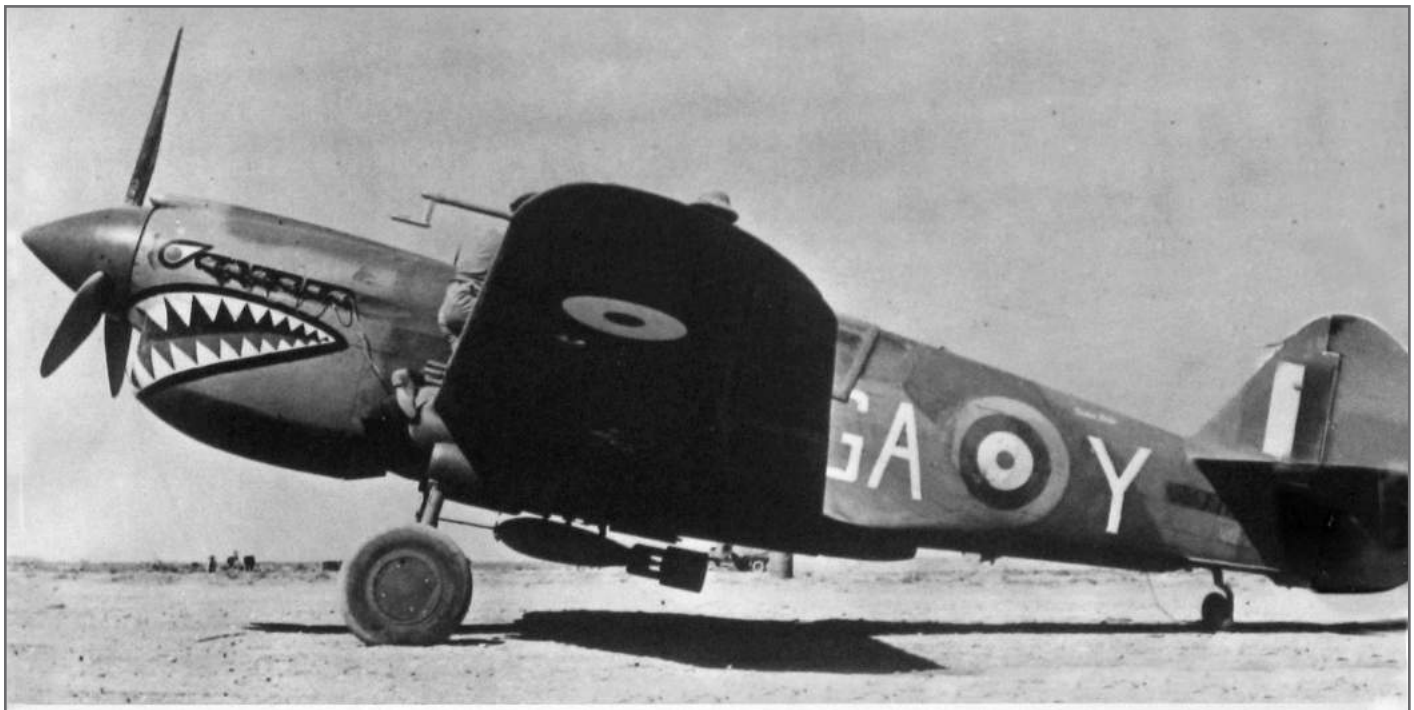
Feliks Gazda, Pilot
and the
Polish Air Force
in
World War II

by Bob Esler

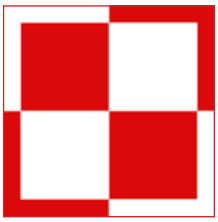


A Curtiss Kittyhawk I (P-40D) AK772 GA•Y "London Pride" of No.112 "Shark" Squadron, flown by F/Lt Gazda, Sgt Derma and Sgt Różański in March 1942
(Crown Copyright, Imperial War Museum, Ref.No.2595)

See page 144 for more about this aircraft, once flown by F/Lt Gazda

for Diana Dale
Proud Daughter

In
Memory
of the thousands of Polish airmen
who were the first to fight,
who kept on fighting,
who never gave up.



The Life and Times of Feliks Gazda, Polish Air Force Pilot

by Diana Dale

Feliks Gazda was born in Zakrzów (near Lublin) on May 6, 1903. His parents, Jan Gazda and Aniela Morek, were farmers. Feliks graduated from Teachers' College in the nearby town of Solec nad Wisła and taught primary school at Hrubieszow, about a hundred kilometres southeast of Lublin, near the current border with Ukraine. He enlisted in the Armed Forces on August 30, 1924 and served as a student in the Warsaw Cadet Officers' School. Upon graduation on July 1, 1925 with rank of Officer Cadet/LAC (plutonowy podchorąży), he was assigned as an instructor to the 34th Infantry Regiment at Biała Podlaska.

Shortly afterwards, however, he enlisted in the Air Force and on November 2, 1926 joined the Air Force Officers' School in Dęblin. Towards the end of 1926, he was sent on a two and a half month training course with the 11th Combat Flight of the 1st Air Force Regiment in Warsaw. During this time, he flew on Breguet XIX's (a light bomber). After his return to the Air Force Officers' School in Dęblin, he completed his aviation training specializing as an observer. As a graduate with the rank of Officer Cadet/Sergeant (sierżant podchorąży), he was assigned to the 35th Combat Flight of the 3rd Air Force Regiment in Poznań on September 16, 1927. There, he flew Potez XXVII aircraft. On May 21, 1929, he was promoted to the rank of Pilot Officer (podporucznik).

Gazda then applied to undertake pilot training, in connection with which he was ordered to the Officers' Air Force Training Centre in Dęblin on May 3, 1929. There he completed the elementary course on September 21, 1929. Upon his return to Poznań, on October 5th of that year, he served as pilot in the 132nd Fighter Flight which at that time was operating Spad 61 C1 aircraft. To elevate his level of pilot training, he received a secondment to the 2nd Air Force Regiment in Kraków for a three week fighter course on September 10th 1930, and upon its completion, returned to the 132nd Flight. Between October 10, 1932 and March 25, 1933, he was the acting commanding officer of this unit. In September of that year, he was transferred to the 133rd Fighter Flight equipped with PWS-10 planes. He was given the duty of technical officer. Later, from the 2nd of September 1934 with a few breaks, he attained the appointment of commander and, from March 20, 1935 was the formal commander of this flight.

On October 1st 1938, Gazda was transferred to the Non-Commissioned Officers' Air Force School for Youth in Bydgoszcz. While there, at first, he served as the Commander of the Platoon of the 3rd Special Flight and then later, as commander of one of the School Flights. As an experienced fighter pilot, on 22 July 1939, he was appointed commanding officer of the Pilots Squadron of the Non-Commissioned Officers' Air Force School for Youth. He retained this rank until the onset of the war.

During the early defence of Poland during the war, as their commander, he led his students out to the South East of Poland. After the Soviet agression on Poland on September 17, 1939, he crossed the border to Romania. Together with his group of students and first year pilots from the Air Force Cadet Officers' School,

he was interned in Slatina where he became the Polish commander of the camp. On October 1st, he escaped and made his way to the Black Sea coast and then to France. He arrived in France on November 12, 1939 (most likely on the deck of the "Patris" sailing from the fishing port of Balchik to Malta and from there on to Marseille on a French vessel).

On November 26, 1939, Gazda was appointed to the Air Force Training Centre in Lyon. From March 15 to June 17, 1940, he was the Deputy Chief of Pilotage at the Air Force Training Centre. There, he took part in the re-training of Polish pilots in the use of French equipment for the attacks on German forces in Western Europe in May 1940, and for military flights against German bombers, piloting Morane Sauliner MS-406 fighters from the Air Force Training Centre Fighter Flight. On June 17 - after the French had proposed capitulating - Feliks Gazda, together with F/Lt (kapitan) Mieczysław Wiorkiewicz commander of the aforementioned squadron and F/O (porucznik) Stanisław Zielinski, flew the squadron planes to Perpignan, France. There they joined up with a group under F/Lt (kapitan) Tadeusz Rolski. This group was planning a second air crossing over to North Africa. A few days later, on June 23rd, Gazda flew from Perpignan to Oran on a passenger transport Caudron Goeland piloted by W/O (chorąży) Stansław Płonczyński. Then, he travelled by rail to Casablanca via Rabat. From Casablanca he got on a ship on July 2nd, which took two weeks to reach Liverpool, England via Gibraltar.

Gazda's first move in England was to Blackpool where he awaited assignment. On October 14, 1940, he was assigned to the 1 School of Army Co-operation, where he underwent training in the use of British equipment (simultaneously on one and two engine planes). Next, he underwent training both theoretical and practical at the RAF White Waltham, RAF Old Sarum and RAF Kemble. In April 1941, he was selected to go to Africa as part of the strategy to strengthen the Polish Aircraft Delivery Unit. On May 9th, he sailed from England and on May 31st made his way to Takoradi in the Gold Coast (now Ghana). The mission, under the leadership of G/Cpt (pułkownik) Mateusz Iżycki, was to fly aircraft (shipped by sea in crates and then assembled on site) from West Africa to Egypt (the pilots returned to Takoradi on transport flights using Lockheed and Dakota aircraft). Shortly after his arrival, on the 4th of June, Gazda flew across Africa for the first time in the cockpit of a Hurricane. He flew 6 times across Africa before the year was finished, transporting Hurricanes and Blenheims.

Towards the end of 1941, Gazda, together with a small group of Polish pilots, asked to be assigned to fly fighter planes on the African Front. As an experienced fighter pilot, he was selected to be commander and instructor of a group of ten pilots. On December 2nd 1941, he was assigned to 71 Operational Training Unit in Khartoum where he refreshed his fighter pilot skills on Hurricanes and Tomahawks. On February 9, 1942, he was assigned to the 112 "Shark" Squadron stationed in Gambut air base, Libya. After a speedy orientation to the Kittyhawks being used by this unit, he began fighter flights over the Libyan Front. He carried out six of these missions, including patrol, fighter sweep, and the interception of enemy planes. On May 5, 1942, he left the "Shark" Squadron and joined for a brief period of time the 108 Maintenance Unit where he carried out several flights in Blenheims, after which on June 16, 1942, he returned to Takoradi and from August again flew repeatedly to Egypt at the helm of Kittyhawks, Blenheims and Baltimores. Altogether during the years 1941-1943, he flew across Africa 23 times. During this time, he contracted malaria 11 times (he was treated in hospital for it, among other places, in Cairo).

In the fall of 1943, with the disbanding of the Polish Aircraft Delivery Unit, he became part of the 216 Transport Group. From this point on, the scope of his duties changed, and he ferried planes throughout North Africa and the Mediterranean Sea (Sicily, Italy, and Gibraltar), adding Spitfires, Mustangs, Beaufighters, Ansons, Dakotas and Wellingtons to the types of aircraft he was flying.

In November of 1944, he left the 216 Group and returned to Great Britain. At first he was assigned to the headquarters of Transport Command and from March 7, 1945, he was the Polish liaison officer for the 44 Transport Group (the composition of this unit included Polish pilots transporting planes across the Mediterranean Sea and to India). On November 22, 1945, he was transferred to a Polish Depot in Dunholme Lodge. Then, from February 6th 1946, he served as an administrative officer in the headquarters of the 84 Fighter Group (within this unit was, among others, the 131 Fighter Wing stationed in Germany). Towards the end of 1946, he was stationed at the RAF Hethel. He was formally discharged from the Polish Air Forces at this time.

Feliks Gazda completed his service in the Polish Air Force with the Polish rank of Squadron Leader (major) and British rank of Squadron Leader (previously he had served temporarily as Acting Wing Commander). He was decorated with the Cross of Valour, the Silver Cross of Merit with Swords, as well as commemorative medals.

In 1947, he joined the Polish Resettlement Corps. He decided on emigration to Argentina, and moved there with his wife and son, in 1948. He settled in Quilmes, near Buenos Aires. He worked for a short time as a pilot and then did construction work. Thanks to the financial support of pilots in Argentina and Canada, he emigrated to Montreal in October 1953. Immediately on arrival, he found a job with the firm Aviation Electric where he was employed testing aviation instruments. Due to the seriousness of the symptoms of Parkinson's disease, which manifested themselves in 1964, he took early retirement and moved to Rosemere, a suburb of Montreal.

In December of 1953, shortly after arriving in Montreal, he and several Polish pilots became co-founders of 310 "Wilno" Wing (under the umbrella of the RCAF), connecting Polish veterans of the Second World War. Squadron Leader (major) Feliks Gazda died at the age of 67 on May 9, 1970 in St. Jerome in the province of Quebec and is buried in the veterans' cemetery Field of Honour in Pointe Claire, Canada. He was married to Ludomira Gazda (née Leja) and had two children, Ryszard Feliks, born in England, and Diana Maria, born in Buenos Aires.

Ludomira Gazda

Ludomira (Mira) was born of Polish parents, Kazimiera Grzybkowska and Dr. Antoni Leja, in Neuhaus Germany on 1 May, 1915. After a childhood in Poland, and shortly after her marriage to Feliks Gazda, she was caught up in the German invasion of Poland in 1939.

She participated in the Polish resistance, as part of the Home Army. Her husband was a pilot in the Polish Air Force and later a squadron leader in the RAF. At the end of the war, the Gazdas were personae non gratae to the new Communist regime in Poland, and moved to Redruth in Cornwall, where their son Ryszard was born. They then moved to Argentina, where Ryszard was killed in an accident, but daughter Diana (Danuta) was born.

In 1953, they moved to Montreal. Her husband died of Parkinsons disease in 1970. Later, she moved with her daughter to London and Kitchener Ontario, finally settling in Ottawa in 1977.

Mira died [peacefully in Ottawa at the Queensway-Carleton Hospital, Wednesday, February 11, 2004 at 6:00 p.m. after a short struggle with pneumonia. She is mourned especially by daughter Diana and son-in-law Ian Dale of Ottawa. A Memorial Mass was celebrated at the Polish Church in Ottawa.

Feliks Gazda's Medals

The Cross of Valor

(Krzyż Walecznych),
This Polish military decoration is awarded to an individual who "has demonstrated deeds of valor and courage on the field of battle."
The medal is given only in wartime or shortly after.

The Silver Cross of Merit with Swords

This is awarded for deeds of bravery and valor during time of war not connected with direct combat, and for merit demonstrated in perilous circumstances.

The aircraft S/Lt Gazda flew, and when and where he flew them:

Polish Air Force Pilot Wings

Avro Anson	1943 ferry flights in the Mediterranean area
Avia BH-33	1930 in Poland
Martin Baltimore	1941 and 1942 trans-Africa ferry flights
Breguet XIX bomber	1926 in Poland
Bristol Beaufighter	1943 ferry flights in the Mediterranean area
Bristol Blenheim	1941 and 1942 trans-Africa ferry flights and 1942 maintenance unit
Caudron Cyclone	1940 in France (as a passenger)
Douglas (DC-2)	1941 and 1942 trans-Africa ferry flights. Used to carry pilots from Cairo back to Takoradi.
Dakota (DC-3)	The name given to the Douglas C-47 and DC-3 by the RAF. Flown by F/Lt Gazda on 1943 ferry flights in the Mediterranean area. Also used to carry pilots from Cairo back to Takoradi during the 1941 and 1942 trans-Africa ferry flights.
F-Boat	Most likely the Shorts S-23 Empire flying boat operated by BOAC on a regular passenger service between Khartoum and Cairo during the war. (as a passenger)
Hawker Hector	1940-41 in Britain during RAF training
Hawker Hurricane	1941, probably first flown in Britain during RAF training, then on trans-Africa ferry flights
Curtiss Kittyhawk	1942 Shark squadron combat flights, 1942 trans-African ferry flights
Curtiss Tomahawk	1941 trans-African ferry flights
Lockheed (Lodestar)	1941 and 1942 trans-Africa ferry flights. Used to carry pilots from Cairo back to Takoradi.
Miles Magister	1940-41 in Britain during RAF training
Miles Master 1	1940-41 in Britain during RAF training
Moraine Saulnier MS-406	in France in 1940
deHavilland Mosquito	1943 ferry flights in the Mediterranean area
P-51 Mustang	1943 ferry flights in the Mediterranean area
Airspeed Oxford	1940-41 in Britain during RAF training
Potez XXVII	1927 in Poland
PZL-P7	1933 in Poland
PZL-P11	1934 in Poland
PWS-10	1932 in Poland
SPAD 61	1929 in Poland
Supermarine Spitfire	1943 ferry flights in the Mediterranean area
deHavilland Tiger Moth	1940-41 in Britain during RAF training
Vickers Wellington	1943 ferry flights in the Mediterranean area

Feliks Gazda's military record in Poland, 1903–1939

1903, May 6: Born in Zakrzow, Poland

1924, August 30: Enlisted in the Armed Forces

1925, July 1: Graduated from Warsaw Cadet Officers's School

1926, November 2: Joined Air Force Officers' School

1926 to early 1927: flew on the **Breguet XIX** light bomber

1927: flew **Potez XXVII** fighter

1929, May 21: Promoted to rank of Pilot Officer

1929: flew **Spad 61 C1** fighter

1930: flew **Avia BH-33** fighter

1932-1933: Acting Commanding Officer of 132nd Flight

1933: flew **PWS-10** fighter

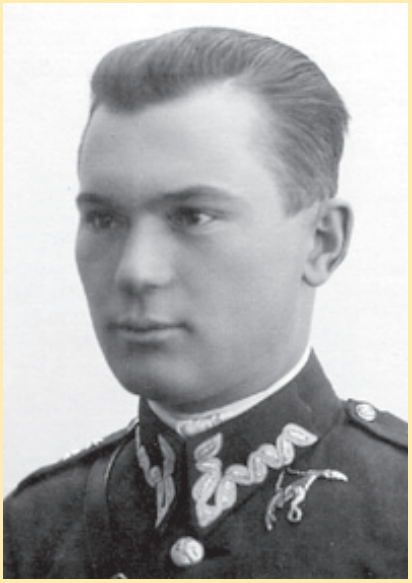
1933: flew **PZL-P.7** fighter

1934, September 2 to March, 1935: Commander of 132nd Flight

1935: flew **PZL-P.11** fighter

1938: Commander of the Platoon of the 3rd Special Flight

1939: Commander of Pilot's Squadron of the NCO's Air Force School for Youth



Polish Air Force Fighter Planes, 1920 to 1939

During the late 1920s, the Polish Air Force used the French Spad 61 and 81 fighters. But, the Spads were just junk. They had a high accident rate, parts wore out quickly and there was a shortage of spare parts. During the interwar period, there were four Polish-built fighter aircraft: the Avia BH.33 (PWS-A), the PWS 10 and the PZL P.7 and PZL P.11.

Poland's first efforts to create its own modern fighter grew out of its friendly technological relationship with Czechoslovakia. It seems that the Czechs were willing not only to make their newest fighter, the Avia BH.33 available to Poland under license production, but also make the design more modern. Under Polish manufacture, this aircraft became the PWS-A and entered service in 1930-1931, but in limited numbers.

Poland then ventured into designing its own fighter and the result was the PWS 10, which was produced in greater numbers than the PWS-A. These entered service in 1932. There is one interesting observation on the way aircraft design was carried out. It seems one of the major shortcomings of the PWS 10 was its high fuel consumption and, therefore, its short range. The fix was to put in a larger fuel tank. Of course, and left unsaid, was that this would increase weight and reduce speed.

The next fighter aircraft used by the Polish Air Force was the PZL P.7a, the famous inverted gull wing creation of Zygmunt Pulawski. The P.7a began production in 1932 and ended in 1933,with 150 aircraft being produced. Although out classed, and replaced by the PZL P.11, by the beginning of the Second World War, the P.7a was credited with seven kills, including a Messerschmitt Bf 110, but none against another single engine fighter.

The last fighter produced before WWII was the PZL P.11, a modern, all metal, open cockpit aircraft introduced in 1935.

Part 1

Poland

Before the War

The Polish Air Force, 1918–1939

1918–1922

The history of the Polish Air Force began at the end of the World War I. In 1918, some aircraft escadres were created within the Polish units in allied countries. One squadron was created in Russia within the Polish corps of General Józef Dowbór-Muśnicki, then disbanded along with the Corps in May 1918. In France, 5 bomber escadres were created within the Army of General Józef Haller. They returned to Poland, equipment intact in 1919.

Military aviation in Poland started in November 1918, when Poland regained its independence. It consisted initially of captured German and Austrian aircraft or those left by them in a damaged state. They were first used in the conflict with Ukraine around Lwów in 1918 and in the bombing of an airfield in Frankfurt (Oder) on 9 January 1919 by airmen of the Great Polish Army.

After 1919, Poland was involved in a war with Soviet Russia and started to buy aircraft abroad. As a result, in 1920 the Polish Air Force consisted of a variety of the British, French, German, Austrian and Italian aircraft of the World War I era, in quantities ranging from a few to some dozen. The main fighters used were: Spad XIII and Fokker D.VII. Main bombers and reconnaissance planes were: Breguet 14, SVA-9, Salmson 2A2, DH-9.

1923–1932

After the Polish-Soviet war, the World War I vintage aircraft were gradually withdrawn, and the air force was equipped mostly with French aircraft. From 1924–26, the typical fighter became Spad 61 (280 units). The standard light bombers were also French: Potez XV (245), then Breguet XIX (250) and Potez XXV (316). Potez bombers were produced in Poland. The medium bombers were Farman Goliath and later a military variant of Fokker F-VII.

Before developing fighters of its own design, 50 Czech biplane Avia BH-33 fighters were licence-produced under a designation PWS-A. The first Polish design was a high wing fighter PWS-10, numbering 80 aircraft from 1932. The Polish naval airforce used a number of French flying boats, mainly Schreck FBA-17, LeO H-13, H-135 and Latham 43. All these aircraft were withdrawn from the combat units by 1939.

1933–1938

In 1933 the first of high-wing all-metal fighters of Zygmunt Pulawski design, the PZL P.7a, entered service. A total of 150 were built, followed by 30 improved PZL P.11a. The final design, PZL P.11c, entered service in 1935 in a series of 175 aircraft. It was a modern fighter in 1935, and remained the only Polish fighter until 1939 when it was made obsolete by the quick progress in aircraft design in the late 1930s.

In a bomber aviation, the Potez XXV and Breguet XIX were replaced by all-metal monoplane PZL.23 Karas, with 250 built by 1936. By 1939, the Karas was outdated. In 1938 the Polish factory PZL designed a modern twin-engine medium bomber PZL.37 Los (Elk), arguably the best bomber in the world when it entered service that year. The PZL.37 Los had a bomb payload of 2,580 kg and a top speed of 439 km/h. Unfortunately too few of them entered service before the war. Approximately 30 Los A bombers with a single-fin tail and 70 Los B bombers with a twin-fin tail were delivered before the war started.

For an observation and close reconnaissance plane, Polish escadres used slow and easy to hit high-wing Lublin R-XIII, then RWD-14 Czapla. The Polish naval aviation used Lublin R-XIII on floats as well. Just before the war, some Italian torpedo planes CANT Z-506 were ordered, but only one was delivered, without armament. The main trainer planes were Polish-built high-wing RWD-8 (primary) and biplane PWS-26 (trainer). In 1939, Poland ordered 160 Moran Sauliner-406 fighters from France and 10 Hawker Hurricane fighters from England, but they weren't delivered before the war.

Breguet XIX - 1926

The Breguet 19 (Breguet XIX, Br.19 or Bre.19) was a light bomber and reconnaissance aircraft, also used for long-distance flights, designed by the French Breguet company and produced from 1924.

The Breguet used duralumin as the primary construction material, instead of steel or wood. At that time, the aircraft was faster than other bombers, and even some fighter aircraft. Therefore, it met with a huge interest in the world, strengthened by its sporting successes. Mass production, for the Aéronautique Militaire and export, started in France in 1924.

The aircraft was a biplane built in a sesquiplane platform, with lower wings substantially smaller than the upper ones. The fuselage, ellipsoid in cross-section, was a frame of duralumin pipes. The front part was covered with duralumin sheets, the tail with canvas. The wings were canvas covered. It had a conventional fixed landing gear with rear skid.

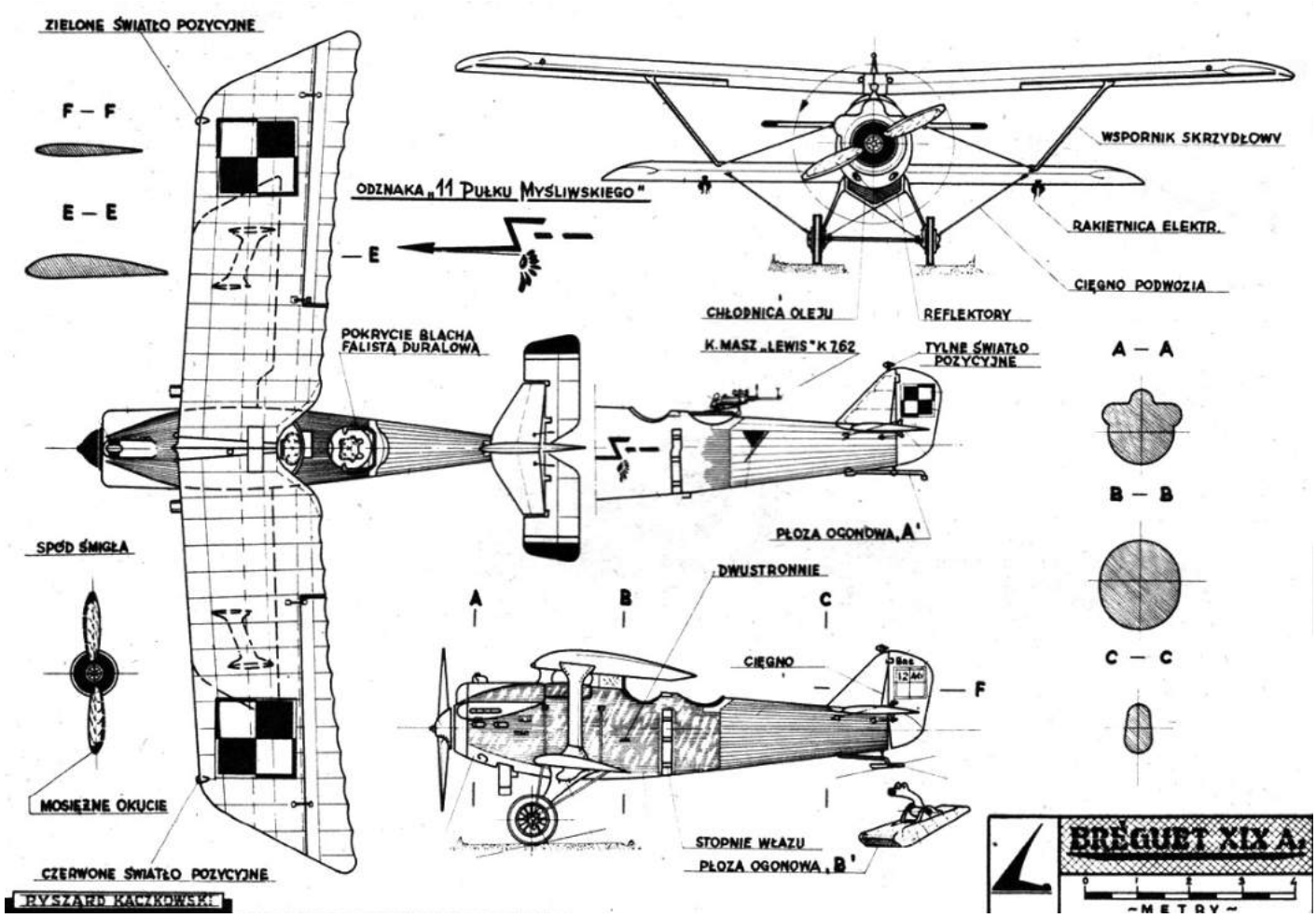
The crew of two, pilot and observer/bombardier, sat in tandem in open cockpits, with dual controls. A wide variety of engine types were fitted, mostly water-cooled V-12 or W-12 inline engines.

A fixed 7.7 mm Vickers machine gun with an interrupter gear was operated by the pilot, while the observer had twin 7.7 mm Lewis Guns. There was also a fourth machine gun which could be fired by the observer downwards through an opening in the floor.

Polish Air Force bought 250 Breguet 19 A2s and B2s, with 450 hp Lorraine-Dietrich 12Eb engines. The first Br.19 entered Polish service in 1926, but most were delivered in 1929–30. They were withdrawn from combat units in 1932–37, and used in training units until 1939. They were not used in combat during the Invasion of Poland of 1939 and most were destroyed on the ground.

Breguet 19 (XIX)

Role	Light bomber/reconnaissance aircraft
Crew:	2
Manufacturer	Breguet Aviation, France
First flight	March 1922
Primary user	French Air Force
Number built	~ 2,700 (250 for the Polish Air Force)
Length:	9.61 m (31 ft 6 in)
Wingspan:	14.83 m (48 ft 8 in)
Height:	3.69 m (12 ft 1 in)
Empty weight:	1,387 kg (3,058 lb)
Max takeoff wt:	2,500 kg (5,512 lb)
Powerplant:	1 × Lorraine 12Ed Courlis W-12 liquid-cooled piston engine, 450 hp
Maximum speed:	214 km/h (133 mph; 116 kn)
Range:	800 km (497 mi; 432 nmi)
Service ceiling:	7,200 m (23,622 ft)


ZIELONE ŚWIATŁO POZYCYJNE
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ODZNAKA „11 PUŁKU MYŚLIWSKIEGO"
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RAKIETNICA ELEKTR.
CIĘGNO PODWOZIA
CHŁODNICA OLEJU
REFLEKTORY
K. MASZ. „LEWIS" K 762
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MOSIĘŻNE OKUCIE
CZERWONE ŚWIATŁO POZYCYJNE
STOPNIE WŁAZU
PŁOZA OGONOWA „B"
BRÉGUET XIX A2
RYSZARD KACZKOWSKI

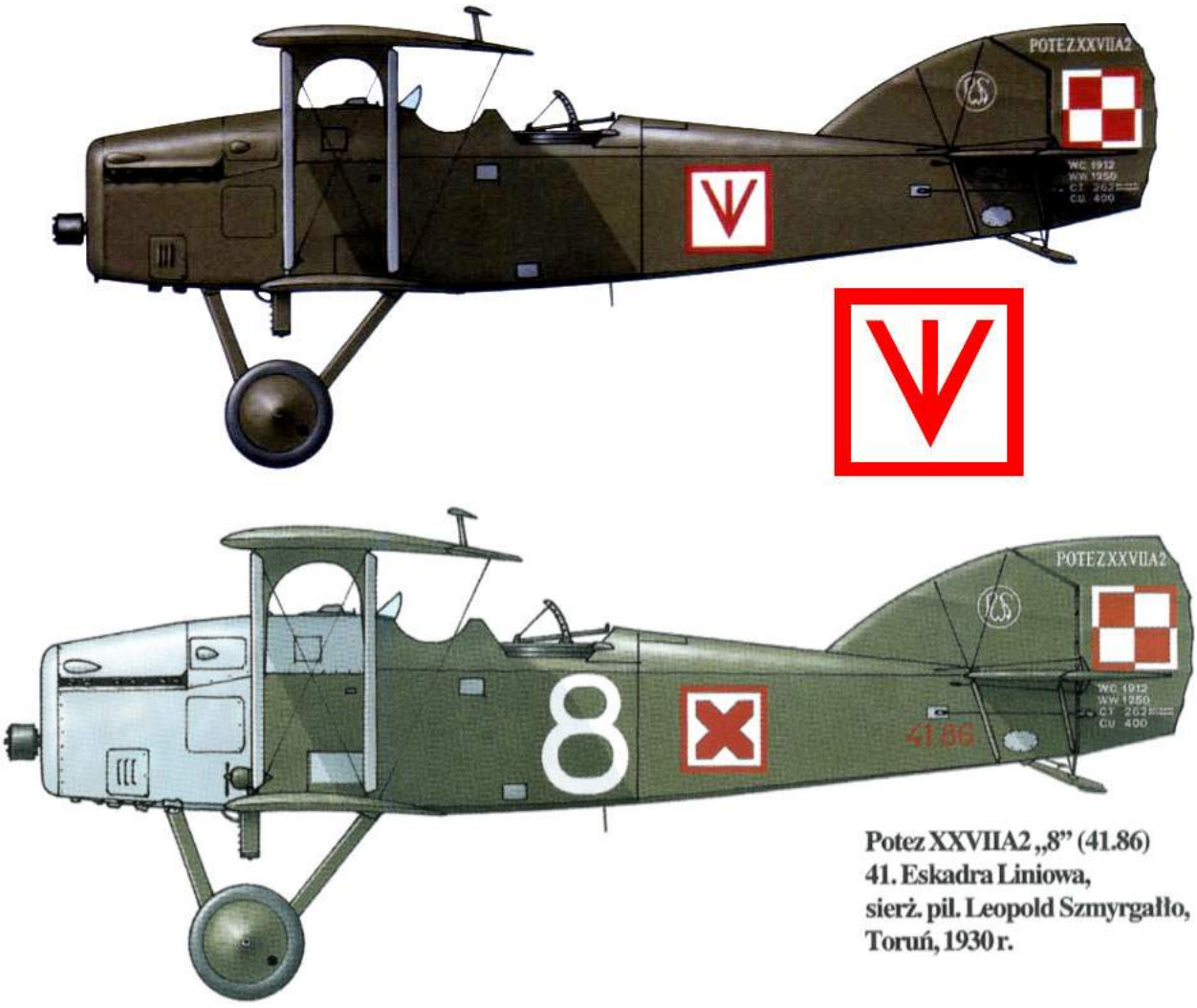
Potez 27 (XXVII) - 1927

The Potez XXVII appeared in 1924. It was a two-seat biplane in the A.2 observation category and combined the engine, fuselage, fin, rudder and cross-axle landing gear of the Potez XV with a tailplane, balanced elevator and unequal-span wings similar to those of the Potez 25.

The type was built in France for export only, Poland obtaining 20 machines in 1925 and subsequently built 155 under licence at the P.W.S. works in Poland;. Some were still serving as trainers in 1936.

Potez 27

Role	Reconnaissance/bomber	Empty weight:	1,487 kg (3,278 lb)
Manufacturer	Potez (France)	Loaded weight:	1,950 kg (4,299 lb)
	PWS (Poland)	Useful load:	463 kg (1,021 lb)
First flight	October 1921	Powerplant:	1 × Lorraine-Dietrich 12Db water-cooled V12 inline engine, 415 hp
Introduction	1923		
Primary users	French Air Force		
	Polish Air Force	Max. speed:	202 km/h (125 mph)
Produced	1923-1926	Range:	510 km (317 mi)
Number built	687	Service ceiling:	4,200 m (13,780 ft)
Crew:	2	Armament:	1 × 7.7 mm Vickers machine gun, fixed in front; 2 × 7.7 mm Lewis Guns, on a ring mounting 125 kg (276 lb) bombs
Length:	8.7 m (28.5 ft)		
Wingspan:	12.68 m (41.6 ft)		
Height:	3.2 m (10.5 ft)		



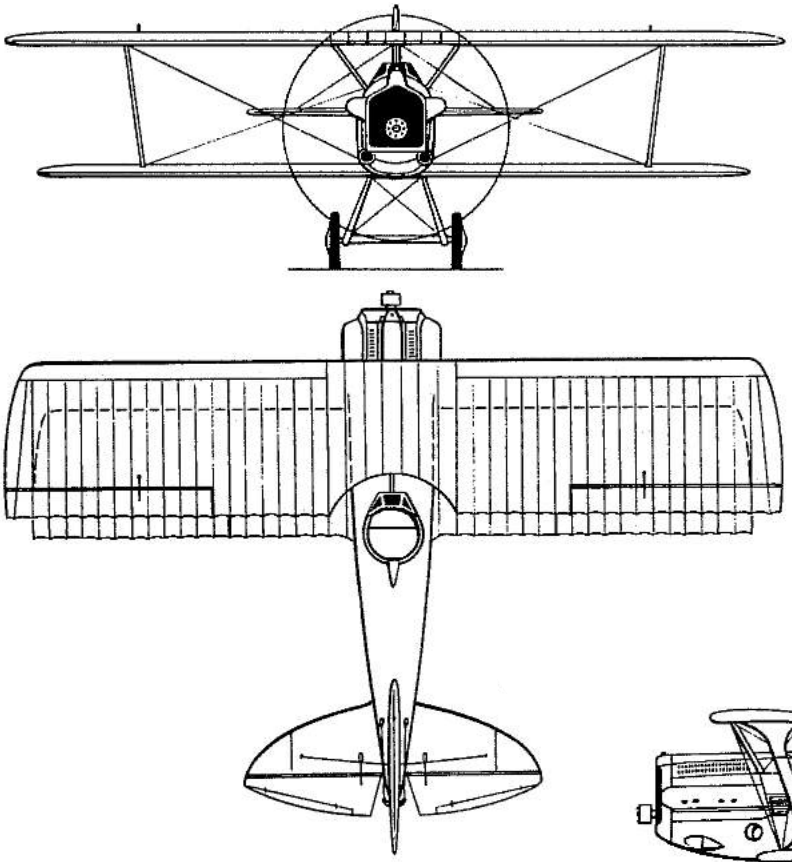
Potez XXVIIA2 „8" (41.86)
41. Eskadra Liniowa,
sierż. pil. Leopold Szmyrgałło,
Toruń, 1930 r.

SPAD S.61 - 1929

The Blériot-SPAD S.61, a conventional biplane, was a French fighter aircraft developed in 1923. The prototype S.61 was evaluated by the French Air Force but was rejected. The Polish Air Force was impressed enough to order 250, as well as purchase licences for local production. The Romanian Air Force also ordered 100 aircraft. About 30 were built in Poland, by the CWL Centralne Warszaty Lotnicze (Central Aviation Workshops), a predecessor of PZL.

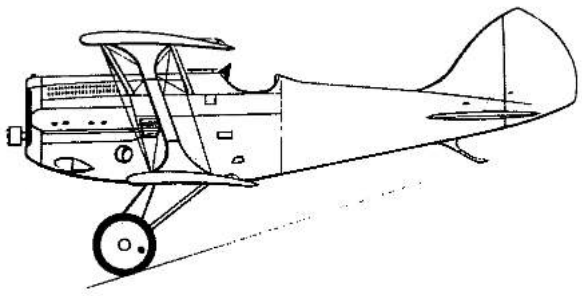
Apart from their military service, S.61s were used in France for racing and record-setting attempts. On 25 June 1925, Pelletier d'Oisy won the cross-country Coupe Michelin in an S.61, and another of the type won the 1927 competition and was placed second in 1929. A Polish S.61 placed second in the Capitaine Echard race at the Zürich aerial meeting in 1927.

The S.61 (known in Poland simply as Spad S.61) had a poor reputation in Poland due to numerous crashes, many attributed to a weak wing mounting. During the period from 1926 to 1931, 26 pilots were killed while flying the S.61.



Spad S.61

Role:	Fighter
Manufacturer:	Blériot, PZL under licence
First flight:	6 November 1923
Primary users:	Polish Air Force, Romanian Air Force
Number built:	~ 350, plus 30 built under licence in Poland
Crew:	one pilot
Length:	6.98 m (22 ft 11 in)
Wingspan:	9.57 m (31 ft 5 in)
Height:	2.90 m (9 ft 6 in)
Empty weight:	1,055 kg (2,326 lb)
Gross weight:	1,565 kg (3,450 lb)
Powerplant:	1 × Lorraine-Dietrich 12Ew, 450 hp
Max. speed:	227 km/h (141 mph)
Range:	603.5 km (375 miles)
Service ceiling:	7,500 m (24,605ft)
Armament	2 × fixed, forward-firing .303 Vickers machine guns



PWS-A (Avia BH-33E)- 1930

The PWS-A was a Polish-built Czech Avia BH-33 biplane fighter that first flew in 1927.

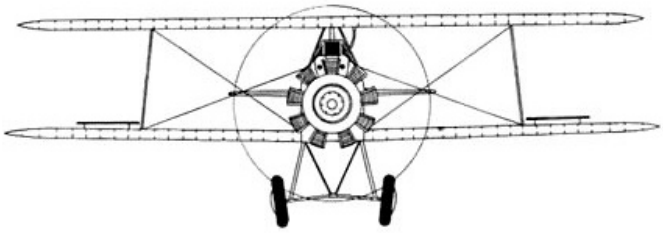
Initial tests of the first prototype were disappointing, even when fitted with a more powerful version of the Jupiter wngine. Two further prototypes followed, each with an increasingly powerful Jupiter variant. The performance of the final example was finally good enough for the Czechoslovakian defence ministry to order a small production run of only five aircraft. Licence production was undertaken, however, in Poland, where a single example was sold along with a licence to build 50 aircraft. These were designated PWS-A and put into service with the Polish Air Force in 1930.

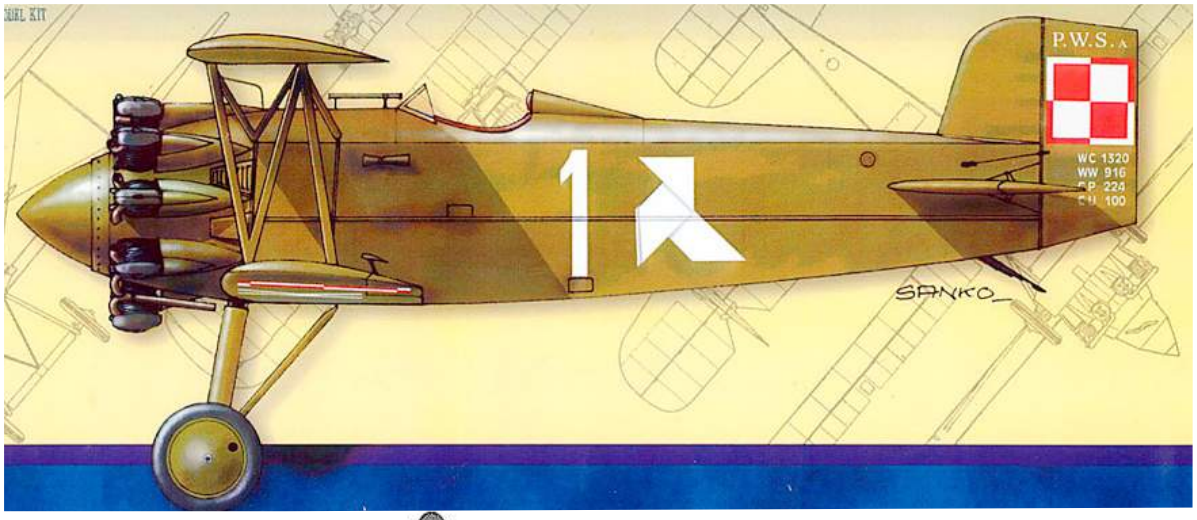
Development continued with an almost total redesign of the fuselage, replacing the wooden, slab-sided structure with one of oval cross-section built up from welded steel tubes. Designated BH-33E, this was at last a world-class fighter for its time. Nevertheless, the response from the Czechoslovakian military was lukewarm (although two were bought for the national aerobatics team), and Avia again looked abroad for customers, this time selling 20 aircraft to Kingdom of Yugoslavia, along with a licence to produce another 24.

Czechoslovakian BH-33s never saw combat, and Poland's examples had long been replaced in service by the time of the German invasion. Two Yugoslavian machines did, however see combat against Luftwaffe Messerschmitt Bf 109s, but were both destroyed and their pilots killed.

PWS-A

Role	Fighter
Crew	1
First flight	21 October 1927
Primary users	Czechoslovak Air Force, Polish Air Force, Yugoslav Royal Air Force
No. Produced	ca. 110, plus 50 licence-built in Poland and 22 in Yugoslavia
Take-off weight	1253 kg 2762 lb
Empty weight	830 kg 1830 lb
Wingspan	8.90 m 29 ft 2 in
Length	7.04 m 23 ft 1 in
Engine	Jupiter 480 nine cylinder radial (600 HP)
Max. speed	285 km/h 177 mph
Armament	2 x 7.7mm machine guns

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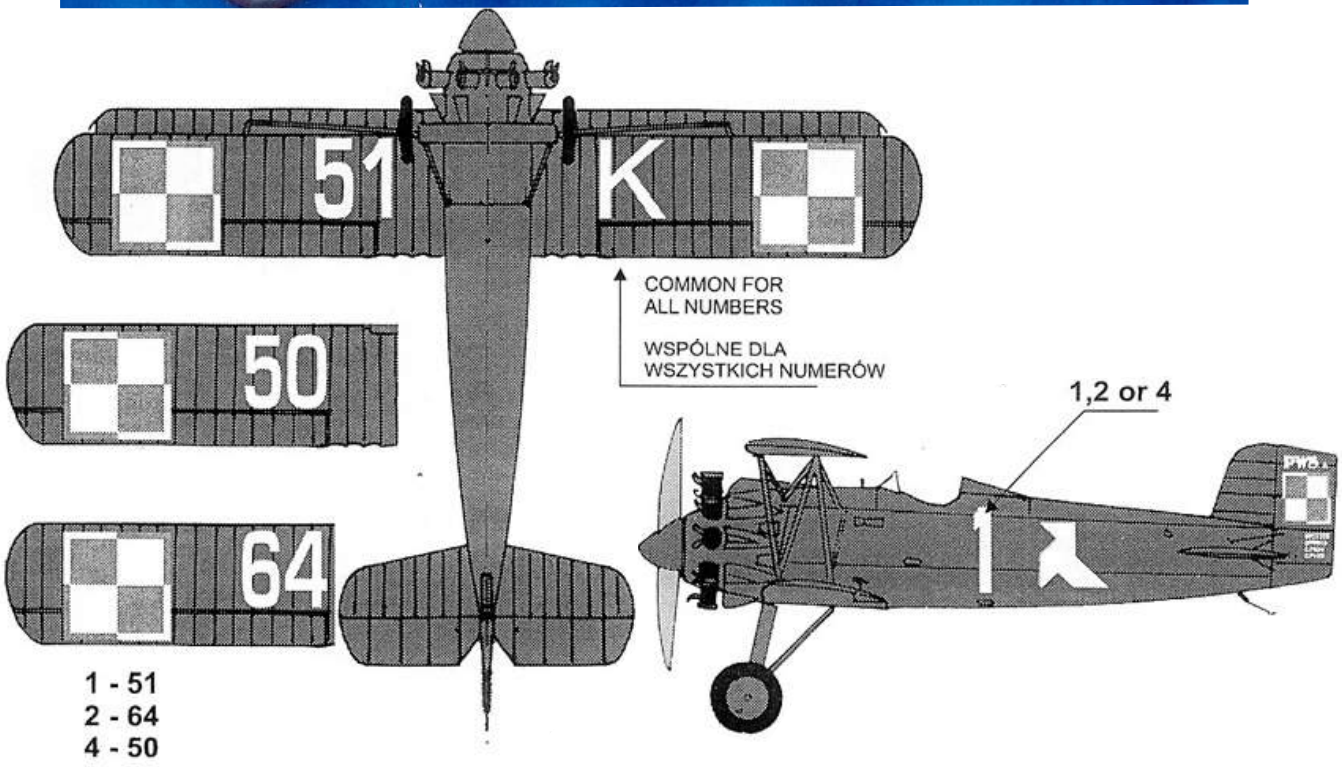
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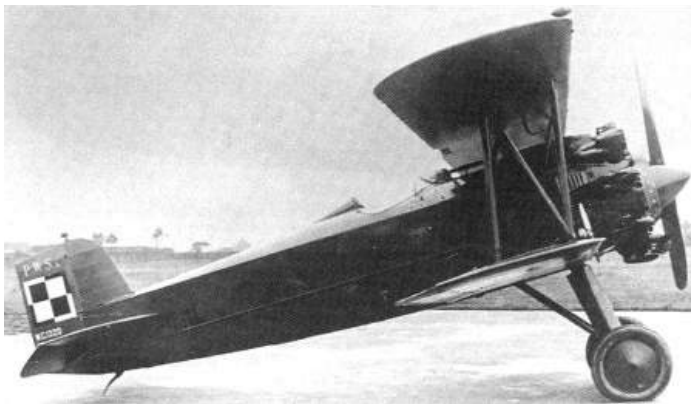


PWS-10 - 1932

The PWS-10 was a Polish fighter aircraft, constructed by the PWS- Podlaska Wytwórnia Samolotów (Podlasie Aircraft Works), located in Biała Podlaska. The PWS-10 was the first Polish-designed fighter to enter serial production.

PWS-10 nr bocz. 6, 132. Eskadra Myśliwska, 3. Pułk Lotniczy, 1933 r. Późniejsza wersja godła *poznański kruk*.

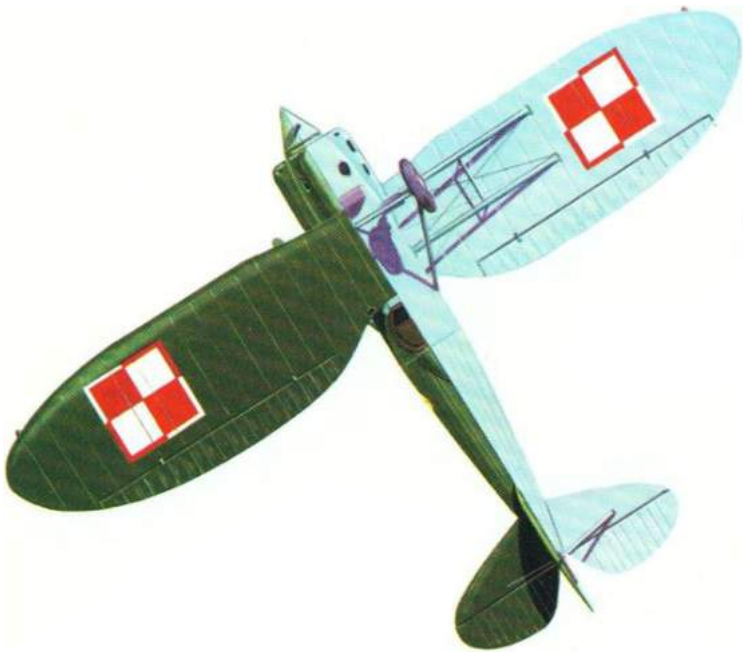
First work on a domestic fighter to replace ill-fated French SPAD 61s in the Polish Air Force was initiated by PWS in 1927. Main designers were Aleksander Grzędzielski and Augustyn Zdaniewski. The first prototype was built in 1929 and it first flew in March 1930. At the same time, the more modern fighter PZL P.1 was developed. Despite the P.1 being a more capable fighter, the War Ministry decided that it needed further work, and a series of 80 PWS-10 was ordered as a temporary measure. In comparison with the advanced P.1, the PWS-10 was a more classic design, a high-wing parasol monoplane of mixed construction. The series was built from 1931 to 1932.

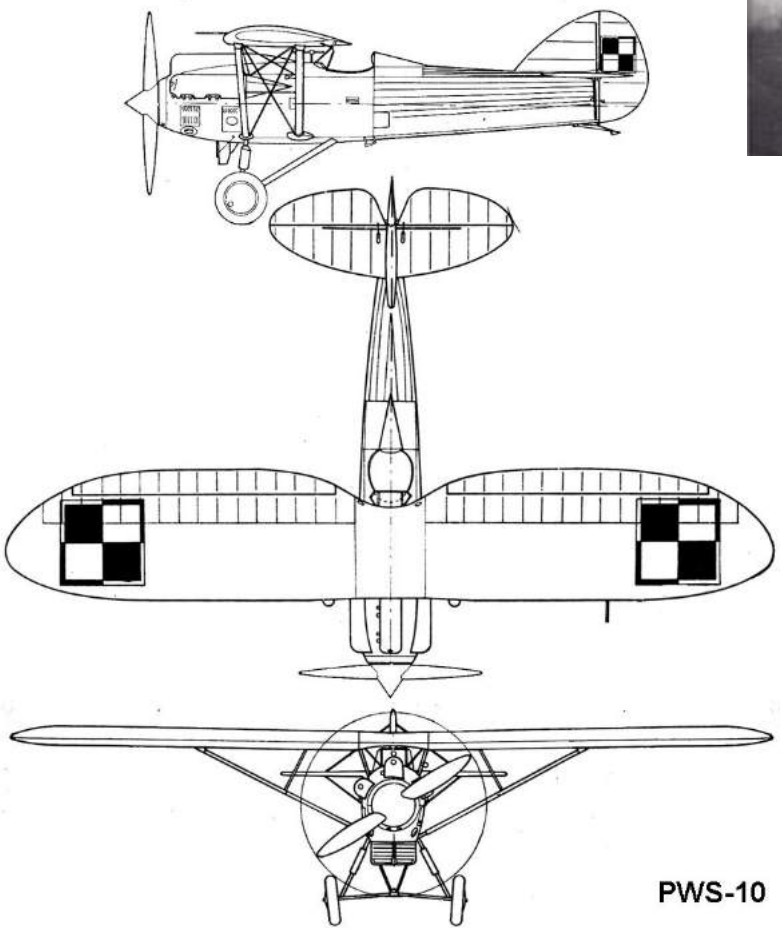
The PWS-10 was a mixed construction high-wing parasol monoplane, canvas and plywood covered. The fuselage had a metal frame, covered with duralumin in front section and canvas in rear section. It had two-spar elliptic wings, of wooden construction, canvas and plywood covered. The stabilizers, rudder and elevator were of metal construction, canvas covered. The pilot's cockpit was open with a windshield. The landing gear was fixed, with a rear skid.

The PWS-10 entered service in the Polish Air Force starting from 1932. Their flight characteristics and performance were mediocre. As soon, as in 1933 they were replaced in combat units by PZL P.7 and moved to the aviation school in Dęblin. During the summer of 1939, all remaining airworthy aircraft were gathered in Ułęż.

In late 1936, during the Spanish Civil War, 20 PWS-10s were sold in secret to Spanish nationalist forces. Aircraft were transported in crates and were assembled by PZL workers. First aircraft was flown in December 1936 in Leon. Being obsolete by then, they were not used as fighters, but for fighter pilot training in El Copero near Seville. Later PWS-10s were transferred to Jerez de la Frontera where were operated between April 1937 and end of 1938. Some were lost in crashes or scrapped, the remaining 11 were operated till the end of the 1938 and were retired in 1939.

During the German invasion of Poland in September 1939 they were too obsolete to be used in combat, but some were used for reconnaissance flights in an improvised Dęblin Group during first days of war.

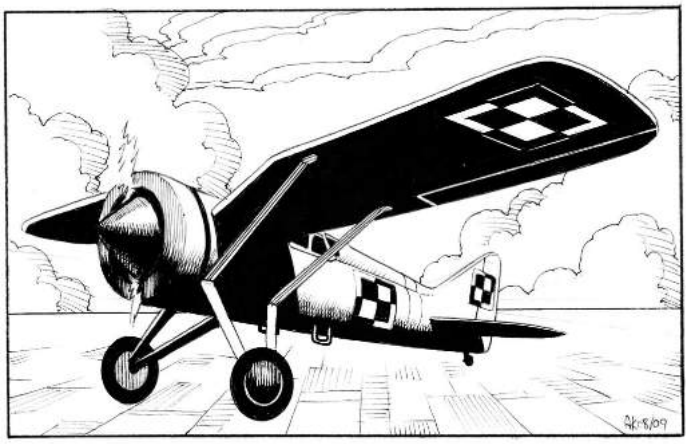




PWS-10

Role	Fighter
Crew:	1
Manufacturer	PWS
First flight	March 1930
Introduction	1932
Retired	1939
Primary users	Polish Air Force, Spanish Air Force
Produced	1931-1932
Number built	80
Length:	7.7 m (25 ft)
Wingspan:	10.5 m (33 ft)
Height:	2.9 m (10 ft)
Empty weight:	1113 kg (2448.6 lb)
Loaded weight:	1500 kg (3300 lb)
Useful load:	387 kg (851.4 lb)
Powerplant:	1 × Lorraine-Dietrich 12Eb water-cooled 12-cylinder inline, 478 hp
Maximum speed:	240 km/h (148.8 mph)
Cruise speed:	215 km/h (133.3 mph)
Range:	520 km (322 mi)
Service ceiling:	5,900 m (19,357 ft)
Armament	2 x 7.7 mm Vickers machine guns

PZL P.7- 1933



The PZL P.7 was the Polish fighter aircraft designed in early-1930s in the PZL factory in Warsaw. It had a state-of-the-art construction and was one of the first all-metal monoplane fighters in the world, in 1933. It was a main fighter of the Polish Air Force. It was replaced in Polish service by its follow-up design, the PZL P.11c. More than 30 P.7 fighters remained in service in the Polish Defensive War of 1939, scoring several kills despite their obsolescence.

The history of the PZL P.7 started in 1928, when a talented designer, Zygmunt Puławski designed an all-metal, metal-covered monoplane fighter, the PZL P.1. It introduced a high gull wing, giving a pilot an optimal view. The wing design was called the "Polish wing" or "Pulawski wing". The P.1 was powered by an in-line engine, and developed a speed of 302 km/h, but remained a prototype, because a decision was made to use a licence produced radial engine in the Polish Air Force fighters. Therefore, the next model, the PZL P.6, flown in August 1930, was powered by the Bristol Jupiter VI FH radial engine. Both aircraft were well received in the aviation world with the press recognizing the P.6 as one of the world's top fighters; it won the American National Air Races in August–September 1931.

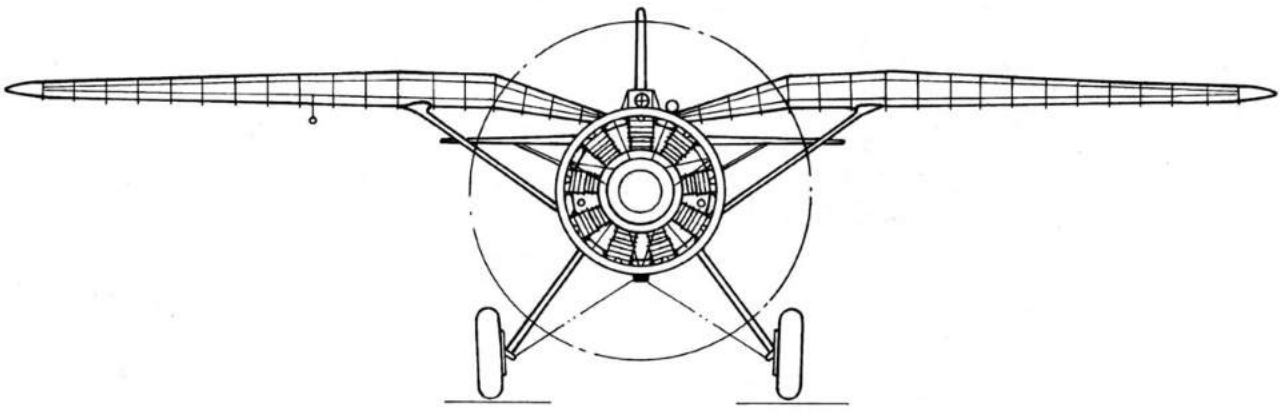
The PZL P.6 did not enter production, because the next variant, the more advanced PZL P.7 was developed. The first prototype was basically the P.6 with a more powerful Bristol Jupiter VII F engine. Due to the use of a supercharger, it had better performance at higher altitude.

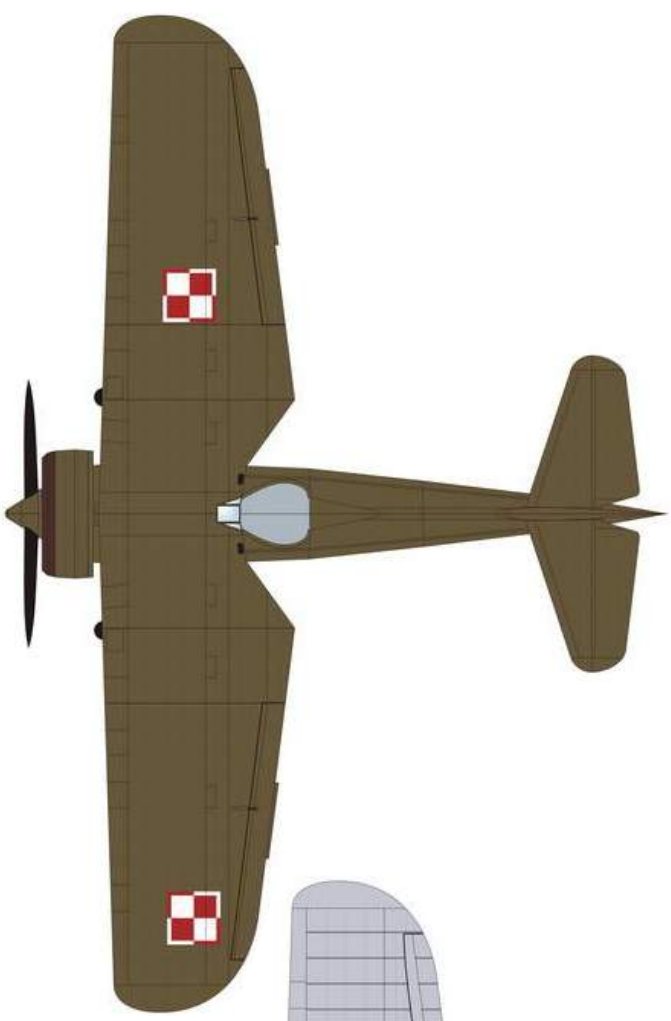
The PZL P.7a entered service in spring 1933, replacing PWS-A (Avia BH-33) and PWS-10 fighters. Consequently, the Polish Air Force became the world's first air force entirely equipped with all-metal monococque fighters. When the P.7 entered service, it was a modern fighter, comparable to or better than contemporary designs, but due to rapid progress in an aircraft technology, it became obsolete by 1939. From 1935, in most combat units the P.7 was replaced by the PZL P.11, which was only slightly more modern. The P.7as were then moved to air schools.

At the outbreak of the World War II on 1 September 1939, the Polish Air Force still had 30 PZL P.7a fighters in combat units. A further 40 were in air schools, 35 in reserve or repairs – a total of 106 available aircraft. The P.7as were used in three squadrons, each with 10 aircraft: the 123rd Squadron in the Pursuit Brigade, deployed around Warsaw, the 151st and the 162nd Squadrons were assigned to land Armies. Despite being obsolete, they took part in the defence of the country during the German Invasion. Apart from combat units, at least 18 P.7a fighters were mobilized in units improvised at air bases in Dęblin and Ułęż.

Although the P.7 had better manoeuvrability than their German opponents, and could operate from short fields (150m to take off), even rough ones, almost all the German aircraft were faster than the P.7a. Furthermore, the Polish aircraft and their engines were worn out from intensive service use. Their armament was also insufficient - only two Vickers machine guns in most aircraft, which had a tendency to jam. For these reasons, the pilots flying the P.7a claimed shooting down only seven German aircraft, suffering combat losses of 22 aircraft. An improvised task force of P.7a aircraft from units at air bases was rather to confuse and disturb the German bombing raids with their aggressive presence, than to shoot down bombers.

Most of the P.7a fighters were destroyed in 1939, in combat or on the ground, some dozen were withdrawn to Romania, but not used in combat there. Some captured P.7s were used by the Germans and Soviets for training.

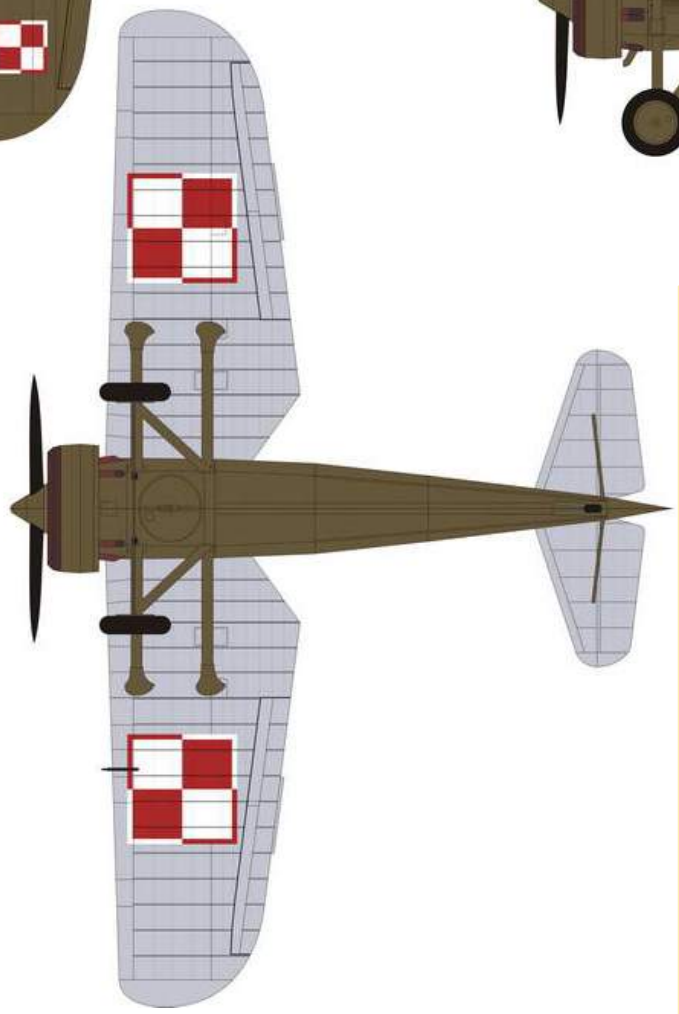




PZL P-7a, 111 Eskadra Myśliwska
1PL w Warszawie

PZL P-7a, 151 Eskadra Myśliwska,
SGO Narew, wrzesień 1939
Pilot: por. J. Brzeziński

PZL P-7a, 122 Eskadra Myśliwska
2PL w Krakowie
Pilot: kpr Karol Pniak



PZL P.7

Role	Fighter
Manufacturer	PZL, Warsaw
Produced	1932-1933
Number built	149+2
Crew:	1
Length:	6.98 m (22 ft 11 in)
Wingspan:	10.57 m (34 ft 8 in)
Height:	2.69 m (8 ft 10 in)
Empty weight:	1,090 kg (2,400 lb)
Loaded weight:	1,476 kg (3,254 lb)
Powerplant:	1 × Bristol Jupiter VIIF 9-cylin der radial engine, 520 hp
Maximum speed:	327 km/h (203 mph)
Cruise speed:	285 km/h
Stall speed:	104 km/h ()
Range:	600 km (370 mi)
Service ceiling:	8,500 m (27,900 ft)
Armament	2 x 7.9 mm Vickers E machine guns (later series: PWU FK wz.33 machine guns)

PZL P.11- 1934

Poland's best fighter on September 1, 1939

After designing the P.7, Zygmunt Puławski he started work on an improved version with more powerful engines. Puławski personally was an inline engine fan, and designed a new fighter, the P.8, with a slim silhouette. It was able to reach a speed of 350 km/h. Unfortunately,Puławski died in an air crash in March 1931, and his inline engine fighter design was cancelled in a favour of the radial engined P.11. When the P.11 entered service in 1934, it was arguably the most advanced fighter in the world. However, due to the quick progress in aircraft technology, the P.11 was obsolete by 1939. The PZL P.11 served as Poland's primary fighter defence in the Polish campaign of 1939, but by that point was outdated in comparison to more advanced contemporary fighters, such as the Hawker Hurricane and Messerschmitt Bf 109.

The first variant ordered by the Polish Air Force was the P.11a, considered an interim model and built in a series of 30. Otherwise similar to the P.7, it had a more powerful 575 hp Bristol Mercury IV S2 radial engine produced in Poland under licence. The final variant for the Polish air force, the P.11c, had a new refined fuselage, with the engine lowered in the nose to give the pilot a better view. The central part of the wings was also modified. Production of the P.11c started in 1934 and 175 were produced, 50 with a 600 hp engine, the rest with 630 hp. The aircraft had high wings, metal-covered. The cockpit was open. An internal fuel tank in a hull could be dropped in case of fire emergency.

The P.11s were distributed within six air regiments and the aviation school in Deblin. Polish aircraft factories were working on improved designs to replace the P.11, but it was clear that war was on the horizon. In an effort to upgrade its fighter force, Poland ordered from France 120 Morane-Saulnier M.S.406s, and from Britain, 14 Hawker Hurricanes (the P.11's chosen replacement), plus one Spitfire for testing, in addition to 100 Fairey Battle light bombers. None of these aircraft were delivered to Poland before September 1939.

At the outbreak of the Second World War, on 1 September 1939, the Polish Air Force had 109 PZL P.11c, 20 P.11a and 30 P.7a in combat units. A further 43 P.11c aircraft were in reserve or undergoing repairs. Only a third of P.11c were armed with four machine guns, the rest had only two, even fewer had a radio. The P.11 were used in 12 squadrons, each with 10 aircraft. Four squadrons were in the Pursuit Brigade deployed around Warsaw, the rest were assigned to Armies. All of them took part in defense during the Invasion of Poland.

By 1 September 1939, the fighter squadrons had been deployed to remote airfields, so they were not bombed by the Germans. During the Polish campaign, the P.11 fought against more modern German bombers and fighters. Not only were the German Messerschmitt Bf 109 and Bf 110 faster and better armed, but also most German bombers were faster. Since the P.11 fighters had seen years of intensive use before the war, their maximum speed was even lower than the theoretical 375 km/h (233 mph). The P.11a were in an even worse condition. Another serious deficiency was their small number which meant that missions involving groups larger than about 20 aircraft were rarely undertaken and reserve machines were practically unavailable.

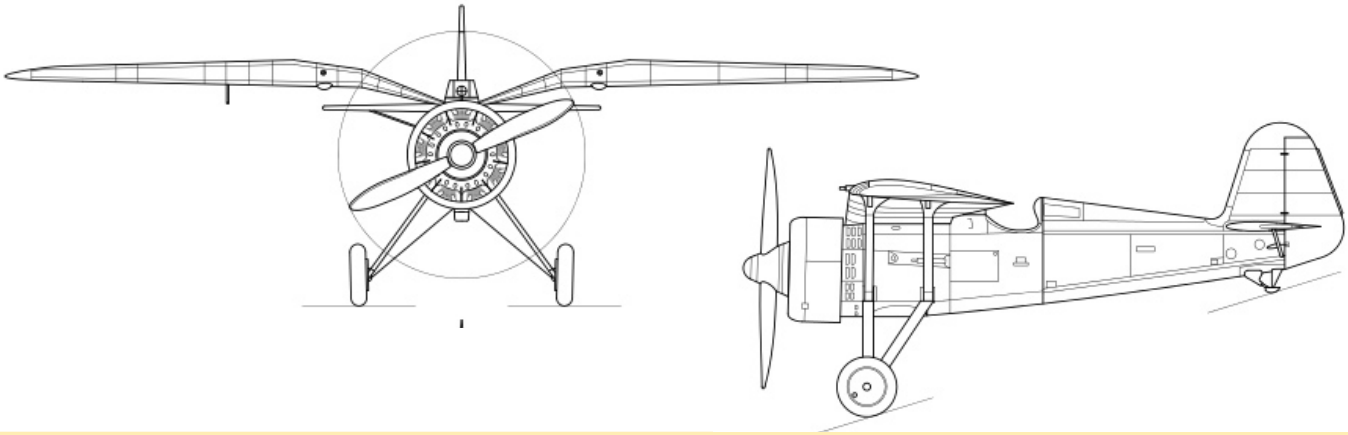
On the other hand, the Polish fighter aircraft had better manoeuvrability and because of their design, had much better vision from the cockpit than the German aircraft. The P.11 had a strong construction, good rate of climb and could operate from short fields, even rough ones. It was also of a very durable construction and could dive at up to 600 km/h (373 mph) without risk of the wings falling apart. Theoretically the only limit in manoeuvres was the pilot's ability to sustain high g forces. Despite the German superiority, the P.11 managed to shoot down a considerable number of German aircraft, including fighters, but suffered heavy losses as well. The exact numbers are not fully verified. A total of 285 German aircraft were lost according to Luftwaffe records, with at least 110 victories credited to the P.11 for the loss of about 100 of their own. Some of the German aircraft shot down were later recovered and put back into service. That allowed German propaganda to claim smaller combat losses.

At dawn on 1 September, Capt. Mieczysław Medwecki flying a PZL P.11c was shot down by Rottenführer (Foreman Leader) Leutnant Frank Neubert of I./StG 2 (Stuka), having the dubious honour of becoming the first aircraft shot down in the Second World War. The first Allied air victory was achieved 20 minutes later by Medwecki's wingman, Wladyslaw Gnys who shot down two Dornier Do 17s with his P.11c. The first aircraft to successfully ram an enemy aircraft in WWII was also a P.11c. The first large air battle of the Second World War took place in the early morning of 1 September over the village of Nieporęt just north of Warsaw, when a German bomber group of about 70 Heinkel He 111 and Dornier Do 17 was intercepted by some 20 P.11 and 10 P.7 fighters, causing the Germans to abandon their mission to Warsaw.

Most of the P.11s were destroyed in 1939, though 36 were flown to Romania and taken over by the Romanian Air Force. Due to their obsolescence, these veteran aircraft were not used in combat; only a small number was used for training while the rest were dismantled for spare parts. Some aircraft were used by the Germans for training. Two PZL P.11s were captured by the Red Army and used for testing.

The sole surviving P.11c aircraft is on display in the Polish Aviation Museum in Kraków.

This is the sole surviving fighter from the Polish Air Force of 1939. The PZL P.11c, Polish serial '8.63'. c/n 562. It is now on display taking pride of place in the new entrance building at the Muzeum Lotnictwa Polskiego in Krakow.



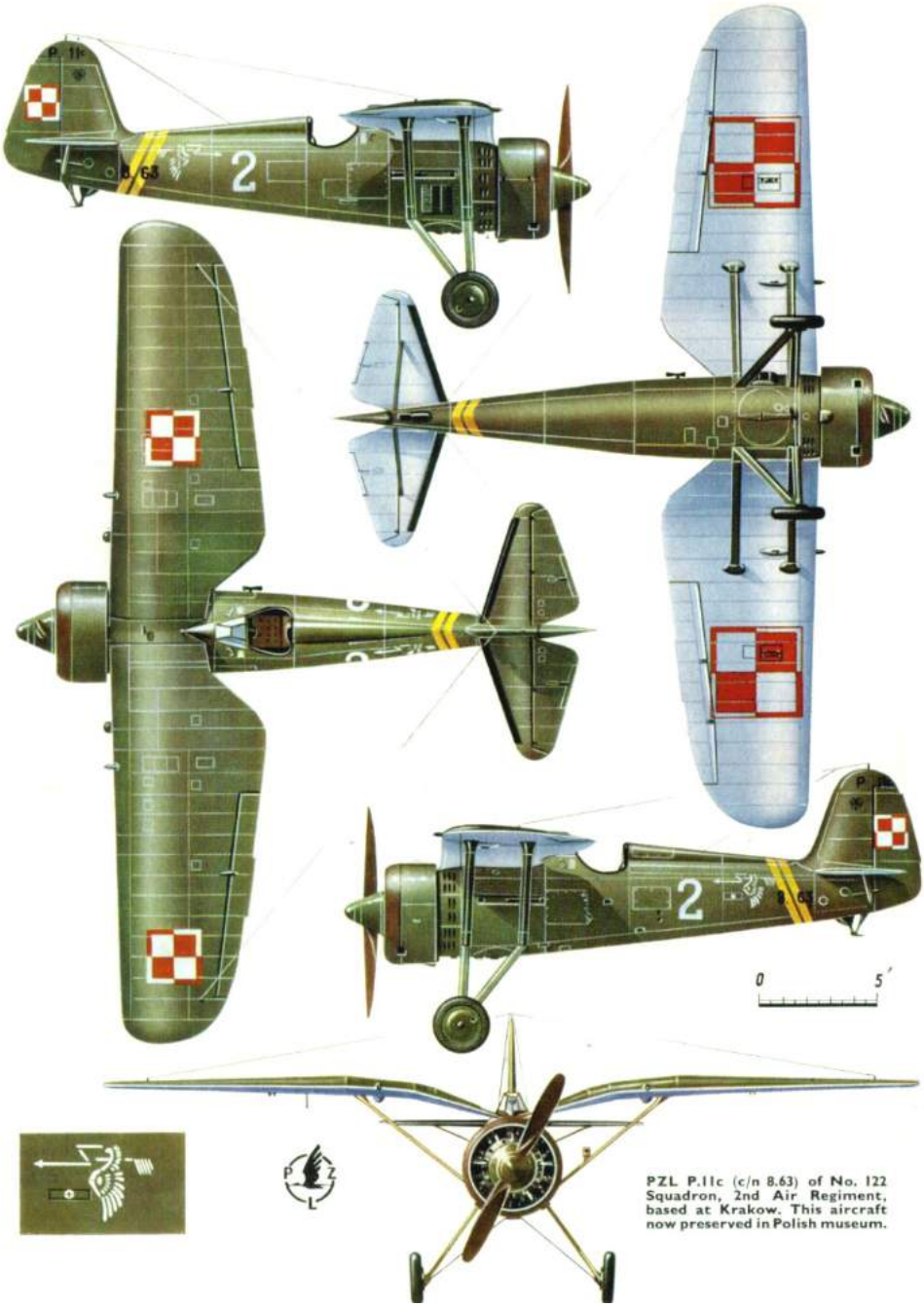
PZL P.11

Role	Fighter
Designer	Zygmunt Pulawski
First flight	August 1931
Number built	325
Developed from	PZL P.7
Crew:	1
Length:	7.55 m (24 ft 9 in)
Wingspan:	10.72 m (35 ft 2 in)
Height:	2.85 m (9 ft 4 in)
Empty weight:	1,147 kg (2,529 lb)
Max takeoff wt:	1,800 kg (3,968 lb)
Powerplant:	

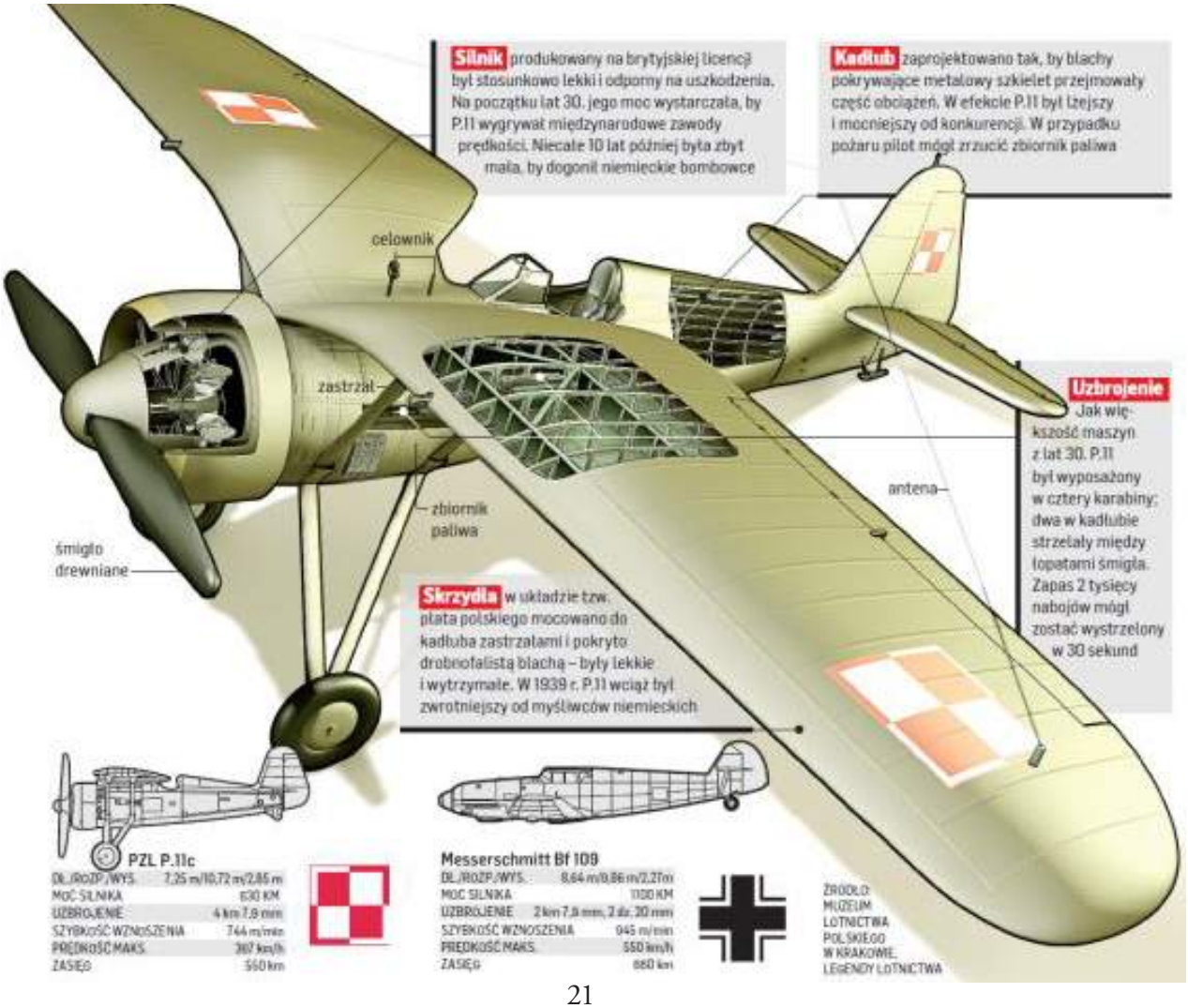
P.11a: 497–517 hp Polish Skoda Works Mercury IV.S2 radial
P.11b: 525 hp Gnome-Rhône 9K Mistral radial.
P11c: Bristol Mercury V.S2 9-cyl. radial engine, 560 hp or Polish Skoda Works Mercury VI.S2 radial, 645 hp.

