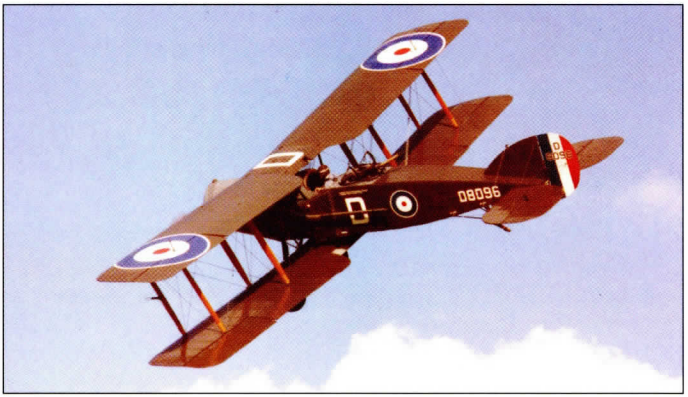
The Illustrated Directory of

FIGHTERS



Mike Spick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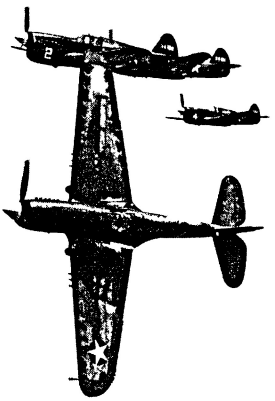

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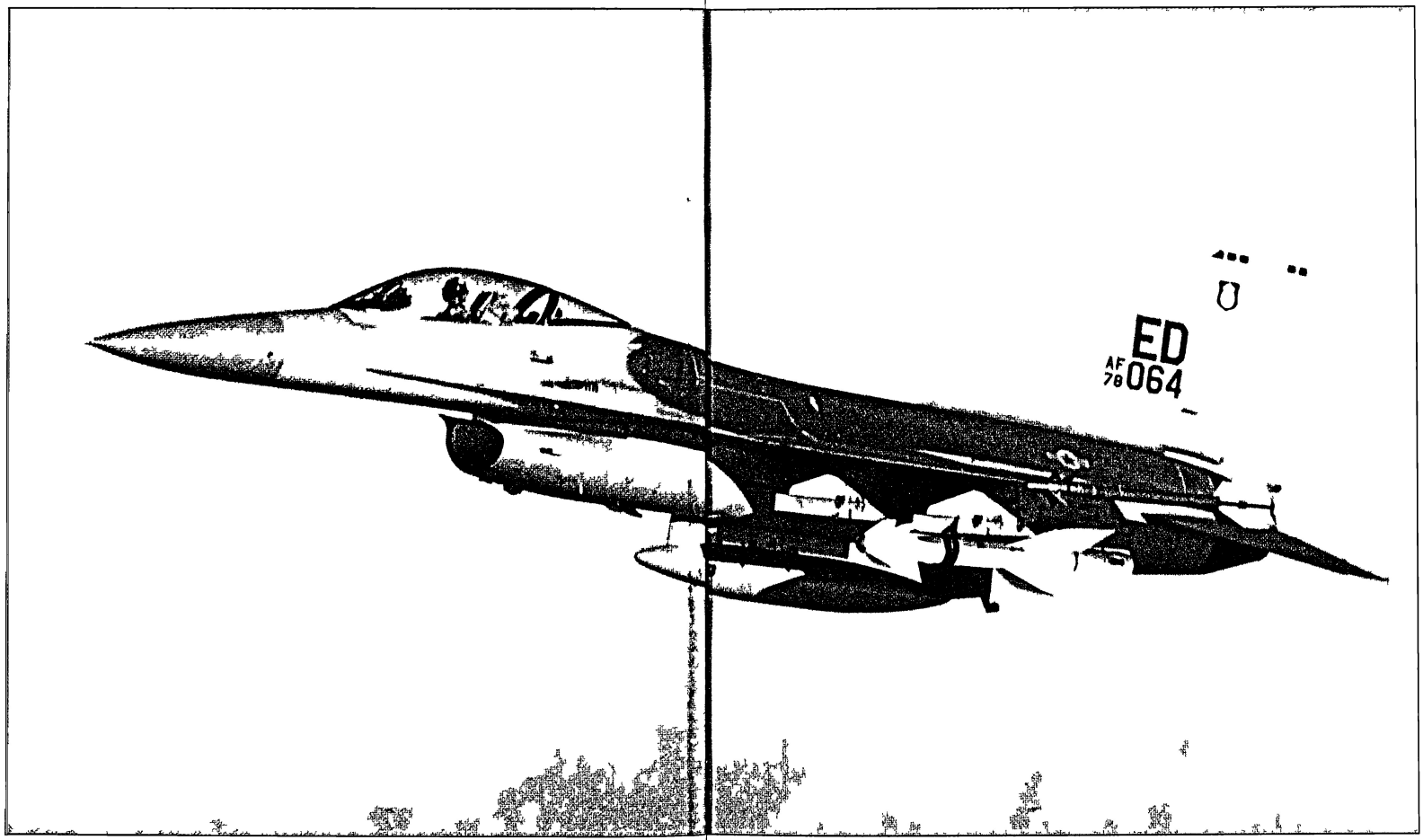

