PROFILE
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Nakajima Ki-44 Shoki ('Tojo') by John F. Brindley 40p

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by John F. Brindley

Only one or two Nakajima Ki-44 *Shoki* (Demon) fighters of the Imperial Japanese Army Air Force survived the Pacific War—apart from those in China and a few shipped out to the USA and Britain for technical assessment—and most ended on the scrapheap of the vanquished.

No Shoki appears to be available for museum display today; which is a pity. For, despite its relatively poor performance against the formidable Boeing B-29 Superfortress,[1] the 'Tojo' (Allied code name) was a noteworthy Japanese fighter design. In essence, the Ki-44 Shoki marked a radical departure from the classic formula of the lightweight but highly manoeuvrable fighter hitherto favoured.

Origins of Nakajima Hikoki KK

The Nakajima Hikoki KK (Nakajima Aircraft Co. Ltd.) could legitimately claim to be Japan's oldest major aircraft manufacturer, having its origins in the Nihon Hikoki Seisakusho KK (Japan Aircraft Manufacturing Works Co. Ltd.) founded in 1917 by Chikuhei Nakajima and Seibei Kawanishi. The two founders split up in 1919 and both names are well-known to students of the Japanese aviation industry. Nakajima set up a new company—the Nakajima Hikoki KK—with the backing of the Mitsui Trading Co. Ltd., one of the largest of all companies in Japan. By the time the Pacific War broke out in December 1941, Nakajima was the largest of the country's aircraft companies and an almost self-contained outfit. Not only did it produce complete aircraft, but also engines and a large proportion of the components going to make up the completed article.

Nakajima had quite a long tradition in fighter development and production. The first design to attract attention in the West during the latter part of the 1930s was the Ki-27 Army Type 97 Fighter, designed by Toru Koyama. The Ki-27, (Allied code-name 'Nate') was a neat low-wing design with an enclosed cockpit, although it had a fixed undercarriage. Powered by a Nakajima Ha-1b 9-cylinder radial engine with a maximum rating of 780 horsepower at 9,515 feet (2,900 metres), the Ki-27 had a maximum speed

An abandoned Ki-44-II-Otsu photographed at Clark Field, Luzon, Philippines. This aircraft was formerly operated by the 22nd Sentai, painted dark-green overall with black anti-dazzle panel forward of the cockpit and white individual marking on the rudder. The aircraft in the background is a Kawasaki Ki-45 (see Profile No. 105). (Photo: US National Archives via Rene J. Francillon)

[1] See *Profile* No. 101.

of 292 miles per hour at 11,480 ft. (470 kilometres per hour at 3,500 m.). Highly manoeuvrable, the type built up a good reputation for itself in China during 1938, when it helped the Japanese establish complete air superiority. The Ki-27 proved to be the equal of the Soviet Polikarpov I-16 fighter (see *Profile* No. 122) in the fighting between the two countries along the Chinese-Mongolian border, in the Khalkin-Gol area, during the summer of 1939. While that 'incident' ended in a relative stalemate, it did serve notice upon the Japanese that the Soviet Union was not to be trifled with (and was a contributing factor in Japan's forebearing to declare war on the Soviet Union in December 1941). The Ki-27 was the most numerous Japanese Army fighter at the beginning of the Pacific War.

The Koku Hombu (Imperial Japanese Army Air Headquarters) gave Nakajima a contract to develop a successor to the Ki-27 in December 1937 and the resulting design, the Ki-43 (see *Profile* No. 46), followed the same philosophy. It was a highly manoeuvrable aircraft, with moderate wing loading and light armament. Entering service in December 1941, the Ki-43 was known as the Army Type 1 Fighter, receiving the popular name Hayabusa (Peregrine Falcon) in Japan and the Allied code-name 'Oscar'. Initially, it did well against the comparatively weak Allied opposition but later fared badly against the US Navy's newest carrier fighters, the Grumman F6F Hellcat and the Chance Vought F4U Corsair (see *Profile* No. 47).

However, even at the time it was issuing the Specification which resulted in the Ki-43, the Koku Hombu realised the need for a defence interceptor, with emphasis placed on high speed and fast climb rate. Designated Ki-44, the new aircraft was required to have a maximum speed of 373 m.p.h. (600 km./h.) at 13,120 ft. (4,000 m.) and to climb to this altitude in less than five minutes. An armament of two 12,7-mm. and two 7,7-mm. machine-guns was to be carried—heavy by Japanese standards of the day.

Work began on the Ki-44 project in 1938, under the leadership of Toru Koyama. To provide the required performance, the Nakajima Ha-41 two-row, 14-cylinder radial, rated at 1,250 h.p. was selected although this powerplant was considered to be a 'bomber engine', being used in the Nakajima Ki-49 heavy bomber. Koyama and his team designed a fairly small airframe around this power unit, with stubby wings and a relatively stout fuselage tapering considerably towards the tail, its side area enhancing directional stability. Combat manoeuvrability was assisted by 'butterfly' flaps.

Unfortunately, the attractive theory embodied in the design layout was jeopardized as development progressed by a disturbing increase in all-up weight. Originally estimated to have a fully loaded weight of about 4,850 lb. (2,200 kg.), the first prototype proved to weigh in at some 5,622 lb. (2,550 kg.) when completed in the summer of 1940. The first prototype (Nakajima c/n or construction number 4401) started flight trials at Ojima Airfield, Ota, in August 1940 and revealed certain promise, although speed performance was down on the specified requirements and the landing speed was higher than the standards to which Japanese pilots were then accustomed. Forward visibility when the Ki-44 was tail down on the ground left something to be desired, but once in the air the three-section cockpit canopy allowed a good all-round view and general handling characteristics were good.

Ironing out the bugs

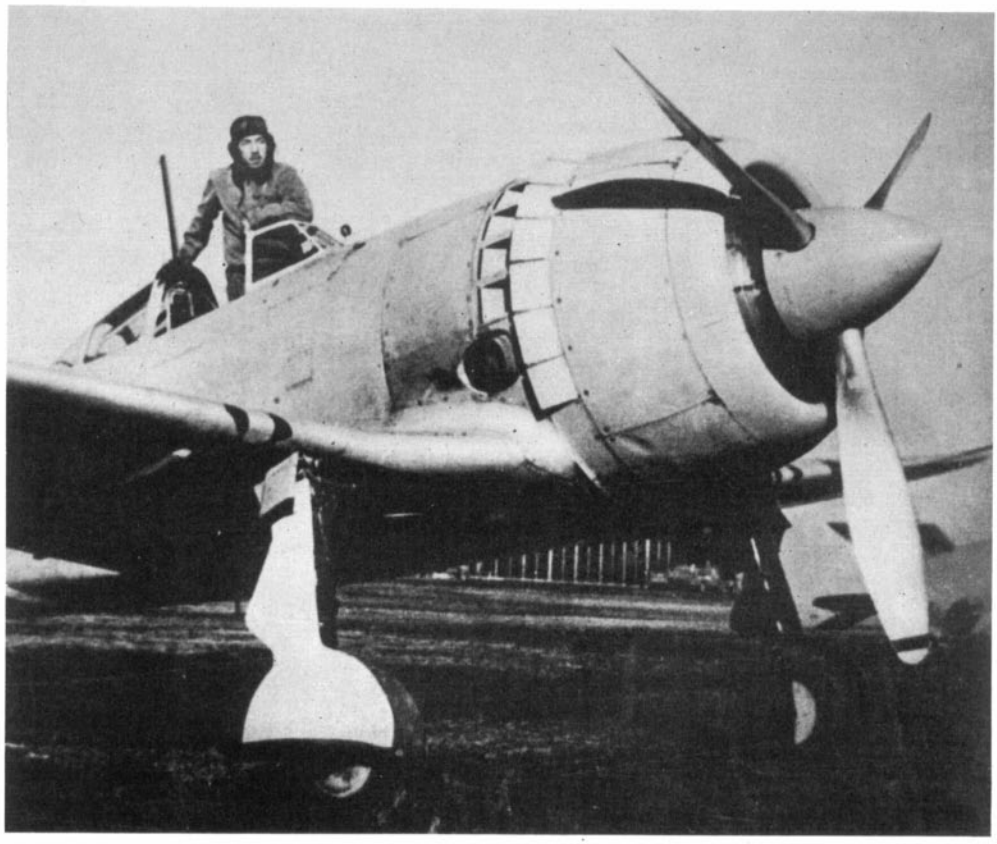
Nakajima was completing two further prototypes (c/ns 4402 and 4403) when the first aircraft flew, and had started work on an evaluation batch of seven pre-production Ki-44s (c/ns 4404–4410). The second and third prototypes were completed soon after the first, but the performance shortcomings of the initial prototype meant that work on the pre-production batch had to be held up while attempts were made to cure the problems.

Maximum speed proved to be only 342 m.p.h. (550 km./h.) at 13,120 ft. (4,000 m.), some 31 m.p.h. (50 km./h.) less than specified, while the time of climb to 16,400 ft. (5,000 m.) was 5 min. 54 sec., instead of the 5 minutes flat called for by the Koku Hombu. The first curative measures tried were to increase the rigidity of the engine mounting, to modify the cowling flaps and to redesign the supercharger air intake. With this done (and the armament removed), at a loaded weight of 5,180 lb. (2,350 kg.), the Ki-44 logged a maximum speed of 354 m.p.h. (570 km./h.) at 13,120 ft. (4,000 m.).

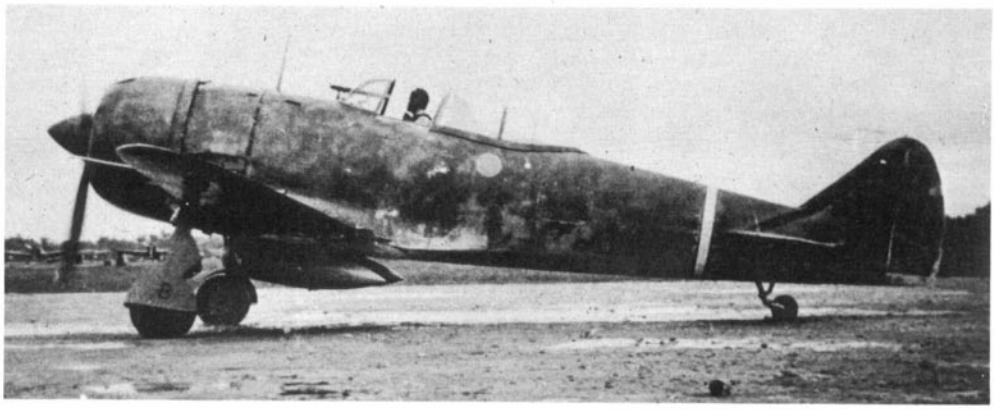
This was still considered insufficient and a continual series of modifications to the engine mounting and cowling was undertaken—the supercharger intake being altered six times, for example. Finally, after further changes to the engine cowling flaps and a firewall installation which made it possible to do away with the cooling vents around the upper fuselage, 389 m.p.h. (626 km./h.) was attained at 13,120 ft. (4,000 m.). The armament was not carried for these trials, but the Koku Hombu estimated that production aircraft, with the full complement of machine-guns, would be able to reach 360 m.p.h. (580 km./h.) at this altitude. Accordingly, the design was frozen and Nakajima was instructed to complete the pre-production aircraft and bring the second and third prototypes up to this specification.

Besides the various detailed differences in the engine area, the pre-production aircraft featured a simplified cockpit canopy, a relocated radio aerial (shifted from the cockpit canopy to the starboard side of the forward fuselage), new rudder contours, and provision for the carriage of two 28.6 Imperial gallon (130-litre) drop tanks under the wing centre-section. Armament

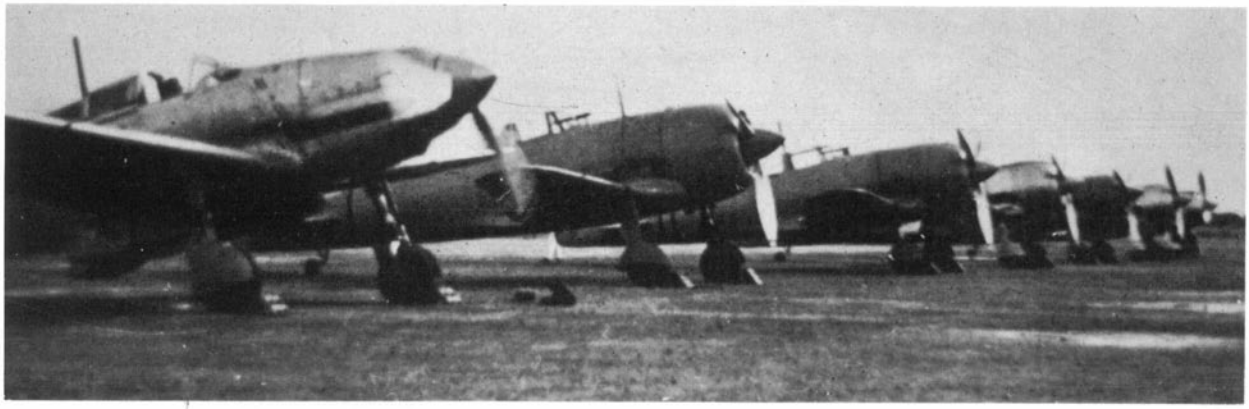
Three prototype and three pre-production Ki-44s lined up alongside a Kawasaki Ki-60 (nearest camera) at Fussa, Yokota. The prototype Ki-44s were painted grey-green, while the pre-production aircraft were natural metal with black anti-dazzle panels. (Photo: via Malcolm Passingham)



Nakajima test pilot Hayashi poses with the first prototype Ki-44 in the summer of 1940. A feature of the prototypes was the semicircle of cooling vents around the upper fuselage just aft of the cowling flaps.
(Photo: via Malcolm Passingham)



The 47th Chutai gave the Ki-44 its first taste of combat in operations over South-East Asia during the winter of 1941–42. Toting two drop tanks, the fifth pre-production aircraft (c/n 4408, hence the '8' on the mainwheel door) is seen here piloted by Captain Yasuhiko Kuroe. This pilot scored the first 'kill' recorded in a Shoki, during January 1942.
(Photo: Yasuho Izawa)



remained unchanged, comprising two 7,7-mm. Type 89 machine-guns in the upper forward fuselage and two 12,7-mm. Type 1 (Ho-103) machine-guns in the wings, outboard of the main undercarriage legs.

