August, each about 15 minutes in length. The aircraft's basic handling was evaluated, and the landing gear was never retracted during the tests. The roll to the right was made worse with the flaps deployed and the engine producing more torque to maintain airspeed. The J7W1 exhibited a tendency for its nose to pitch down, which was countered by a steady pull on the control stick. The engine, extension shaft, and remote gear reduction caused some vibration issues.

Modifications were contemplated to neutralize the engine's torque reaction and correct the aircraft's handling. A proposition was made to increase the foreplane's angle of incidence to three degrees and change the main wing's flap deployment to 30 degrees. In addition, the oil cooler needed to be improved. It was decided that speed tests would be initiated on the aircraft's next flight, scheduled for 17 August. However, all work was stopped with the Japanese surrender on 15 August, and much of the aircraft's documentation was burned on 16 August.



The J7W1 on display in Japan after it was repaired and painted. The inlet for the right oil cooler can be seen just behind the induction scoop, and the oil cooler's exit can be seen right before the propeller. Note that the flaps are partially deployed.

At the end of the war, the second J7W1 was nearly complete and waiting on its [Ha-43] 42 engine, and the third aircraft was under construction. No other examples were completed to any meaningful level. The third J7W1 was planned to have the three-degree foreplane angle of incidence and a [Ha-43] 43 engine that produced an additional 130 hp (97 kW) for takeoff. This engine would have a single impeller for its first-stage, continuously-variable supercharger. The intake for the engine was moved to the inside of the J7W1's cooling air inlets. The fourth and later aircraft would incorporate the changes from the third and also have a four-blade propeller 11 ft 6 in or 11 ft 10 in (3.5 m or 3.6 m) in diameter. The four-blade propeller had wider blades, was easier to manufacture, and was intended to cure some of the J7W1's tendency to roll to the right. Beginning with the eighth aircraft, a 2,250 hp (1678 kW) [Ha-43] 51 engine would be installed. The [Ha-43] 51 had a single-stage, three-speed, mechanical supercharger instead of two-stage supercharging with a continuously-variable first stage.

The second and third J7W1 were both destroyed following the Japanese surrender. The first prototype, with around 45 minutes of flight time, was captured by US Marines and found to have all of the cockpit glass removed and some body panels damaged, possibly from a typhoon. For many years, it was thought that the first prototype was destroyed and that the second aircraft was captured by US forces, but this was later found to be incorrect. Under US orders, the aircraft was repaired and repainted while still in Japan. Most pictures of the J7W1 are immediately after the repairs have been made or shortly after it was painted. In almost all of the pictures, the cockpit glass is missing. In October 1945, the J7W1 was disassembled and shipped to the United States.



Six US Servicemen and four Japanese dignitaries pose next to the J7W1. Masayoshi Tsuruno, the aircraft's designer, is the fourth from the left. The men give a good indication of the aircraft's tall stance and overall size.

The surviving J7W1 was assigned 'Foreign Evaluation' FE-326 (later T2-326), and attempts were made to bring the aircraft to a flightworthy status. It is believed that most of this work, including new cockpit glass and installing several American flight instruments, was conducted in mid-1946 at Middletown Air Depot (now Harrisburg International Airport) in Pennsylvania. In September 1946, the aircraft was moved to the Orchard Field Airport (now O'Hare Airport) Special Depot in Park Ridge, Illinois. Instructions indicated that the J7W1 could be made airworthy if an overhauled engine was found, but this never occurred and the aircraft was not flown in the United States. The J7W1 was transferred to the Smithsonian National Air and Space Museum in 1960. The aircraft is preserved in a disassembled and unrestored state, with the [Ha-43] 42 engine still installed in the fuselage. Amazingly, [video of the aircraft's aborted first flight attempt and eventual first flight can be found on YouTube](#).

Around 2016, a full-size model of the J7W1 was built by Hitoshi Sakamoto. The model was on special display at the Yoichi Space Museum in Hokkaido, but it is not known if it is still there.

A turbojet version of the aircraft had been considered from the start, but a suitable powerplant had not been built in Japan by the close of the war. Designated J7W2 Shinden-Kai, the jet aircraft most likely would have had shorter landing gear, with additional fuel tanks in the wings occupying the space formerly used by the longer gear. There is no indication that the J7W2 had progressed beyond the preliminary design phase before the war's end.



Today, J7W1 is disassembled but fairly complete. However, the years of storage have led to many bent and dented parts. The aircraft was long stored in the Smithsonian National Air and Space Museum's Paul E. Garber facility, but the cockpit and foreplanes are on display at the Steven F. Udvar-Hazy Center in Chantilly, Virginia. ([NASM image](#))

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