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Mike Spick is a leading commentator on military aviation, with more than 30 books to his credit. He maintains close ties with former and current serving fighter pilots and aircraft design personnel, and several distinguished test pilots. For many years a consultant to the Swiss-based helicopter programme Project Atlas, he has also been Consultant Editor to *AirForces Monthly* journal, and contributor to *Air International*, *Air Enthusiast*, and the Malaysian-based *Asia Pacific Defense Review*.

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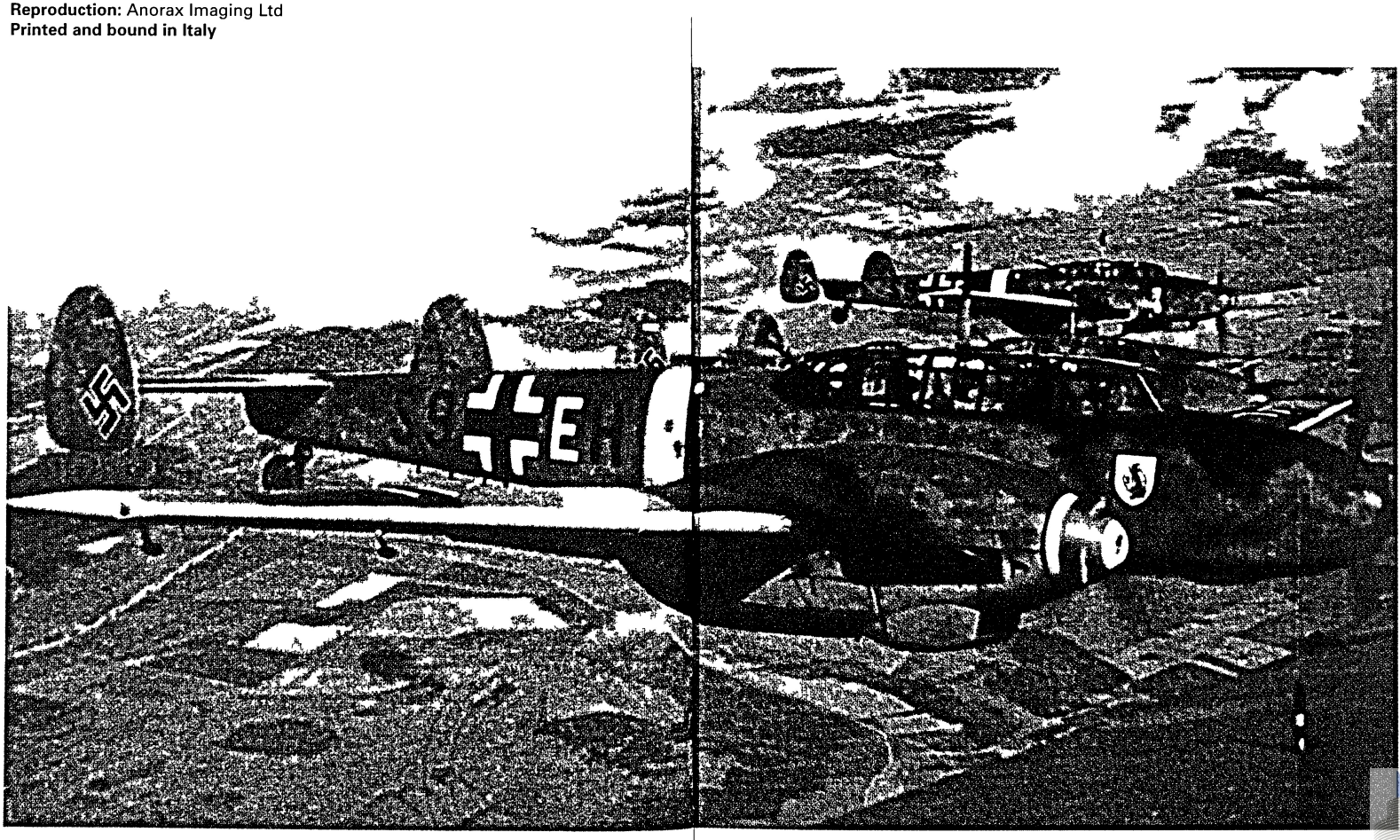