Completion of the seven pre-production Ki-44s was quickly accomplished during the summer of 1941, following the detailed changes outlined above, the last (c/n 4410) flying in the August. To speed up operational deployment of the Ki-44, the Imperial Japanese Army Air Force (IJAAF or simply JAAF) decided to form a special unit—the 47th Dokuritsu Hiko Chutai (47th Independent Air Company[1])—for service evaluation by experienced pilots who had distinguished themselves in China. On September 15 1941, all seven pre-production aircraft and the two modified prototypes were issued to this unit at Fussa, Yokota, which was also the home of the JAAF's Air Test Department (equivalent to the RAF's Aeroplane & Armament Experimental Establishment (A&AEE), Boscombe Down, and the USAAF's Wright Field facilities at that time).

After an initial period of getting used to their new equipment—which differed radically from any of the JAAF's previous fighter aircraft—the 47th Chutai moved to Canton, on the Chinese mainland. This unit's subsequent activities are mentioned later in this *Profile*.

The first production batch

The Ki-44's general performance with the 47th Chutai on the Asian mainland was good enough to persuade the Koku Hombu that the type was a worthy aircraft to be ordered into production—although there was still some concern about the high speed performance. An initial series of 40 aircraft was ordered in January 1942, designated Ki-44-I and given the name Shoki (a mythological demon which was said to defend Japan against danger).

The Ki-44-I was similar to the pre-production version, but only a few of the batch of 40 had been completed before the armament was boosted by the replacement of the cowling-mounted 7,7-mm. Type 89 machine-guns by a pair of 12,7-mm. Ho-103 machine-guns. With the four 12,7-mm. guns, the aircraft was known as the Ki-44-I-Ko[2], while a further slight variation on the theme was the Ki-44-I-Otsu, on which the oil cooler was moved from inside the engine cowling to a point beneath it outside. The last few of the batch featured a slight change to the main undercarriage; the lower hinged portions of the fairings were moved from the legs to the lower fuselage. This alteration, which resulted in the designation Ki-44-I-Hei, was dictated by troubles with the original system during service evaluation.

Close-up of the last pre-production Ki-44, showing cowling and undercarriage details, as JAAF crewmen prepare for take-off. (Photo: Koku Shonen via Richard Ward/Richard Bueschel)

The Imperial Japanese Army Air Force evaluation trials were completed in September 1942 and the Ki-44-I was officially adopted by the service as the Army Type 2 Single-seat Fighter, Model I. The deciding factor had been a series of comparative tests, held at Kakamigahara, during that summer, of the Ki-44-I alongside the Kawasaki Ki-61, Nakajima Ki-43-II Hayabusa, Messerschmitt Bf 109E and the Curtiss P-40E Warhawk. The Ki-61 was considered to be the best of the bunch, but the Shoki proved to be superior to the German and American types. (The Ki-61 was then in the early development stage but later entered production as the Army Type 3 Single-seat Fighter, receiving the Allied code-name 'Tony'. Readers are referred to *Profile* No. 118.)

A more powerful motor

This seeming acceptance of the Ki-44-I's capabilities was not entirely comforting, however,

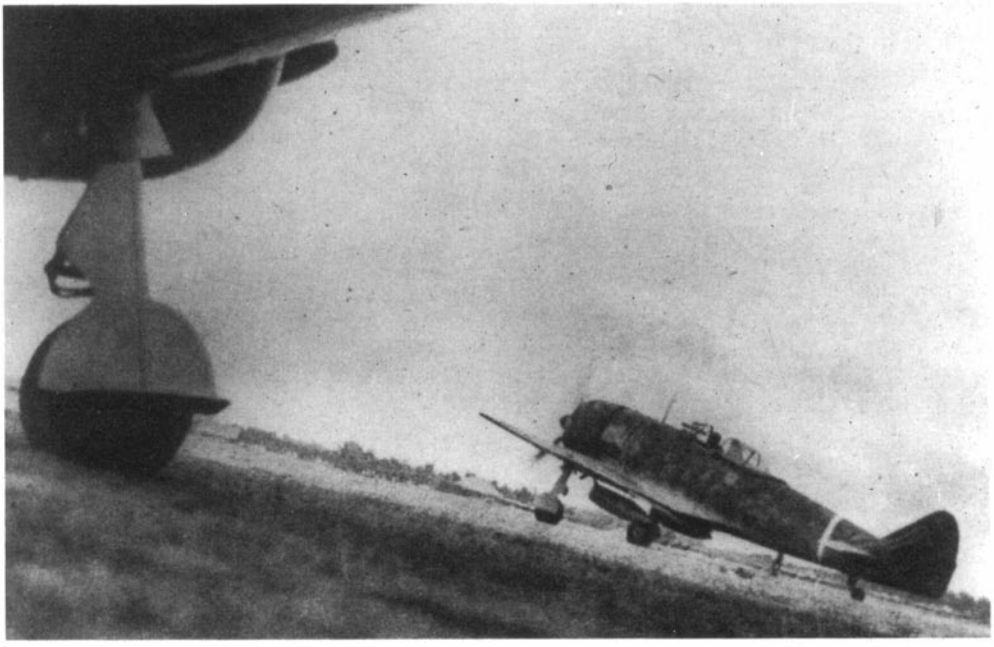
[1] The organization of the IJAAF has been dealt with in René Francillon's excellent *Profiles* on Japanese Army aircraft, but readers may care to note that the basic unit was the Air Regiment, designated according to its primary function. The Fighter Regiment had an establishment of about 48 aircraft, comprising three Companies with 15 or 16 aircraft each; Companies, in turn, were operated tactically as Squads (or Sections) of three to four fighters each. For special purposes, Independent Air Companies were formed, the 47th being one of these units.

[2] All aircraft designed for the Japanese Army Air Force were assigned a Ki-number (this coming from Kitai which meant airframe): hence Ki-44, which applied to the original design and to the prototypes. Production models were allocated Roman numerals: Ki-44-I indicating the first and Ki-44-II the second, for example. Minor modifications within a production series were indicated by additional Japanese characters: Ki-44-I-Ko, -Otsu and -Hei (usually represented as Ki-44-Ia, -Ib and -Ic in the English alphabet for the sake of convenience).

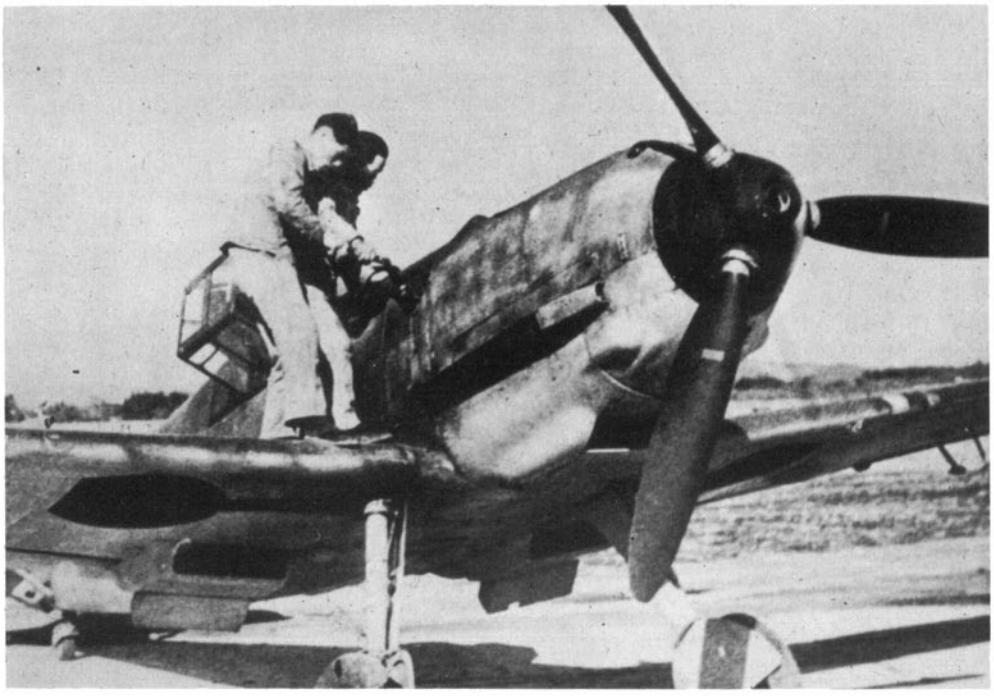
because the aircraft was, in fact, slower than the Mitsubishi Ki-46 reconnaissance aircraft (Allied code-name 'Dinah', see *Profile* No. 82). One approach to the speed problem had been tried when a Ki-44-I-Hei had been modified to mount a pair of two-blade contra-rotating propellers. However, this did not work out very well—not least because of the complexity of the gearbox—and the aircraft was converted back to standard configuration.

Already, early in 1942, designer Koyama had faced up to the need to find a more powerful engine, an enforced step in that the Ha-41 was being taken out of production. For the Ki-49 bomber, which had also been powered by the Ha-41, the Nakajima Ha-109, rated at 1,520 h.p. for take-off, had been chosen as the replacement. It was a natural choice, being a development of the Ha-41, with similar dimensions. Koyama also chose this engine for the Ki-44, the Ha-109's extra power more than compensating for its increased weight.

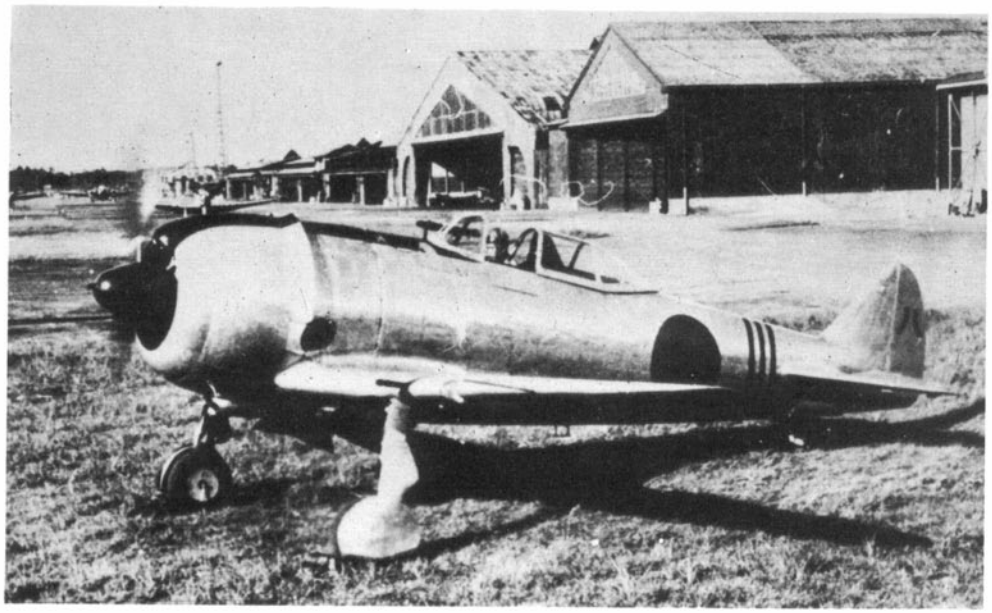
Nakajima was told to produce five prototypes and three pre-production examples of the



This photograph is thought to show the second prototype Ki-44 (c/n 4402) during its service with the 47th Chutai, when it was flown by Warrant Officer Mitsumoto.
(Photo: Koku Asahi via Richard Ward/Richard Bueschel)



One of the aircraft against which the Ki-44-I was evaluated during the summer of 1942 was the Messerschmitt Bf 109E (see Profile No. 40). JAAF ground handlers are seen preparing to start the engine. Although not used in combat by the Japanese, the Bf 109 was given the Allied code-name 'Mike'.
(Photo: Aireview via Rene J. Francillon)



Two views of the third prototype Ki-44-III at Fussa. In this version, the Ha-41 of the Ki-44-I was replaced by an Ha-109.
(Photos: via Malcolm Passingham and Maru via A. Ishikawa)

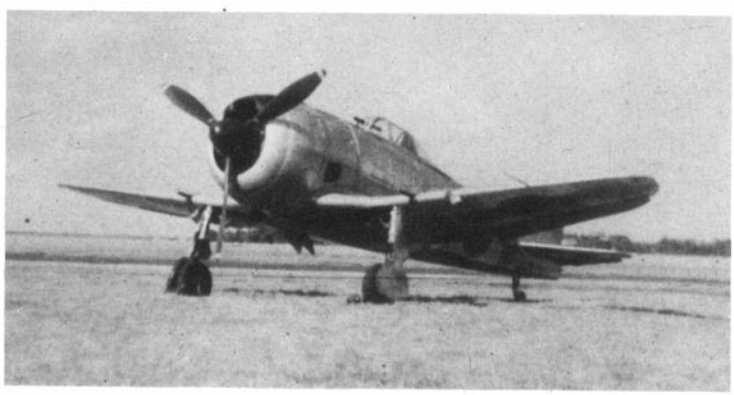
Ha-109-powered Shoki, which received the JAAF designation Ki-44-II, or Army Type 2 Single-seat Fighter, Model 2. Besides the new engine installation, the Model 2 version featured a stronger undercarriage and some protection for the pilot and the fuel tanks. The Ki-44-I's telescopic gunsight was intended to be replaced by a reflector system but, in practice, a shortage of the latter meant that a large proportion of Ki-44-IIs was delivered with the old-style telescopic sight. The prototypes and pre-production aircraft, which were all delivered during the late-summer and autumn of 1942, were armed with two 7,7-mm. Type 89 machine-guns in the upper forward fuselage and two 12,7-mm. Ho-103 machine-guns in the wings.

The Ki-44-II was put into production in November 1942 on completion of evaluation of the pre-series aircraft. The first examples were known as the Ki-44-II-Ko and had the same armament as the prototype and pre-production examples. However before the year was out, the -II-Ko had given way to the Ki-44-II-Otsu, armed with four 12,7-mm. Ho-103 machine-guns, this being the principal production variant.