Propeller:	2-bladed Szomański fixed pitch wooden
Maximum speed:	390 km/h (242 mph) at 5,000 m 300 km/h (186 mph) at sea level
Stall speed:	98 km/h (61 mph)
Range:	700 km (435 mi)
Service ceiling:	8,000 m (26,247 ft)
Absolute ceiling:	11,000 m (36,089 ft)
Guns:	
P.11a, b c:	2 x 7.92 mm machine guns with 500 rounds per gun (rpg).
P.11c:	optionally an extra 2 × 7.92 mm machine guns with 300rpg
P.11f, g:	4 x 7.92 mm machine guns

PZL P.11c



PZL P.11c (c/n 8.63) of No. 122 Squadron, 2nd Air Regiment, based at Krakow. This aircraft now preserved in Polish museum.


Silnik produkowany na brytyjskiej licencji był stosunkowo lekki i odporny na uszkodzenia. Na początku lat 30. jego moc wystarczała, by P.11 wygrywał międzynarodowe zawody prędkości. Niecałe 10 lat później była zbyt mała, by dogonić niemieckie bombowce
Kadłub zaprojektowano tak, by blachy pokrywające metalowy szkielet przejmowały część obciążeń. W efekcie P.11 był lżejszy i mocniejszy od konkurencji. W przypadku pożaru pilot mógł zrzucić zbiornik paliwa
celownik
zastrzał
zbiornik paliwa
śmigło drewniane
antena
Uzbrojenie Jak większość maszyn z lat 30. P.11 był wyposażony w cztery karabiny: dwa w kadłubie strzelały między łopatami śmigła. Zapas 2 tysięcy nabojów mógł zostać wystrzelony w 30 sekund
Skrzydła w układzie tzw. płata polskiego mocowano do kadłuba zastrzałami i pokryto drobnofalistą blachą – były lekkie i wytrzymałe. W 1939 r. P.11 wciąż był zwrotniejszy od myśliwców niemieckich
PZL P.11c
DŁ./ROZP./WYS. 7,25 m/10,72 m/2,85 m
MOC SILNIKA 630 KM
UZBROJENIE 4 km 7,9 mm
SZYBKOŚĆ WZNOSZENIA 744 m/min
PRĘDKOŚĆ MAKS. 367 km/h
ZASIĘG 550 km
Messerschmitt Bf 109
DŁ./ROZP./WYS. 8,64 m/9,86 m/2,27m
MOC SILNIKA 1100 KM
UZBROJENIE 2 km 7,9 mm, 2 dz. 20 mm
SZYBKOŚĆ WZNOSZENIA 945 m/min
PRĘDKOŚĆ MAKS. 550 km/h
ZASIĘG 660 km
ŹRÓDŁO: MUZEUM LOTNICTWA POLSKIEGO W KRAKOWIE, LEGENDY LOTNICTWA

Gazda Fights the German invaders in the 1939 Defensive War

September 1, 1939: Germany invades Poland. Poland's military resists with all its strength. Britain and France fail to honor their promise to invade Germany in retaliation.

September: First weeks of the battle: Feliks Gazda and his students move to the south east of Poland to protect the Romanian Bridgehead

September 17: The Soviet Union invades Poland, sealing the fate of a free Poland.

September, Last weeks of the battle: Gazda crosses into Romania with his students. They most likely flew out of Poland in PZL P.7 fighter aircraft (records show a dozen P.7s were flown to Romania.) Gazda and his students were interned in Slatina. Gazda becomes the Polish commander of the camp.

October 1: Gazda escapes from camp, goes to the Black Sea, then heads to France.

Novenber 12: Gazda arrives in Malta on a ship, likely the cargo ship *Patris*, then to France. (The ship was later sunk on April 7, 1941, by the Luftwaffe during the battle of Greece.)

Part 2

Poland

Sepember, 1939

The Invasion of Poland, also known as the 1939 Defensive War, marked the beginning of World War II in Europe. The German invasion began on 1 September 1939, one week after the signing of the Molotov–Ribbentrop Pact, while the Soviet invasion commenced on 17 September following the Molotov-Tōgō agreement which terminated the Russian and Japanese hostilities in the east. The campaign ended on 6 October with Germany and the Soviet Union dividing and annexing the whole of Poland.

On the morning of September 1, German forces invaded Poland from the north, south, and west. As the Germans advanced, Polish forces withdrew from their forward bases of operation close to the Polish–German border to more established lines of defense to the east. After the mid-September Polish defeat in the Battle of the Bzura, the Germans gained an undisputed advantage. Polish forces then withdrew to the southeast where they prepared for a long defense of the Romanian Bridgehead and awaited expected support and relief from France and the United Kingdom. Those two countries had pacts with Poland and had declared war on Germany on 3 September, though in the end, their aid to Poland in the September campaign was non-existant.

The Soviet Red Army's invasion of Eastern Poland on 17 September rendered the Polish plan of defence obsolete. Facing a second front, the Polish government ordered an emergency evacuation of all troops to neutral Romania. On 6 October, following the Polish defeat at the Battle of Kock, German and Soviet forces gained full control over Poland. This marked the end of the Second Polish Republic, though Poland never formally surrendered.

On 8 October Germany directly annexed western Poland and the former Free City of Danzig and placed the remaining block of territory under the administration of the newly established General Government. The Soviet Union incorporated its newly acquired areas into its constituent Belarusian and Ukrainian republics, and immediately started a campaign of sovietization. In the aftermath of the invasion, a collective of underground resistance organizations formed the Polish Underground State within the territory of the former Polish state. Many of the military exiles that managed to escape Poland subsequently joined the Polish Armed Forces in the West, an armed force loyal to the Polish government in exile.

Germany had a substantial numeric advantage over Poland and had developed a significant military before the conflict. The army had some 2,400 tanks organized into 6 panzer divisions, utilizing a new operational doctrine. It held that these divisions should act in coordination with other elements of the military, punching holes in the enemy line and isolating selected units, which would be encircled and destroyed. This would be followed up by less-mobile mechanized infantry and foot soldiers. The Luftwaffe provided both tactical and strategic air power, particularly dive bombers that disrupted lines of supply and communications. Together, the new methods were nicknamed "Blitzkrieg" (lightning war).

Aircraft played a major role in the campaign. Bombers also attacked cities, causing huge losses amongst the civilian population through terror bombing and strafing. The Luftwaffe forces consisted of 1,180 fighters, 290 Ju 87 Stuka dive bombers, 1,100 conventional bombers (mainly Heinkel He 111s and Dornier Do 17s), and an assortment of 550 transport and 350 reconnaissance aircraft. In total, Germany had close to 4,000 aircraft, most of them modern. Due to its earlier participation in the Spanish Civil War, the Luftwaffe was probably the most experienced, best-trained and best-equipped air force in the world in 1939.

Preparations in Poland for a defensive war with Germany were ongoing for many years, but most plans assumed fighting would not begin before 1942. The Polish Army had approximately a million soldiers, but less than half were mobilized by 1 September.

The Polish Air Force was at a severe disadvantage against the German Luftwaffe, although it was not destroyed on the ground early on as is commonly believed. The Polish Air Force lacked modern fighters, but its pilots were among the world's best trained, as proven a year later in the Battle of Britain, in which the Poles played a major part.

Overall, the Germans enjoyed numerical and qualitative aircraft superiority. Poland had only about 600 aircraft, of which only 37 P-37 Łoś bombers were modern and comparable to its German counterparts. The Polish Air Force had roughly 185 PZL P.11 and some 95 PZL P.7 fighters, 175 PZL.23 Karaś Bs, 35 Karaś As, and by September, over 100 PZL.37s were produced. However only some 70% of those aircraft were mobilized during the September war. The Polish fighters were a generation older than their German counterparts; the PZL P.11 fighter—produced in the early 1930s—had a top speed of only 365 km/h (227 mph), far less than German bombers. To compensate, the pilots relied on its maneuverability and high diving speed..

The Soviet invasion was one of the decisive factors that convinced the Polish government that the war in Poland was lost. Before the Soviet attack from the east, the Polish military's fall-back plan had called for long-term defence against Germany in the southeastern part of Poland, while awaiting relief from a Western Allies attack on Germany's western border. However, the Polish government refused to surrender or negotiate a peace with Germany. Instead, it ordered all units to evacuate Poland and reorganize in France.

The Polish September Campaign was an instance of total war. Consequently, civilian casualties were high during and after combat. From the start, the Luftwaffe attacked civilian targets and

columns of refugees along the roads to wreak havoc, disrupt communications, and target Polish morale. Apart from the victims of battles, the German forces (both SS and the regular Wehrmacht) murdered several thousand Polish civilians. During Operation Tannenberg, nearly 20,000 Poles were shot at 760 mass execution sites by the Einsatzgruppen.

The Polish Campaign was the first action by Adolf Hitler in his attempt to create Lebensraum, or living space, for the ethnic German people. The German retaliation against the opposing Polish civilians quickly turned into an atrocity, an irregular warfare against Polish men, women, and children. The brutality that the German army carried out on the civilians was justifiable in their eyes. Many historians have studied the reasoning behind this brutality and have found that Nazi propaganda could be one of the factors. Nazi propaganda worked to manipulate the German people into believing that the Jewish and other ethnic people were the enemy.

Altogether, the civilian losses of Polish population amounted to about 150,000–200,000, while German civilian losses amounted to roughly 3,250 (including 2,000 who died fighting Polish troops as members of a fifth column).

About 65,000 Polish troops were killed in the fighting, with 420,000 others being captured by the Germans and 240,000 more by the Soviets (for a total of 660,000 prisoners). Up to 120,000 Polish troops escaped to neutral Romania (through the Romanian Bridgehead and Hungary), and another 20,000 to Latvia and Lithuania, with the majority eventually making their way to France or Britain. Most of the Polish Navy succeeded in evacuating to Britain as well.

German personnel losses were less than their enemies (~16,000 KIA).

The invasion decimated urban residential areas, civilians soon became indistinguishable from combatants, and the forthcoming German occupation (both on the annexed territories and in the General Government) was one of the most brutal episodes of World War II, resulting in between 5.47 million and 5.67 million Polish deaths (about 20% of the country's total population, and over 90% of its Jewish minority)—including the mass murder of 3 million Polish citizens- mainly Jews as part of the final solution- in extermination camps like Auschwitz, in concentration camps, and in numerous ad hoc massacres, where civilians were rounded up, taken to a nearby forest, machine-gunned, and then buried, whether they were dead or not.

According to the Polish Institute of National Remembrance, Soviet occupation between 1939 and 1941 resulted in the death of 150,000 and deportation of 320,000 of Polish citizens, when all who were deemed dangerous to the Soviet regime were subject to sovietization, forced resettlement, imprisonment in labor camps (the Gulags) or murdered, like the Polish officers in the Katyn massacre.

Myth: Poland offered little resistance and surrendered quickly.

False on both counts

In the first few days, Germany sustained very heavy losses: Poland cost the Germans an entire armored division, thousands of soldiers, and 25% of its air strength. As for duration, the September Campaign lasted only about one week less than the Battle of France in 1940, even though the Anglo-French forces were much closer to parity with the Germans in numerical strength and equipment. Furthermore, the Polish Army was preparing the Romanian Bridgehead, which would have prolonged Polish defence, but this plan was cancelled due to the Soviet invasion of Poland on 17 September 1939.

Polish and German forces during the Invasion of Poland (September, 1939):

	Poland	Germany
Soldiers:	1,000,000	1,800,000
Guns:	4,300	10,000
Tanks:	880	2,800
Aircraft	421	4,000

Allied forces and German forces in the Battle of France (June, 1940):

	France + Allies	Germany
Soldiers:	2,862,000	3,350,000
Guns:	13,974	7,378
Tanks:	3,384	2,445
Aircraft	3,099	5,446

Germany had almost double the troops and ten times the operational aircraft as Poland during September 1939. The French had more guns and tanks in the Battle of France than did the Germans, with numbers of troops and aircraft closer to parity.

German military losses in the 1939 Defensive War:
16,000 personnel dead
34,000 wounded
1,000 tanks (30% of their total at the time)
370 artillery pieces
564 aircraft (about 25% of their total at the time)

Polish losses in the 1939 Defensive War:
66,300 military personnel killed
133,700 wounded
150,000 to 200,000 civilians killed
333 aircraft (the rest were flown to Romania)
420,000 taken prisoner by the Germans
190,000 taken prisoner by the Soviets
Most equipment and arms were captured

Myth: The Polish Air Force was destroyed on the ground in the first days of the war.
False

The Polish Air Force, though numerically inferior, had been moved from air bases to small camouflaged airfields shortly before the war. Only some trainers and auxiliary aircraft were destroyed on the ground. The Polish Air Force, significantly outnumbered and with its fighters outmatched by more advanced German fighters, remained active up to the second week of the campaign, inflicting significant damage on the Luftwaffe. The Luftwaffe lost, to all operational causes, 285 aircraft, with 279 more damaged, while the Poles lost 333 aircraft.

Poland's PZL.37 Łoś Light Bomber was as advanced as the German counterpart, but only 36 of the 100 total in the Polish Air Force were available for combat on September 1.

Polish Air Force
Number of planes on September 1, 1939

Type & Model	Total	In combat formations
Fighters		
PZL P.11	185	140
PZL P.7	95	30
Light bombers/tactical bombers		
PZL.23A	35	0
PZL.23B	175	120
Medium bombers		
PZL.37 Łoś	100	36
PZL.30 Żubr	15	0
Surveillance aircraft and Army cooperation plane		
Lublin R-XIII	150	55
RWD-14 Czapla	60	40
Total	**771**	**421**

Most of the Polish Air Force was destroyed in combat during the campaign, the rest of the aircraft were captured or withdrawn to Romania. Subsequently, the Romanians interned some of the Polish pilots and employed the remaining aircraft for their own use. A great number of pilots and air crews managed to escape to France where they intended to continue the fight.

The Betrayal of Poland

On March 31, 1939, in response to Nazi Germany's defiance of the Munich Agreement and occupation of Czechoslovakia, the United Kingdom pledged the support of itself and France to guarantee Polish independence.

"... in the event of any action which clearly threatened Polish independence, and which the Polish Government accordingly considered it vital to resist with their national forces, His Majesty's Government would feel themselves bound at once to lend the Polish Government all support in their power. They have given the Polish Government an assurance to this effect. I may add that the French Government have authorised me to make it plain that they stand in the same position in this matter as do His Majesty's Government."

When the German invasion came on September 1, Britain and France spent that day and the next trying to negotiate with Hitler. While a formal declaration of war came on September 3, after thousands of Polish military and civilian personnel had already perished, there was no miliary response from Britain and France. The word "betrayal" was used to describe these so-called allies who failed to fulfill their treaty responsibilities to stand by the countries they swore to protect.

Deep in its pacifist fantasies, Britain did not consider the violation of her allies borders a valid cause for war. France's response to the invasion was similar, expressing a willingness to negotiate though refusing to send any deadline for a German response.

During September, the two western Allies remained mostly idle. Ninety-two French divisions stook idle behind the Maginot Line, facing 35 third-grade German divisions. While Poland desperately requested the French Army to advance into Germany to tie down German divisions and requested Britain to bomb German industrial centers, Britain and especially France did nothing in fear of German reprisals. In one of the biggest "what-if" scenarios of WWII, even Wilhelm Keitel noted that had France reacted by conducting a full-scale invasion of Germany, Germany would have fallen immediately. "We soldiers always expected an attack by France during the Polish campaign, and were very surprised that nothing happened.... A French attack would have encountered only a German military screen, not a real defense", he said.

Polish historian Paweł Wieczorkiewicz wrote: "Polish leaders were not aware of the fact that England and France were not ready for war. They needed time to catch up with the Third Reich, and were determined to gain the time at any price". Publicist Stanisław Mackiewicz stated in the late 1940s: "To accept London's guarantees was one of the most tragic dates in the history of Poland. It was a mental aberration and madness". On the same day when Britain pledged her support of Poland, Lord Halifax stated: "We do not think this guarantee will be binding". Other British diplomat, Alexander Cadogan wrote in his diary: "Naturally, our guarantee does not give any help to Poland. It can be said that it was cruel to Poland, even cynical".

Poland Never Surrendered

Poland also never officially surrendered to the Germans. Under German occupation, the Polish army continued to fight underground, as Armia Krajowa and forest partisans—Leśni. The Polish resistance movement in World War II in German-occupied Poland was one of the largest resistance movements in all of occupied Europe.

Polish officials took measures to maintain the continuity of the Polish government after the German takeover. On September 30, 1939, in accordance with the Polish Constitution, Polish President Ignacy Mościcki (who was interned in Romania) resigned and nominated Władysław Raczkiewicz (who was at the time in Paris) to the post of Polish president. At the same time, the Polish government, also interned in Romania, resigned. This permitted the new Polish president to entrust the formation of a new government to General Władysław Sikorski, who was in France at the time.

A new government was formed with General Sikorski as prime minister and commander in chief, thus maintaining the continuity of the Polish State and Polish participation in the war. The Government in Exile moved to England after the fall of France and functioned in London throughout the war and beyond.

When it lost accreditation after the war in England, France, the United States and other countries– which recognized the communist puppet regime imposed on Poland by the Soviets– the Government in Exile continued its struggle against communism

until 1990, when the Soviet Union disintegrated and Poland regained its freedom.

In the same year- 1990- fifty years after the formation of the Polish Government in Exile, a ceremony was held in the rebuilt Royal Castle in Warsaw. The man who was the sixth Polish President in Exile, Ryszard Kaczorowski, handed over the Polish State insignia to Lech Wałęsa, the democratically elected president of Poland. The insignia had been kept by the Polish Government in Exile in London while Poland was under foreign occupations by the Germans and the Soviets. It is currently on display at the Royal Castle in Warsaw.

The Polish Air Force Standard

The Standard of the Polish Air Force in Britain was made secretly by Polish women in German occupied Poland and smuggled across German-ruled Europe to Britain. In the photo on the right, it is being passed from one squadron to another.

The Polish Air Force Standard.
The inscription is “Love Demands Sacrifice”

Gazda fights in France, 1939–1940

1939, November 26: Gazda is appointed to the Air Force training center in Lyon. He retrains Polish pilots to use French aircraft. The **Caudron C.R. 714 Cyclone** was the airplane assigned to the Polish pilots initially.

1940, May 10: Germany invades the low countries and France.

1940: May and June: F/LtGazda flies **Moraine Saulnier MS-406** fighters to make attacks on the German invators of France

1940, June 17: Gazda and his squadron fly to Perpignan, France near the Spanish border, as the Nazis take over northern France.

1940, June 23: Gazda flies (as a passenger) from Perpignan to Oran, Algeria, in a **Caudron C440 Goeland**. He then makes his way to Britain.

Battle of France Timeline:

May 10, 1940: Germany begins invasions of Belgium, the Netherlands, and France

May 13: French and British troops move into Belgium but are trapped between German armies

May 14: Luftwaffe bombs central Rotterdam; Netherlands surrenders to Germany

May 27: British troops begin mass evacuation from Dunkirk. In one week, using more than 800 civilian and military sea vessels, more than 300,000 men were brought back across the English Channel to Britain.

June 3: Germans bomb Paris; Dunkirk evacuation ends.

June 10: Norway surrenders to the Nazis; Italy declares war on Britain and France.

June 12: German forces penetrate France's final lines of defense

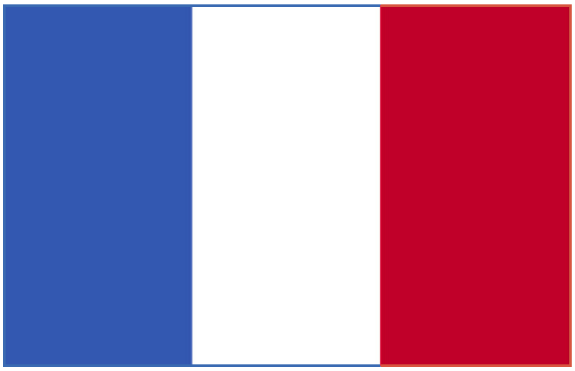
June 14: Germans enter an undefended Paris.

June 22: Marshal Pétain's puppet government signs armistice with Germany.

June 23 Hitler visits Paris

Part 3

France



The Battle of France, 1940

"If the tanks succeed, then victory follows."
- Heinz Guderian, leader of Panzer units in Poland, France and Russia.

By May 1940, Europe had been at war for nine months. Yet Britain and France, despite having declared war on Germany in September 1939 following Hitler's attack on Poland, had seen little real fighting. This tense period of anticipation – which came to be known as the 'Phoney War' – met an abrupt end on 10 May 1940, when Germany launched an invasion of France and the Low Countries.

The German plan of attack entailed an armoured offensive through the Ardennes Forest, which bypassed the strong French frontier defences of the Maginot Line. The advance would then threaten to encircle French and British divisions to the north, stationed on the Belgian frontier.

The German offensive quickly overwhelmed Dutch forces, and the bombing of Rotterdam persuaded the Netherlands to surrender on 15 May. And although German forces in the north encountered strong French and Belgian resistance, the main German thrust through the Ardennes met with tremendous success. French second-rate divisions in the area were not prepared or equipped to deal with the major thrust of tanks that developed. It was thought by the French that the forest and the poor roads in the area would make a tank assault impossible.

Just four days into the invasion German troops crossed the Meuse river and had broken through the French lines. Attempts by the Allies to launch counterattacks by air and land either failed with heavy losses, or were thwarted by the pace of events. The British Expeditionary Force, along with the best units of the French army, were still in the north and had seen little fighting. But the German breakthrough to the south now forced them into rapid retreat to avoid being cut off with their backs to the sea. On 20 May ,German tanks reached Amiens and effectively trapped the British, who now made for Dunkirk and an unlikely attempt at evacuation to England.

In these desperate circumstances, an evacuation plan known as 'Operation Dynamo' was hastily prepared in Dover by Vice Admiral Bertram Ramsay. His strategy included an appeal for all civilian vessels that could cross the Channel to help ferry the troops from the beaches to larger ships offshore, or to evacuate them entirely. Between 26 May and 4 June - a period during which Hitler halted the advance of his troops on Dunkirk - 200,000 British and 140,000 French troops were evacuated to England. Nine allied destroyers and approximately 200 civilian vessels were lost during the evacuation, and the RAF suffered severe casualties covering the operation from the air.

On 5 June, the Germans swung southwards and French resistance finally collapsed, although not without heavy fighting. On 10 June, Italy opportunistically entered the war on Germany's side. Four days later, the French capital fell, provoking the flight of the French Government to Bordeaux. The Government capitulated on 25 June, just seven weeks after the beginning of the invasion.

To arms, citizens!
Only one fight for only one fatherland

The Polish Air Force Joins the Battle of France

The fall of Poland in late September of 1939 found most of the surviving personnel of the Polish Air Force in neighboring Romania. Most were gathered at an assembly point in the city of Tulcea, far to the south near the Black Sea. However, with their move to internment camps in the malaria-ridden area of Babadag, a short distance even further south, conditions became deplorable and the overall situation chaotic.

More than 1000 officers of the Polish Air Force left for France in "organized transports" before the end of November 1939. Their evacuation route led from ports on the Black Sea to Beirut, Syria, aboard hired Greek vessels. From Beirut, they proceeded on French vessels to the port of Marseille, France. There, in accordance with the Franco-Polish Military Alliance of 1921 and the amendments of 1939, Polish Air Force units were to be re-created.

Once in France, the men were sent to the Aviation Receiving Point which had been set up by the Polish Aviation Command on October 30. From there, they went to the Aviation Assembly Station at Lyon, France, followed by training at the Polish camp at Lyon-Bron Air Base which started in late November, 1939.

A few Polish pilots were selected for the first Polish squadron formed as part of the French Air Force (Armee de l'Air). Those with more flying experience were instead posted to the Fighter Training Squadron, a unit of the Polish Air Force that operated out of Lyon-Mions Airfield beginning in March 1940.

By April 12, 1940, 59 pilots were undergoing training with the Fighter Training Squadron. This included eight 2-hour flights on the Caudron C.R.714 Cyclone fighter, followed by 12 hours flying time on the Morane-Saulnier M.S. 406 fighter, then the mainstay of the French Air Force. While it was vastly under powered and lightly armed, the M.S. 406 was easy to fly and dependable. The Polish pilots who were forced to fly the Caudron C.R.714 in combat were even more unfortunate. This plywood constructed aircraft was not only lightly armed, but its rate of climb and maneuverability were very poor.

Once their training was complete, the Polish pilots were considered ready for combat service. The only complete unit created before the German attack on France was the GC 1/145 fighter squadron, stationed at Lyon-Mions airfield, flying the Caudron C.714, the only unit operating that aircraft. The Polish pilots were also deployed to different French squadrons because the French military was hesitant about creating large Polish air units. Instead most Polish pilots were attached to small units, so-called "keys."

The German "Blitzkrieg" against France and the Low Countries began at dawn on May 10, 1940. At this time there were more than 8,000 Polish Air Force personnel on active duty in France, half stationed at bases around Lyon. The French Air Force suffered heavy casualties in the opening days of the fighting, but stubbornly resisted the full use of the Polish pilots who were ready and willing to fight. Instead of allowing the formation of all-Polish fighter wings, they instead asked the Poles for help in reinforcing French units at the front, or as local defense flights.

The units defending local areas were called a Light Defense Squadrons. They consisted of three to seven aircraft each and their job was to protect strategic sites, usually factories and supply depots. The pilots called them "chimney flights" as that was what they protected. The pilots flew these flights, shooting down numerous German attack aircraft, during May and into June. A total of 52 confirmed and three probable German aircraft were shot down by the Polish pilots in France during this time.

The Polish 1/145 fighter squadron, once equipped with the outdated Caudron C.714, went into action. After 23 sorties the bad opinion of the plane was confirmed by the front-line pilots. It was seriously underpowered and was no match for the enemy fighters of the period. Because of that, on May 25, one week later, French minister of war ordered all C.714s withdrawn.

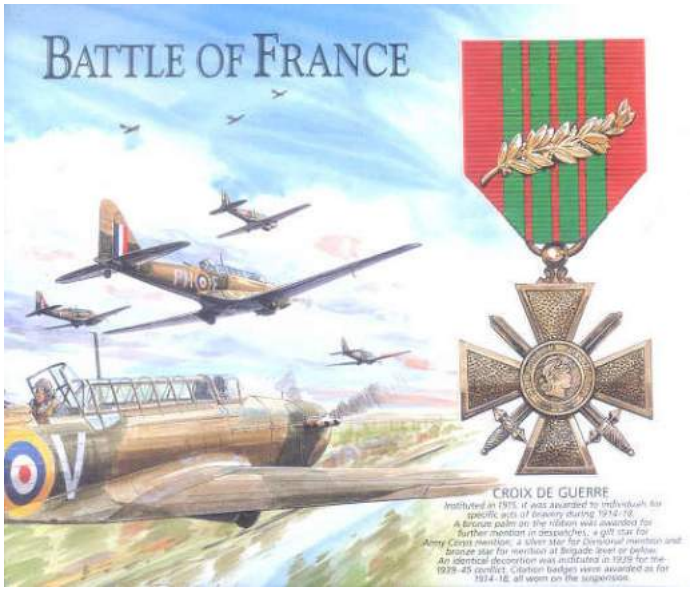
However, since the French authorities had no other planes to offer, the Polish pilots ignored the order and continued to use the planes. Although the planes were hopelessly outdated compared to the German Messerschmitt Bf 109E's they faced, the Polish pilots nevertheless scored 12 confirmed and three unconfirmed kills in three battles between June 8 and June 11, losing nine aircraft in the air and nine more on the ground. Interestingly, among the planes claimed shot down were four Dornier Do 17 bombers, but also three Messerschmitt Bf 109 and five Messerschmitt Bf 110 fighters.

Altogether, the Polish pilots flew 714 sorties during the Battle of France. According to Bartłomiej Belcarz, they shot down 53 aircraft, including 19 kills shared with the French. These 53 victories makes 7.93% of 693 allied air victories in the French campaign. At the same time, the Poles lost 44 planes in combat, accidents and on the ground, and lost eight fighter pilots in combat, one listed as missing, and four pilots in accidents.

The Battle of France in 1940 was a frustrating time for the Polish Air Force. The French utilized less than 10 per cent of the available Polish personnel, with only about 190 Polish pilots seeing action. Some of these pilots did not join their units until late June and may not have flown in combat at all. One historian estimated that only about 140 Polish pilots flew at one time. Their failure to use the experienced Polish pilots at their disposal was undoubtedly just one of many reasons why France, a more industrialized country with a much stronger air force than Poland, held out for just 38 days against the German invasion– only three days longer than did Poland.

With the fall of Paris imminent, the Polish Air Force Command abandoned the capital city. On June 18, General Sikorski gave orders for the evacuation of all Polish Air Force personnel to England. Most of the Polish personnel left France through the Mediterranean ports of Port Vendres and Argeles in extreme southern France near the Spanish border. They went to North Africa, then Gibraltar on the way to England. Others evacuated on Polish ocean liners from ports on the Atlantic coast, including Saint-Jean-de-Luz just south of Bayonne.

Some 8,400 Polish airmen were evacuated to the United Kingdom, which they now called Wyspa Ostatniej Nadziei or "The Island of Last Hope."



Belligerents	
France	Germany
Belgium	Italy (from 10 June)
United Kingdom	
Netherlands	
Canada	
Free Polish Forces	
Free Czechoslovak Forces	
Luxembourg	

Commanders and leaders	
Maurice Gamelin (until 17 May)	Walter von Brauchitsch
Alphonse Georges (until 17 May)	Gerd von Rundstedt
Maxime Weygand (from 17 May)	Fedor von Bock
Leopold III (POW)	Wilhelm von Leeb
Lord Gort	Albert Kesselring
Henri Winkelman (POW)	Hugo Sperrle
Władysław Sikorski	Umberto di Savoia

Allies: 144 divisions
3,300,000 troops
13,974 guns
3,383 tanks
2,935 aircraft
Losses:
360,000 dead or wounded,
1,900,000 captured
2,233 aircraft destroyed

Germany: 141 divisions
3,350,000 troops
7,378 guns
2,445 tanks
5,638 aircraft
Losses:
157,621 dead/wounded (Germany)
6,029 dead /wounded (Italy)
1,876 aircraft destroyed
795 tanks destroyed

Legacy

The French collapse: As sudden as it was unexpected

The French collapse was as sudden as it was unexpected. It ripped up the balance of power in Europe, and overnight left the strategic assumptions on which Britain had planned to fight Hitler completely obsolete. With France out of the equation, Britain's war for the next four years was fought in the air, at sea, and in the Mediterranean - but not on the Western Front. Not until D-Day, 6 June 1944, did a major British army return to France.

The legacy for France itself was complex. Resistance groups formed, but risked bringing savage reprisals on the civilian population if they attacked the occupying forces. While Charles de Gaulle formed an army and a government in exile in Britain, he was technically a rebel.

Historians have located the seeds of the French defeat in low morale and a divided pre-war society. This may be so, but in purely military terms, the Germans were a vastly superior force, although not in numbers. They used their mechanisation and manoeuvre more effectively, and benefited from domination in the air. German military doctrine was more advanced, and generally their commanders coped much better with high-tempo operations than did their Allied counterparts.

Allied command and control was cumbersome, and the Anglo-French operational plan was deeply flawed. However, the very success of the risky blitzkrieg approach led the Germans to gamble even more heavily on their next major operation - the invasion of Russia. But this time the strategy failed, with consequences for the Nazi regime that were ultimately fatal.

Caudron C.714 Cyclone- 1939

"A deathtrap waiting to happen."

by Gareth Wood

It was underpowered. It was underarmed. It was unarmoured. It was ungainly. It was even worse a plane than the Morane-Saulnier 406. It was the Caudron 714 Cyclone.

In the mid 1930s as Germany was beginning to create the first echelons of what in 1940 would seem to be the all-conquering Luftwaffe, the French looked at their air force and decided they needed new, modern fighters. With the French aviation industry prone to strikes on top of a shortage of certain strategic metals, such as aluminium, the Armee De L'air would be equipped with a new generation of wooden fighters.

The advantage of this was that it meant production could be dispersed, away from factories vulnerable to bombing or industrial action, to small workshops where teams of craftsmen could create a single plane.

While several prototypes were built under this plan, only the Caudron C.714 entered service. Developed from a long line of racing aircraft, it was quickly found to be brutally unsuited to modern aerial warfare.

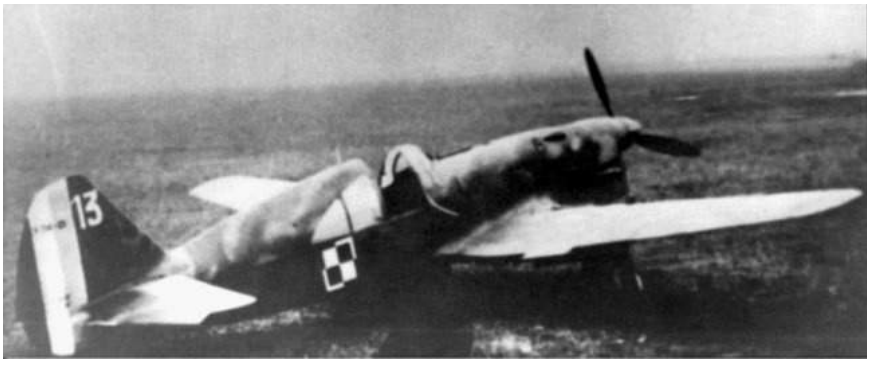
Caudron's idea was to build a smaller, lighter aircraft that wouldn't need an overly powerful engine. But that led to a plywood airplane with an engine that was inadequate, with seriously limited rate of climb. Testing revealed the plane was too slow, while the service ceiling was only 13,000 feet. Nor did it have much in the way of manoeuvrability. Combat would show that both its armament and its wooden construction weren't up to the task, the latter being easily damaged by enemy fire.

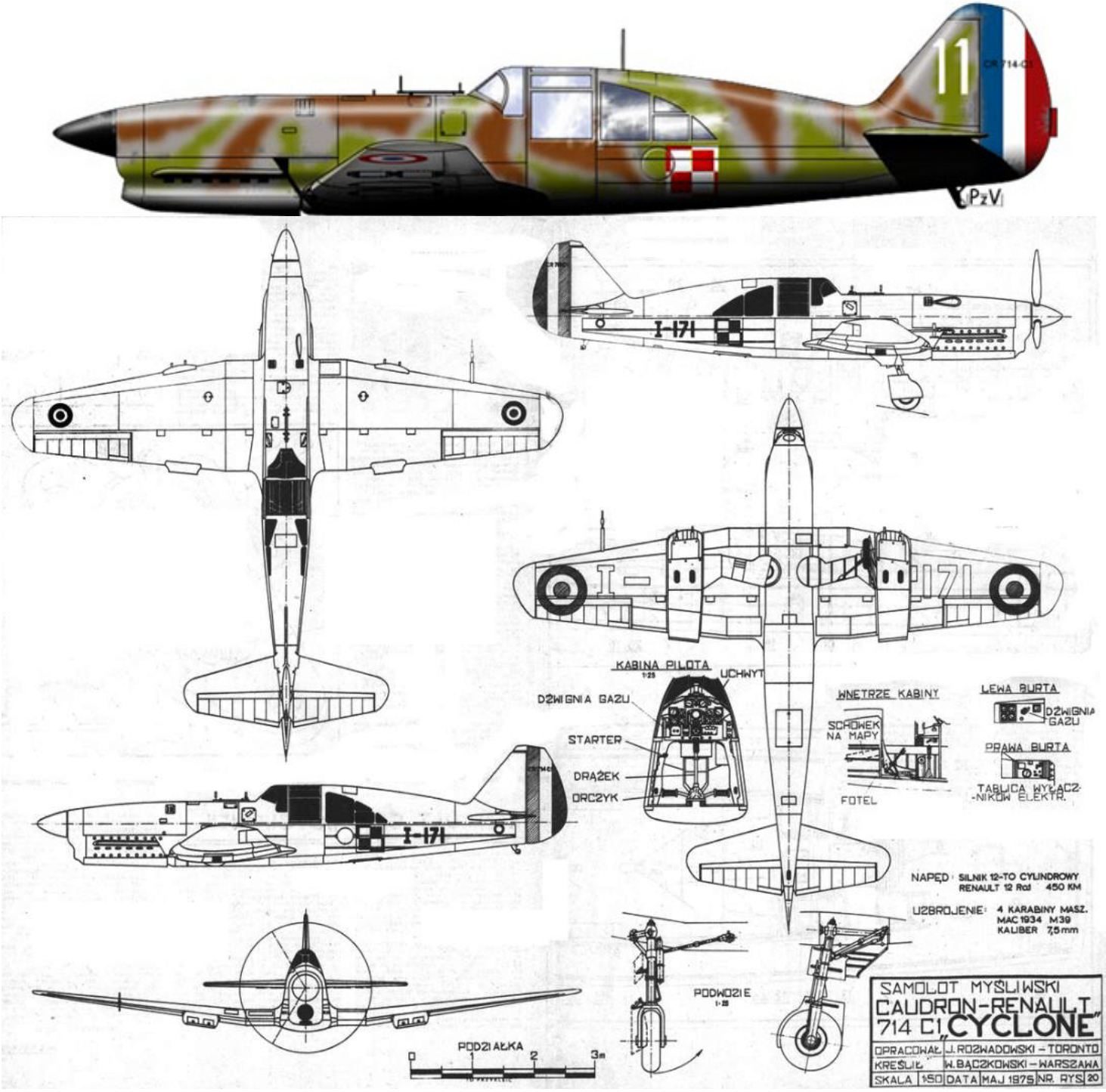
The French government ordered 200 airplanes, but protracted development (the plane only entered service in January 1940) and the disappointing performance meant that once the 90th machine rolled off the factory lines, the order was cancelled. The Caudron was withdrawn from active service by the French Air Force in February 1940, just one month after it entered service.

However, on 18 May 1940, eight days after the start of the German invasion, 35 Caudrons were delivered to the Polish Warsaw Squadron, the Groupe de Chasse polonais I/145, stationed at the Lyon-Mions airfield. The Caudron fighter was also used by the Polish training squadron based in Bron near Lyon. Although the pilots managed to disperse several bombing raids, they did not score any kills; but they did not lose any aircraft either.

By the end of June when France fell, only 53 production Caudron Cyclones had been delivered. Later, 15 of them were flown to Britain where they were placed in storage and scrapped soon after. The Luftwaffe used 20 for training before presumably scrapping them too. Six ended up in Finland but the Finns, desperate as they were for modern aircraft, weren't so desperate as to make use of the C.714 in combat, and these too were withdrawn in 1941.

After the Battle of France, the C.714 never again fired its guns in anger and today its remembered more as an example of how not to build an aircraft. Even by the standards of French fighters in 1940, this was a deathtrap waiting to happen. It says much for the valour of the Polish pilots that they continued to fight in such a machine.





Caudron C.714 Cyclone

Role	Fighter
Manufacturer	Caudron-Renault
Primary users	Polish Air Force in France
Produced	1939-1940
Number built	approximately 90
Crew:	1
Length:	8.63 m (28 ft 4 in)
Wingspan:	8.97 m (29 ft 5 in)
Height:	2.87 m (9 ft 5 in)
Empty weight:	1,395 kg (3,075 lb)
Loaded weight:	1,880 kg (4,145 lb)
Powerplant:	1 × Renault 12R-03 inverted V-12 ,500 hp
Maximum speed:	460 km/h (286 mph)
Range:	900 km (559 mi)
Service ceiling:	4,000 m (13,120 ft)
Armament:	4 × 7.5 mm MAC 1934 machine guns

Morane-Saulnier M.S. 406 - 1940

The M.S.406 was a French Armée de l'Air fighter aircraft built by Morane-Saulnier starting in 1938. Numerically, it was France's most important fighter during the opening stages of World War II.

Although sturdy and highly manoeuvrable, it was under-powered and weakly armed when compared to its contemporaries. Most critically, it was out-performed by the Messerschmitt Bf 109 during the Battle of France. The M.S.406 held its own in the early stages of the war (the so-called Phoney War), but when the war restarted in earnest in 1940, losses to all causes amounted to approximately 400 aircraft of the total of 1176 aircraft manufactured. Out of this total some 150 were lost to enemy fighters and ground fire, another 100 were destroyed on the ground in enemy air raids and the remainder was deliberately destroyed by French military personnel to prevent the fighters from falling into enemy hands intact. In return M.S.406 squadrons achieved 191 confirmed victories and another 83 probable victories. The type was more successful in the hands of Finnish and Swiss air forces who developed indigenous models.

The M.S. 406 was a low-wing monoplane of mixed construction, with fabric-covered wooden tail, but a bonded metal/wood material (Plymax) skin fixed to duralumin tubing. Plymax consisted of a thin sheet of duralumin bonded to a thicker sheet of plywood.

The M.S. 406 had a three-bladed propeller, a retractable undercarriage and a retractable radiator under the fuselage. Power was supplied by a single Hispano-Suiza 12Y-31 series V12 liquid-cooled engine developing 860 horsepower. The aircraft could fly at 301 miles per hour with a ceiling of nearly 31,000 feet and a range close to 500 miles.

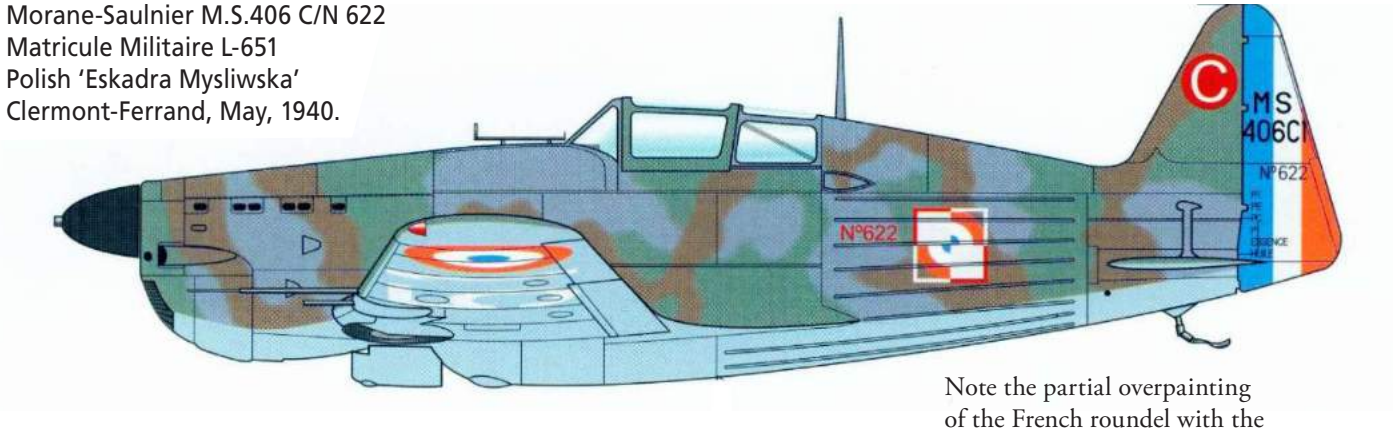
Vision from the cockpit canopy was adequate even though it was situated aft of the wings. Armament was subpar when compared to other aircraft of the time and was centered around a 20mm Hispano-Suiza H.S. 404 series cannon (60 rounds) which fired through the propeller hub, along with a pair of 7.5mm machine guns, one fitted to each wing (300 rounds each).

A weakness of the MAC 1934 was its operation at high altitudes. It was found that at altitudes over 20,000 ft, the guns had a tendency to freeze. Heaters were added to the guns for high altitude use.

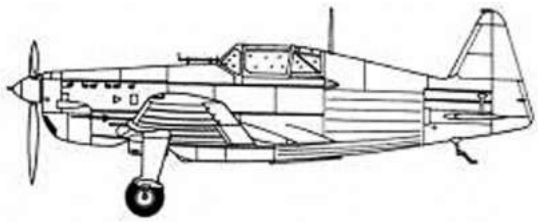
Morane-Saulnier M.S.406

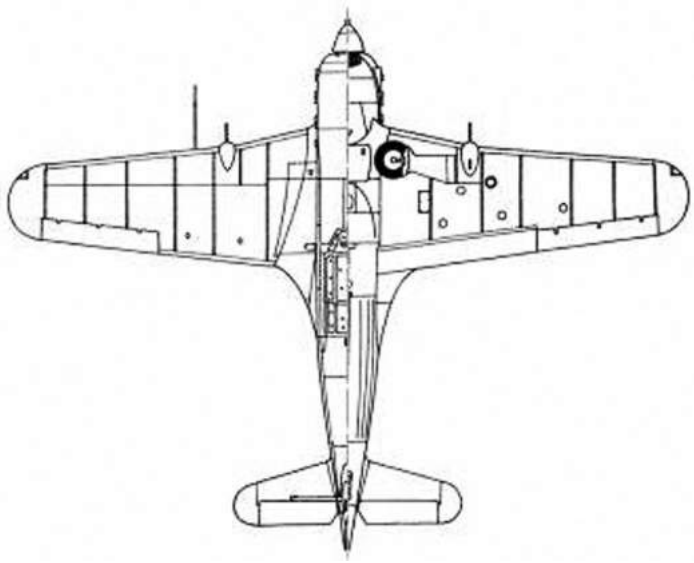
Role	Fighter
Manufacturer	Morane-Saulnier
Introduction	1938
Number built	1,176
Crew:	1
Length:	26.77 ft (8.16 m)
Width:	34.78 ft (10.60 m)
Height:	9.28 ft (2.83 m)
Weight (Empty):	4,189 lb (1,900 kg)
Weight (Max):	5,445 lb (2,470 kg)
Powerplant:	1 x Hispano-Suiza V12 liquid-cooled engine, 860 hp.
Maximum Speed:	301 mph (485kmh; 262 kts)
Range:	497 miles (800 km)
Service Ceiling:	30,840 ft (9,400 m)

Morane-Saulnier M.S.406 C/N 622
Matricule Militaire L-651
Polish 'Eskadra Mysliwska'
Clermont-Ferrand, May, 1940.



Note the partial overpainting of the French roundel with the Polish 'checkerboard'.





Polish Air Force in exile in France operated at least 91 M.S. 406 aircraft within several training and combat units of the French Air Force:

* Groupe de Chasse de Varsovie
* Section no.1 Łaszkiewicz GC III/2
* Section no.2 Pentz GC II/6
* Section no.3 Sulerzycki GC III/6
* Section no.4 Bursztyn GC III/1
* Section no.5 Brzeziński GC I/2
* Section no.6 Goettel GC II/7
* Jasionowski Koolhoven Flight
* DAT section Krasnodębski GC I/55 based at Châteaudun
* DAT section Skiba GC I/55
* DAT section Kuzian based at Nantes
* DAT section Opulski based at Romorantin
* DAT section Krasnodębski based at Toulouse-Francazal
* Centre d'Instruction d'Aviation de Chasse at Montpellier
* Ecole de Pilotage No 1 (Chasse) at Etampes
* Ecole de Pilotage at Avord
* Centre d'Instruction at Tours
* Depot d'Instruction de l'Aviation Polonaise at Lyon-Bron
* Montpellier Flight

A TOUS LES FRANÇAIS

La France a perdu une bataille!
Mais la France n'a pas perdu la guerre!

Des gouvernants de rencontre ont pu capituler, cédant à la panique, oubliant l'honneur, livrant le pays à la servitude. Cependant, rien n'est perdu!

Rien n'est perdu, parce que cette guerre est une guerre mondiale. Dans l'univers libre, des forces immenses n'ont pas encore donné. Un jour, ces forces écraseront l'ennemi. Il faut que la France, ce jour-la, soit présente à la victoire. Alors, elle retrouvera sa liberté et sa grandeur. Tel est mon but, mon seul but!

Voila pourquoi je convie tous les Francais, où qu'ils se trouvent, à s'unir à moi dans l'action, dans le sacrifice et dans l'espérance.

Notre patrie est en peril de mort.
Luttons tous pour la sauver!

VIVE LA FRANCE !

TO ALL FRENCHMEN..

LONG LIVE FRANCE!

C. de Gaulle

GÉNÉRAL DE GAULLE

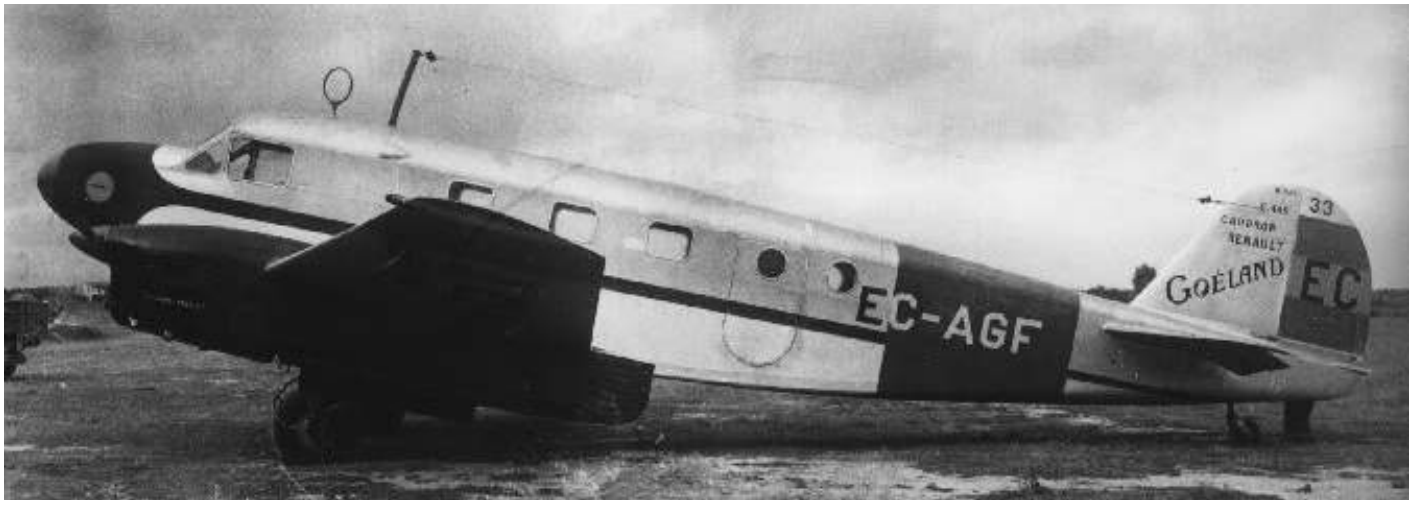
QUARTIER-GÉNÉRAL,
4, CARLTON GARDENS,
LONDON, S.W.1.

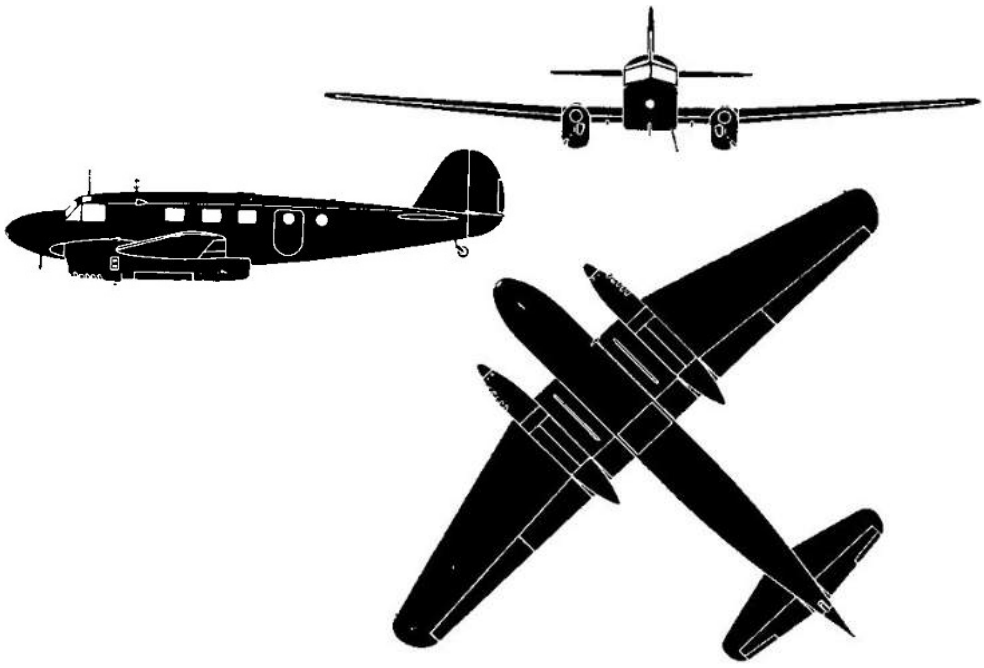
Caudron C.440 Goeland (Seagull)- 1940 (as a passenger)

Flight from Perpignan, France, to Oran, Algeria, June 23, 1940

The Caudron C.440 Goéland ("Seagull") was a six-seat twin-engine utility aircraft developed in France in the mid-1930s. It was a conventionally configured low-wing cantilever monoplane with tailwheel undercarriage. The main undercarriage units retracted into the engine nacelles. Construction was wooden throughout, with wooden skinning everywhere but the forward and upper fuselage sections, which were skinned in metal. As usually configured, the cabin seated six passengers with baggage compartments fore and aft, and a toilet aft.

Role	Civil utility aircraft
Manufacturer	Caudron
First flight	1934
Number built	1,702
Accomodation:	2 pilots, 6 passengers
Length:	13.68 m (44 ft 11 in)
Wingspan:	17.59 m (57 ft 9 in)
Height:	3.40 m (11 ft 2 in)
Empty weight:	2,292 kg (5,053 lb)
Gross weight:	3,500 kg (7,716 lb)
Powerplant:	2 × Renault 6Q, 220 hp
Maximum speed:	300 km/h (186 mph)
Range:	1,000 km (620 miles)
Service ceiling:	7,000 m (22,965 ft)





Feliks Gazda in England: 1940–1941

1940, July 2: Gazda arrives in Liverpool, England, on a ship, after travelling by rail from Oran to Casablanca.

July 10 to October 31: The Battle of Britain

August: The Polish Air Force was granted independent status, but under RAF command.

October 14: In Blackpool, Lt. Gazda undergoes training in use of British aircraft, both single and twin engine planes.

May 9, 1941: Gazda departs England for Africa.

It is likely that the aircraft he flew during this 7-month period were, in this order:

1. de Havilland Tiger Moth (basic trainer)
2. Hawker Hector (Cooperation aircraft)
3. Miles Magister (basic trainer)
4. Miles Master (advanced trainer)
5. Hawker Hurricane (front line fighter)
6. Supermarine Spitfire (front line fighter)
7. Airspeed Oxford (twin-engine basic trainer)
8. Bristol Blenheim (twin-engine light bomber)

Part 4

England

"The Polish Air Force has ceased to exist," exclaimed Goering, intoxicated by the victory Germany over Poland. But, there was as much truth in this as in Goering's other notorious statement to the effect that no British bomb would ever fall on German soil. In compliance with orders, 90 percent of the Polish airmen left to renew the struggle elsewhere

The pilots themselves, on their way to France or Great Britain, were pursued by agents of the Gestapo and often imprisoned or interned in Romania, Hungary, Lithuania and Latvia. At the end of 1939 and in early 1940, considerable numbers of Poles crossed over to Britain where they looked forward to having modern aircraft at their disposal.

"Here in England," one of them said, "we were given the means to go on fighting. There was much to learn. Few of us could speak the language. None of us had flown Hurricanes or Sptifires. Their instruments were marked in strange measures, pounds, feet, gallons, which we had to translate mentally into kilos, metres and liters. The mechanics' lot was easier. They just set ot work, stripping and reassembling the machinery. There was no need to talk. A mechanic's fingers speak the same tongue in all countries. From dawn until far into the night, we worked. In two months we went into action."

As for the Polish airmen who had been left in France awaiting arrival of new equipment, it seemed that the French did not understand these Allies. Their temperment and their eagerness to fight were incomprehensible to the average Frenchman. History will in due course reveal why there was so great a delay in providing the Poles with aircraft; it will probably fail to disclose why 140 Polish fighter pilots, instead of being organized into entirely Polish units, were dispersed among French squadrons.

When it became necessary, with the fall of France eminent, for the Polish airmen to join their compatriots in Britain, there were welcomed wholeheartedly by the RAF. One month after the collapse of France the first Polish fighter squadron, No. 303, came into existence and took part in the Battle of Britain. This squadron played a very important role in the decisive moment of the battle. With the loss of only seven pilots, the Polish fighters brought down 117 German aircraft.

from the British magazine, *Flight,* August 6, 1942

The Polish Air Force regroups in Great Britain

After the collapse of France in May, 1940, a large part of the Polish Air Force contingent was withdrawn to the United Kingdom. However, the RAF air staff were not willing at first to accept the independence and sovereignty of Polish forces.

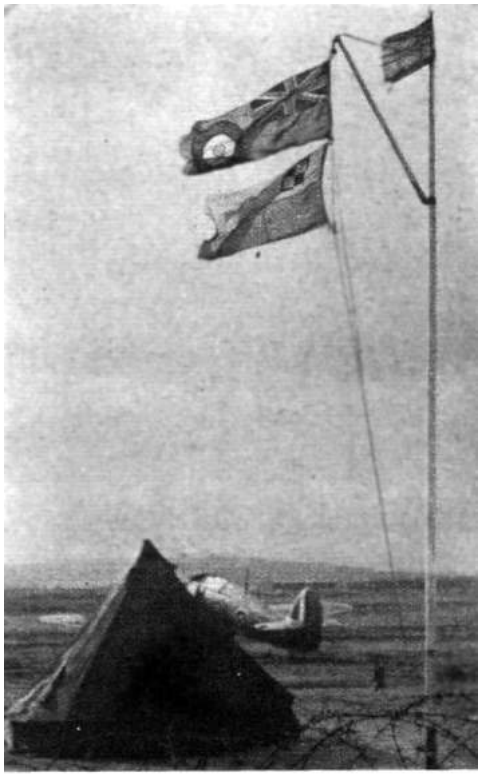
Air Marshal Sir Hugh Dowding later admitted he had been "a little doubtful" at first about the Polish airmen. Shortly after his arrival, the British government informed General Sikorski that at the end of the war, Poland would be charged for all costs involved in maintaining Polish forces in Britain.

Initial plans for the Polish airmen greatly disappointed them: they would only be allowed to join the Royal Air Force Volunteer Reserve, they must wear British uniforms, fly British flags and be required to take two oaths, one to the Polish government and the other to King George VI. Each officer was required to have a British counterpart, and all Polish pilots were to begin with the rank of "pilot officer", the lowest rank for a commissioned officer in the RAF. Only after posting would anyone be promoted to a higher grade.

Because of this, the majority of highly experienced Polish pilots had to wait in training centers, learning English command procedures and language, while the RAF suffered heavy losses in the first days of the Battle of Britain due to lack of experienced pilots.

On June 11, 1940, a preliminary agreement was signed by the Polish and British governments and soon the British authorities allowed for creation of two bomber squadrons and a training center as part of the Royal Air Force. The next step was figuring out just what role the Poles would have. By an agreement of August 1940, the Polish Air Force was granted independent status, though it remained under RAF command.

The first four Polish squadrons inside the RAF were the 300 and 301 bomber squadrons and the 302 and 303 fighter squadrons. The fighter squadrons, flying the Hawker Hurricane, first saw action in the third phase of the Battle of Britain in late August 1940, quickly becoming highly effective. Polish flying skills were well-developed from the 1939 Defensive War and the pilots were regarded as fearless, sometimes bordering on reckless. Their success rates were very high in comparison to the less-experienced British Commonwealth pilots. The 303 fighter squadron became the most efficient RAF fighter unit at that time, and RAF commanders protested when government censors refused to allow this fact to appear in the press.



Under two flags. The R.A.F. and Polish ensigns symbolise the close comradeship which has developed between the two services.

RAF Training in 1940

Upon arrival in England, Polish pilots were sent to RAF training schools, Feliks Gazda included. Given entries in his logbook, Gazda appears to have started at the beginning, despite his many years of flying, including in combat, with the Polish Air Force. In the pages that follow, the various training aircraft Mr. Gazda piloted will be presented.

The following was written in December, 1940, by a pilot officer in the RAF about his instruction.

(After basic training), I was posted to an EFTS (Elementary Flight Training School). I became, in fact, a pupil pilot—or, in other words—a "Nit"—the derivation of this term is obvious.

There I joined in with other "Nits" who had just come from an Initial Training Wing. There they'd already had instruction in several useful things like Morse code, and navigation and armament.

The main job of the EFTS was to teach us to fly. But, in the case of people like me, who thought they could fly already, the instructor had a double job to do- first showing us that we couldn't fly and then teaching us the right, proper official and RAF way to fly.

My instructor was a very tough and exceedingly competent Flight-Lieutenant, with that odd mixture of patience and explosiveness which forced his pupils to keep on their best performance all the time they were flying with him. I shan't forget his remark to me on my first bit of dual. He told me to do some turns. I pushed the aeroplane round to the right in my most polished manner. Silence from the front cockpit. So I pushed her round to the left. Still silence. I sat and waited. There came, in my earphones, a long over-patient sigh, and then a gentle voice: "You may call those turns, laddie, but, as far as I'm concerned, they're just changes of direction."

The machines we flew were de Havilland Tiger Moths, open cockpit biplanes of great stability and little speed. We grew to love them—they were such very forgiving aeroplanes. The one I flew mostly- old 84- forgave me many things: crooked loops, bad sideslips, flat turns, bump landings. So much, in fact, that when my flying got a bit better, and 84 had less to put up with, I felt like giving her a lump of sugar, or an extra ration of oil, or something, in return for past favours. Most of my fellow "Nits" went solo after about seven or eight hours dual. The ordinary flying syllabus included slow rolls; stalled turns; rolls off the top of a loop; spinning at least once every two hours, and other gentle means of disturbing one's half-digested lunch—and also we had to do forced landing practices, cross-country flights, and one or two other indispensable exercises.

And a last word about the instructors themselves. Someone recently published a bit of verse which summed up their lives.

He wrote:
"What did you do in the war, daddy?
How did you help us to win?
Circuits and bumps and turns, laddie,
And how to get out of a spin."

And very true it is. These men, experienced pilots all of them, are doing one of the RAF's greatest and most unpublicised jobs. Hours of circuits and bumps, correcting the same old faults, getting "Nits" off solo, and then seeing them go away, having their places taken by another bunch, who're going to do the same silly things in the same silly way all over again. Yet, on the whole, most of them say it isn't too bad, and that they become first-rate psychologists, which probably they do.

It's been a week or so now since I left EFTS. for a more advanced Flying Training School where I'm now busy flying twin-engined machines, and preparing for another and stiffer examination. I'll try to let you know how I make out.

DeHavilland DH.82 Tiger Moth- RAF's basic trainer

From the outset, the Tiger Moth proved to be an ideal trainer, simple and cheap to own and maintain. The Tiger Moth entered service at the RAF Central Flying School in February 1932. By the start of the Second World War, the RAF had 500 of the aircraft in service and large numbers of civilian Tiger Moths were impressed to meet the demand for trainers.

During a British production run of over 7,000 Tiger Moths, a total of 4,005 Tiger Moth IIs were built during the war specifically for the RAF, nearly half being built by Morris Motors Ltd at Cowley, Oxford.

The Tiger Moth became the foremost primary trainer throughout the Commonwealth and elsewhere. It was the principal type where thousands of military pilots got their first taste of flight in this robust little machine. The RAF found the Tiger Moth's handling ideal for training future fighter pilots. While generally docile and forgiving in the normal flight phases encountered during initial training, when used for aerobatic and formation training the Tiger Moth required definite skill and concentration to perform well — a botched manoeuvre could easily cause the aircraft to stall or spin.

The Tiger Moth exhibits the fundamental requirements of a training aircraft, in being 'easy to fly, but difficult to fly well'. Some instructors preferred these flight characteristics because of the effect of "weeding" out the inept student pilot. The aircraft's benign handling when within its limits made it easy for the novice to learn the basic skills of flight.

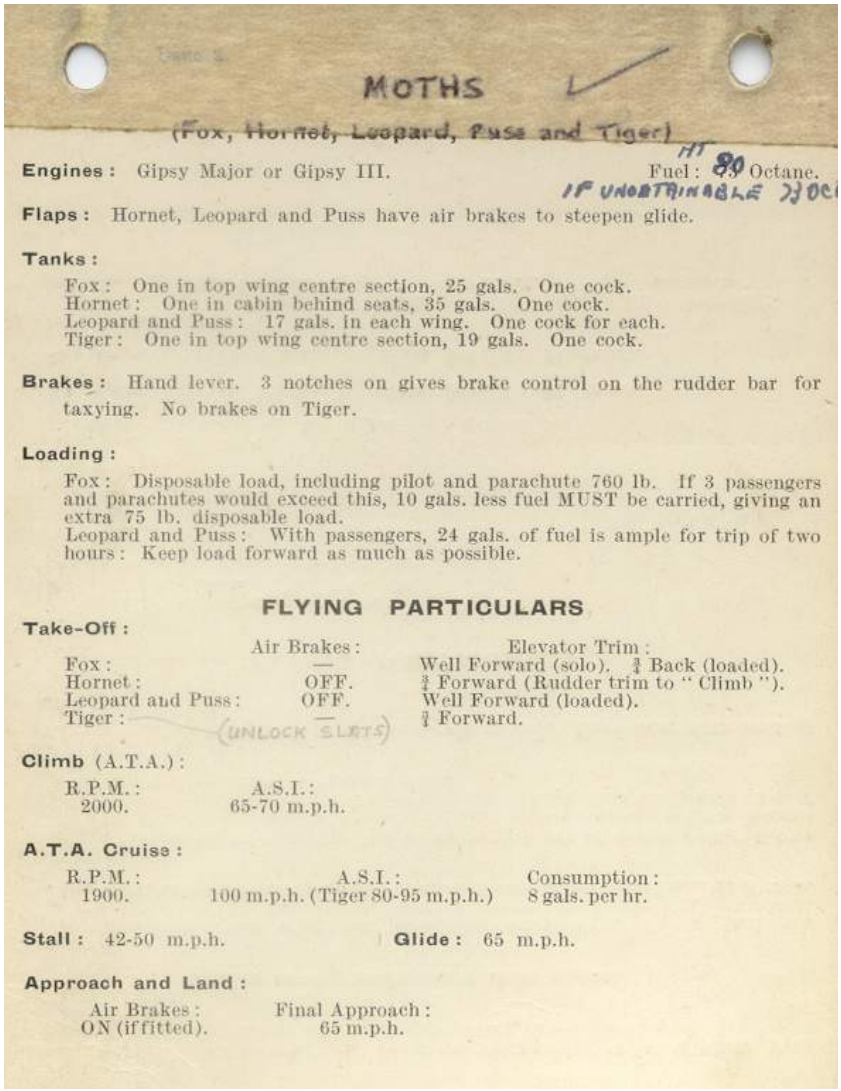
At the same time techniques such as coordinated flight must be learned and used effectively, and the aircraft will show up mishandling to an observant instructor or attentive pupil. As training progresses towards more advanced areas, especially aerobatics, the skill required on the part of a Tiger Moth pilot increases. The aircraft will not, like some training aircraft, 'fly its way out of trouble' but will instead stall or spin if mishandled. However the stall and spin remain benign, again showing up deficient piloting without endangering the aircraft or the crew. These characteristics were invaluable to military operators, who must identify between pilots with the potential to go on to fly fighter aircraft, those more suited to lower-performance machines and those who must be relegated to non-pilot aircrew positions. (continued next page)

Because the Tiger Moth has no electrical system, it must be started by hand. This needs to be done with care to prevent being struck by the propeller, which would result in serious injury. Being a tail-dragging biplane, taxiing also requires care. The pilot cannot see directly ahead, so the lower wing can hit obstructions, and it is susceptible to gusts of wind on its inclined, large, upper wing.

The takeoff is uneventful, and it has a reasonable rate of climb. However, full power should not be maintained for more than a minute to avoid damaging the engine.

The Tiger Moth's biplane design makes it strong, and it is fully aerobatic. However, it has ailerons only on its bottom wing, which makes its rate of roll relatively slow for a biplane, and the ailerons on a Tiger Moth normally operate with a heavy degree of designed-in differential operation (mostly deflecting up, hardly at all downwards) to avoid adverse yaw problems in normal flight. Most manoeuvres are started at about 90 to 110 knots, and it has a Velocity Never Exceeded (VNE) of 140 knots. It is important to lock the automatic slats (leading edge flaps) during aerobatic manoeuvres.

Landings are straightforward, as the plane is pushed on to the runway at a moderate speed with just the main wheels on the ground, and the tail is held up until speed reduces. The open cockpit allows pilots to move their heads over the side to see the runway. As the aircraft is a tail dragger, it is essential to land it straight with no sideways movement, to avoid ground loops.



MOTHS

(Fox, Hornet, Leopard, Puss and Tiger)

Engines : Gipsy Major or Gipsy III. Fuel : 80 Octane.

IF UNOBTAINABLE 73 Oct

Flaps : Hornet, Leopard and Puss have air brakes to steepen glide.

Tanks :

Fox : One in top wing centre section, 25 gals. One cock.
Hornet : One in cabin behind seats, 35 gals. One cock.
Leopard and Puss : 17 gals. in each wing. One cock for each.
Tiger : One in top wing centre section, 19 gals. One cock.

Brakes : Hand lever. 3 notches on gives brake control on the rudder bar for taxying. No brakes on Tiger.

Loading :

Fox : Disposable load, including pilot and parachute 760 lb. If 3 passengers and parachutes would exceed this, 10 gals. less fuel MUST be carried, giving an extra 75 lb. disposable load.
Leopard and Puss : With passengers, 24 gals. of fuel is ample for trip of two hours : Keep load forward as much as possible.

FLYING PARTICULARS

Take-Off :

	Air Brakes :	Elevator Trim :
Fox :	—	Well Forward (solo). ¾ Back (loaded).
Hornet :	OFF.	¾ Forward (Rudder trim to " Climb ").
Leopard and Puss :	OFF.	Well Forward (loaded).
Tiger :	—	¾ Forward.

(UNLOCK SLATS)

Climb (A.T.A.) :

R.P.M. :	A.S.I. :
2000.	65-70 m.p.h.

A.T.A. Cruise :

R.P.M. :	A.S.I. :	Consumption :
1900.	100 m.p.h. (Tiger 80-95 m.p.h.)	8 gals. per hr.

Stall : 42-50 m.p.h. **Glide :** 65 m.p.h.

Approach and Land :

Air Brakes :	Final Approach :
ON (if fitted).	65 m.p.h.

This sheet was issued to pilots training on the Tiger Moth.

D.H. 82 Tiger Moth

Role	Trainer
Manufacturer	de Havilland Aircraft Co. de Havilland Canada
Designer	Geoffrey de Havilland
First flight	26 October 1931
Produced	1931–1944
Number built	8,868
Crew:	2, student & instructor
Length:	23 ft 11 in (7.34 m)
Wingspan:	29 ft 4 in (8.94 m)
Height:	8 ft 9 in (2.68 m)

Empty weight:	1,115 lb (506 kg)
Loaded weight:	1,825 lb (828 kg)
Powerplant:	1 × de Havilland Gipsy Major I inverted 4-cylinder inline, 130 hp
Maximum speed:	109 mph at 1,000 ft (175 km/h)
Cruise speed:	67 mph (59 kts)
Never Exceed Speed:	140 mph
Range:	302 miles (486 km)

The Tiger Moth Instrument Panel

This is what the aircraft shown to the right has installed. The panels on 1940s trainers were similar. Tiger Moths flying today have more instruments and more modern ones.

Airspeed Indicator
Multiply numbers x 10

Artificial Horizon
Shows turns and banks

Slide slip indicator

The red instrument measures oil pressure.

Tachometer
Numbers show engine RPM in thousands

Control Column
Used to control aircraft pitch and bank.

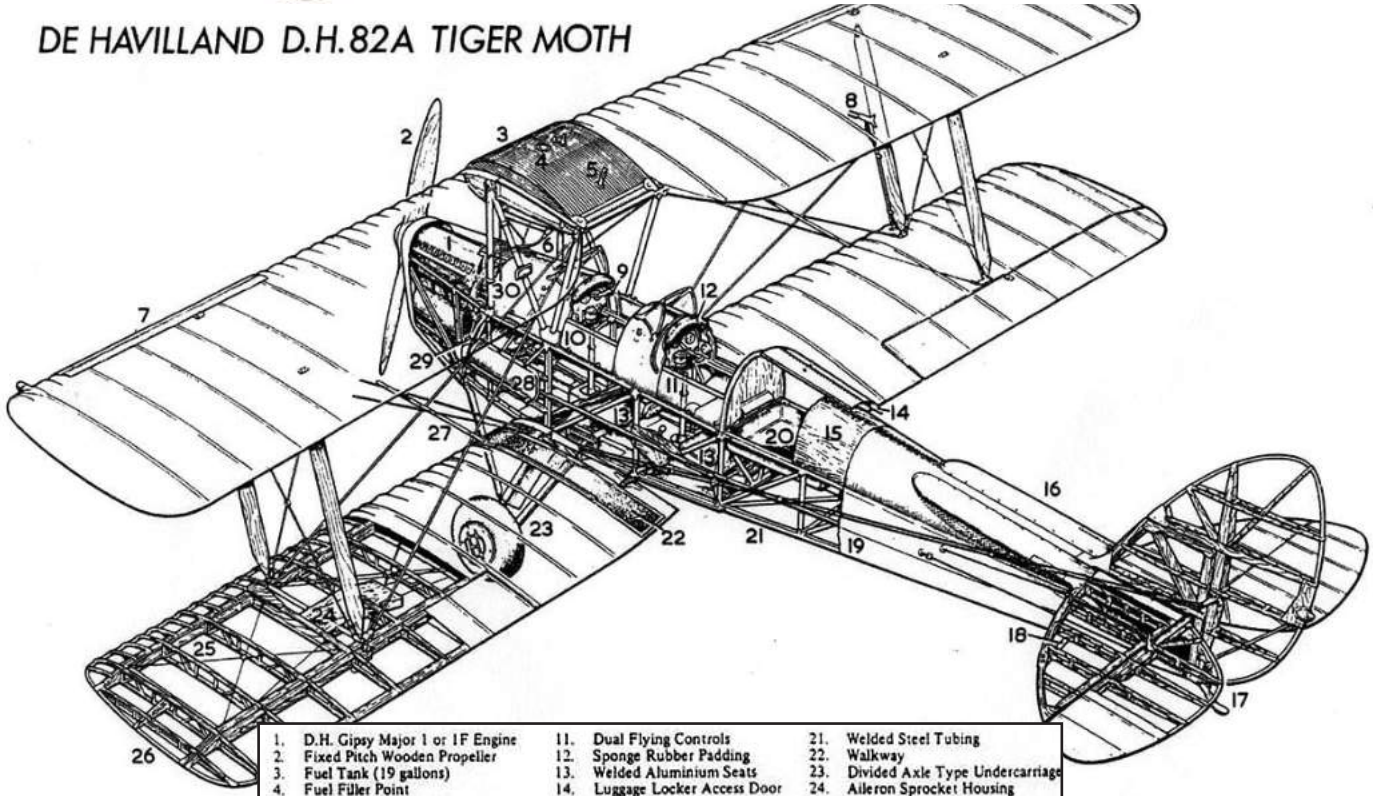
Altimeter. Numbers show feet above sea level in thousands. Knob at bottom is for setting the current barometric pressure since the instrument is actually a barometer and must be reset to current conditions.

The student sat up front, the instructor in the back. Only five basic instruments were available. The silver lever on the lower left side of the cockpit is the throttle. The tops of the dual control columns are visible above the open side panels.

Tiger Moths used for training by the Polish Air Force in England carried these markings.

DE HAVILLAND Tiger Moth Mk.II T8209 (10) - 25 (Polska) Szkoła Pilotażu Początkowego; Hucknall, 1943.
DE HAVILLAND Tiger Moth Mk.II T8209 (10) of No. 25 (Polish) Elementary Flying School; Hucknall, 1943.