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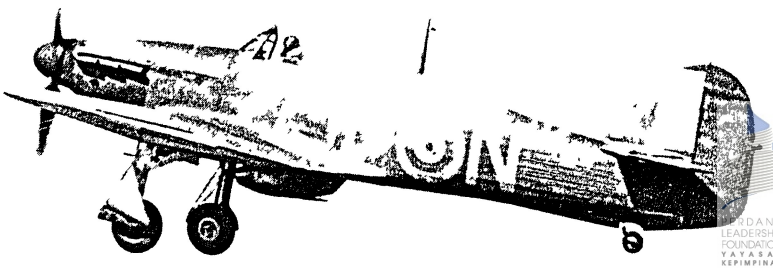
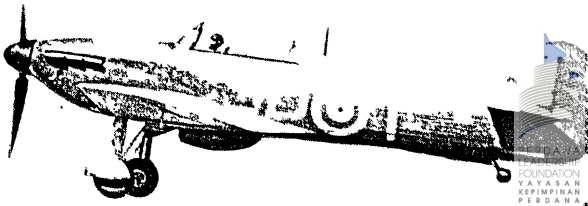




Introduction

The definition of what constitutes a fighter has become blurred. Among the many fighter types that have attained widespread service, there are few that have not, at one time or another, had air-to-surface ordnance or cameras hung on them. Other types, designed specifically for the attack or reconnaissance missions, have been given a secondary air combat capability for self-defence. Matters have not been helped by the use of fighter designations like F-105 and F-117 for aircraft intended to deliver ordnance to ground targets. The definition adopted for this directory is that a fighter is an aircraft designed to destroy other aircraft in air combat. This must have been its primary mission at the design stage, even though it may subsequently have gone on to achieve success in other fields.

Other points require clarification. Many World War II night fighters were modified from bombers but, since the modifications turned them into dedicated aircraft destroyers, they qualify for inclusion here. The same applies to the interceptor variant of the Tornado. Finally, although the modern trend is for multi-rôle aircraft, such as the Joint Strike Fighter, these tend to be fighters first and attack aircraft second. It would therefore be unreasonable to omit them.

The choice of entries for this directory has not been easy. Many fighters were self-selecting, among them the Fokker Eindecker, the Spitfire and Mustang, the F-4 Phantom II and the F-16 Fighting Falcon. For the rest, the following criteria were used. They had to be (a) numerically significant, (b) technically innovative, (c) historically significant, or (d) interestingly odd, with the proviso that they actually flew at least once. To avoid confusion often caused by mergers and takeovers, they are listed in alphabetical order by manufacturer or designer; the names are those current at the time of first flight. For example, the F-16 is listed under General Dynamics, not Lockheed Martin.

The fighter was born out of necessity. First, this was the need to deny information to enemy reconnaissance aircraft and artillery spotters. Then, as air arms grew and developed, it became essential to dominate the air space over the battlefield. Other threats emerged: bombers and airships had to be countered. World War I was a steep learning curve for all concerned. By 1918, the most usual fighter configuration was a single-engined tractor, single-seat biplane, armed with one or two fixed rifle-calibre machine guns which were aimed by pointing the whole aircraft. There were of course a few exceptions.