Beginning early in 1943, cannon-armed versions began to be interspersed with the standard Ki-44-II-Otsu, these having the generic designation Ki-44-II-Hei. A considerable amount of confusion exists today as to the variations on the -II-Hei theme (which regrettably the author has been unable to resolve). One variation which does not appear to have been widely used was the installation of four 20-mm. cannon in lieu of the four machine-guns. In view of its seeming effectiveness, it is surprising that more use was not made of this installation, although there was a shortage of 20-mm. cannon in Japan (as witnessed by the need to import 800 Mauser MG 151 20-mm. cannon from Germany in 1943 for installation in the Ki-61).

The main production variations of the Ki-44-II-Hei were either two wing-mounted 37-mm. Type 3 (Ho-203) cannon and two fuselage-mounted 12,7-mm. Type 1 (Ho-103) machine-guns, or two wing-mounted 40-mm. Ho-301 cannon and two fuselage-mounted 12,7-mm. guns. The Ho-203 installation was provided with only 25 rounds per gun, but Ki-44-II-Hei aircraft thus equipped had some success against Boeing B-29 Superfortress bombers during 1944–45. When fitted with 40-mm. Ho-301 cannon, the Ki-44 was less satisfactory. The Ho-301 was interesting in that the projectiles—only 10 per gun—had a self-contained propellant, rather than making use of conventional cartridges. Employed against armoured vehicles, as well as B-29s, the Ho-301's main drawback was its maximum effective range of only about 500 feet (150 m.).

Late-production Ki-44-IIs were fitted with individual exhaust stacks with thrust augmentation, following the testing of this feature on the Ki-44-III. However, the number of aircraft



involved does not appear to have been very large.

The Final (Unsuccessful) Variant

Nakajima was still looking for ways to improve the Ki-44's performance, even as production of the Model 2 was rising to about 50–60 per month at its peak. Early in 1943, work began on the Ki-44-III, the Model 3, powered by the 2,000 h.p. Nakajima Ha-145 18-cylinder, two-row radial. The -III differed externally from its predecessors in having increased wing area—204.5 sq. ft. (19.0 sq. m.), compared with 161.5 sq. ft. (15.0 sq. m.)—and a larger vertical tail unit. The new version also incorporated exhaust thrust augmentation, like late-model Ki-44-IIs. The prototype Ki-44-III was first flown in June 1943 and Nakajima then produced a pre-production batch of half-a-dozen in two versions: the Ki-44-III, armed with four 20-mm. Ho-5 cannon (two in the wings and two in the upper forward fuselage); and the Ki-44-III-Ko, fitted with two fuselage-mounted 20-mm. Ho-5 cannon and two wing-mounted 37-mm. Ho-203 cannon. Evaluation of the Ki-44 Model 3 was completed late in 1943 and the Koku Hombu decided that, in view of the great promise shown by the Nakajima Ki-84 Hayate (Allied code-name 'Frank', see *Profile* No. 70), development of this version should be terminated.

This was not the end of the Shoki, however, since the Ki-44-II remained in production until the end of the following year. The loss of the JAAF leader's faith in the Ki-44 was brought about by the first B-29 Superfortress raids, from bases in China. With its cannon armament and fast climb rate, the Ki-44-II-Hei was thought to be well-suited to interception of the B-29: terrible disillusionment awaited the Koku Hombu when the two aircraft tangled for the first time in the late-summer and early-autumn of 1944. True, some B-29s were shot down but it was obvious that the Ki-44 was no antidote to the American bomber. Production of the Shoki was ordered to be halted as soon as possible and the 1,225th and last example came off the Nakajima line at Ota, which had built all Ki-44s, during December 1944.

The Ki-44-II Described

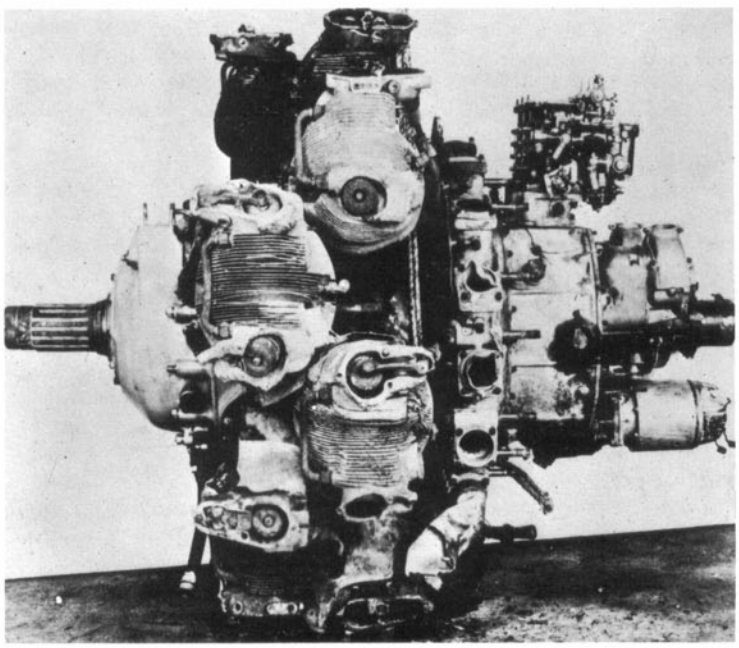
Put briefly, the Nakajima Ki-44-II Shoki was a single-seat, all-metal, low-wing monoplane fighter. The wing was a two-spar structure with a stressed-skin covering, except for the control surfaces, which were covered with fabric. The centre-section was an integral part of the fuselage and housed a 23-Imp. gal. (105-litre) fuel tank in the port half and a 27.5-Imp. gal. (125-litre) fuel tank in the starboard half. The trailing-edge 'butterfly' flaps provided extra manoeuvrability in combat, being actuated by a switch on the pilot's control column.

The stressed-skin-covered fuselage was of oval section aft of the engine and housed the pilot beneath a two-piece canopy, the rear part of which slid aft to allow entry and exit. The tailplane was an all-metal structure, covered with stressed-skin, apart from the fabric-covered control surfaces. A 56-Imp. gal. (255-litre) fuel tank was sited forward of the pilot, with an 8.8-Imp. gal. (40-litre) oil tank between it and the powerplant. A Type 99 wireless set was provided for the pilot, who sighted his guns through either a telescopic or a reflector gunsight. Armour protection was provided for the pilot and the fuel tanks.

Power was provided by a Nakajima Ha-109 Army Type 2 14-cylinder, air-cooled supercharged radial engine, rated at 1,520 h.p. for take-off, 1,440 h.p. at 7,050 ft. (2,150 m.), and 1,320 h.p. at 17,220 ft. (5,250 m.). The engine drove a constant-speed, three-blade metal propeller of 9.84 ft. (3.0-m.) diameter. All three undercarriage members were retractable. The mainwheels folded inward to lie flat under the centre-section, while the tail unit retracted backwards.

The Ki-44-II-Otsu had an armament of four 12,7-mm. Ho-103 Type 1 machine-guns, with 250 rounds per gun. Two of the guns were sited in the upper decking of the forward fuselage and the other two in the wings outboard of the airscrew disc and the main undercarriage legs. Provision was made for a spent cartridge collector beneath each wing. The various cannon installations of the Ki-44-II-Hei have been discussed in an earlier section. Hardpoints under the wing centre-section were stressed to take either two 220-lb. (200-kg.) bombs or two 28.6-Imp. gal. (130-litre) auxiliary tanks.

When it first entered service, the Shoki was considered quite a handful by Japanese Army



The Nakajima Ha-109 fourteen cylinder, two-row radial was rated at 1,520 h.p. for take-off and powered the Ki-44-II series.
(Photo: US National Archives via Rene J. Francillon)

pilots, not least because of its high landing speed. However, they came to appreciate its good roll and dive characteristics and its steadiness as a gun platform. Certain manoeuvres were restricted, notably spins, stalls, snap rolls and inverted flight at high speed. The main points of criticism were the poor visibility in a three-point attitude on the ground, and the ineffectiveness of the pilot and fuel tank armour protection against enemy 0.50-in. (12,7-mm.) machine-guns, not to mention even larger calibre ammunition. One Ki-44-II, captured in the Philippines early in 1945, was evaluated by the Allies, as 'S 11' of the Technical Air Intelligence Unit—South West Pacific Area. By this time, the exercise was largely academic since the Allies were by then operating superior performance aircraft and the B-29 was showing an encouragingly high rate of survivability.

Service Deployment of the Shoki

Mention has been made of the formation of the 47th Chutai earlier in this article and, if the Ki-44's experimental evaluation by this unit from the autumn of 1941 can be considered operational service in the proper sense of the word, the type served throughout the Pacific War. It certainly did not make much of an impact initially because it was not identified by the Allies until the second half of 1943. On being established as a definite type, it was allocated the code-name 'Tojo'. (By 1943, the Allies were quite discriminating about identifying new aircraft, after being rather profligate early in the Pacific War: even some imaginary types received code-names in the chaotic early days. Towards the end of the war, however, despite good intelligence, one notable fighter—the Kawasaki Ki-100 Type 5 Single-seat Fighter—completely escaped perception.)

The 47th Chutai, also known as the 'Kingfisher' company, made the move to Canton, in China, at the end of November 1941, and was attached to the 12th Sentai (12th Air Regt) on completion of the transfer. Almost immediately, the unit moved to Indo-China to support the Japanese landings in Malaya. At first, flying the Ki-44 was a rather frustrating affair, because of serviceability problems, but the unit's morale rose as the invasion of Malaya made progress and hit a peak during the first week of January 1942 when Captain Yasuhiko Kuroe shot down a Brewster Buffalo over Johore. Captain Kuroe was leader of the 47th's 3rd Shotai (Squad); among the unit's other pilots were Major Sakagawa, leader of the 1st Squad, and Captain Jinbo, leader of the 2nd Squad, while Major Itagawa commanded the unit. Rarely can a combat formation have boasted such distinguished members!

Once the Malayan campaign was over, the 47th Chutai returned to China and in May 1942 it was expanded to full Air Regiment status. By this time, the original batch of prototype and pre-production Ki-44s was being supplemented by Ki-44-Is. The same month was also the occasion of the audacious American raid on the Japanese mainland by North American B-25 Mitchells of the USAAF led by Major James Doolittle. Launched from the aircraft carrier USS *Hornet*, these aircraft flew low and fast over Japan dropping a small number of bombs and causing little damage. However, they served a warning on the Japanese that the Americans would attack whenever the opportunity presented itself. Since the Ki-44 was designed as a defence interceptor above all, the 47th Fighter Regiment was moved back to Japan in case the enemy should try to repeat the tactic, being based at Narimasu Airfield, in the Tokyo area.

It is evident that, in their time of torment, the Allies took little notice of the Shoki—if it was ever thought of, which seems improbable in view of the long interval before the type was allocated a code-name. Meantime, the process of full-scale conversion to the new type was underway. The 9th and 87th Sentais began conversion from the Ki-27 to the Ki-44 during the summer of 1942, followed within a few weeks by the 85th Sentai—this unit also having previously had Ki-27s.

It is noteworthy that all three of these units were assigned to the Asian mainland. The 9th Sentai was made part of the China Occupation Force, based at Nanking, and was destined to spend the whole of the rest of the Second World War in the area. The 85th was also sent to Nanking, while the 87th was assigned to the defence of Harbin, Manchuria (then known as Manchukuo). In the event, the latter unit did not stay long in Manchuria, moving early in 1943 to Palembang, in the Netherlands East Indies, to defend the oil refineries so vital to the Japanese war effort.

The operations of the China-based units are of considerable interest and have received little attention to date. There is insufficient space to discuss the convoluted politics of the Chinese during 1941–45—or of the American involvement in the country[1]—but it could be fairly said that, by and large, the Chinese Air Force was not particularly occupied in fighting the Japanese. Chiang Kai-shek's regime was more concerned about maintaining its position *vis-à-vis* the Communists and letting external events take care of the invading Japanese. The upshot of this was that almost the only active aerial opposition to the Japanese was furnished by General Chennault's Fourteenth Air Force. Technically, the Allies outnumbered the Japanese Army Air Force units in China, but accounting the 14th AF as the sole effective counterweight the balance was roughly equal.

In the first instance, the Shoki was able to give

[1] The best work to date on both Chinese politics and the United States relationship with China is Barbara W. Tuchman's *Stilwell and the American Experience in China, 1911–45* (The Macmillan Company, New York, 1971).

Key to colour side views

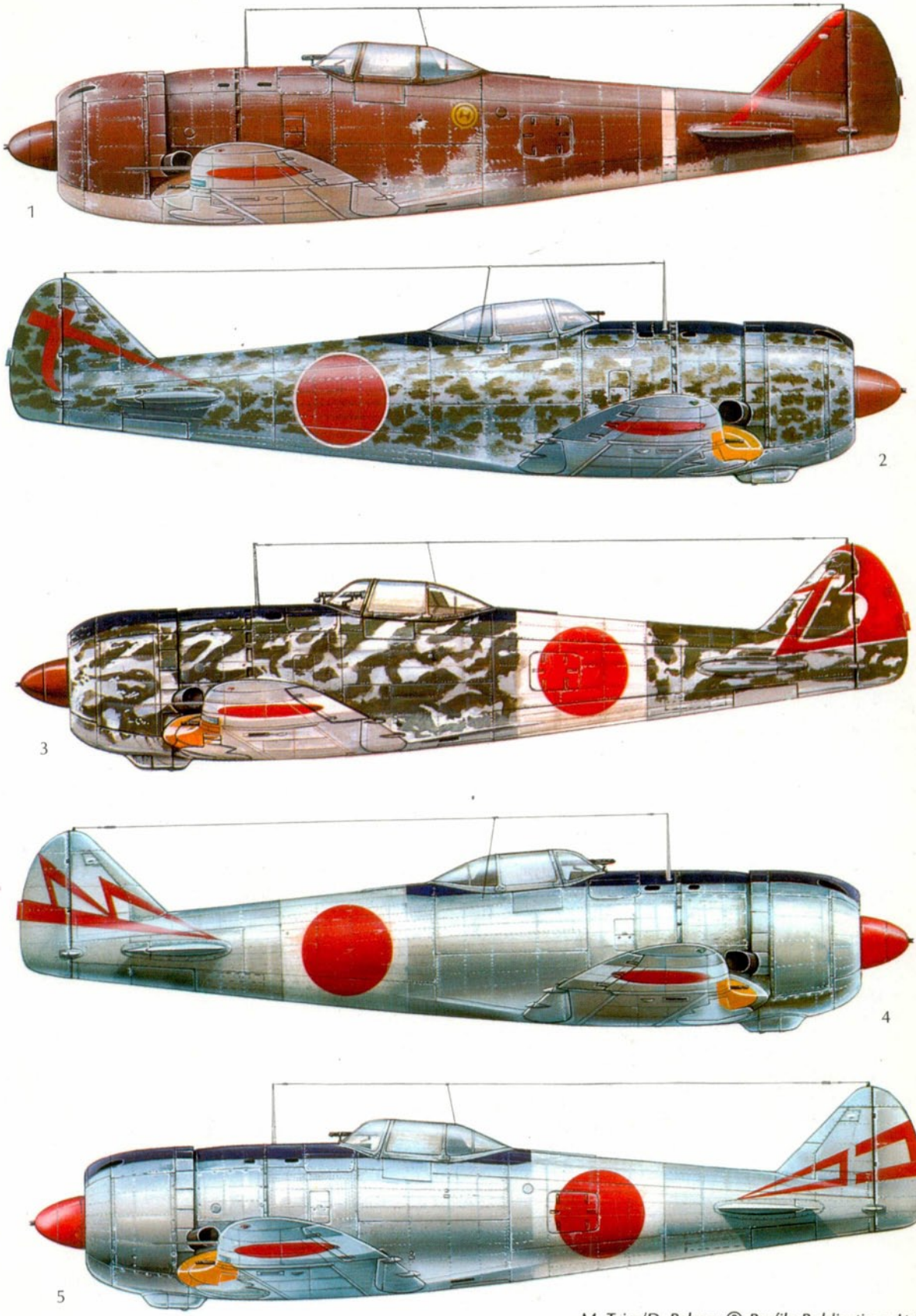
1 Pre-production Ki-44 (Aircraft c/n 4408), 47th Chutai, flown by Captain Yasuhiko Kuroe, French Indo-China, January 1942.