DE HAVILLAND D.H.82A TIGER MOTH



1. D.H. Gipsy Major 1 or 1F Engine
2. Fixed Pitch Wooden Propeller
3. Fuel Tank (19 gallons)
4. Fuel Filler Point
5. Fuel Contents Gauge
6. Fuel Supply Pipe
7. Automatic Slats
8. Pitot Head
9. Intercomm. Speaking Tube
10. Hinged Cockpit Side Panels
11. Dual Flying Controls
12. Sponge Rubber Padding
13. Welded Aluminium Seats
14. Luggage Locker Access Door
15. Plywood Decking
16. Anti-Spin Strakes
17. Steerable Tail Skid
18. Tailplane Bracing Tube
19. Fabric Covering
20. Luggage Locker
21. Welded Steel Tubing
22. Walkway
23. Divided Axle Type Undercarriage
24. Aileron Sprocket Housing
25. Spruce Spars and Ribs
26. Light Alloy Tip
27. Bracing Wire Spreader Bars
28. Oil Tank (2.1 gallons)
29. Oil Tank Filler
30. Rear View Mirror

Hawker Hector- 1940

The Hawker Hector was put into service with the RAF in the then new Army Cooperation Wing in 1937, equipping seven RAF army cooperation squadrons. It began to be replaced by Westland Lysanders in 1938. Becoming obsolescent in 1939, it did not go to France with the British Expeditionary Force, but six Hectors went into action on the 26 May 1940, dive bombing enemy troops invading Calais. In 1940 the Hector was relegated to target and glider-towing. They were finally withdrawn from service in 1942

The type was deeply unpopular with ground crews due to the complicated nature of the engine, which had 24 cylinders, with 24 spark plugs and 48 valves, all of which required frequent maintenance.

Army Cooperation Aircraft

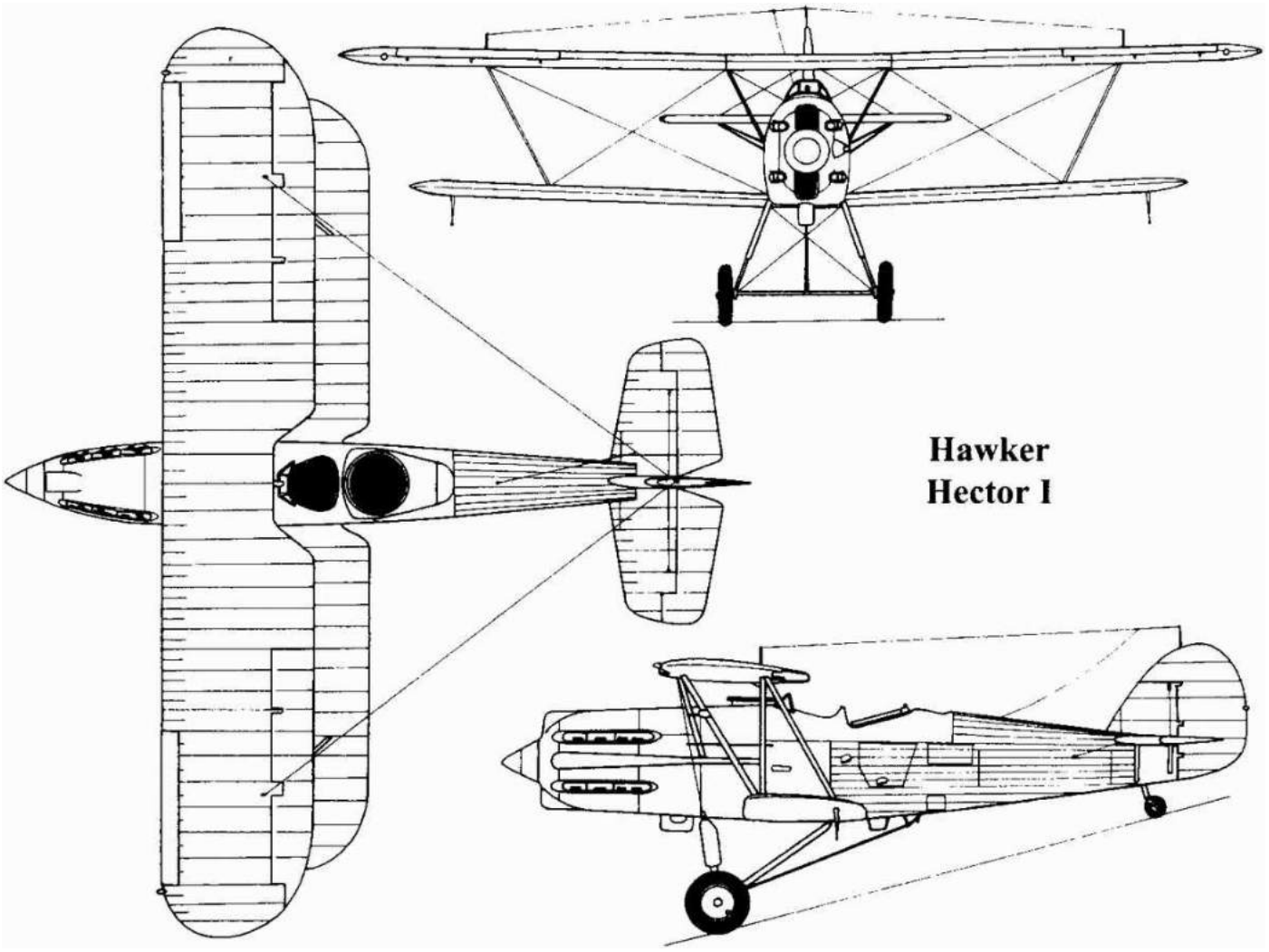
The Army Cooperation Aircraft was an inter-war concept of an aircraft capable of support of ground units in a variety of roles. Army cooperation planes combined the roles of artillery spotter aircraft, liaison, reconnaissance plane and close air support.

The concept of Army Cooperation Units was invented in France at the end of World War I. Numerous countries experimented with the idea of creating separate units tasked with close cooperation with ground units. However, in most cases the roles of observation, reconnaissance and liaison were kept separate, with each assigned to a more specialised unit. One of the few countries to actually implement the idea was Poland. By the end of the 1930s the Polish Army had 12 escadrilles of "assisting aircraft", usually operating as platoons of 3 to 6 aircraft attached to regiments of infantry or cavalry.

Typical Polish army cooperation planes included Lublin R-XIII, PZL Ł.2 and RWD-14 Czapla. According to Polish specifications of the late 1920s, the army cooperation aircraft were capable of STOL (Short Take Off and Landing), had folding wings and relatively small dimensions to allow them to operate from improvised airfields and improvised hangars such as barns. The folding wings also allowed for the plane to be towed by a car or truck, which was essential for the planes to operate in cooperation with the land units.

Hawker Hector

Role	Army Cooperation aircraft
Manufacturer	Hawker Aircraft
First flight	14 February 1936
Number built	179
Crew:	Two
Length:	29 ft 10 in (9.09 m)
Wingspan:	36 ft 11 in (11.26 m)
Height:	10 ft 5 in (3.18 m)
Empty weight:	3,389 lb (1,537 kg)
Loaded weight:	4,910 lb (2,227 kg)
Powerplant:	1 × Napier Dagger III 24-cylinder air-cooled H-block engine, 805 hp
Maximum speed:	187 mph (301 km/h)
Stall speed:	50 mph (80.5 km/h)
Range:	300 mi, (483 km)
Guns:	1 × forward-firing .303 in Vickers machine gun; 1 × .303 in Lewis gun in the rear cockpit
Bombs:	Mountings for a camera, flares, and 2 × 112 lb bombs


Hawker
Hector I

Miles M.14A Magister ("Maggie")- 1940

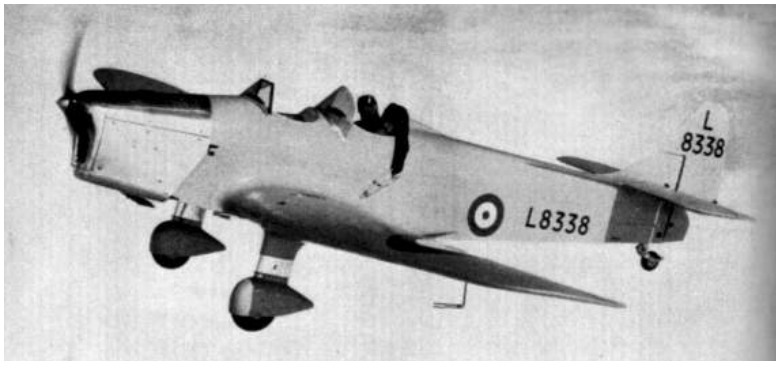
The Miles M.14 Magister was a British two-seat monoplane basic trainer aircraft built by the Miles Aircraft for the Royal Air Force and Fleet Air Arm. Affectionately known as the Maggie, the Magister was the first monoplane designed specifically as a trainer for the RAF. As a low-wing monoplane, it was an ideal introduction to the Spitfire and Hurricane for new pilots.
The Magister is an open-cockpit, low wing cantilever monoplane of spruce structure covered in plywood. Early Magisters suffered a number of accidents when the aircraft could not be recovered from a spin. To solve this problem, the tailplane was raised by 6 inches (15 cm), anti-spin strakes fitted to the rear fuselage, and eventually, a new taller rudder. Thus modified, the aircraft became the definitive M.14A.

Production began in October 1937 and by the start of the Second World War over 700 Magisters had entered service with RAF Elementary Flying Training Schools.

Notwithstanding the relatively large number built, contemporary glues used to assemble the wooden aircraft have not stood the test of time and few survive today.

M.14A Magister

Role	Trainer
Manufacturer	Miles Aircraft
First flight	1937
Primary users	Royal Air Force
Number built	1,303
Crew:	2 (instructor and student)
Length:	24 ft 7 in (7.51 m)
Wingspan:	33 ft 10 in (10.31 m)
Height:	6 ft 8 in (2.03 m)
Wing area:	176 ft2 (16.3 m2)
Empty weight:	1,260 lb (570 kg)
Loaded weight:	1,845 lb (839 kg)
Powerplant:	1 × de Havilland Gipsy Major I inverted four-cylinder inline piston engine, 130 hp
Maximum speed:	142 mph (229 km/h)
Cruise speed:	124 mph (200 km/h)
Stall speed:	43 mph (69 km/h) (flaps down)
Range:	380 miles (612 km)
Service ceiling:	18,000 ft (5,490 m)



The forward cockpit. The speaking tube is visible- the way student and instructor communicated. This aircraft has more instruments than the Tiger Moth.

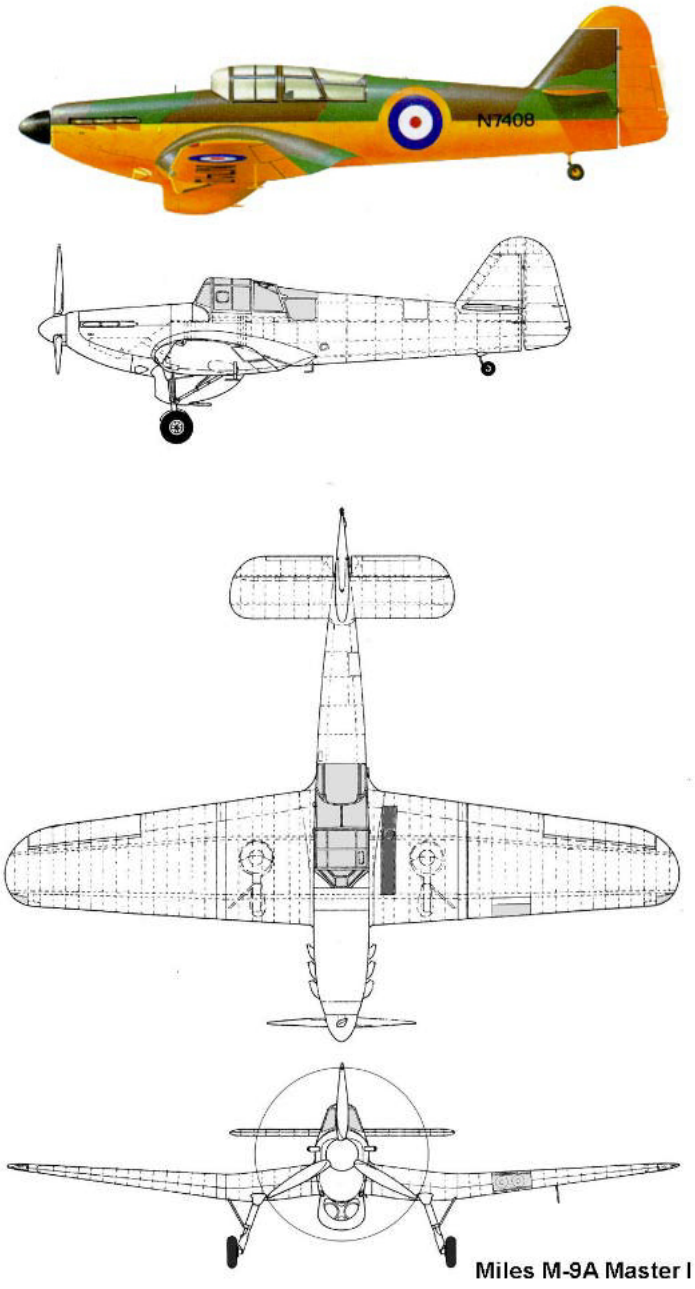
Miles M.9A Master I - 1940

RAF Advanced Trainer

The Miles Master was a British 2-seat monoplane advanced trainer built by Miles Aircraft Ltd for the Royal Air Force and Fleet Air Arm during the Second World War.

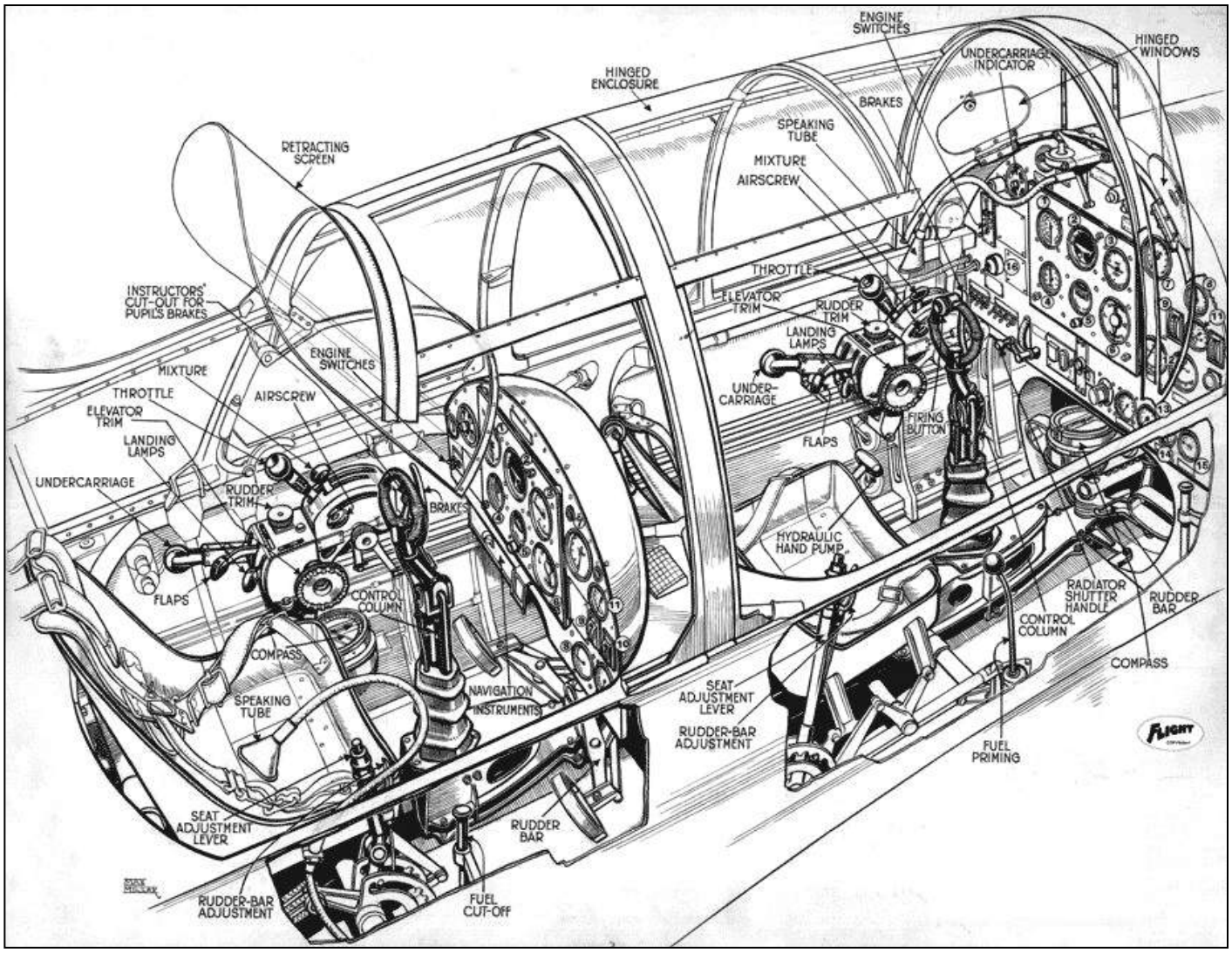
The Master I was based on the M.9 Kestrel trainer, powered by the 745 hp Rolls-Royce Kestrel V-12 engine, could reach 296 mph. Miles rebuilt the Kestrel into a prototype for the Master, fitting a lower powered 715 hp Rolls-Royce Kestrel XXX engine, of which there were large surplus stocks available. The airframe was extensively revised, which included a new cockpit canopy, a modified rear fuselage and tail, and moving the radiator from under the nose to under the centre-section of the wing. These modifications significantly reduced the aircraft's speed, but it remained one of the fastest and most maneuverable trainers of its day. The first true production Master I made its maiden flight on 31 March 1939. The Master entered service just before the start of the war, and eventually 900 Mk. I and Mk. IA Masters were built.

It went through a number of variants according to engine availability and was even modified as an emergency fighter during the Battle of Britain. It was a fast, strong and fully aerobatic aircraft and served as an excellent introduction to the high performance British fighter aircraft of the day: the Spitfire and Hurricane.



Miles Master I

Role	Advanced trainer
Manufacturer	Phillips and Powis Aircraft Ltd
First flight	31 March 1939
Introduction	1939
Number built	900 (3200 of all variants)
Crew:	Two (instructor and student)
Length:	30 ft 5 in (9.3 m)
Wingspan:	39 ft 0 in (11.89 m)
Height:	9 ft 3 in (2.82 m)
Empty weight:	4,370 lb (1,947 kg)
Max. weight:	5,573 lb (2,528 kg)
Powerplant:	1 × One 715 hp Rolls Royce Kestrel 30 V-12
Maximum speed:	226 mph (364 km/h)
Range:	675 mi (1086 km)
Service ceiling:	25,100 ft (7,650 m)
Guns:	1 × .303 in Vickers K machine gun

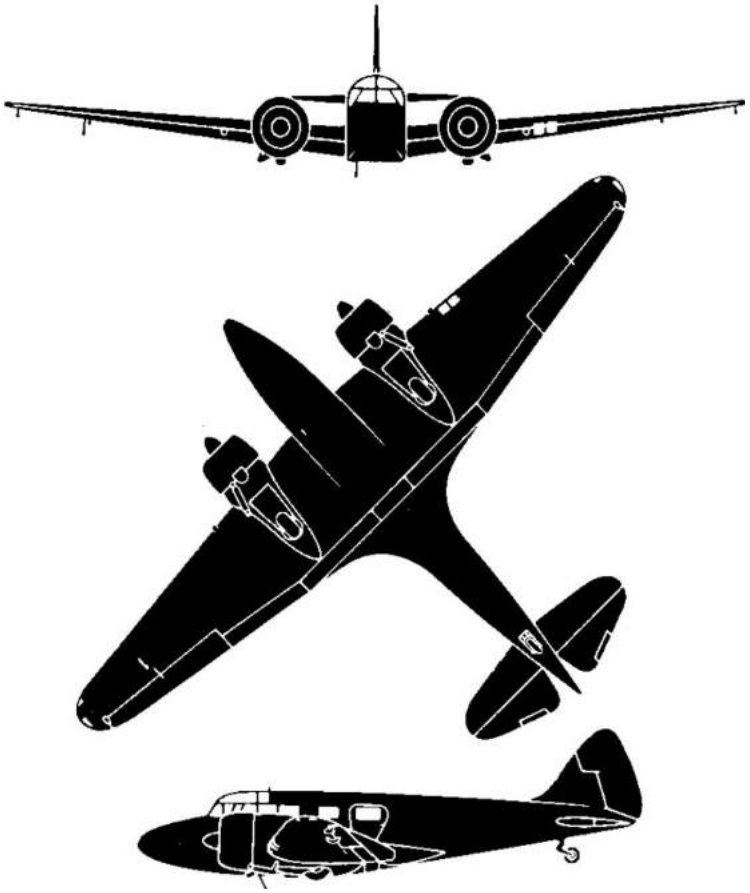


Two views of the Miles Master cockpit. The student sat in front, the instructor in back.

Airspeed Oxford- 1941

Twin engine trainer

The Airspeed AS.10 Oxford (nicknamed the 'Ox-box') was used to prepare complete aircrews for RAF's Bomber Command and as such could simultaneously train pilots, navigators, bomb aimers, gunners, or radio operators on the same flight. Oxfords were also used in communications and anti-submarine roles and as ambulances in the Middle East.The Oxford was based on Airspeed's commercial 8-seater aircraft, the AS.6 Envoy. The Oxford was a low-wing cantilever monoplane with a semi-monocoque constructed fuselage and wooden tail unit. Its main landing gear struts retracted into the engine nacelles.



With a normal crew of three, the seating could be changed to suit the training role. The cockpit had dual controls and two seats for a pilot and either a navigator or second pilot. When used for bombardier training, the second set of controls was removed and the space was used for a prone bomb-aimer. When used as a navigation trainer the second seat was pushed back to line up with the chart table. Aft of the pilots' area was a wireless operator station, facing aft on the starboard side of the fuselage.

Two variants were planned, the Mark I would be a general-purpose training aircraft with a dorsal gun turret, and the Mark II without a turret but fitted with dual-controls. A total of 8,586 Oxfords were built.

Although the Oxford was equipped with fixed-pitch wooden, or Fairey-Reed metal propellers, the cockpit contained a propeller pitch lever which had to be moved from "Coarse" to "Fine" for landing. This was done to reinforce this important step for training pilots.

Airspeed Oxford

Role	Training aircraft
Manufacturer	Airspeed Ltd
First flight	19 June 1937
Primary user	Royal Air Force
Number built	8,586
Crew:	3
Length:	34 ft 6 in (10.52 m)
Wingspan:	53 ft 4 in (16.26 m)
Height:	11 ft 1 in (3.38 m)

Empty weight:	5,322 lb (2,419 kg)
Loaded weight:	7,500 lb (3,409 kg)
Powerplant:	2 × Armstrong Siddeley Cheetah X radial engines, 350 hp each
Maximum speed:	192 mph (309 km/h)
Endurance:	5.5 hr
Service ceiling:	23,550 ft (7,180 m)
Guns:	7.7 mm Vickers K machine gun in dorsal turret
Bombs:	16× 11.5 lb practice bombs carried externally

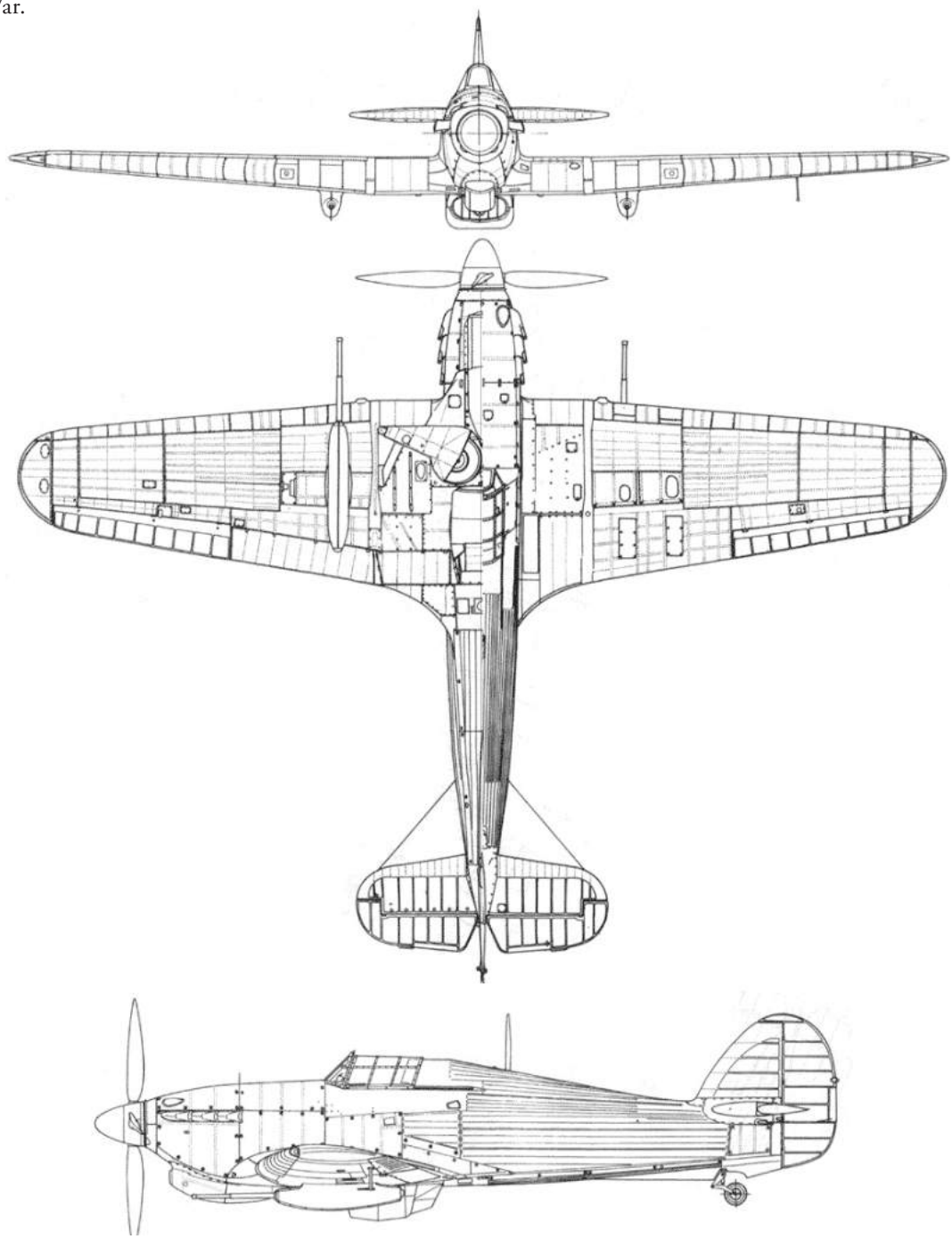

V3388


705
BM705
704
BM704


25

Hawker Hurricane - 1940

The Hawker Hurricane is a British single-seat fighter aircraft that was designed and predominantly built by Hawker Although largely overshadowed by the Supermarine Spitfire, the aircraft became renowned during the Battle of Britain, accounting for 60% of the RAF's air victories in the battle, and served in all the major theatres of the Second World War.



Hawker Hurricane Mk.IIC

Role	Fighter
Manufacturer	Hawker Aircraft
First flight	6 November 1935
Introduction	25 December 1937
Primary user	Royal Air Force, Royal Canadian Air Force
Produced	1937–1944
Number built	14,583, including 1,400 in Canada
Crew:	1
Length:	32 ft 3 in (9.84 m)
Wingspan:	40 ft 0 in (12.19 m)
Height:	13 ft 11⁄2 in (4.0 m)
Empty weight:	5,745 lb (2,605 kg)
Max. takeoff wt:	8,710 lb (3,950 kg)
Powerplant:	1 Rolls-Royce Merlin XX liquid-cooled V-12, 1,185 hp
Maximum speed:	340 mph (547 km/h)
Range:	600 mi (965 km)
Service ceiling:	36,000 ft (10,970 m)
Rate of climb:	2,780 ft/min
Guns:	4 × 20 mm Hispano Mk II cannon
Bombs:	2 × 250 or 500 lb bombs

My First Flight in a Hurricane

by Roland Beaumont, trainee pilot

Then, with tail trimmer set, throttle and mixture lever fully forward... and puffs of grey exhaust smoke soon clearing at maximum r.p.m. came the surprise! There was no sudden surge of acceleration, but with a thunderous roar from the exhausts just ahead on either side of the windscreen, only a steady increase in speed... In retrospect that first Hurricane sortie was a moment of elation, but also of relief. Apart from the new scale of speeds that the pilot had to adapt to, the Hurricane had all the qualities of its stable, secure biplane predecessor the Hart, but enhanced by livelier controls, greater precision and all this performance.

Hurricane Design and Construction

The Hawker Hurricane's constructional design was already outdated when introduced. It used a Warren truss box-girder primary fuselage structure with high-tensile steel longerons and duralumin cross-bracing with mechanically fastened rather than welded joints. Over the metal primary structure, wooden formers and stringers carried the doped linen covering.

An advantage of the steel-tube structure was that cannon shells could pass right through the wood and fabric covering without exploding. Even if one of the steel tubes were damaged, the repair work required was relatively simple and could be done by ground crew at the airfield. In contrast, the contemporary Spitfire used all-metal monocoque construction and was thus both lighter and stronger, though less tolerant to bullet damage. A damaged stressed skin structure, as used by the Spitfire, required more specialised equipment to repair.

Initially, the wing structure of the Hurricane consisted of two steel spars, and was also fabric-covered. An all-metal, stressed-skin wing of duraluminium was introduced in April 1939 and was used for all of the later versions. The metal skinned wings allowed a diving speed that was 80 mph (130 km/h) higher than the fabric-covered ones. They were very different in construction but were interchangeable with the fabric-covered wings. Changing the wings only required three hours work per aircraft.

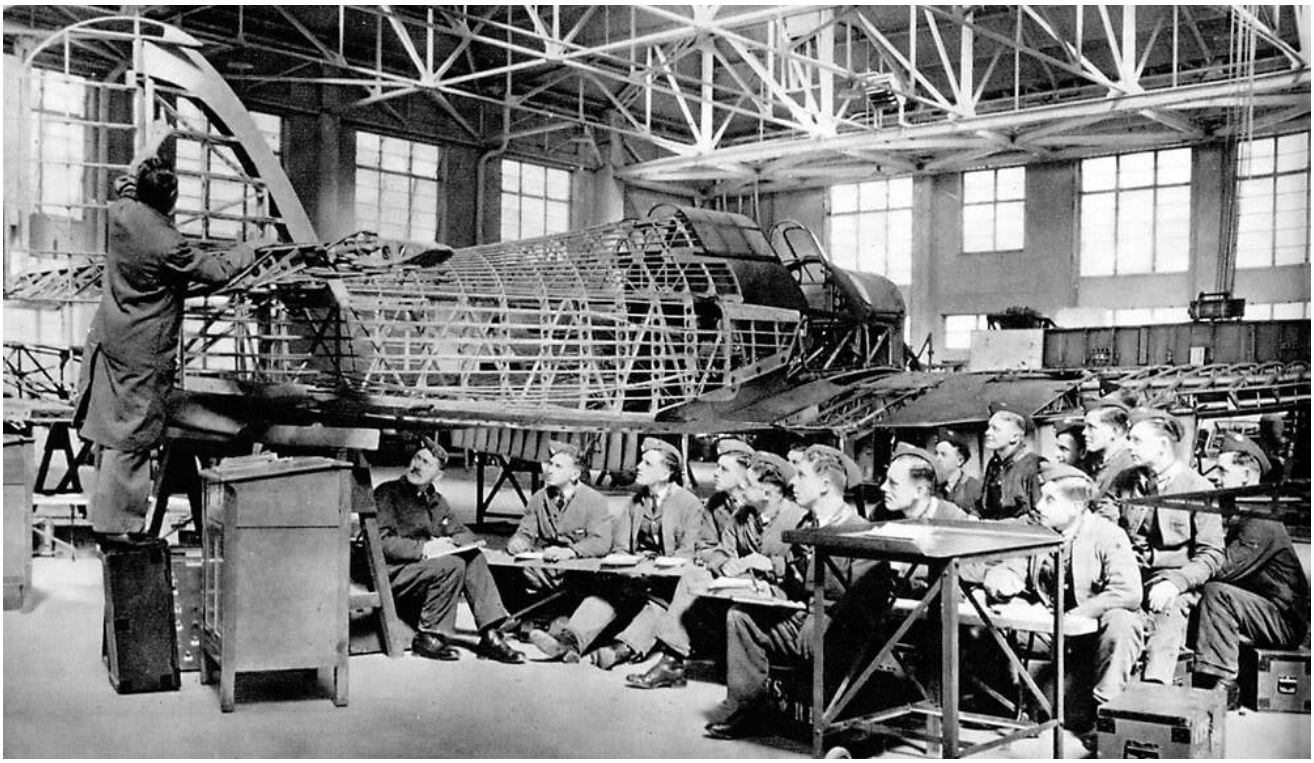
The prototype and early production Hurricanes were fitted with a Watts two-bladed fixed-pitch wooden propeller. Since this was inefficient at low airspeeds, the aircraft required a long ground run to get airborne, causing concern at Fighter Command. Trials with a De Havilland variable-pitch propeller reduced the take-off run from 1,230 to 750 ft (370 to 230 m). Deliveries of these began in April 1939: this was later replaced by the hydraulically operated constant-speed Rotol propeller, which came into service in time for the Battle of Britain.

In service, the Hurricane was relatively easy to repair, and the simplicity of its design enabled the improvisation of some remarkable repairs in squadron workshops. The Hurricane was also significantly cheaper than the Spitfire, requiring 10,300 man hours to produce versus 15,200 for the Spitfire.

The old-fashioned structure also permitted the assembly of Hurricanes with relatively basic equipment under field conditions. Crated Hurricanes were assembled in West Africa and flown across the Sahara to the Middle East theatre.

One of the designg priorities was to provide the pilot with good all-round visibility. To this end, the cockpit was mounted reasonably high in the fuselage, creating a distinctive "hump-backed" silhouette.

With its ease of maintenance, widely-set landing gear and benign flying characteristics, the Hurricane remained in use in theatres of operations where reliability, easy handling and a stable gun platform were more important than performance, typically in roles like ground attack. One of the design requirements of the original specification was that both the Hurricane and the Spitfire were also to be used as a night fighter. The Hurricane proved to be a relatively simple aircraft to fly at night and was to be instrumental in shooting down several German aircraft during the nocturnal hours. From early 1941, the Hurricane would also be used as an "intruder" aircraft, patrolling German airfields in France at night in an attempt to catch night bombers during takeoffs or landings.



Mechanics are receiving instruction on repair of the Hurricane. The rear section of the fuselage was covered in doped linen.

Loading 7.7 mm rounds into the Browning machine guns, 600 rounds per gun.

Hawker Hurricane Variants

Hurricane Mk I
Fabric-covered wings, a wooden two-bladed, fixed-pitch propeller, 1,030 hp Rolls-Royce Merlin Mk II or III engine. Produced from 1937 to 1939.

Hurricane Mk I Revised
Had a constant speed metal propeller, metal-covered wings, armour and other improvements. In 1939, the RAF had about 500 of this variant.

Hurricane Mk IIA Series 1
Had the more powerful Merlin XX engine. Fuselage extended 4.5 inches in front of the cockpit to hold the longer engine, which made the aircraft slightly more stable. First service September 1940.

Hurricane Mk IIB
Carried racks for two 250 lb or two 500 lb bombs or two 45-gallon drop fuel tanks to increase range.

Hurricane Mk IIB Trop.
Tropicalised for use in North Africa, they were fitted with engine dust filters and the pilots were issued with a desert survival kit, including a bottle of water behind the cockpit.

Hurricane Mk IIA Series 2 (Mk IIC) Hurribomber
Hurricane IIA Series 2 became the Mk IIC in June 1941, using a slightly modified wing. By then performance was inferior to the latest German fighters, and the Hurricane changed to the ground-attack role, sometimes referred to as the Hurribomber. The mark also served as a night fighter and intruder.

Hurricane Mk IID
Mk IIB conversion with additional guns and armour for the pilot, radiator and engine. The outer wing attachments were strengthened so that 4G could be pulled at a weight of 8,540 lb. These were nicknamed “Flying Can Openers”

Hurricane Mk IV
The last major change. Introduction of the “universal wing”, a single design able to mount two 250 or 500 lb bombs, two 40 mm Vickers S cannon guns (16 rounds per gun), drop tanks or eight “60 pounder” RP-3 rockets. Two 7.7 mm Browning machine guns (600 rounds per gun) were fitted to aid aiming of the heavier Vickers guns. Had the improved Merlin 24 or 27 engines of 1,620 hp, equipped with dust filters for desert operations. The radiator was deeper and armoured. Additional armour was also fitted around the engine.

Hawker Hurricane Mk. IV

Hawker Hurricane F Mk IV Specification

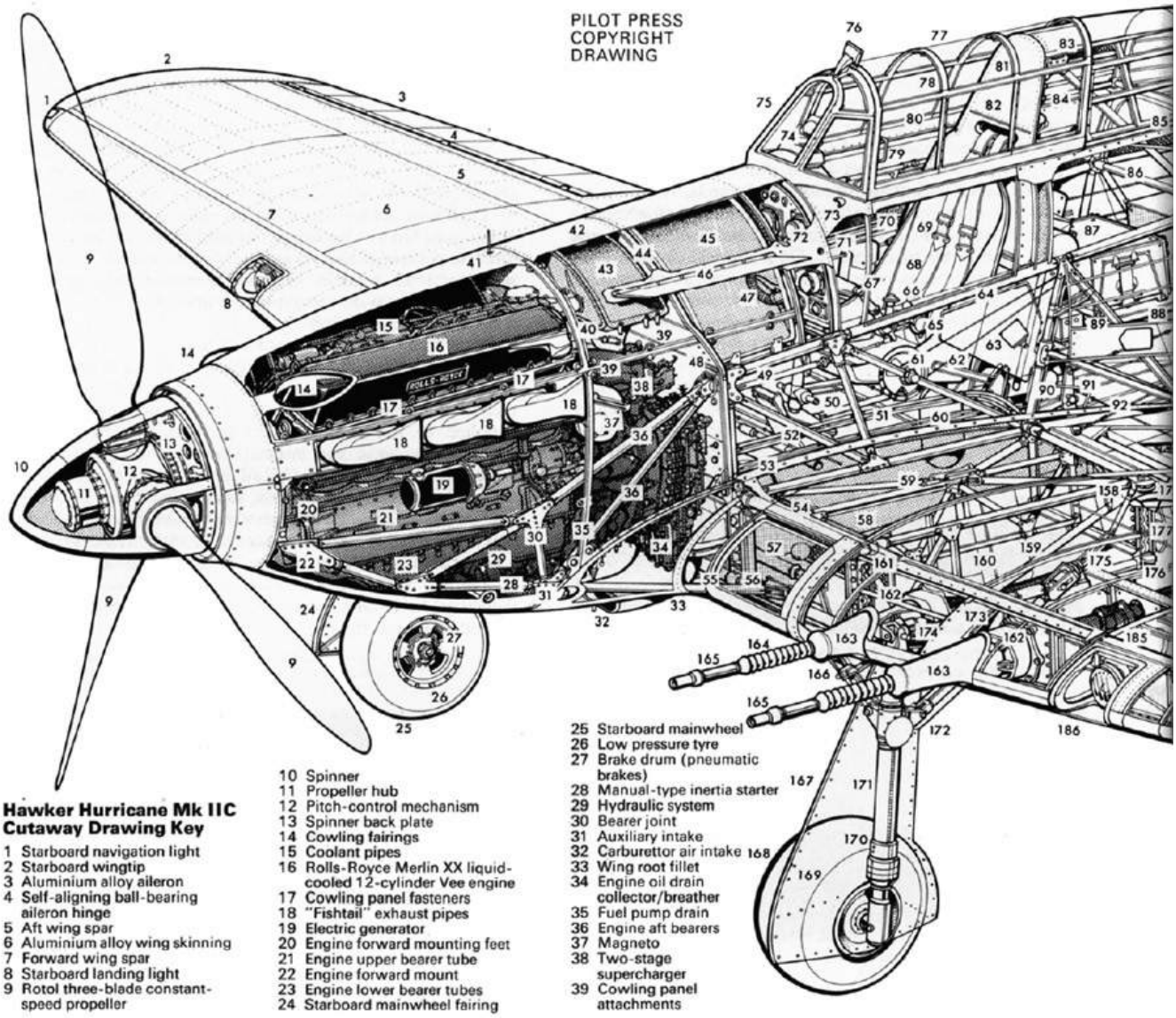
Power Plant: One Rolls-Royce Merlin 27 liquid-cooled 12-cylinder Vee engine rated at 1,300 hp at sea level, 1,460 hp at 6,250 ft (1 905 m) in M gear and 1,435 hp at 11,000 ft (3 353 m) in S gear. Rotol three-bladed constant speed propeller of 11 ft 3 in (3,43 m) diameter. Fuel capacity, 97 Imp gal (441 l).

Performance: Max speed, 314 mph (505 km/h) at 13,500 ft (4 115 m) and 293 mph (471 km/h) at 7,000 ft (2 134 m); cruising speed, 224 mph (360 km/h) at weak mixture power, 176 mph (283 km/h) for best range at 2,000 ft (610 m); time to 2,000 ft (610 m), 45 sec; service ceiling, 36,000 ft (10 973 m); take-off distance to 50 ft (15,2 m), 2,040 ft (621 m); landing distance from 50 ft (15,2 m), 2,130 ft (649 m); range, 495 mls (796 km) with full internal tanks at 176 mph (283 km/h).

Weights: Tare, 5,900 lb (2 679 kg); empty equipped (no fuel or ammunition), 7,200 lb (3 269 kg) with guns, 7,000 lb (3 178 kg) with rockets, max take-off, 8,100 lb (3 677 kg) with guns, 8,500 lb (3 860 kg) with rockets.

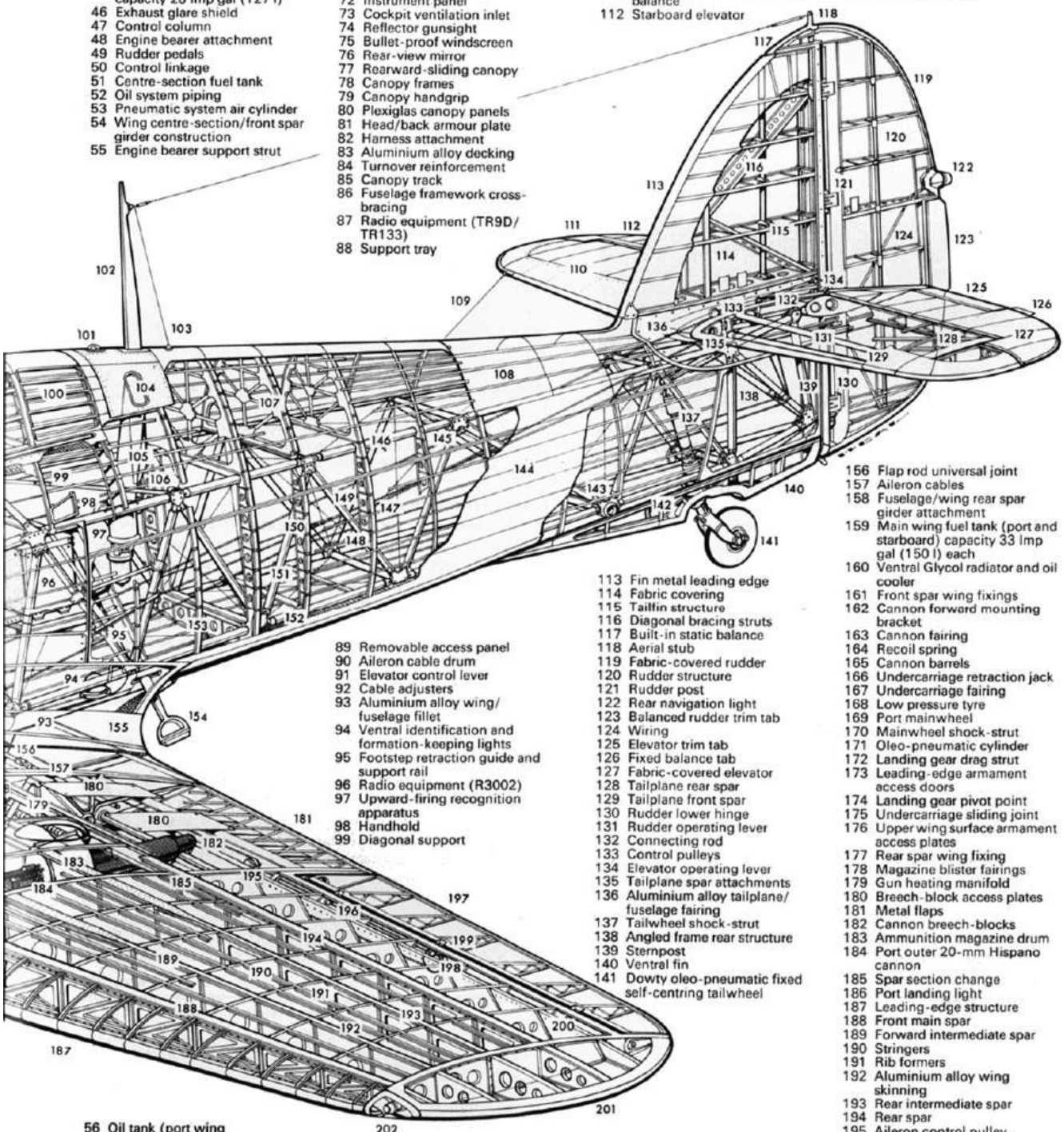
Dimensions: Span, 40 ft 0 in (12,19 m); length, 32 ft 3 in (9,83 m); overall height, 13 ft 3 in (4,04 m); wing area, 258 sq ft (23,97 m²); undercarriage track, 7 ft 10 in (2,39 m); aspect ratio, 6·2:1; dihedral, 3·5 deg on outer wing panels.

Armament: Two 0·303-in (7,7-mm) Browning machine guns in wings with 600 rpg plus two 40-mm Vickers cannon under wings with 16 rpg or eight 60-lb (27-kg) rocket projectiles under wings.



Hawker Hurricane Mk IIC Cutaway Drawing Key

1 Starboard navigation light
2 Starboard wingtip
3 Aluminium alloy aileron
4 Self-aligning ball-bearing aileron hinge
5 Aft wing spar
6 Aluminium alloy wing skinning
7 Forward wing spar
8 Starboard landing light
9 Rotol three-blade constant-speed propeller
10 Spinner
11 Propeller hub
12 Pitch-control mechanism
13 Spinner back plate
14 Cowling fairings
15 Coolant pipes
16 Rolls-Royce Merlin XX liquid-cooled 12-cylinder Vee engine
17 Cowling panel fasteners
18 "Fishtail" exhaust pipes
19 Electric generator
20 Engine forward mounting feet
21 Engine upper bearer tube
22 Engine forward mount
23 Engine lower bearer tubes
24 Starboard mainwheel fairing
25 Starboard mainwheel
26 Low pressure tyre
27 Brake drum (pneumatic brakes)
28 Manual-type inertia starter
29 Hydraulic system
30 Bearer joint
31 Auxiliary intake
32 Carburettor air intake
33 Wing root fillet
34 Engine oil drain collector/breather
35 Fuel pump drain
36 Engine aft bearers
37 Magneto
38 Two-stage supercharger
39 Cowling panel attachments



40 Engine rpm indicator drive
41 External bead sight
42 Removable aluminium alloy cowling panels
43 Engine coolant header tank
44 Engine firewall (armour-plated backing)
45 Fuselage (reserve) fuel tank, capacity 28 Imp gal (127 l)
46 Exhaust glare shield
47 Control column
48 Engine bearer attachment
49 Rudder pedals
50 Control linkage
51 Centre-section fuel tank
52 Oil system piping
53 Pneumatic system air cylinder
54 Wing centre-section/front spar girder construction
55 Engine bearer support strut

64 Fuselage tubular framework
65 Landing lamp control lever
66 Oxygen supply cock
67 Throttle lever
68 Safety harness
69 Pilot's seat
70 Pilot's break-out exit panel
71 Map case
72 Instrument panel
73 Cockpit ventilation inlet
74 Reflector gunsight
75 Bullet-proof windscreen
76 Rear-view mirror
77 Rearward-sliding canopy
78 Canopy frames
79 Canopy handgrip
80 Plexiglas canopy panels
81 Head/back armour plate
82 Harness attachment
83 Aluminium alloy decking
84 Turnover reinforcement
85 Canopy track
86 Fuselage framework cross-bracing
87 Radio equipment (TR9D/TR133)
88 Support tray

105 Mast support
106 Wire-braced upper truss
107 Wooden fuselage fairing formers
108 Fabric covering
109 Radio antenna
110 All-metal tailplane structure
111 Static and dynamic elevator balance
112 Starboard elevator

149 Elevator cables
150 Aluminium alloy formers
151 Diagonal brace wires
152 Lower tube/longeron
153 Aluminium alloy former bottom section
154 Retractable entry footstep
155 Wing root fillet

89 Removable access panel
90 Aileron cable drum
91 Elevator control lever
92 Cable adjusters
93 Aluminium alloy wing/fuselage fillet
94 Ventral identification and formation-keeping lights
95 Footstep retraction guide and support rail
96 Radio equipment (R3002)
97 Upward-firing recognition apparatus
98 Handhold
99 Diagonal support

113 Fin metal leading edge
114 Fabric covering
115 Tailfin structure
116 Diagonal bracing struts
117 Built-in static balance
118 Aerial stub
119 Fabric-covered rudder
120 Rudder structure
121 Rudder post
122 Rear navigation light
123 Balanced rudder trim tab
124 Wiring
125 Elevator trim tab
126 Fixed balance tab
127 Fabric-covered elevator
128 Tailplane rear spar
129 Tailplane front spar
130 Rudder lower hinge
131 Rudder operating lever
132 Connecting rod
133 Control pulleys
134 Elevator operating lever
135 Tailplane spar attachments
136 Aluminium alloy tailplane/fuselage fairing
137 Tailwheel shock-strut
138 Angled frame rear structure
139 Sternpost
140 Ventral fin
141 Dowty oleo-pneumatic fixed self-centring tailwheel

156 Flap rod universal joint
157 Aileron cables
158 Fuselage/wing rear spar girder attachment
159 Main wing fuel tank (port and starboard) capacity 33 Imp gal (150 l) each
160 Ventral Glycol radiator and oil cooler
161 Front spar wing fixings
162 Cannon forward mounting bracket
163 Cannon fairing
164 Recoil spring
165 Cannon barrels
166 Undercarriage retraction jack
167 Undercarriage fairing
168 Low pressure tyre
169 Port mainwheel
170 Mainwheel shock-strut
171 Oleo-pneumatic cylinder
172 Landing gear drag strut
173 Leading-edge armament access doors
174 Landing gear pivot point
175 Undercarriage sliding joint
176 Upper wing surface armament access plates
177 Rear spar wing fixing
178 Magazine blister fairings
179 Gun heating manifold
180 Breech-block access plates
181 Metal flaps
182 Cannon breech-blocks
183 Ammunition magazine drum
184 Port outer 20-mm Hispano cannon
185 Spar section change
186 Port landing light
187 Leading-edge structure
188 Front main spar
189 Forward intermediate spar
190 Stringers
191 Rib formers
192 Aluminium alloy wing skinning
193 Rear intermediate spar
194 Rear spar
195 Aileron control pulley
196 Aileron inboard hinge
197 Aluminium alloy aileron
198 Aileron control gear main pulley
199 Self-aligning ball-bearing hinge
200 Aileron outboard hinge
201 Detachable wingtip
202 Port navigation light

56 Oil tank (port wing root leading edge)
57 Dowty undercarriage ram
58 Port undercarriage well
59 Wing centre-section girder frame
60 Pilot's oxygen cylinder
61 Elevator trim tab control wheel
62 Radiator flap control lever
63 Entry footstep

100 Fuselage fairing
101 Dorsal identification light
102 Aerial mast
103 Aerial lead-in
104 Recognition apparatus cover panel

142 Fin framework
143 Handling-bar socket
144 Fabric covering
145 Swaged tube and steel gusset fitting and through bolts
146 Upper tube/longeron
147 Rudder cables
148 Wooden stringers

Supermarine Spitfire

The Supermarine Spitfire was built in many variants, using several wing configurations, and was produced in greater numbers than any other British aircraft. It was also the only British fighter to be in continuous production throughout the war.

The Spitfire was designed by R. J. Mitchell, chief designer at Supermarine Aviation Works, a subsidiary of Vickers-Armstrong Ltd. In accordance with its role as an interceptor, Mitchell designed the Spitfire's distinctive elliptical wing to have the thinnest possible cross-section; this thin wing enabled the Spitfire to have a higher top speed than several contemporary fighters, including the Hawker Hurricane.

A Spitfire flown by Polish pilots in the Battle of Britain. (Note the Polish Air Force checkerboard rondell on front fuselage.)

During the Battle of Britain (July–October 1940), the Spitfire was perceived by the public to be the top RAF fighter, though the more numerous Hawker Hurricane shouldered a greater proportion of the burden against the Luftwaffe. However, because of its higher performance, Spitfire units had a lower attrition rate and a higher victory-to-loss ratio than those flying Hurricanes.

After the Battle of Britain, the Spitfire superseded the Hurricane to become the backbone of RAF Fighter Command, and saw action in the European, Mediterranean, Pacific and the South-East Asian theatres. Much loved by its pilots, the Spitfire served in several roles, including interceptor, photo-reconnaissance, fighter-bomber and trainer, and it continued to serve in these roles until the 1950s. Although the original airframe was designed to be powered by a Rolls-Royce Merlin engine producing 1,030 hp, it was strong enough and adaptable enough to use increasingly powerful Merlin and, in later versions, Rolls-Royce Griffon engines producing up to 2,340 hp. As a consequence, the Spitfire's performance and capabilities improved dramatically over the course of its life.

In the mid-1930s, aviation design teams worldwide started developing a new generation of all-metal, low-wing fighter aircraft, designed to take advantage of new techniques of monocoque construction and the availability of new high-powered, liquid-cooled, in-line aero engines. They also featured refinements such as retractable undercarriages, fully enclosed cockpits and low drag, all-metal wings– all introduced on civil airliners years before but slow to be adopted by the military, who favoured the biplane's simplicity and manoeuvrability.

The Spitfire's airframe was complex: the streamlined, semi-monocoque duralumin fuselage featured a large number of compound curves built up from a skeleton of 19 formers, also known as frames. A combination of 14 longitudinal stringers and four main longerons attached to the frames helped form a light but rigid structure to which sheets of alclad stressed skinning were attached.

In 1934, the design staff decided to use a semi-elliptical wing shape to solve two conflicting requirements; the wing needed to be thin, to avoid creating too much drag, while still able to house a retractable undercarriage, plus guns and ammunition. An elliptical planform is the most efficient aerodynamic shape for an untwisted wing, leading to the lowest amount of induced drag. The ellipse also served as the design basis for the Spitfire's fin and tailplane assembly, once again exploiting the shape's favourable aerodynamic characteristics.

The radiators were housed in a new radiator-duct design which used the cooling air to generate thrust, greatly reducing the net drag produced by the radiators.

There were 25 marks of Spitfire and many sub-variants: from the Merlin to Griffon engines, the high-speed photo-reconnaissance variants and the different wing configurations. Different wings (A, B and C), featuring a variety of machine guns and cannons, were fitted to most marks. Although the Spitfire continued to improve in speed and armament, because of its limited fuel capacity its range and endurance were also limited: it remained "short-legged" throughout its life except in the dedicated photo-reconnaissance role, when its guns were replaced by extra fuel tanks.

The first Rolls Royce Griffon-engined Mk XII flew operationally in April 1943. This mark could nudge 400 mph (640 km/h) in level flight and climb to an altitude of 33,000 ft (10,000 m) in under nine minutes.

As American fighters took over the long-range escorting of USAAF daylight bombing raids, the Griffon-engined Spitfires took up the tactical air superiority role, and played a major role in intercepting the V-1 flying bomb. The Merlin-engined variants were adapted to the fighter-bomber role. Although the later Griffon-engined marks lost some of the favourable handling characteristics of their Merlin-powered predecessors, they could still outmanoeuvre their main German foes and other, later American and British-designed fighters.

The following specifications are for the Mark IIA variant, which was the front-line RAF version from early 1940 to April, 1941, during the period which included the Battle of Britain.

Supermarine Spitfire Mk IIA

Role	Fighter / Photo-reconnaissance
Manufacturer	Supermarine (Vickers)
Introduction	4 August 1938
Primary user	Royal Air Force
Produced	1938–1948
Number built	20,351
Unit cost	£12,604
Crew:	1
Length:	29 ft 11 in (9.12 m)
Wingspan:	36 ft 10 in (11.23 m)
Height:	9 ft 10 in (3.02 m)
Wing area:	242.1 ft^2 (22.48 m^2)
Empty weight:	4,541 lb (2,059 kg)
Loaded Weight:	6,172 lb (2,799 kg)
Powerplant:	1 × Rolls-Royce Merlin XII supercharged V12 engine, 1,135 hp
Maximum speed:	354 mph, (570 km/h)
Combat radius:	405 mi, (651km)
Ferry range:	1,135 mi, (1,827 km)
Service ceiling:	37,600 ft (11,460 m)
Rate of climb:	2,995 ft/min (15.3 m/sec)
Guns:	8 x .303" Browning Mk II machine guns (350 rounds per gun)

Supermarine Spitfire

Spitfire Mk XIVe TB995, ZF-O, from 308 (Polish) Sqn, on display at the Kraków Air Museum. The squadron became operational only after the Battle of Britain, the aircraft itself a late-mark Spitfire from 1945.

The powerful Griffon engine helped this version reach top speeds of 449 mph and impressive climb rates:

Supermarine Spitfire Mk XIVe

Role	Fighter
Produced	1944-45
Length:	32 ft 8 in (9.95 m)
Wingspan:	36 ft 10 in (11.23 m)
Height:	12 ft 9 in (3.89 m)
Empty weight:	6,653 lb (3,034 kg)
Loaded Weight:	8,574 lb (3,889 kg)
Powerplant:	1 × Rolls-Royce Griffon 65 V12 engine, 2,050 hp
Maximum speed:	449 mph, (722 km/h)
Combat radius:	460 mi, (720km)
Ferry range:	855 mi, (1,375 km)
Service ceiling:	43,000 ft (13,560 m)
Rate of climb:	4,700 ft/min (23.8 m/sec)
Guns:	2 x 20mm Hispano II cannon, 120 rounds per gun 2 x .50" Browning M2 machine guns (250 rpg)

Spitfire of Lt L. Kurylowicz of the 303 (Polish) Squadron. The Spitfire on this and the facing page is a later model version (post-1943) with a larger, more powerful Rolls Royce Griffon engine driving a 4-bladed propeller. Each of these Spitfires carries one Hispano II cannon in each wing, which fired 20mm (0.79") shells. Each gun could be fed 120 rounds.

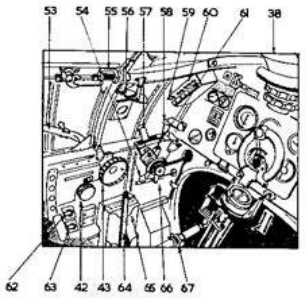
Pilots of RAF Polish Squadron 303 pose with their Squadron Leader, Jan Zumbach, in front of his Spitfire at Kirton-in-Lindsey, Lincolnshire, England (October 1942)

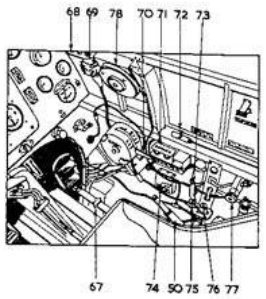
WE GRATEFULLY ACKNOWLEDGE THE GENEROUS HELP GIVEN BY VICKERS ARMSTRONGS AIRCRAFT LTD. WHO LENT WORKS DRAWINGS, THE DIRECTOR OF THE IMPERIAL WAR MUSEUM WHO GRANTED SPECIAL FACILITIES, AND GROUP CAPTAIN DOUGLAS BADER C.B.E., D.S.O., D.F.C., WHO SUPPLIED HISTORICAL INFORMATION AND CHECKED THE DRAWINGS.

WING COMMANDER'S BADGE

RED STRIPES ON AIR FORCE BLUE FIELD WITH ROYAL BLUE BORDER

SPITFIRE VA W3185 WAS FLOWN BY DOUGLAS BADER WHEN LEADER OF THE TANGMERE WING, 1941.





1. INSTR. PANEL 2. STARTER BUTTON 3. COCKPIT FLOODLIGHT SWITCHES 4. IGNITION SWITCHES 5. BRAKE TRIPLE PRESS. GAUGE 6. DEV. CARD HOLDER 7. ELEVATOR TRIM INDICATOR 8. U/C INDICATOR 9. OXYGEN REGULATOR 10. NAV. LAMPS SWITCH 11. FLAP CONTROL 12. A.S.I. 13. ALTIMETER 14. REFLECTOR SIGHT SWITCH 15. OPENING FOR SUN SCREEN 16. ART. HORIZ. 17. VOLTMETER 18. DIRECTION INDICATOR 19. RATE OF CLIMB 20. TURN & BANK INDIC. 21. R.P.M. 22. OIL PRESS. 23. FUEL PRESS. 24. BOOST PRESS. 25. OIL TEMP. 26. RAD. TEMP. 27. FUEL PRESS. WARNING LIGHT 28. FUEL GAUGE & PUSHBUTTON 29. PRIMING PUMP 30. FUEL TANK PRESS. COCK 31. FUEL COCK CONTROL 32. COMPASS 33. RUDDER BAR 34. BRAKE LEVER 35. FIRING BUTTON 36. CAMERA GUN BUTTON 37. T.R. 1143 V.H.F. CONTROL BOX 38. REFLECTOR GUN SIGHT 39. HEADREST 40. VOLTAGE REGULATOR 41. VERY CARTRIDGE RACK 42. RUDDER TRIM HANDWHEEL 43. ELEVATOR TRIM HANDWHEEL 44. AILERON CABLE DRUM 45. TWO-LEVEL RUDDER PEDAL 46. ENGINE CONTROLS 47. TAIL LIGHT 48. RUBBER CRASH PAD 49. SUTTON SAFETY HARNESS 50. SEAT ADJUSTING LEVER 51. ARMOUR PLATING 52. REAR VIEW MIRROR 53. CROWBAR 54. PROPELLER PITCH CONTROL 55. DOOR RELEASE 56. FLOODLIGHT 57. FUEL CUTOFF CONTROL 58. THROTTLE 59. T/R SWITCH 60. CHANNEL SELECTOR BUTTONS 61. U/C INDICATOR MASTER SWITCH 62. OIL DILUTION PUSHBUTTON 63. SUPERCHARGER GROUND TEST BUTTON 64. MANUAL RAD. FLAP LEVER 65. MAP CASE 66. PROP. CONTROL FRICTION ADJUSTER 67. PEDAL ADJUSTING STARWHEEL 68. SPARE LAMPS FOR GUNSIGHT 69. W/T SIGNALLING SWITCHBOX 70. U/C CONTROL LEVER 71. I.F.F. PUSHBUTTONS 72. HARNESS RELEASE 73. U/C EMERGENCY LOWERING LEVER 74. WINDSCREEN DE-ICING COCK 75. WINDSCREEN DE-ICING NEEDLE VALVE 76. WINDSCREEN DE-ICING PUMP 77. OXYGEN SUPPLY COCK 78. REMOTE CONTACTOR AND SWITCH 79. UP LOCK 80. LOCKING PIN ENGAGED IN DOWN LOCK 81. CHAIN DRIVE FROM 70 82. LOCKING ASSEMBLY BOLTED TO REAR FACE OF SPAR 83. LOCKING ROD 84. BRAKE LINE 85. FISHTAIL EXHAUSTS ON LATE MODELS

SCALE 0 1 2 3 4

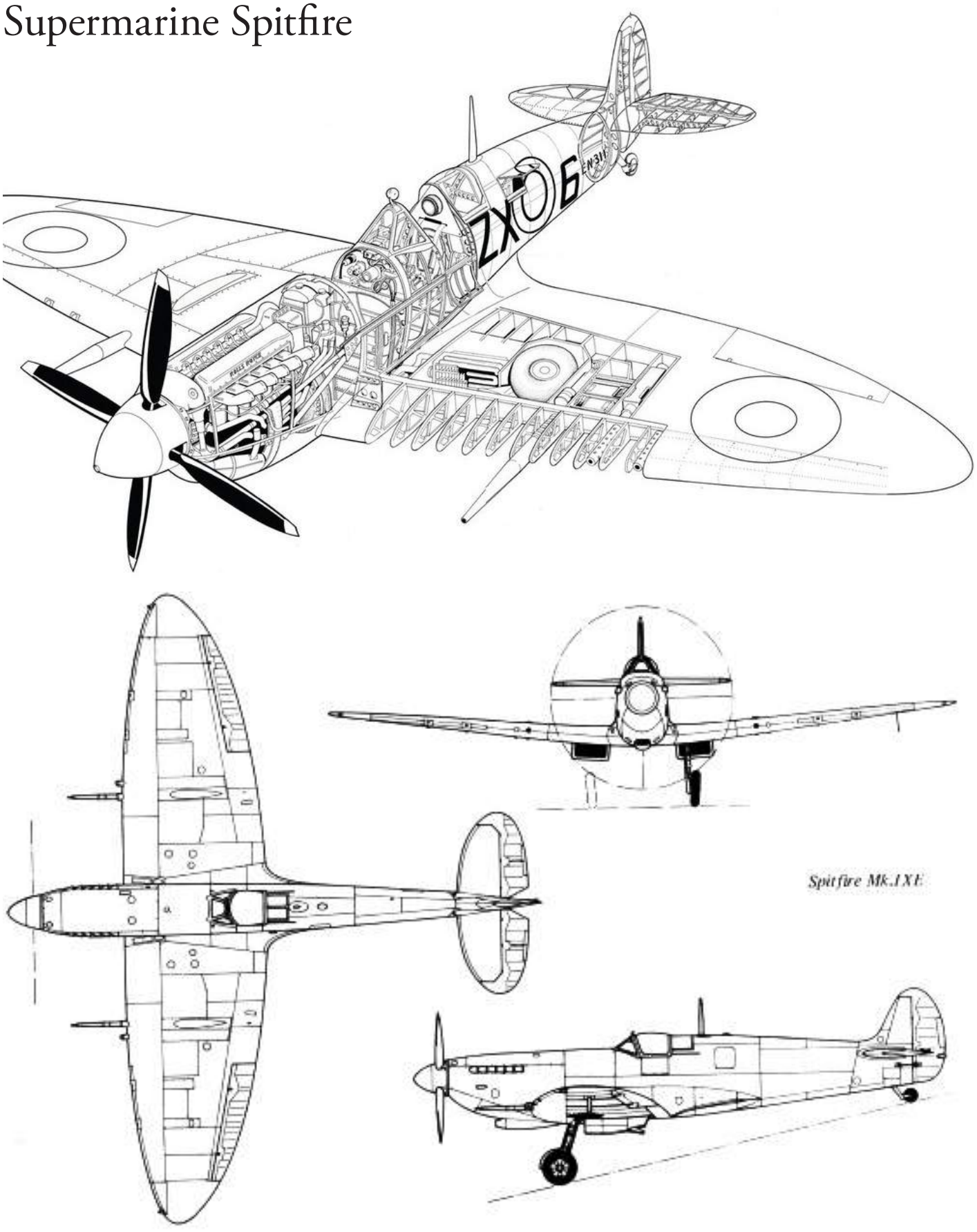
VICKERS-SUPERMARINE

SPITFIRE Mk I

DRAWN BY G.A.G. COX AND M.J. LEE. SCALE 3/4" = 1'0"

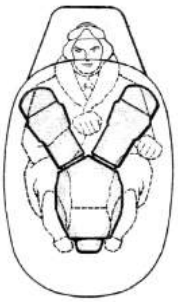
SUPERSCALE

Supermarine Spitfire



Rolls-Royce Merlin Engine- A British Masterpiece

There were two primary types of piston aircraft engines used during World War II- air cooled radials like the Wright Cyclone R-1820 and liquid cooled V-12s like the Rolls-Royce Merlin and Allison V-1710. Radial engines have a large cross section (typically 55 inches in diameter) and were used on larger aircraft such as bombers and transports. V-12 engines had a smaller cross section and was a popular choice for fighters where speed was of prime importance. For example, the frontal area of the Merlin V-12 is 5.8 square feet, while that of the Wright Cyclone R-1820 radial is 16.4 square feet- and that engine produced 200 less horsepower.



Showing the small frontal area of a V type liquid-cooled engine

The British Rolls-Royce Merlin was used in more aircraft types and was considered a better engine than the U.S.-built Allison V-1710. During the war, twice as many Merlins were produced as Allisons. (The numbers refer to the nmber of cubic inches displaced by the cylinders in each engine- a measure of its size.)

While the two engines were of similar size, weight and power output, they differed in how they were supercharged to maximize performance at high altitudes. The U.S. Army preferred exhaust-driven turbochargers, instead of superchargers which were driven by a geared shaft connected to the crankshaft. The Army believed that a supercharger reduced power output of the engine, while the turbocharger used exaust gas that would otherwise be wasted. Thus, little effort was invested in equipping the Allison V-1710 with a complex two-stage supercharger like the one used on the Merlin and German engines. What's more, some U.S. fighter

designs like the Bell P-39 or Curtiss P-40 lacked enough room in the fuselage for even a turbocharger, so those planes did not come equiped with one. Since the P-40 was intended to be a low altitude ground support fighter, a non-turbo Allison was deemed sufficient. As a result, the engine suffered tremendously at higher altitudes. It was for this reason that the V-1710 was later removed from the P-51 Mustang and replaced with the Merlin.

While the Merlin was a better choice for fighters, the Allison V-1710 was a still a fine design, very rugged and tolerated abuse better than most any water-cooled aircraft engine. In fact, Allison powered P-40's were more reliable than the Merlin-powered versions in North Africa because the Allison was less prone to damage from sand ingestion. It helped that the Allison's downdraft carburetor and air intake were mounted on top of the cowling, as opposed to the Merlin's updraft carburetor and the air intake which were located in the air scoop below the propellor.

Considered a British icon, the Merlin was one of the most successful aircraft engines of the World War II era.

Rolls Royce Merlin

Type: 60° V-12-cylinder, supercharged, liquid-cooled, piston aircraft engine.
Bore: 5.4 in (137 mm)
Stroke: 6.0 in (152 mm)
Displacement: 1,647 cu in (27 L)
Length: 88.7 in (225 cm)
Width: 30.8 in (78 cm)
Height: 40 in (102 cm)
Dry weight: 1,640 lb (744 kg)
Frontal Area: 5.8 sq ft
Power output:
1,565 hp at 3,000 rpm at 12,250 ft
1,580 hp at 3,000 rpm at 23,500 ft
Specific power: 0.96 hp/cu in
Compression ratio: 6:1
Power-to-weight ratio: 0.96 hp/lb at max power.
Supercharger: Two-speed, two-stage. Boost pressure automatically linked to the throttle, coolant-air aftercooler between the second stage and the engine.
Fuel system: Twin-choke updraught Rolls-Royce/S.U. carburettor with automatic mixture control. Twin independent fuel pumps.
Fuel type: 100/130 Octane petrol.
Cooling system: 70% water and 30% ethylene glycol coolant mixture, pressurised.

Allison V-1710

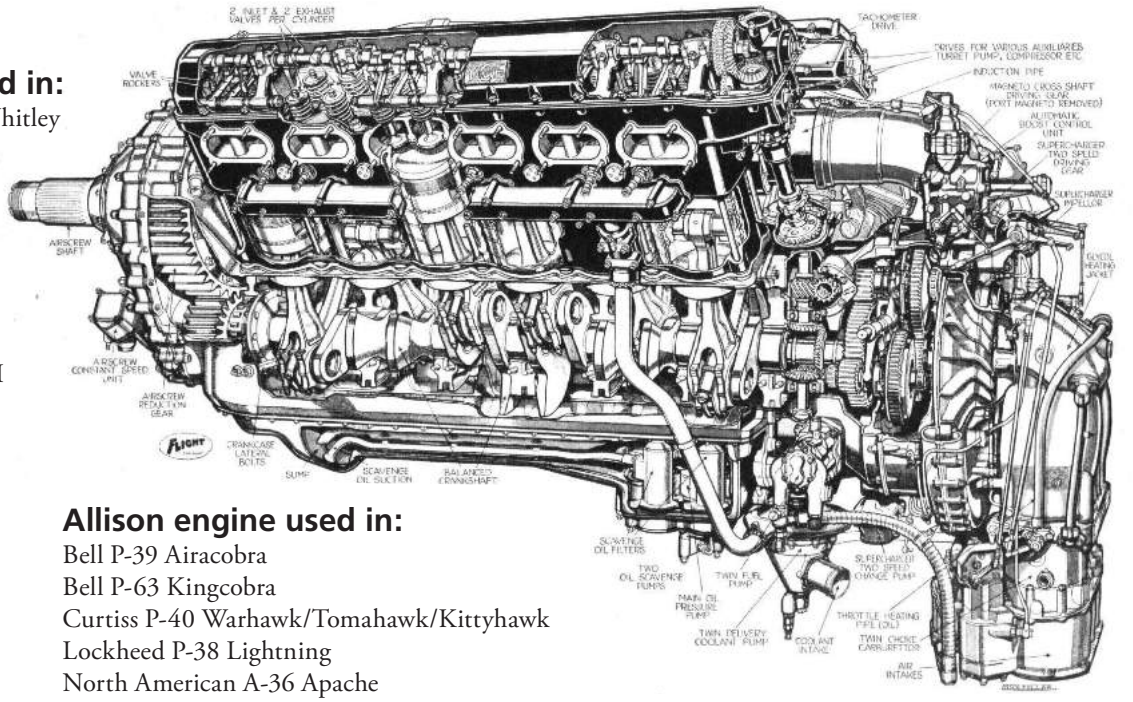
Type: 60° V-12 cylinder supercharged, liquid-cooled piston aircraft engine.
Bore: 5.5 in (140 mm)
Stroke: 6.0 in (152 mm)
Displacement: 1,710 cu in (28.02 l)
Length: 86 in (2,184 mm)
Width: 29.3 in (744 mm)
Height: 37.6 in (955 mm)
Dry weight: 1,395 lb (633 kg)
Frontal Area: 6.1 sq ft
Power output:
1,500 hp at 3,000 rpm at sea level
1,100 hp at 2,600 rpm at 30,000 ft
Specific power: 0.88 hp/cu in
Compression ratio: 6.65:1
Power-to-weight ratio: 1.05 hp/lb at max power
Supercharger: Centrifugal-type, single-stage, 8.1:1 gear ratio, 15-vane impeller, 10.25 in diameter and a General Electric turbo-supercharger with intercooler
Fuel system: 1 x Bendix Stromberg PD-12K8 2-barrel injection downdraught carburetor with automatic mixture control
Fuel type: 100/130 octane gasoline
Cooling system: Liquid-cooled with a mixture of 70% water and 30% ethylene glycol, pressurized.

Merlin engine used in:

Armstrong Whitworth Whitley
Avro Lancaster
Avro Lincoln
Avro Tudor
Avro York
Boulton Paul Defiant
Bristol Beaufighter II
Canadair North Star
Curtiss P-40 Kittyhawk II
de Havilland Mosquito
Fairey Battle
Handley Page Halifax
Hawker Hurricane
Miles M.20
P-51 Mustang Mk X
Supermarine Seafire
Supermarine Spitfire
Vickers Wellington
Vickers Windsor

Allison engine used in:

Bell P-39 Airacobra
Bell P-63 Kingcobra
Curtiss P-40 Warhawk/Tomahawk/Kittyhawk
Lockheed P-38 Lightning
North American A-36 Apache
North American P-51 Mustang



The Merlin engine

Negative G cut-out and Miss Beatrice Shilling

Early versions of the Rolls-Royce Merlin engine came equipped with an SU carburettor. When these airplanes performed a negative G force manoeuvre (pitching the nose hard down), fuel was forced upwards to the top of the float chamber of the carburettor rather than into the engine, leading to loss of power. If the negative G continued, this would lead to a fuel-flooding rich mixture cut-out, which would shut down the engine completely, a serious drawback in combat.

During the Battles of France and Britain, German fighter aircraft had fuel injected engines and therefore did not suffer from this problem as the fuel injection pumps kept the fuel at a constant pressure whatever manoeuvre was made. The German pilots could exploit this by pitching steeply forward while pushing the throttle wide open, the pursuing British aircraft being left flat footed since trying to emulate the manoeuvre would result in loss of power, or fuel flooding and engine shutdown. The British countermeasure, a half roll so the aircraft would only be subjected to positive G as they followed German aircraft into a dive, could take enough time to let the enemy escape.

Complaints from the pilots led to a search for a solution. Beatrice 'Tilly' Shilling, a young engineer working at the Royal Aircraft Establishment at Farnborough, came up with a disarmingly simple solution. She introduced a simple flow restrictor: a small metal disc much like a plain metal washer. The restrictor orifice was made to accommodate just the fuel needed for maximum engine power, the power setting usually used during dogfights.

While not completely solving the problem, the restrictor, along with modifications to the needle valve, permitted pilots to perform quick negative G manoeuvres without loss of engine power. Miss Shilling travelled with a small team around the countryside to one RAF base after another in early 1941 fitting the restrictors, giving priority to front-line units. By March 1941 the device had been installed throughout RAF Fighter Command. The device was immensely popular with pilots, who affectionately named it 'Miss Shilling's orifice' or simply the 'Tilly orifice'.

This simple and elegant solution was only a stopgap: it did not allow inverted flight for any length of time. The problems were not finally overcome until the introduction of Bendix and later Rolls-Royce pressure carburettors in 1943.

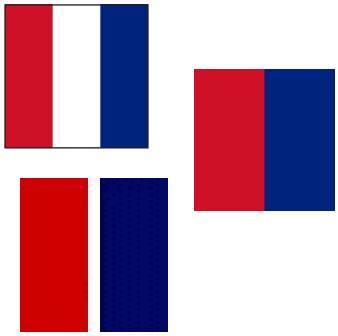
Shilling was an avid motorcyclist as well as an engineer

"...We should remember that, during the Battle of Britain, the turning point of our history, Polish airmen were almost the only allies – apart from Commonwealth nations – who fought in strength at our side. In that battle alone Polish Airmen brought down or crippled over two hundred enemy aircraft..."