The 1930s saw the perceived threat change. Advances in all branches of aeronautics produced a revolution. Bigger and more efficient engines, with supercharging to increase power at high altitudes; more streamlined shapes; retractable undercarriages; monoplanes rather than biplanes; monocoque metal stressed skin construction; all combined to increase performance. And initially the main beneficiary was the bomber! A new breed of bomber emerged, too fast to be intercepted by the biplane fighters of the time.

Fighter aircraft designers of the day would not let this go unchallenged. The result was the fast, rapid-climbing, multi-gunned monoplane, with an enclosed cockpit, retractable undercarriage and, most importantly, radio. Most of the important fighter types of World War II had prewar origins. One other fighter trend, which was largely unsuccessful, was the twin-engined, long-range strategic fighter.

World War II saw the widespread use of self-sealing fuel tanks and armour protection, ever heavier gun armament, the introduction of radar in night fighters, and a constant quest for greater performance. By the end of the conflict, the piston engine was nearing the limits of what was possible, but already the turbojet, and to a lesser degree the rocket motor, had started to enter service.

The Korean War, 1950-1953, saw the ever faster, ever higher fighter combat reach its zenith. But more serious threats were already emerging. The first was the fast, high-flying nuclear bomber; the second was the possibility of an all-out war in Europe between NATO and the Warsaw Pact. The situation prompted what amounted to a technological explosion. Fighter speeds increased, firstly to supersonic, then bisonic, with Mach 3 on the horizon. Batteries of unguided rockets were supplanted by homing missiles, while interceptors carried radar and automated fire control systems. The weapons system was born.

The confrontation in Europe was another matter. The debate here was quantity versus quality. The Warsaw Pact had quantity in abundance, hordes of inexpensive fighters and tactical aircraft. The best Western fighter was the ubiquitous Phantom, although its performance against Russian fighters in Vietnam was uninspiring. While this was shortly to be backed up by the superb F-14 and F-15, the newcomers were proving unaffordable in the quantities needed. The U.S. solution adopted was the hi-lo mix, lots of austere dogfighters, backed up by fewer hi-tech birds. Thus was born the F-16, the fighter that set new standards for close air combat.

Since then, the existing fighters have held the ring. The next generation will use stealth, supercruise, advanced electronics, and vectored thrust for supermanoeuvrability. But these are yet to enter service.

Fighter aircraft have been with us for less than nine decades, but in that time their performance, weaponry and systems have progressed from barely adequate to almost incredible. But what of the future? As at 2002, predictions are focused around the Unmanned Combat Air Vehicle, or UCAV. This has long been forecast, but only now does the technology appear to be reaching maturity. Also, public opinion in the Western world seems to require that wars, if they have to be fought, are without casualties. This is another factor pushing us towards the UCAV.

It is therefore possible that we are now seeing the final generation of manned fighters. If this seems like heresy, consider the fate of the armoured knight, the archer, the musket, and the battleship. All fell to the onward march of technology. Will the fighter pilot go the same way?

AIDC A-1 Ching Kuo

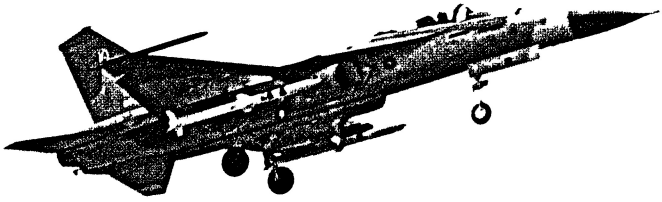
Origin: AIDC, Taiwan.
Type: Single-seat, twin-engined interceptor and air defence fighter with a secondary ground attack and anti-shipping function. The two-seater conversion trainer is fully combat capable, albeit with reduced internal fuel.
Engines: Two ITEC TFE1042-70 afterburning turbofans rated at 9,250lb (4,196kg) thrust maximum and 6,300lb (2,858kg) thrust military.
Dimensions: Span 30ft 10.25in (9.42m); length 46ft 7.75in (14.20m); height 15ft 6in (4.72m); wing area 260sq.ft (24.20m²).
Weights: Empty 14,300lb (6,486kg); normal takeoff 21,000lb (9,526kg); maximum takeoff 27,000lb (12,247kg).
Loadings (at normal takeoff weight)**:** Wing 81lb/sq.ft (394kg/m²); thrust 0.90.
Performance: Maximum speed (altitude) Mach 1.65; maximum speed (sea level) Mach 1.05; operational ceiling 50,000ft (15,239m); initial climb rate 50,000ft/min (254m/sec).
Armament: One 20mm M61A1 cannon with 511 rounds in the port wing root; four Sky Sword I heat-homing AAMs plus two Sky Sword II SARH AAMs; two AGM-65 Maverick or three Hsiung Feng II ASMs; or a variety of conventional air-to-surface weaponry. Maximum weight of stores 8,600lb (3,901kg).
History: First flight prototype 28 May 1989; production delivery 10 January 1994 to 2000.
User: Republic of China Air Force (Taiwan).