2 Ki-44-II-Otsu, 2nd Chutai, 9th Sentai, Nanking, China, mid-1944.

3 Ki-44-II-Otsu, 23rd Sentai, home island defence, Japan, 1944.

4 Ki-44-II-Otsu, 2nd Chutai, 47th Sentai, defence of Tokyo, 1944.

5 Ki-44-II-Otsu, 2nd Chutai, 70th Sentai, Japan (western defence sector), spring 1945.



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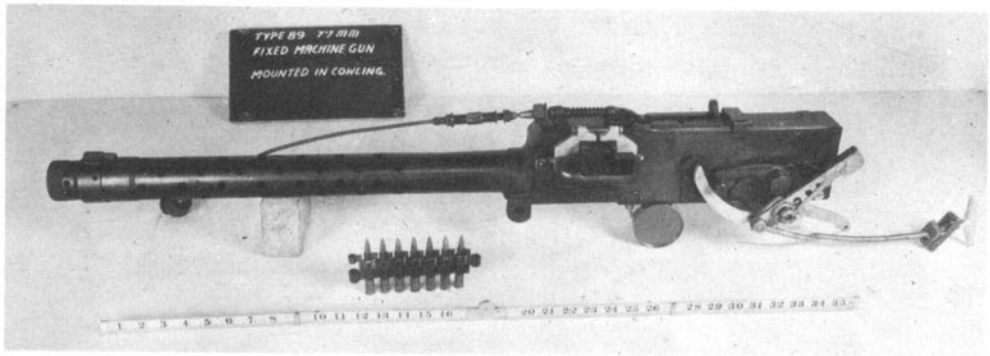

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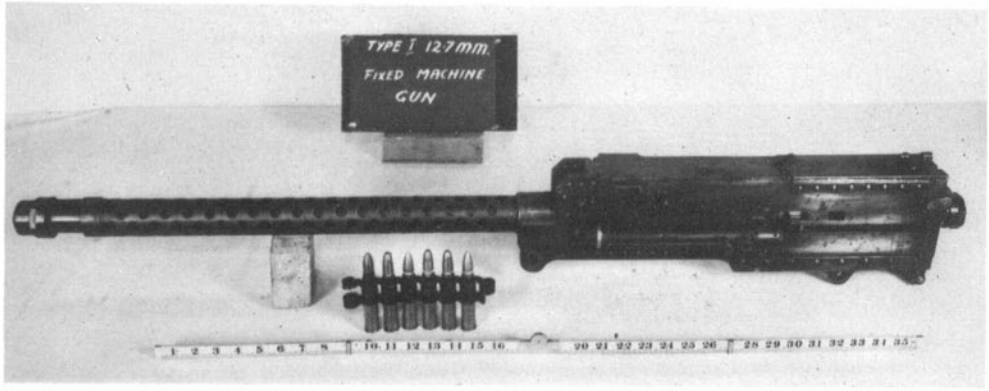

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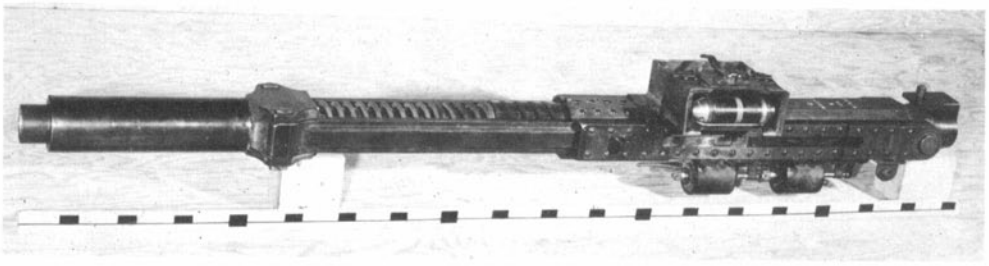

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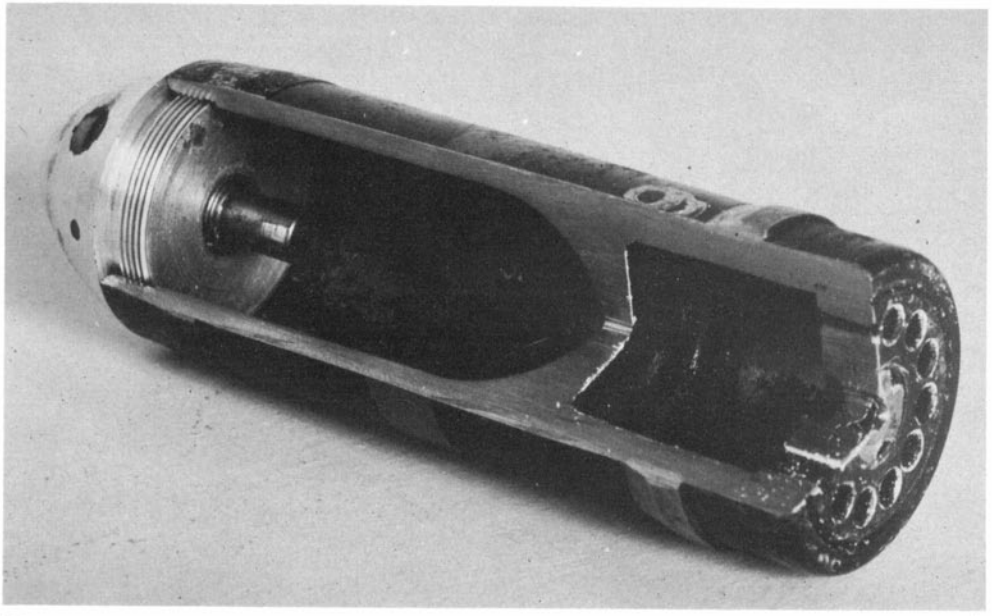


Shoki armament: (1) the 7.7-mm. Type 89 Model 2 machine-gun (the scales shown in these photographs are in inches – 1 inch = 2.54 cm.); (2) the 12.7-mm. Ho-103 (Type 1) machine-gun; (3) the 40-mm. Ho-301 cannon fitted to some Ki-44-II-Hei aircraft; and (4) the special shell, without cartridge, fired by the Ho-301. The propelling charge for this 40-mm. shell was contained at the base and exhausted through 12 ports. The Ho-301's effective range was only about 500 ft. (150 m.). (Photos: US National Archives via Rene J. Francillon)

a very good account of itself in China, being opposed chiefly by Lockheed P-38 Lightnings and Curtiss P-40s, which were not only slower but less manoeuvrable. The Allied build-up of air power in China, the prelude to using the country as a base for Boeing B-29 Superfortress raids on the Japanese home islands, resulted in a counter by the Japanese. Among the reinforcements sent by the Koku Hombu during 1944 was the 22nd Sentai, assigned to the defence of Hankow in August 1944. The 29th Sentai had a brief sojourn in Formosa during the summer of 1944, before being rushed to the Philippines late in the year, while the 70th was assigned to Manchuria.

The arrival of the B-29 in China and the heavy bomber raids on Japan was, as will be related, a serious problem for the Ki-44 units. However, no less troublesome was the advent of the North American P-51 Mustang, the first fighter in the area capable of outclassing the Shoki. The Japanese Army Air Force units in China and Manchuria badly needed further strengthening to meet the twin challenges but, as American pressure in the Pacific grew more difficult to handle, reserves were running dry.

The first major tussle between the Shoki and the Superfortress came over Manchuria in September 1944. The 70th Sentai's Ki-44s were fitted with 37-mm. Ho-203 cannon but even this could not conceal the fact that the fighter was unable to provide an effective antidote to the American bomber. In one raid the previous month, the Japanese had succeeded in knocking down 14 B-29s over their homeland (out of a force of 72), but the interception of 90 Superfortresses over Anshan, Manchuria, on September 8 1944, proved to be a bitter disappointment. Only three B-29s were shot down on this occasion and on the 26th of the month not one of a raiding force of 83 was downed—while the Shokis were badly mauled. The Americans claimed 11 confirmed and nine 'probable' Shokis, plus over two dozen damaged.

The Japanese did not disclose their losses but they were sufficiently serious to lead the Koku Hombu to decide that single-engined fighters were unsuitable for intercepting the B-29. Besides the China-based Shokis, the type was assigned to home defence with the 47th and 246th Sentais, the latter having converted from the Ki-27 in mid-1943. In October 1944, the 23rd Sentai returned from Iwo Jima and exchanged its Ki-43s for the Ki-44 as a home defence unit. However, while the B-29 'problem' was growing, another threat materialised when the Americans invaded the Philippines in October 1944.

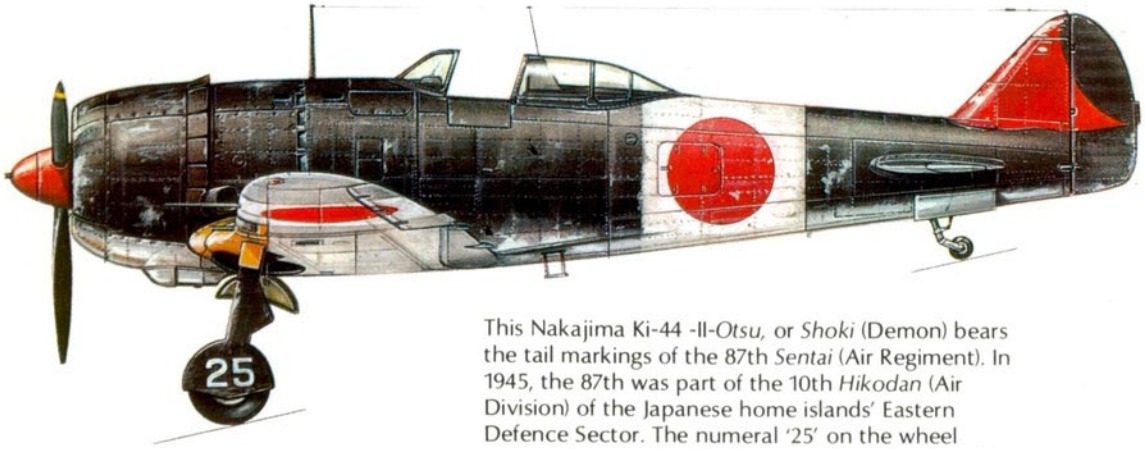
The Shoki-equipped 246th Sentai had been moved to Formosa that month but was assigned to the Philippines within a few weeks, where it joined the 22nd and 29th Sentais. The 22nd had been the first Shoki unit in the area, absorbing the initial crunch of the US invasion. The hurried reinforcements did the defending Japanese no good—the vast American advantage in quality and quantity was to all intents and purposes unstoppable. The back of the Japanese air effort was broken in January 1945 when US Navy carrier aircraft entered the fray in some numbers, strikes on Clark Field, Manila, during the first week of the month destroying many aircraft on the ground.

The 246th Sentai was so badly hammered that it was taken off operations in December 1944 and shipped back to Japan for reforming and re-equipping with Ki-44s. Shortly afterwards, the 22nd moved out to Japan for home defence duties and the 29th returned to Formosa, from whence it came.