The Rt. Hon. Lord Vansittart, on the Polish Air Force in the Battle of Britain

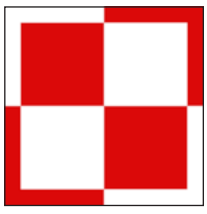
Identificaion marks on Polish Air Force planes after May, 1940

The Hawker Hurricane (rear) and Supermarine Spitfire (front)



RAF fin flash on tail (3 versions)

RAF roundel on side, mid-ship



Poland roundel and "POLAND" on the fuselage side, usually forward of the cockpt

Historical Detour:

The Polish Air Force in England

1940 to 1945

During the Second World War, the Royal Air Force welcomed into its ranks thousands of exiles from German-occupied Poland. Polish personnel served in all RAF commands and in all theatres, and earned a reputation for exceptional courage and devotion to duty. Tragically, though the Poles fought so hard to liberate Europe from tyranny, it would be many years before their own country would again be free.

Polish Air Force Accomplishments:

The 303 Squadron fought in the Battle of Britain, and scored a record number of kills surpassing all other squadrons.

In the Battle of Britain, Poland had 145 pilots, but lost only 32 pilots in battle.

The Polish Air Force took part in all Royal Air Force missions in the United Kingdom, Europe, and Africa.

About 13% of frontline squadrons were Poles. The British increased it to 20% because of RAF losses.

Polish bombers took part in air raids against Berlin, Bremem, and Cologne in 1941.

The Polish Air Force flew supplies to Greece, Poland, Italy, and Yugoslavia for three years.

Polish fighters discovered the secret V-1 and V-2 rocket installations at Peenemunde, and alerted RAF Command. It was immediately bombed setting back German production by six months.

From 1941 to 1945 Polish fighters destroyed 778 aircraft, probably destroyed 206 , and damaged 259; they destroyed 190 V-1 rockets, for a total of 1,600 hits.

The Battle of Britain

The fierce battle raged on from July until October 1940, as the Germans tried to win air superiority over Britain by destroying their air force, and aircraft industry. "The Battle of France is over. The Battle of Britain is about to begin," famously quoted Churchill in June 1940. The French had just surrendered to Germany, which caused Hitler to turn his attention to Britain.

Before Hitler could even think of an invasion though, German air superiority in the south of England was essential, and Hermann Goering, the head of the Luftwaffe, was instructed that the RAF must be "beaten down to such an extent that it can no longer muster any power of attack worth mentioning against the German crossing".

It all kicked off in July 1940 with German bomber attacks against British convoys and ports. On August 13, Hitler heated things up a bit and unleashed the main offensive called Adlerangriff ('Eagle Attack') which was initially against air base, aircraft factories and against radar stations in southeastern England. To defend the country the British arranged more than 600 front line fighters and Fighter command employed squadrons of durable and heavily armed Hawker Hurricanes. Britain also had the faster and more agile Supermarine Spitfires up its sleeve - saved for use against the bombers' fighter escorts.

Thanks to their superior equipment the British actually had the advantage against the German bombers that were mostly lightly armed, twin-engine planes like the Heinkel He 111 and Junkers Ju 88. These aircraft in daylight were very vulnerable and also lacked the bomb load capacity to strike fatal blows. Even more vulnerable to being shut down was the once feared Junkers Ju 87 "Stuka" dive-bomber and the German premier fighter, the Messerschmitt Bf 109, which was operating at the limit of its flying range so could only provide brief long-range cover for the bombers.

By the end of August 1940, the Luftwaffe had lost more than 600 aircraft and the RAF only 260. However, Fighter Command was still losing fighters and experienced pilots at too great a rate to be sustained. Number 11 Group in particular was in a fight for its life and subsequently for Britain's well-being too. Churchill recognised that the country's fate hung on the sacrifice of its airmen, and in a speech to Parliament on August 20, said: "Never in the field of human conflict was so much owed by so many to so few."

Thankfully, Britain had the advantage of fighting against an enemy that had no systematic or consistent plan of action. By mid-September, it was becoming clear that the Luftwaffe could not gain air superiority over Britain. British fighters were shooting down German bombers faster than German industry could produce them. The Luftwaffe even shifted almost entirely to night raids on Britain's industrial centres, in order to avoid the RAF fighters. The night raids, also known as the "Blitz," caused many deaths and hardship for the people of Britain at the time, but it didn't help the Germans dominate the skies and invade Britain.

By September, Fighter Command had more aircraft and pilots than it had at the beginning while the Luftwaffe was finding it difficult to replace its losses; many of the British pilots who were shot down parachuted to safety and could be back in the cockpit in a matter of hours. In September, the Luftwaffe redirected its attacks to London and major ports but this resulted in heavy losses, including 80 air craft on September 15, a day celebrated afterwards as Battle of Britain Day. In mid-September the invasion was cancelled. German losses totalled 1,733 air craft, British losses 915.

On October 12, 1940 Hitler announced that the operation was off for the winter, and long before the arrival of spring he decided to turn eastward against Russia. Plans for an invasion were discarded and the campaign against Britain then became a blockade of its sea approaches, conducted mainly by submarines and only supplemented by the Luftwaffe. The Battle of Britain really tested the efficiency of British airplane technology and the swift development of German airpower cause Britain to sharpen their own air force. Britain developed the use of radar and galvanised the air force into a separate military branch. The Royal Air Force helped defeat the Germans and played a vital part in turning the tide of the Second World War. The Battle of Britain was very significant because it was the first major military campaign in history to be fought entirely in the air.

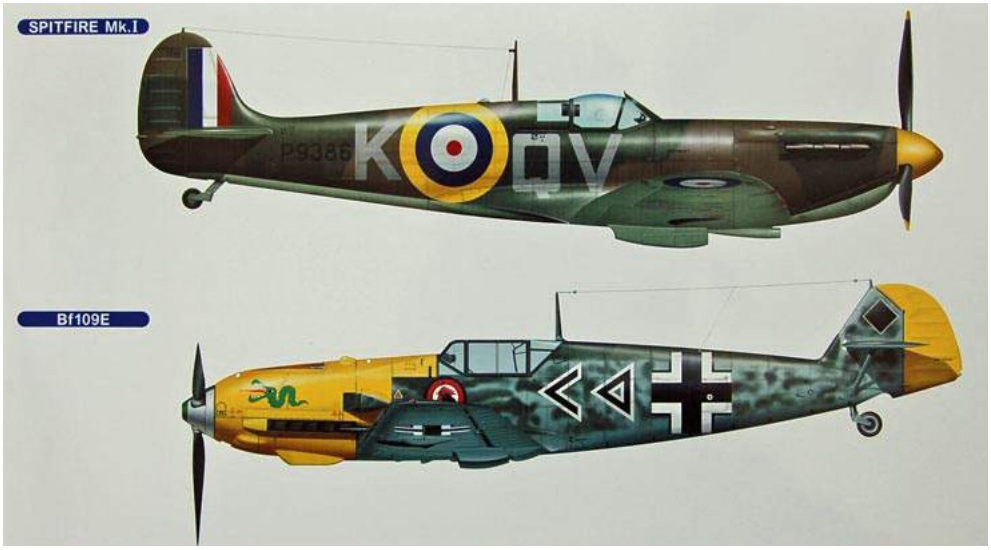
The Hurricane and Spitfire in the Battle of Britain

At the end of June 1940, following the fall of France, the majority of the RAF's 36 fighter squadrons were equipped with Hawker Hurricanes. The Battle of Britain officially lasted from 10 July until 31 October 1940, but the heaviest fighting took place between 8 August and 21 September. Both the Supermarine Spitfire and the Hurricane are renowned for their part in defending Britain against the Luftwaffe.

Generally, the Spitfire would intercept the German fighters, leaving Hurricanes to concentrate on the bombers. Despite the undoubted abilities of the "thoroughbred" Spitfire, it was the "workhorse" Hurricane that scored the higher number of RAF victories during this period, accounting for 55 percent of the 2,739 German losses, according to Fighter Command, compared with 42 per cent by Spitfires.

As a fighter, the Hurricane had some drawbacks. It was slower than both the Spitfire I and II and the Messerschmitt Bf 109E, and the thick wings compromised acceleration, but it could out-turn both of them. In spite of its performance deficiencies against the Bf 109, the Hurricane was still capable of destroying the German fighter, especially at lower altitudes. The standard tactic of the 109 was to attempt to climb higher than the RAF fighters and "bounce" them in a dive; the Hurricanes could evade such tactics by turning into the attack or going into a "corkscrew dive", which the 109s, with their lower rate of roll, found hard to counter. If a 109 was caught in a dogfight, the Hurricane was just as capable of out-turning the 109 as the Spitfire. In a stern chase, the 109 could easily evade the Hurricane.

The Hurricane was a steady gun platform and rugged. Several were badly damaged, yet returned to base. But, while it was sturdy and stable, the Hurricane's construction made it dangerous in the event of the aircraft catching fire. The wood frames and fabric covering of the rear fuselage meant that fire could spread through the structure quite easily. In addition, the gravity fuel tank in the forward fuselage sat right in front of the instrument panel without any form of protection for the pilot. Many Hurricane pilots were seriously burned as a consequence of a jet of flame which could burn through the instrument panel. This became of such concern to Hugh Dowding that he had Hawker retrofit the fuselage tanks of the Hurricanes with a self-expanding rubber coating called Linatex. If the tank happened to be punctured by a bullet, the linatex coating would expand when soaked with petrol and seal it. Some Hurricane pilots also felt that the fuel tanks in the wings, although they were protected with a layer of Linatex, were vulnerable from behind, and it was thought that these, not the fuselage tank, were the main fire risk.



The Polish Come to the Aid of Britain

Approximately 1,500 Royal Air Force pilots took part in the Battle of Britain, of more than 150 of whom were Polish. This was the largest contingent of foreign pilots fighting with the British against the Germans. Half of the Poles flew in British squadrons and the other half flew in two Polish squadrons, the 302 and the 303. The 302 became operational on August 15, 1940, and the 303 followed suit on August 30, albeit in a most irregular fashion when Lieutenant Paszkiewicz shot down a German Dornier bomber without orders during a training flight. For this, he concurrently received a reprimand and a commendation.

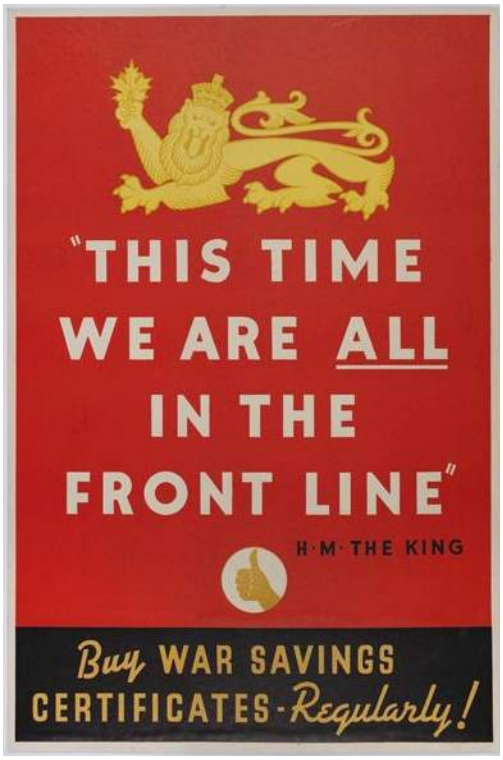
Squadron 303 was formed around the nucleus of the old First Warsaw Air Regiment. These pilots had scored several kills in Poland and in France. During the Battle of Britain, 303 squadron became the highest scoring allied squadron. The Poles used their own tactics to achieve these results, often leaving the British skeptical that the number of kills claimed by the Poles was exaggerated.

One of the doubters was British Group Captain Vincent. On one occasion when 303 squadron went into action, he took off in a plane and followed them. The squadron met a large enemy formation over the London docks. Two of the squadron's Hurricanes immediately climbing high above, while the rest hung back with Vincent behind them. Then, the two lone planes dived almost vertically into the Germans, spitting fire and pretending to ram them. This forced the bombers to break formation. Vincent wrote, "the Poles behind jumped on the scattered planes and suddenly the air was full of burning aircraft, parachutes and pieces of disintegrating wings. It was all so rapid it was staggering."

Vincent tried to join in himself, but each time he fixed on a German plane, it sidintegrated before his eyes as a Pole got there first. "I returned to Northolt feeling old and musty," he wrote, "and told Wilkins (the intelligence officer) that what they claimes, they did indeed get."

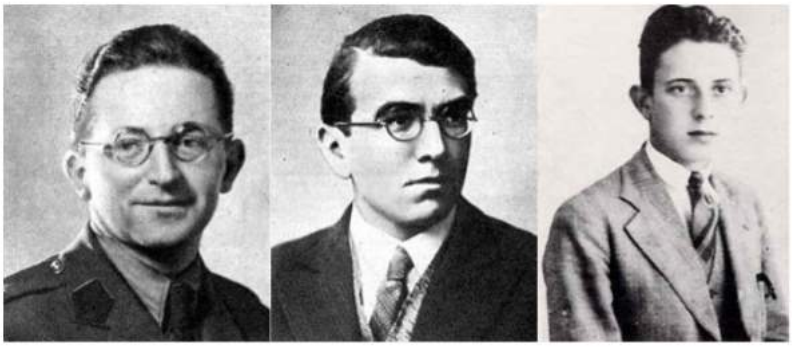
The Polish successes were often aescribed by the British to "the almost incredible audacity" of the Poles. One example was the case of pilot Stanislaw Skalski, who flew with the British 501 squadron. Skalski, badly burnt the second time he was shot dwon, slipped out from the hospital where he was recovering and rejoined his squadron. He was left with such a terror of fire that could not even bear to light a cigarette, but he did not admit this to his British commanding officer. He insisted on going operational, even though his leg was so badly wounded he could not run during a scramble and therefore had to sit in his plane for hours awaiting the signal.

Evantually, he became an ace with 22 enemy planes destroyed, six in Poland in 1939 and 16 in Great Britain. In 1943 he became the commander of the British 601 fighter squadron named "County of London."



Polish Cryptologists Provide a Priceless Weapon

Having conquered France, Hitler now focused his attention on Great Britain. The planned invasion of the British Isles was given the code name "Sea Lion." The German naval commander Admiral Raeder laid down an essential condition for the success of the operation: the absolute superiority of the Luftwaffe. Marshall Goering was confident his air force could chase the British out of the sky. He had at his disposal 2,800 aircraft (1,400 medium range bombers, 300 dive bombers, 1,100 fighters). Great Britain could only muster 531 Hurricanes and Spitfires to defend the homeland.



Od lewej: Marian Rejewski, Henryk Zygalski i Jerzy Różycki.

The RAF Fighter Command was headed by air chief Marshall sir Hugh Dowding, who would not have had much chance of winning the Battle of Britain against such odds had he not possessed a great advantage, shrouded in utmost secrecy: the ability to read the most secret German radio signals.

Just before the start of the war, the Polish government provided the Allies with a priceless weapon: the ability to read the most secret German radio signals. Before the war, Polish criptoanalysts had broken the secret of the German coding machine "Enigma" and then passed the secret, along with a reconstructed copy of the machine, to the French and British five weeks before the outbreak of the war. Without the ability to read German signals, it is doubtful the British would have prevailed during the Battle of Britain, since the Nazis had three times the aircraft as Britain at the time.

Since Dowding was able to read Goering's messages, he could deploy his squadrons in the most effecient manner, often incomprehensive to those who did not know the secret. Along with rudimentary radar coverage of the English Channel, also a secret, Dowding's fighters were able to compensate for the enemy's superiority in numbers.

An Enigma machine was an electro-mechanical rotor cipher machine invented by the German engineer Arthur Scherbius at the end of World War I. From the early 1920s, it was adopted by military and government services of several countries, most notably Nazi Germany before and during World War II.

German military messages enciphered on the Enigma machine were first broken by the Polish Cipher Bureau, beginning in December 1932. This success was a result of efforts by three Polish cryptologists, Marian Rejewski, Jerzy Różycki and Henryk Zygalski, working for Polish military intelligence. Rejewski reverse engineered the device, using theoretical mathematics and material supplied by French military intelligence.

Subsequently the three mathematicians designed mechanical devices for breaking Enigma ciphers, including the cryptologic bomb. From 1938 onwards, the Germans repeatedly added complexity to the Enigma machines, making decryption more difficult and requiring larger numbers of equipment and personnel to decipher messages, more than the Poles could readily produce.

On 25 July 1939, in Warsaw, the Poles shared with French and British military intelligence representatives their Enigma-decryption techniques and equipment, including Zygalski sheets and the cryptologic bomb, and delivered to each delegation a Polish-reconstructed Enigma. The demonstration represented a vital basis for the later British continuation and effort.

During the war, British cryptologists decrypted a vast number of messages enciphered on Enigma. The intelligence gleaned from this source, code named "Ultra" by the British, was a substantial aid to the Allied war effort.

Praise for the Polish Pilots

By late 1940 the American visitor Ralph Ingersoll reported that the Poles were "the talk of London" because of their victories. Although at first the Poles memorized basic English sentences to identify themselves if shot down over Britain to avoid being mistaken as Germans, the visitor wrote that now "they always have a girl on each arm. They say the girls cannot resist the Poles, nor the Poles the girls".

A total of 145 Polish fighter pilots served in the RAF during the Battle of Britain, making up the largest non-British contribution. By the end of the war, around 19,400 Poles were serving in the Polish Air Force in Great Britain and in the RAF.

Many Polish pilots flew in other RAF squadrons were given nicknames because, as Ingersoll wrote, "the Polish names, of course, are unpronounceable". The fighter squadrons initially flew Hurricanes, then Supermarine Spitfires, and eventually some were equipped with North American P-51 Mustangs. Night fighters used by 307 squadron were the Boulton-Paul Defiant, Bristol Beaufighter and the de Havilland Mosquito. The bomber squadrons were initially equipped with the Fairey Battle and Vickers Wellington, then Avro Lancaster, Handley Page Halifax, Consolidated B-24 Liberator, de Havilland Mosquito and North American B-25 Mitchell. The 663 squadron flew Auster observation light planes.

By VE Day, the Polish Air Force had a strength of 15 fighter, bomber, coastal and special duties squadrons supported by 14,000 airmen and airwomen. Poles continued to serve in the RAF and three Polish officers commanded RAF units.

On April 6, 1944, a further agreement was reached and the Polish Air Forces in Great Britain came under Polish command, without RAF officers. This resulted in the creation of a dedicated Polish Air Force staff college at RAF Weston-super-Mare, which remained open until April 1946.

After the war, due to the fact that Poland ended the war under Soviet Union influence, only a small proportion of the pilots returned to Poland, while the rest remained in exile.

King George VI, on visiting a Polish squadron, asked a Polish airman what was the toughest thing he had to deal with in the war. The reply was "King's Regulations...."

The Poles are equally adept at scoring bull's eyes on a German aircraft and on the dartboard. Scene in a Polish squadron's crew room.

From a Canadian pilot who was a squdron leader during the Battle of Britain.

In the fall of 1940, I was a flight commander in the now famous Polish squadron, flying Hurricanes.

I want to tell you right now that it was a grand experience fighting with the Poles. When the squadron was first formed at the end of July the nucleus consisted of an English Squadron Leader and two flight commanders, of whom I was one. The Poles who came along had plenty of fighting experience. They had fought in Poland, and later in France, and when we got together in the early days of August we were all flat out to have a crack at the Huns. By the end of the month we had taken our place in the front line.

The first morning in the front line we were sent to escort a formation of our bombers; we ran into a raid and we got a Dornier 17 first crack. The next day we got six Messerschmitt 109 fighters, and from then on we slapped 'em down as they'd never been slapped before. In their first four weeks that Polish squadron shot down more than one hundred enemy aircraft, and in five weeks we had shot down more than one hundred and twenty.

You can take it from me that those Poles were magnificent fighters—and they still are. They introduced their own technique into air fighting. They sailed right into the enemy, holding their fire until the very last moment. That was how they saved ammunition and how they got so many enemies down on each sortie.

Polish Air Force Memorial

A memorial to those Polish pilots killed while on RAF service has been erected at the RAF Northolt airport near London. A large mural to Polish Air Force squadrons in the war is situated on the floor of the north aisle of the reconstructed Wren church, St Clement Danes, London.The memorial exhibition tells the proud story of the Polish Air Force in WWII.

Polish Air Force Squadrons 1940-1946

When the Polish RAF squadrons were formed, a series of badges or coats of arms were designed for each of the Polish squadrons or flying units. Some of the squadron badges were based on squadron or escadrille badges of Polish flying units pre-1939 and others were designed specially for the large and growing number of flying units being formed in the RAF. The badges are incorporate into the Polish Air Force memorial mosaic at Northolt Airfield near London, shown on the previous page.

300 Squadron's badge has "CCC" meaning "300" in Roman numerals. It was the first Polish RAF squadron formed. It combines the coats of arms of both Poland and England - it has the Polish White Eagle "Orzeł Biały" and it has the English Lion. Between July 19, 1940 and May 8, 1945, the crews of the squadron flew 3,891 sorties and spent 20,264 hours in air. Aircraft flown: Fairey Battle, Vickers Wellington, Avro Lancaster.

300 Polish Bomber Squadron, "Land of Masovia"

301 Squadron was in fact two completely different units, with two different roles and different aircraft types; one was a bomber unit, the other was transport, formed in November 1944, operating in North Africa and in Italy for Special Duties flights. It used a circular badge with a Polish Eagle, and below it - a Pomeranian red griffin passant shield - and a Maid of Warsaw "Syrena" shield, with the number "301" below. Aircraft (bombers): Fairey Battle, Vickers Wellington, Handley Page Halifax, B-24 Liberator, Vickers Warwick.

301 Polish Bomber Squadron, "Land of Pomerania"

The crew of the B-24 Libereator bomber flown by the 301 Polish Bomber Squadron.

302 Squadron was one of the four Polish RAF squadrons that participated in the Battle of Britain. The 302 became the first Polish Squadron to land in France, five days after D-Day. Squadron's badge uses an old Polish design. The diamond shape badge includes a red, white and blue background from both the French and UK flags and it has both the French Armée de l'Air "I/145" unit number and RAF "302". Aircraft: Hawker Hurricane, Supermarine Spitfire, P-51 Mustang

302 Polish Fighter Squadron, "City of Poznan"

303 "Kościuszko" Polish Fighter Squadron was the highest scoring of the 16 Polish-manned RAF squadrons during the Battle of Britain. It had a distinguished combat record throughout the war. Squadron's badge is the same as the older Polish "Kościuszko" unit, used for the Brygada Poscigowa (Pursuit Brigade) tasked with the defense of Warsaw. Aircraft: Hawker Hurricane, Supermarine Spitfire, P-51 Mustang.

303 Polish Fighter Squadron, "Kosciuszko"

304 Polish Bomber Squadron served as a bomber unit in RAF Bomber Command, as an anti-submarine unit in RAF Coastal Command and as a transport unit in RAF Transport Command. It's badge shows a bomb and a "V" ("5th") reference which may refer to the fact that 304 Sqn was the fifth unit, or it may refer to "V for Victory". Aircraft: bombers: Fairey Battle and Vickers Wellington; transports: Vickers Warwick and Handley Page Halifax.

304 Polish Bomber Squadron, "Land of Silesia"

305 Squadron's first mission was bombing of petrol and fuel storage tanks at Rotterdam. It was a specialized arm of the RAF that was centered on tactical air strikes on vital enemy targets such as bridges, supply trains, etc., on the Continent. During the Normandy landings, bombers of the squadron destroyed 13 million liters of the German fuel stored near Nancy, France. The Squadron's badge uses a graphic image of a feather, a letter "P" probably for Polska ("Poland") and a spear signifying launched attack and the colour roundel of the RAF and the square roundel of the Polish Air Force. The squadron number "305" is added. Aircraft: Fairey Battle, Vickers Wellington, B-25 Mitchell, de Havilland Mosquito.

305 Polish Bomber Squadron, "Land of Greater Poland"

306 Polish Fighter Squadron, upon its formation in 1940, inherited the traditions, the emblem and a large part of the initial crew, of the pre-war Polish Torunian Fighter Squadron. Throughout its existence, the squadron claimed 68 confirmed kills, 16½ probable and additional 26 damaged. In addition, the crews of the 306 downed 59 enemy V1 rockets. The squadron's badge uses an old Polish design with an added bear and tree, a symbol for Warwickshire, UK and Madrid. Aircraft: Hawker Hurricane, Supermarine Spitfire, P-51 Mustang.

306 Polish Fighter Squadron, "City of Torun"

307 Polish Night Fighter Squadron is named after the Polish city of Lwów, and nicknamed "Eagle Owls". Squadron's badge uses a crescent moon, an aircraft and an Eagle Owl derived from the heroic exploits of The Lwów Eaglets (Polish: Orlęta Lwowskie) young fighters who died defending the city of Lwow in Galicia, Poland from invading Ukrainian & Russian forces during the Polish-Ukrainian War (1918–1919). The name "Eagle Owls" is also appropriate because 307 Squadron's role was night-fighter defence. Aircraft: Boulton Paul Defiant, Bristol Beaufighter, de Havilland Mosquito.

307 Polish Night Fighter Squadron, "Lwów Eagle Owls"

308 Polish Fighter Squadron was formed in 1940 and after training at Speke it was supplied with Hurricanes. By October 1941 the squadron converted to Spitfires. The squadron was then involved in operations over France before its transfer to the 2nd Tactical Air Force as a fighter-bomber squadron. The squadron then followed the allied advance across Europe after the Normandy Landings in 1944. Squadron's badge uses an old Polish design previously used for 121 Escadrille. Aircraft: Hawker Hurricane, Supermarine Sptifire.

306 Polish Fighter Squadron, "City of Krakow"

309 squadron was at first a reconnaissance squadron, Their aircraft operated in pairs, crossing the English Channel a few feet above water to avoid enemy's radar detection. The leader of the section would fly at some 900 feet and top speed taking pictures and making a visual reconnaissance, while his weaver would keep a lookout against enemy fighters.
Aircraft: Westland Lysander, North American P-51 Mustang, Hawker Hurricane. (More about this squadron on the following pages)

307 Polish Reconnaissance-Fighter Squadron, "Land of Czerwien"

315 In 1941, the squadron made frequent patrols over naval convoys, then began to conduct offensive fighter sweeps over occupied Europe. The squadron also formed part of southern England's defence against the V-1 flying bombs and served in the Battle of Normandy. The squadron later carried out operations over Germany, Norway, and the Netherlands. 315 Squadron's badge uses an old Polish design previously used for 112 Escadrille in the Brygada Poscigowa (Pursuit Brigade) tasked with the defence of Warsaw. Aircraft: Hawker Hurricane, Supermarine Spitfire, P-51 Mustang.

315 Polish Fighter Squadron, "City of Deblin"

Polish Air Force Squadrons (continued)

Supermarine Spitfire flown by the 316 Polish Fighter Squadron

316 Squadron was formed on 15 February 1941 as a Polish fighter unit equipped with Hawker Hurricanes. It was engaged in defensive duties over south-west England and later began sweeps over northern France. It later re-equipped with the Spitfire and then P-51 Mustang aircraft. Squadron's badge uses an old Polish design previously used for 113 Escadrille in the Brygada Poscigowa (Pursuit Brigade) tasked with the defense of Warsaw. Aircraft: Hawker Hurricane, Supermarine Spitfire, P-51 Mustang.

316 Polish Fighter Squadron, "City of Warsaw"

317 As with most Fighter Command squadrons 317 alternated between offensive sweeps from bases in the south and defensive duties while based in the north and midlands. During the buildup to the invasion of Normandy the squadron carried out offensive sweeps in preparation for the landings. After the invasion they conducted ground attack operations in support of Allied ground forces, moving to the continent in August. The squadron arrived in Belgium in October 1944 and Germany in April 1945, remaining there as part of the occupation forces until disbanding as a Polish fighter unit in January 1947. 317 Squadron's badge uses an old Polish design previously used for 151 and 152 Escadrilles in the pre-war Polish "Narew Army Group". Aircraft: Hawker Hurricane, Supermarine Spitfire

317 Polish Fighter Squadron, "City of Wilno"

663 Squadron was an Air Observation Post (AOP) unit formed in Italy in August 1944. Volunteer Polish Army officers were drawn from Polish artillery units and trained in South Africa. The squadron's primary role was to observe enemy ground targets and to help direct artillery fire on them. Unarmed Auster 'spotter' aircraft were flown in the unit's close support operations. Before the Battle of Bologna commenced (April 9, 1945), pilots amassed over 500 operational flying hours, achieving great efficiency in ranging, often directing the artillery on two different targets simultaneously. Then in just three weeks, Poles recorded 504 operational flying hours and directed 258 artillery bombardments. Thanks to refined tactics of AOP units, the effectiveness of the Allies guns was greatly improved, especially in flat countryside, where the field vision was often reduced to less than 100 yards. 663 Squadron's badge uses the Polish red and white chequered square "roundel" set as a diamond with a Polish eagle flying and carrying an artillery shell. Aircraft: Auster

Auster Light Observation Aircraft (Polish roundel on nose)

318 Formed on 20 March 1943, and, after training with Hurricanes, it moved to the Middle East, operating from RAF Muqeibila and RAF Gaza. Training continued until 1944 when the squadron converted to Spitfires. The 318 was then involved in ground attack and tactical reconnaissance operations over Italy in support of the Eighth Army following the allied advance and seeing action at the Battle of Monte Cassino. 318 Squadron's badge uses the coat of arms of the City of Gdansk - a red shield with two white crosses and a golden crown above. The only additions are the golden wings surrounding the shield and the number "318" at the top. Aircraft: Hawker Hurricane, Supermarine Spitfire

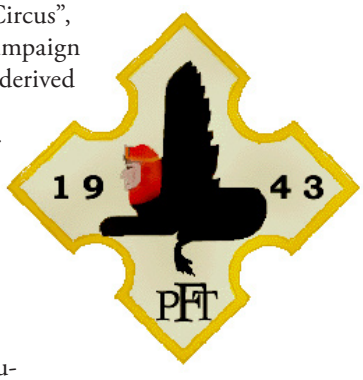
318 Polish Fighter-Reconnaissance Squadron, "City of Gdansk"

138 (Special Duties) RAF Squadron was reformed in 1941, and was tasked with dropping agents and equipment of the Special Operations Executive inside occupied territory. Between 1 April 1943 and November of 1943 it included Polish Special Duties Flight, as a Flight C. The entire squadron, including its "Polish C Flight", used the badge of the earlier RAF 138 Squadron which shows a sword cutting the reef-knot in a cord or rope, symbolising their role of liberating occupied territories during World War II. Aircraft: Handley Page Halifax, B-24 Liberator.

138 Special Duties Squadron, Polish Flight "C"

PFT-Polish Fighting Team

PFT, also known as "Skalski's Circus", fought in the North African Campaign during 1943. Its nickname was derived from its commander, Stanisław Skalski. In late 1942, Polish Air Force Staff Command sent specially chosen pilots to the North African theatre of operations to acquire experience in operating as a part of a tactical air force in preparation for future Allied landings on the European continent. Volunteers had to be experienced with at least 30 operation missions completed.



PFT-Polish Fighting Team, "Skalski's Circus"

Some 15 pilots were chosen for the operational tour of three months. The team was initially attached to No. 145 Squadron RAF, equipped with the Spitfire and operating from Bu Ghara, 150 miles west of Tripoli. The PFT began flying on 18 March and the unit gained an immediate reputation for combat effectiveness. The German Army in Africa surrendered on 13 May and the PFT was disbanded.

Three pilots stayed on and became part of Desert Air Force units; Skalski became CO of No. 601 Squadron, Horbaczewski CO of No. 43 and Drecki a Flight Commander in No. 152.

The "Polish Fighting Team" badge uses a sphinx with a wing. It may have derived its badge and traditions via a Polish unit. Aircraft: **Supermarine Sptifire.**

Spitfires of the PFT "Skalski's Circus" in North Africa

303 Squadron: Battle of Britain's best

No. 303 "Kościuszko" Polish Fighter Squadron was one of 16 Polish squadrons in the Royal Air Force (RAF) during the Second World War.

The squadron was named after the Polish and US hero General Tadeusz Kościuszko. 303 squadron was formed in July 1940 in Blackpool, Britain before deployment to RAF Northolt on 2 August 1940. It had a distinguished combat record and was disbanded in December 1946.

The Poles were keen to fight but the RAF would not at first let them fly operationally. This was because few of the exiles spoke English and there was concern about their morale. What the British did not yet realise was that many of the Poles were excellent pilots. Having come through the Polish and French Campaigns, they had more combat experience than most of their British comrades and they employed superior tactics.

As the Battle of Britain wore on, and the shortage of trained pilots became critical, the exiles were accepted into RAF squadrons and two Polish fighter units, 302 and 303 Squadrons, were formed. Once committed to action, the Poles flew and fought superbly, shooting down 203 enemy aircraft for the loss of 29 pilots killed. 303 Squadron became the most successful Fighter Command unit in the Battle, shooting down 126 German machines in only 42 days. Czech Sergeant Josef Frantisek, also of '303', was the top scoring pilot with 17 confirmed victories. During the Battle of Britain, No. 303 Squadron was equipped with Hawker Hurricane fighter aircraft.

Its success in combat can be mainly attributed to the years of extensive and rigorous pre-war training many of the long-serving Polish veterans had received in their homeland, far more than many of their younger and inexperienced RAF comrades then being thrown into the battle. Tactics and skill also played a role; on one occasion, No. 303's Sgt Stanislaw Karubin resorted to extreme tactics to bring down a German fighter. Following a prolonged air battle, Karubin was chasing a German fighter at treetop level. As he closed in on the tail of the German fighter, Karubin realised that his Hurricane had run out of ammunition. Rather than turning back to base, he closed the distance and climbed right above the German fighter. The German pilot was so shocked to see the underside of the Hurricane within arm's reach of his cockpit that he instinctively reduced his altitude to avoid a collision and crashed into the ground. As Gen. Jajko pointed out, the Poles scored more hits precisely because they disregarded standard British air tactics, employing ingenious and daring ones of their own.

In late January 1941, the squadron converted to the Supermarine Spitfires. In February, the unit participated in the first fighter offensive sweeps, usually escorting a small number of light bombers. The squadron fought, with some breaks for rest, during the rest of the war, always scoring near the top in enimy planes shot down.

In April 1944, the squadron moved to the advanced landing ground at Horne, 30 miles south of London. The unit began flying escort sorties for bombing missions against V-1 flying bomb facilities.

On D-Day, 303 flew several times over the landing beaches. With the commencement of the V-1 offensive on London, on 19 June 1944, No. 303 moved to RAF Westhampnett and then to Merston. On 18 July, the unit went back to Westhampnett and received new Spitfire Mk IXs. Any Luftwaffe fighter opposition now remained largely absent from the Squadron's sphere of operations, but flak defences still took a toll. No. 303 continued using its Spitfires on various ground attack missions on V-1 and V-2 launch sites located in the Netherlands.

On 25 April 1945, No. 303 made its last wartime operational sortie, escorting Avro Lancasters on a raid on Berchtesgaden.

No. 303 Squadron was the most effective Polish RAF squadron during the Second World War. After the end of the war, squadron morale decreased due to the treatment of Poland by the Allies (Western betrayal of Poland), and the squadron was eventually disbanded in December 1946.

Air Chief Marshal Sir Hugh Dowding, who led Fighter Command, would later write:

"Had it not been for the magnificent material contributed by the Polish squadrons and their unsurpassed gallantry, I hesitate to say that the outcome of the Battle of Britain would have been the same."

Pilots of No. 303 (Polish) Squadron, Leconfield, 1940. During the Battle of Britain No. 303 Squadron was the most successful Fighter Command unit, destroying 126 enemy aircraft.

303 Squadron in action, 19 July 1940 until 8 May 1945

Year:	1940	1941	1942	1943	1944	1945	Total
Combat sorties	1,049	2,143	1,348	2,075	2,653	632	9,900
Hours of flight time	1,086	2,743	1,967	3,693	5,259	1,118	15,866

309 Polish Reconnaissance and Fighter Squadron

After four bomber and five fighter squadrons were established on British soil in 1940, the Air Ministry approved formation of another Polish Air Force unit: No. 309 Polish Army-Cooperation Squadron. The squadron received used Westland Lysanders, a two-seater designed specifically for army cooperation and tactical reconnaissance. The aircraft was armed with four machine guns and light bomb racks.

Polish pilots were trained in low level visual reconnaissance, picking up and delivering messages, artillery spotting and ranging, as well as bombing. On the December 5, 1940, the first operational flight took place: two-aircraft section patrolled the Clyde River estuary. The task was to keep in readiness against marauding German planes, the role in which Lysnaders were absolutely inadequate with the maximum speed of just over 200 mph. On the beginning of 1941, all pilots were fully trained in Lysanders flying, and theirs effort were recognized with many promotions. In January, the crews begun training with Army units, and soon two things became apparent: The Poles would make excellent fighter pilots and that their rather impatient temperament has to be tempered.

The Westland Lysander carried a pilot and an observer who sat in the area behind the wing.

Toward the end of spring 1941, the Air Ministry recognized the tactics of Army Co-operation Command as obsolete, its aircraft too slow and very easy target for enemy flak and fighters. It was learned that what Army needed was effective tactical photo reconnaissance, permitted by already developed high-speed photography, and done by fast flying planes. Finally, in the spring of 1942, the first group of pilots began initial training on Mustangs with the Allison engine. The first operational sortie on Mustang – reconnaissance over France – was done on 21 May 1942. In August, the 309 was fully converted to P-51 Mustangs.

For some time Mustang's operational range was greatly debated among the 309 pilots, who were the first Polish unit to fly that aircraft. Contrary to the common knowledge that Mustang couldn't be flown to Norway and back, F/Lt Janusz Lewkowicz - fully qualified aeronautical engineer himself - made some calculation and was convinced it was not so. His calculations were duly submitted to the Group Headquarters where they were simply ignored. To prove his point, he made an unauthorized flight to Norway (28 September 1942), where he strafed some military installations at Stavanger and returned safely. This flight became notorious among Polish airmen and nothing short of a sensation among allied air forces. For his flight, Lewkowicz was reprimanded for breaking the regulations and at the same time sincerely congratulated by Air Marshall Barratt. After that, nearly overnight, the Group's planners had to reevaluate the task for the Mustang squadrons.


F/Lt Lewkowicz in front of the Mustang, AG648, the aircraft he flew during his notorious flight to Norway on September 28th, 1942.

On 5 December 1942, the "B" Flight commenced its operational duties, reconnoitering the fortification along the French coast, between Le Havre and Boulogne. The aircraft operated in pairs, crossing the channel few feet above water to avoid enemy's radar detection. The leader of the section would fly at some 900 feet and top speed taking pictures and making a visual reconnaissance, while his weaver would keep a lookout against enemy fighters. The actual picture taking never lasted more than 2 to 3 minutes, during which the pilot had to operate the camera and fly at precise altitude and angles keeping constant speed. This wasn't an easy task, and pilot had absolutely not to pay any attention to what was happening on the ground. Sometimes, lone hedgehopping aircraft, made attacks on certain installations.

On 7 December 1942 the whole 35 Wing was to fly reccon sorties over France, and many pairs of Mustang took off into extremely foggy weather over the channel. In less than 20 minutes, they were called back to base. All but one pair returned. Two Polish pilots of No. 309 Squadron continued in their flight, crossed the channel and found their objective basking in a bright sunshine and carried out the task. One hour after the call back, they returned with excellent photographs of important strongholds around Fécamp.

In December, 1942, the squadron began regular reconnaissance sorties over the Dutch ports between Terschelling (at the entrance to the Zuyder Zee) and the Hook of Holland, which were crucial

points in the German industry supply route with Swedish iron ore and other raw materials. Simultaneously, the pilots went through a refreshing course in fighter tactics. Soon after, they were given also the task of attacking strategic points on Frisian Islands.

The squadron's was most effective providing data on enemy shipping (attacked afterwards by British torpedo-carrying planes) and vital land targets. Toward the end of summer 1943, the enemy shipping between Scandinavia and the Netherlands declined sharply, due to its mounting losses. German bolstered their air defences in the area, and reconnaissance sorties became dangerous, particularly for Mustangs very vulnerable in low flying. Luftwaffe started to provide regular fighter patrols. Areas of ports Den Helder and Ijmuiden were strictly avoided. It's worth noticing, that Poles of 309 suffered no losses in that period.

Mustang IV, coded PD-L, usually flown by W/O Leszek Bisanz; No. 303 (Polish) Squadron, 3rd Polish Fighter Wing, based at RAF Hethel, UK, 1946,

Mustang III, coded WC-V, usually flown by F/L Mieczysław Gorzula; No. 309 (Polish) Squadron

In January 1944, in view of the planned invasion of the continent, the fighter-reconnaissance squadrons were reorganized. The decision was made to transform 309 Squadron into a fighter-bomber unit. The somewhat disappointed Poles exchanged their Mustangs for worn-out Hurricanes Mk. IVs. Now their role was to bomb targets on the Dutch coast. The aircraft range, however, proved to be insufficient, and in April the squadron exchanged them for Mk. IICs, an equally fatigued lot. On 23 April, with new old planes, the 309 was detailed off to RAF Drem in Scotland, to defend the area against German riders flying from Norway bases. The Hurricane was a vintage fighter plane during the Battle of Britain, but in 1944 it was obsolete. The squadron's pilots were yet again deeply disappointed. Other Polish fighter squadrons received new aircraft and were preparing for an imminent invasion and became envy for the 309 airmen. During the months preceding invasion, the squadron spent endless hours in every day readiness. Yet not once the enemy aircraft showed up, and as to "rub it in", they had to constantly patrol over the east coast of Scotland and the Firth of Forth, after a solitary Ju88 dropped some bombs on Edinburgh. Strangely enough, the general opinion was that this Ju88 lost its way, and blundered over the city.

Finally, in September 1944, the unit was converted back to P-51 Mustangs and became purely a fighter squadron. It also received the new CO: S/Ldr Glowacki, hero of the Battle of Britain with status of ace achieved in one day. Toward the end of October, a full complement of Mustang Mk IIIs was ferried in, and after familiarizing flights pilots begun to take part in escort missions. The flying personnel also changed, as ten most experienced in air-reconnaissance pilots were transferred to other units. Four went to the Polish 318 Fighter-Reconnaissance Squadron operating in Italy, while other six joined back the No. 35 Reconnaissance Wing.

On 12 December 1944, the squadron joined 133 Polish Fighter Wing stationed at Andrews Field. Since then, till the end of war, the unit flew almost solely escort missions to various targets in Germany. Sporadically, but to their delight, pilots were employed in ground attacking sorties.

On 9 April 1945, during escort mission to Hamburg, the unit's pilots stumbled on several Me262 jet fighters attacking bombers, and scored the last kills for the Polish Air Force during the war. F/Lt Gorzula, F/Lt Mencel and W/O Murkowski were each credited with one Me262 destroyed, while F/O Lewandowski and P/O Mozolowski damaged another. On April 25th, the unit made its last operational sortie.

The squadron's wartime effort, from 8 October 1940 till 8 May 1945 can be summarized by 1230 operational flights in 3228 flying hours; 4 enemy aircraft shot down and 2 damaged; one pilot killed in action, and four airmen killed in training.


The Hawker Hurricane, used briefly in 1944 by the 309th.


The P-51 Mustang of the 309th, the mainstay of the unit.

138 Squadron aids the Polish Underground, 1941-45

In June of 1940, the British government created a secret organization called the SOE - Special Operations Executive. It was designed to aid the underground resistance movement in the countries under Nazi occupation. A Polish section of the SOE was soon established.

In August, 1941, the 138 Special Duties Squadron began operating. In September, 1941, the squadron was joined by three Polish crews, and their service was to last nearly four years. All the Polish pilots were volunteers and had operational and combat experience.

On 1 April 1943, a Polish flight consisting of six crews plus a maintenance crew was formed as a part of the 138 Squadron. The flight was equipped with three Halifax and three B-24 Liberator bombers, and numbered "301" to commemorate the Polish bombing squadron of the same number which had suffered substantial losses during the bombing raids over the Germany in 1941-42 and been disbanded as a result.

During the unit's stay in England, the Polish SOE carried out 103 operations in support of the Polish Underground. 194 members of the Polish Cichociemni special forces, along with 80 tons of supplies, were redeployed. Ten planes were lost in the process.

As the passage via the northern route from England grew more difficult and dangerous (in September of 1943 eight planes were lost during night-time operations), the Flight was moved to Tunis, and then, in December of 1943, to the Campo Casale airport near Brindisi, Italy.

The transfer of the base to the south proved to be the right choice. In April and May of 1944, 104 people as well as 172.5 tons of supplies were redeployed to Poland - twice as much as during the previous 3 years of operating from the UK. Five planes were lost during that period.

The Polish section stationed in Italy operated effectively for the whole year 1944. A total of 620 combat flights to Poland were carried out over that time, 290 of which (47%) proved successful. Their losses amounted to 48 four-engine planes.

The uprising began on 1 August 1944, as part of a nationwide plan, Operation Tempest, when the Soviet Army approached Warsaw. The main Polish objectives were to drive the German occupiers from the city and help with the larger fight against Germany and the Axis powers. Secondary political objectives were to liberate Warsaw before the Soviets did, to underscore Polish sovereignty by empowering the Polish Underground State before the Soviet-backed Polish Committee of National Liberation could assume control. Also, short-term causes included the threat of a German round-up of able-bodied Poles, and Moscow Radio calling for the uprising to begin.

The Polish insurgents were short of weapons and ammunition. The situation became critical after the first few unsuccessful attacks on German installations. In August, 1944, Polish Air Force Liberators and Halifaxes made a series of flights from Italy to Warsaw to drop supplies and ammunition to the Polish Resistance Home Army fighters during the Warsaw Uprising.

Initially, the Poles established control over most of central Warsaw, but the Soviets ignored Polish attempts to establish radio contact and did not advance beyond the city limits. Intense street fighting between the Germans and Poles continued. By 14 September, Polish forces under Soviet high command occupied the east bank of the Vistula river opposite the resistance positions; but only 1,200 men made it across to the west bank, and they were not reinforced by the bulk of the Red Army. This, and the lack of Soviet air support from a base five minutes flying time away, led to allegations that Joseph Stalin tactically halted his forces to let the operation fail and allow the Polish resistance to be crushed. Arthur Koestler called the Soviet attitude "one of the major infamies of this war which will rank for the future historian on the same ethical level with Lidice."

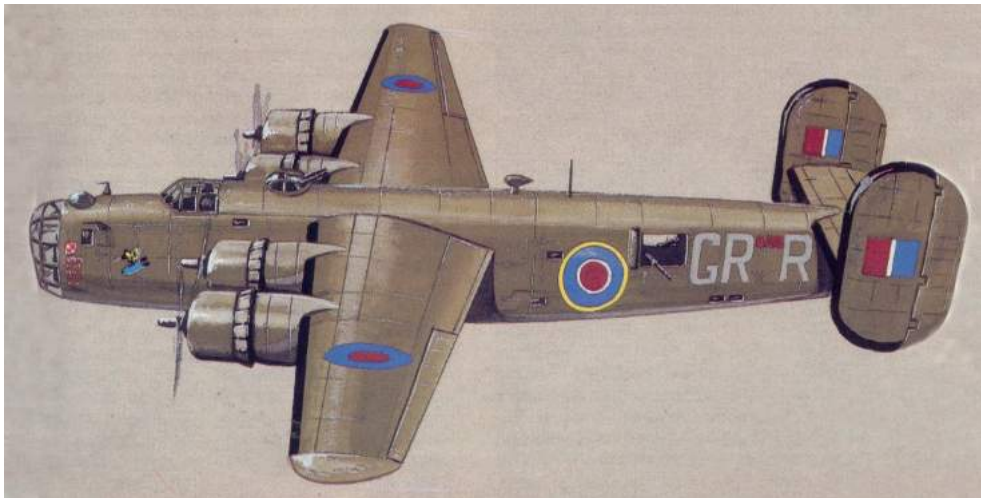
Winston Churchill pleaded with Stalin and Franklin Roosevelt to help Britain's Polish allies, to no avail. Then, without Soviet air clearance, Churchill sent over 200 low-level supply drops to Poland by the Royal Air Force, the South African Air Force and the Polish Air Force. Later, after gaining Soviet air clearance, the US Army Air Force sent one high-level mass airdrop. The Soviet Union refused to allow American bombers from Western Europe to land on Soviet airfields after dropping supplies to the Poles.

Although the exact number of casualties remains unknown, it is estimated that about 16,000 members of the Polish resistance were killed and 6,000 badly wounded. In addition, between 150,000 and 200,000 Polish civilians died, mostly from mass executions. Jews being harboured by Poles were exposed by German house-to-house clearances and mass evictions of entire neighbourhoods. German casualties totalled more than 8,000 soldiers killed and missing, and 9,000 wounded. During the urban combat approximately 25% of Warsaw's buildings were destroyed. Following the surrender of Polish forces, German troops systematically leveled another 35% of the city block by block. Together with earlier damage suffered in the 1939 invasion of Poland and the Warsaw Ghetto Uprising in 1943, more than 85% of the city was destroyed by January 1945, when the course of the events in the Eastern Front forced the Germans to abandon the city.

Halifax bomber

Crew: 7.
Manufactured by Handley Page Ltd, Samlesbury, Lancashire, England
Engines: 4 Rolls-Royce Merlin, 1,260 hp each
Dimensions: wing span 30.12 m, length 21.82 m, height 6.32 m
Weights: empty 17,350 kg; maximum operational weight: 27,340 kg
Performance: maximum speed: 451 km/h, typical range 4,800 km, maximum range 5,470 km;
5,900 kg of bombs

The two bombers used by the 138th were similar in appearance, size, and performance. The major difference was in their engines: The Halifax used Rolls-Royce Merlin 12 cylinder in-line water-cooled engines, the Liberator was powered by Pratt & Whitney 14-cylinder radial air-cooled engines. Both engines produced about the same power- 1,200 horsepower each.



B-24 Liberator bomber

Crew: 7-8.
Manufactured by Consolidated Aircraft Co. in Ypsilanti, Michigan
Engines: 4 Pratt & Whitney "Twin-Wasp" 14-cylinder R-1830-43, 1,200 hp each;
Dimensions: wing span 33.55 m, length 20.52 m, height 5.49 m,
Weights: empty 17,200 kg, loaded 32,300 kg
Performance: maximum speed 480 km/h, typical range 3,700 km, maximum range 4,500 km
5,800 kg of bombs

The Polish crew of this B-24 Liberator pose along side of their aircraft.

Feliks Gazda in Africa: 1941–1944

1941, May 9: Sailed from England, en route to West Africa to assist Polish Aircraft Delivery Unit. The unit flew planes that were shipped in crates from Britain to West Africa, assembled on site, then flown to Cairo.

1941: May 31: Gazsa arrives in Takoradi, Gold Coast (now Ghana).

1941, June 4: Gazda flies across Africa (Takoradi to Cairo) in a Hawker Hurricane, his first of 23 such flights.

1941: Gazda makes six flights from Takoradi to Cairo between June and December in Hurricanes and Bristol Blenheims. Return trips were in Lockheed Lodestars, Douglas DC-2s and C-47 Dakotas as a passenger.

1941, December: Gazda and other Polish pilots are chosen to fly fighter planes on the African front. Gazda was selected to be commander and instructor of 10 pilots.

1942, February 9: Gazda joins the 112 "Shark" Squadron at Gambut air base in eastern Libya. Soon, he began flying Curtiss Kittyhawks over the Libyan front, completing six missions before May.

1942, May 5: Gazda leaves the 112th and joins the 108 Maintenance Unit, flying Blenheims.

1942, June 16: Gazda returns to Takoradi and from August flew across Aftica on the Takoradi-Cairo route 17 more times by the fall of 1943, in Kittyhawks, Blenheims and Martin Baltimores.

1942-1943: Gazda contracts malaria 11 times.

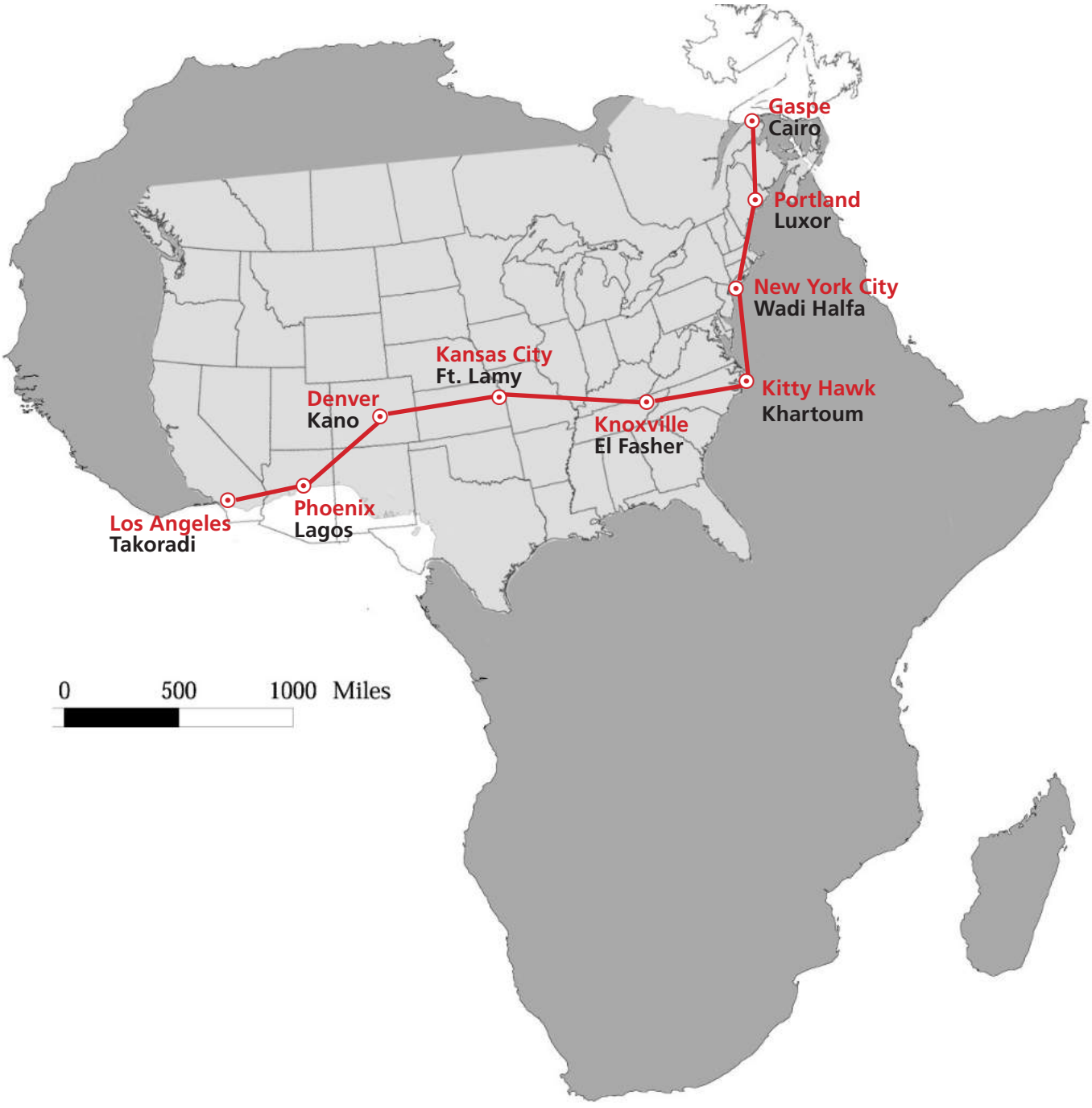
1943, Fall: The Polish Aircraft delivery unit was disbanded and Gazda joined the RAF 216 Transport and Ferry Group, based at the time in Cairo. He flew Spitfires, Mustangs, Beaufighters, Ansons, Dakotas and Wellingtons throughout North Africa, Sicily, Italy and Gibraltar.

1944, November: Gazda leaves the 216th and returns to England, to HQ of the RAF Transport Command.

Part 5

West Africa

Feliks Gazda spent more than three years in Africa, much of it ferrying airplanes from the coast of what is now Ghana, across jungles and deserts, to Cairo. As the crow flies, the distance between the two cities is 4472 km (2779 miles), almost exactly the same distance as that between Vancouver and Halifax, Nova Scotia. F/Lt. Gazda did not fly a straight-line route, however – the distance he flew on each of his 23 trans-African trips was about 5957 km (3698 miles). If his flights were in North America instead of Africa, the route would be approximately the one shown below– from Los Angles on the Pacific to Kitty Hawk on the Atlantic, then north to the mouth of the St. Lawrence River near Gaspe, Quebec. The intermediate stops in Africa roughly correspond to the U.S. cities shown on the map.



Takoradi-Cairo Ferry Flights

Feliks Gazda made 26 flights from Takoradi to Cairo in the period June 6, 1941, to the Fall of 1943. This article describes how the delivery system worked and what it was like to make the long flights.

by Jim Pickering, in the website RAF Liberators.com (edited)

In the early 1930s the British government-owned Imperial Airways established an air in Africa route from Cape Town to Cairo. In the mid-1930s it added a branch route from Lagos to Khartoum, where passengers could connect to flights to Cairo or Cape Town. In November, 1939, the airline changed its name to British Overseas Airways Corporation (BOAC)

Airfields and staging posts were constructed by Imperial at Lagos, Kano, Maiduguri, El Geneina, El Fasher and El Obeid. These facilities, built for commercial airline travel, were put to use in the early 1940s by the RAF to supply aircraft and supplies to its forces fighting in North Africa. The British military built a deep water port and dock facilities at Takoradi-Sekondi and a large airfield and accomodation for personnel was constructed nearby.

On 14 July 1940, an advance party arrived by sea in Takoradi, followed on 21 August by the main party. The two groups contained some 350 men, including 25 ferry pilots. Small maintenance parties of RAF tradesmen were sent to each of the airfields along the route from Takoradi to Cairo. Longer and stronger runways were built, radio communications were set up and living accomodations were constructed and supplied with fuel, oil, starter batteries, safety equipment, rations and basic spares.

On 5 September 1940, a Bristol Blenheim bomber and six Hawker Hurricane fighters arrived in crates at Takoradi. Crews reconstructed the airplanes and on September 18, the first air convoy was flown from Takoradi to Egypt. It arrived seven days later.

They were the first of many machines that reached the Middle East along this route. On 8 February 1941 the first aircraft from America, 100 Curtiss P-40 Tomahawks, arrived at Takoradi. On 30 July 1943, the unit erected its 5000th aircraft. In October 1943 the unit ceased to operate its aircraft role after the Axis forces had surrendered in North Africa.

Between September 1940 and October 1943, a total of 5203 aircraft were dispatched from Takoradi. These included 2272 Hurricanes, 1114 Blenheims, 736 Spitfires, 337 Beaufighters, 259 Kittyhawks and 232 Tomahawks.

When Japan entered the war in December 1941, aircraft delivered by boat to Takoradi were also flown across Africa, Arabia and India for squadrons in the Far East.

The first RAF aircrew posted to Takoradi were mostly prewar trained. They were provided with the valuable assistance of British Overseas Airways navigators for their first flights along the route and were the first convoy leaders. They were joined by 24 experienced Polish pilots led by S/Ldr Rayski who flew tirelessly and immaculately whenever an aircraft was ready for ferrying.

Some pilots arrived at Takoradi by boat to join squadrons in Egypt and flew their aircraft from Takoradi to their new squadrons. Some of these pilots were straight from flying school and the 24-hour flight from Takoradi to the base at Cairo, a distance of some 3700 miles with a dozen or so landings, doubled their experience on Hurricanes in some cases.

Most of the ferry pilots were posted to a quarters in Cairo which occupied several Nile paddle-wheel steamers moored alongside the Isle of Gezira in central Cairo. While waiting for the next ferry trip the pilots enjoyed the facilities at Cairo.

Such a vast programme had its problems. U-boats took their toll on crated aircraft and personnel in transit from England to West Africa. The re-erecting was carried out by partially trained tradesmen who mainly were dealing with aircraft of which they had no previous experience. The small parties based at each airfield spread across Africa had to take all the necessary actions to enable convoys to move on to the next airfield. This included refuelling from cans or with hand pumps, restoring serviceability of aircraft and repairing them when damaged. Sand affected engine wear, instruments and variable pitch airscrews. Moulded perspex windscreens and canopies distorted or cracked in the heat. Distribution of spares caused repair delays. Malaria, jaundice and dysentry reduced the effectiveness of staging posts. All these problems caused delays in aircraft movements but the flow never stopped.

Once at Egypt aircraft were delivered to maintenance units such as Abu Suier, Kasfariet, Kilo 17 and Heliopolis (Cairo) for servicing and modification for operational flying.

Ferry pilots would return to Takoradi in the back of BOAC Lockheed Lodestars or RAF Bombays. After a few days wait at Takoradi a pilot would be allocated to another convoy. Six fighter aircraft would be led by a medium bomber (usually a Blenheim) whose crew would contain a navigator and wireless operator. The lead bomber aircraft would use high frequency radio to obtain bearings from the next airfield on the route. There was no radio communication between the lead aircraft and the airplanes being convoyed.

The convoy leaders at Takoradi, selected for their experience and not for their seniority in rank, were made totally responsible for convoy procedures and discipline. The convoy leader would ensure that all aircraft had been flight tested and that all pilots had been adequately briefed, this included handling and taxiing on the ground. Each aircraft was given a specific position in an open formation so that the lead aircraft could see all the machines at all times. If an aircraft broke away because of a problem all the other aircraft remained on station. If the lead aircraft force landed, a deputy leader, appointed before take off, would take over. The route to be followed, position of emergency landing grounds and the next airfield were explained at each stage by the leader. Convoy discipline had to accomodate pilots with a bare minimum of flying experience and others to whom, after a tour of operations, the temptation to indulge in some free aerobatics was hard to resist. Transgression of flying discipline or disobedience of orders were dealt with immediately by the convoy leader, who was the authority.

Hawker Hurricanes take off from a desert airstrip in Africa

During the first few months of 1941 the main fighter machine being ferried was the Curtiss P-40D Kittyhawk. On many P-40s the electric constant speed unit of the propeller leaked oil, then sand stuck to the oil. It covered the windscreen and quarter panels and blanked forward visibility when landing.

The first leg of the route, Takoradi to Lagos, was 380 miles. From Lagos, pilots heading north-east to Kano, 540 miles away. During the flight to Kano the machines would pass over emergency landing grounds at Eshagbo, Minna and Kaduna where landings were made if necessary. It was then eastwards to Khartoum some 1600 miles away. Refueling would be done at Fort Lamy and El Fasher. From Khartoum the aircraft would fly a distance of about 1000 miles to Cairo. The approved track roughly followed the Nile River, accompanied for much of its length by a British built railway. Refueling was either made at Wadi Halfa or Luxor or both. The most difficult and frustrating part of the whole journey was the bus trip from the Helipolis airfield east of Cairo to the houseboats in central Cairo. The 8-mile road journey in an antique and unserviceable Egyptian bus driven by a maniac over atrocious roads was far more dangerous than flying!

An average round-trip took three to four days to get back to Takoradi, three days rest at Takoradi, five days flying in convoy, three days rest at Cairo. On average this would result in 400 flying hours with 400 passenger hours a year for each pilot.

The original ambitions of most ferry pilots was to join an operational squadron. Individual requests from the Aircraft Delivery Unit for a posting to an operational squadron was not sympathetically received. But many ferry pilots did join operational fighter squadrons fighting Rommel's forces in North Africa.

Trans-Africa Ferry Route: 3945 miles

Douglas DC-2 ("Douglas")

Flew ferry pilots from Cairo back to Takoradi

The Douglas DC-2 is a 14-seat, twin-engined airliner produced by the Douglas Aircraft Corporation starting in 1934. Airlines often referred to the aircraft type as simply "Douglas" since it was the first airliner produced by the company. In 1935, Douglas produced a larger version called the DC-3, which became one of the most successful aircraft in history. Only then did some airlines begin to use the term "DC-2".

In the early 1930s, fears about the safety of wooden aircraft structures (responsible for the crash of a Fokker Trimotor that killed the legendary Notre Dame football coach, Knute Rockne) compelled the American aviation industry to develop all-metal types. United Air Lines had a monopoly on the new, all-metal Boeing 247, so rival Transcontinental and Western Airlines (TWA) issued a specification for an all-metal tri-motor.

The Douglas response was a revolutionary airliner with only two engines. When it flew on July 1, 1933, the prototype DC-1 had a robust tapered wing, retractable landing gear, and two 690 hp Wright Cyclone radial engines driving variable-pitch propellers. It seated 12 passengers.

TWA accepted the basic design and ordered twenty DC-2s, which had more powerful engines and a bit more length, enough to carry 14 passengers, one on each side of an aisle in a 66-inch-wide cabin. The design impressed American and European airlines and further orders followed. Those for European customers such as KLM, LOT-Poland, and Swissair, were assembled by Fokker in the Netherlands under licence from Douglas. A total of 130 civil DC-2s were built with another 62 for the United States military.

Although overshadowed by its ubiquitous successor, it was the DC-2 that first showed that passenger air travel could be comfortable, safe and reliable.

In late 1940, as war raged in Europe but before the U.S. got actively involved, the U.S. Army impressed 22 civilian DC-2s and turned them over to the Royal Air Force. The first three aircraft (from American Airlines) were handed over in November and December, 1940. Eight more (4 from TWA, 4 from Delta) were given to the RAF in February, 1941, one (AA) in March, 4 from Pan American in April and May and three more by October. The aircraft were flown over the South Atlantic to Takoradi Gold Coast, then on to Cairo. Some stayed in Africa and were part of a fleet of airliners that returned ferry pilots back to Takoradi after they flew fighter and bombers to Cairo. Other DC-2s made they way to India and Burma.

Douglas DC-2

Role	Passenger & military transport
Manufacturer	Douglas Aircraft Company
First flight	May 11, 1934
Introduction	May 18, 1934 with TWA
Produced	1934–1939
Number built	198
Developed from	Douglas DC-1
Developed into	Douglas DC-3
Crew:	two pilots, one attendant (civil)
Capacity:	14 passengers
Length:	62 ft 6 in (19.1 m)
Wingspan:	85 ft 0 in (25.9 m)
Height:	15 ft 10 in (4.8 m)
Empty weight:	12,455 lb (5,650 kg)
Loaded weight:	18,560 lb (8,420 kg)
Powerplant:	2 × Wright GR-1820-F53 Cyclone 9-cyl radial engines, 730 hp each
Maximum speed:	210 mph (338 km/h)
Range:	1,085 mi (1,750 km)
Service ceiling:	22,750 ft (6,930 m)

KLM's DC-2s carried just 8 passengers on the very long route from Amsterdam to Batavia (Jakarta) Indonesia.

One of the few DC-2s still flying is this restored aircraft, photographed at the EAA air show in Oshkosh.

The interior of the TWA DC-2 in 1934. The fourteen passengers flew in wide, comfortable seats and, as you can see, were served elaborate meals on china.

Lockheed Lodestar ("Lockheed")

Lockheed Lodestars were used, along with DC-2s and DC-3s to return ferry pilots to Takoradi after they delivered their fighters to Cairo.

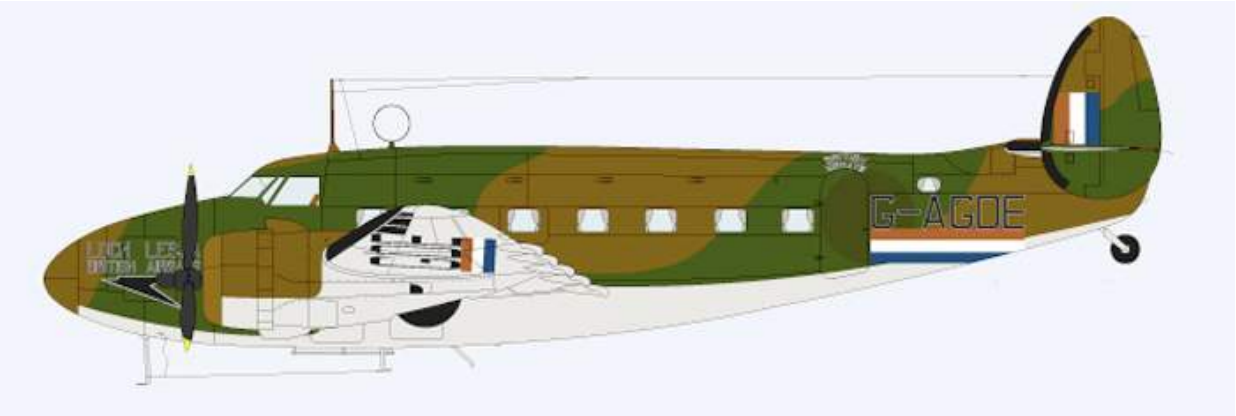
The Lodestar was the last twin-engine transport designed by Lockheed. The prototype, a Lockheed 14 Super Electra lengthened by five feet, flew on the 21st of September, 1939. Designed for the commercial market, Lockheed found domestic sales slow due to previous commitments by airlines to buy the DC-3. The Lodestar used the same engines as the DC-3 and was faster, but much smaller. The narrow fuselage had room for just one seat on each side of the aisle, compared to room for two seats on each side the aisle in the DC-3. The Lodestar was about one-third the size of the DC-3 but carried only about half the payload. Only 31 Lodestars were bought by US airlines. Overseas sales were a little better, with 29 bought by the government of the Netherlands East Indies. South African Airways (21), New Zealand National Airways Corporation (13), Trans-Canada Air Lines (12) and BOAC (9).

After the attack on Pearl Harbor, a number of civilian Lodestars were impressed by the military and designated C-56. Between 1942 and 1943, the US Army Air Force acquired 324 new Lodestars (designated C-60) and used them as 18-seat paratroop transports. Some of these aircraft were passed on to the RAF which named them Lodestar I (C-56), Lodestar IA (C-59), and Lodestar II (C-60), and most were operated as medium-range transports.

After the war, a few were returned to civil airlines, with National in the U.S. as the primary user.

Lockheed Model 18 Lodestar

Role	Passenger transport
National origin	United States
Manufacturer	Lockheed
First flight	September 21, 1939
Introduction	March 30, 1940
Number built	625
Variants	Lockheed Ventura bomber
Crew:	3
Capacity:	18 passengers
Length:	49 ft 10 in (15.19 m)
Wingspan:	65 ft 6 in (19.96 m)
Height:	11 ft 10 in (3.6 m)
Empty weight:	12,075 lb (5,480 kg)
Loaded weight:	18,500 lb (8400 kg)
Powerplant:	2 × Wright R-1820-87 nine-cylinder radial engines, 1,000 hp each
Max. speed:	266 mph (426 km/h)
Cruise speed:	200 mph (322 km/h)
Range:	1,660 mi (2672 km)
Service ceiling:	25,400 ft (7,740 m)



The Lodestars shown in the upper and lower photos were operated by BOAC for the RAF and carried the civilian registrations of G-AGDE and G-AGIL respectively. They were the kinds of planes used in Africa to fly pilots from Cairo to Takoradi.

5029 Aircraft Ferried from Takoradi to Cairo

For several months the convoys were made up of one Blenheim and six Hurricanes but later the convoys were Spitfires, Tomahawks and Kittyhawks, led by Beaufighters, Baltimores and Bostons. Ferry flights began in January 1941, and ended in October 1943. More than 5000 aircraft arrived in crates at the port of Takoradi-Secondi, were assembled at the Takoraki airfield, and flown across Africa to Cairo during this period.

The following is from The Mediterranean & Middle East Vol II by Maj. Gen Playfair (The Official British history)-Appendix 7 Details of Arrivals of Aircraft in Takoradi, Jan. 1941-Sept. 1942

1941:

January (56 aircraft)
Blenheim 11
Hurricane 44
Baltimore 1

February (70)
Blenheim 38
Hurricane 30
Baltimore 2

March (56)
Blenheim 35
Hurricane 13
Baltimore 6
Tomahawk 2

April (131)
Blenheim 37
Hurricane 62
Baltimore 7
Tomahawk 25

May (125)
Blenheim 39
Hurricane 39
Baltimore 6
Tomahawk 41

Gazda flies 6 trips from June 4 to December 31, 1941

June (147)
Blenheim 28
Hurricane 62
Baltimore 11
Tomahawk 46

July (160)
Blenheim 76
Hurricane 52
Baltimore 5
Tomahawk 27

August (126)
Blenheim 44
Hurricane 27
Baltimore 11
Tomahawk 44

September (157)
Blenheim 25
Hurricane 115
Baltimore 3
Tomahawk 14

October (123)
Blenheim 26
Hurricane 81
Baltimore 10
Tomahawk 6

November (42)
Blenheim 16
Hurricane 26

December (154)
Blenheim 60
Hurricane 93
Tiger Moth 1

Total for 1941:
Blenheim 445
Hurricane 644
Baltimore 52
Tomahawk 205
Tiger Moth 1

1942:

January (241)
Blenheim 52
Hurricane 186
Lysander 3

February (99)
Blenheim 7
Boston 4
Hurricane 87
Baltimore 1

March (81)
Boston 10
Hurricane 71

April (133)
Beaufighter 5
Boston 2
Hurricane 111
Spitfire 15

May (58)
Beaufighter 17
Blenheim 23
Hurricane 13
Tomahawk 3

Gazda flies 17 trips from June, 1942, to October, 1943

June (206)
Beaufighter 31
Blenheim 42
Boston 5
Hurricane 122
Spitfire 6

July (246)
Beaufighter 28
Blenheim 136
Hurricane 78
Spitfire 4

August (239)
Beaufighter 49
Blenheim 101
Hurricane 83
Tiger Moth 1
Spitfire 3

September (315)
Beaufighter 51
Blenheim 51
Hurricane 163
Spitfire 50

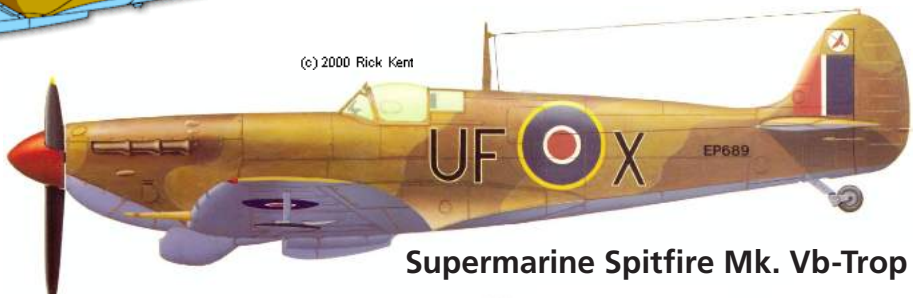
Totals
Jan 1941-Sept 1942
Beaufighter 181
Blenheim 721
Boston 21
Hurricane 1471
Lysander 3
Baltimore 53
Tiger Moth 2
Spitfire 78
Tomahawk 208
Total this period: 2738

Grand Totals
Jan 1941-Oct 1943
Beaufighter 337
Blenheim 1114
Boston 21
Hurricane 2272
Lysander 3
Kittyhawk 259
Baltimore 53
Tiger Moth 2
Spitfire 736
Tomahawk 232
Grand Total 5029

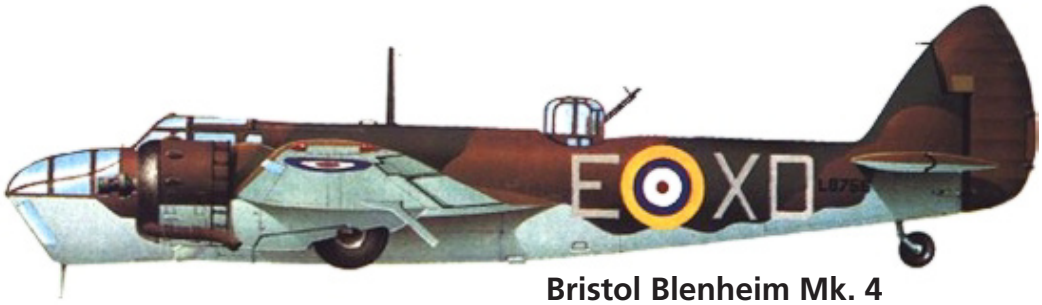
Hawker Hurricane Mk. 1

Curtiss P-40B Tomahawk IIA

Curtiss P-40F Kittyhawk II

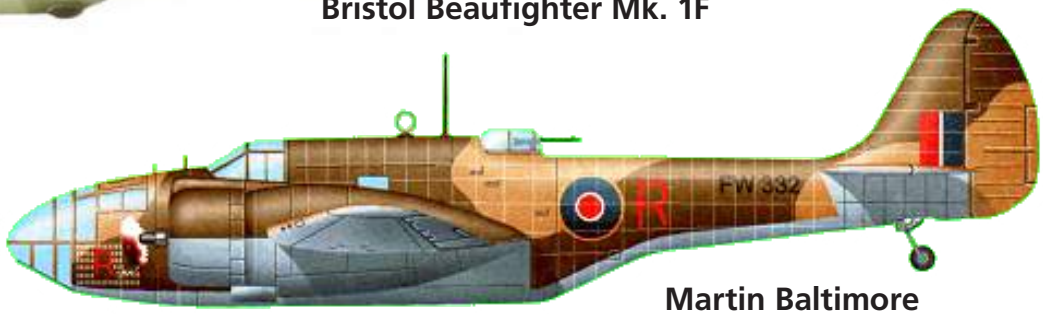


Supermarine Spitfire Mk. Vb-Trop



Bristol Blenheim Mk. 4

Bristol Beaufighter Mk. 1F



Martin Baltimore

Bristol Blenheim

The Bristol Blenheim was a British light bomber that was used extensively in the early days of WWII. Among its other missions, it served as the lead aircraft in many ferry convoys from Takoradi to Cairo. It was adapted as an interim long-range and night fighter. It was one of the first British aircraft to have all-metal stressed-skin construction, to utilise retractable landing gear, flaps, a powered gun turret and variable pitch propellers.

The Blenheim Mk I stood little chance against the German Messerschmitt Bf 109 during daylight operations, though it proved successful as a night fighter. The Mark IV variant was equally unsuccessful in its daylight bombing role, suffering major losses in the early stages of the war.

To achieve its relatively high speed, the Blenheim had a very small fuselage cross-section. The pilot's quarters on the left side of the nose were so cramped that the control yoke obscured all flight instruments while engine instruments eliminated the forward view on landings. Most secondary instruments were arranged along the left side of the cockpit, with essential items like propeller pitch control actually placed behind the pilot where they had to be operated by feel alone. Like most contemporary British aircraft, the bomb bay doors were kept closed with bungee cords and opened under the weight of the released bombs. Because there was no way to predict how long it would take for the bombs to force the doors open, bombing accuracy was consequently poor.

The light armament was seldom able to deter fighter opposition. The Blenheim also proved to be vulnerable to flak, especially around the rear fuselage. Flexible, self-sealing liners had been fitted to the fuel tanks but they were still not fully protected against the 20 mm cannon carried by the Luftwaffe 's Bf 109s and Bf 110s.