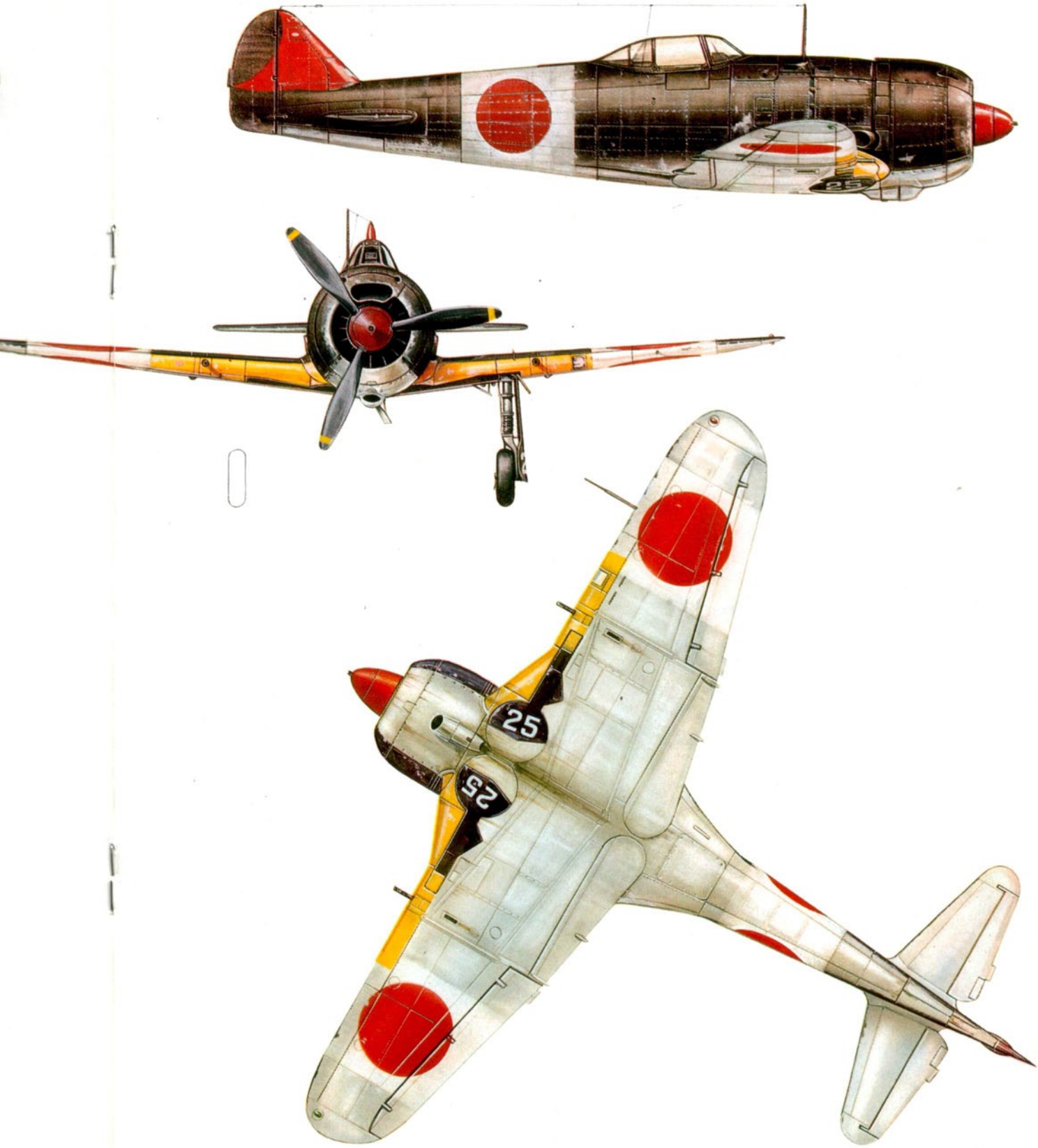
As noted earlier, the 87th Sentai was also in South East Asia, defending the oil fields in Sumatra. The unit had also been detached to the Burma front and Malaya during 1943–44. Initially, activity in Sumatra revolved round routine—and undisturbed—patrols of the Palembang area. However, a surprise attack on the oil fields was launched by a Royal Navy carrier-based force of Avenger bombers and escorting fighters on January 4 1944. Just 20 days later, the British returned and besides hitting the oil refineries caught the 87th Sentai on the ground. Captain Hideaki Inayama shot down two Grumman Avengers, but the 87th lost 12 Ki-44s and several pilots in the raid. The Japanese situation in Sumatra gradually deteriorated during 1944 as Allied air attacks increased and the 87th was withdrawn, along with other JAAF units in December of that year, and allocated to home defence duties.

Shoki strength in operational units reached a peak at the end of 1944—ironically, just as the last examples were coming off the production line. The type's lack of success against the B-29 Superfortress, which was a major factor in its being withdrawn from production, boded ill for the Japanese since there were seven Ki-44 Sentais based in Japan at the beginning of 1945, and one in Formosa, all assigned to home defence. (The 9th Sentai was based at Nanking.) The tough enemy opposition and the closing of the line meant that Shoki strength was to decline rapidly as 1945 progressed.

The year opened as B-29 attacks were building up to a peak in the spring, every available Japanese fighter being sent up in vain attempts to stem the bombing onslaught. Some indication of the defenders' desperation can be gained from the considerable attention which was given to ramming attacks as a method of stopping the Superfortress. A pilot of the 47th Sentai had rammed a B-29 during a raid on November 24 1944 (killing himself) and the unit then proceeded to form a special flight, known as the Shinten (Sky Shadow) Air Superiority Company, for similar attacks. Manned by volunteers, the Shinten Company had four stripped-down Ki-44s and was the object of a considerable propaganda campaign to boost the morale of



This Nakajima Ki-44 -II-*Otsu*, or *Shoki* (Demon) bears the tail markings of the 87th *Sentai* (Air Regiment). In 1945, the 87th was part of the 10th *Hikodan* (Air Division) of the Japanese home islands' Eastern Defence Sector. The numeral '25' on the wheel covers identifies this *Shoki* as that flown by Captain Hideaki Inayama, JAAF, of the 87th's *2nd Chutai* (Air Company)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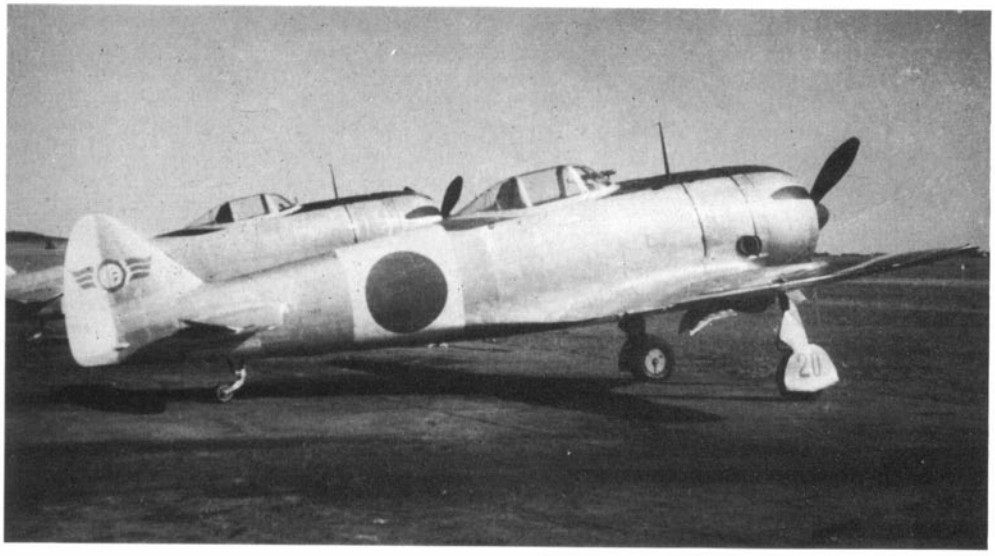
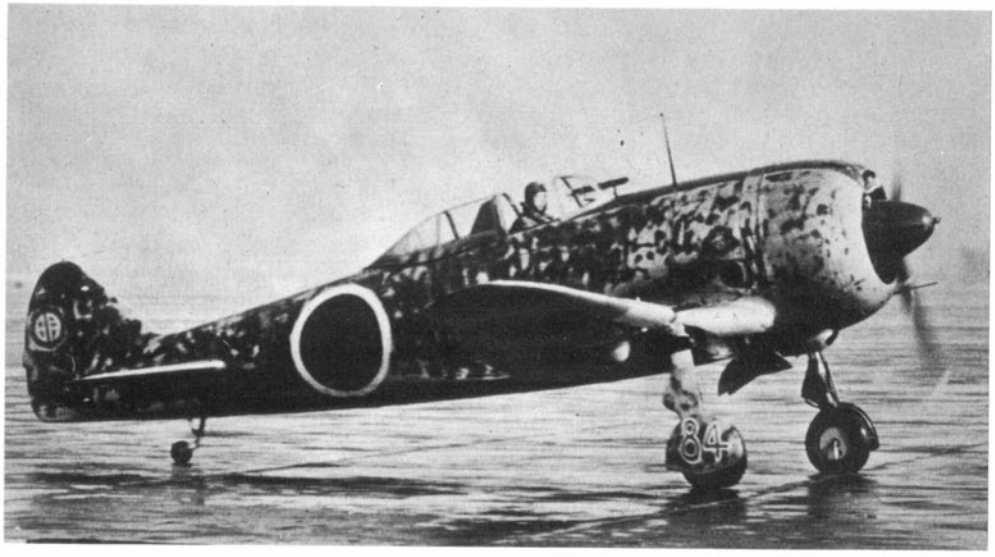


Ki-44-IIs at the Akeno Fighter Training School. The uncamouflaged aircraft, with the white fuselage band and winged tail insignia, was operated by the Instructors' Flight. The camouflage effect on the other aircraft was achieved by the simple expedient of daubing dark-green paint on the natural metal finish.
(Photos: via Rene J. Francillon and via Malcolm Passingham)

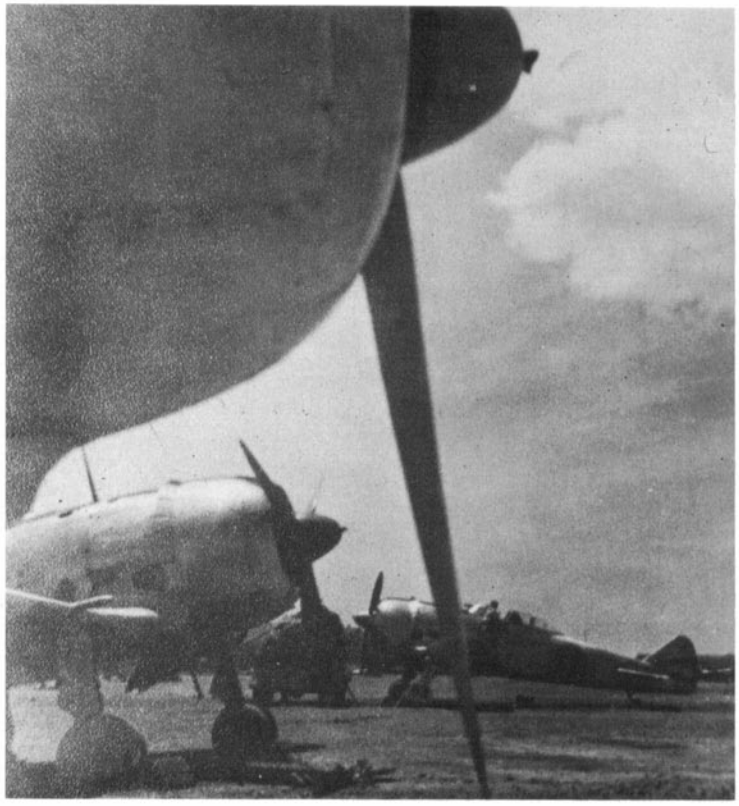


Ki-44-II of an unidentified Sentai.
(Photo: via Malcom Passingham)

the Japanese 'man in the street'. The results obviously were not sufficient to stem the mounting tide of raiding aircraft.

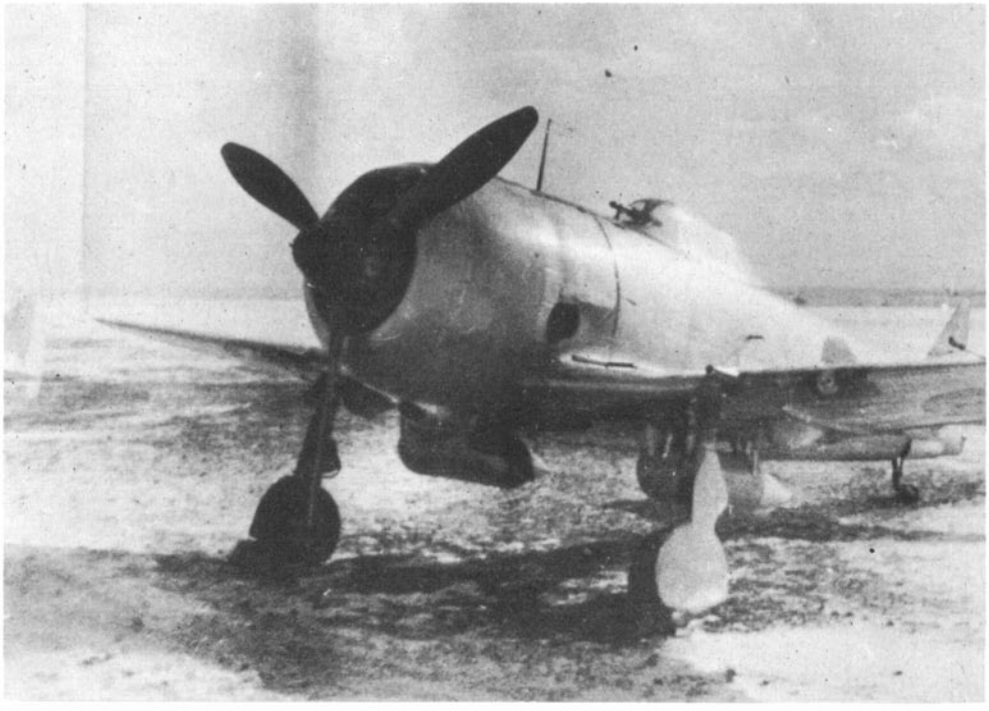
Of the Shoki units defending the homeland, four were based in the so-called Eastern Defence Sector with the 10th Hikodan (Air Division, similar to an RAF Group)—the 22nd, 23rd, 47th and 87th Sentais; one with the 11th Hikodan in the Central Defence Sector—the 246th Sentai; and two with the 12th Hikodan in the Western Defence Sector—the 59th (which fought over Okinawa) and the 70th Sentais. The Ki-44's relative lack of success against high-flying B-29s the previous summer boded ill for the future. The best method of attack for the Nakajima fighter was to struggle for altitude ahead of the big bombers and then make a shallow diving head-on pass, diving away just short of the enemy to avoid being jostled by the B-29's vortices. Tail and belly approaches were not recommended.

The situation changed markedly for the worse in February 1945—as if it was not bad enough already—when American and British carrier aircraft began to make their appearance around Japan. Long-ranging P-51 Mustangs, escorting the B-29s, were encountered a little later and then, in May, the Americans began to use Okinawa as a base. The final pressure came in July 1945 and continued during the last five weeks before August 15, when enemy carrier forces kept Japan under continuous attack, airfields being a favourite target. When the end came, only three Sentais—the 9th, 29th and 87th—were still more or less fully-equipped with the Ki-44.

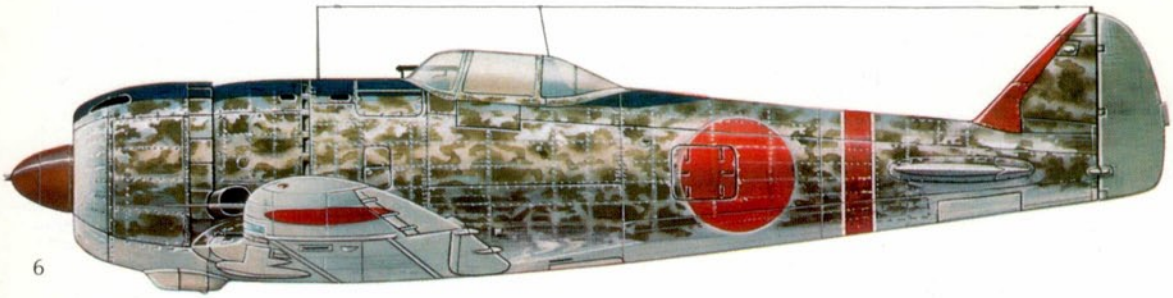


Brief Post-War Use in China

Generally, the Ki-44's end was ignominious: along with all the other aircraft littering Japan's airfields, except for a few considered worthy of transportation back to Britain and the USA, the



The 70th Sentai on active service: (below) an aircraft —which appears to be a Ki-44-II-Hei with wing-mounted Ho-203 cannon— at Kyoju, Manchuria, in December 1943; and (above) Ki-44-IIs at Kashiwa, Japan, on home defence duties during the winter of 1944–45.
(Photos: Yoshio Yoshida via Yasuho Izawa)



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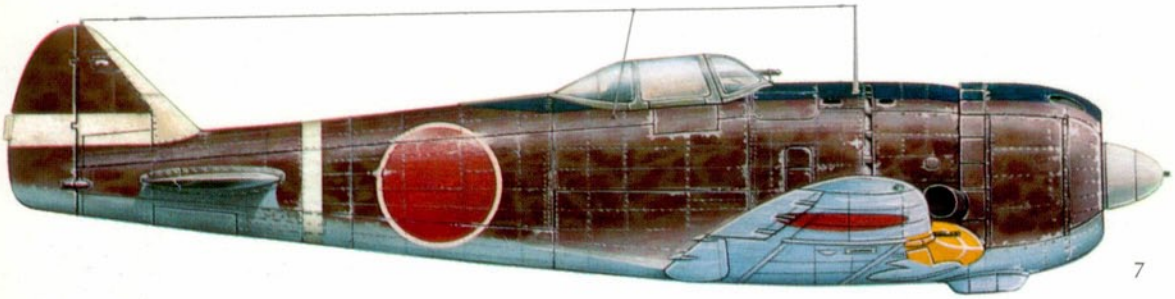

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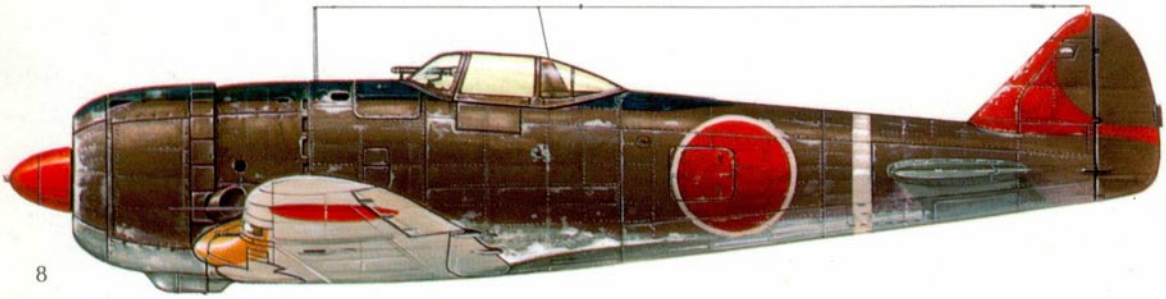

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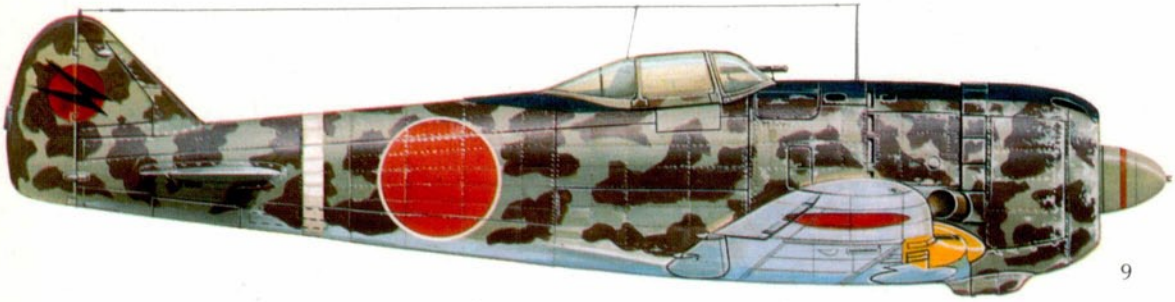

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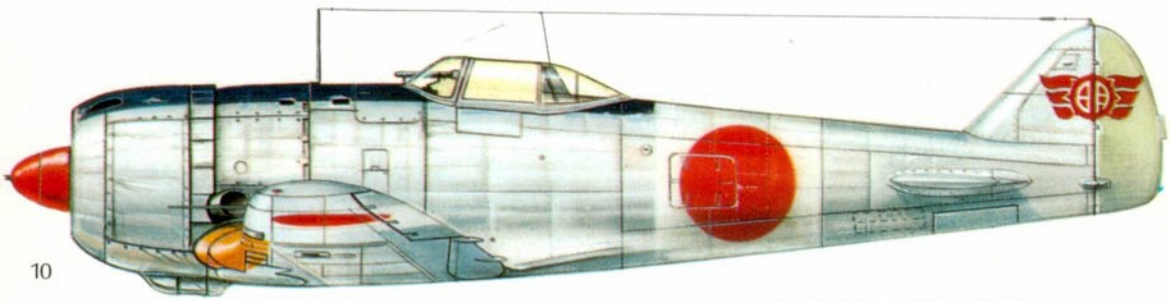

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surviving Shokis were scrapped. At airfields around the country, aircraft were piled into heaps, doused with gasoline and burnt.

However, in China, battle-lines were being drawn up by the Nationalists and the Communists, to finally settle the long internecine strife whose conclusion had only been postponed by the war in the Pacific. The 9th Sentai had been based at Nanking and, as soon as the World War was over, its Ki-44s were taken over by the Chinese Nationalist Air Force. The Air Force of the Red Army of China, the Communists' air arm, acquired its Shokis from those which had ended their Japanese Army service based in Korea and Manchuria. Nothing very substantial is known about the type's post-war service in China, although both sides used Japanese pilots as mercenaries. It appears that the Ki-44 was not used in combat operations.

NOTES ON Ki-44 UNITS

The principal units which operated the Shoki are listed in a table at the end of the *Profile*. However, to complement this the opportunity is taken to briefly outline their histories between July 1 1938 and August 1945. The former date is of importance, since it was the occasion of the Japanese Army Air Force's reorganisation into the form with which it fought the war in the Pacific (see footnote on page 52). To simplify listing, the Sentais are considered in numerical order.

9th Sentai: This unit was the 3rd Fighter-Reconnaissance Sentai prior to July 1 1938. At the time of the change, it was based at Kainei, flying the Kawasaki Ki-10 biplane (Allied code-name 'Perry'), but began conversion to the Nakajima Ki-27 at that time. The 9th participated in the fighting against the Soviet Union at Khalkin-Gol during the summer of 1939. Conversion to the Ki-44 took place in the summer of 1942 and the unit, which had been in Manchuria, returned to China. As related earlier, the 9th Sentai spent the remainder of its existence in China with Nanking as its home base. It was disbanded there when the war ended.

22nd Sentai: Formed at Fussa, in Japan, in March 1944, the Shoki was the 22nd's first mount, although not long afterwards the unit became the first to receive the Nakajima Ki-84. It moved to Hankow, in China, in August of that year and was assigned to the Philippines the following month. After a mauling in the hard-fought Philippines campaign, the 22nd returned to Japan and was based in the Eastern Defence Sector early in 1945. Before the war's end, the unit moved yet again—to Korea. It was disbanded at Kimpo, Korea.

23rd Sentai: Likewise a relative late-comer, the 23rd was formed at Chiba, Japan, in October 1944 and initially used the Nakajima Ki-43. Immediately, the unit was sent to Iwo Jima where it fought in the February 1945 American invasion. On its return to Japan, it converted largely to the Ki-44, although it also used the Kawasaki Ki-61, and was assigned to the Eastern Defence Sector. Latterly, a few Ki-84s also joined the 23rd's strength. It was disbanded at Chiba when the war ended.

29th Sentai: The background to this unit proved to be difficult to trace, although it was originally the 29th Independent Chutai. It was apparently formed in mid-1941 and operated in Indo-China: the author has been unable to substantiate reports that the Chutai flew the Ki-44, although it certainly did when it gained Sentai status in 1944. In the autumn of that year, the 29th was sent to the Philippines, also having some Ki-84s by that time. Subsequently, it went to Formosa early in 1945 and was disbanded there, at Taichu, when the Japanese surrendered.

47th Sentai: The background to this famous unit was given in the text, as its predecessor, the 47th Independent Chutai, was the 'guinea pig' unit which evaluated the first Shokis under operational conditions. When the 47th was given Sentai status in May 1942, it returned to Japan, spending the rest of the war on home

Key to colour side views

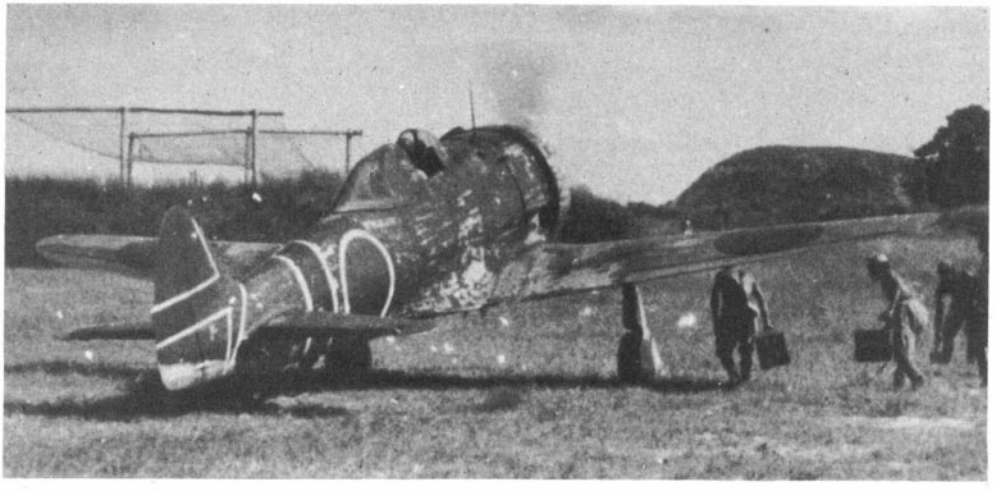
6 Ki-44-II-Ko, 2nd Chutai (Commander's Aircraft), 85th Sentai, Nanking, China, mid-1943.

7 Ki-44-II-Otsu, 1st Chutai, 85th Sentai, Canton, China, mid-1944.

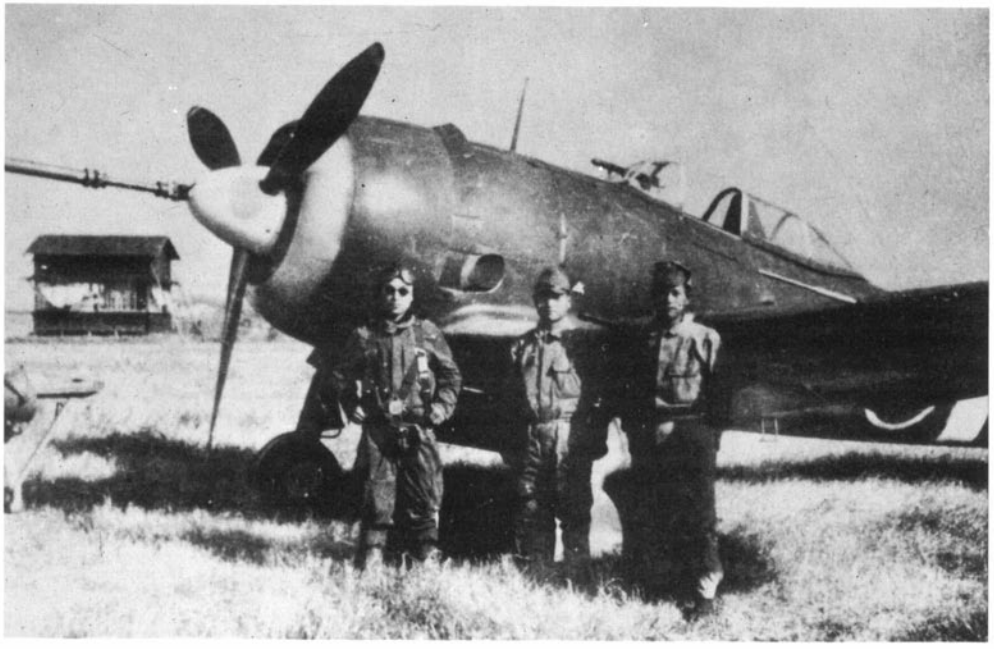
8 Ki-44-II-Otsu, 2nd Chutai, 87th Sentai, Sumatra, Netherlands East Indies, late-1943.