Blenheim-equipped units had been formed to carry out long-range strategic reconnaissance missions over Germany and German-occupied territories, as well as bombing operations. In this role, the Blenheims once again proved to be too slow and vulnerable against Luftwaffe fighters and they took constant casualties. Gradually, with the introduction of the Bristol Beaufighter in 1940–1941, the Blenheim was supplanted by its faster, better-armed descendant.

Bristol Blenheim Mark IV

Role	Light bomber / fighter
Manufacturer	Bristol Aeroplane Company
Introduction	1937
Retired	1944
Number built	4,422
Crew:	3
Length:	42 ft 7 in (12.98 m)
Wingspan:	56 ft 4 in (17.17 m)
Height:	9 ft 10 in (3.0 m)
Empty weight:	9,790 lb (4,450 kg)
Loaded weight:	14,400 lb (6,545 kg)
Powerplant:	2 × Bristol Mercury XV radial engine, 920 hp each
Maximum speed:	266 mph (428 km/h)
Cruise speed:	198 mph (319 km/h)
Range:	1,460 mi (2,351 km)

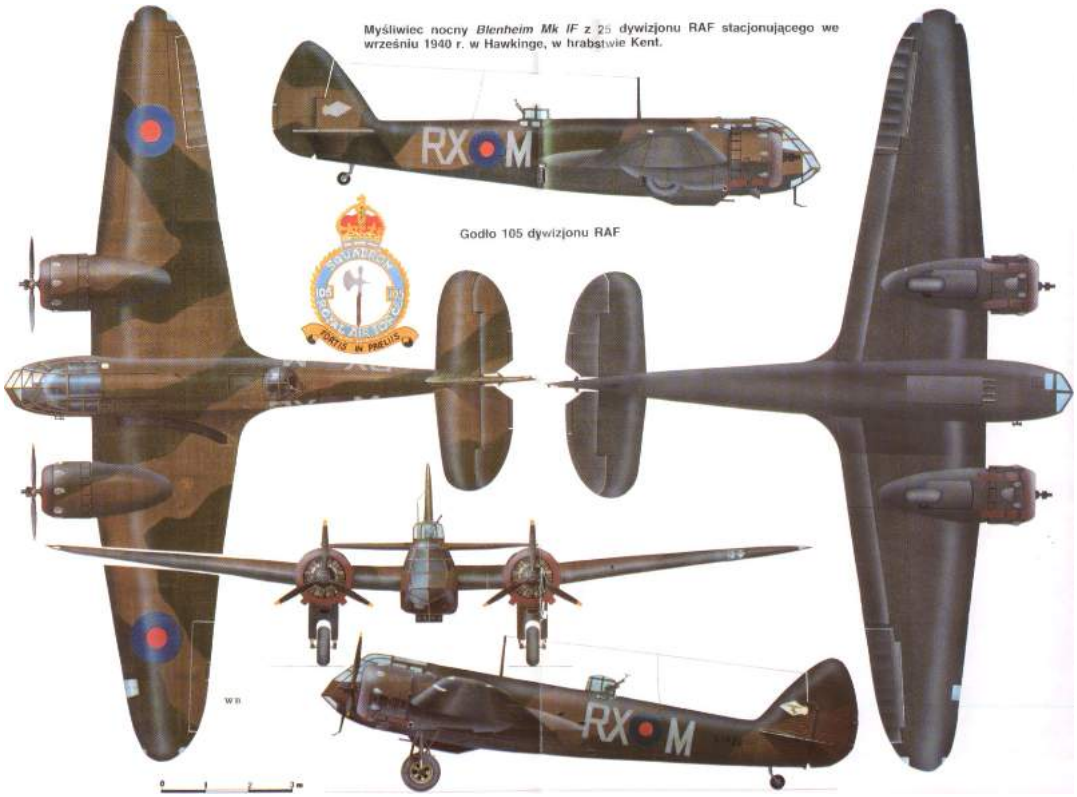
Guns:
1 × 7.7 mm Browning machine gun in port wing
1 or 2 × 7.7 mm Browning guns in rear-firing under-nose blister or turret
2 × 7.7 mm Browning guns in dorsal turret
Bombs: 1200 lb (540 kg) total:
4 × 250 lb (113 kg) bombs or
2 × 500 lb (227 kg) bombs internally and
8× 40 lb (18 kg) bombs externally

The Blenheim Mk IV cockpit. The navigator position was in the nose, in front of the pilot. The ring and bead gunsight for the forward firing guns is visible. The pilot and navigator had to lower themselves in via a hatch above the cockpit, and minor scrapes and cuts were common. The navigator/ bomb aimers position in the Mk I was cramped, with no space for a proper map table. However, the pilot did have excellent visibility.

Blenheims in North Africa

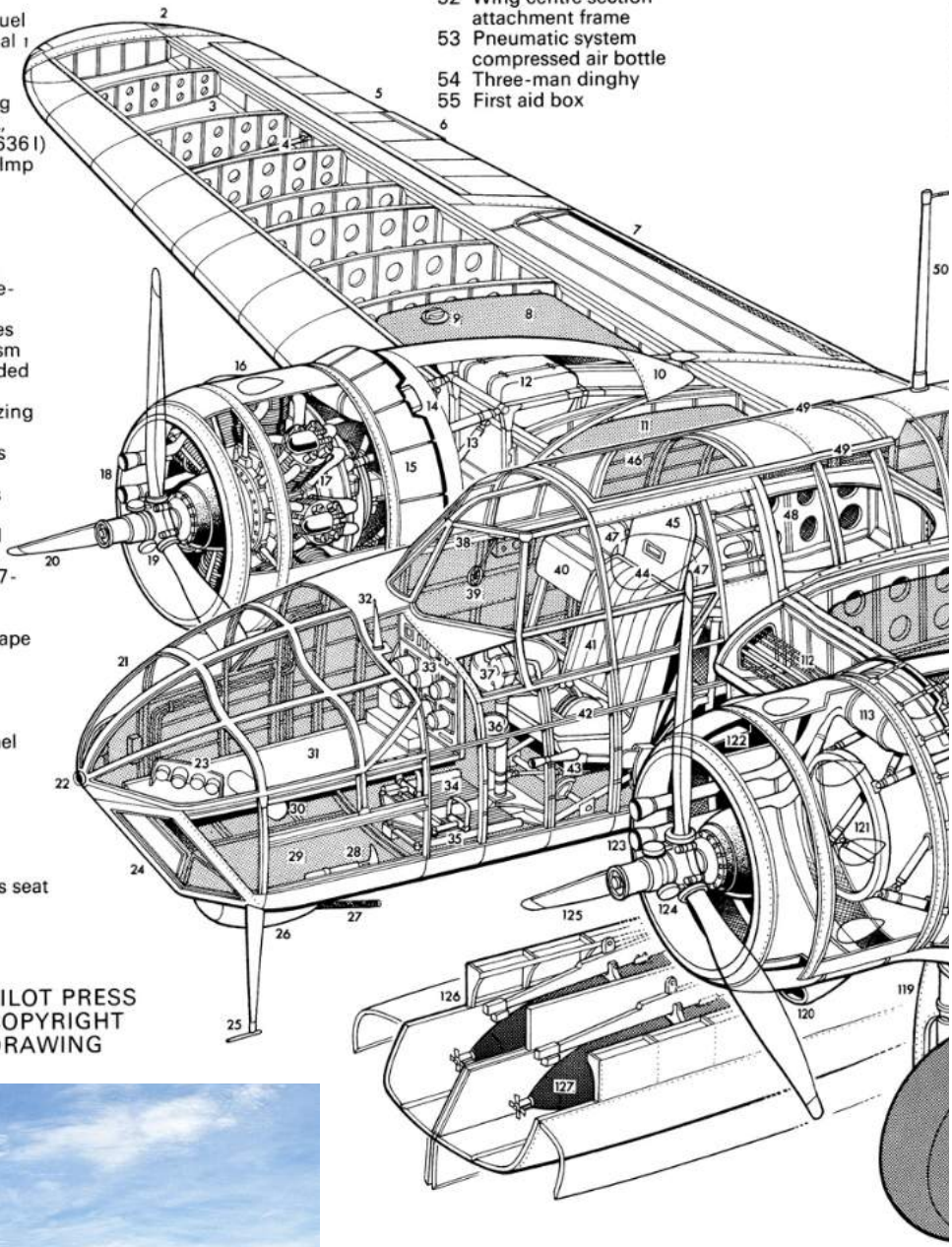
By the time war broke out, the Blenheim Mk I had been withdrawn from service in Britain, and instead equiped squadrons in North Africa and the Far East. Blenheims made the first British air attack on Italian positions in North Africa on 10 June 1940. Three squadrons took part in the fighting there between June 1940 and the Italian surrender in May 1941,

The Blenheim was the only modern RAF bomber in the theatre at first. It was only when the Luftwaffe began to appear in force that the Blenheim would find itself outclassed once again. In 1941, saw five Blenheim squadrons in Greece suffered very heavy loses during the German invasion. After the evacuation from Greece, 30 Squadron was sent to Crete, where it was virtually wiped out. The Blenheim Mk IV remained active in the desert until the end of 1941. At that point most of the remaining Blenheim squadrons were rushed to the Far East. Only two squadrons retained the Blenheim Mk V until the end of the desert war in May 1943.



Bristol Blenheim Mk. IV

1 Starboard navigation light
2 Starboard formation light
3 Wing rib construction
4 Aileron control rod
5 Starboard aileron
6 Aileron tab
7 Starboard outer flap
8 Outboard, long-range fuel tank, capacity 94 Imp gal (427 l)
9 Fuel tank filler cap
10 Starboard nacelle fairing
11 Main, inboard fuel tank, capacity 140 Imp gal (636 l)
12 Oil tank, capacity 11·5 Imp gal (52 l)
13 Engine bearers
14 Oil cooler exhaust duct
15 Engine cooling flaps
16 Cowling blister fairings
17 Bristol Mercury XV nine-cylinder radial engine
18 Oil cooler ram air intakes
19 Propeller hub mechanism
20 De Havilland three-bladed propeller
21 Nose compartment glazing
22 Cabin air intake
23 Navigator/bombardier's instrument panel
24 Bomb aiming windows
25 Pitot tube
26 Rearward firing, ventral machine gun cupola
27 Browning 0·303-in (7,7-mm) machine gun
28 Fireman's axe
29 Nose compartment escape hatch
30 Fire extinguisher
31 Chart table
32 Fixed foresight
33 Back of instrument panel
34 Foot boards
35 Rudder pedals
36 Compass
37 Control column
38 Windscreen panels
39 Pilot's gunsight
40 Navigator/bombardier's seat
41 Pilot's seat
42 Engine throttles
43 Venturi tube
44 Pilot's blister observation window
45 Armoured headrest
46 Cockpit roof sliding hatch
47 Parachute stowage
48 Wing centre section construction
49 Sliding hatch rails
50 Aerial mast
51 Parachute stowage
52 Wing centre section attachment frame
53 Pneumatic system compressed air bottle
54 Three-man dinghy
55 First aid box



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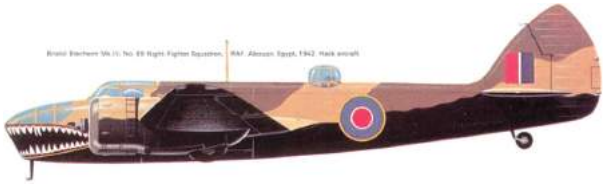
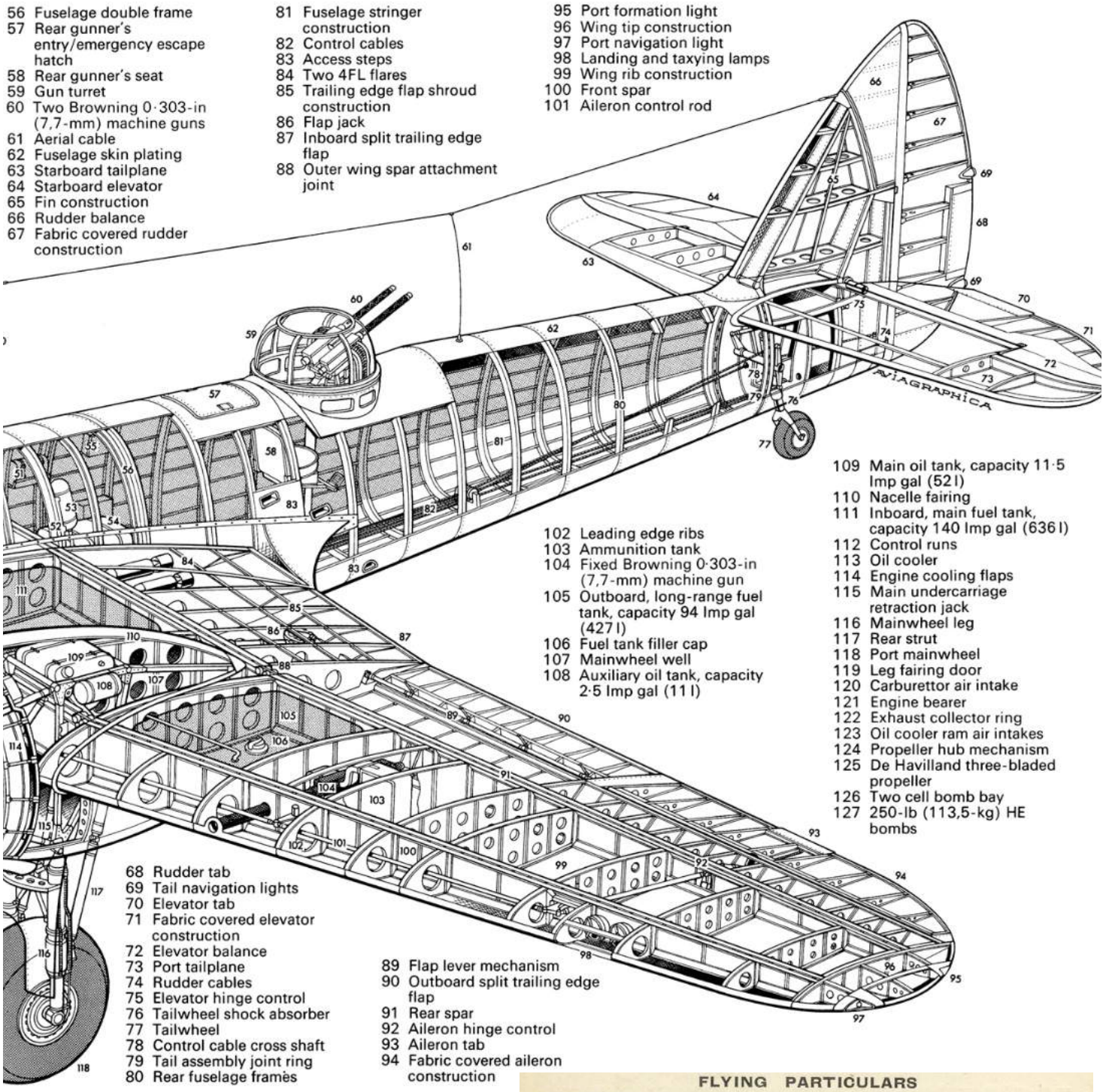




56 Fuselage double frame
57 Rear gunner's entry/emergency escape hatch
58 Rear gunner's seat
59 Gun turret
60 Two Browning 0·303-in (7,7-mm) machine guns
61 Aerial cable
62 Fuselage skin plating
63 Starboard tailplane
64 Starboard elevator
65 Fin construction
66 Rudder balance
67 Fabric covered rudder construction

81 Fuselage stringer construction
82 Control cables
83 Access steps
84 Two 4FL flares
85 Trailing edge flap shroud construction
86 Flap jack
87 Inboard split trailing edge flap
88 Outer wing spar attachment joint

95 Port formation light
96 Wing tip construction
97 Port navigation light
98 Landing and taxying lamps
99 Wing rib construction
100 Front spar
101 Aileron control rod

102 Leading edge ribs
103 Ammunition tank
104 Fixed Browning 0·303-in (7,7-mm) machine gun
105 Outboard, long-range fuel tank, capacity 94 Imp gal (427 l)
106 Fuel tank filler cap
107 Mainwheel well
108 Auxiliary oil tank, capacity 2·5 Imp gal (11 l)

109 Main oil tank, capacity 11·5 Imp gal (52 l)
110 Nacelle fairing
111 Inboard, main fuel tank, capacity 140 Imp gal (636 l)
112 Control runs
113 Oil cooler
114 Engine cooling flaps
115 Main undercarriage retraction jack
116 Mainwheel leg
117 Rear strut
118 Port mainwheel
119 Leg fairing door
120 Carburettor air intake
121 Engine bearer
122 Exhaust collector ring
123 Oil cooler ram air intakes
124 Propeller hub mechanism
125 De Havilland three-bladed propeller
126 Two cell bomb bay
127 250-lb (113,5-kg) HE bombs

68 Rudder tab
69 Tail navigation lights
70 Elevator tab
71 Fabric covered elevator construction
72 Elevator balance
73 Port tailplane
74 Rudder cables
75 Elevator hinge control
76 Tailwheel shock absorber
77 Tailwheel
78 Control cable cross shaft
79 Tail assembly joint ring
80 Rear fuselage frames

89 Flap lever mechanism
90 Outboard split trailing edge flap
91 Rear spar
92 Aileron hinge control
93 Aileron tab
94 Fabric covered aileron construction

BLENHEIM

Engines:
Marks I, IV & V: Two Mercury VII, XV or 25. Mixture control: OVERRIDE—NORMAL, then Manual range, OR 2-position, NORMAL—WEAK. Single-speed blowers. Fuel: 87 Octane.
Propellers: Counterweight: Mks. I & IV, 2-pitch. Mk. V, constant speed.
U/C Operation:
Normal: Hydraulic. Pump on port engine. 2-position plunger selector with thumb-catch release to right of seat. Some have 2-position lever right of dash. All have 3-position hydraulic power plunger at pilot's right: DOWN on ground, DOWN for operation, OFF (midway) when airborne.
Reserve: Hand pump.
Emergency: None or CO_2 or cartridge. Control aft of hydraulic power plunger.
Indicators: Green lights, locked DOWN. No lights, IN TRANSIT. Red lights locked UP. Warning horn. Also mechanical indicators.
Flaps:
Normal: Hydraulic. 3-position plunger selector to right of seat: Always return to NEUTRAL. 3-position hydraulic power plunger: DOWN on ground, DOWN for operation, OFF (midway) when airborne.
Reserve: Hand pump.
Emergency: None.
Indicators: Mechanical.
Gills: Manual or electric. Control to right and rear of seat.
Tanks: INNER (140 gals.) and OUTER (88 gals.) in each wing. Only use Inners for ferrying. Outers may be empty or not fitted.
Starting: 12 or 24-volt direct, or hand cranking. Dopers and starter mag. switches in nacelles. Some have booster coil switches (under flap in roof).

FLYING PARTICULARS

Static R.P.M.: Mks. I & IV: 2300 minimum.
Take-Off:

Hydraulics:	Boost:	Pitch or R.P.M.:	Mixture:	Gills:	Trim: Elevator:	Rudder:
DOWN.	+5*.	Fine or 2650*.	Override (if fitted), otherwise Normal.	Closed.	⅜" Down.	Neutral.

*(100 oct.: +9 and 2750 r.p.m.)

[Flaps: UP. Safety Speed: 120 m.p.h.

Climb (Max.):

	Boost:	Pitch or R.P.M.:	Mixture	A.S.I.:		Pitch:	Boost:	A.S.I.:
Mks. I & IV:	+3½.	Fine.	Normal.	120 m.p.h.	*THEN*	Coarse.	0.	140 m.p.h.
Mk. V.:	+3½.	2400.	Normal.	140 m.p.h.				

A.T.A. Cruise:

Hydraulics:	Boost:	Pitch or R.P.M.:	Mixture:	Gills:	A.S.I.:	Consumption:
OFF (Midway).	0.	Coarse or 1900.	Weak (if automatic)	Watch Temps.	180 m.p.h.	30 gals. eng./hr.

Single Engine:

	Boost:	Pitch:	Mixture:	Gills:	Dead Prop.:	A.S.I.:
Level:	+1½	Coarse (above 1000 ft.)	Normal.	Closed.	Coarse.	115-120 m.p.h.
Climb:	+3½	Fine (below 1000 ft.). OR Mk. V: 2400.				

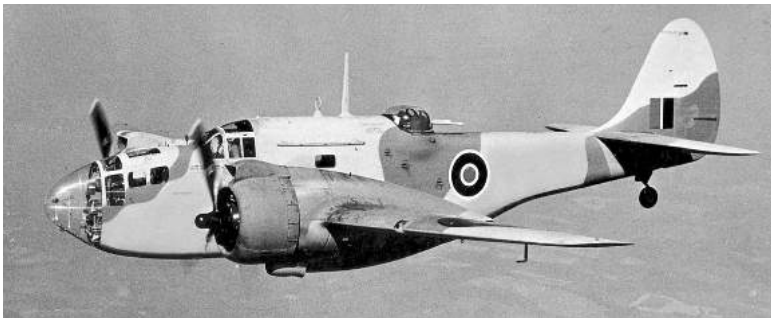
Stall: Flaps and U/C UP: 70 m.p.h. Flaps and U/C DOWN: 60 m.p.h.
Approach and Land:

Hydraulics:	Flaps:	Effect:	Max. speed for flaps:	Final Approach:
DOWN.	DOWN.	Slight.	120 m.p.h.	90 m.p.h. (at 15,000 lb.). 85 m.p.h. (at 13,000 lb.).

Note: Weight varies considerably with equipment; check when collecting.

Martin Baltimore

Trans-Africa ferry flights, 1942-1943



The Martin Baltimore was a mid-wing, all-metal light attack-bomber. It was an American designed and built, but never used by the US forces. All of the 1,575 built were delivered to the RAF. It carried a crew of four comprised of a pilot, navigator/bomb aimer, radio-operator and top-gunner. The radio operator would also man a ventral gun position.

The first British aircraft were delivered in late 1941 to equip Operational Training Units. The RAF only used the Baltimores operationally in the Mediterranean theater and North Africa.

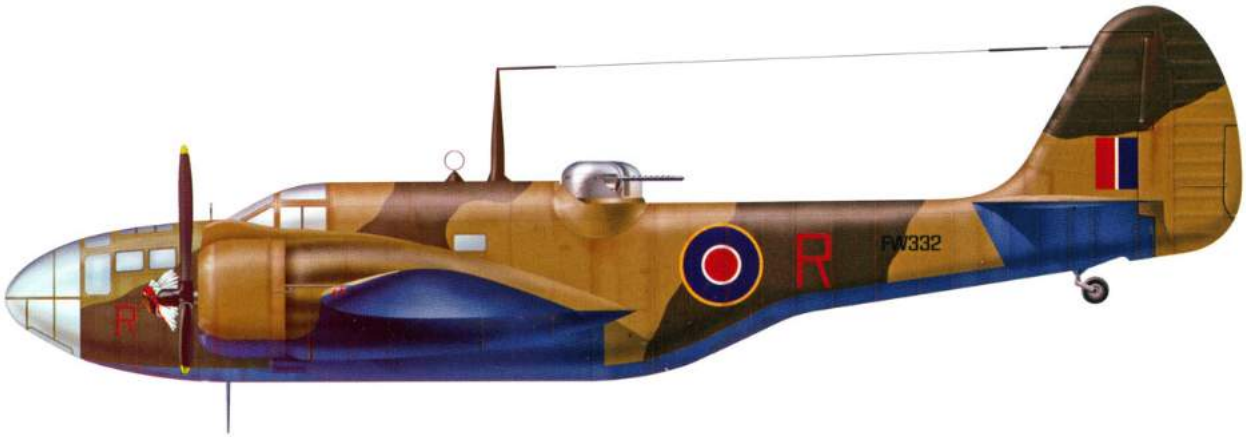
The Baltimore represented a step-up from older aircraft like the Bristol Blenheim. Pilots praised the aircraft for its heavy armament, structural strength, maneuverability, bombing accuracy, and relatively high performance, but crews complained of cramped conditions. Due to the narrow fuselage it was nearly impossible for crew members to change positions during flight if wounded (the structure of the interior meant that the pilot and observer were separated from the wireless operator and rear gunner). Crews also complained about the difficulties in handling the aircraft on the ground. On takeoff, the pilot had to co-ordinate the throttles perfectly to avoid a nose-over, or worse.

Thrown into action to stop Rommel's advance, the Baltimore suffered massive losses when it was utilized as a low-level attack aircraft, especially in the chaos of the desert war where most missions went unescorted. However, operating at medium altitude with fighter escorts, the Baltimore had a very low loss rate, with the majority of losses coming from operational accidents. The majority of accidents were during takeoffs and landings due to the aircraft's fairly high wing loading, high approach speed and a directional stability problems during takeoffs.

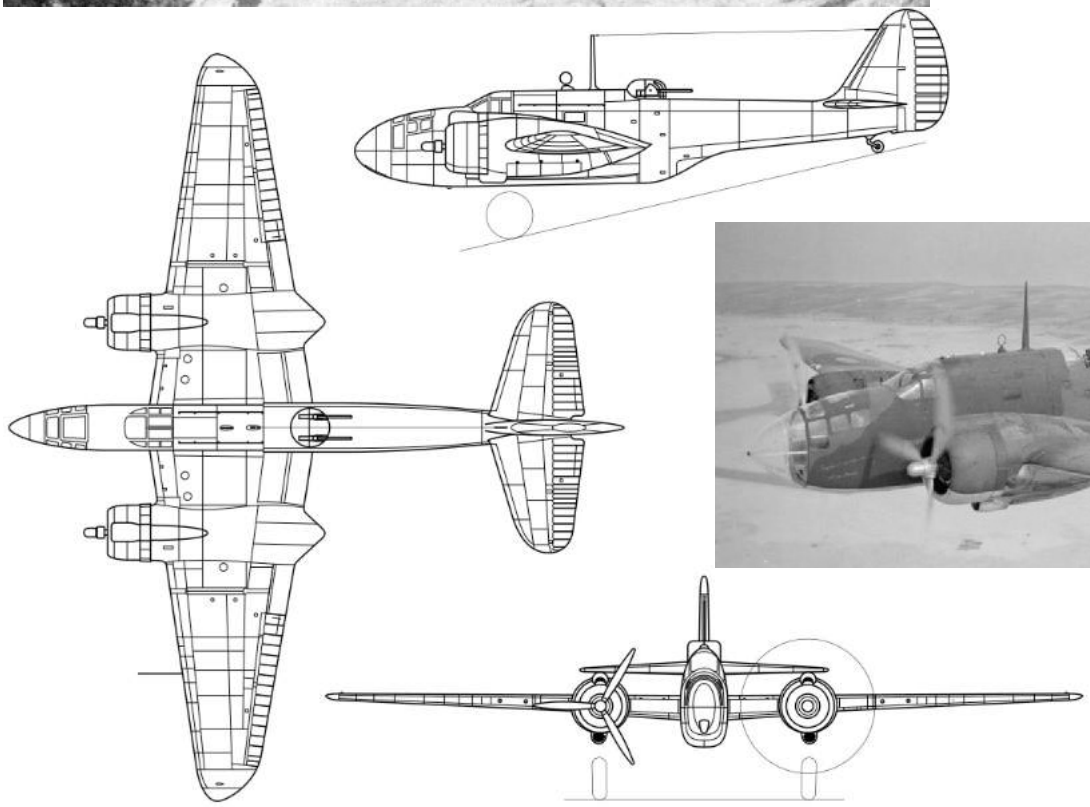
Undertaking a variety of missions in the Middle East, Mediterranean and European theaters, the Baltimore's roles included reconnaissance, target-towing, maritime patrol, night intruder and even served as highly uncomfortable fast transports. After the capitulation of Italy in 1943, the type was used intensively in the Italian campaign to clear the road to Rome for advancing Allied forces.

Martin Baltimore

Role	Light bomber, Reconnaissance
Manufacturer	Glenn L. Martin Company
Introduction	1941
Retired	1949
Primary users	Royal Air Force Royal Canadian Air Force Royal Australian Air Force South African Air Force
Number built	1,575
Unit cost	$120,000
Crew:	4: pilot, navigator/bombardier, radio operator, gunner
Length:	48 ft 6 in (14.8 m)
Wingspan:	61 ft 4 in (18.7 m)
Height:	14 ft 2 in (4.32 m)
Empty weight:	15,991 lb (7,253 kg)
Loaded weight:	23,185 lb (10,900 kg)
Powerplant:	2 × Wright GR-2600-A5B geared radial engines, 1,700 hp each
Maximum speed:	305 mph (488 km/h)
Cruise speed:	224 mph (360 km/h)
Range:	980 miles (1,577 km)
Guns:	4 wing mounted 7.7 mm M1919 Browning machine guns. 2–4 7.7 mm guns in dorsal turret. 2 7.7 mm machine guns in ventral 4 fixed rear firing 7.7 mm guns.
Bombs:	2,000 lb (910 kg) carried internally



My dad was an RAF ferry command pilot and delivered many Baltimore's to the African theater. Vicar taught him some of the aircraft's secrets to survival. Seems when rigged with long range tanks, they were a real pain to get airborne. If it wasn't lined up when the tail wheel came up you chopped the throttles or got ready to ground loop.



Bristol Beaufighter

Trans-Africa Ferry Flights, 1942-1943

The Bristol Type 156 Beaufighter was a British long-range heavy fighter derivative of the Bristol's earlier Beaufort design. The name Beaufighter is a portmanteau of "Beaufort" and "fighter".

Unlike the Beaufort, the Beaufighter had a long career and served in almost all theatres of war in WWII, first as a night fighter, then as a fighter bomber, eventually replacing the Beaufort as a torpedo bomber.

In general, the differences between the Beaufort and Beaufighter were minor. The wings, control surfaces, retractable landing gear and aft section of the fuselage were identical to those of the Beaufort, while the wing centre section was similar apart from certain fittings.

The bomb bay was omitted, and four forward-firing 20 mm Hispano Mk III cannons were mounted in the lower fuselage area. The cannons were supplemented by six 7.7 mm Browning machine guns in the wings. This was one of the heavier, if not the heaviest, fighter armament of its time.

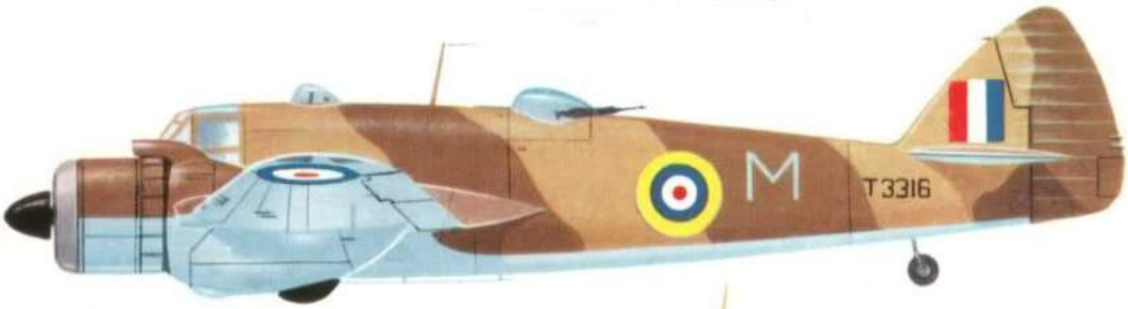
The Bristol Taurus engines of the Beaufort were not powerful enough for a fighter and were replaced by the more powerful Bristol Hercules engines.

By fighter standards, the Beaufighter Mk.I was rather heavy and slow. It had an all-up weight of 16,000 lb (7,000 kg) and a maximum speed of only 335 mph (540 km/h) at 16,800 ft (5,000 m). Nevertheless, this was all that was available at the time.

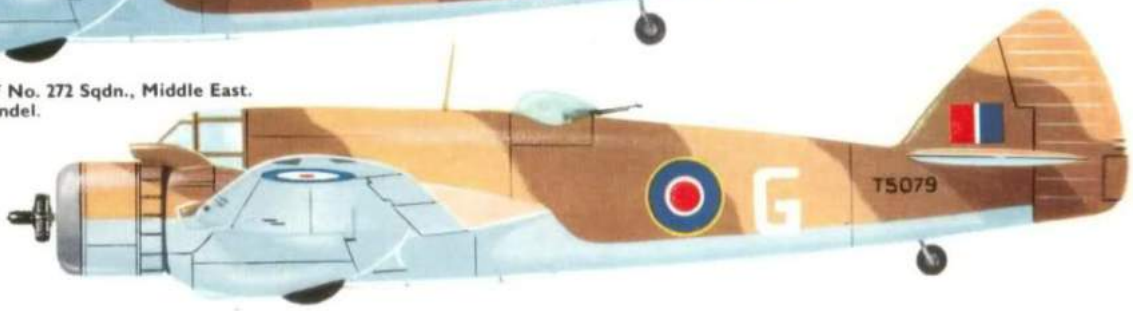
By the autumn of 1943, the Mosquito was available in enough numbers to replace the Beaufighter as the primary night fighter of the RAF. By the end of the war some seventy pilots serving with RAF units had become aces while flying Beaufighters.

Bristol Beaufighter

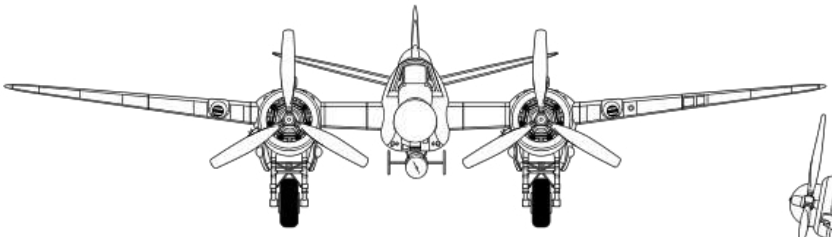
Role	Heavy fighter / strike aircraft
Introduction	27 July 1940
Primary users	Royal Air Force Royal Canadian Air Force Royal Australian Air Force
Produced	1940–1946
Number built	5,928
Developed from	Bristol Beaufort
Crew:	2: pilot, observer
Length:	41 ft 4 in (12.6 m)
Wingspan:	57 ft 10 in (17.65 m)
Height:	15 ft 10 in (4.84 m)
Empty weight:	15,592 lb (7,072 kg)
Max. takeoff wt:	25,400 lb (11,521 kg)
Powerplant:	2 × Bristol Hercules 14-cylinder radial engines, 1,600 hp each
Maximum speed:	320 mph (515 km/h)
Range:	1,750 mi (2,816 km)
Service ceiling:	19,000 ft (5,795 m)
Rate of climb:	1,600 ft/min (8.2 m/s)
Armament:	4 × 20 mm Hispano Mk III cannon (60 rpg) in nose. depending on role; 4 × 7.7 mm Browning machine guns (outer starboard wing) 2 × 7.7 mm machine gun (outer port wing) 8 × RP-3 "60 lb" (27 kg) rockets or 2× 1,000 lb (450 kg) bombs

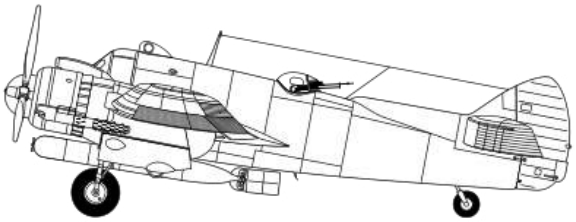


Beaufighter Mk. IC, T3316, of No. 272 Sqdn., Middle East, 1941.

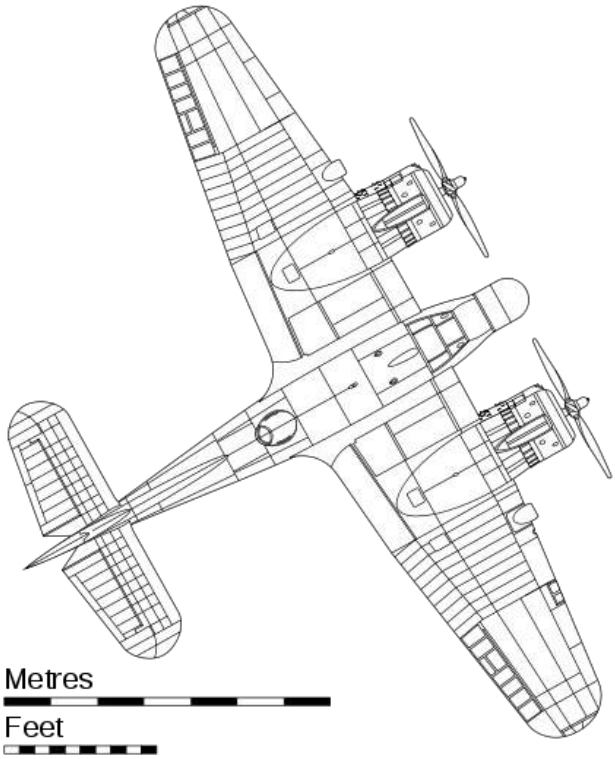


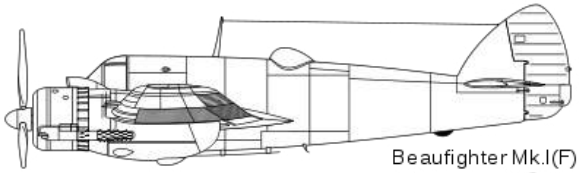
Beaufighter Mk. IC, T5079, of No. 272 Sqdn., Middle East. Note later style fuselage roundel.



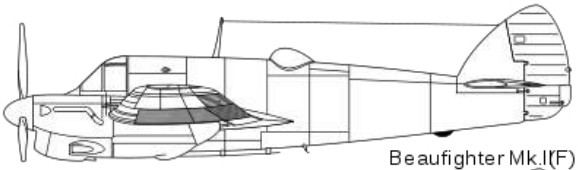


BeaufighterTF Mk X

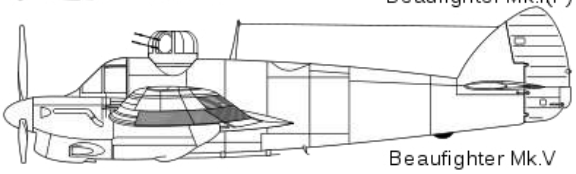




Beaufighter Mk.I(F)



Beaufighter Mk.II(F)



Beaufighter Mk.V

Metres

Feet

An Account of a Flight Across Africa

by Nelson Gilboe

The following pages are excerpts from a book written by Nelson Gilboe, a Canadian pilot who did exactly what Feliks Gazda did in 1941. Gilboe sailed from England to Takoradi and flew a Hurricane across Africa to Cairo. His detailed account of this adventure would have been familiar to F/Lt Gazda. This is an edited version of his diary, which can be found here in full: http://www.oocities.org/vienna/5373/gilboe-war-diaries.htm

Sailing to Takoradi

There was a war going on in Africa which many people had more or less forgotten about. It started out being only skirmishes between the British Expeditionary Forces and the Italian army which had been fighting in Ethiopia, but as the fighting increased and the Italians faced defeat, Hitler sent Field Marshall Rommel to help the Italians with his Afrika Corps. The fighting there was escalating and there was a desperate need for the RAF to provide air cover to the British army. I signed up. I was taken with other volunteers by ship from England to "somewhere in Africa." After several weeks at sea, dodging the U-boats, we inched our way towards Takoradi, our destination. On the way, nearly all of us would suffer from attacks of ring worm, tinnea, and lice. That is not to mention riding on the backs of some of the biggest cockroaches any of us had ever seen. Finally on about the tenth of April, 1941, we arrived at the small port of Takoradi where we reported immediately to the camp hospital for a general clean up and delousing. We learned then, for the first time, that we would be flying Hurricanes across Africa to the Egyptian capital of Cairo. Life was beginning to take on a new glow.

Takoradi

Takoradi was a small port city on the west coast of Africa and about 4000 miles from what would be my destination. The Hurricane aircraft arrived by boat in large wooden packing crates. They then had to be assembled by the local labor force and made airworthy for the flight. It was part of my duties to see that the aircraft which had been assigned to me was properly assembled and made ready to fly. I would be the test pilot to take it on it's first flight. Some of the planes so badly assembled that some almost fell to pieces. I think that the native mechanics that helped to assemble the planes only had tool kits comprising of hammers.

Everything was new and unfamiliar to me. I had never been in a tropical setting before, certainly nowhere as strange as this dark side of Africa. The assembly plant and landing strip had been cut out of the dense jungle overgrowth. Monkeys played in the trees and watermelons grew wild in the open fields. And, most of all were the mosquitoes. Millions of them carrying malaria to the unprotected. We wore our pants tucked into the top of our boots all the time and in the evening we wore nets over our pith helmets to cover our faces and any exposed skin that might seem attractive to some bloodthirsty critter.

Day 1- Takoradi to Kano:

Finally the time came that my Hurricane was ready to test, so I took an especially good look around it and climbed into the cockpit. The powerful Rolls-Royce Merlin engine roared to life and soon we were rolling down the runway and lifting quickly into the African sky. I guess I had expected that the wings might come off, or some other major catastrophe would befall me on this maiden flight, but all went very well and soon I was enjoying my first look at the West African countryside. After about an hour of getting acquainted with the local area, I landed and declared the aircraft serviceable for the long flight to Cairo.

There would be six Hurricanes flying as a group and we would be led across the continent by an experienced crew flying a twin engine Bristol Blenheim bomber. We only had to follow the leader. There would be some pitfalls. We were issued no maps of the region as none were available. The radios in the Hurricanes were not made serviceable so we could not communicate between aircraft or to the ground stations. The Blenheim did have radios and a navigator, but not the Hurricanes. When we asked what we should do in the case that one of us got separated from the pack, we were told that the route was well marked by burned out aircraft which we would spot as we flew our course. Could they be joking? We were to discover that they were not!

The morning came for us to leave. The weather was reported good to our first refuelling stop at Lagos about two and a half hours flying time from Takoradi. Our leader took off in the twin engine Blenheim and circled the field waiting for his fold of six Hurricanes to get off the ground and fall in behind him. When we were convened into a loose formation, we set off for Accra. We flew at 12,000 feet where the summer air was cooler making it more comfortable for the pilots and easier on the engines. From that height we were able to get a good view of the African landscape as we covered the 380 miles to our station.

We reached Lagos without incident and landed in time for lunch. While we ate, the aircraft were refuelled and we were soon on our way to the next stop at the the city of Kano, another three and a half hours of flying time away. By the time we reached Kano we had spent more than six hours strapped into the small cockpit of a fighter aircraft. We were all glad to know that we would be spending the night here in a comfortable hotel room.

We had passed the tropical part of West Africa now and had entered the western edge of the Sudanese desert. Daytime temperatures reached past 125 degrees but a light jacket felt comfortable after the sun had set. We enjoyed a good dinner in the hotel dining room. Since air conditioning was unheard of in the desert at that time, a large rectangular frame covered with a cloth material to act as a fan, was suspended from the ceiling and hung over the dining tables on two long ropes. Another rope connected the fan to a "Punka Walla", a boy hidden behind the wall. As the boy pulled on his end of the rope, the fan began to move back and forth across the dining room creating a breeze each time it passed overhead. And so you ate in cool comfort as long as the punka walla behind the wall did not tire of making the large fan swing to and fro.

Day 2- Kano to the middle of nowhere

Early in the morning we were on our way again. Six Hurricanes following closely to our leader who was the only one who knew where we were going. It would not have mattered if we had known. With no navigational aids and a landscape below that looked like a sea of sand it would have been impossible for any of us to know where we were at any given moment. After a short flight of only two hours the Blenheim began to let down and led us to a landing at a refuelling station near the village of Maiduguri. There was time for a cool drink and we were soon off again for and equally undistinguished village of El Geniena. A very small spot in the middle of the Sudan desert.

We had been flying for nearly four hours when it became apparent that our leader was making large circles in the sky. Obviously he was looking for the landing ground and I began to have suspicions that he might be lost. Others in the pack must have felt the same way, as they began to fly closer to the leader in the hopes that they could get some signal as to what was happening. The flight began to take on an ominous note. Suddenly my yellow caution light indicating low fuel level came on and I knew that we soon would have to make a decision to land whether we found the landing ground or not. When I thought it was time, I switched to my reserve tank to avoid having an engine failure in the air. I knew that now I had only twenty minutes of flying time left. We still had not found our base. I had visions of the engine stopping and me having to make a crash landing somewhere in that great expanse of sandy desert below me.

Finally I took my fate into my own hands. I had only ten minutes of fuel left. I flew up beside the leader and gave a hand signal that I was going down. I waved goodbye and he waved me a thumbs up for good luck, and I throttled back and headed for the desert floor. I soon was flying at about five hundred feet looking for a flat spot on the ground which might provide a safe landing site. Suddenly, I saw it. Flat as a plate and no obstacles to be seen. I still had five minutes of fuel. I turned back, never taking my eyes off my target, and when I was satisfied that I was in the right position, I put down the landing gear and lowered some flap and in a few seconds my obedient Hurricane was rolling along the hard desert floor to a safe landing. When I had come to a stop and turned off the engine, all became very quiet and I took a moment to say thank you to Him who had led me down safely. I thought too about what might have happened to the ones I had left up above. I was sure they too had reached the end of their fuel supply. I learned later that the other five Hurricanes had stuck together and all made crash landings near to each other. Though none of the pilots were injured, we lost all of those aircraft. The Blenheim leader eventually found the station and made a safe landing to report that he had lost all of his charges.

I had not eaten or had anything to drink since breakfast, and it was now getting to be late afternoon. My thoughts began to turn to food and water and the possibility that I might not have any. There was supposed to be a survival kit buried somewhere in the bowels of the Hurricane. I would have to find it. I began to remove a panel marked “Survival Kit” from the side of the fuselage and sure enough, there I found a small

A pilot dismounts his Hurricane aircraft holding the Irvine seat parachute and the flying helmet with oxygen mask

container of food, water, and emergency medical supplies. The food I found consisted of one tin of bully beef and about a dozen hard tack biscuits. There was also about a quart of water in a metal container with a screw on top. My first need was water so I opened the container and took a sip to taste its contents. The water had a foul taste of metal and was nearly too hot to drink since the temperature on the interior of the fuselage was much higher than the outside temperature which even in the late afternoon exceeded one hundred degrees. My next effort was directed towards the tin of beef. The tin was opened using a key in the same way that sardine tins are opened. When I had rolled the top of the tin part way back, I saw that there was much melted fat exposed so I poured the fat onto the ground for the insects to eat. When I had emptied the tin of its fat content it became evident that there was little else left in the can, and what there was looked unappetizing. I gave up on the bully beef and decided that at least I could eat the biscuits.

It was about at that point when I saw an individual approaching on horseback. He was dressed in the uniform of the British army. He also was a native Sudanese and spoke no English, but he did indicate that he had some knowledge of the airplane. First, he wanted me to use my radio to contact his base. I tried to explain that the radio was not serviceable, but he was not convinced. He jumped up on the wing and stuck his head in the cockpit, and began twirling the radio dials in vain. Finally, he gave up and taking a pad from his pocket, he indicated that I should write a note for him. This I did, telling whom it may concern that the aircraft was serviceable and needed only fuel. I said also that the bearer knew my location. The native then put the note in his pocket and turned to leave. The soldier told me to stay where I was and to be sure to sleep in the cockpit during the night.

When darkness fell I did as I had been told and got a small amount of sleep. The desert nights are cool compared to the torrid daytime temperatures, and it felt good to relax on my parachute cushion and try to forget my troubles for a few moments. I slept well that night.

Day 3- Stuck in the desert

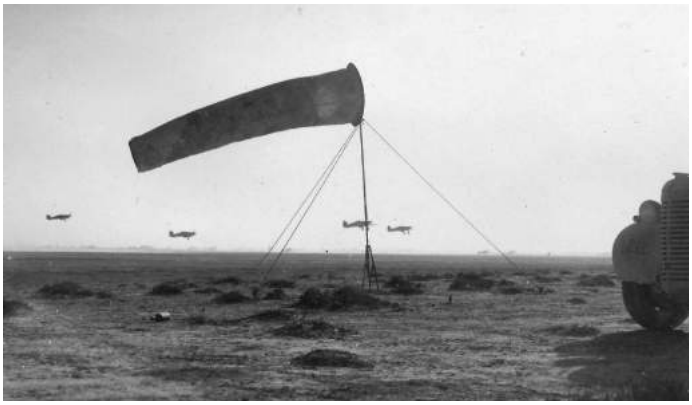
The nest day passed with no sign of any rescuers. Up until now I had been managing on biscuits and water, but I would need something more substantial soon. I prayed that tomorrow would bring better news. I slept better the second night.

Day 4- Off we go

When morning came, I saw a cloud of dust indicating that someone was approaching. In a couple of minutes a British Land Rover car came into view carrying two British airmen and my old friend the native soldier. After much hand shaking and many "Glad to see yas" the airmen went about their work. They had brought ten five gallon cans of fuel with them, so proceeded to put twenty gallons in the reserve tank and the remaining thirty gallons into the main tank. They assured me that I had enough fuel to easily reach the refueling station which was less than fifty miles distant. The plan was, that another aircraft would arrive around noon and circle overhead. It would wait there until I could get the Hurricane airborne and then they would lead me to the base station. I anxiously awaited the arrival of my new leader. In the meantime, my rescuers had thought to bring along some sandwiches and tea and we enjoyed a civilized repast.

As planned, a Blenheim appeared overhead and one of the airmen with me fired a flare to indicate our position. The pilot took note and was soon in a holding pattern waiting for me to join him. I climbed into the cockpit, did a quick check, set the throttle, and the Rolls engine burst into life. In a few minutes I had climbed up to join the Blenheim and was flying alongside his wing. We had flown less than ten minutes when the pilot signaled to me that the landing strip was dead ahead and we began to let down on our approach. I had allowed myself to get well behind the Blenheim so as to follow and land behind him. I still had not seen the runway when I saw his wheels being lowered, so I followed suit and lowered my own gear and flaps in preparation for landing. Then I saw them; oil barrels that marked the edges of the landing strip. A couple of shacks and a pile of five gallon fuel cans was all that marked this station. Everything was covered with a layer of sand. Finding the place from the air was like looking for a particular wave in a sea of water. No wonder our previous leader had not been able to find it before his charges ran out of fuel.

Soon, I was completely refuelled and ready to proceed on my mission to deliver this Hurricane to Cairo. The problem now was that I was alone and had to continue by myself. The Blenheim that had just led me to safety was going in the opposite direction back towards Takoradi. I had the option of waiting for another group to come by which I could join, or I could continue on alone. To wait would have meant that I might spend the next several days at this Spartan station which had no sleeping facilities for guests. I was told that the next stop only an hour and a half to the East and was easy to spot from the air. They had regular barracks facilities and a proper mess hall. That did it for me. I would take my chances alone.



I set course for El Fasher and prayed that I would not miss it. There was nothing but more desert for many miles beyond El Fasher. Sure enough, after what seemed like a very short flight, I spotted a small town which was an oasis in this vast desert. I soon had the landing field in sight and I felt relieved when I had rolled to a stop in front of the refueling area.

They had comfortable quarters at this desert unit and I enjoyed my stay overnight. After a good dinner in the mess room. one of the airmen took me for a visit tothe local bazaar. I bought several souvenirs including a figurine of seven elephants walking head to tail all carved from ivory. It never occurred to me at that time that elephants were killed just to get the ivory tusks.

Day 5- El Fasher to Khartoum

The next morning I was ready to leave El Fasher for the next stop which was Khartoum on the river Nile, more than three hours flying time to the east. I had the opportunity to study a large map of the region and decided that if I flew east until I came to the river, then turned left, I would eventually come to Khartoum. I left after lunch so as to avoid flying into the rising sun all morning. After three hours I was beginning to wonder where the river had gone when I spotted a large patch of green landscape coming up on the horizon. Sure enough, there was the river winding its way to the north and eventually to Cairo and the Mediterranean Sea. I made a left turn and headed north. After about thirty minutes I came upon a large city that could only be Khartoum. I flew around to the east side of the city and found a large airport. Since I had no radio to receive landing instructions I flew over the airport and took note of the wind tee to see which runway was in use. I then made my approach and landed after making sure that no other aircraft were on the approach at the same time. I then taxied to the designated area and parked the Hurricane to await further instructions.

Khartuum was a large city with good hotels and fine restaurants. I decided that this would be a good place to spend the night. I needed a bath and a change of clothes. so I took my kit bag from the aircraft and hired a taxi to take me into town. It felt good to be clean again after nearly a week since I had left the relative comfort of Takoradi. I had been under considerable stress in all that time and I felt the need of some rest. The hotel was just as you may have seen in pictures. It was made of stone blocks with many large openings so that air could move freely through the rooms. The windows had no glass but were covered with iron grills and drapes that could be drawn for privacy.

They never saw much rain so there was no provision to keep it out. There were large ceiling fans in the dining room and in each bedroom to help make living in the desert heat a little more comfortable. After I had bathed and put on fresh clothes, I went down to the dining room and had a cool gin and lime. It was important that you had your ration of lime juice every day to help in avoiding malaria. It seemed natural to me that you should take your ration of lime juice with a little gin There was good food in the hotel. The war had had little effect on what was made available to their kitchens. I had my first taste of curried chicken that night and I have grown to like the flavor of curry on not only chicken but also with shrimp and rice.

Day 6- Khartoum to Luxor

In the morning I took a taxi back to the station at the airport. The Hurricane had been checked by the RAF ground crew and been refuelled. The rest of the trip to Cairo should be a snap. I had only to follow the Nile for about a thousand miles as it wandered through the desert. My next refuelling stop would be at Wadi Halfa some three hours away. I should be there before lunch. I enjoyed flying down the Nile. There was so much to see. I flew low enough so that I could get a good look at the boats that were pushed up and down the river by men who used a long pole to stick into the river bottom and then leaning against the pole they would push the boat from under them as they walked along the gunwales. There were pumps that fed water into the narrow green strip of desert that was irrigated on both sides of the river. These pumps were powered by oxen that walked around and around in a circle all day as they pulled water out of the river and dumped it into the irrigation ditches. Nothing seemed to have changed for these people in the past several thousand years. Men rode camels and carts were drawn by oxen. Watermelons were the crop of the season, and could be seen being carted everywhere.

I soon reached Wadi Halfa and landed without incident. There were other Hurricanes being serviced there and I had a chance to talk to other ferry pilots. I got what information I could about the weather (It never changed!), and enjoyed a spot of tea and a sandwich.

I was back in the air headed for Luxor where I would spend the night. Luxor was only two hours from Wadi Halfa. After about an hour I noted that my engine temperature was beginning to rise. I opened the cooling vents to their full opened position, and climbed to a little higher altitude where the air would be cooler. This strategy seemed to work, as the engine temperature stabilized. However; I began to be anxious to reach my destination at Luxor before I had real engine problems. Lady luck was kind to me again as I saw signs of a city come up in the distance. It was easy to find the airport in Luxor and I made a short approach and quick landing, being eager to get the Hurricane on the ground while the Rolls was still running.

An examination found that I had developed a small glycol leak in the engine cooling system. A part would have to be removed and replaced by a new one. An easy job except that the part would have to be ordered from, and come from the maintenance depot at Cairo. “How long will that take?” I asked. “Well, if we order it tomorrow” the mechanic said, “and if they ship it by air on the BOAC airline run, we could have it in two or three days.”

“Tell them it’s urgent “ I said and I thought about what I would find to do in Luxor if I had to stay a week. Luxor is on the site of the ancient city of Thebes. It had not been so long since I was in high school studying my ancient history, that some of these names took on a familiar ring. Here could be found the ruins of the temple of Karnak, the avenue of sphinxes, the valley of the kings, and the recently discovered tomb of king Tutankhamun. There was much to be explored in Luxor.

Days 7, 8 and 9- A tourist in Luxor

It would be several days before my Hurri would be serviceable again, so with the help and recommendations of some of the staff at the maintenance hangar, I found a room at one of the only two hotels available in the town of Luxor. After getting settled into the small room, I went to the front desk to inquire about some sightseeing around this ancient city. Tourism had been somewhat suspended since the war in the Middle East had been raging for more than two years. I spent the next three days seeing all the fabulous sights in Luxor.

Day 10- Luxor to Cairo

I had kept in touch with the maintenance crew that was repairing my aircraft. They told me that the required part had arrived and the Hurricane would be serviceable sometime in the afternoon. I would be able to get on my way again. So now, four days after I had arrived in Luxor, I was back at the airfield making a brief inspection of the plane and getting ready to leave on the last leg of my journey. That would take me to Cairo, only two hours away straight down the Nile valley. A DC-3 belonging to BOAC was getting ready to depart for Cairo in about thirty minutes. I had a chance to talk to the pilot about the weather and I asked him if it would be a problem if I tagged along with him to his destination. He replied that he had no objection if I stayed well behind and below him so that his passengers would not see me. He thought some of them would get nervous if they thought that they were needing a fighter escort on this leg of their trip. I promised him he would never know I was there, but since I had never flown in this area before, I would feel much more secure following someone who knew where he was going.

I took off about twenty minutes before the DC-3 was scheduled to depart. I wanted to be sure that the repair that had been made to my cooling system was satisfactory. Also, I wanted another look at some of the sights I had seen in the past two days. I flew low over the temple and then across the river to the valley of the kings and the dead city. I could see evidence of a great many tombs buried in the rocks below. I flew over the colossi of Memnon, which are two huge statues built of rock depicting gods sitting on their thrones. There are holes placed strategically into these statues so that when the wind blows they give off an eerie howling sound.

The DC-3 was lifting off the runway, so I circled far behind him and took up my position there. He would fly the short trip at a

relatively low altitude of about 5000 feet. I followed along much lower. I saw many pyramids built along the edge of the river. There were field crops like cotton and some forms of grain. Many sail powered boats plied their ways up and down stream. All in all it was a very interesting flight, although I had to fly a little slower than I normally would. The Hurricane's cruising speed was considerably faster than that of the commercial transport.

Soon, I began to see signs that we were approaching Cairo. Populated suburbs began to line the river, and many roads were in evidence. When the DC-3 began to let down I flew up beside him, although some distance away and waggled my wings to thank him and to tell him I was leaving. I then found an airfield that had many Hurricanes parked around the hangars. It was the RAF base at Heliopolis Airfield. Although it was a major base for the RAF, it did not have paged runways. Aircraft just landed on the flat, hard sand. I made my landing and taxied over to what seemed to be the main hangar and shut down the Rolls-Royce for the last time. I had just delivered a Hurricane IIC to the maintenance and repair depot at the Heliopolis airport near Cairo. The staff made me welcome and congratulated me on delivering the aircraft to them in good condition. I learned that luckily all the pilots that started the journey with me survived the crash landings in the desert and eventually returned to their units. This journey had finally ended, but another was about to begin. Somewhere a squadron was waiting for me.

Heliopolis

Quite a grand name, City of the Sun and a fitting place to start our exploration of the aerodromes and landing grounds of 113 Squadron. Heliopolis, unlike many of the desert landing grounds and jungle strips we flew out of, is one of the few places that you could confidently point at a map and locate.

Heliopolis has history, being one of the first aerodromes in Africa. It also has geography, being a suburb of Cairo and a stopping point for those early aviators who tamed the flying beast and then went on to conquer the globe. They would stop at Heliopolis to be photographed by the Pyramids, which could be seen from the aerodrome.

At the outbreak of the First World War Heliopolis had a starker purpose. Its long flat lands were used as marshalling grounds for troops from the Anzac nations most notably in the lead up to the tragic assault on Gallipoli

As the years went by Heliopolis increased in strategic importance. Italy's land grab in Libya and Ethiopia with the aim of forming an Italian Empire increased local tensions and the British Empire strengthened its hold over Egypt, Palestine and Iraq. The oil fields in Iraq were almost as important as the Suez Canal and any expansionist nation looked greedily upon them.

Heliopolis officer's club break room. Food and drink was available.

Officers enjoyed this Christmas feast in 1941.

The RAF base at Heliopolis in 1942. The base did not have paved runways. The flat, hard packed sand was the landing field. Heliopolis was transfromed over the years into what is now Cairo International Airport.

The Cairo Houseboats:

When I landed at Heliopolis, I asked where the Ferry pilots report to after they have delivered an aircraft. "Oh," he said, "You have to report to the RAF houseboats across the river. Any cab driver will take you there." And he hurried off.

I went back outside and hailed a cab. When we arrived, I saw that there were three large houseboats moored along the river docks that bordered on the street. The grounds around them were beautifully landscaped and everything seemed to be fresh and clean. A refreshing change from the kind of places I had been visiting in the past two or three weeks. I found what seemed to be an office aboard the center boat and announced myself to the NCO in charge. He took my name and a few particulars, and then had a Sudanese houseboy show me to a room with a river view.

The houseboy made sure everything was in order, and asked me if I would like a bath. I must have looked like I needed one! When I said that would be nice, he said he would draw it and inform me when it was ready. I had never been treated with such respect before. Certainly not while I was in the air force. In a few minutes the "Boy" announced to me that my bath was ready, and he led me down the center hall to a bathroom, where he directed me to a tub half filled with warm water. He then handed me a large bath towel and said that he would wait for me outside the door. After a relaxing twenty minutes in the tub, I put on the only clean underwear I had with me and opened the door to the outside. My friend was standing there with a light cotton robe for me to wear while he took the damp towel from me and I returned to my room.

I learned that the servant had been assigned to look after my needs while I was aboard the houseboat. He brought me drinks when I ordered them from the mess bar, and if I sat on the deck to drink them and watch the activity in the river, he would stand behind me with a fly swisher (A part of a horse's tail attached to a leather handle) and brush the flies off my clothing whenever one landed where he could see it. In talking with some of the other resident officers, I learned too that this was a rest and recreation station for those Ferry pilots that were between assignments. The usual stay was two or three days.

Transports for Trans-Africa Ferry Service:

Waves of fighters and light bombers were ferried from Takoradi to Cairo between June 1941 and 1943. The ferrying operation demanded also a transport service for returning pilots to Takoradi following the completion of deliveries to Cairo, and for hauling critical items of supply east from Takoradi. The need was met by transport planes that seated 14 to 28 passengers. But getting those transports to Africa was a major feat in itself.

By the spring of 1941, communication with Egypt by way of the Mediterranean was virtually closed to the Allies. The United States government undertook to secure the needed transport aircraft from U.S. civil airlines. Only 20 could be spared by the airlines, and no Army planes were available. Getting the planes to Africa was a problem as the Army had no pilots with the necessary long-range overwater experience. Rather than ship the planes by water, the ferrying job was turned over to Pan American Airways, which obtained the pilots from several sources. A sufficient number were found to ferry the planes to Africa in flights of ten or less. The British agreed to meet all expenses and to furnish the navigators.

On the night of 21 June 1941 the first flight of ten transports took off from Miami, Florida, bound for Port of Spain, Trinidad. The next stop was at Belem, Brazil. From Belem, the ten transports proceeded to Natal Brazil and thence across the Atlantic to Bathurst, Gambia, just south of Dakar Senegal. All made the 1794-mile (2887 km) overwater crossing safely. The crews took the planes as far as Lagos before returning to the United States. Seven of the remaining ten planes left Miami in late July. The last three of the twenty were delivered in September, 1941, completing successfully and without loss the first ferrying operation from the United States to Africa.

The 20 aircraft were Lockheed L-18 Lodestars and Douglas DC-2s and DC-3s that had been operated by several U.S. airlines, including United, Pan Am, American and Delta. To make the long overwater crossing, the planes carried extra fuel tanks inside the fuselage. Range for the planes with a normal payload was around 1000 miles, but with a minimum load and maximum fuel, they could go about 1500 miles without auxiliary fuel tanks. With extra tanks, range was more than 2000 miles.

About the author:

Nelson E. Gilboe

Born April 28, 1922 Windsor Ontario, Canada

Died Dec 2, 1997 Westland, Michigan, USA

Canadian Fighter Pilot who downed Germany's Top Ace (Hauptmann Hans Joachim Marseille, credited with 158 victories) in WWII

In 1942, he was assigned to duty in North Africa flying RCAF P-40F Kittyhawks. He had two kills to his credit when his P-40 mid-aired Germany's top ace flying an Bf 109, killing Marseille. Gilboe bailed out with minor injuries to himself. He was 19 years old at the time.

Gilboe was immediately captured by the Italians and turned over to the German Infantry. He was imprisoned in Stalag Luft III, about 60 miles southeast of Berlin. He was liberated at Lübeck, Germany by the advancing British troops in May 1945.

Nelson's uniform is now enshrined in the R.C.A.F Memorial Museum - Trenton, Ontario Canada.

Historical Detour:

Development of Air Routes in Africa

The route flown by FLt Gazda across Africa was first developed by Imperial Airlines in the mid-1930s. The story of what this British government-owned airline accomplished in the 1930s is worth telling at this point.

The "Trans-Africa" route was first flown by Imperial Airways on 9 February 1936, when it began flying 6-passenger land planes from Lagos to Khartoum. Imperial built airstrips at about a dozen cities and villages along the route as the aircraft it used had limited range. Passengers flew only during daylight hours and spent the nights in lodging built by Imperial.

In addition, Gazda's logbook shows a flight on a flying boat from Cairo to Khartoum and back. During the time he was in North Africa (1941-1944), this flight was probably on a Short Bros. S-23 Empire flying boat operated by Britiah Overseas Airways Corporation, the name adopted by Imperial Airways in 1939. BOAC maintained a regular schedule between Durban and Cairo (via Khartoum) throughout the war. It was part of the famous "Horseshoe" route that ran from Durban to Cairo to India to Australia and New Zealand, which will be described in later pages.

Imperial serves the Commonwealth and the Colonies

The expansion of air routes throughout the British Empire happened quickly in the early 1930s. By early 1932 there was service from London to Cape Town, South Africa. By the summer of 1933, Imperial Airways flights were reaching Calcutta, India. And by 1934 there was regular service to Australia.

Imperial passengers in 1934 paid £180 (about £10,900 or $17,600 when adjusted for inflation) to get fom London to Singapore. Hotel accommodations, food, and nearly everything but the alcohol was included in the price. But what a headache.

The 8,458 mile trek took eight days and included stops in Paris, Brindisi, Athens, Alexandria, Cairo, Gaza, Baghdad, Basra, Kuwait, Bahrain, Sharjah, Gwadar, Karachi, Jodhpur, Delhi, Cawnpore, Allabad, Calcutta, Akgats, Rangoon, Bangkok and Alor Star. But compare that with more than a month by ship- 42 days via the SS Stratnaver, for example, and it was really hard to complain.

Cairo to Cape Town

The 8,000-mile air route from Cairo to Cape Town, first flown in 1932, fulfilled a British dream that had been envisioned in the late 19th century. Imperial Airways, the 'chosen instrument' of British air imperialism, linked Cairo to Cape Town, the twin citadels of British power and presence in Africa. Much of Africa would now be days rather than weeks away from London. First services were with land planes, but in 1937 the giant S-23 Empire flying boat was put on both the Africa and Asia routes. The four-engined planes were luxury palaces in the air.

The airlines would try to play up the sense of adventure while also trying to assure passengers that their every need would be met. Imperial Airways appealed to the consumer who desired the most luxurious way to travel. But it wasn't always very pleasant, despite the most advanced technology of the time. People would often get sick- bowls were discreetly placed under the seats to ensure that passengers had a place to throw up. The widespread pressurization of cabins wouldn't occur until the 1950s, so altitude sickness often meant that people needed to receive oxygen.

The temperature inside the cabin was also a major consideration, since horror stories of incredibly cold flights were common in the late 1920s. Imperial Airways hoped to assure passengers in 1939 that such discomforts were well in the past: "There is no need to wrap yourself up. All aeroplanes are heated and air-conditioned... and there is no need to worry about noise, for the walls are insulated, allowing conversation to be carried on in a normal voice."

By 1938, Imperial Airways had a network of about 25,000 miles touching nearly every corner of Britain's empire. With the onset of World War II, flying the rich and famous around the world was no longer fitting with the country's mission. Imperial merged with British Airways in 1939 to create the British Overseas Airways Corporation. Needless to say, their largest concern was now the war effort.

Imperial Airways Routes, April 1939

Just before the start of World War II, Imperial Airways operated regular service over the routes shown. Flights on the segments shown in **dark blue** were flown with Empire flying boats, which landed on rivers, lakes and in ocean harbors. Flights on the segment shown in **light blue** (Khartoum to Takoradi and Bangkok to Hong Kong) were flown in 4-engined Diana land planes. Imperial did not fly during nighttime hours. Instead, the planes and passengers rested each night at the cities shown in **red** on the map. Thus, a traveller from London to Durban spent 5 nights en route; 9 nights from London to Sidney.

Imperial Airways Africa Timetable, April, 1939

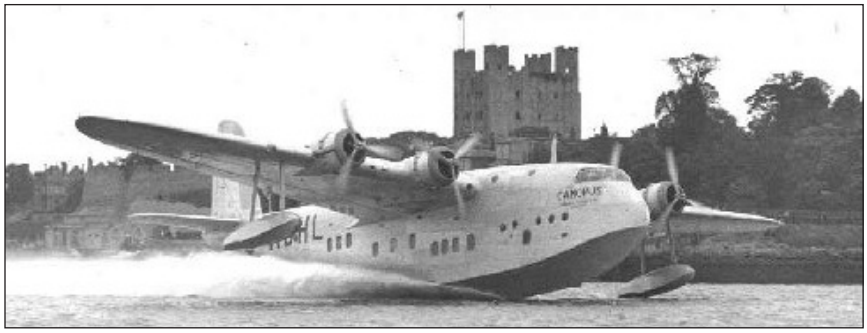
ENGLAND–SOUTH AFRICA SERVICES

ENGLAND, EGYPT, ANGLO-EGYPTIAN SUDAN, BRITISH AND PORTUGUESE EAST AFRICA, UNION OF SOUTH AFRICA operated throughout by *Imperial* flying-boats

Southbound ENGLAND - EGYPT - SOUTH AFRICA

Beginning Tuesday 18 April 1939

Miles from South-ampton	PORTS OF CALL Junctions and Termini shown in CAPITALS (See Notes on the right)	Local Standard Time	Green-wich Mean Time	Days of Services
				Every
	LONDON (Waterloo) .....dep.	19 30	18 30	Tues. Thur.‡ Fri.
	Southampton *England* .....arr.	21 28	20 28	★
	SOUTHAMPTON .....dep.	05 30	04 30	Wed. Fri. Sat.
624	Marseilles *France* .....dep.	10 40	09 40	
1005	Rome *Italy* .....dep.	13 45	12 45	
1325	Brindisi *Italy* .....dep.	16 30	15 30	
1704	Athens *Greece* .....arr.	20 20	18 20	
	Athens .....dep.	05 00	03 00	Thur. Sat. Sun.
2291	ALEXANDRIA *Egypt* .....dep.	10 00	08 00	
2403	Cairo *Egypt* .....dep.	11 25	09 25	
2992	Wadi Halfa *Anglo-Egyptian Sudan* .....arr.	15 35	13 35	
	Wadi Halfa .....dep.	04 45	02 45	Fri. Sun.‡ Mon.
3441	KHARTOUM *Anglo-Egyptian Sudan* .....dep.	08 15	06 15	
3867	Malakal *Anglo-Egyptian Sudan* .....dep.	11 40	09 40	
4200	Juba *Anglo-Egyptian Sudan* .....dep.	14 30	12 30	
4536	Port Bell (Kampala) *Uganda* .....dep.	18 05	15 20	
4682	KISUMU *Kenya Colony* .....arr.	19 20	16 35	
	Kisumu .....dep.	06 00	03 15	Sat. Tues
5135	Mombasa *Kenya Colony* .....dep.	09 50	07 05	
5329	Dar-es-Salaam *Tanganyika Territory* .....dep.	11 55	09 10	
5550	Lindi *Tanganyika Territory* .....dep.	14 10	11 25	
5900	Mozambique *Portuguese East Africa* .....arr.	16 10	14 10	
	Mozambique .....dep.	05 30	03 30	Sun. Wed.
6413	BEIRA *Portuguese East Africa* .....dep.	10 05	08 05	
6930	Lourenço Marques *Portuguese E. Africa* dep.	14 25	12 25	
7216†	DURBAN *Natal* ..... arr.	16 35	14 35	



The Short Empire flying boat flew the Southhampton to Durban route

The 4-engine, 10-12-passenger Diana land plane flew the connecting route from Khartoum to Accra once a week.

WEST AFRICA SERVICE

KHARTOUM - ACCRA

Operated by *Diana* class landplanes

Miles	PORTS OF CALL See notes at foot	Local Standard Time	Green-wich Mean Time	Day of Service
Miles from South-ampton	**SOUTHBOUND**			*Every*
	Southampton *England* .....dep.	05 30	04 30	Fri.
3441	Khartoum *Anglo-Egyptian Sudan* arr.	07 50	05 50	Sun.
Miles from Durban	**NORTHBOUND**			
	Durban *Natal* .....dep.	06 30	04 30	Thur.
3760	Khartoum *Anglo-Egyptian Sudan* arr.	16 25	14 25	Sat.
Miles from Khar-toum	**SOUTHBOUND** Beginning Sunday 23 April 1939 from KHARTOUM			
	KHARTOUM *A.-E. S.* ....dep.	09 00	07 00	Sun.
758	El Geneina *A.-E. S.* ...arr.	17 15	15 15	
	El Geneina .....dep.	06 30	04 30	Mon.
1726	Kano *Nigeria* .....arr.	15 10	14 10	
	Kano .....dep.	07 00	06 00	Tues.
2252	Lagos *Nigeria* .....dep.	13 10	12 10	
2504	ACCRA *Gold Coast* ✶ .... arr.	14 10	14 10	
Miles from Accra	**NORTHBOUND** Beginning Thursday 13 April 1939 from ACCRA			
	ACCRA *Gold Coast* ✶ ....dep.	07 00	07 00	Thur.
252	Lagos *Nigeria* .....dep.	11 00	10 00	
778	Kano *Nigeria* .....arr.	16 40	15 40	
	Kano .....dep.	07 00	06 00	Fri.
1746	El Geneina *A.-E. S.* ....arr.	17 10	15 10	
	El Geneina .....dep.	06 30	04 30	Sat.
2504	KHARTOUM *A.-E. S.* .. arr.	14 30	12 30	
2504	Khartoum *Anglo-Egyptian Sudan* dep.	07 00	05 00	Sun.
5945	Southampton *England* ..... arr.	12 40	11 40	Tues.
	SOUTHBOUND			
2504	Khartoum *Anglo-Egyptian Sudan* dep.	08 15	06 15	Mon.
6264	Durban *Natal* ..... arr.	16 35	14 35	Wed.

Calls will also be made at El Obeid, El Fasher, Fort Lamy, Maidugur Kaduna, Minna and Oshogbo (Southbound only) if opportunity offers an circumstances permit

✶ Summer Time commences 1 September on the Gold Coast so that fro that date the Local Arrival Time will be 14.30 and the Local Departur Time will be 07.20

This service is operated by Imperial Airways between Khartoum and Lagos, an by Elders Colonial Airways, a company in association with Imperial Airways between Lagos and Accra

Passengers spend the night at

EL GENEINA Rest House KANO Railway Hotel

Imperial Airways

Six Days to Durban

In April, 1939, Imperial Airways operated two flights per week from Southampton to Durban, South Africa, using Empire flying boats. Another flight ran between Southhampton and Wadi Halfa, Sudan each week. The flight from Southhampton to Durban took five days and made 18 stops along the way. Four nights were spent in hotels, five if the passenger started the trip in London.

Day 1: A London passenger began the journey at Waterloo rail station on either a Tuesday or Friday, by boarding the 7:30 pm train to Southhampton. Overnight at the South Western Hotel.

Day 2: The passenger boarded the giant Empire flying boat for a 5:30 am departure. Stops were made at Marseilles, Rome, Brindisi and, at 8:20 pm, the final stop- Athens. Overnight at the Hotel Grande Bretagne.

Day 3: After departing Athens at 5:00 am, stops were made in Alexandria and Cairo Egypt, and Wadi Halfa, Anglo-Egyptian Sudan, arriving at 1:35 pm. Passengers had the rest of the afternoon and evening in this small river town. Overnight was at the Nile Hotel.

Day 4: This day began at 4:45 am in Wadi Halfa. The Empire flying boat landed at Khartoum, Malakai, and Juba, Sudan, and Port Bell (on Lake Victoria just outside Kampala), and finaly Kisumu, Kenya, (also on Lake Victoria), arriving at 7:20 pm. Overnight at the Kisumu Hotel.

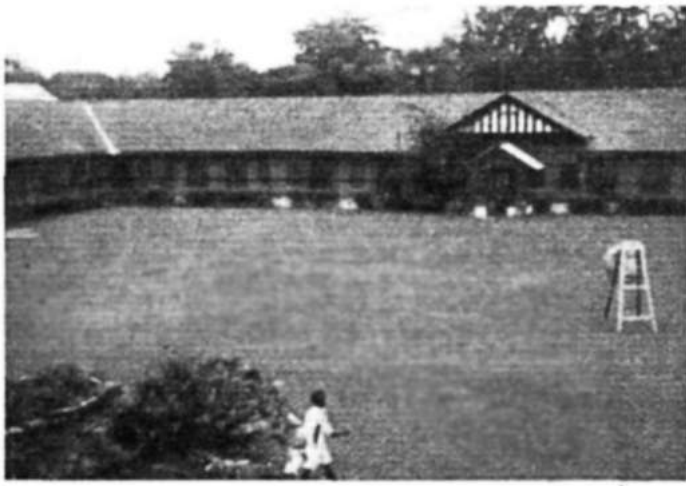
Day 5: Off the lake at 6:00 am and on to Mombasa, Dar-es-Salaam, Lidi, and Mozambique, arriving at 4:10 pm. Overnight at the Rest House, operated by Imperial Airways.

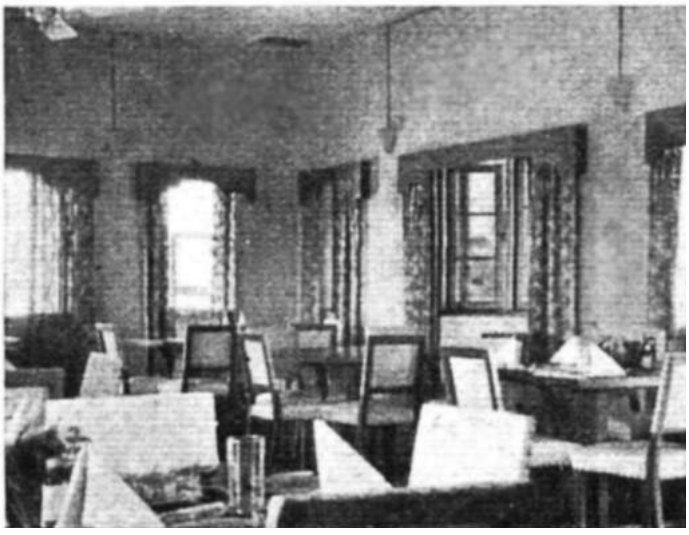
Day 6: Departing at 5:30 am, the flying boat set down in the seaports of Beira and Lourenco Marques before arriving at the final destination of Durban at 4:35 pm.

Three Days Across Africa

For those travelling to West Africa, a service was run once a week between Khartoum and Accra. A passenger could start the journey in London at 5:30 pm Friday, arriving in Khartoum at 7:50 am Sunday on the Empire flying boat. Waiting there would be a small Diana class 10 or 12-passenger land plane, which left Khartoum at 9:00 am. The plane would make refueling stops along the way before landing in El Geneia at 5:15 pm, where passengers stayed overnight at the airline's rest house. On Monday, the Diana would fly to Kano, again stopping for fuel at intermediate points, departing at 6:30 am, arriving at 3:10 pm. Overnight was at the Kano Railway Hotel. On Tuesday, the plane flew from Kano (7:00 am departure) to Accra, arriving at 2:10pm. Passengers flying north from Durban could also make a connection in Khartoum to the once a week flight to Lagos.

Nile Hotel, Wadi Halfa, in 1939





The two photos above show the Imperial Airways rest house in Lagos. The restaurant interior is shown in the botom photo.

Short S-23 Empire Flying Boat

In 1935 the British government decided to carry all mail within the Empire at the ordinary surface rate- in Britain then equal to 0.625p- and with increasing passenger traffic, this led to an expansion of Imperial Airways. New, larger aircraft were needed and Imperial placed an order for 28 of a totally new flying-boat 'off the drawing board' from Short Brothers. Flying-boats were then favoured because they could be more heavily loaded than landplanes, which were constricted by the small and rough airfields available at the time.

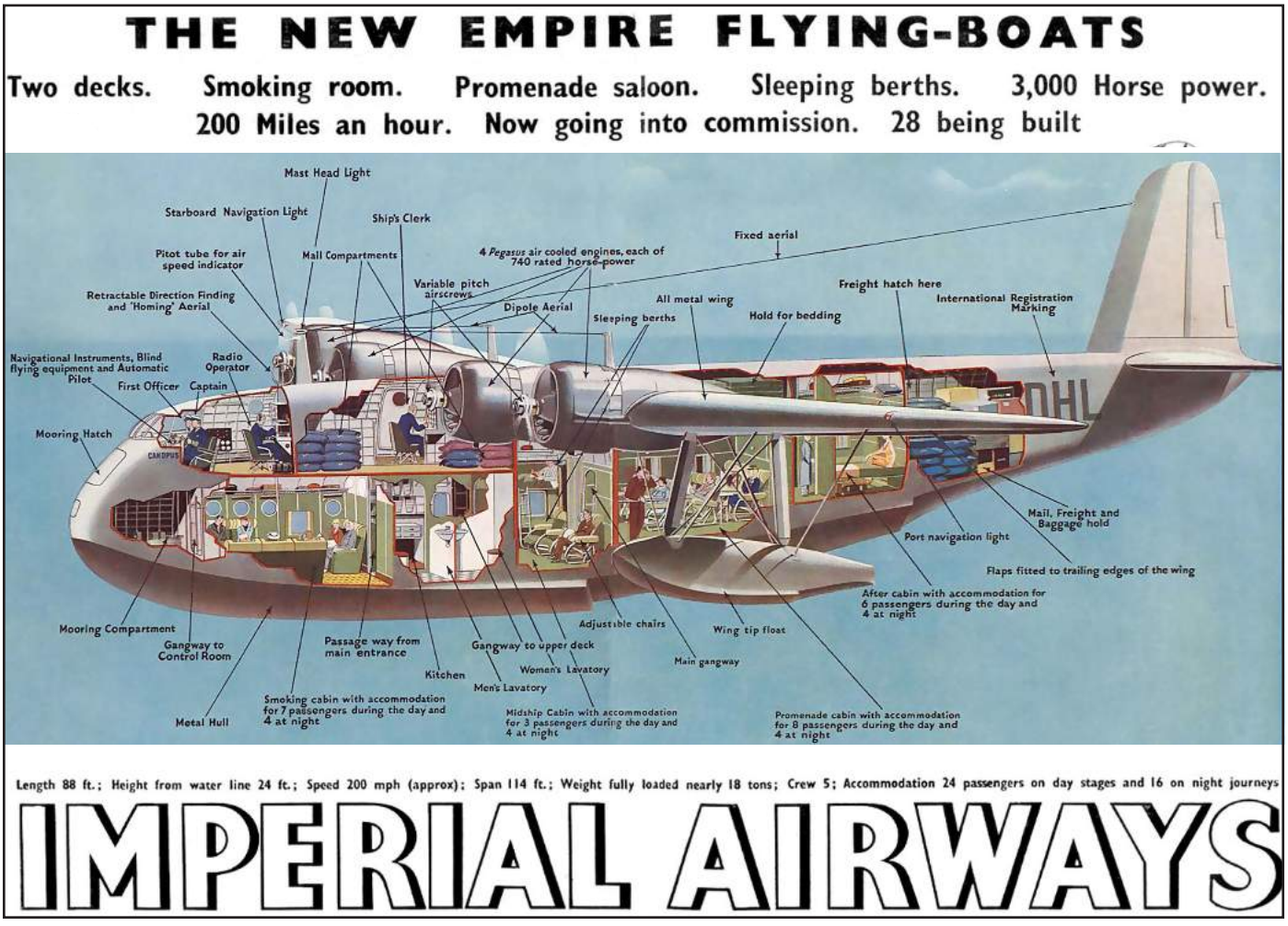
The prototype Short S.23 made its very successful maiden flight on 4 July 1936. It was named "Canopus" and all sister-ships had names beginning with C, the boats also being known as the C-class. Imperial also gave the fleet a name- "Empire" flying boats.

This was a period when air mail held the British Empire together and luxurious air travel was for the privileged few. Every journey was an adventure for both passengers and crew, in aviation's golden age during the last days of the British Empire. Finally, the sun did set and a lavish standard of service, never since surpassed, was snuffed out following the start if WWII in 1939.

The S-23 Empire flying boats featured a light-alloy stressed-skin construction; a cantilever high wing with four 910 horsepower Bristol Pegasus radial engines; and a streamlined nose incorporating an enclosed flight deck for captain, first officer, navigator and flight clerk. A steward's pantry was amidships and seats were arranged in front and rear cabins for 24 passengers. On long hauls, sleeping accommodation was provided for 16. The aircraft also featured a promenade lounge. On some routes mail capacity had to be increased from 1.5 to 2 tonnes, reducing the passenger seats to 17.

All 28 aircraft were delivered, plus three additional for Qantas of Australia. Two were longer-range boats with increased weight and transatlantic range. Shorts also constructed eleven S-30 flying boats (8 for Imperial and 8 for Tasman Empire Airways of New Zealand) which were similar to the S-23 but with more powerful 1010 hp engines and greater range. Shorts built two final boats- S.33s with increased weight and more powerful engines than the S-30s.

During World War II most of these aircraft served on long routes all over the world and most were re-engined with the 1010 hp engines. Their achievements were amazing: one made 442 crossings of the Tasman Sea, two evacuated 469 troops from Crete and one was flown out of a small river in the Belgian Congo in 1940. Others maintained schedules on the North Atlantic, between Britain and Africa, the dangerous Mediterranean route from Gibraltar to Malta and Cairo, and the Horseshoe route between Australia, India and South Africa. Most were retired in 1947.



The RAF took four of the Empire flying boats for military duty during the war, including "Carpentaria."

Short S-23 Empire Flying Boat

Role:	Mail and passenger carrier
Manufacturer:	Short Brothers
First flight:	3 July 1936
1st revenue flight:	6 February 1937
Retired:	1946-47
Primary users	Imperial Airways/BOAC Qantas Empire Airways Royal Australian Air Force Royal Air Force
Produced:	1936-1940
Number built:	42
Unit cost:	£ 48,830
Length:	88 ft (26.82m)
Wingspan:	114 ft (34.75 m)
Height:	31 ft 9¾ in (9.70 m)
Empty weight:	23,500 lb (10,659 kg)
Max. takeoff wt:	40,500 lb (18,370 kg)
Powerplant:	4 × Bristol Pegasus radial engines, 920 hp each
Maximum speed:	200 mph (322 km/h)
Range:	760 miles (1,223 km)
Service ceiling:	20,000 ft (6,100 m)

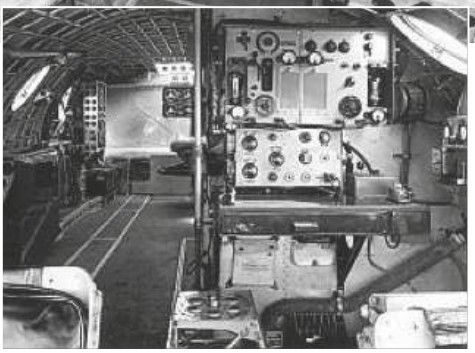
The Luxury Interior of the Empire Flying Boat

Two views of the Smoking Cabin, located at the front of the aircraft just under the flight deck. There were seats for seven in this cabin: three seats faced two seats with a table in between. Round windows were placed well above the heads of the seated passengers, although one large rectangular window was positioned at seated eye level.
Berths could be set up in two of the cabins, even though in 1939 all flying was done during the daytime. Breakfast could be served in bed.

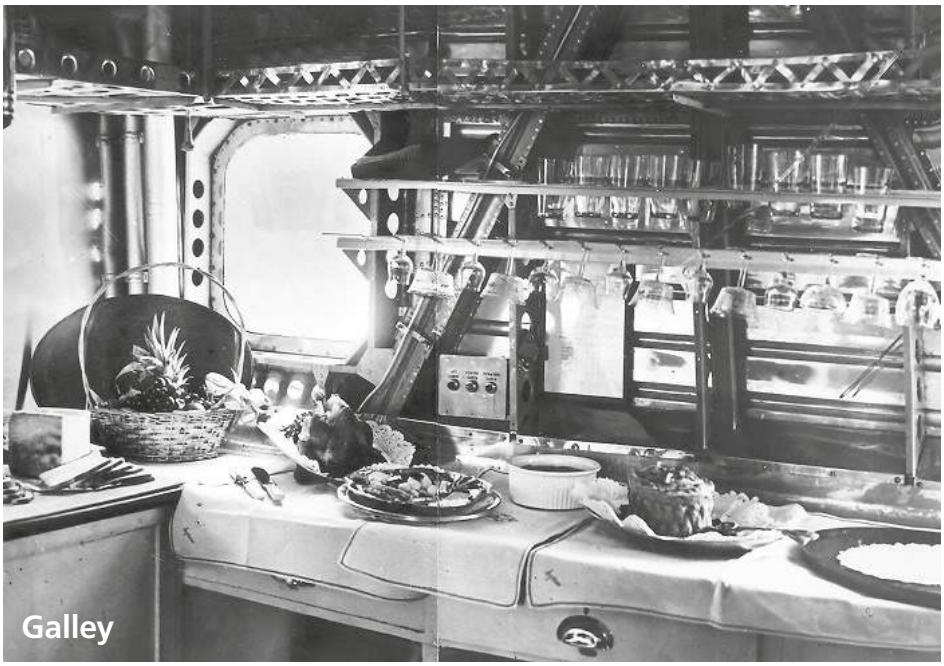
Smoking Cabin

Smoking Cabin

Upper and Lower Sleeping Berths



The upper deck held the cockpit and a mail room and space for the radio operator.



Imperial Airways used these posed photos (above) to publicize the spaciousness of the Empire flying boats. Both look to the rear of the plane. The Promenade Cabin carried large, comfortable seats for 8 passengers for day travel and bunks for 4 at night. The wide open space on the left (port) side of the cabin suggested a promenade area found on ships. Windows were at the eye level of standing passengers. Stewards cooked elaborate meals in the galley and served them to the passengers on fine china.

The After Cabin, just behind the Prominade cabin, had seats for 6 during the day and bunks for 4 for nighttime travel.

De Havilland D.H. 86 “Diana”

The last of the wooden bi-planes

The D.H.86 was a four-engined aircraft of wooden construction with fabric covering, and powered by four De Havilland Gipsy Six engines. The aircraft was built for Imperial Airways and Qantas as a passenger feeder liner, but later served the RAF as a trainer.

Imperial Airways gave the D.H.86 the class name “Diana.” They were used on European and Empire air routes including the run from Lagos to Khartoum. Several small Australian airlines also used the aircraft.

Seriously lacking in directional stability, the D.H.86s were frequently in trouble. The Royal Air Force tested the D.H.86A design in 1936 following three fatal airline crashes in Europe. It would be forty years before the report was published – one of the most damning indictments ever written on the design of a commercial airliner put into series production. The D.H.86 had been rushed from design concept to test flight in a record four months to meet the deadlines set by the Australian air mail contracts, and a lot of attention to detail had been ignored. It was a big aircraft for its power, and as a result very lightly built. There was poor response to control movements in certain speed ranges, the wings were inclined to twist badly if the ailerons were used coarsely and, most seriously, the vertical tail surface was of inadequate area. The result was an aircraft that, although quite safe under normal conditions, could rapidly get out of control under certain flight regimes.

Although the control problems were overcome on later-manufactured D.H.86Bs by the fitting of a new spring in the elevator control and the fitting of auxiliary fins, the results of these tests do not appear to have been communicated to Australia and the D.H.86s already in use were never modified in this way to improve their safety. This lack of communication may have caused a number of later accidents including at least one of two further fatal disasters in commercial service.

Following the first three fatal Australian D.H.86 accidents and a forced landing to VH-USW Lepena on 13 December 1935 (a Friday) when the pilot believed his aircraft was about to break up

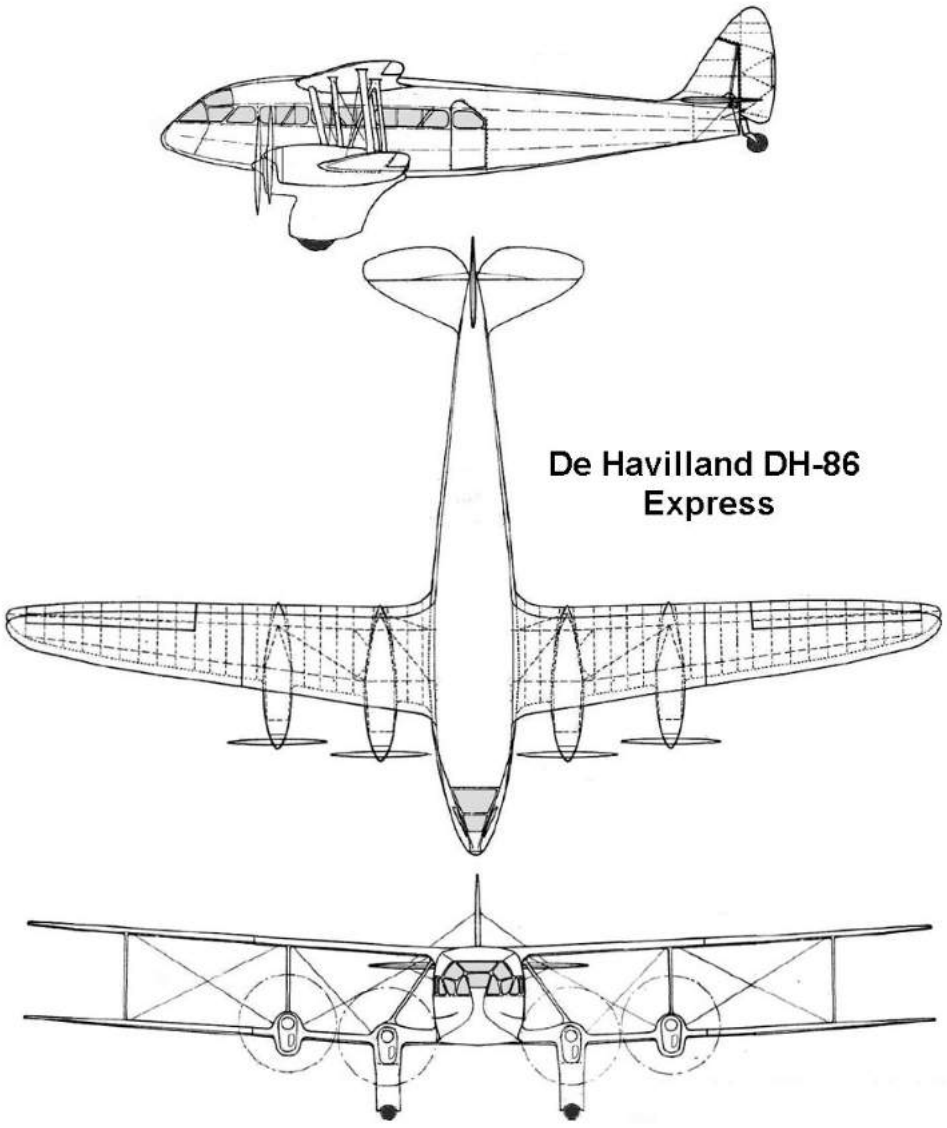
The interior normally held 10 passenger seats, with some aircraft carrying an additional two seats. Two pilots sat in front.

in mid-air, the Australian Government temporarily suspended the type's Certificate of Airworthiness. This caused outrage in Britain as it reflected on the whole British aircraft industry. In fact, the D.H.86 had approached the limits to which traditional "plywood and canvas" aircraft construction could be taken, and was obsolete compared to all-aluminium stressed-skin aircraft like the Boeing 247 and the Douglas DC-1 that were already flying before it was even designed, and the Douglas DC-3 that had its first flight just four days after the forced-landing of VH-USW. Under pressure from Holymans and other companies, the Australian Government rescinded its ban on the import of American aircraft during 1936, and for the next 25 years most large commercial aircraft imported into Australia were of American manufacture.

The DH 86B is shown (left) with the extra fins on the tail to improve stability. The 3-view drawing below shows the original DH 86 with a single tail fin.

De Havilland DH-86 Diana

Role	Passenger transport
Manufacturer	De Havilland
Introduction	1934
Primary users	Imperial Airways, Qantas, Royal Air Force
Produced	1934 - 1937
Number built	62
Crew:	2- pilot and co-pilot
Capacity:	10-12 passengers
Length:	46 ft 1 in (14.04 m)
Wingspan:	64 ft 6 in (19.66 m)
Height:	13 ft 0 in (3.96 m)
Empty weight:	6,140 lb (2,791 kg)
Loaded wt:	10,250 lb (4,659 kg)
Powerplant:	4 × De Havilland Gipsy 6 inline engine, 200 hp each
Max speed:	166 mph (267 km/h)
Cruise speed:	142 mph (229 km/h)
Range:	760 mi (1,223 km)

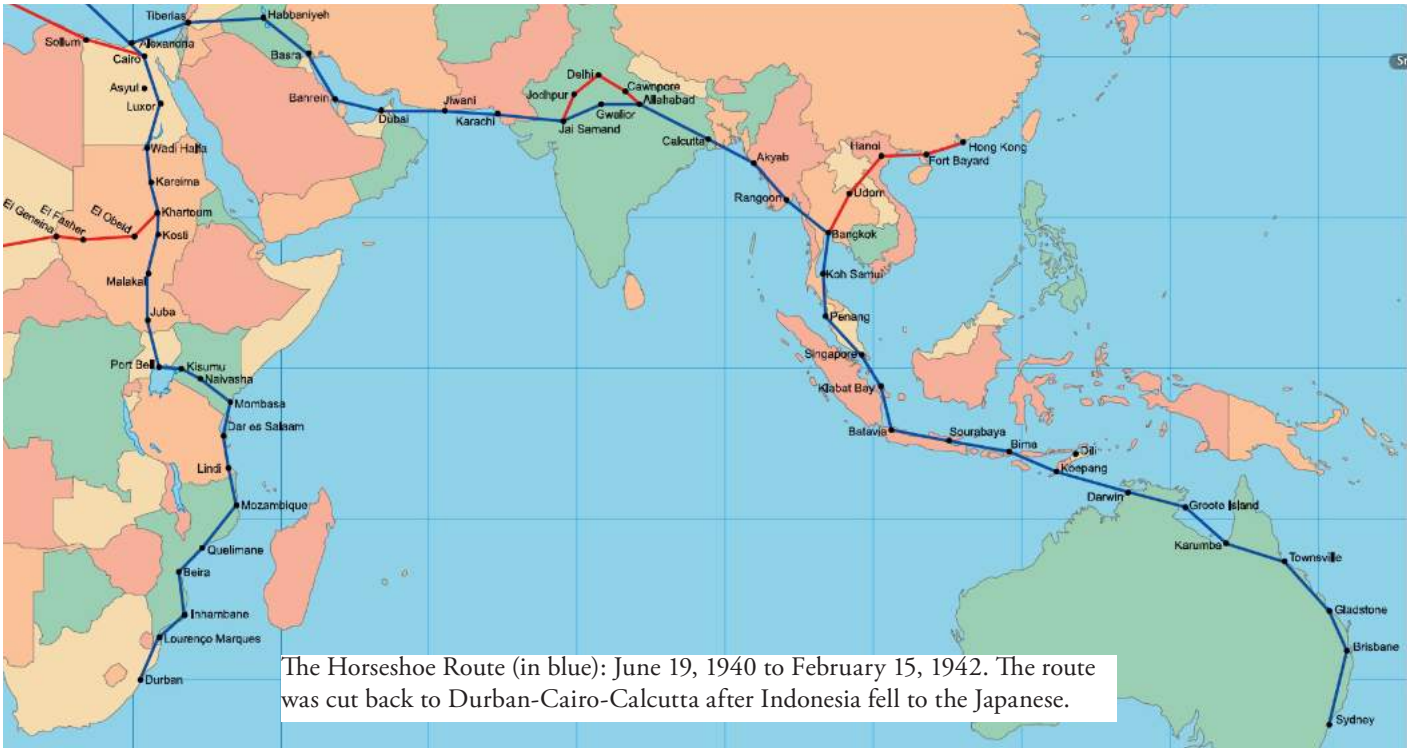


Wartime Adjustments in Air Service: 1939–1940

Within a few days after war had been declared in September, 1939, British air services gradually resumed, Short S-23 and S-30 Empire flying-boat services continued to operate twice weekly from Southampton to both Australia and South Africa.

This relative peace came to an end on 9 April 1940 when Germany invaded Denmark and Norway. On 10 May 1940 Germany invaded Belgium, Holland and France, resulting in the French surrender six weeks later on 17 June. On 10 June, Italy entered the war and the Mediterranean was now cut off. Flying boat service from the U.K. was suspended.

Anticipating these events, Durban South Africa had been set up as a base for Flying boat operatons in early 1940. With the Mediterranean closed off, the Horseshoe Route came into being on 19 June and which flew with various interruptions until 1946.



The Horseshoe Route (in blue): June 19, 1940 to February 15, 1942. The route was cut back to Durban-Cairo-Calcutta after Indonesia fell to the Japanese.

The Horseshoe Route: 1940-1946

With the fall of France and the entry of Italy into the war, mail could no longer be flown between the U.K and Alexandria Egypt via the routes established in the 1930s by Imperial Airways.

However, the Cairo to Durban air mail services were still possible, along with the Cairo to Sydney and Auckland services. The result was the Horseshoe Route whereby mail left the U.K on ships which sailed to Durbn. From there, mail was flown north to Cairo on Short S-23 flying boats, then east from Cairo to India to Sydney and Auckland on the same S-23 flying boats. Mail was sent from Auckland to the U.K on the same routes.

The first flights on the Horseshoe Route, numbered "NE1" which ran north from Durban to Cairo then east to Sydney and "WS1" from Sydney west and south to Durban both left on Wednesday 19 June 1940 and arrived at their destination on Monday 1 July, a total of 12 days.

The first mail dispatch from London also occured on 19 June and was sent on a ship to Durban. It was then loaded on an Empire flying boat operating as flight "NE4" which left Durban on 10 July and arrived in Sydney on 24 July- 35 days after leaving London.

There were dispatches from London for the Horseshoe Route on 3, 11 and 17 July. Demand for mail services was so great that, in August, 1940, the frequency of flights on the Horseshoe Route increased to twice a week.

After Pearl Harbor in December, 1941, the Pacific was closed to Pan American Airways. It had operated a flying boat service between the U.S. and the Phillipines and Australia. Mail that had been routed from England to the U.S. and then to Australia how had to be sent over the Horseshoe route.

The day after the attack on Pearl Harbor both Siam (now Thailand) and Malaya were attacked by the Japanese on 8 December and Siam surrendered later that day. The Horseshoe route was then modified to avoid Siam, with flights from Rangoon to Batavia swinging west to points on Sumatra.

When Singapore fell to the Japanese on 15 February, 1942, and Sumatra and all of Indonesia fell a short time later, the Horseshoe route was cut back and all flights operated from Durban to only as far east as Calcutta, India. The only way for mail to reach Australia and New Zealand was by sea from Calcutta.

The Trans-Africa Route: 1941

The Desert War in North Africa began in earnest in the spring of 1941, and aircraft and equipment was desperately needed by British forces. With the closure of French and the Mediterranian airspace to British commercial and military aircraft, it became necessary to modify the route significantly. Flying boats now left Southhampton and flew direct to Lisbon, then to Bathurst, Freetown and Lagos in order to link up with the Trans-African land plane route to Khartoum and Cairo.

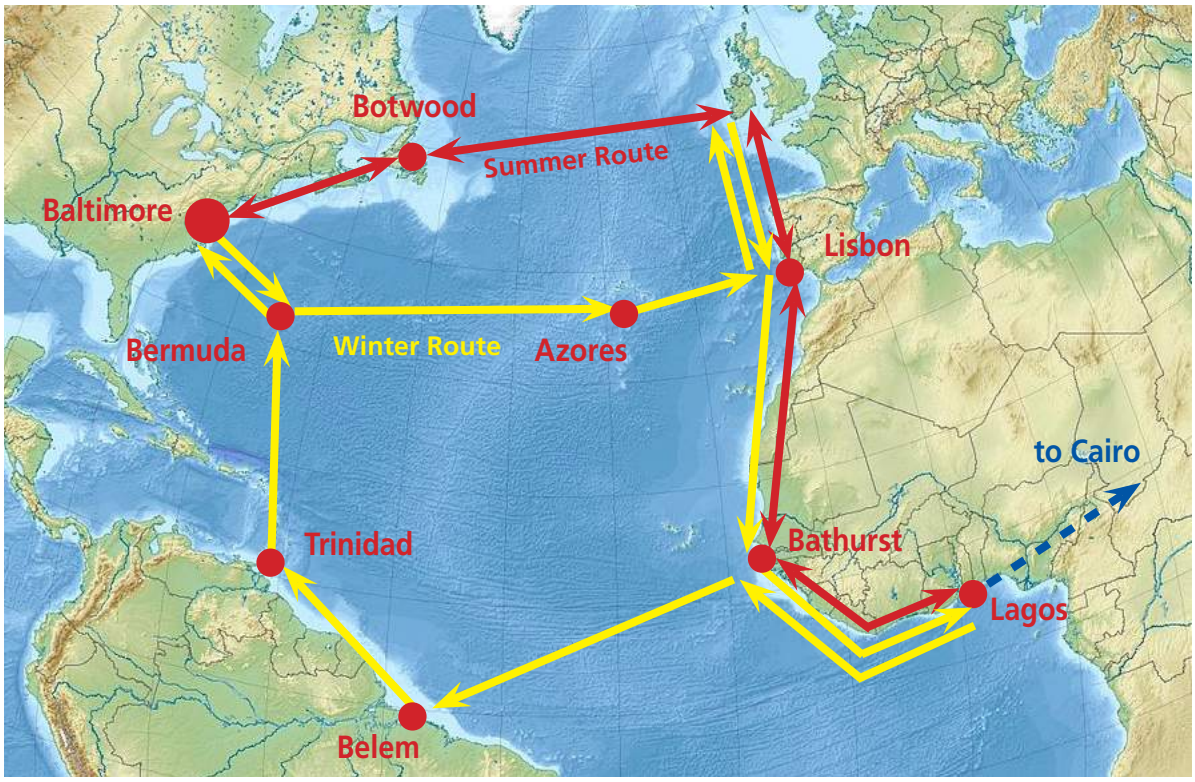
Cairo then bacame the real center of operations. Malta and Greece were within easy flying times and the Horseshoe Route passed through Cairo. To aid the ground battle for North Africa, BOAC aircraft were used to ferry both men and supplies to the front lines over this circutious routing. The RAF and BOAC also started flying Lockheed Lodestar land planes to cities around the Red Sea and Persian Gulf from Cairo.

Boeing Flying Boats Enter Service: 1941

By the end of 1940, BOAC found itself severely short of aircraft with sufficient range and payload to service the new routes to Africa as well as maintaining the transatlantic service to the USA. Apart from a couple of long-range modified Short S.30 flying boats with more powerful engines, there were no aircraft of British manufacture which could serve these needs. During the summer of 1940, the British government acquired three Boeing 314 flying boats from Pan American Airways at £259,000 each. These three aircraft were delivered in May, June and July 1941, with the first service to Africa taking place in May.

Notwithstanding the enormous contribution these three aircraft made, there were operational issues. The Lend-Lease agreement required that spare parts and maintenence be done in the U.S., so Baltimore became the maintenance base where the aircraft returned every 120 hours of flight time. During the summer months, the 314s would fly from Baltimore to Botwood, Nova Scotia, then to Foynes, Ireland. It would then operate a flight from Foynes to Lagos via Lisbon and Bathurst. It would then retrace the route- back to Foynes, then to Botwood and Baltimore for maintenance. Foynes, near Shannon in western Ireland, replaced Southampton as the port serving the U.K., because of the need to avoid the Engish Channel war zone.

Botwood was unusable in the winter, so the flights would route from Baltimore to Bermuda, Azores and Lisbon to Foynes and then from Foynes back to Lisbon, Bathurst, Lagos, Belém, Trinidad and Bermuda. These three aircraft were a huge asset to BOAC delivering greater speed, range and, most importantly, capacity and provided outstanding service until the end of the Lend-Lease programme in 1946. The last transatlantic flight took place on 7 March 1946.



The Boeing Clippers had to return to Baltimore for maintenance every 120 hours of fllight time. In the summer, the route shown in red was flown- Baltimore to Lagos, and then back to Baltimore. In the winter, the yellow route was flown: Baltimore to Foynes via the Azores, then Foynes to Lagos, then Lagos to Baltimore via Belem.

The Vital Trans-Africa Air Route: 1942

from Flight magazine, May 28, 1942

Before the war there was an important spur line to Imperial Airway's Empire air route across Africa. It was a land plane service from Khartoum to West Africa via El Obeid, El Fasher, El Geneina, Fort Lamy, Maiduguri, Kano, Kaduna, Minna, and Lagos. Elders Colonial Airways, and associate company of Imperial Airways, operated an extension from Lagos to Accra to Takoradi. This feeder service, one weekly each way, was operated with De Havilland 86 "Diana" class aircraft which carried ten passengers.

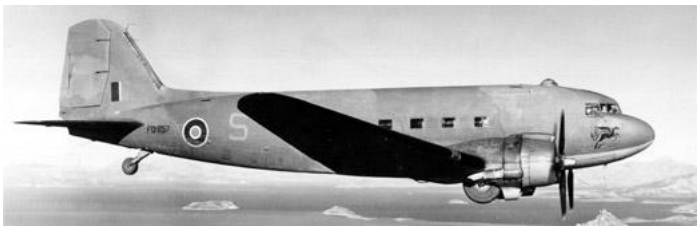
Until the summer of 1940, the trans-African route remained what it has been since its inception in February, 1936, a spur line from the main Empire flying-boat route between the United Kingdom and Durban, South Africa. But with the closing of the Mediterranean to British civil aircraft due to Italy's entry into the war, the trans-African route assumed a much more important position. It is now the main route of British Overseas Airways Corporation (the new name for Imperial after 1939), with Sabena Belgian National Air Lines co-operating. Moreover, it has become a supply route for our forces in the Middle East in which Pan American Airways also plays a part. The airlines fly under the direction of the British military, but mostly with pilots that formerly worked for the airlines. This is espcially true for the pilots of the flying boats, which require exceptional skills for safe operation.

In August, 1940, BOAC flying-boats, now requisitioned by the RAF, opened a regular service between England and West Africa. This and the land plane route from West Africa to Khartoum then became the main artery from the UK to the Horseshoe Route that runs from Durban through Egypt to Iraq, India, and at that time, to Singapore, Australia and New Zealand.

At present (1942), nine services per week each way operate between Takoradi on the Gold Coast and Khartoum in the Anglo-Egyptian Sudan. Pan American and BOAC share the services, with 3 of the British flights going beyond Khartoum. One flight using "Ensign" aircraft runs from Lagos to Asmara and return. The trans-African flights are generally along the old Imperial Airways routes, and the old stopping places are seeing more and more aircraft, although most carry mainly military and RAF personnel and equipment. Such picturesque spots as Kano, Fort Lamy, El Geneina, and El Fasher are on this route. At most of them, passengers are accomodated when there is an overnight stop, in rest homes specially built and equipped for European travellers in these tropical regions by Imperial Airways in the late 1930s.

The trans-African landplane services, both BOAC and Pan American, are in the main operated with Lockheed L-14 Electras, Lockheed Lodestars, Douglas DC-3s and De Havilland 95s. Sabena operates twice weekly in each direction from Takoradi to Stanleyville to Khartoum with Junkers Ju 52s and Lockheed L-14s. One of these flights continues on to Cairo from Khartoum.

BOAC also operates a flying-boat route across central Africa. The service operates once each week in each direction from Lagos to Libreville, Pointe Noire, Leopoldville, Coquailhatville, Stanleyville, Butiaba, Port Bell, Juba, Malakai, Khartoum, Wadi Haifa, Luxor, and Cairo.



Douglas Dakota (DC-3)- 28 pasengers, 170 mph cruise speed, Range: 1,600 mi (2,575 km)

Lockheed L-18 Lodestar, 18 passengers, 200 mph cruise speed Range: 2,500 mi (4,025 km)

De Havilland DH95 Flamingo, 17 passengers, 204 mph cruise speed, Range: 1,345 mi (2,165 km)

Junkers Ju52- 17 passengers, 138 mph cruise speed, Range: 590 mi (950 km)

Lockheed L-14 Super Electra: 12 to 14 passengers, 215 mph cruise speed, range 851 mi (1,370 km)

1942 Air Service in Africa

British Overseas Airways Corp (BOAC) Horseshoe Route

2 flights per week Cairo-Durban (Short S.23 Flying Boat)

2 per week Cairo to Sydney/Auckland (S.23 Flying Boat)

BOAC and Pan American

Frequent flights from USA and Ireland to Lagos (Boeing 314 Flying Boat and Short S.30 Flying Boat)

BOAC

1 flight per week Lagos-Port Bell-Cairo (Short S.23)

BOAC and Pan American

9 flights per week Takoradi-Khartoum (Lockheed 14, Lockheed Lodestar, Douglas DC-3 Dakota, de Havilland 95)

3 of these 9 flights continue Khartoum-Cairo

1 of these 9 flight continues Khartoum to Asmara

SABENA Belgian Airlines

2 flights per week Lagos to Khartoum, one continues to Cairo (Junkers Ju52, Lockheed 14)

Boeing 314 Clipper Flying Boat

The Boeing 314 Clipper flying boat was one of the largest aircraft of the time. The first 314, the "Honolulu Clipper," entered regular service with Pan American on its San Francisco-Hong Kong route in January 1939, a trip that took more than six days to complete. The "Yankee Clipper" flew across the Atlantic on a route from Southampton England to Port Washington, New York, with stops at Foynes, Ireland, Botwood, Newfoundland, and Shediac, New Brunswick. The inaugural trip occurred on June 24, 1939.

Commercial passenger service lasted less than three years, ending when the United States entered World War II in December 1941. Of the 12 Clippers that were built; 9 were put into service for Pan Am and later transferred to the U.S. military. The remaining three were sold to BOAC and delivered in early 1941. They replaced BOAC's three Short S.30 long-range flying-boats that had been requisitioned by the RAF.

The Clipper fleet was used for ferrying personnel and equipment to the European and Pacific fronts. The aircraft were purchased by the War and Navy Departments and leased back to Pan Am for a dollar. American military cargo was carried via Natal, Brazil to Liberia, to supply the British forces at Cairo and even the Russians, via Teheran. The Model 314 was then the only aircraft in the world that could make the 2,150-statute-mile (3,460 km) crossing over water with a full load, and was given the military designation C-98. Since the Pan Am pilots and crews had extensive expertise in using flying boats for extreme long-distance over-water flights, the company's pilots and navigators continued to serve as flight crew.

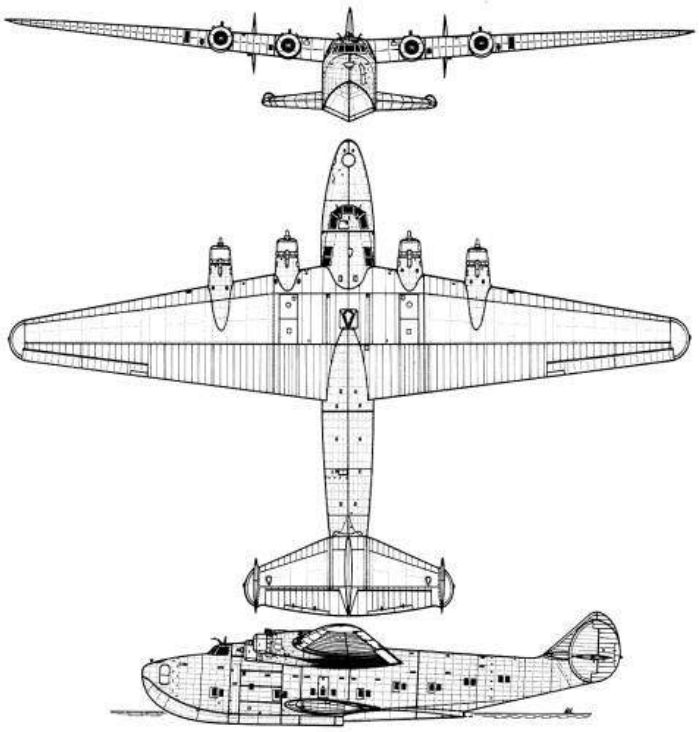
Boeing 314A Clipper

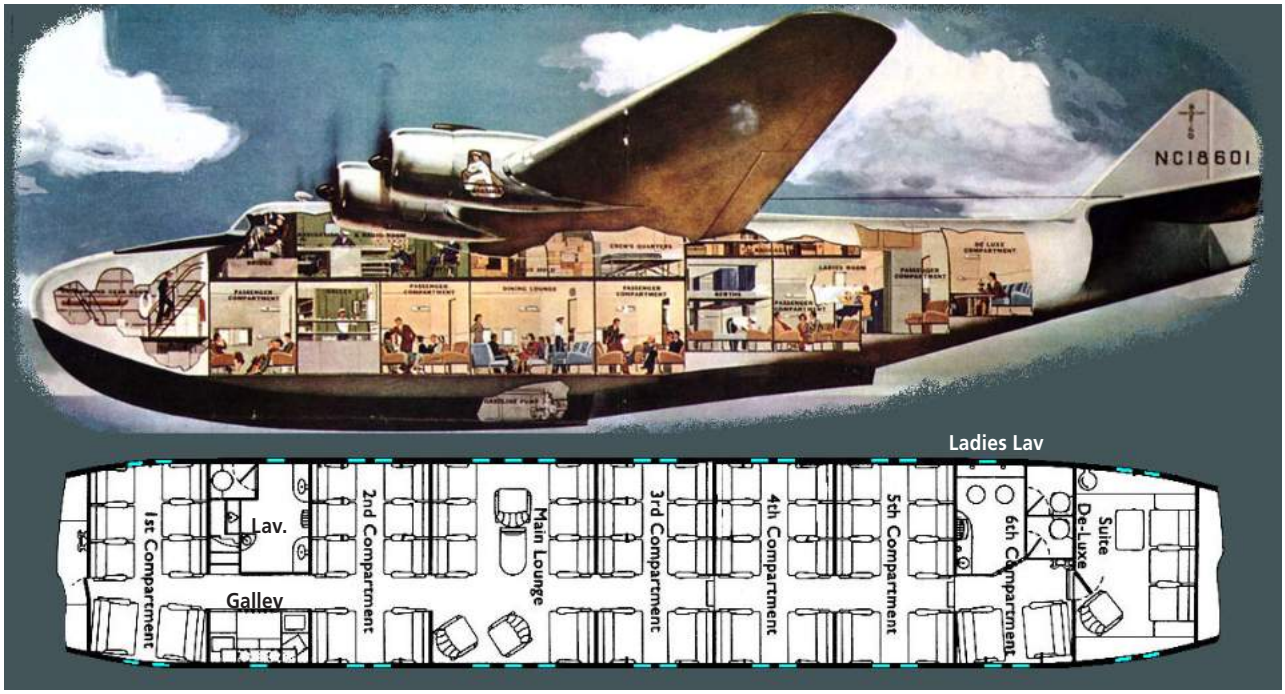
Role	Flying boat airliner
Manufacturer	Boeing Airplane Company
First flight	June 7, 1938
Introduction	1939
Produced	1938–1941
Number built	12
Primary users	Pan American World Airways, British Overseas Airways Corporation
Crew:	11, including 2 cabin stewards
Capacity:	Daytime: 74 passengers, Nighttime: 36 passengers
Payload:	10,000 lb (4,500 kg) of mail and cargo
Length:	106 ft (32.33 m)
Wingspan:	152 ft (46.36 m)
Height:	20 ft 4.5in (6.22 m)
Empty weight:	48,400 lb (21,900 kg)
Loaded weight:	84,000 lb (38,000 kg)
Powerplant:	4 × Wright R-2600-3 radials, 1,600 hp each
Maximum speed:	210 mph (340 km/h)
Cruise speed:	188 mph (302 km/h) at 11,000 ft
Range:	3,685 mi (5,896 km) normal cruise

Variants:

Model 314- Six with 1,500 hp Twin Cyclone engines, built for Pan Am.

Model 314A- Improved version with 1,600 hp Twin Cyclones, additional 1,200 US gallons (4,500 l) fuel capacity, and revised interior. Six built- three for Pan Am and three leased to BOAC.





All Pan Am's "Clippers" were built for "one-class" luxury air travel, a necessity given the long duration of transoceanic flights. All flying was done during daylight hours, except for the long overnight legs between San Francisco and Honolulu. Up to 72 passengers could be accomodated for daylight flights. The seats were converted into 36 upper and lower bunks for the overnight flights. While the cruising speed was 188 miles per hour (303 km/h), typically flights at maximum gross weight were carried out at 155 miles per hour (249 km/h) to extend range. In Pan Am's 1940 schedule, San Francisco to Honolulu took 19 hours.

The standard of luxury on Pan American's Boeing 314s has rarely been matched on airliners since. The 314s had a lounge and dining area, and the galleys were crewed by chefs from four-star hotels. Men and women were provided with separate dressing rooms, and white-coated stewards served five and six-course meals with gleaming silver service.

Above: The Main Lounge compartment located amidship. Tables were set up between seats. Left: Bunks were available for 36 passengers.

Feliks Gazda in Africa: 1941–1942

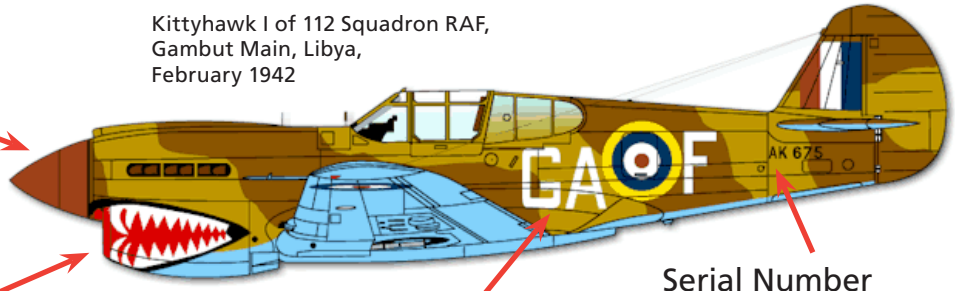
Feliks Gazda, like many ferry pilots, hoped to get into the action in North Africa in 1941. British forces were in a furious battle with Rommel's Afrika Korps and in 1941, the British were not winning.

In December, 1941, Gazda and other Polish pilots were chosen to fly fighter planes on the African front. On 9 February 1942 Gazda joined the 112 "Shark" Squadron at the Gambut air base in eastern Libya. Soon, he began flying Curtiss Kittyhawks over the Libyan front, completing six missions before May.

112 Squadron Markings

By the time that the Squadron re-equipped with Kittyhawks in December 1941 the new code letters "GA" were used. Note that the wing root fairing goes over the top of the fuselage roundel yellow - this was common on RAF Tomahawks both in the UK and North Africa. The serial number is smaller than the standard 8 inches specified, being about only 6 inches high. This again was a common feature on aircraft in the African theatre.

Kittyhawk I of 112 Squadron RAF,
Gambut Main, Libya,
February 1942



Red Spinner

The propeller spinner is painted the normal dull red recognition colour used on fighters right through the war in the Mediterranean Theatre.

Shark Mouth

While not official, this appeared on almost every P-40. The details of the design varied from plane to plane.

112 Squadron Codes

XO	May 1939 - Sep 1939
RT	1940 - Jun 1941
GA	Jun 1941 - Dec 1946

Serial Number

Numbers began with two letters, such as AK, followed by an individual 3-digit number. For example, one of Gazda's Kittyhawks carried "AK 719".

Part 6

Shark Squadron

112 Squadron in WWII

As war loomed, the squadron was re-formed 16 May 1939 for service in Egypt. After Italy entered the war, on 10 June 1940, the squadron was almost immediately in action, defending Egypt from Italian bombers. In January 1941, the squadron joined Allied forces defending Greece, providing air cover and offensive support over Albania. It later took part in fierce dogfights as part of the air defence of the Athens area. With the collapse of the Allied campaign on the Greek mainland, 112 Sqn withdrew to Crete and then to Egypt, from where it rejoined the North African Campaign, supporting the Eighth Army.

During July 1941, the squadron was one of the first in the world to become operational with the P-40 Tomahawk, which it used in both the fighter and ground attack role. Inspired by the unusually large air inlet on the P-40, the squadron began to emulate the "shark mouth" logo used on some German Messerschmitt Bf 110s of Zerstörer Geschwader 76 earlier in the war. This practice was later followed by Curtiss P-40 units in other parts of the world, including the Flying Tigers, American volunteers serving with the Chinese Air Force.

In December 1941, the Tomahawks were replaced by the updated P-40D Kittyhawks, which the squadron used for the remainder of its time with the Desert Air Force, often as a fighter bomber.

The squadron during this time included a significant number of personnel from the air forces of Poland, Australia, Canada and New Zealand. For most of 1942, it was commanded by the highest-scoring Australian ace of WWII, Clive Caldwell. He was succeeded by Billy Drake, the highest-scoring RAF P-40 pilot and the second-highest-scoring British Commonwealth P-40 pilot, behind Caldwell. Later in the war, an increasing number of South African pilots joined the unit.

Messerschmitt Bf 110 shark mouth in 1941.

After the invasion of Sicily on July 10, 1943, the squadron moved to bases there, in July 1943, and onto the Italian mainland in September. In June 1944 the Kittyhawks were replaced by the Mustang Mark III and, from February 1945, Mustang Mark IVs. The squadron remained in Italy at Lavariano as part of the occupying forces until disbanding on 30 December 1946 at Treviso.

By the end of the war some 206 air victories had been claimed by the Squadron, with an additional 62 aircraft destroyed on the ground.

112 Squadron, RAF

Active from 16 May 1939 to 30 December 1946

Nickname	"The Shark Squadron"
Motto	"Swift in Destruction"
Battle honours	Egypt 1940, Greece 1941, Western Desert 1941–43, Italy 1943
Squadron Badge	"A cat sejant".

Aircraft Operated

1941 - Hawker Hurricane I
1941 - Curtiss Tomahawk I
1941 - Curtiss Tomahawk IIA & IIB
1941–42 - Curtiss Kittyhawk 1A
1942–44 - Curtiss Kittyhawk III
1944 - Curtiss Kittyhawk IV
1944–45 - North American Mustang III
1945–46 - North American Mustang IV

Timeline of the Desert War, 1940 to 1943

1940

June 10: Italy declares war on France and the UK.
June 14: British forces invade Libya from Egypt.

1941

Feb 7: British forces stop at El Agheila, Libya, and turn their attention to the fighting in Greece.
Feb 14: First units of the Afrika Korps under Erwin Rommel arrive in Libya.
March 24: Rommel advances to the east and captures El Agheila.
April 10: Rommel continues eastward and the seige of Tobruk begins.
Fighting rages the rest of 1941 in the Tobruk area, but by December, the tide turns and the British and Commonwealth forces start to push Rommel westward.
Dec. 31: The front line returns to El Agheila.

Field Marshall Erwin Rommel with aides, 1942

1942

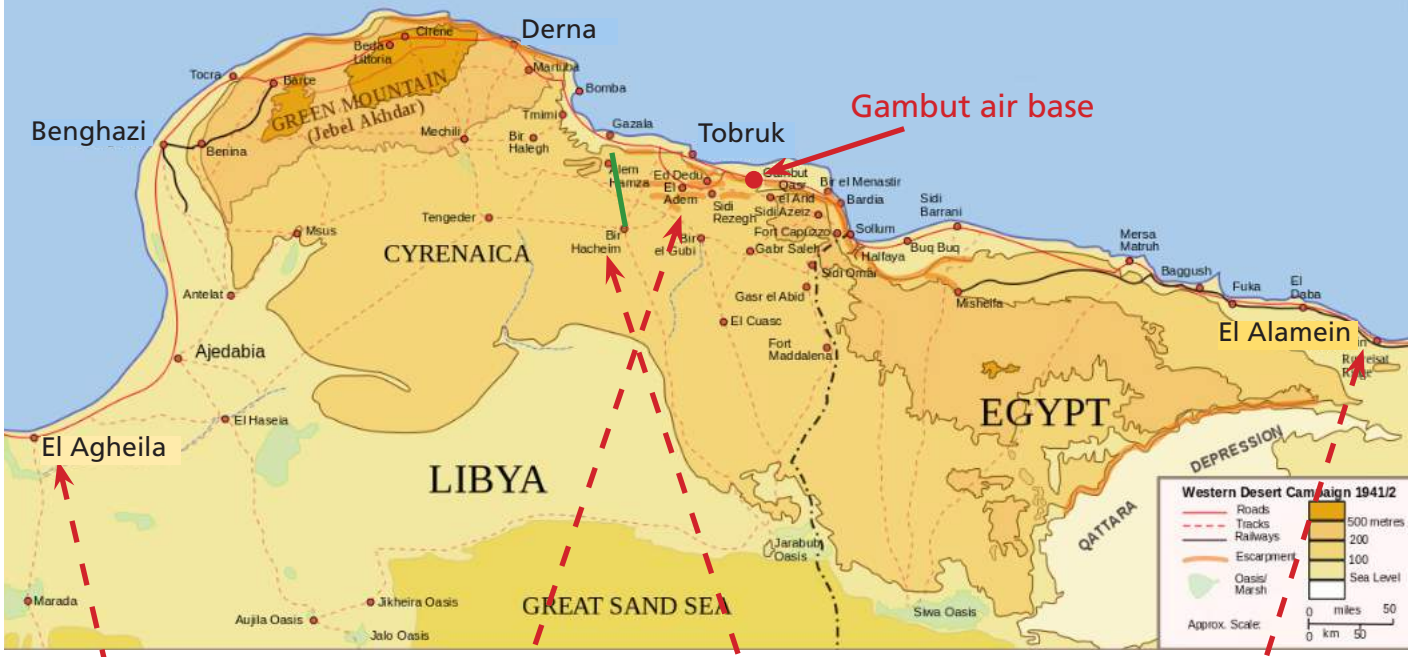
21 January: Rommel's second offensive begins from El Agheila.
29 January: Benghazi is captured by Axis forces.
4 February: Front line is established between Gazala and Bir Hakeim.
9 February: Feliks Gazda flies his first combat mission out of Gambut.
5 May: Gazda flies his sixth and final combat mission with the 112th.
26 May: Axis forces assault the Gazala line, the Battle of Gazala and Battle of Bir Hacheim begin. Axis forces gain the upper hand.
21 June: Tobruk is captured by Axis forces. Gambut air base is also captured.
30 June: Axis forces reach El Alamein and attack the Allied defences.
31 July: Allied commander Auchinleck calls off offensive activities to allow Eighth Army to regroup and resupply.
13 August: Alexander and Montgomery take command respectively of Middle East Command and British Eighth Army.
5 November: Axis lines at El Alamein are broken. The Allies push westward.
13 November: Tobruk captured by Eighth Army.
15 November: British forces capture Derna.
20 November: Benghazi captured by Eighth Army.
12 December: Eighth Army starts an offensive towards Axis forces near El Agheila

1943

23 January: Tripoli captured by British Eighth Army.
4 February: Axis forces in Libya retreat to Tunisian border south of the Mareth Line
26 March: Eighth Army launch Operation Supercharge II outflanking and making the Axis position at Mareth untenable.
22 April: Allied forces launch Operation Vulcan
7 May: British enter Tunis, Americans enter Bizerte
13 May: Axis Powers surrender in Tunisia.

Messerschmitt Bf. 109s over the Libyan desert, 1942

Area of fighting, February 1941 to Spring 1943



1. Feb 1941: British advance stops in El Agheila.

2. March 1941: Rommel captures El Agheila

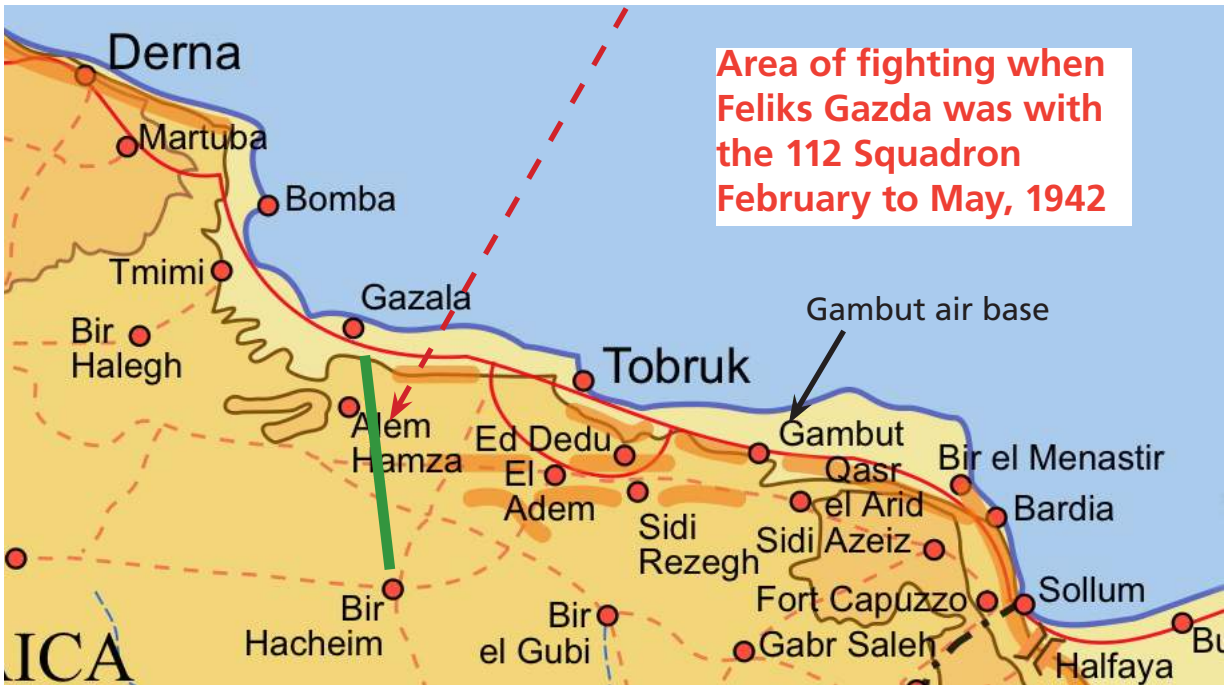
3. April 1941: Rommel reaches Tobruk

4. Dec 31, 1941: Front line returns to El Agheila

5. Jan 1942: Rommel lauches second offensive. Front line established Gazala to Bir Hacheim.

6. June, 1942: Rommel forces advance as far east as El Alamein.

7. November, 1942: Allied counter attack begins at El Alamein, eventually pushing Rommel west out of Libya and into Tunisia, where the Axis surrendered in May, 1943



Area of fighting when Feliks Gazda was with the 112 Squadron February to May, 1942

The Curtiss P-40: Workhorse of the Desert War

The Curtiss P-40 was an American single-engined, single-seat, all-metal fighter and ground-attack aircraft that first flew in 1938. When production of the P-40 ceased, 13,738 had been built, all at Curtiss-Wright Corporation's main production facilities at Buffalo, New York.

P-40 "Warhawk" was the name the US Army Air Corps adopted for all its models, making it the official name in the United States for all P-40s. The British Commonwealth used the name Tomahawk I for models equivalent to the P-40, Tomahawk IIA for the P-40B and Tomahawk IIB for the P-40C. The name Kittyhawk was applied to models equivalent to the P-40D and all later variants.

Tomahawks first saw combat with the British Commonwealth squadrons of the Desert Air Force in the Middle East and North African campaigns during June 1941. The famous RAF 112 Squadron was among the first to operate Tomahawks in North Africa and the unit was the first Allied military aviation unit to feature the "shark mouth" logo.

Because the P-40's Allison engine lacked a two-stage supercharger it was inferior to Luftwaffe fighters such as the Messerschmitt Bf 109 in high-altitude combat and was rarely used in Northwest Europe. Spitfires used in the theater operated at heights around 30,000 ft (9,100 m), while the P-40's Allison, with its single-stage, low altitude rated supercharger, worked best at 15,000 ft (4,600 m) or lower.

But the P-40 played a critical role with Allied air forces between 1941 and 1944 in three major theaters: North Africa, the Southwest Pacific and China. The P-40's marginal performance at high altitudes was not as important in those theaters, where it served as an air superiority fighter, bomber escort and fighter-bomber.

Although it gained a postwar reputation as a mediocre design, suitable only for close air support, recent research indicates that the P-40 performed surprisingly well as an air superiority fighter, at times suffering severe losses but also taking a very heavy toll of enemy aircraft. The P-40 offered the additional advantage of low cost, which kept it in production as a ground-attack aircraft long after it was obsolete as a fighter.

The P-40 was originally conceived as a ground support aircraft and was very agile at low and medium altitudes. At medium and high speeds it was one of the tightest turning monoplane designs of the war due to its great structural strength. At lower speeds it was out turned by the lightweight fighters.

Allison V-1710 engines produced about 1,040 hp: not powerful by the standards of the time and the early P-40 variants' top speeds were unimpressive. Also, the single-stage, single-speed supercharger meant that the P-40 could not compete with contemporary designs as a high-altitude fighter. Later versions, with 1,200 hp Allisons or more powerful 1,400 hp Packard Merlin engines were more capable. Climb performance was fair to poor, depending on the subtype. Dive acceleration was good and dive speed was excellent. The highest-scoring P-40 ace, Clive Caldwell (RAAF), who claimed 22 of his 28.5 kills in the type, said that the P-40 had "almost no vices". Caldwell added that the P-40 was "faster downhill than almost any other aeroplane with a propeller."

The P-40 tolerated harsh conditions in the widest possibl evariety of climates. It was a semi-modular design and thus easy to maintain in the field. It lacked innovations of the time, such as boosted ailerons or automatic leading edge slats, but it had a strong structure including a five-spar wing, which enabled P-40s to survive some midair collisions. Both accidental impacts and intentional ramming attacks against enemy aircraft were occasionally recorded as victories by the Desert Air Force. Caldwell said P-40s "would take a tremendous amount of punishment, violent aerobatics as well as enemy action." Operational range was good by early war standards, and was almost double that of the Supermarine Spitfire or Messerschmitt Bf 109.

Caldwell found the Tomahawk IIB's armament of two 12.7 mm Browning "light-barrel" dorsal nose-mount synchronized machine guns and two 12.7 mm Browning machine guns in each wing to be inadequate. This was rectified with the P-40D Kittyhawk I which abandoned the nose gun mounts and instead had two 12.7 mm guns in each wing. The Kittyhawk had armor around the engine and the cockpit, which enabled it to withstand considerable damage. Visibility was adequate, although hampered by an overly complex windscreen frame, and completely blocked to the rear in early models due to the raised turtledeck. Poor ground visibility and the relatively narrow landing gear track led to many losses due to accidents on the ground.

In all, 18 Royal Air Force (RAF) squadrons, as well as four Royal Canadian Air Force (RCAF), three South African Air Force (SAAF), and two Royal Australian Air Force (RAAF) squadrons serving with RAF formations, used P-40 Tomahawks and Kittyhawks. The first units to convert to P-40s were Hawker Hurricane squadrons of the Desert Air Force (DAF) in early

1941. The first Tomahawks delivered came without armor, bulletproof windscreens or self-sealing fuel tanks. These were installed in subsequent shipments. Pilots used to British-designed fighters sometimes found it difficult to adapt to the Tomahawk's rear-folding landing gear, which was more prone to collapse than the lateral-folding landing gear found on the Hurricane or Spitfire. In contrast to the "three-point landing" commonly employed with British types, Tomahawk pilots were obliged to use a "wheels landing"- a longer, low angle approach that touched down on the main wheels first.

The Tomahawk was superseded in North Africa by the more powerful Kittyhawk types from early 1942, though some Tomahawks remained in service until 1943. Kittyhawks included many major improvements, and were the DAF's air superiority fighter for the critical first few months of 1942, until "tropicalised" Spitfires were available.

Desert Air Force units received nearly 330 Packard Merlin V-1650-powered P-40F and P-40L Kittyhawk IIs. The DAF also received 21 of the later P-40K and the majority of the 600 P-40Ms built, which aarrived from early 1943 and were used mostly in the fighter-bomber role.

The P-40 initially proved quite effective against Axis aircraft and contributed to a shift of momentum in the Allied favor. The gradual replacement of Hurricanes by the Tomahawks and Kittyhawks led to the Luftwaffe accelerating retirement of the Bf 109E and introducing the newer Bf 109F which were flown by the veteran pilots of elite Luftwaffe units.

S/Ldr Clive Caldwell and Polish Pilot Sgt Jerzy Rózański, March 1942, in North Africa

Most air combat in North Africa took place well below 16,000 ft (4,900 m), thus negating much of the Bf 109's superiority at high altitudes. The P-40 usually had an edge over the Bf 109 in horizontal maneuverability, dive speed and structural strength, was roughly equal in firepower, but was slightly inferior in speed and outclassed in rate of climb and operational ceiling.

But the P-40 had its strenghts. It was considered to be a stable gun platform, and its rugged construction meant that it was able to operate from rough front line airstrips with a good rate of serviceability.

Some DAF units initially failed to use the P-40's strengths and/or utilised outdated defensive tactics such as the Lufbery circle. However, the superior climb rate of the Bf 109 enabled fast, swooping attacks, neutralizing the advantages offered by conventional defensive tactics. Various new formations were tried by Tomahawk units in 1941-42, including: "fluid pairs" (similar to the German rotte); one or two "weavers" at the back of a squadron in formation, and whole squadrons bobbing and weaving in loose formations. Werner Schröer, who was credited with destroying 114 Allied aircraft in only 197 combat missions, referred to the latter formation as "bunches of grapes", because he found them so easy to pick off. The leading German expert in North Africa, Hans-Joachim Marseille, claimed as many as 101 P-40s during his career.

From 26 May 1942, all Kittyhawk units operated primarily as fighter-bomber units, giving rise to the nickname "Kittybomber". As a result of this change in role, and because DAF P-40 squadrons were frequently used in bomber escort and close air support missions, Kittyhawks suffered relatively high attrition rates, Many Desert Air Force Kittyhawk pilots were caught flying low and slow by marauding Bf 109s.

Clive Caldwell believed that Operational Training Units did not properly prepare pilots for air combat in the Kittyhawk, and as a commander, stressed the importance of training novice pilots properly.

Victory claims and losses for three Tomahawk/Kittyhawk squadrons of the Desert Air Force, June 1941–May 1943.

Unit	3 Sqn RAAF	112 Sqn RAF	450 Sqn RAAF*
Claims with Tomahawks	41	36	-
Claims with Kittyhawks	74.5	82.5	49
Total P-40 claims	115.5	118.5	49
P-40 losses (total)	34	38	28

* Began conversion to P-40s in December 1941; operational in February 1942.[42]

Felix Gazda's Experiences in the Shark Squadron

This is the report of F/Lt Feliks Gazda in service with the 112 "Shark" Squadron, in 1941 and 1942. Gazda was stationed at RAF Gambut, which was a complex of six military airfields in Libya, located about 50 kilometres (31 mi) east-southeast of Tobruk. The complex was an important facility, used by a large number of RAF squadrons, including the 112th.

Gazda left Gambut on 5 May 1942. Axis forces captured Gambut on 21 June 1942, after the Battle of Tobruk. The airfield saw use by the German Luftwaffe until its recapture by the New Zealand 4th Infantry Brigade on 25 November, 1942.

by Feliks Gazda, F/Lt, RAF
(translation by Diana Dale)

Report covering fighter pilot training and work in the 112 Shark squadron at the front from November 11, 1941 to May 5, 1942

The fighter pilot school in Khartoum provided an opportunity for an excellent preparation for battle. In spite of this, the majority of our pilots came out of it without adequate preparation. Pilots were rarely assigned individually to the training course as we were. More often, members of entire squadrons and other organized units passed through the entire program on the orders of their commander. As a result, individual pilots tried to leave the school as quickly as possible, without sufficiently mastering their training. This is how it was for us with these pilots. They left for the front having between 14-20 hours of formation flying (this was something we noticed in particular). The school authorities took into account the desire to go to the front quickly and so, a pilot with sufficient number of hours but not the quality of assignments, could leave the school.

Training in Operational Training Units (OTU) consisted of ground and air training:

Ground training (servicing of equipment and tactical training) allowed pilots the possibility of acquiring the maximum knowledge in a very accessible format. The British and our Polish authorities ensured the acquisition and making possible these studies. We had all the educational help possible. All the instructors worked hard on our behalf. The Polish authorities assigned us translators and all tactical training was translated into Polish. Pilots sufficiently mastered the ground training.

Air training. The time for air training was not specified, a pilot could study between 3-7 weeks depending on how fast he wished to go to the front. The training program consisted of 25 assignments, including night flights.

Our pilots were not trained sufficiently. There were reasons for this: (our) pilots had between 100 to 150 hours of ferrying flights on fighter aircraft, resulting in the school authorities viewing them as experienced fighter pilots, apparently not realizing that except for good landings, these people had absolutely no idea of fighter pilot training. After having flown many hours as a ferry pilot, and an insufficient amount of hours as a fighter pilot, they were supposed to go to the front - they finished school. The pilots themselves began to say that school had not given them anything. It did not give them anything because they wanted to leave quickly. For example, one can give witness by comparing my flights to theirs. I was a fighter pilot for 8 years. They were, for the most part, civil pilots of flying clubs. In school, I carried out about 25 flights, among these 10 involved firing my weapons. Others executed between 14 and 20 (flights), among them just two or three with weapons practice. Our superiors heard about this and also gave the opportunity for additional schooling. The pilots, except for me, were all sent to gunnery school in Bibeis. I am not able to write much about that school. I know that the school had been recently established, was not completely organized, and that there, they [the pilots] executed between two and six flights and returned to the front.

The will to finish quickly as well as not paying attention to my recommendations (I could only serve by giving advice since I had no other authority), avenged itself. In my opinion, there were about four pilots who were good as ferry pilots; the rest were barely able to maintain themselves in the air. As an example, I can mention a conversation after a sortie. When I asked a pilot what he did when he was attacked by the enemy, he answered, "I pushed my stick and escaped to earth." Or, a pilot exits from his plane after a patrol says "today's flight went very well, because the gyro was always in the middle".

We arrived at the front to be part of the 112 squadron on February 10, 1942. There we were introduced to a new type of aircraft, the "Kittyhawk". Again, the pilots did not listen to my advice; for them only the English were their superiors. Without any real training, after just two test flights, we flew fighter missions. During the first flight, F/O Matusiak was killed while doing a dogfight within 100 meters in an unknown type of aircraft for him.

The following was the method of putting us to work: After completing two flights on the new type of aircraft, the commander asked if we felt good. Naturally, we all replied that we felt more than good. We should have, in my opinion, executed between five and ten flights. We were posted on the waiting list for sortie. This was quite a briefing. To remain at the ready. The work in the squadron was organized in such a way that for half the day, half the pilots sat in their aircraft and then the next half of the day, the second half of the pilots did the same. If there was a

1943: A Kittyhawk Mark III of 112 Squadron, taxiing through scrub at Medenine, Tunisia. The aircraftman sitting on the wing is directing the pilot, whose view ahead is hindered by the aircraft's nose, a common problem for tailwheel aircraft when taxiing.

readiness, then the pilots sat around all day. I did not hear of any assignments which went beyond the appointment of a place in battle listing. Preceding and following a flight, with the exception of when there was a meeting, it was necessary to give a report to the information officer.

The news of the enemy and equipment was limited to the posting of aircraft silhouettes in the officers' mess. I do not recall us being informed of news about where the enemy front was or where their air bases were located. The planes were not identified by name and in this connection I heard complaints from our pilots. The method of how assignments were executed was as follows: The squadron's officer commanding (who had about 20 hits) had a couple of section leaders. The rest of the pilots, as extras, covered the rear. During the attack of the enemy, which was generally from a higher altitude (Kitty is a low altitude plane) the pilots turned either towards the left or right. Those attacked were left on the battlefield, and the rest, not seeing the enemy, returned to the air base. I cannot recall if any squadron returned to the air base as a whole. Return to base was done singly, in pairs and in groups of fives. The reasons for this were unknown, due to the fact, I suspect, that no one asked.

There were quite a few encounters, about three a week. There were losses in each encounter, with the exception of encounters with Italians. The mood was, after a while, generally poor. Pilots were killed by the enemy or got into a flat spin- that is how three pilots died during my stay with the squadron.

On one occasion, three priests of different faiths came to our squadron. They sat with us, heard confessions, and held services. Coinciding with their visit, the quality of our food improved because there was a joint mess set up with the non-commissioned officers. This was during a particularly depressing time. This method of religious consolation, did not, I suspect lift the mood. For me, personally, it had a negative impact.

The activities executed were the following:
1) interception 2) close cover 3) bombing 4) sweeps

Interception: The first type of activity, so-called scrambling, where pilots were in their aircraft, had as its objective, to fight the enemy who had crossed the front. This method was not always effective at a distance of about 70 miles from the front. So, after a certain time, the squadron was moved to about 40 miles from the front. The enemy harassed our squadron by bombing using single fighter planes, sometimes quite accurately, due to the impossibility for complete or even partial camouflage in the desert. We were forced to move the squadron backwards. The resolution of this matter was as follows: for the daytime, the squadron started for the advanced air base and in the evening returned to the main base. It was a type of ambushing to a large extent. I think this was a better approach to our work, although it was changed after a short time.

Cover: This type of activity did not differ from our cover, with the exception that cover here was not only from above, but also for both sides of the bombing formation.

Bombing: The target was sought out by the pilot or assigned in advance. Bombing from low altitudes gives excellent results. I saw how one fighter pilot damaged about six planes on one flight.

Sweeps: Sweeps are done by two squadrons, and in the following way, so that part of the flying force flies over the enemy (for

Feliks Gazda's Experience, continued

example, an air base), and then the majority of the forces encounters the enemy after the passing over and provoking of the enemy. The objective and method of this type of activity does not differ from our own. The destruction of the enemy which is encountered happens at various altitudes.

General observations. In spite of inadequate flight training from a fighter pilot perspective, pilots flew quite often, especially the non-commissioned officers, in difficult desert conditions and put in enormous degrees of effort. People got used up at a very high rate in these conditions. Evidence of this is the fact that, during my term of service with the squadron from 10 February 1941 to 5 May 1942, the entire personnel of the squadron changed, with the exception of three other pilots and eight of our own group.

The English personnel section is, in my opinion, very good, since they facilitate matters for each pilot to transfer to a non-operational unit after three months duty. As a result, the mood among pilots does not manifest itself by hopelessly sitting in the squadron until the time of their demise. Among our pilot group of eight, three were shot down. Witnessing this, seeing their colleagues leaving the squadron and encountering other problems probably caused them to apply for transfers to Polish squadrons.

The exhaustion of combat troops, support staff and equipment in the desert is incommensurately big compared to that in other situations. In these special conditions it is necessary, in my opinion, to rotate personnel like the English do. A squadron made up of so many nationalities, does not give excellent results. In spite of professional collegiality, small groups always form. There were about 3 English, about 3 Canadians, 8 Australians and 8 Poles. Radio communications can often be misleading or create linguistic misunderstandings, especially in serious situations, when one needs them most.

Encounters and tactical battles with the enemy. Encounters, as I have noted previously, happened quite often. In principle the enemy flew at a greater altitude than us and attacked from above. Our course of action was, in such cases, defensive. We avoided [the enemy] by turning right or left and attacked the enemy after being attacked by them. We had a numerical superiority, outnumbering them, in spite of the fact that about 15% of our aircraft did not start for one reason or another.

The Germans flew together with the Italians very often. The Italian Macchi 202 aircraft, during battles with our pilots, proved to be inferior. During one battle, there was a loss of about 10 Macchis. The Messerschmitt Bf.109s appeared in groups of two, four or six. The Germans flew in small groups, attacking even our large groups, attacking once and escaping, not engaging in battle. Once or two to three times a month, about 30 or 40 Messerschmitts appeared making obvious sweeps. It is suspected that they gathered at the base in Sicily for a couple of days, and then again formed small groups, attacked us and made their escape.

I will say a few words about the bases. The bases were good landing grounds, always able to refuel entire squadrons simultaneously. After starting out, we gained altitude in the desert, where there were not much surveillance. It was difficult to camouflage the base. Camouflaging was limited to installing the squadron in a vast space, 2 kilometers. Sometimes, they positioned decoy aircraft- German planes or our own no longer serviceable aircraft- in various places. I did not see any German bombers during the daytime, most likely as a result of our advantage. However, I did witness, on a couple of occasions, that they did bomb us using single Messerschmitt 109 fighter planes. The enemy flew very high, and then at a certain time, with a suitable angle of light, they flew down low over the base, dropping bombs. The night fighter air force has a relatively good job, because of the clear nights and frequent enemy flights.

Kittyhawk Mark IA of 112 Squadron RAF based at LG 91, Egypt, which force-landed at El Daba following combat with Messerschmitt Bf 109s.

Frequent sandstorms make live miserable in Libya.

Clive Caldwell in North Africa

112 Squadron Leader in 1942

Group Captain Clive R. Caldwell served as 112 Squadron leader in 1942 when Feliks Gazda flew with the squadron. Caldwell was the leading Australian air ace of World War II, officially credited with shooting down 28.5 enemy aircraft in over 300 operational sorties. He was the highest-scoring P-40 pilot from any air force and the highest-scoring Allied pilot in North Africa.

Caldwell's first, brief combat posting was a British Hurricane unit, No. 73 Squadron, RAF, in the early stages of the North African campaign. After struggling to acquire the skill of gunnery deflection, Caldwell developed a training technique, known as "shadow shooting", in which he fired at the shadow of his own aircraft on the desert surface. This was later widely adopted by the Desert Air Force.

While flying to his base alone, over northwest Egypt on 29 August 1941, Caldwell was attacked by two Messerschmitt Bf 109s in a simultaneous approach at right angles. His attackers included one of Germany's most famous Experte ("expert", or ace), Leutnant Werner Schröer. Caldwell's Tomahawk was hit by more than one hundred 7.9 mm bullets and five 20 mm cannon shells, but he shot down Schröer's wingman, and heavily damaged Schröer's aircraft, causing Schröer to disengage. Caldwell sustained three separate wounds from ammunition fragments and/or shrapnel.

On 23 November, Caldwell shot down another Experte, Hauptmann Wolfgang Lippert, Gruppenkommandeur (Group Commander) of II./JG 27, who bailed out. Lippert struck the stabiliser on his way out and following capture had his legs amputated. Ten days later, a gangrene infection set in and he died on 3 December. For this action, Caldwell was awarded the Distinguished Flying Cross. Caldwell claimed five Junkers Ju 87 (Stuka) dive bombers in a matter of minutes on 5 December. For this he was awarded a Bar to his DFC.

Squadron Leader Clive Caldwell (center) receiving his "gapa" (Polish pilot wings). With Zbigniew Urbańczyk (left) and Różański (right)

On 24 December, Caldwell was involved in an engagement which mortally wounded another Luftwaffe ace, Hpt. Erbo Graf von Kageneck (credited with 69 air victories). Caldwell only claimed a "damaged" at the time, but postwar sources have attributed him with the kill.

In January 1942, Caldwell was promoted to Squadron Leader and was given command of No. 112 Squadron RAF, becoming the first Australian to command a British squadron. The 112 Sqn. at that time included a number of Polish aviators, and this was why Caldwell was later awarded the Polish Krzyż Walecznych (KW; "Cross of Valour").

When Caldwell left the theatre later that year, the commander of air operations in North Africa and the Middle East, Air Vice Marshal Arthur Tedder described him as: "[a]n excellent leader and a first class shot". Caldwell claimed 22 victories while in North Africa flying P-40s.

During 1942, Australia came under increasing pressure from Japanese forces, and Caldwell was recalled by the RAAF, to serve as the wing leader of No. 1 (Fighter) Wing, comprising No. 54 Squadron RAF, No. 452 Squadron RAAF and No. 457 Squadron RAAF. The wing was equipped with the Supermarine Spitfire and in early 1943 was posted to Darwin, to defend it against Japanese air raids.

It was due to his leadership, confidence and daring, his work with a contingent of Polish pilots attached to 112 Squadron, and continued success with this squadron that he received the Polish Cross of Valour (Krzyz Walecznych).

112 Squadron Damages and Losses

Feb. 9, 1942 to May 5, 1942- the time Feliks Gazda flew with the 112th

Feb. 12, 1942:

Kittyhawk Mk. I AK584
Flg Off Czeslav Matusiak, (Polish)
A/C destroyed on training flight during practice dog fight, pilot KIA buried in Tobruk cemetery, mentioned in Brian M Thompson 3 Sqn war diary, that the plane went in and burnt

Feb. 15:

Kittyhawk Mk.I AK583/GA X
Sgt Donald Neil McQueen, RAAF (Australian)
A/C damaged Cat II in combat 1755 hours. 112 Sqdn pilot wounded in arms and legs. The last of this group was a plane marked GA-X. Its pilot, Sergeant McQueen, saw the Messerschmitt approaching quickly, but there was nothing he could do about it. Flying just above the ground, he had few maneuver possibilities. He took in the close-range shots tucking in behind his armor plate. The sound of bullets hitting it resembled "hitting the keys of a grand piano without strings". He didn't manage to avoid all of the bullets and was shot in the arms and legs. Its a mystery how he got out of the situation with his plane still in the air.