9 Ki-44-II-Otsu, 2nd Chutai, 246th Sentai, Philippines, late-1944.

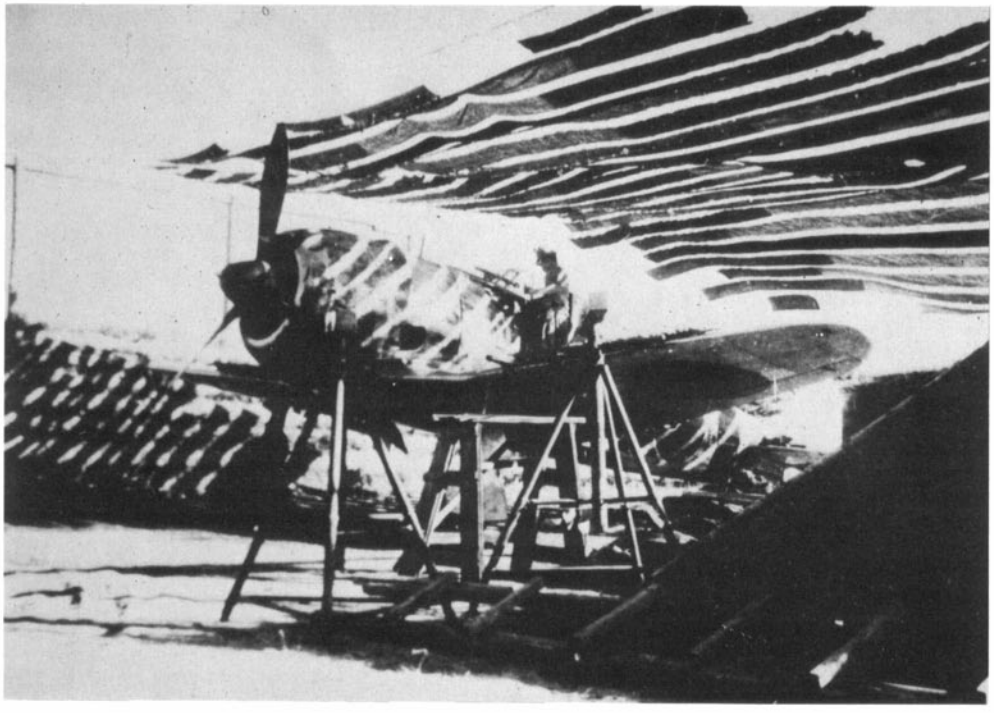
10 Ki-44-II-Otsu, Akeno Flying School, 1944.



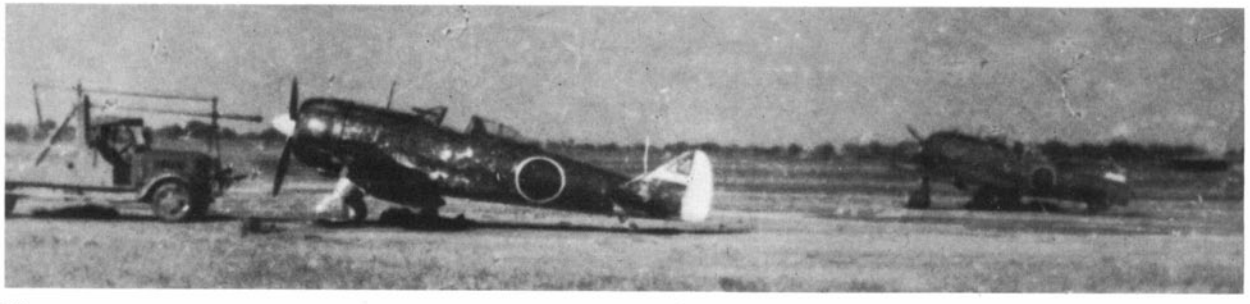
Ki-44-II flown by Major Togo Saito, officer commanding the 85th Sentai, seen during the summer of 1944 at Canton.
(Photo: Ryoichi Kotaka via Yasuho Izawa)



The aircraft of First Lieutenant Horaguchi, leader of the 85th Sentai's 1st Chutai, at Canton, sometime during 1943–44. (Photo: Ryoichi Kotaka via Yasuho Izawa)



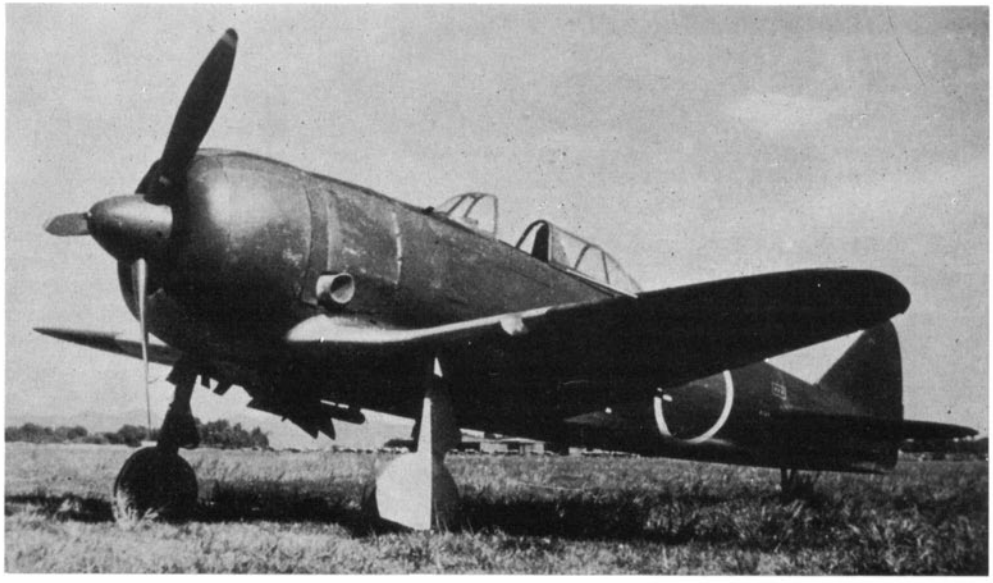
Two more views of the 85th Sentai in China during 1943–44: (left) maintenance under camouflage netting, which also provided some shade from the sun; and (below) an aircraft of the 1st Chutai starting up with the aid of a truck-mounted system.
(Photos: Ryoichi Kotaka via Yasuho Izawa)



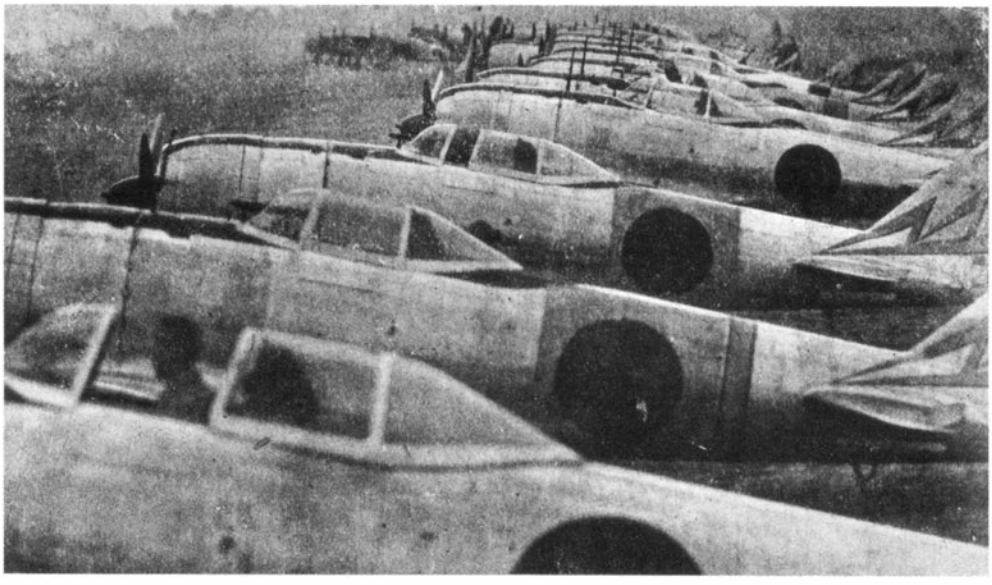
defence duties. During the last year of the war, it included the Shinten (Sky Shadow) flight for ramming attacks. Based in the Eastern Defence Sector, the 47th was disbanded at Oguchi, in Yamaguchi Prefecture.

59th Sentai: The 59th only used the Ki-44 for a few weeks late in 1944, at a time when it was moving from the Ki-43 to the Ki-84. It was formed at Kamigahara on July 1 1938 and first used the Ki-27 as a home defence unit. In 1939, the unit fought at Khalkin-Gol and two years later was one of the first recipients of the Ki-43. It operated over Indo-China, Malaya and the Netherlands East Indies during the opening months of the Pacific War and later moved to Manchuria. In the latter half of 1944, the 59th was brought back to Japan as a home defence unit and began conversion to the Ki-61. Assigned to the Western Defence Sector late in 1944, it served over Okinawa the following spring. Finally, in June 1945, the unit was one of the few to operate the Kawasaki Ki-100. It was disbanded at Fukuoka after VJ-Day.

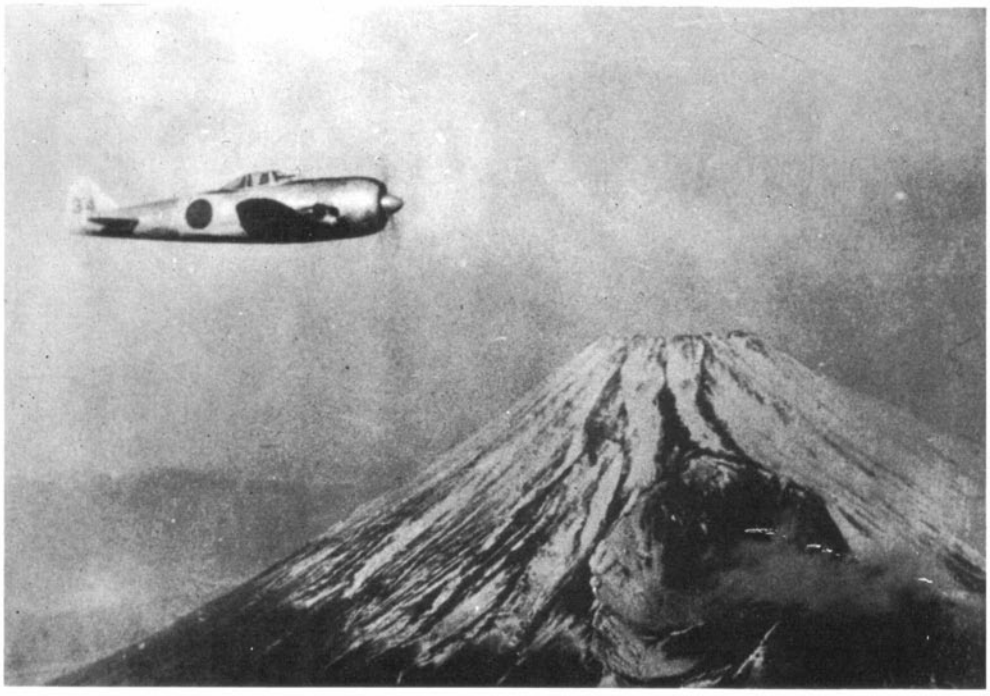
64th Sentai: Another short-term user of the Ki-44 during 1944, the 64th Sentai was one of the Japanese Army Air Force's leading units. It was created in August 1938 by renaming the Ki-10-equipped 2nd Fighter Battalion and re-equipping with the Ki-27. Initially based at Shotoku, Manchuria, the 64th fought at Khalkin-Gol, and returned to Japan in mid-1941 to become (with the 59th) one of the first two Ki-43 units. Its commander was Captain Tateo Kato, a great Japanese hero of the day. The 59th moved to South-East Asia just before the Pacific War started, and then operated over



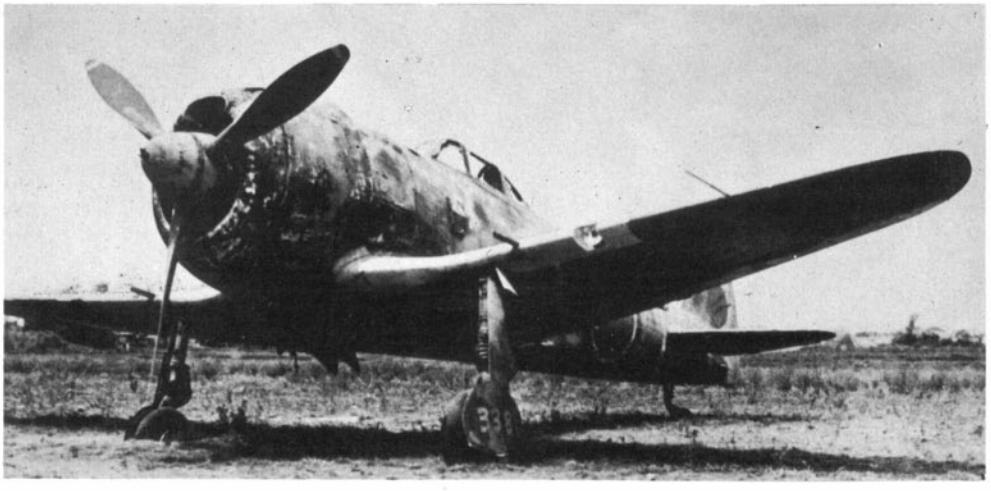
A Ki-44-II-Otsu with wing armament removed.
(Photo: Aireview via Rene J. Francillon)



Line-up of Ki-44-IIs of the 47th Sentai on home defence duties at Narimasu airfield during 1944.
(Photo: US National Archives via Rene J. Francillon)

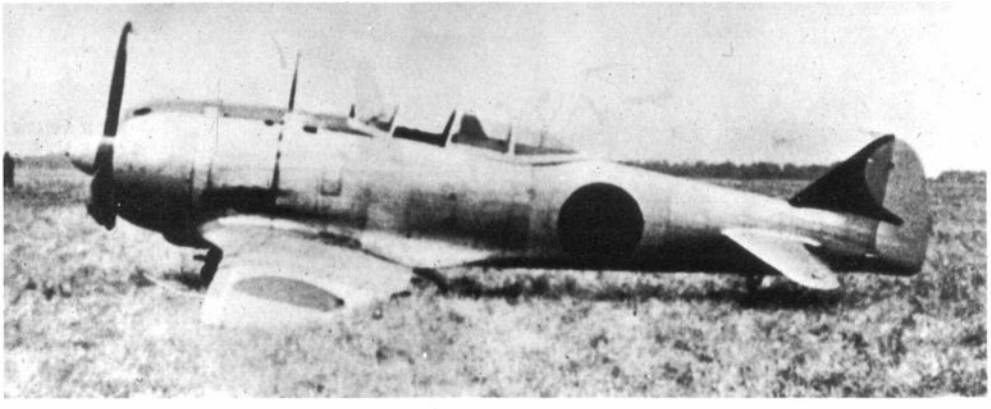


A home-defence Ki-44-II flying near Mount Fuji (unit unknown). The national marking is outlined by white bands, while the spinner and tail number are thought to have been red.
(Photo: Maru via A. Ishikawa)