McQueen had no idea that his attacker, having already shot down four planes, had simply run out of ammunition. Smoking, with a coughing engine, its wings riddled with bullet holes, The "Kittyhawk" flew toward the darkening horizon. The wounded pilot brought it to base, where he managed to land just before losing consciousness. McQueen's wounds were tended, but the ruined AK583 GA-X never flew again.

The German attacker, Otto Schultz, returned to the ground after twenty minutes. He reported five victories and the fact that some of the Curtiss planes he had attacked bore Polish markings on their fuselage. Could it have been one of the Poles, present in the 112 Squadron for a week? Anyway, the victory over McQueen, which crowned today's success, raised the German pilot's victory count to 44. It also earned him the Knight's Cross, handed to him a few days later by Marshal Kesselring, who arrived from Martuba especially for this purpose.

McQueen was the only pilot from the attacked five who managed to survive. On April 13, 1942, he left the hospital in Cairo and returned to his unit on the next day. He was greeted warmly.

Feb. 21:

Kittyhawk Mk. I AK781/ N/A
Sgt Phillip Thornton Elliott, RAAF (Australian)
A/C badly damaged in combat over EL Adem, (cannon shell in the engine).

Feb. 21:

Kittyhawk Mk. I AK678
Sgt. Joseph Derma, (Polish)
A/C crash landed. Pilot ran out of fuel near El Adem,

Feb. 21

Kittyhawk Mk. I AK814
Lt Witold Jander. (Polish)
A/C shot down. Pilot suffered a broken leg in the forced landing, his leg was set in Tobruk and he was sent to England for convalescence. On 25 October 1942. The hospital was bombed by 2 FW190's. Lt Jander was killed in the bombing and buried in Exeter.

Feb. 23:

Kittyhawk Mk. I AK578 GA Y
Flying Off Neville Fredrick Duke, RAF Volunteer Reserve
At 10.000 feet. his engine cut so he force landed. The plane was wore out and was replaced 26 February.

Feb. 27:

Kittyhawk Mk. I AK707/GA Y
No pilot involved. Personal aircraft of Neville Duke
A/C damaged during air raid of Gambut by Bf 109 #5/JG27. We had an early visit from Jerry insofar that five 109's shot up Gambut and wrecked five "Kittyhawks" with another 2 burnt out, whilst another shot down a "Hurricane" directly above us. The Jerry, in turn, was shot to pieces by our ack-ack.

Feb. 27:

Kittyhawk Mk. I AK761
No pilot involved
A/C damaged by enemy strafe of Gambut by 5/JG27

Feb. 27:

Kittyhawk Mk. I AK658/GA X
No pilot involved
Caldwells "Grim Jester" A/C destroyed by enemy strafe of Gambut damaged beyond repair by 5/JG27

Feb. 27:

Kittyhawk Mk. I AK802
No pilot involved
A/C destroyed by enemy strafe of Gambut damaged beyond repair by 5/JG27

Feb. 27:

Kittyhawk Mk. I AK910
No pilot involved
A/C damaged beyond repair by enemy strafe by 5/JG27

Feb. 27:

Kittyhawk Mk. I AK959
Flt Sgt Earl Morse Jackson. RCAF (Canadian)
Aircraft was scrambled as part of 4 aircraft formation. During the scramble this aircraft Spun into the ground after turning to tightly 12M South East of Gambut from approx. 10,000 ft. Pilot KIA

Polish Pilots Suffer Losses in the 112 Squadron

A group of 12 Polish ferry-transport pilots volunteered for RAF service on 29 August 1941 and after training they joined "Shark" squadron in February 1942. In contrast with the great successes for Polish pilots of Skalski's Circus, their endeavours with 112 Squadron weren't as fruitful.

• On 12 February, 1942, Flg Officer Ceslav Matusiak was killed on a training flight while practicing dog fighting. His plane went in and burned.

• In combat with 6 Bf 109 fighters on 21 February 1942 three Kittyhawks of 112 Sqn were downed, two of them piloted by Polish pilots: Sgt. Joseph Derma and Lt. Witold Jander.

• On 13 March 1942 pilots P/O Bartle (English) and Sgt. Rozanski (Polish) left a formation of 12 "Sharks" in the Tobruk area and they were caught by surprise and attacked by Oberfeldtwebel Otto Schulz. Both Kittyhawks were downed, but Rozanski luckily escaped his crashed, burning aircraft. On the following day Sgt. Urbanczyk together with Squadron Leader Caldwell got one Bf 109.

On 15 March 1942, 112 Squadron was moved from the front line to Sidi Haneish for replacements. Polish pilots didn't return to duty in this unit until 16 April 1942.

Feb 29:
2 Kittyhawk left at El Adem when Sqdn moved to Gambut 2
Group Captain Cross
Planes damaged when Group Capt. Cross insisted on being checked out in a Kittyhawk, the cause maybe that Neville Duke had recently crashed the Group Captain's new personal Miles Magister.

March 3:
Kittyhawk Mk. I
450 Sqdn "L" had her nose ripped off by a "Kittyhawk" of 112 Squadron on take-off from Gambut South. The offending "Kitty" had to be crash landed as a result of damage sustained.

March 9:
Kittyhawk Mk. I AK700/GA B
Sgt Phillip Thornton Elliott, RAAF (Australian)
A/C spun in near Gambut Main. Possibly shot down by unseen attack, or damaged during earlier attack on Ju88 - actual cause not known, pilot KIA. Sergeant Elliott's machine obtained heavy damages, and Elliott died of the wounds in two weeks. The plane had suffered hits the day before while being flown by F/O Knapik

March 13:
Kittyhawk Mk. I AK834
Sgt Jerry W Rózanski, (Polish)
A/C shot down near EL Adem. Pilot made a forced landing east of Tobruk, the aircraft exploded shortly after he got out, pilot OK

March 13:
Kittyhawk Mk. I AK632
P/O John (Jack) Phillip Bartle, RAAF (Australian)
A/C shot down near EL Adem, pilot OK

March 14:
Kittyhawk Mk. I AK878/GA C
Sgt Robert Bishop "Punk" Evans "A" Flight RCAF (Canadian)
A/C shot down at Bir Hakeim, by Me202, pilot wounded and put into hospital after parachuting

March 14:
Kittyhawk Mk. I AK900/GA A
Sgt Robert Emil Simonsen, RCAF "A" Flight (Canadian)
A/C shot down at Bir Hakeim, by Mc202, pilot KIA

May 2:
Kittyhawk Mk. I AK578/GA V
Plt Off Felix Francis Joseph Edwards, RAF Volunteer Reserve
A/C Damaged Cat B in combat.

May 2:
Kittyhawk Mk. I AK957/GA D
Fg Off Felix Knoll, PAF (Polish)
A/C Damaged during combat.

May 5:
Kittyhawk Mk. I AK766
S/Ldr Clive Robertson Caldwell, RAAF (Australian)
A/C Slightly damaged during sortie.

Source: http://raf-112-squadron.org/planelosses.html
(All losses from 1939 to 1945 are listed)

Curtiss P-40 Tomahawk

The P-40 was the best known Curtiss-Wright airplane of World War II. The Americans called it the "Warhawk" and the British called early versions "Tomahawk" and later versions "Kittyhawk." It was also one of the most controversial fighters of the war. It was vilified by many as being too slow, lacking in maneuverability, having too low a climbing rate.

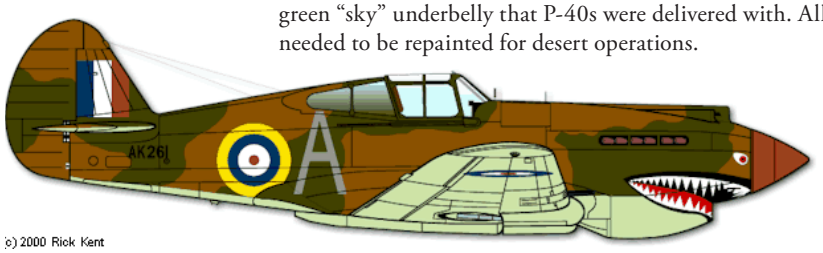
While these criticisms had some degree of validity, it is also true that the P-40 served Allied forces well during the first years of the war. The P-40 had no serious vices and was a pleasant aircraft to fly, and, when flown by an experienced pilot who was fully aware of its strengths and weaknesses, was able to give a good account of itself in aerial combat. The P-40 continued in production long after later types were readily available, the numbers manufactured reaching the third highest total of American World War II fighters, after the Republic P-47 Thunderbolt and the North American P-51 Mustang.

The P-40 was obsolete by European standards even before the first prototype flew, and it never did catch up. The P-40 had been developed as a low-altitude close-support fighter under mid-1930s U.S. tactical concepts which envisaged more need for low-level ground support operations than for high-altitude interceptions. Low-altitude performance and rugged construction received priority over high-altitude capabilities.

At a very early stage, the Curtiss P-40 attracted the attention of foreign air forces. The Americans agreed to defer deliveries of their P-40s so that the Tomahawk I could be supplied to Britain as soon as possible. The first Tomahawk I reached England in September of 1940. Britain quickly concluded that these planes were not suitable for combat, since they lacked armor protection for the pilot, armor-glass windshields, and self-sealing fuel tanks. Nevertheless, since a German invasion was feared to be imminent, they were actually issued to several operational squadrons.

However, the Germans never invaded England, and so the Tomahawk Is were used only for training roles within Britain. Overseas, the first Desert Air Force squadron to be equipped with Tomahawks was No. 112, the squadron that became famous for its "shark's tooth" insignia on the engine air intake.

This Tomahawk carries the dark green/dark earth over gray-green "sky" underbelly that P-40s were delivered with. All needed to be repainted for desert operations.



Tomahawk IIA and IIB variants were active in the Middle East from October of 1941 onward. They shared in the strafing of the retreating Axis troops. The ability of the Tomahawk to absorb an incredible amount of punishment became almost legendary. At low altitudes, the Tomahawk II was actually superior to the Bf 109, but this advantage rapidly disappeared when combat took place at altitudes above 15,000 feet. The weight which handicapped the performance of the Tomahawk did have one tangible benefit–the rugged structure could absorb a terrific amount of battle damage and still allow the airplane to return to base. Although generally outclassed by the Bf 109, the Tomahawk was a capable fighter in the hands of experienced pilots such as Neville Duke. Wing Commander Clive Caldwell of the RAAF scored more than twenty victories while flying a Tomahawk in the Middle East.

The It is with the Flying Tigers in China that the P-40 achieved immortality. Chinese Army Brigadier General Claire Chennault went to the U.S. in November 1940 to recruit pilots for the American Volunteer Group (AVG) of the Chinese Air Force. General Chennault acquired 100 P-40s. By the time of Pearl Harbor, some 80 American pilots were serving with the AVG. Contrary to popular understanding, the AVG did not actually enter combat until after Pearl Harbor. The famous "shark's tooth" marking did not originate with the Flying Tigers, but was copied from the markings used by the Tomahawks of the RAF's No. 112 Squadron in North Africa, who copied it from a German squadron.

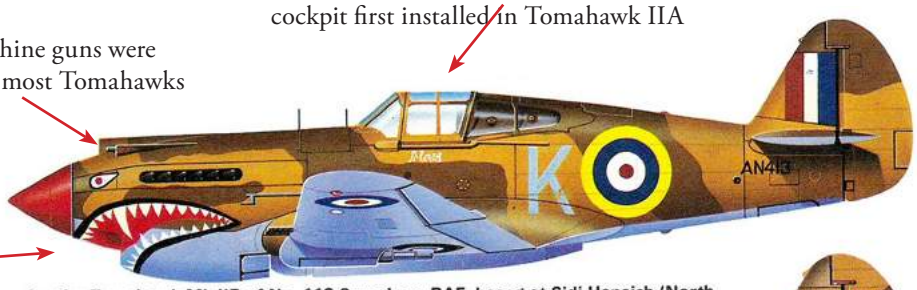
Curtiss P-40C Tomahawk IIA

Role	Fighter aircraft
National origin	United States
Manufacturer	Curtiss-Wright Corporation
First flight	13 March 1941
Based on	P-40B, P-40
Number built	930
Crew:	1
Length:	31.67 ft (9.66 m)
Wingspan:	37.33 ft (11.38 m)
Height:	12.33 ft (3.8 m)
Empty weight:	6,070 lb (2,753 kg)
Max. takeoff wt:	8,810 lb (4,000 kg)
Powerplant:	1 × Allison V-1710-33 liquid-cooled V12 engine, 1,040 hp
Maximum speed:	352 mph (566 km/h)
Range:	730-1230 mi (1,173-1977 km)
Service ceiling:	32,400 ft (9,875 m)
Rate of climb:	2,100 ft/min (11 m/s)
Guns:	2 x 0.50 in. Browning machine guns in the nose. 4 x 0.30-inch Brownings in wings

Bulletproof canopy and armor for the cockpit first installed in Tomahawk IIA

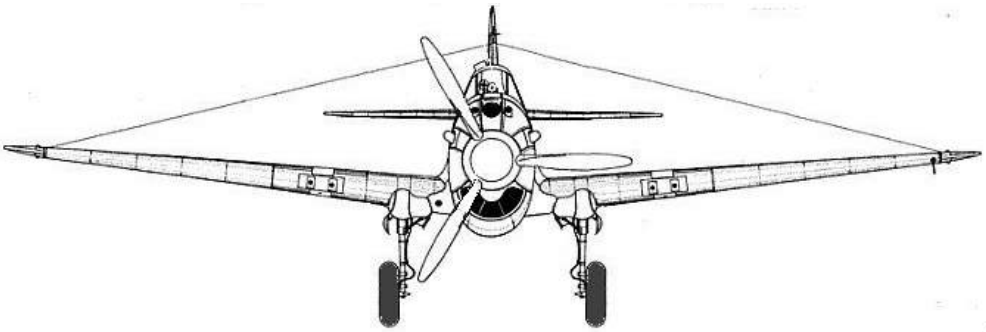
Two 0.50 in. machine guns were mounted here on most Tomahawks

"Shark mouth" design varied from plane to plane. The Tomahawk had a smaller air intake than the later Kittyhawks.

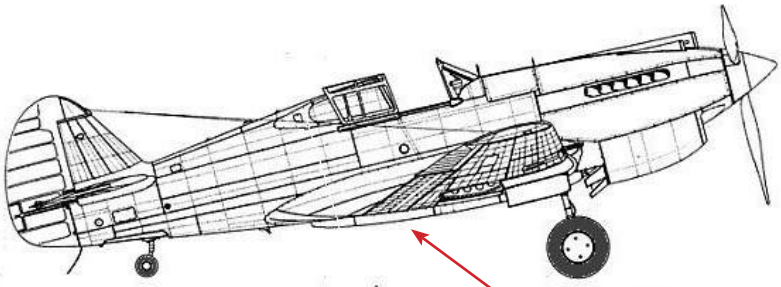


Curtiss Tomahawk Mk IIB of No. 112 Squadron, RAF, based at Sidi Haneish (North Africa) in autumn 1941.

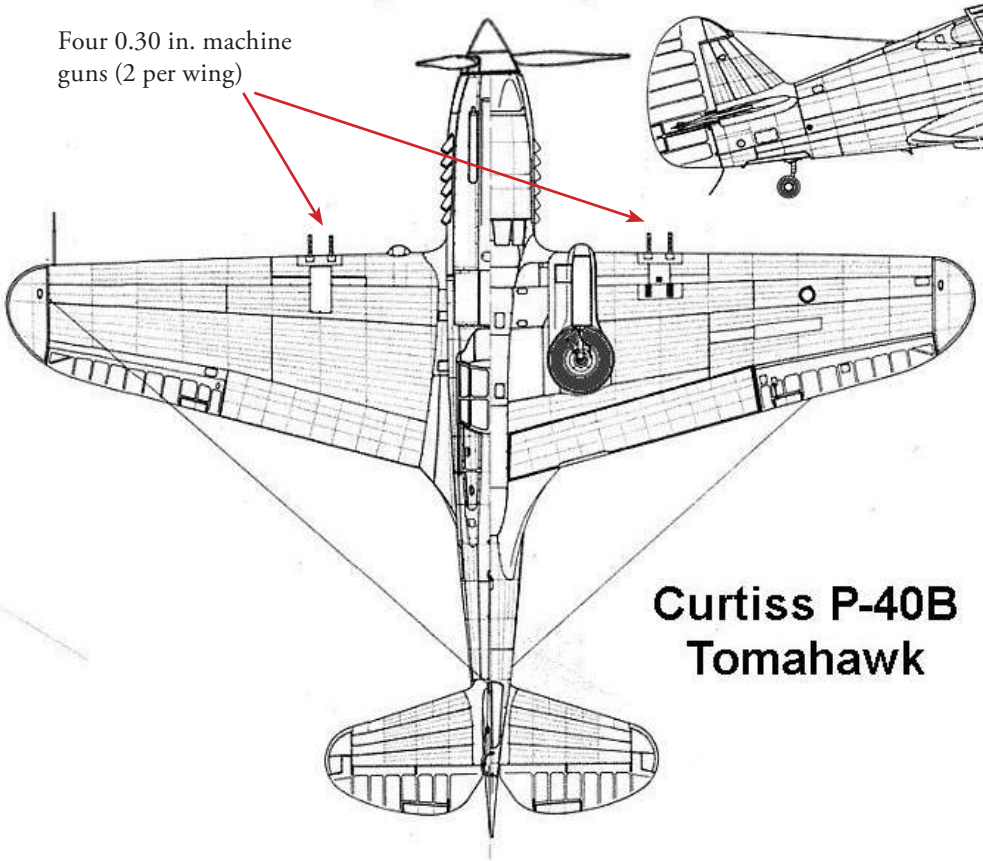
Curtiss Tomahawk Mk IIB of No. 112 Squadron, RAF, based at Sidi Haneish (North Africa) in October 1941.



Four 0.30 in. machine guns (2 per wing)



The fuselage hard-point could carry one 500 lb bomb or a 50-gallon drop tank.



Curtiss P-40B Tomahawk

The Kittyhawk

The Kittyhawk Mark I was the name given by the RAF to the Curtiss P-40D, an improved version of the P-40C Tomahawk. A improved Mark 1A entered service in 1942 and was replaced by more advanced Kittyhawk variants during 1943. Additional improved variants were also named Kittyhawk, with different marks.

This was the first version armed with six .50 caliber machine guns. More powerful than the Tomahawk in terms of both armor, armament and performance, this was the type which fought as a fighter during the most crucial period in both the Pacific and North African campaigns. The P-40E played a major role in the defense of Australia and New Guinea in 1942, and with the Desert Air Force (DAF) in intense fighting against the Luftwaffe and Regia Aeronautica also in 1942. The P-40E was also an important type for the Soviets.

In the Desert War the arrival of the Kittyhawk led to the early retirement of the Messerschmitt Bf 109E and its replacement by the faster and more maneuverable Bf 109F. The top- scoring DAF squadrons, including No. 3 Squadron RAAF and No. 112 Squadron RAF, transitioned from the Tomahawk to the Kittyhawk, scoring many kills against Luftwaffe and Regia Aeronautica types, helping the DAF hold on through this tough period.

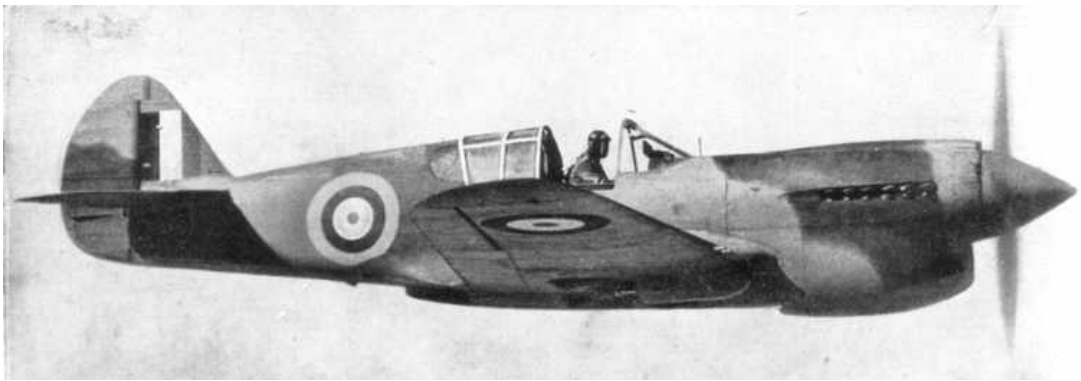
Later versions had more powerful Allison engines, and one version, the Kittyhawk Mk. II, was powered by a Merlin engine built in the U.S. by the Packard Motor Co.

Many of the Merlin-powered Kittyhawks were lightened in the field to make them 'hot' by removing some armor and wing guns. The lighter version was nicknamed "Gypsy Rose Lee" after the famous stripper. Some had four guns some only had two, top speed for this type was 368 mph, climb and acceleration were better as well. This fighter could cope with the Bf 109F and G within its effective performance ceiling.

As the more advanced North American P-51 Mustang entered service in significant numbers in 1943, the Kittyhawk's role changed. Many were used as fighter-bombers (the "Kittybomber").

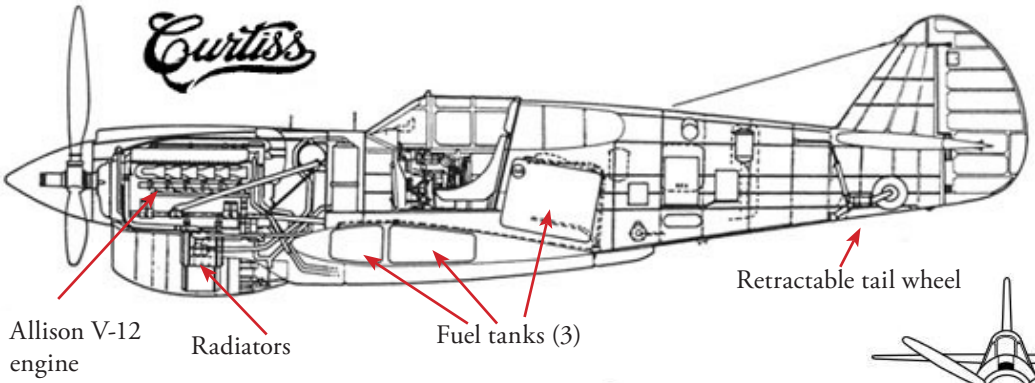
Vintage Wings of Canada's P-40N is painted in the exact Desert Air Force markings of 260 squadron ace James F. "Stocky" Edwards who flew the P-40 throughout the war in North Africa and is Canada's highest scoring surviving fighter pilot with 20 victories and six probables.

Pilots flew with the canopy open during take off and landing in order to make a quick excape if something went wrong.



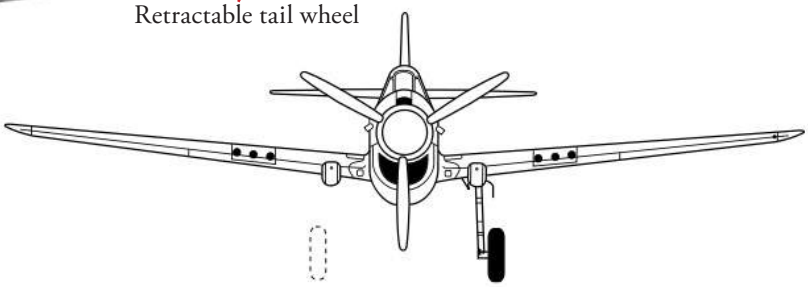
Kittyhawk Mk IV (P-40N)

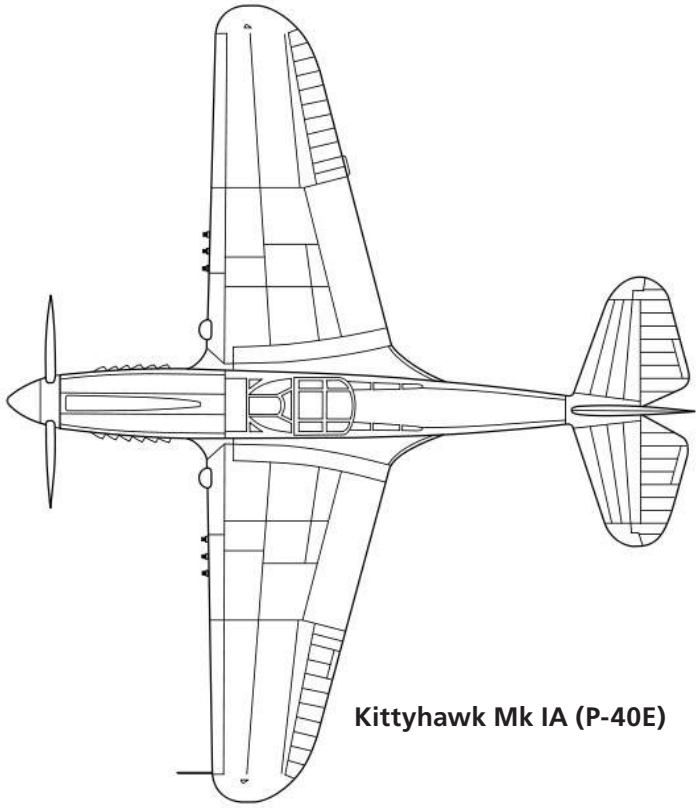
The later version Kittyhawk Mk. IV had an extended tail and cooling vents just behind the prop.



Curtiss P-40E Kittyhawk Mk IA

Role	Fighter aircraft
National origin	United States
Manufacturer	Curtiss-Wright Corp.
First flight	14 October 1938
Produced	1939–1944 (for all P-40 variants)
Number built	13,738 (for all P-40 variants)
Unit cost	US$44,892 in 1944
Crew:	1
Length:	31.67 ft (9.66 m)
Wingspan:	37.33 ft (11.38 m)
Height:	12.33 ft (3.76 m)
Empty weight:	6,070 lb (2,753 kg)
Max. takeoff wt:	8,810 lb (4,000 kg)
Powerplant:	1 × Allison V-1710-39 liquid-cooled V12 engine, 1,150 hp
Maximum speed:	360 mph (580 km/h)
Cruise speed:	270 mph (435 km/h)
Range:	650 mi (1,100 km)
Service ceiling:	29,000 ft (8,800 m)
Rate of climb:	2,100 ft/min (11 m/s)
Guns:	6 × 50 caliber Browning machine guns with 235 rounds per gun in the wings
Bombs:	250 to 1,000 lb bombs to a total of 2,000 lb on 3 hard points (1 under the fuselage and 2 underwing)





Kittyhawk Mk IA (P-40E)

The Kittyhawk

A comment from Nicky Barr, 3 Sqn RAAF:

"I would evade being shot at accurately by pulling so much G-force, that you could feel the blood leaving the head and coming down over your eyes. And you would fly like that for as long as you could, knowing that if anyone was trying to get on your tail they were going through the same bleary vision that you had, and you might get away. I had deliberately decided that any deficiency the Kittyhawk had was offset by aggression. And I'd done a little bit of boxing – I beat much better opponents simply by going for them. And I decided to use that in the air. And it paid off."

Behind the Shark Mouth: This Kittyhawk has the front cowling removed to show the three massive radiators located below the Allison V-12 liquid-cooled engine. Right and left are for the glycol engine coolant, the lower center is the engine oil cooler. Cowl flaps (or "gills" as the British labeled them) are just behind and below the radiators (one can be seen in this photo). They can be open to increase air flow on the ground or in hot temps, closed for reduced drag at altitude or at high speed.

Kittyhawk Mk. 1

Kittyhawks of the Desert War

Kittyhawk Mk. I, 112 Squadron, RAF, Amirya, Egypt, October 1942

The 112 Squadron Kittyhawk I shown here is thus a six-gunned aircraft with the serial number AK 675 repainted in black. These Kittyhawks were painted the North African desert camouflage of Dark Earth-Mid Stone with Azure Blue on the underside. The code letters "GA", which 112 used form June, 1941, until the end of the war, plus the individual identification letter "F" are in white. Note that the whole area in the middle of the shark mouth is red, the front teeth are curved, and this aircraft has no eyes. The red in the shark mouth was always brighter than the dull red in the national insignia and on the propeller spinner.

Kittyhawk Mk. IA, 112 Squadron, RAF, Amirya, Egypt, October 1942

The basic camouflage scheme is the same as for the Mk.I (above) but the markings differ somewhat. The roundels and fin flash have the narrow (2 inches) white and yellow introduced in July 1942. This aircraft also has the yellow wing leading edges outboard of the guns, a feature that was also quite common on Kittyhawks and some other single-engined fighters in the Mediterranean Theatre even on the desert finish; indeed many had the yellow right up to the fuselage. This aircraft has the usual red propeller spinner of this theatre as did all of 112 Sqn's aircraft from the Tomahawk onwards to the Mustang by the end of WW II in Italy. Yet again, the middle of the mouth is red, but the teeth are quite different from the previous Mk.I profile; also this aircraft has its eyes in place. The other thing of note is that the white code letters are fairly thin in stroke and quite square in shape, something that became a feature of most of the Squadron's aircraft for the rest of the war.

The Kittyhawk once flown by F/Lt Feliks Gazda

According to the photo on the first page of this document, the aircraft in this illustration was flown by F/Lt Gazda at least once in March, 1942. Other sources say it was also flown by 112 Squadron Leader Clive Robertson Caldwell. The aircraft in the photo and the drawing on this page is carrying a 250-lb GP Bomb, fitted with a surface-burst impact fuse, under the fuselage. This aircraft was lost on a ground attack mission near Bir Hacheim Libya on 30 May 1942, shortly after F/Lt Gazda left the squadron. Its Australian pilot, Pilot Officer H. G. Burney, was killed.

Incidently, the GA Y identification was applied to more than one Kittyhawk in the Desert Air Force. GA stood for the 112 squadron, the Y was for the individual aircraft. All 24 letters were used, and then some- a "?" was sometimes used among other symbols. When one plane was destroyed, its three letter ident was painted on a replacement. Only the serial number (AK 772) was unique to one aircraft.

Kittyhawk Mk I of the 112 Sqn, No. 239 wing,
211 Group, Desert Air Force at Gambut Air Base, Libya.
Code letters: GA Y, RAF Serial no. AK 772
Nicknamed "Pride of London"

This artwork depicts Kittyhawk GA Y shooting at a Messerschmitt Bf 109, causing it to break up.

Photos of a detailed model of Kittyhawk GA Y. Note that the ident letters on the right side, along with the rondell, could be read "YOGA."

The camouflage scheme is as most Kittyhawks in the 112 Squadron: dark earth and middle stone for the uppeer surfaces. The machine was delivered to the RAF in the Curtiss factory scheme of dark green, dark earth with a light grey underside. To better suit the desert environment in which the aircraft were to be operated, the dark green was over painted with the light brown color "middle stone" which was applied freehand with a spray gun in the field. Azure blue replaced the light grey on the undersides of most Kittyhawks. The aircraft's serial number is painted on a dark green rectangle which was a result of a simple mask being applied over the area when the middle stone color was sprayed over the dark green. While most Kittyhawks had an azure blue underside, AK772's is dark blue. Some say the color is Mediterranean Blue, others say Deep Sky. Other peculiarities include the over painted left hand edge of port fuselage roundel and the lack of yellow wing leading edge stripes.

Tomahawk and Kittyhawk Variants

Tomahawk IIB- AK354

P-40 or Tomahawk I

The first production variant. 199 built. A 1040 hp Allison V-1710-33 engine. It had one 0.30-inch in each wing, two 0.50-inch guns in the nose. It lacked bulletproof windshields, armor for the pilot and self-sealing fuel tanks, but the British pressed these into service into North Africa anyway.

P-40A designation was skipped.

P-40B or Tomahawk IIA

Identical to the Tomahawk I except it had protective armor and self-sealing tanks. A total of 110 were built for the RAF.

P-40C or Tomahawk IIB

It had four 0.303-inch Browning machine guns in the wings in addition to the two nose-mounted 0.50-in guns. A total of 930 were built. It was fitted with a new fuel system with 134 gallons in new tanks with improved self sealing. In addition, provisions were made for a 52-gallon drop tank below the fuselage.

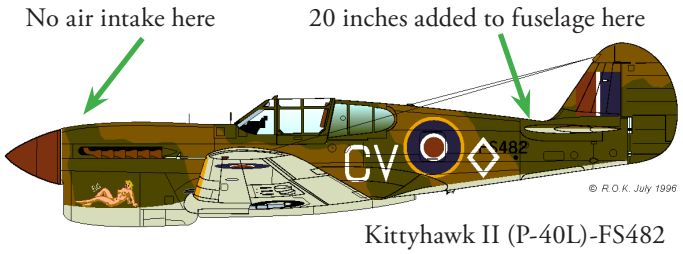
Kittyhawk I- AK675

P-40D or Kittyhawk I

Less than 50 were made. With a new, larger Allison engine, slightly narrower fuselage, redesigned canopy, and improved cockpit, the P-40D eliminated the nose-mounted 12.7 mm guns and instead had a pair of 12.7 mm guns in each wing. The distinctive chin airscoop grew larger so they could adequately cool the large Allison engine.

P-40E or Kittyhawk IA

This variant was similar in most respects to the P-40D, except for a slightly more powerful engine and an extra 12.7 mm (.50 caliber) machine gun in each wing, bringing the total to six. Some aircraft also had small underwing bomb shackles. The P-40E was the variant that bore the brunt of air-to-air combat in the key period of early to mid 1942 with the RAF/Commonwealth in North Africa. The top scoring DAF squadrons, including No. 112 Squadron RAF, transitioned from the Tomahawk to the Kittyhawk, scoring many kills against Luftwaffe and Regia Aeronautica. Time in Service 1942–43. (The Kittyhawk in the Canada Aviation and Space Museum in Ottawa is a IA variant.)



Kittyhawk II (P-40L)-FS482

P-40F or Kittyhawk II

Both the F and L variants featured the Packard V-1650 Merlin engine in place of the normal Allison, and thus did not have the carburetor scoop on top of the nose. The Merlin took in air at the bottom of the engine. Both had a fuselage stretched by 1 foot 8 inches in front of the vertical stabilizer to compensate for higher torque and thus make for better stability. Performance for these models at higher altitudes was better than their Allison-engined cousins. The Packard Merlin engine improved performance, but the single stage, two-speed supercharger still limited the effective ceiling to about 20,000 feet.

P-40L or Kittyhawk II

The P-40L was sometimes nicknamed “Gypsy Rose Lee”, after a famous stripper of the era, due to its stripped-down condition (2 wing guns were deleted). A total of 330 of this version were supplied to the Commonwealth air forces under the designation Kittyhawk Mk II.

Kittyhawk III (P-40K)-FL900

P-40K or Kittyhawk III

Had an Allison engine with the nose-top scoop retained and the Allison-configured nose radiators scoop, cowl flaps. Did not have the stretched fuselage. Time in Service 1942–43

P-40M or Kittyhawk III

Generally similar to the P-40K, but with a stretched fuselage like the P-40L and powered by an Allison V-1710-81 engine giving better performance at altitude compared to previous Allison versions. It had some detail improvements and it was characterized by two small air scoops just before the exhaust pipes. These were the slowest and heaviest P-40 variants.

Specifications of key Tomahawk and Kittyhawk Variants

Aircraft Variant	P-40B Tomahawk IIA	P-40E Kittyhawk IA	P-40F Kittyhawk II	P-40N Kittyhawk IV
Powerplant	Allison V-1710-33 1040 hp	Allison V-1710-39 1150 hp	Packard Merlin V-1650 1300 hp	Allison V-1710-115 1360 hp
Length	31' 8" (9.66 m)	31' 8" (9.66 m)	33' 4" (10.16 m)	33' 4" (10.16 m)
Wingspan	37' 4" (11.4 m)	37' 4" (11.4 m)	37' 4" (11.4 m)	37' 4" (11.4 m)
Height	12' 4" (3.8 m)	12' 4" (3.8 m)	12' 4" (3.8 m)	12' 4" (3.8 m)
Wing Area	235.9 ft^2 (21.9 m^2)	235.9 ft^2 (21.9 m^2)	235.9 ft^2 (21.9 m^2)	235.9 ft^2 (21.9 m^2)
Empty Weight	5,590 lb (2,535 kg)	6,350 lb (2,880 kg)	6,590 lb (2,990 kg)	6,405 lb (2,905 kg)
Max. Takeoff Wt	7,600 lb (3,447 kg)	8,810 lb (4,000 kg)	9,350 lb (4,238 kg)	8,860 lb (4,020 kg)
Maximum Speed	352 mph (566 km/h)	360 mph (580 km/h)	364 mph (585 km/h)	378 mph (608 km/h)
Cruise Speed	n.a	270 mph (435 km/h)	n.a.	280 mph (455 km/h)
Range	730-1230 mi (1173-1977 km)	650 mi (1050 km)	700 mi (1125 km) 1500 mi (2400 km) with drop tank	745 mi (1200 km)
Service Ceiling	32,400 ft (9875 m)	29,000 ft (8840 m)	34,400 ft (10,500 m)	31,000 ft (9450 m)
Climb Rate	2860 ft/min (14.5 m/sec)	2100 ft/min (10.7 m/sec)	n.a.	2240 ft/min (11.4 m/sec)

Kittyhawk IV-FX740

P-40N or Kittyhawk Mk IV

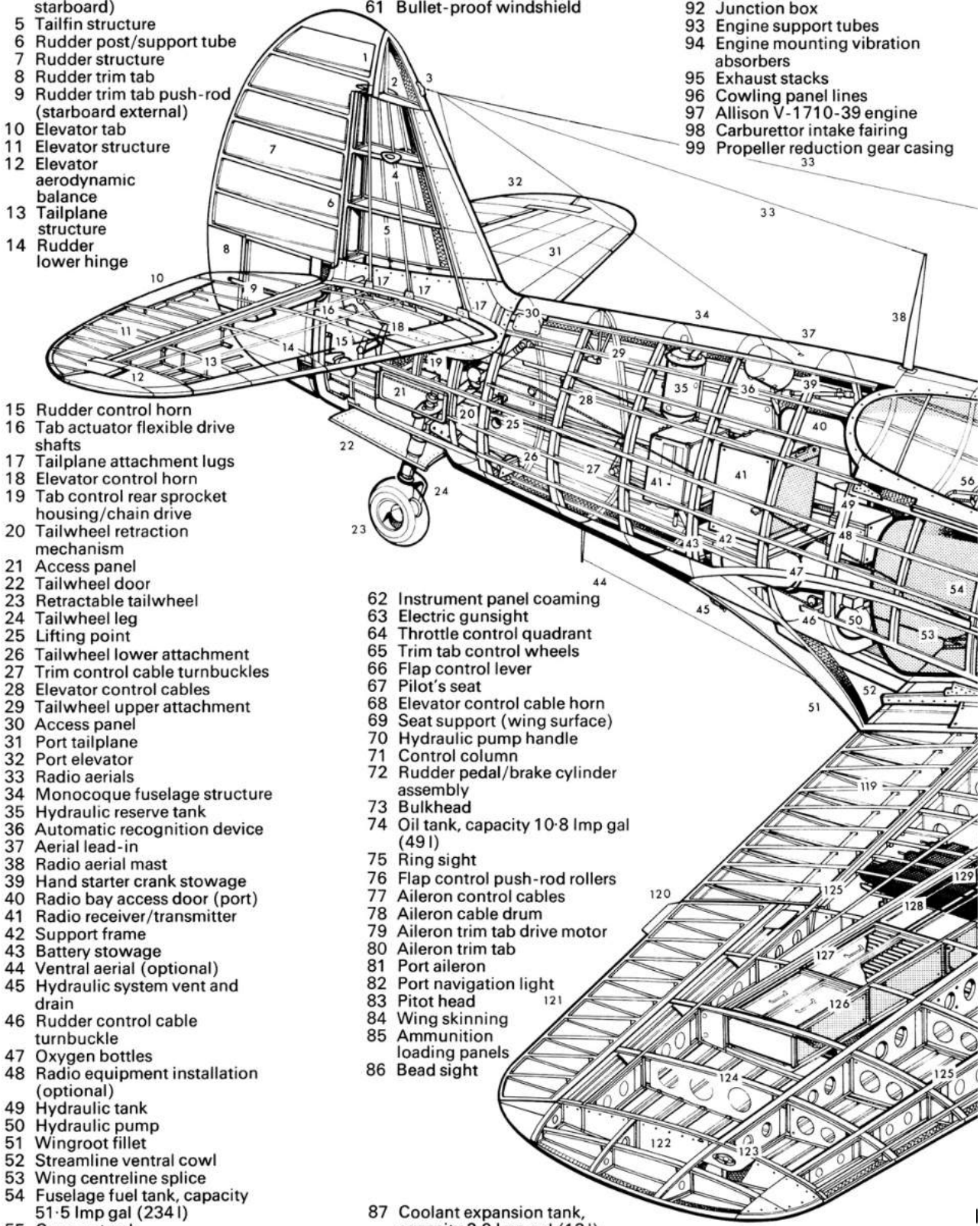
The final production model featured a stretched rear fuselage to counter the torque of the larger, late-war 1300 hp Allison engine, and the rear deck of the cockpit behind the pilot was cut down at a slant to improve rearward visibility. Subvariants of the P-40N ranged widely in specialization from stripped down four-gun "hot rods" that could reach the highest top speeds of any production variant of the P-40 (up to 380 mph), to overweight types with all the extras intended for fighter-bombing or even training missions. This version was the most produced of all P-40s, with 5,220 examples built. In other theaters it was principally used as a fighter/bomber. Manufactured 1943-44.

XP-40Q (Experimental)

Had a 4-bladed prop, cut-down rear fuselage and bubble canopy, supercharger, squared-off wingtips and tail surfaces, and improved engine with two-speed supercharger. But its performance was not enough of an improvement to merit production. The XP-40Q was, however, the fastest of the P-40 series with a top speed of 422 mph (679 km/h) as a result of the introduction of a high-altitude supercharger gear.

RAF Serial Numbers

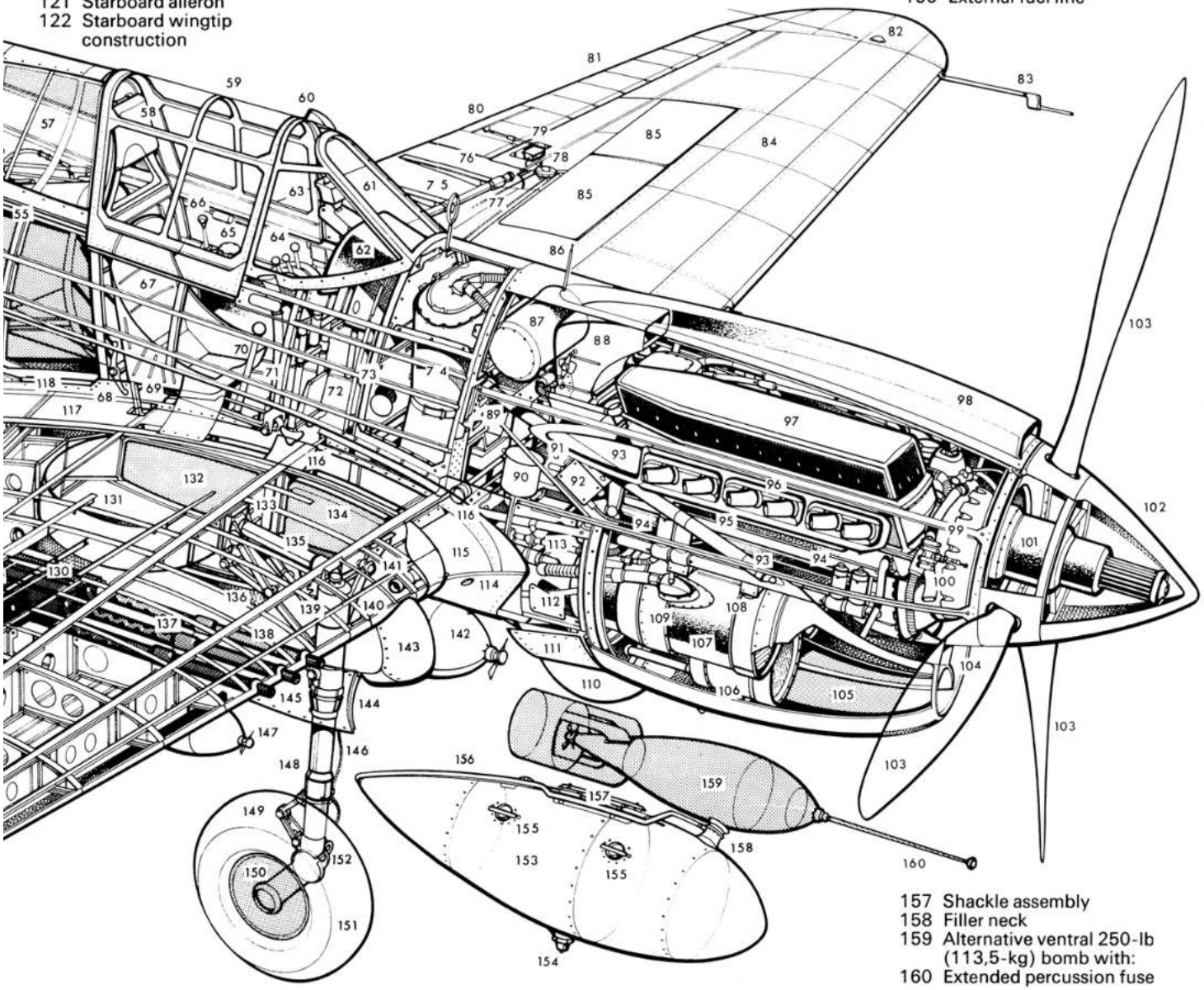
Version	RAF serial numbers
Tomahawk Mk. I	AH741..880
Tomahawk Mk. IIA	AH881..990
Tomahawk Mk. IIB	AH991..999 (all to VVS) AK100..570 (36 to AVG) AM370..519 (64 to AVG) AN218..517
Kittyhawk Mk. I & Mk. IA	AK571..999 AL100..230
P-40E-1 (Kittyhawk Mk. IA)	ET100..999 EV100..699
Kittyhawk Mk. II (P-40Fs and Ls)	FL219..448
Kittyhawk Mk. II (P-40L)	FS400..499
P-40K-1 and Kittyhawk Mk. III	FL875..905 FR111..115 FR210..361 FL710..713
Kittyhawk Mk. III (P-40K)	FL714..730 FR116..140 FR385..392 FR413..521
Kittyhawk Mk. III (P-40M)	FR779..872 FS100..269
Kittyhawk Mk. IV	FS270..399 (all to VVS) FT849..954 FX498..847



1 Rudder aerodynamic balance
2 Rudder upper hinge (port external)
3 Radio aerial bracket/insulator
4 Rear navigation light (port and starboard)
5 Tailfin structure
6 Rudder post/support tube
7 Rudder structure
8 Rudder trim tab
9 Rudder trim tab push-rod (starboard external)
10 Elevator tab
11 Elevator structure
12 Elevator aerodynamic balance
13 Tailplane structure
14 Rudder lower hinge
15 Rudder control horn
16 Tab actuator flexible drive shafts
17 Tailplane attachment lugs
18 Elevator control horn
19 Tab control rear sprocket housing/chain drive
20 Tailwheel retraction mechanism
21 Access panel
22 Tailwheel door
23 Retractable tailwheel
24 Tailwheel leg
25 Lifting point
26 Tailwheel lower attachment
27 Trim control cable turnbuckles
28 Elevator control cables
29 Tailwheel upper attachment
30 Access panel
31 Port tailplane
32 Port elevator
33 Radio aerials
34 Monocoque fuselage structure
35 Hydraulic reserve tank
36 Automatic recognition device
37 Aerial lead-in
38 Radio aerial mast
39 Hand starter crank stowage
40 Radio bay access door (port)
41 Radio receiver/transmitter
42 Support frame
43 Battery stowage
44 Ventral aerial (optional)
45 Hydraulic system vent and drain
46 Rudder control cable turnbuckle
47 Oxygen bottles
48 Radio equipment installation (optional)
49 Hydraulic tank
50 Hydraulic pump
51 Wingroot fillet
52 Streamline ventral cowl
53 Wing centreline splice
54 Fuselage fuel tank, capacity 51·5 Imp gal (234 l)
55 Canopy track
56 Fuel lines
57 Rear-vision panels
58 Pilot's headrest
59 Rearward-sliding cockpit canopy
60 Rear-view mirror (external)
61 Bullet-proof windshield
62 Instrument panel coaming
63 Electric gunsight
64 Throttle control quadrant
65 Trim tab control wheels
66 Flap control lever
67 Pilot's seat
68 Elevator control cable horn
69 Seat support (wing surface)
70 Hydraulic pump handle
71 Control column
72 Rudder pedal/brake cylinder assembly
73 Bulkhead
74 Oil tank, capacity 10·8 Imp gal (49 l)
75 Ring sight
76 Flap control push-rod rollers
77 Aileron control cables
78 Aileron cable drum
79 Aileron trim tab drive motor
80 Aileron trim tab
81 Port aileron
82 Port navigation light
83 Pitot head
84 Wing skinning
85 Ammunition loading panels
86 Bead sight
87 Coolant expansion tank, capacity 2·9 Imp gal (13 l)
88 Carburettor intake
89 Engine bearer support attachment
90 Air vapour eliminator
91 Hydraulic emergency reserve tank
92 Junction box
93 Engine support tubes
94 Engine mounting vibration absorbers
95 Exhaust stacks
96 Cowling panel lines
97 Allison V-1710-39 engine
98 Carburettor intake fairing
99 Propeller reduction gear casing

Curtiss Kittyhawk IA (P-40E)

100 Coolant thermometer
101 Propeller hub shaft
102 Spinner
103 Curtiss Electric propeller
104 Radiator (divided) intakes
105 Intake trunking
106 Oil cooler radiator (centreline)
107 Glycol radiators (port and starboard)
108 Radiator mounting brackets
109 Glycol radiator intake pipe
110 Port mainwheel
111 Controllable cooling gills
112 Access panel (oil drain)
113 Engine bearer support truss
114 Fresh air intake
115 Wingroot fairing
116 Fuselage frame/wing attachment
117 Walkway
118 Wing/fuselage splice plate
119 Split flap structure
120 Aileron fixed tab
121 Starboard aileron
122 Starboard wingtip construction
123 Starboard navigation light
124 Wing rib
125 Multi (7)-spar wing structure
126 Inboard gun ammunition box (235 rounds)
127 Centre gun ammunition box (235 rounds)
128 Outboard gun ammunition box (235 rounds)
129 Three 0·50-in (12,7-mm) M-2 Browning machine guns
130 Ammunition feed chute
131 Starboard wheel well
132 Wing centre-section main fuel tank, capacity 42·1 Imp gal (191 l)
133 Undercarriage attachment
134 Wing centre-section reserve fuel tank, capacity 29·2 Imp gal (133 l)
135 Retraction cylinder
136 Retraction arm/links
137 Machine gun barrel forward support collars
138 Blast tubes
139 Bevel gear
140 Undercarriage side support strut
141 Gun warm air
142 500-lb (227-kg) bomb (ventral stores)
143 Undercarriage oleo leg fairing
144 Undercarriage fairing door
145 Machine gun ports
146 Hydraulic brake line
147 One (or two) underwing 40-lb (18-kg) bomb(s)
148 Oleo leg
149 Torque links
150 Axle
151 30-in (76,2-mm) diameter smooth-contour mainwheel tyre
152 Tow ring/jack point
153 Ventral auxiliary tank, capacity 43·3 Imp gal (197 l)
154 Vent line
155 Sway brace pads
156 External fuel line



157 Shackle assembly
158 Filler neck
159 Alternative ventral 250-lb (113,5-kg) bomb with:
160 Extended percussion fuse

Kittyhawk Cockpit

As you can see in the two photos, instrument panel layouts varied across the many versions of the P-40, but the main controls were in the same places for all versions.

Carb air intake control

Electric gun sight

Manual gun sight

Crank to open/close canopy

Magneto switch

Prop control

Throttle

Fuel mixture control

Fuel tank selector

Rudder trim

Elevator trim

Landing Gear control

Flap Control (hidden) is just aft of the Landing Gear control.

Control stick
(Firing button on top)
push stick forward to pitch down and descend
pull back to pitch up and climb
move to the right to roll wings clockwise and turn right
move to the left to roll counterclockwise and turn left
stick swivels 360˚, so one can climb and turn at the same time, etc.

Fuel gage (wing tank)

Hydraulic system hand pump (used to raise and lower landing gear)

Cowl Flap lever

Kittyhawk Instrument Panel

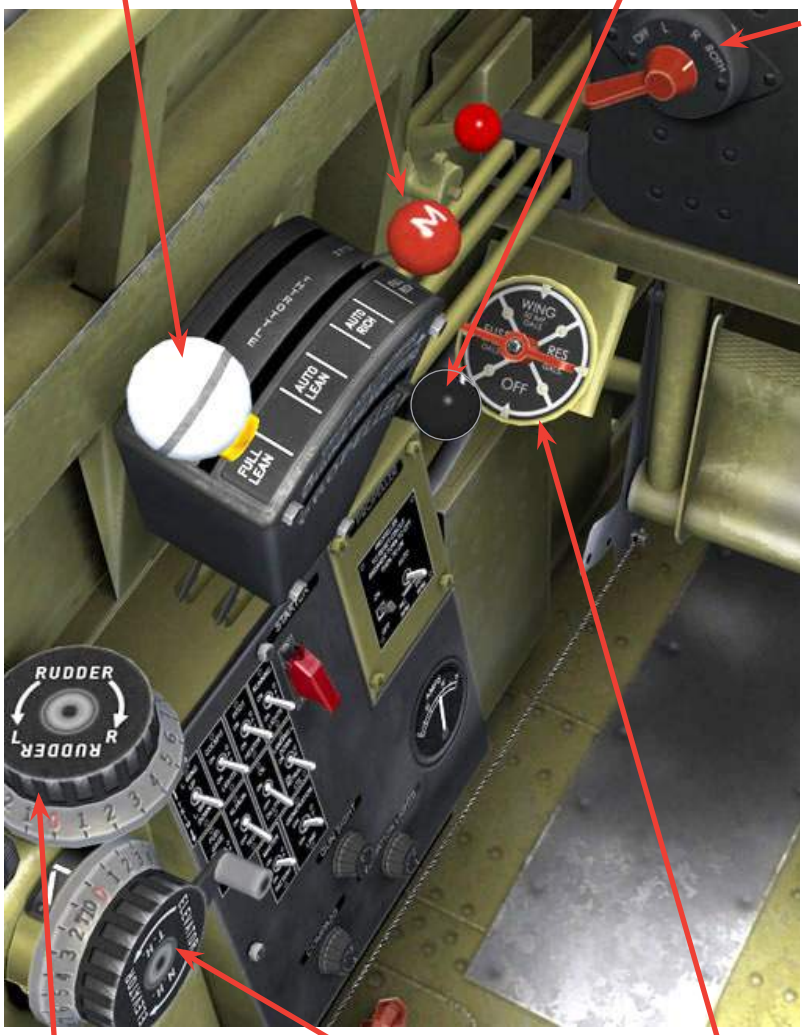
This panel has a few modern instruments (Tach, Manifold Pressure VHF radio), but is otherwise pretty close to what F/Lt Gazda looked at in combat.

Piloting the Kittyhawk

Throttle (white ball)
Push forward to increase gasoline flow to the engine and increase RPMs.

Mixture (red ball)
4 settings: Full Lean, Auto Lean, Auto Rich, Full Rich, Controls fuel flow.

Prop (black ball)
The propeller's pitch was adjusted electrically.



Magneto Switch
Two engine-driven magnetos provide electricity to the spark plugs.

Rudder trim (top) and **Elevator trim** (below)
These controls move small trim tabs on the rudder and elevator. A pilot can adjust these tabs to permit flying with hands off the control stick. For example, when climbing, the pilot will pull back on the control stick. If the climb will take more than a few seconds, the pilot will adjust the elevator trim so the plane will climb without the need to keep pulling back on the control stick. The rudder trim adjusts the rudder to keep the plane flying straight without yaw to left or right, something that can happen at different engine RPMs.

Fuel tank selector
The Kitty had three fuel tanks:
one in the fuselage, just behind the pilot's seat (51.5 Imp gal/ 234L), a main tank in the wing center section just below the pilot's seat (42.1 Imp gal/191L) and a reserve tank just in front of the wing main tank- under the pilot's feet (29.2 Imp gal/133L)

A Flight in the Kittyhawk

Pre-flight and engine startup

Ignition off.
Flaps neutral.
Parking brake set.
Do a visual inspection outside of the aircraft check ailerons, elevator, and rudder, look for leaks, loose bolts, etc.
Climb inside cockpit.
Set fuel tank to RESERVE.
Turn on switches for battery, generator, prop safety, fuel pump.
Set Prop control switch to AUTO.
Set Cowl flaps to SHUT.
Ammeter should read 45 amps.
If cold start, set Carb heat to COLD.
Move Magneto switch to BOTH.
Depress Primer two times.
Set Throttle one inch open.
Set Mixture to Full Rich.
Make sure area around the prop is clear of people, objects.
Engage starter button.
Rev engine to 800–1000 rpm.
Move Mixture to AUTO RICH.
With canopy OPEN, taxi to run-up area.
Oil temp: it should be 40 to 60˚C.
Oil pressure should be 60-80 lbs.
Radiator temp should be 80˚C.
Set Prop switch to MANUAL.
Rev engine to 2200 rpm.
Check Magneto function Left and Right and watch tach for differences - no more than 26 inches of mercury showing on the Manifold Pressure gauge.
Set magneto to BOTH.
Set prop switch to AUTO.

Takeoff

Make sure attitude gyro is uncaged.
Check Glycol (coolant) warning by toggling the warning test switch on the lower left side of your cockpit panel.
Check that Mixture is still Auto Rich.
Set flaps to 10 degrees.
Set elevator trim tabs for take-off.
Check engine oil pressure, oil temp, coolant temp, and vacuum.
If engine is running too warm, open up cowl flaps to ¾.
Ease throttle to no more than 40 inches of mercury as shown on the Manifold Pressure (MP) gauge. As the plane begins to move, you may have to apply a little brake until the tail gets sufficient airflow to the rudder.
Even though the P-40 has no wild inclination to veer left, still a little right rudder should be applied on takeoff roll.
Rotate at 110 mph.
Raise landing gear and ease off the flaps as you get a positive climb and wheels are securely in the wheel well.

Climb

To climb, set throttle back to 35 inches of mercury MP. The best climb rate to 16,000 ft. is at 150-160 mph at 35 inches MP or 2600 rpm.
Ease mixture to between auto rich and auto lean at 5000 ft AGL. Set trim to approx 5.8 degrees or 43 to 45 percent. This should allow you to climb at 2100 ft/min at 140 mph.
At 10,000 feet, set mixture to 35 percent for best climb and maintaining 2600 rpm and 35 inches of MP. Turn on your oxygen.

Cruising at 14,000-16,000 ft

For high speed cruise, set RPM to 2600, Mixture Auto Rich, MP at 35 in.
For normal cruising, set RPM to 2280 with manifold pressure at 27.9, Mixture set to auto rich.
For economy cruise, set to 2190 rpm, manifold at 25.2 inches, switch the prop from Auto to manual and ease off the mixture until you see a drop of 40-50 rpms, then switch propeller control back to automatic.
The aircraft tends to yaw to the right so left rudder trim is needed to maintain straight flight.

Aerobatics

Aerobatics may be carried out on this aircraft. Due to the controls being powerful and moderately light, the aerobatic qualities are good, but great care must be exercised to see that all aerobatics are carried out at sufficient height to enable the pilot to recover from a dive, spin, or stall without exerting excessive loads on the aircraft. Care should also be taken to ensure that speed is maintained during aerobatics in the looping plane.

Stalls

- Clean (wheels up, flaps up): tail buffets at 68 kts, stall and spin at 58 kts.
- Flaps down, wheels up: tail buffets at 62 kts, stall with no spin at 53 kts, recovery is automatic.
- Wheels down, flaps up: tail buffets at 58 kts and stalls at 53 kts, recovery was difficult with opposite rudder and reduced power, aircraft fell from 14,000 to 3,580 before recovering, many spins.

* Wheels down, flaps down 5,000 ft AGL: tail buffets at 58 kts and stalls at 53 kts, one spin, easy recovery, lost 1,000 feet.

Rolls

- 12,000 feet, 250 kts IAS (indicated Air Speed), mixture at 35% throttle at full: very responsive, loss of 120 feet.
- 20,000 feet 250 kts IAS, mixture at 21%, full throttle: somewhat sluggish and mushy.

* 29,000 feet 212 kts IAS, mixture at 18%, full throttle, 23 in. MP, 3,000 rpms: quick roll resulted in a stall and spin to 22,000 feet.

Sharp Turns

- 29,000 feet AGL, 212 kts IAS, mixture 18%, full throttle: combat turn was somewhat sluggish and resulted in tail buffet and black-out if turning too tightly.

* 20,000 feet AGL, 220 kts IAS: 360 degree tight turn reasonably quick with no buffeting or blackout.
* 12,000 fee AGL, 220 kts IAS, 360 degree tight combat turn: full black-out but quick recovery, tail buffeting when black-out started, let up on stick just enough to return to full recover while continuing my turn.

Dives

- 29,000 feet, 200 kts at start of dive, dive goes into overspeed at 368 kts IAS. Maximum permissible airspeed is 470 mph, beyond that speed you would experience compressibility, and you will receive an overspeed warning followed by a break-up of the aircraft. At 470 mph IAS, at this altitude your true airspeed is 658 mph. At this speed your controls become useless.

Flaps must never be used in an attempt to reduce diving speed. They can separate from the aircraft.
As the speed of the dive increases, you will notice a tendency for the aircraft to yaw right. Before it reaches a critical point, you will want to add a bit of left rudder.
Before you begin your dive, you should put your prop into a course pitch, and open your throttle only slightly. Do not attempt to dive with full throttle.

Landing

Begin descent 8-10 km out at an altitude of 3000 ft AGL (Above Ground Level).
Set fuel selector to FUSELAGE tank.
Set mixture to FULL RICH
Set cowl flaps to ½
Turn on carb heat
Open cockpit canopy
Lower landing gear at speeds under 175 mph.
At 140 mph, add 10˚ flaps and hold the nose of the aircraft up until a speed of 120 mph is reached. Do not lower your flaps at speeds of over 140 mph IAS. Be prepared to compensate for the extreme nose drop once flaps are applied.
Maintain 95 to 100 mph on final approach as your landing will be engine assisted, not a power-off glide
Center up on the runway, better to come in a little high so as to give a good view of the runway centerline.
Lower speed accordingly and flare using your engine, let the aircraft land on the main wheels and ease back to the tail wheel. Make sure you don't hit tail wheel first!
Raise flaps and open cowl flaps fully.
Turn carb heat off.
Taxi to parking spot.

That's it. You have just taken a flight in this legendary aircraft.

Canada's Kittyhawks

A Kittyhawk Mk.I is currently stored in the Reserve Hangar of the Canada Aviation and Space Museum, Rockcliffe Airport, Ottawa. Visitors can tour the hanger which holds dozens of significant aircraft.

The Museum's Kittyhawk was manufactured by the Curtiss-Wright Corporation in Buffalo, New York, in 1942 for the RAF, but was diverted to the RCAF on March 23, 1942, on loan from the RAF. It was issued to 132 Squadron, forming at Rockcliffe Airport, and was then moved to British Columbia, where it served as a trainer successively at Sea Island, Patricia Bay, Tofino, and Boundary Bay until 1943. The aircraft then went to No. 3 Training Command at Montreal in January 1944, and to No. 2 Training Command at Winnipeg in June 1945. It was then stored at Vulcan, Alberta, until it was brought to Rockcliffe Airport in 1964, when it was transferred by the RCAF to the Museum and placed on display.

Vintage Wings of Canada owns this flyable Kittyhawk Mk. IV, as well as a Hurricane and Spitfire. It is located at the Ottawa/Gatineau Airport (CYND) 20 minutes from downtown Ottawa. The address is 1699 Rue Arthur Fecteau Street, Gatineau, Quebec, Canada, J8R 2Z9

The bottom of Kittyhawks were painted light blue to blend into the sky over the desert. You can see that the wheels, when retracted, were not covered. This is a photo of Vintage Wings' Kittyhawk.

Oujda Air Base, Morocco: ". . a Fiery Furnace"

Note: F/Lt Gazda's logbook shows flights from Oujda to airports in the Mediterranean area to deliver aircraft, namely Dakotas and DC-3s. Here is a description of life in that air base.

A C-47 with glider in tow training at Oujda, French Morocco, North Africa, on 17 June 1943." (Gives an idea of the terrain around the Oujda training base.)

William A. Clark, an airman in the U.S. 82nd Division, often made comment that the time at Oujda was the worst he experienced during the entire war. Matthew Ridgway, Commanding General of the 82nd Airborne handpicked the area near Oujda in French Morocco as the Division's training base. He believed the conditions there would harden the troopers for the extreme trials of combat they would soon face.

From Ridgway's autobiography: "We had picked, on purpose, land that was not in use for grazing or agricultural purposes. We trained in a fiery furnace, where the hot wind carried a fine dust that clogged the nostrils, burned the eyes, and cut into the throat like an abrasive. We trained at first by day, until the men became lean and gaunt from their hard work in the sun. Then we trained at night, when it was cooler, but the troopers found it impossible to sleep in the savage heat of the African day. The wind and the terrain were our worst enemies. Even on the rare calm days, jumping was a hazard, for the ground was hard, and covered with loose boulders, from the size of a man's fist to the size of his head."

Oujda was located about 30 miles (48km) from the coast, a few miles outside of the town of Oujda on flat, open ground adjacent to a large French airfield. It was unbearably hot, with temperatures in the shade of 115 to 120 degrees Fahrenheit (46 to 49 degrees Celsius). Cases of heat exhaustion quickly mounted, but it wasn't only the heat that made Oujda the hell it was. It was the flies and the sand and the diseases they carried.

The African flies attacked without mercy. A prevailing wind brought in the flies and sand contaminated with animal dung. These got into everything. Cases of Typhus and Malaria sprang up and were soon followed by waves of dysentery which quickly spread through the camp, making no distinctions across rank.

"An entrenching tool became a standard part of everyone's daily uniform. This malady was so universal and struck so suddenly it became commonplace to see someone break ranks and tear off to some unoccupied part of the desert, with no explanation needed or demanded. Toilet paper became more valuable than French franc notes," wrote Allen Langdon in "Ready: A World War II History of the 505th Parachute Infantry Regiment."

The soldiers denounced the food at Oujda as terrible, but with everyone suffering from the 'runs' at one time or another, it was perhaps their least concern. Everything they were fed was the same canned or powdered stuff given to just about every World War II US Army outfit. It was a monotony of things like salmon, eggs, Spam, chipped beef, bread, mashed potatoes, and beans mixed in with disease-carrying flies and dung infested sand. They had no access to roughage in the form of vegetables and fruit, so their gums developed painful gingivitis. Water was a huge issue in the heat and its scarcity meant no showers were available. They were each given half a canteen of water a day to wash and shave. The hot, heavily chlorinated drinking water was barely consumable and it burned their throats.

In the midst of all this misery, the men were subjected to an intense training schedule. Due to the heat, Colonel Gavin was forced to change the timing for infantry training exercises. Infantry training began at dusk and finished at dawn. They trained in infantry tactics designed specifically for Airborne troops. Individual training concentrated on refining hand-to-hand combat skills and bayonet fighting.

Initially an extensive program of jump training was scheduled, but it was soon discovered that an unforeseen strong wind blew across the area for days on end presenting a big problem for parachuting. The high winds and the rocky terrain around the drop zone led to a large number of injuries. In the end Ridgway and Gavin were forced limit the practice jumps and focus on tactical ground training. Even with the truncated jump training program all troopers got in at least one practice jump in while at Oujda. Gavin and Ridgway worried that it wasn't enough. Ridgway personally believed the 82nd was ill prepared and doomed to a disastrous failure in the upcoming Sicily invasion, but outwardly he projected an indomitable optimism and confidence in his men.

Part 7

The Mediterranean

S/L Gazda Ferrys Planes in the Mediterranean Area

In the fall of 1943, with the disbanding of the Polish Aircraft Delivery Unit, Gazda became part of the 216 Transport and Ferry Group. From this point on, the scope of his duties changed, and he ferried planes throughout North Africa and the Mediterranean Sea (Sicily, Italy, and Gibraltar), adding Spitfires, Mustangs, Beaufighters, Ansons, Dakotas and Wellingtons to the types of aircraft he was flying.

216 Air Transport and Ferry Group RAF

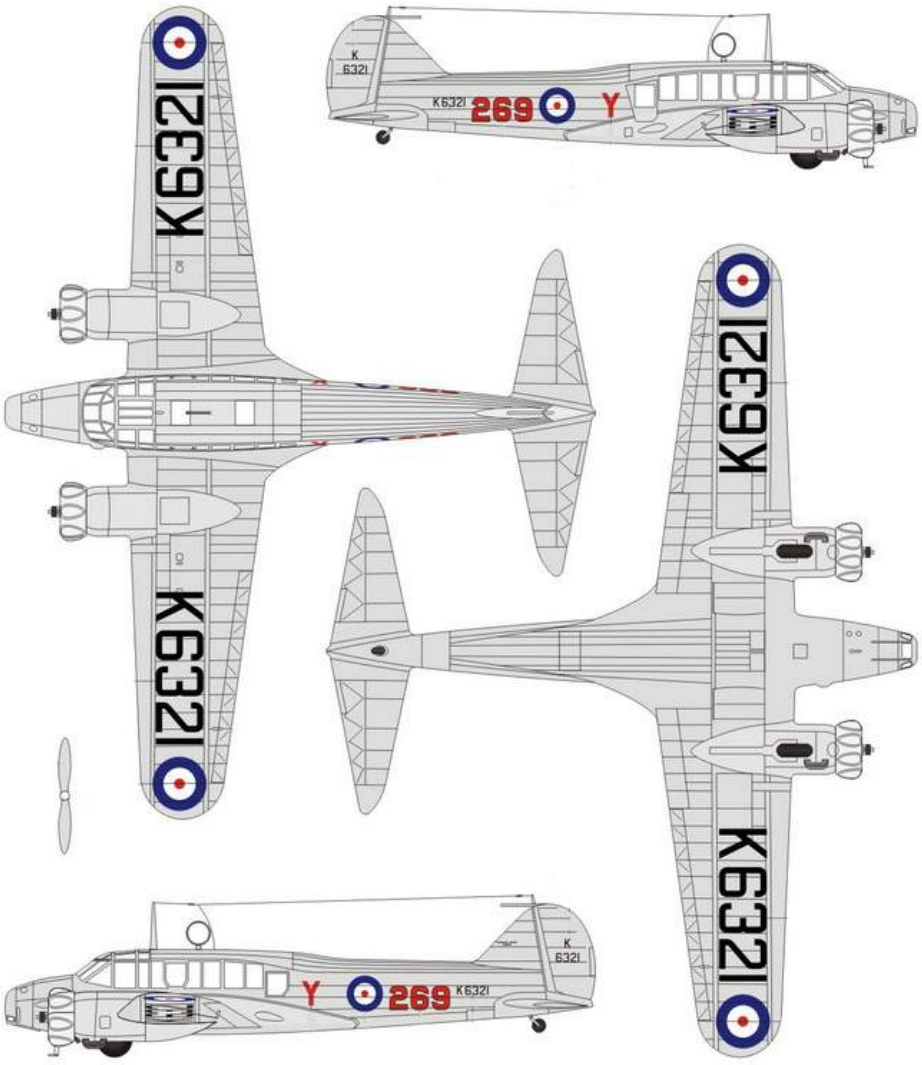
The 216 Ferry Group was a command of the Royal Air Force (RAF) during World War II established on May 21, 1942. The group was renamed No. 216 Air Transport and Ferry Group on September 9, 1942.

No. 216 Group became a major sub-command of the Mediterranean Air Command that was created at the Casablanca Conference in January 1943. The group was sometimes aided by British Overseas Airways Corporation in the receiving, preparing, and dispatching of aircraft reinforcements into the North African and Mediterranean Theater of Operations.

The routes shown above were listed in F/Lt Gazda's pilort logbook for flights in DC-3s and Dakotas.

Avro Anson

Flown from Oujda to Sale, Morocco, 1943 or 1944



The Anson was the first RAF monoplane with a retractable undercarriage. The gear retraction mechanism required no fewer than 140 turns of the hand crank by the pilot. To forgo this laborious process, early model aircraft often made short flights with the landing gear extended at the expense of 30 mph of cruise speed. A total of 11,020 Ansons were built by the end of production in 1952, making it the second-most-numerous (after the Vickers Wellington), British multi-engined aircraft of the war.

At the start of the Second World War, there were 26 RAF squadrons operating the Anson in both Coastal Command and Bomber Command. However, by this time, it was obsolete in the roles of bombing and coastal patrol and was being superseded by the A.W. Whitley and Lockheed Hudson.

The aircraft's true role, however, was to train pilots for flying multi-engined bombers such as the Avro Lancaster. The Anson was also used to train the other members of a bomber's aircrew, such as navigators, wireless operators, bomb aimers and air gunners. Postwar, the Anson continued in the training and light transport roles. The last Ansons were withdrawn from RAF service with communications units on 28 June 1968.

Avro Anson

Role	Bomber, patrol, trainer
Manufacturer	A.V. Roe, Ltd.
Introduction	1936
Primary users	Royal Air Force
Produced	1936–1952
Number built	11,020
Crew:	3-4
Length:	42 ft 3 in (12.88 m)
Wingspan:	56 ft 6 in (17.22 m)
Height:	13 ft 1 in (3.99 m)
Wing area:	463 ft2 (43.01 m2)
Empty weight:	5,512 lb (2,500 kg)
Max. takeoff wt:	8,500 lb (3,900 kg)
Powerplant:	2 × Armstrong Siddeley Cheetah IX radial engines, 350 hp each
Maximum speed:	188 mph (302 km/h)
Range:	790 mi (1,271 km)
Service ceiling:	19,000 ft (5,791 m)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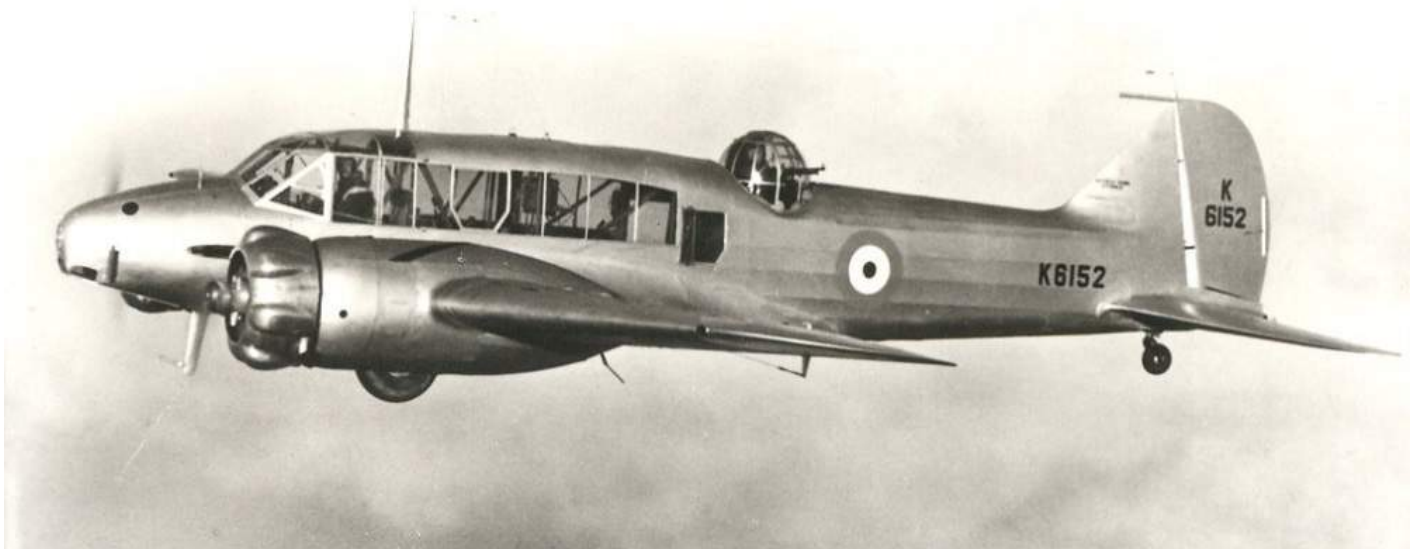
K6183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Douglas C-47 Dakota

The Douglas DC-3 is one of the most important aircraft ever built. It enabled airlines to make profits for the first time, and was the primary airliner in the world from 1935 to well into the 1950s. The C-47 military verson of the DC-3 played a significant role in the Allied victory in WWII. General Dwight D. Eisenhower, Supreme Commander of Allied Forces in Europe, termed it one of the three most vital pieces of military equipment used to win the war, along with the Jeep and the M-1 rifle.

The DC-3 was born of the intense competition for modern commercial aircraft in the early 1930s. It was the direct descendant of the 12-passenger DC-1, which first flew in 1933 as Douglas' response to Boeing's 10-passenger Model 247, the first, low-wing, all-metal airliner. The DC-1 was the prototype of the larger, more powerful 14-passenger DC-2, of which 193 were built for TWA, American, Braniff and Eastern in the U.S and KLM in Europe.

In 1934, American Airlines asked Douglas for a larger version of the DC-2 that would have a fuselage wide enough to permit sleeping accommodations for transcontinental flights. Douglas responded with the DST (Douglas Sleeper Transport), which first flew on December 17, 1935, and entered service on June 25, 1936. It carried seats for 26 passengers for daytime travel. The seats could be converted into 14 railroad style berths (7 upper, 7 lower) for overnight travel. Douglas soon offered a 21-passenger version without berths, which they named "DC-3."

Recognizing its great potential as a military transport, the United States Army specified a number of changes needed adapt the aircraft for military use, including more powerful engines, the removal of airline seating in favor of utility seats along the walls, a stronger rear fuselage and floor, and the addition of a large loading door. A large order was placed in 1940 for the military DC-3, which was designated C-47 and became known in the U.S. as the "Skytrain."

During World War II, the armed forces of many countries used the C-47s for the transport of troops, cargo, and wounded. In Europe, the C-47 and a specialized paratroop variant, the C-53 Skytrooper, were used in vast numbers in the later stages of the war, particularly to tow gliders and drop paratroops. In the Pacific, with careful use of the island landing strips of the Pacific Ocean, C-47s were even used for ferrying soldiers serving in the Pacific theater back to the United States.