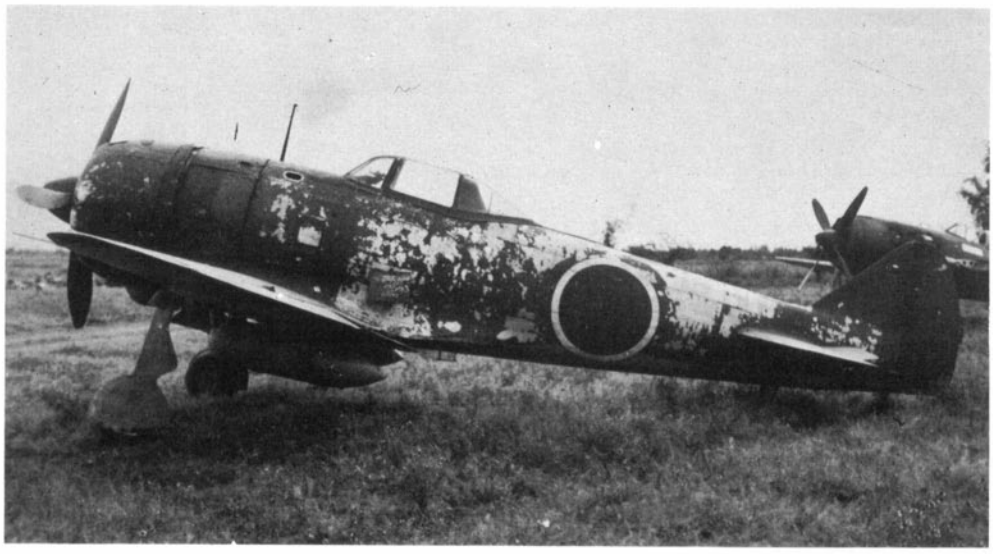
Front and rear views of a Ki-44-II-Otsu of the 246th Sentai abandoned in the Philippines early in 1945. The missing panel was for access to the radio system.
(Photos: US National Archives via Rene J. Francillon)

Ill-met by moonlight! A home-defence unit (possibly the 47th Sentai) prepares for night operations.
(Photo: Maru via A. Ishikawa)



One of the 87th Sentai's aircraft comes to grief on landing, a photograph taken in Japan during 1944.
(Photo: Koku Fan via Richard Ward/Richard Bueschel)

Close-up of a 40-mm. Ho-301 cannon installation on a Ki-44-II-Hei found at Clark Field, Manila, early in 1945.
(Photo: US National Archives via Rene J. Francillon)



More round-the-clock views of the Ki-44-II-Otsu featured on the title page of this Profile. *This particular aircraft was later restored to flying condition by the Technical Air Intelligence Unit, South-West Pacific Area.*
(Photos: US National Archives via Rene J. Francillon)

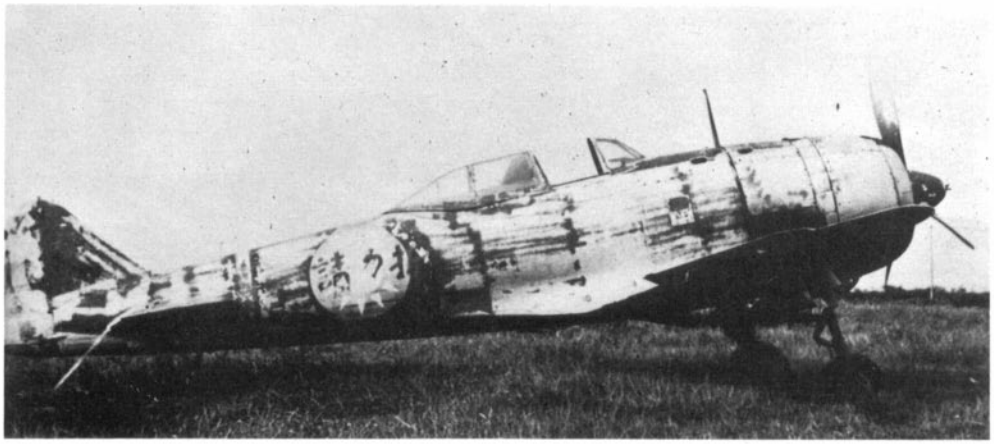
Indo-China, Thailand, Malaya and Burma. Kato was shot down in May 1942, with 59 'kills' and the unit was subsequently known as the 'Kato Sentai'. The 64th then settled down in Thailand and stayed there for the rest of the war, being one of the longest operators of the Ki-43, although it started to convert to the Ki-84 in the summer of 1945. It was disbanded in Thailand.

70th Sentai: This unit was formed as a home defence unit at the end of July 1941, equipped with Ki-27s, and was initially not operational. It was not re-equipped until July 1944, when it received Ki-44s and moved from Japan to Manchuria. Some Ki-84s were operated by the 70th, the number increasing as the war moved to a close. Around the end of 1944, the 70th moved back to Japan and was assigned to the Western Defence Sector. It was disbanded at the war's end at Matsudo, in Chiba Prefecture.

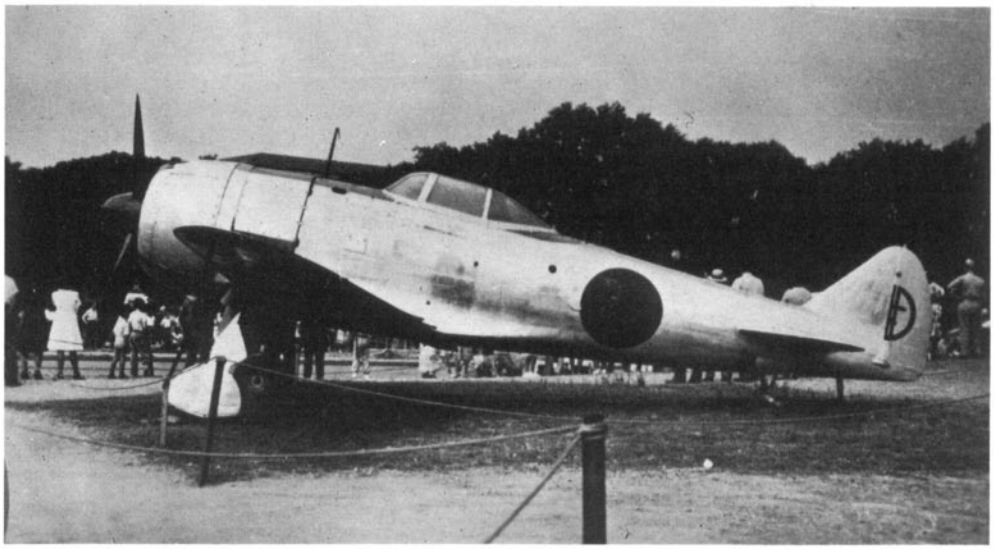
85th Sentai: Formed in China during March 1941, the 85th was first equipped with the Ki-27. In July 1942, it was moved from Manchuria, where it had moved meantime, to Nanking and re-equipped with the Shoki. The 85th moved to the Canton area at the end of 1943 and remained there until the spring of 1945, when it transferred to Korea. By this time, the unit was largely equipped with the Ki-84. When VJ-Day came, it was disbanded at Seoul, Korea.

87th Sentai: This unit was formed at Harbin, Manchuria, in March 1941, operating Ki-27s. It was re-equipped with the Ki-44, which it kept until the war's end, in July 1942. The following year, the 87th was moved to Palembang to defend the Sumatra oil fields, remaining in the area until late in 1944. It then returned to Japan for home defence, being assigned to the Eastern Defence Sector, and was disbanded there after the nation's defeat.

246th Sentai: Formed as a home defence unit in Japan during July 1942, the 246th was initially equipped with the Ki-27 and converted to the Ki-44 in the summer of 1943. It was sent to the Philippines in November 1944, including some Ki-84s on its strength. After this campaign, the 246th returned to Japan and was assigned to the Central Defence Sector in April 1945. It was disbanded at Osaka at the end of the war.



An aircraft of the 9th Sentai after being taken over by the Chinese Nationalists following the Japanese surrender in August 1945.
(Photo: D. W. Lucabaugh via Richard Ward/Richard Bueschel)



Ki-44-II Shoki *on display in the USA after the war.*
(Photo: via Malcolm Passingham)

TECHNICAL DATA	Ki-44-I	Ki-44-II-Otsu [1]
Powerplant	1,250 h.p. Nakajima Ha-41	1,520 h.p. Nakajima Ha-109
Armament	2 × 7,7-mm. & 2 × 12,7-mm.	4 × 12,7-mm.
Underwing bomb load, kg. (lb.)	—	200 (440)
Dimensions		
Span, m. (ft.)	9.45 (30.01)	9.45 (30.01)
Length, m. (ft.)	8.85 (29.03)	8.84 (29.00)
Height, m. (ft.)	3.12 (10.23)	3.12 (10.23)
Wing area, $m.^2$ ($ft.^2$)	15.0 (161.5)	15.0 (161.5)
Weights		
Empty, kg. (lb.)	1,944 (4,396)	2,106 (4,643)
Normal loaded, kg. (lb.)	2,571 (5,668)	2,764 (6,094)
Maximum loaded, kg. (lb.)	2,886 (6,362)	2,998 (6,598)
Performance		
Maximum speed, km./h. (mi./h.) at altitude, m. (ft.)	580 (360) @ 3,700 (12,140)	605 (376) @ 5,200 (17,060)
Cruise speed, km./h. (mi./h.) at altitude, m. (ft.)	400 (249) @ 4,000 (13,120)	400 (249) @ 4,000 (13,120)
Stalling speed, km./h. (mi./h.)	145 (90)	150 (93)
Climb to 5,000 m. (16,404 ft.)	5 mins. 54 secs.	4 mins. 26 secs.
Service ceiling, m. (ft.)	10,820 (35,500)	11,200 (36,750)
Normal range, km. (mi.)	926 (575)	1,200 (746)
Maximum range, km. (mi.)	1,722 (1,070)	1,600 (994)

[1] A description of the Ki-44-II is included in the main text.

Ki-44 Production

All Ki-44s were manufactured by the Nakajima Hikoki KK at its Ota plant, the first prototype being completed in August 1940 and the final production example in December 1944. A total of 1,225 was built, including:

10 prototypes and pre-production examples (August 1940—September 1941);
40 Ki-44-Is (January—October 1942);
1,175 Ki-44-IIs and -IIIs (August 1942—December 1944).

UNITS WHICH OPERATED THE Ki-44 SHOKI

Unit	Period	Areas of operation
47th Chutai	September 1941—May 1942 [1]	China, Indo-China, Malaya
9th Sentai	Summer 1942—August 1945	China
22nd Sentai	March 1944—August 1945	China, Philippines, Japan, Korea
23rd Sentai	October 1944—August 1945	Japan
29th Sentai	Summer 1944—August 1945	Formosa, Philippines
47th Sentai	May 1942—August 1945	Japan
70th Sentai	July 1944—August 1945	Manchuria, Japan
85th Sentai	Autumn 1942—August 1945	China, Japan, Korea
87th Sentai	July 1942—August 1945	Manchuria, Netherlands East Indies, Burma, Japan
246th Sentai	June 1943—August 1945	Philippines, Japan

Notes: [1] The 47th Chutai was redesignated 47th Sentai at the end of May 1942. The Ki-44 was also briefly used by the 59th Sentai—in Manchuria at the end of 1944—and the 64th Sentai—in Burma and Thailand during 1944—but both units soon moved on to other equipment. Several of the units listed above as operating the type until the end of the war retained it only as a supplement to other aircraft (such as the Ki-84) which formed their main equipment. This is clarified in the text. Finally, as was customary with all Japanese Army front-line aircraft, the Ki-44 was used at the Akeno and Hitachi flying schools and at the Tokorozawa maintenance school.

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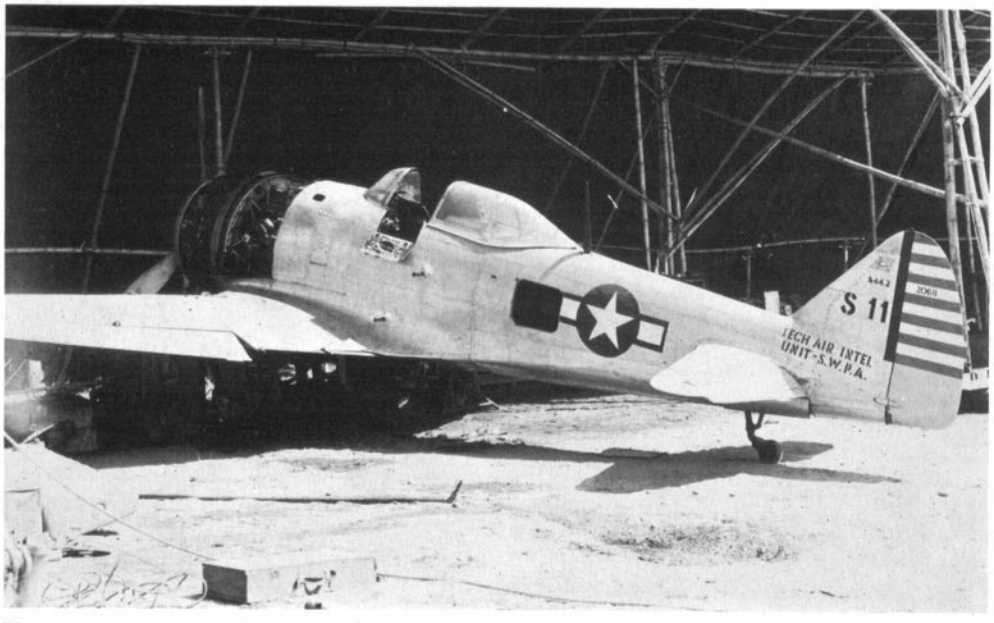

The captured Shoki *photographed during the work necessary to restore it to flying condition at Clark Field early in 1945.* (Photo: US Air Force)