The 2000 C-47s in British and Commonwealth service were given the name "Dakota," possibly inspired by the acronym "DACoTA" for Douglas Aircraft Company Transport Aircraft. The C-47 also earned the informal nickname "Gooney Bird" in the European theater of operations.

As a supply plane, the C-47 could carry up to 6,000 pounds of cargo. It could also hold a fully assembled jeep or a 37 mm cannon. As a troop transport, it carried 28 soldiers in full combat gear. As a medical airlift plane, it could accommodate 14 stretcher patients and three nurses.

C-47s remained in active military service long after the end of World War II. They played a critical role in the 1948 Berlin Airlift and saw action in the Korean and Vietnam wars. More than 300 DC-3/C-47 aircraft are still flying, 80 years after the first one flew.

Douglas C-47B (Dakota IV)

Role:	Military transport
National origin:	United States
Manufacturer:	Douglas Aircraft Company
First flight (DC-3):	17 December 1935
First Flight (C-47B):	23 December 1941
Number built :	13,177
Crew:	4 (Pilot, Co-Pilot, Navigator, Radio Operator)
Capacity:	28 troops
Payload:	6,000 lb (2,700 kg)
Length:	63 ft 9 in (19.43 m)
Wingspan:	95 ft 6 in (29.41 m)
Height:	17 ft 0 in (5.18 m)
Empty weight:	18,135 lb (8,226 kg)
Loaded weight:	26,000 lb (11,793 kg)
Max. takeoff weight:	31,000 lb (14,061 kg)
Powerplant:	2 × Pratt & Whitney R-1830-90C Twin Wasp supercharged 14-cyl. engines, 1,200 hp each
Maximum speed:	224 mph (360 km/h)
Cruise speed:	170 mph (257 km/h)
Range:	1,600 mi (2,575 km)
Ferry range (extra tanks):	3,600 mi (5,795 km)
Service ceiling:	26,400 ft (8,045 m)

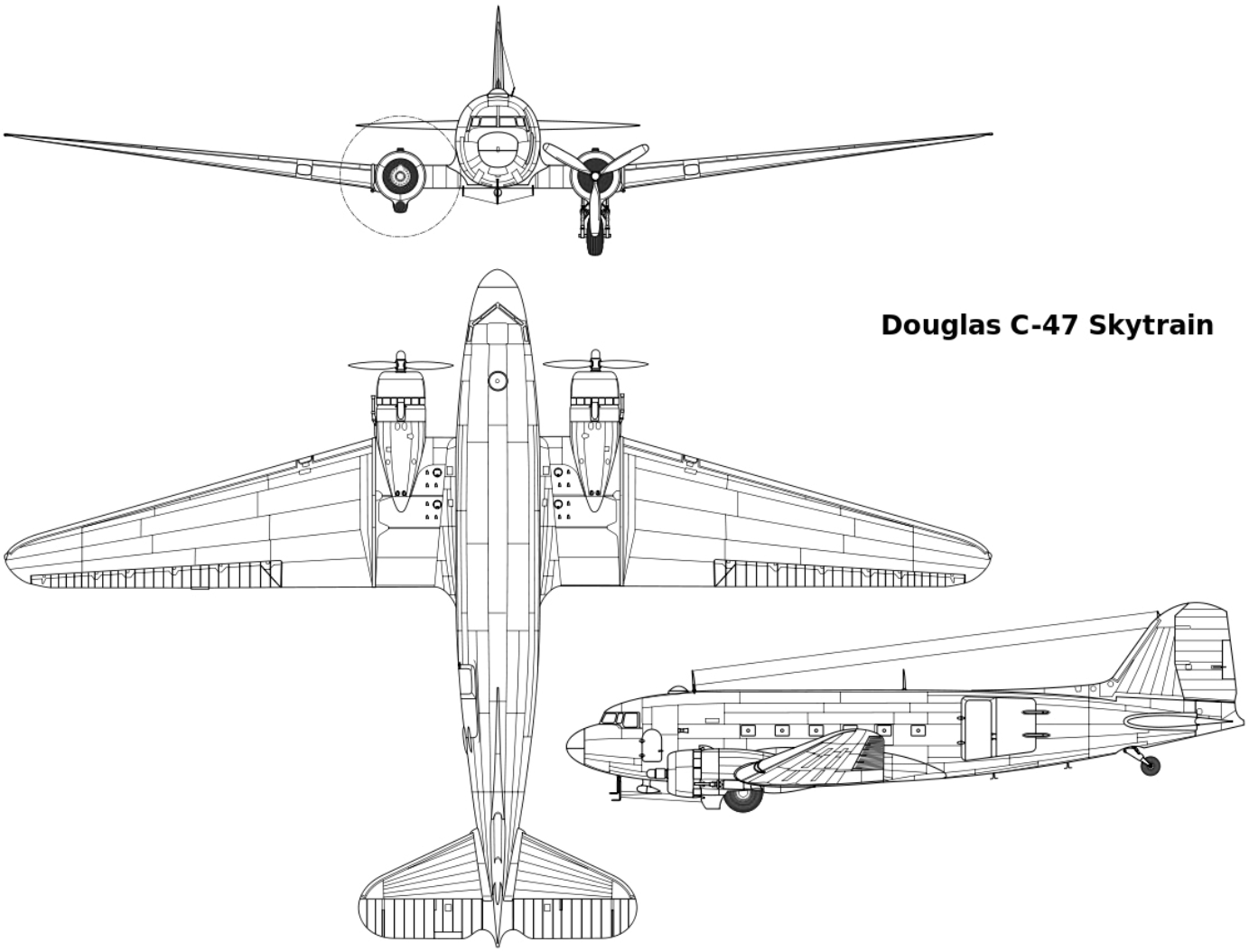
Major Variants:

C-47 (Dakota I)- Initial military version of the DC-3. Two Pratt and Whitney R-1830-92 engines, 1200 hp. 965 built

C-47A (Dakota III)- the C-47 with a 24-volt electrical system, 5,254 built

C-47B (Dakota IV)- Powered by R-1830-90 engines with superchargers and provisions to carry extra fuel in the cabin to cover the China-Burma-India routes, 3,364 built

C-53 Skytrooper (Dakota II)- similar to the C-47 but without the large cargo door (it had the same door as the DC-3) ane without the reinforced floor. It was designed as a paratroop carrier or VIP transport.



This view of a C-47B cabin looks forward. The two large 100-gallon drums hold extra fuel to extend the range of the aircraft. The tanks are mounted right at the aircraft's center of balance over the wing. Behind the tanks are two types of seats- padded center-facing and the metal "bucket" seats that paratroopers in full gear rode in on the way to a drop.

Douglas DC-3 and C-47 Skytrain Production

Civilian Douglas DC-3:
607 built between 1936 and 1942

DST (Douglas Sleeper Transport): The initial DC-3 version built for American Airlines, first revenue flight June 25, 1936. Had 24 seats which were converted into 14 berths for overnight travel. Powerplant: Two Wright R-1820 Cyclone 9-cyl. radial engines, 1,100 hp each. Only 40 DSTs were built.

DC-3: The 21-seat airliner that entered service in 1936. Wright R-1820 engines.

DC-3A: The 21-seat airliner with Pratt & Whitney R-1830 Twin Wasp 14-cyl. two-row radial engines, 1,200 hp each.

DC-3B: The 21-seat airliner with more powerful Wright R-1830 Cylcone engines, 1200 hp each.

Military Douglas C-47:
9,963 built between 1941 and 1945

C-47 Skytrain: 965 built. Based on the civil DC-3A, powered by 2 × Pratt & Whitney R-1830-92 radials, rated at 1,200 hp each. It differed from it's civil brother in having a large 2-part freight-door on the port side, reinforced cabin floor with tie-down rings, increased wingspan by 6 in, provision for as many as 9 auxiliary cabin fuel tanks of 100 US gal each, and an astrodome in the top of the fuselage behind the flight deck. Later aircraft of this version also featured attachments under the center of the wings for large loads that could be paradropped, and revision of the tail so it could tug gliders.

C-47A Skytrain: 5,253 built. Identical to the C-47, but with improved cabin heating, and the electical system's voltage increased from 12 Volts to 24 Volts.

C-47B Skytrain: 3,232 built. Identical to the C-47A, but because this version was meant for high altitude transport over large and high mountain ranges, it was powered by 2 × Pratt & Whitney R-1830-90C radials fitted with two-stage superchargers, rated at 1,200 hp each. An additional 133 TC-47B navigational trainer aircraft were built in 1942.

C-53 Skytrooper: 221 built. Identical to the C-47 but with the same small main door as the civil DC-3 and without the reinforced cabin floor of the C-47. These were solely used as 28-seat troop transports (7 rows of seats, two abreast on each side of an aisle) and for glider tug duties.

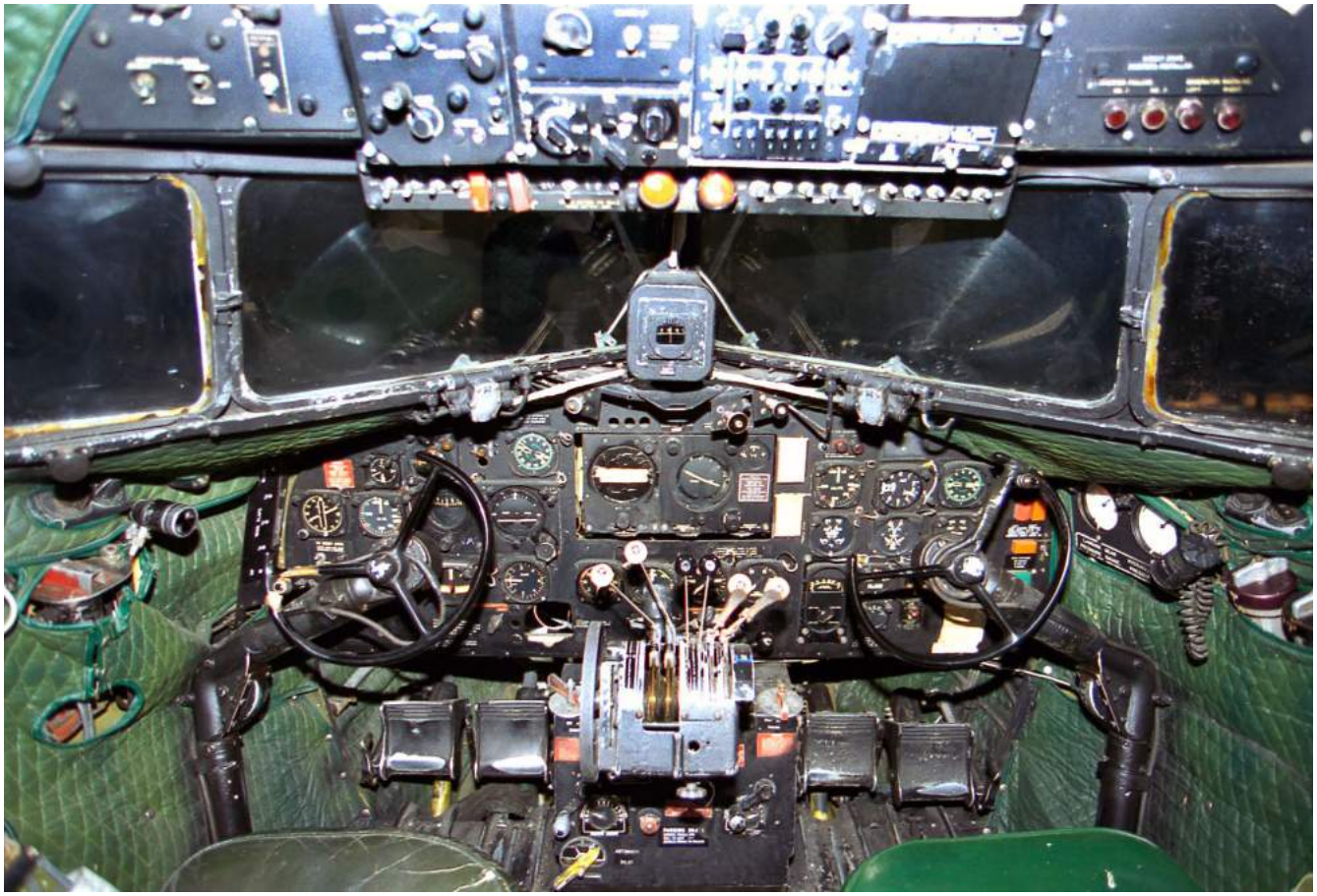
C-53D Skytrooper: 159 built. Identical to the C-53, except for the placement of 14 bucket seats along each side of the cabin.

In addition, 201 U.S. civilian airliners were impressed into military service in 1942. Depending on the model DC-3, they were given the designation C-48, C-49, C-50 and C-52,

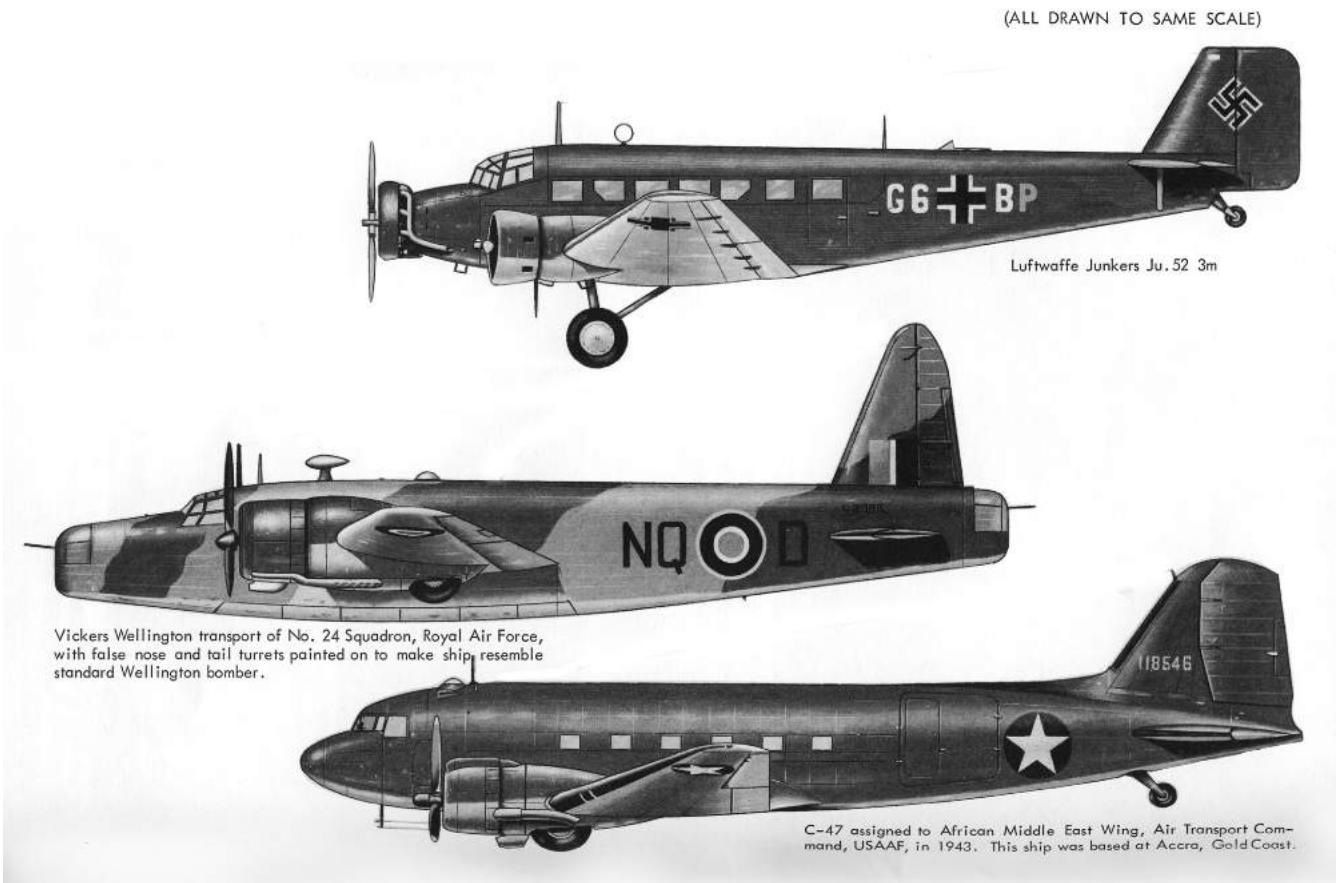
he Japanese built 485 versions which they designated L2D Showa. The Russians built 4937 C-47s under license, which they designated Li-2. This added 5422 to the total DC-3 based aircraft built for a total of 15,992 built world-wide.

C-47s for the RAF:
1926 total transferred from the U.S.

Dakota Mk I: 61 C-47 aircraft
Dakota Mk II: 7 of the DC-3 civil aircraft impressed into military service.
Dakota Mk III: 962 C-47A.
Dakota Mk IV: 896 C-47B.



C-47 cockpit. Dual controls and two sets of flight instruments. Center pedestal has levers for the throttle, mixture and propeller pitch. A large wheel on the left side of the pedestal controls elevator trim. Ceiling panel has switches for the electrical system.

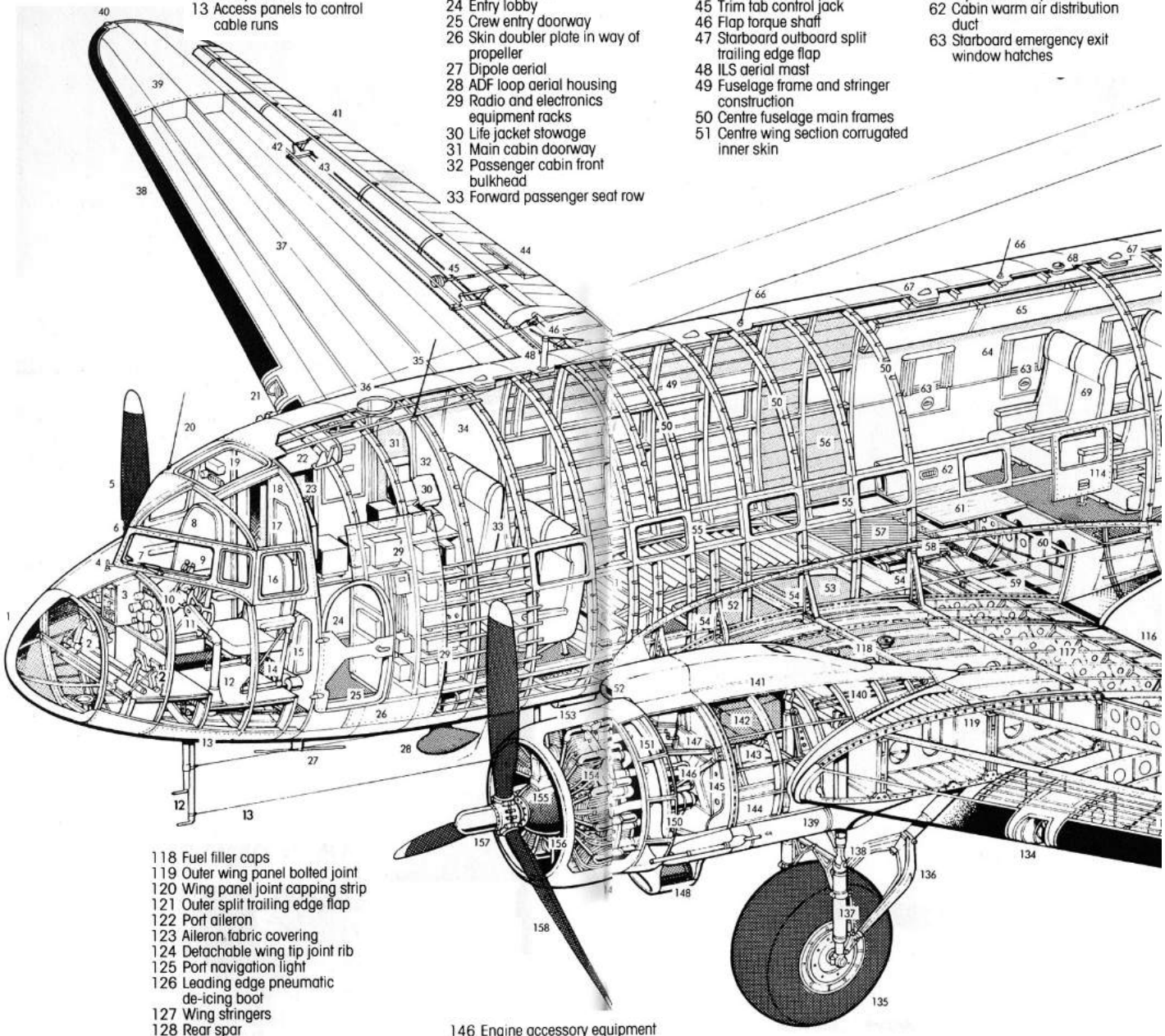


Inside the C-47 Dakota

The C-47 interior was a wholly different place than the inside of a DC-3. No soundproofing was installed on the cabin walls, no carpeting on the floors. Most did not have airliner-type seats arranged in pairs and aligned to each window. Instead, they had "bucket" seats as shown to the right, 14 per side. They were made of aluminum and had an indention for the soldier to sit in. The seats were mounted to a hinge on the sidewall and could be folded down and back against the wall when the mission was to carry cargo. The mission for many C-47s was to carry paratroopers to the drop zone. In the photo below, paratroopers in full geat are sitting in the bucket seats, facing each other.

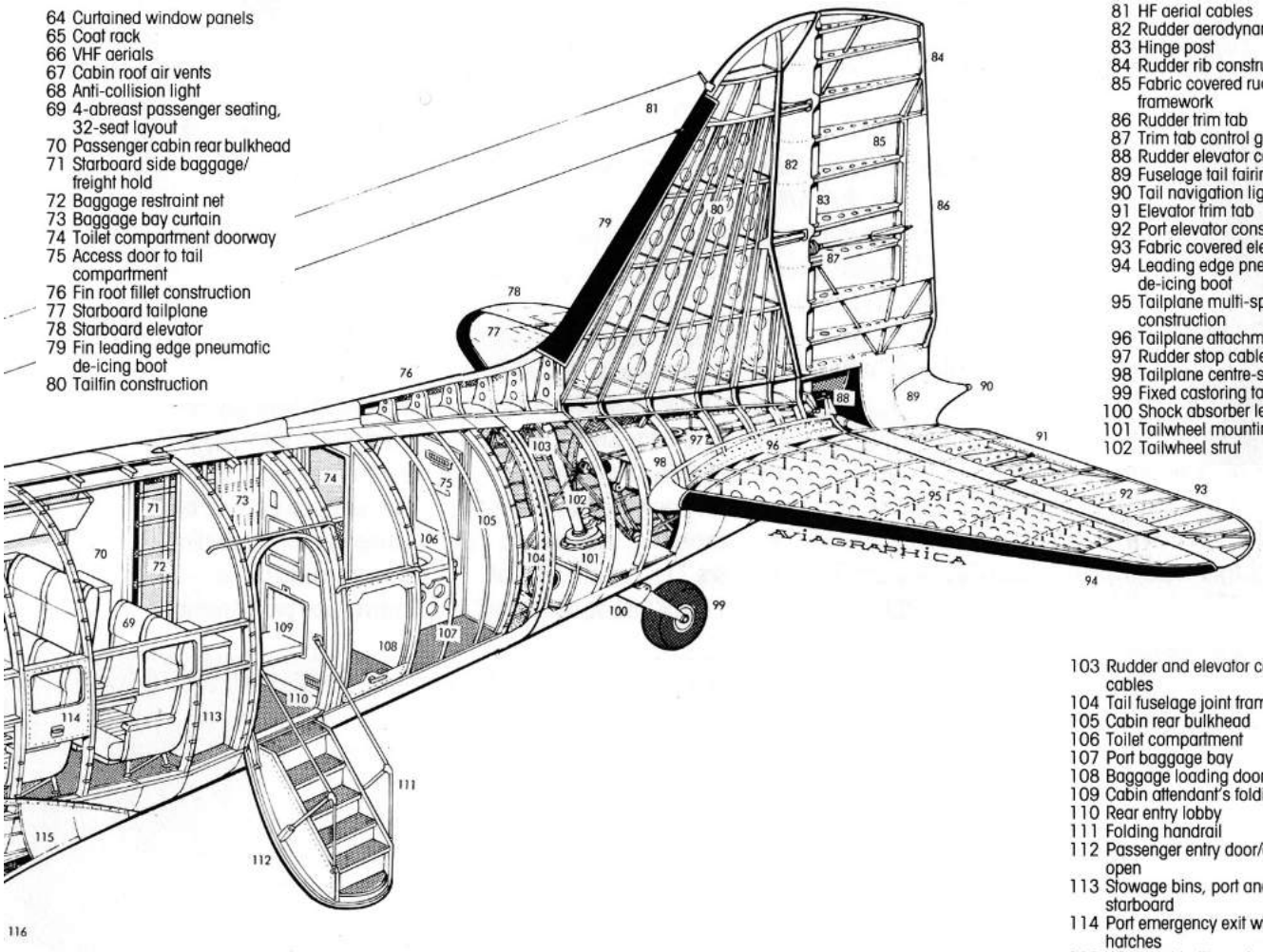
Some C-47s were fitted out as air amublances. There was space for 18 injured people, stacked three high along the cabin wall.

Medical Transport: Interior of a C 47 air ambulance flying between Catania, Italy to the General Hospital in Tunis, Tunisia. US Army nurse, Miss Mary Smith, is taking particulars from the patient during the flight. These men had started their journey at a Casualty Clearing Station (CCS) at Forgia.

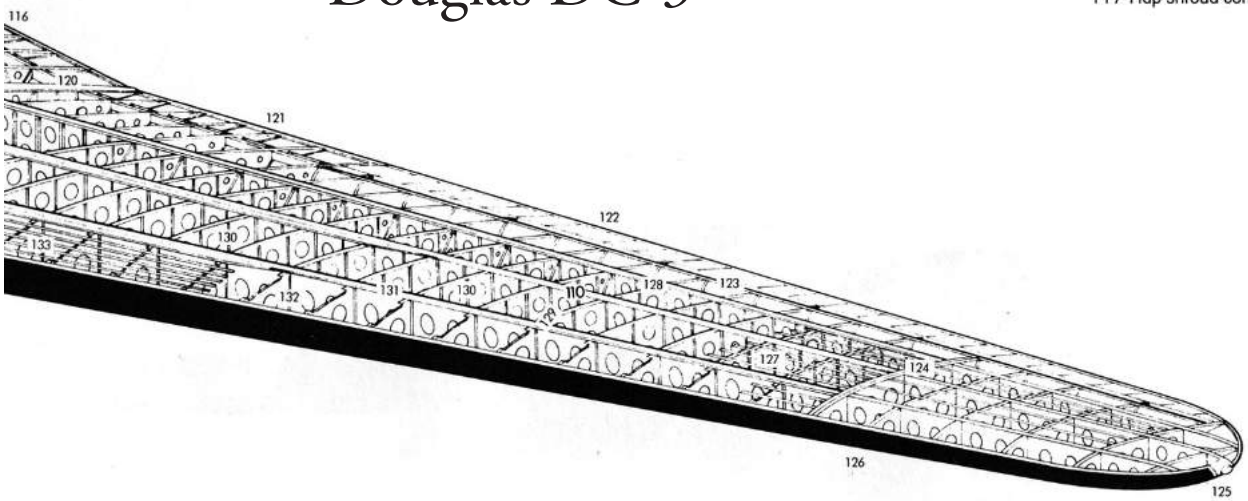


1 Hinged nose cone, access to instruments and controls
2 Rudder pedals
3 Instrument panels
4 Windscreen de-icing
5 Starboard propeller
6 Windscreen panels
7 Windscreen wipers
8 Co-pilot's seat
9 Engine throttle levers
10 Trim control handwheel
11 Control column
12 Cockpit floor level
13 Access panels to control cable runs
14 Adjustable seat mountings
15 Propeller de-icing fluid tank
16 Pilot's seat
17 Electrical fuse panel
18 Cockpit bulkhead
19 Cockpit roof escape hatch
20 Whip aerial
21 Starboard landing/taxying lamp
22 Windscreen and carburettor de-icing fluid tank
23 Starboard baggage/freight compartment
24 Entry lobby
25 Crew entry doorway
26 Skin doubler plate in way of propeller
27 Dipole aerial
28 ADF loop aerial housing
29 Radio and electronics equipment racks
30 Life jacket stowage
31 Main cabin doorway
32 Passenger cabin front bulkhead
33 Forward passenger seat row
34 Cabin wall trim panelling
35 Whip aerial
36 Astro-hatch observation window
37 Starboard outer wing panel
38 Leading edge pneumatic de-icing boot
39 Wing skin panelling
40 Starboard navigation light
41 Starboard aileron
42 Hinge control linkage
43 Aileron operating cables
44 Aileron tab
45 Trim tab control jack
46 Flap torque shaft
47 Starboard outboard split trailing edge flap
48 ILS aerial mast
49 Fuselage frame and stringer construction
50 Centre fuselage main frames
51 Centre wing section corrugated inner skin
52 Port main fuel tank, capacity 175 Imp Gal (794l)
53 Port auxiliary fuel tank, capacity 167 Imp Gal (760l)
54 Wing spar attachment joints
55 Cabin window panels
56 Cabin wall insulating and soundproofing lining
57 Corrugated flap shroud panel
58 Flap hydraulic jack
59 Centre section flap
60 Floor beam construction
61 Plywood floor panel
62 Cabin warm air distribution duct
63 Starboard emergency exit window hatches

118 Fuel filler caps
119 Outer wing panel bolted joint
120 Wing panel joint capping strip
121 Outer split trailing edge flap
122 Port aileron
123 Aileron fabric covering
124 Detachable wing tip joint rib
125 Port navigation light
126 Leading edge pneumatic de-icing boot
127 Wing stringers
128 Rear spar
129 Centre spar
130 Wing rib construction
131 Front spar
132 Leading edge nose ribs
133 Leading edge stringers
134 Port landing/taxying lamp
135 Port mainwheel
136 Main undercarriage drag strut
137 Shock absorber leg strut
138 Undercarriage leg knee joint
139 Exhaust pipe
140 Undercarriage bungee cables
141 Engine nacelle tail fairing
142 Oil tank, capacity 24 Imp Gal (109l)
143 Main undercarriage hydraulic retraction jack
144 Mainwheel well
145 Engine bay fireproof bulkhead
146 Engine accessory equipment
147 Engine bearer struts
148 Oil cooler
149 Detachable engine cowling panels
150 Cooling air exhaust flaps
151 Exhaust collector pipe
152 Carburettor air intake
153 Ventral cabin air intake duct
154 Pratt & Whitney R-1830-92 air cooled 14-cylinder two-row radial engine
155 Propeller reduction gearbox
156 Cowling nose ring/cooling air intake
157 Propeller hub pitch change mechanism
158 Hamilton Standard three-blade constant speed propeller



Douglas DC-3



A C-47 flown by the Polish Air Force for the RAF. It is titled "City of Lwow."

P-51 Mustang

North American Aviation's P-51 Mustang was the first U.S. fighter airplane to push its nose over Europe after the fall of France. It scurried back and forth across the channel, taking on the best the Axis could put in the air. Mustangs met and conquered every German plane from the early Junkers to the sleek, twin-jet Messerschmitt 262s.

Although first designed for the British as a medium-altitude fighter, the Mustang excelled in hedge-hopping strafing runs and long-range escort duty. It made a name for itself by blasting trains, ships and enemy installations in western Europe and by devastating Axis defenses prior to the Allied invasion of Sicily and Italy.

An amazing array of firsts was piled up by the Mustang while carrying the war to the heart of the German fatherland. It was the first single-engined plane based in Britain to penetrate Germany, first to reach Berlin, first to go with the heavy bombers over the Ploesti oil fields and first to make a major-scale, all-fighter sweep specifically to hunt down the dwindling Luftwaffe.

One of the highest honors accorded to the Mustang was its rating in 1944 by the Truman Senate War Investigating Committee as "the most aerodynamically perfect pursuit plane in existence."

The Mustang story began in 1940 when the British contacted North American Aviation with a request to build fighters for the RAF. North American was willing, and they offered to design and build a new fighter that would meet British requirements, and be easy to mass produce. In only 100 days North American Aircraft rolled out the first prototype Mustang. By November 1941 the first of more than 600 aircraft produced under British contract were delivered to the RAF At least eight versions of the P-51 were produced over the course of the war, with more than 15,000 built in all.

The new fighter incorporated many of the latest developments in aeronautics. One was a wing designed using laminar flow airfoils which were developed co-operatively by North American Aviation and the National Advisory Committee for Aeronautics (NACA). These airfoils generated very low drag at high speeds. The wings were designed to be easy to manufacture, with only two spars. The main wheels were set twelve feet apart, for good stability on landing. It carried twice as much internal fuel as a Spitfire, 180 gallons in self-sealing wing tanks.

The first Mustangs (Mk. I) used the Allison V-1710 engine, which had limited high-altitude performance. It was first flown operationally by the Royal Air Force (RAF) as a tactical-reconnaissance aircraft and fighter-bomber. The addition of the Rolls-Royce Merlin to the P-51B/C model transformed the Mustang's performance at altitudes above 15,000 ft, matching or bettering that of the Luftwaffe's fighters. The definitive version, the P-51D, was powered by the Packard V-1650-7, a license-built version of the Rolls-Royce Merlin 60 engine with a two-stage two-speed supercharger, and armed with six .50 caliber Browning machine guns.

P-51D Mustang

Role	Fighter
National origin	United States
Manufacturer	North American Aviation
First flight	26 October 1940
Introduction	1942
Number built	5,586
Unit cost	US$50,985 in 1945
Crew: 1	
Length:	32 ft 3 in (9.83 m)
Wingspan:	37 ft 0 in (11.28 m)
Height:	8 ft. 8 in
Empty weight:	7,635 lb (3,465 kg)
Loaded weight:	9,200 lb (4,175 kg)
Max. takeoff wt:	12,100 lb (5,490 kg)
Powerplant:	1 × Packard Merlin V-1650-7 liquid-cooled supercharged V-12, 1,490 hp; 1,720 hp at War Emergency Power
Maximum speed:	437 mph (703 km/h) (490 mph in P-51H)
Rec. limit:	Mach 0.8
Cruise speed:	362 mph (80 km/h)
Stall speed:	100 mph (160 km/h)
Range:	1,650 mi (2,755 km) with external tanks
Service ceiling:	41,900 ft (12,800 m)
Rate of climb:	3,200 ft/min (16.3 m/s)
Guns:	6× 0.50 caliber M2 Browning machine guns with 1,880 total rounds (400 rounds for each on the inner pair, and 270 rounds for each of the outer two pair)
Bombs:	2× hardpoints for up to 2,000 lb
Rockets:	6 or 10× T64 5.0 in (127 mm) H.V.A.R

Poland's Mustangs

During World War II, five Polish Air Force in Great Britain squadrons were equipped with Mustangs. The squadrons and the dates they took delivery of Mustangs are:

309 "Ziemi Czerwieńskiej" Squadron: 7 June 1942 (Mk.I).

306 "Toruński" Squadron: 26 March 1943 (Mk.III).

315 "Dębliński" Squadron: 26 March 1943 (Mk.III).

316 "Warszawski" Squadron: 13 March 1944 (Mk. III).

309 "Ziemi Czerwieńskiej" or"Land of Czerwien" Squadron (new name) replaced Mk.I with Mk. III (20 October 1944.

303 "Kościuszko" Sqn received Mk IV (1945).

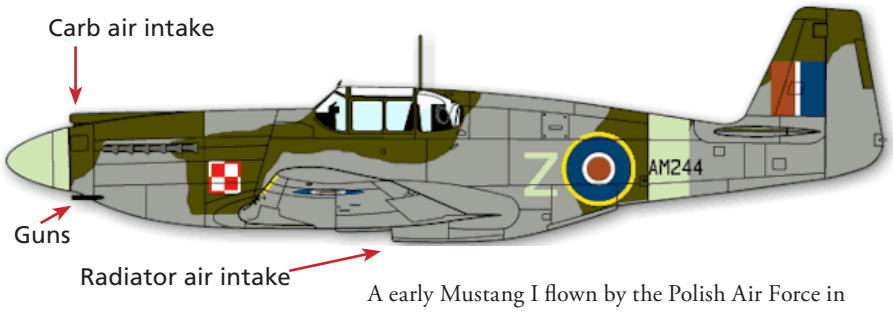
Between 6 December 1946 and 6 January 1947, all five Polish squadrons equipped with Mustangs were disbanded. Poland returned approximately 80 Mustangs Mk IIIs and 20 Mustangs Mk IVs to the RAF, which transferred them to the U.S. government.

A Mustang III of 315 Squadron (Polish Unit)
Flown by F/O Maciej Kriste who ended the war with 2 1/3 kills and 2 damaged.

Mustang Variants:

P-51 (Mustang I in the U.K.)

Entered service in early 1942. The 1,150 hp. Allison V-12 powered the early Mustang models. This resulted in poor high altitude performance, so the RAF used their Mustang I and II models for low altitude ground attack and reconnaissance duties. The Mustang I had a top speed of 370 m.p.h. Handling and maneuverability were good. The P-51 was a pilot's airplane.



A early Mustang I flown by the Polish Air Force in the RAF. This is an Allison-powered version has a carburetter air intake above the prop spinner a relatively small radiator air intake below the wing. The canopy is the "birdcage" style. It has two guns in the nose, four in the wings.

P-51A (Mustang II)

Same Allison engine as Mk.I. Production was divided between America and Britain. There were ground attack versions of the P-51A in U.S. service which served the AAF in the North African campaign. There were also specialized photo reconnaissance versions of all major Mustang models, the F-6 series.

P-51B/C (Mustang III)

The B-model entered service in June, 1943. The C-model was identical to the B, but built in Dallas instead of Inglewood, California. Powered by the Packard-built Merlin V-12, driving a four-bladed propeller. The airframe was strengthened, the radiator was re-designed, the ailerons were improved, and racks for long range drop tanks or bombs were added under the wings. The 1,450 hp. Packard Merlin engine (1,595 hp. war emergency power rating) gave the P-51B a top speed of 445 m.p.h.
Its range was an astounding 2,200 miles with two 150 gal. drop tanks. Endurance with drop tanks was 8.7 hours.

A P-51B Mustang Mk. III flown by 315 Polish Fighter Squadron, "City of Deblin." The Packard Merlin engine had the carb air intake below the prop spinner. As it had more power than the Allison, the radiator air intake was larger. It did not have nose guns. It had the "Malcolm Hood" canopy, which improved visibility for the pilot.

The new engine completely changed the character of the Mustang, turning it into a high altitude fighter suitable for bomber escort missions. It came at a crucial moment for the AAF daylight bombing campaign. Luftwaffe fighters were taking such a toll of un-escorted heavy bombers that the losses were becoming unsupportable. The great range of the P-51B- allowed it to escort the heavy bombers all the way to their targets deep inside Germany. In March of 1944, Mustangs went to Berlin. Eighth Air Force bomber losses plummeted, while Luftwaffe fighter losses skyrocketed.

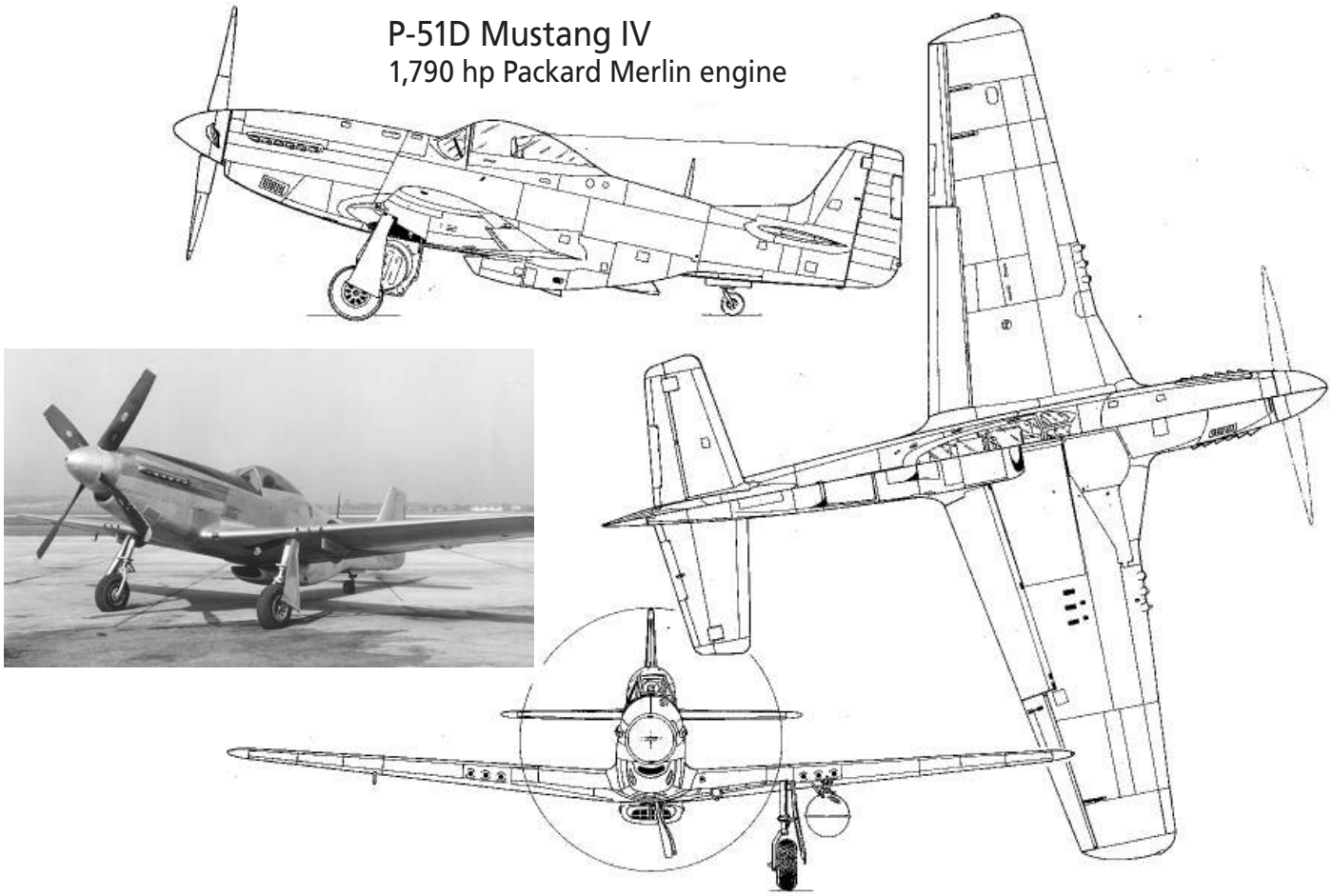
P-51D (Mustang IV)

Entered service in 1944. It sported a "tear drop" canopy and cut down rear fuselang for better all around-vision and a more powerful 1,790 hp. version of the Packard Merlin engine, along with many detail improvements. The armament was increased to six .50 caliber wing machne guns and all manner of external stores could be carried.

This P-51D Mustang Mk. IV was flown by the 112 "Shark" fighter-bomber squadron in 1944 while based in Lavariano, Italy. This Packard Merlin powered Mustang has the teardrop canopy and cut-down fuselage behind the canopy to improve visibility even more. A dorsal fin was added to the fin to improve directional stability. Three machine guns were fitted into each wing. Note that it carries the same "GA-Y" squadron markings as the Kittyhawk flown by F/Lt Gazda in 1942.

P-51H

No structural part was left in common with earlier models. Streamlining was improved to increase speed and stability was increased. A new version of the Packard Merlin, with water injection, delivered over 2000 hp. These changes resulted in the finest American fighter of the war. Speed was 486 m.p.h. at 30,000 ft. best climb rate was 5,350 ft./min. at 5,000 ft. Service ceiling was 41,600 ft. First flown on February 3, 1945, whether or not the P-51H participated in combat in WWII is still controversial



This picture shows Pfc John T. Fields, aircraft armorer, checking the magazine feeds of the Browning .50 caliber machine guns on a P-51B Mustang. During the period this photo was taken, the 332nd was engaged in frequent ground strafing of Axis airfields in Hungary, Austria and Italy. Behind Pfc Fields is the P-51B Mustang "Stinky II." Before each flight, the plane's armorer would seal the machine guns with tape to prevent moisture from forming ice in the guns at high altitude, which would cause them to jam. Since most of the 332nd's fighters were hand-me-downs from other groups, they were often war-weary aircraft and had frequent malfunctions. The P-51B had four machine guns; the later D-model had six.

Date: Friday, 1 September 1944, Place: Ramitelli, Campobosso, Italy. Private First Class John T. Fields, of the 100th Fighter Squadron, 332nd Fighter Group, 15th Air Force. The 332nd Fighter Group was composed of Afro-American pilots and ground support personnel trained at Tuskegee, Alabama. The members of the group became collectively known as the "Tuskegee Airmen".

De Havilland DH.98 Mosquito

The de Havilland DH.98 Mosquito was a British multi-role combat aircraft with a two-man crew that served during and after the Second World War. When the Mosquito began production in 1941, it was one of the fastest operational aircraft in the world. The light bomber version could hit a top speed of 415 mph while carrying a 4000 lb. bomb load.

It was one of few operational front-line aircraft of the era constructed almost entirely of wood and was nicknamed "The Wooden Wonder". The Mosquito was also known affectionately as the "Mossie" to its crews. Originally conceived as an unarmed fast bomber, the Mosquito operated in many roles during the Second World War, being tasked to perform medium bomber, reconnaissance, tactical strike, anti-submarine warfare and shipping attack and night fighter duties, both defensive and offensive, until the end of the war..

Despite an initially high loss rate, the Mosquito ended the war with the lowest losses of any aircraft in RAF Bomber Command service. Post war, the RAF found that, in terms of useful damage done, the Mosquito had proved 4.95 times cheaper than the Lancaster. In April 1943, in response to "political humiliation" caused by the Mosquito, Hermann Göring ordered the formation of special Luftwaffe units to combat the Mosquito attacks, though these units were not very successful against the elusive RAF aircraft.

In one example of the daylight precision raids carried out by the Mosquito, on 20 January 1943, the 10th anniversary of the Nazis' seizure of power, a Mosquito attack knocked out the main Berlin broadcasting station while Göring was speaking, putting his speech off air. Göring himself had strong views about the Mosquito, lecturing a group of German aircraft manufacturers in 1943 that:

> *"In 1940 I could at least fly as far as Glasgow in most of my aircraft, but not now! It makes me furious when I see the Mosquito. I turn green and yellow with envy. The British, who can afford aluminium better than we can, knock together a beautiful wooden aircraft that every piano factory over there is building, and they give it a speed which they have now increased yet again. What do you make of that? There is nothing the British do not have. They have the geniuses and we have the nincompoops. After the war is over I'm going to buy a British radio set - then at least I'll own something that has always worked."*

The glue and wood construction of the Mosquito not only led to light weight, elegant lines, and reduced demand for strategic materials, but also minimized demands on production tooling, meaning that subassemblies could be and were built by such firms as furniture and piano manufacturers. The modular design of the machine also helped support distributed production, with various subcontractors providing subassemblies that could be integrated in the factory.

The oval-section fuselage was a monocoque shell built in two halves split vertically. The shell halves were made of sheets of Ecuadorean balsa wood sandwiched between sheets of Canadian birch. In areas needing extra strength, stronger woods replaced the balsa filler. The overall thickness of the birch and balsa sandwich skin was only 7⁄16 inch (11 mm). This sandwich skin was so stiff that no internal reinforcement was necessary from the wing's rear spar to the tail bearing bulkhead.

This split construction greatly aided the assembly of the internal equipment as it allowed the technicians easy access to the fuselage interior.

The all-wood wing was built as a one-piece structure. It was made up of two main spars, spruce and plywood compression ribs, stringers, and a plywood covering. The outer plywood skin was covered and doped like the fuselage. The engine radiators were mounted in the inner wing, just outboard of the fuselage on either side. The wing contained metal framed and skinned ailerons, but the flaps were made of wood and were hydraulically controlled. The nacelles were mostly wood, although, for strength, the engine mounts were all metal as were the undercarriage parts.

The pilot and crewman sat side-by-side, with the pilot's seat on the right and the crewman's seat slightly staggered back. In the reconnaissance and bomber versions, the crewman could crawl forward to a prone bombardier's position in the glass nose.

The greenhouse-style cockpit was set forward of the leading edge of the wing and provided excellent forward visibility, except for the obstruction of the engine nacelles. Rearward visibility wasn't so good. Some of the later reconnaissance variants had a transparent bubble on top of the greenhouse, allowing a navigator to stick his head up and take sightings, and also check the "6:00" position for troublemakers.

Fighter versions had a flat forward windscreen, which increased drag relative to bomber and reconnaissance variants but improved aiming. Bomber and reconnaissance versions had blisters on the side window panels to give a downward view, and these blisters were not fitted to fighter variants.

Radiators were mounted behind the rectangular openings in the wing roost.

DeHavilland DH.98 Mosquito

Roles:	Light bomber, Fighter-bomber, Night fighter, Maritime strike aircraft, photo-reconnaissance
First flight	25 November 1940
Produced	1940–1950
Number built	7,781

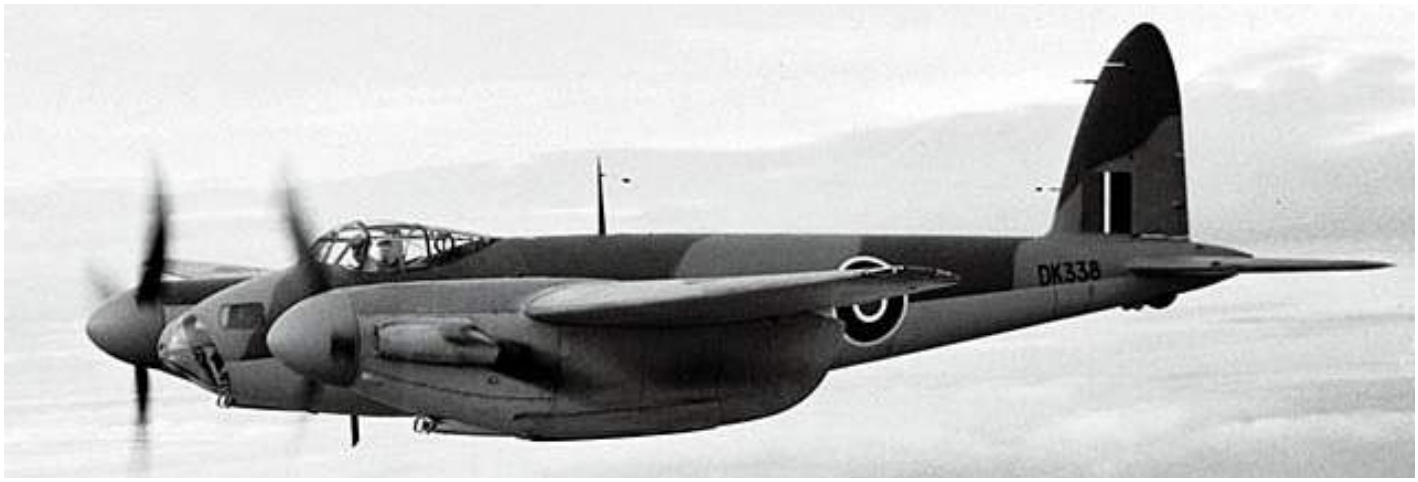
Fighter version: Mosquito F Mk II

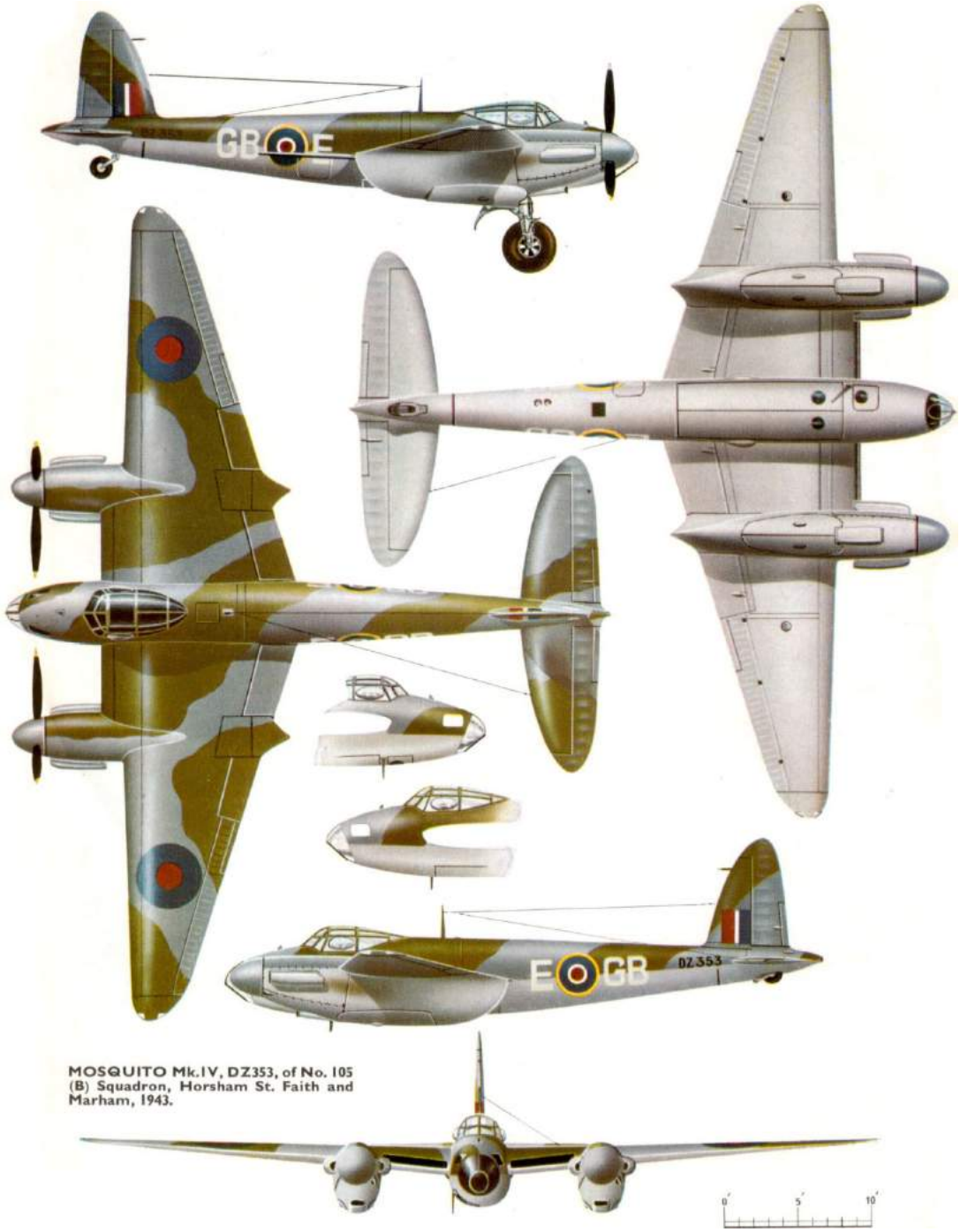
Crew:	2- pilot, navigator/radar operator
Length:	41 ft 2 in (13.57 m)
Wingspan:	54 ft 2 in (16.52 m)
Height:	17 ft 5 in (5.3 m)
Empty weight:	13,356 lb (6,058 kg)
Loaded weight:	17,700 lb (8,028 kg)
Powerplants:	2 × Rolls-Royce Merlin 21 liquid-cooled V12 engines, 1,480 hp each
Maximum speed:	366 mph (589 km/h)
Range:	900 mi (1,400 km)
Service ceiling:	29,000 ft (8,839 m)
Guns:	4 × 20 mm Hispano Mk II cannon (fuselage) and 4 × 7.7 mm)Browning machine guns (nose)
Avionics	AI Mk IV or Mk V radar

Definitive bomber version: Mosquito B Mk XVI

Crew:	2- pilot, bombardier/navigator
Length:	44 ft 6 in (13.57 m)
Wingspan:	54 ft 2 in (16.52 m)
Height:	17 ft 5 in (5.3 m)
Empty weight:	14,300 lb (6,490 kg)
Loaded weight:	18,100 lb (8,210 kg)
Powerplants:	2 × Rolls-Royce Merlin 76 liquid-cooled V12 engines, 1,710 hp each
Maximum speed:	415 mph (668 km/h)
Range:	1,500 mi (2,400 km)) with full weapons load
Service ceiling:	37,000 ft (11,000 m)
Bombs:	4,000 pounds (1,800 kg)

De Havilland Mosquito





MOSQUITO Mk.IV, DZ353, of No. 105 (B) Squadron, Horsham St. Faith and Marham, 1943.

Vickers Wellington

The Vickers Wellington was a British twin-engined, long range medium bomber. It was widely used as a night bomber in the early years of the Second World War, before being displaced by the larger four-engined "heavies" such as the Avro Lancaster.

The Wellington continued to serve throughout the war in other duties, particularly as an anti-submarine aircraft.

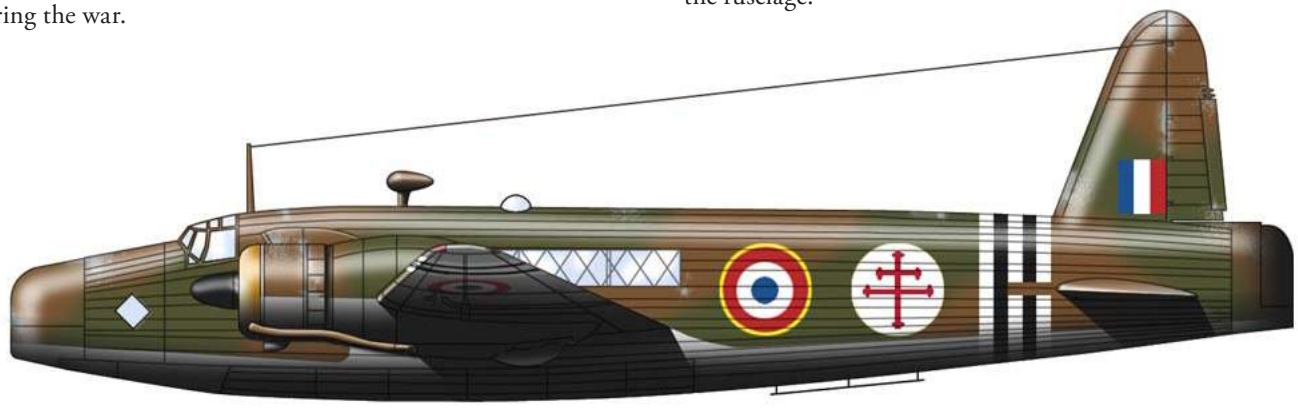
The Wellington used geodesic construction, devised by Barnes Wallis who was inspired by his work on airships. The fuselage was built from 1650 elements, consisting of aluminium alloy (duralumin) W-beams formed into a framework. Wooden battens screwed to the aluminium were covered with Irish linen, which, treated with layers of dope, formed the outer skin of the aircraft. The metal lattice gave the structure strength, because any one stringer could support some of the weight even from the opposite side of the aircraft. Blowing out one side's beams would still leave the aircraft as a whole intact. As a result, Wellingtons with huge areas of framework missing returned home when other types would not have survived. The dramatic effect was enhanced by the doped fabric skin burning off, leaving the naked frames exposed.

The geodesic structure was strong and light for its size, which gave the Wellington a load-and range-to-power-ratio advantage over similar aircraft, without sacrificing robustness.

In an early raid in late 1939, Luftwaffe fighters destroyed 12 of the bombers and badly damaged three others, thus highlighting the aircraft's vulnerability to attacking fighters, having neither self-sealing fuel tanks nor sufficient defensive armament. While the aircraft's nose and tail turrets protected against attacks from the front and rear, the Wellington had no defenses against attacks from the side and above, as it had not been believed that such attacks were possible owing to the high speed of aircraft. As a consequence, Wellingtons were switched to night operations and participated in the first night raid on Berlin on 25 August 1940. In the first 1,000-bomber raid on Cologne, on 30 May 1942, 599 out of 1,046 aircraft were Wellingtons (101 of them were flown by Polish aircrews). In all, Wellingtons flew 47,409 operations, dropped 41,823 tons of bombs and lost 1,332 aircraft in action during the war.

While the Wellington was superseded in the European Theatre, it remained in operational service for much of the war in the Middle East, particularly in North Africa. This versatile aircraft also served in anti-submarine duties with 26 Squadron SAAF based in Takoradi, Gold Coast.

A number of Wellingtons were converted into 18-passenger troop carriers. The nose and tail gun turrets were covered with solid fairings and unconfortable bucket seats were squeezed into the fuselage.

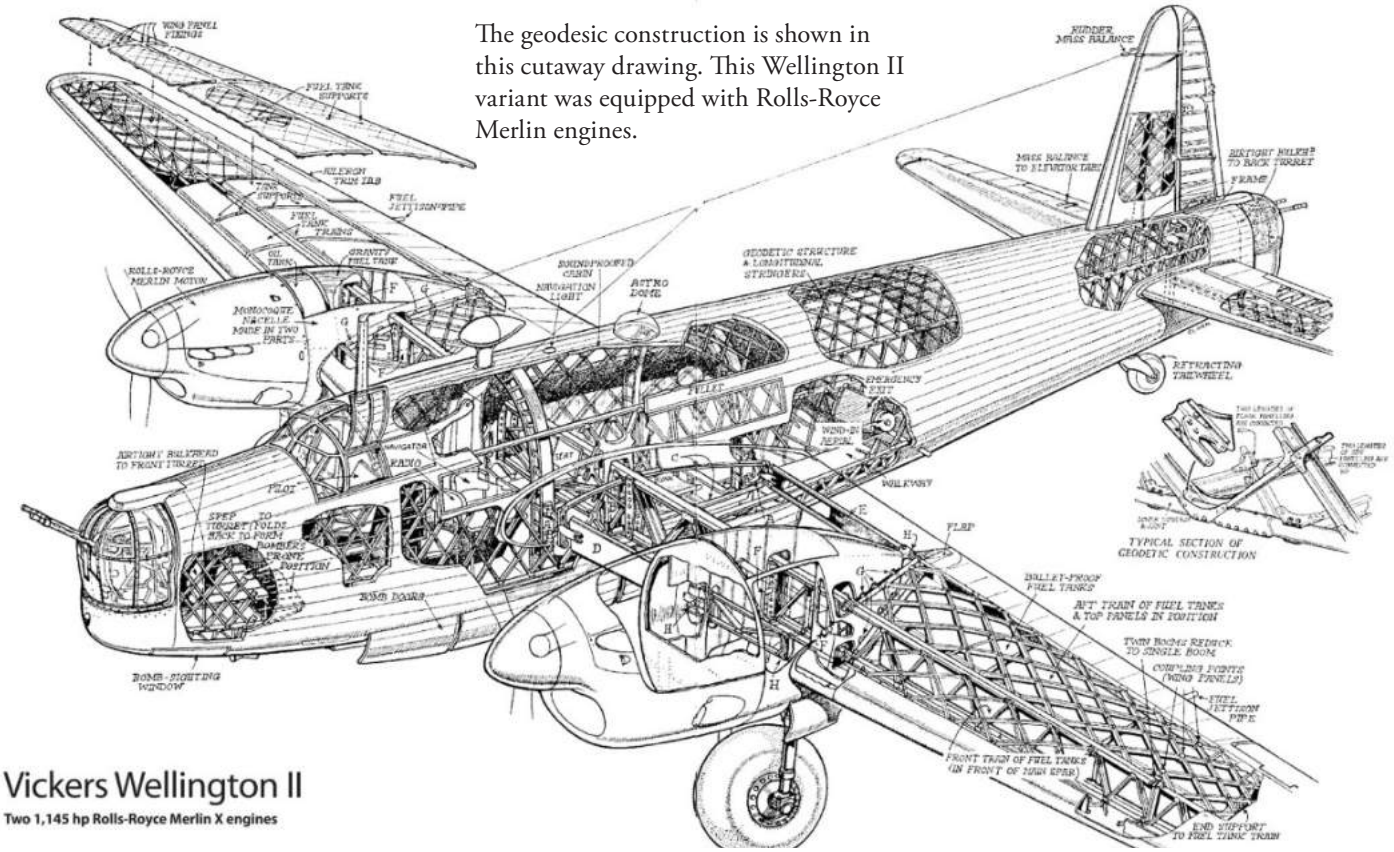


A Wellington transport converted from the Mk IA bomber was able to carry 18 troops.

Vickers Wellington Mark IC

Role	bomber, anti-submarine
Manufacturer	Vickers-Armstrongs Ltd.
First flight	15 June 1936
Introduction	October 1938
Primary users	Royal Air Force, RCAF, Polish Air Forces
Produced	1936–1945
Number built	11,461
Crew:	6
Length:	64 ft 7 in (19.69 m)
Wingspan:	86 ft 2 in (26.27 m)
Height:	17 ft 5 in (5.31 m)
Empty weight:	18,556 lb (8,435 kg)
Max. takeoff wt:	28,500 lb (12,955 kg)
Powerplant:	2 × Bristol Pegasus radial engines, 1,050 hp each
Maximum speed:	235 mph (378 km/h)
Range:	2,550 mi (4,106 km)
Service ceiling:	18,000 ft (5,490 m)
Guns:	6× .303 Browning machine guns: 2 in nose turret, 2 in tail turret, in waist positions
Bombs:	4,500 lb (2,041 kg) bombs

The geodesic construction is shown in this cutaway drawing. This Wellington II variant was equipped with Rolls-Royce Merlin engines.



Vickers Wellington II

Two 1,145 hp Rolls-Royce Merlin X engines

PIEŚŃ LOTNIKÓW

Szumią śmigla, grzmią motory,
Ptak stalowy w słońcu lśni,
Na podniebne rusza tory
W bój Eskadra Trzysta Trzy.

Uniesiemy się nad chmury
I spojrzymy Stwórcy w twarz,
Zażądamy by On z góry
Poprowadził atak nasz.

W huku bomb, w ogniu bez końca
Pali się germański świat,
Budowany od tysiąca
Lat-na gruzach polskich chat.

To za Wilno, za Warszawę,
Westerplatte, Lwów i Hel
I za całe dzieje krwawe
Barbarzyńców bierz na cel.

Będziem wieczność bombardować
W nocy dziejów, we mgle lat,
Aż powstanie Polska nowa,
A z nią nowy-lepszy świat..

Jeszcze Polska nie zginęła
Póki my żyjemy,
Co nam obca przemoc wzięła–
Mocą odbierzemy.

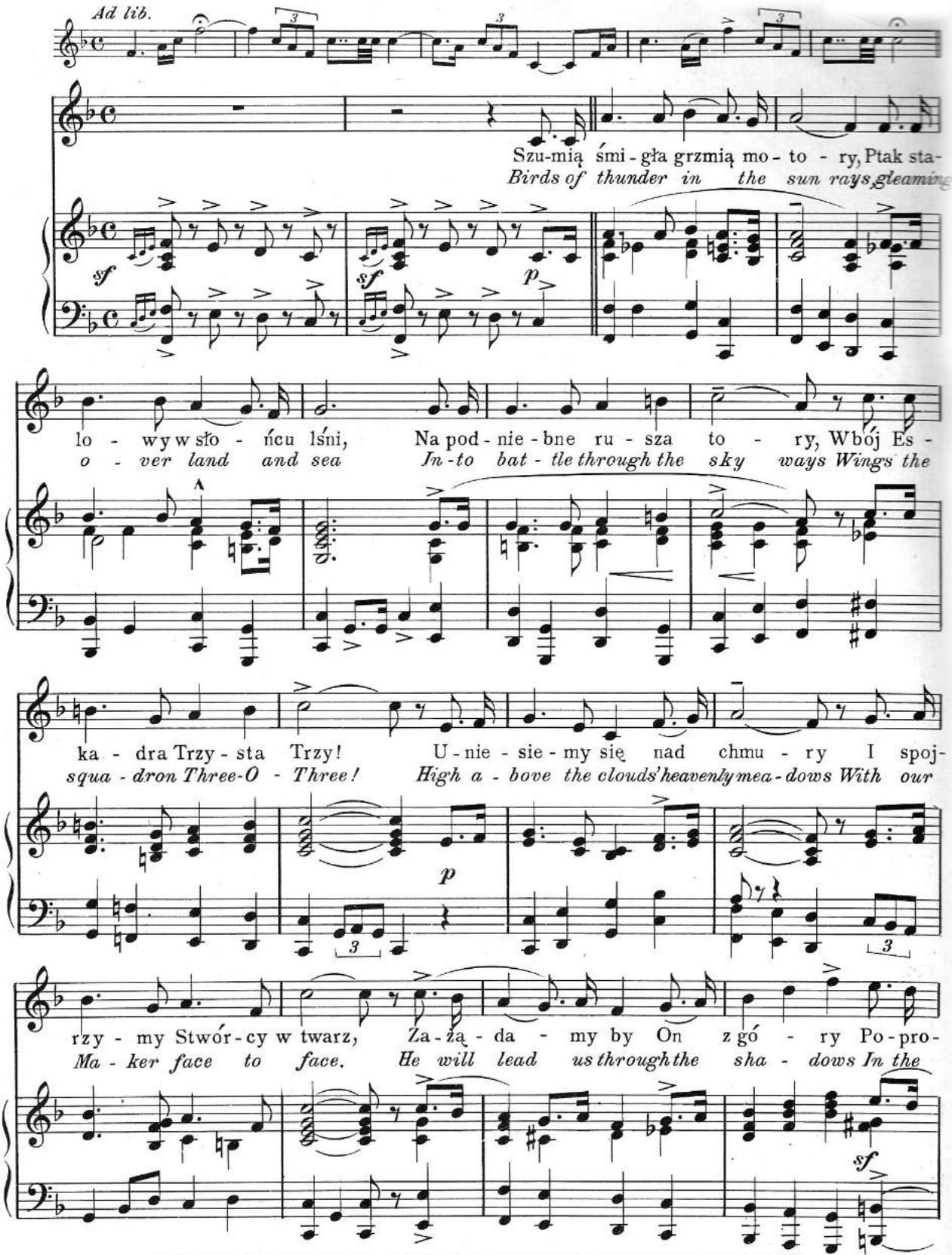
Nie zginęła, jest i żyje,
Rośnie u dziejowych dróg –
Przed nią sławy łuna bije,
Nad nią chwała, my i Bóg.

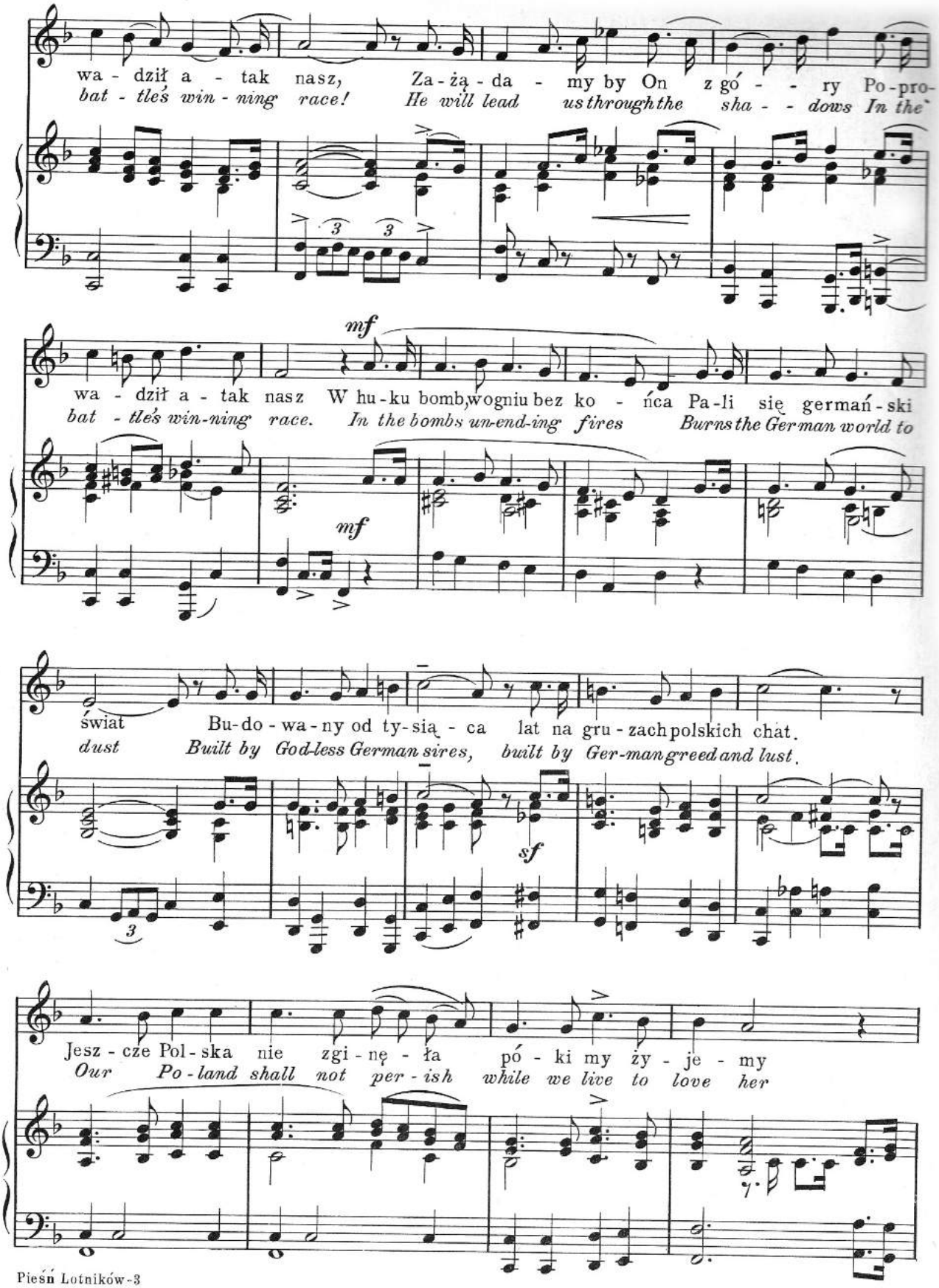
Pieśń Lotników

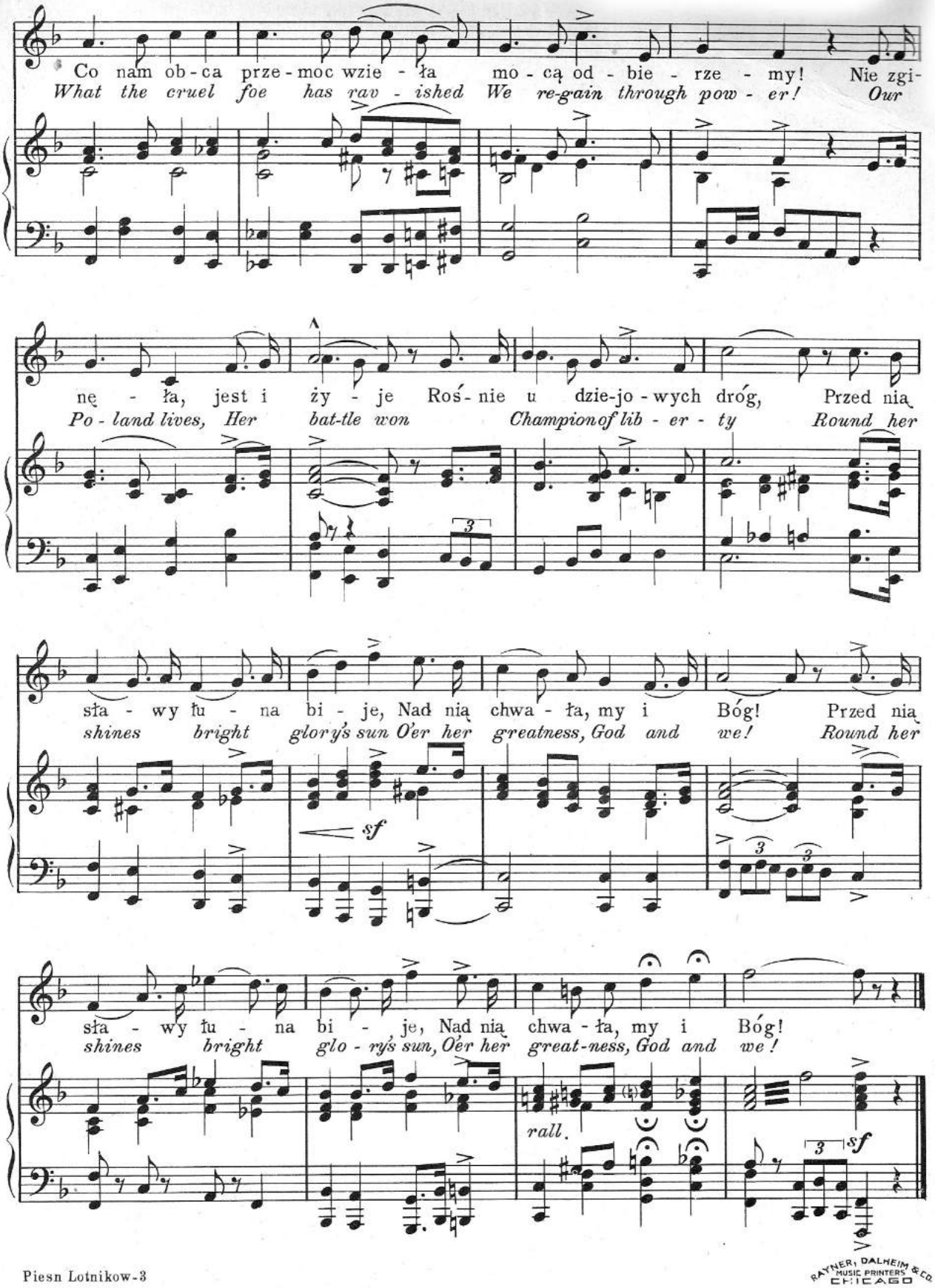
(Song Of the Airmen)

Words by
M. NIEDŹWIECKI
English Version by V. Janda

Music by
JERZY G. CZAPLICKI




wa - dził a - tak nasz, Za - żą - da - my by On z gó - - - ry Po - pro-
bat - tle's win - ning race! He will lead us through the sha - - dows In the
mf
wa - dził a - tak nasz W hu - ku bomb, w ogniu bez ko - ńca Pa - li się germań - ski
bat - tle's win - ning race. In the bombs un-end-ing fires Burns the German world to
mf
świat Bu - do - wa - ny od ty - sią - ca lat na gru - zach polskich chat.
dust Built by God-less German sires, built by Ger-man greed and lust.
sf
Jesz - cze Pol - ska nie zgi - nę - ła pó - ki my ży - je - my
Our Po - land shall not per - ish while we live to love her



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