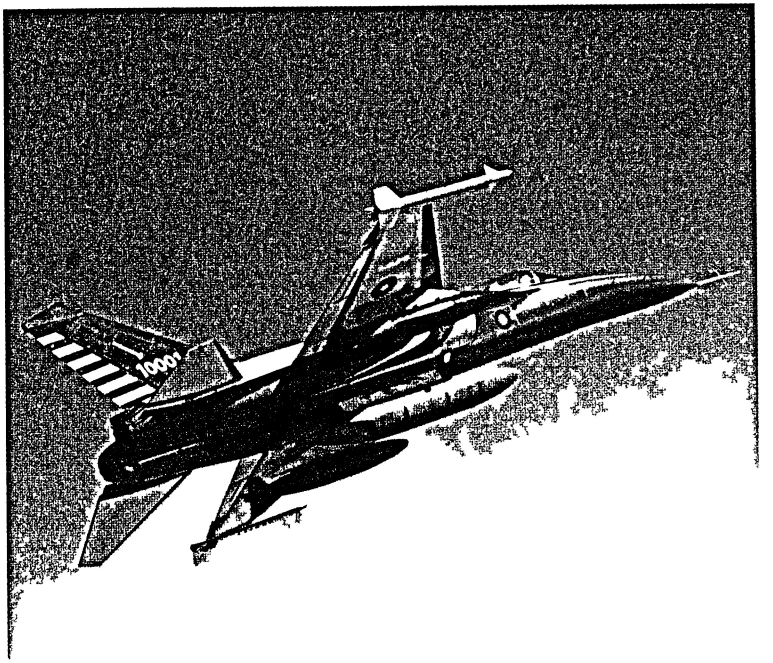
By 1982, Taiwan was no longer able to obtain fighters from the USA. Faced with an aging fleet, AIDC commenced the development of an indigenous defence fighter with technical aid from General Dynamics. The design, with F-16 influence clearly visible, was finalised in 1985. The wing planform was similar, although the trailing edge featured a shallow reverse sweep. The tail surfaces varied mainly in having raked-back tips.

As no suitable large powerplant was available, two small ITEC TFE1042-70 afterburning turbofans were adopted, developed from Garrett engines. These provided an adequate, if not exceptional, thrust to weight ratio, and were fed by fixed geometry oval side intakes located under the wing root extensions.

Construction is mainly of aluminium alloy, but with some composites in the tail

Below: The Ching-Kuo is the only indigenous Taiwanese fighter in service.





Above: From this angle the design influence of General Dynamics is obvious.

and speed brakes, and titanium engine nozzles. The flight control system is triplex digital fly-by-wire, with many similarities to that used in the JAS 39 Gripen.

Unlike the F-16, the canopy is orthodox, with a wrap-around windshield, but the cockpit layout clearly shows Fort Worth influence. Two multi-function displays dominate the dash, a sidestick controller replaces a central control column, and the ejection seat is a steeply raked Martin Baker Mk 12.

Radar is the indigenous Golden Dragon 53, developed from the Westinghouse APG-67(V) multi-mode pulse-Doppler set. This has a maximum search range of about 35 miles (56km) and can provide guidance for semi-active homing missiles. A 20mm M61 Vulcan cannon is housed in the left wing root. There are six weapons stations for missiles: two wingtip rails; two underwing pylons, and two underfuselage hardpoints in tandem.

The second seat displaces a fuel tank in the conversion trainer but, as three hardpoints are plumbed for external tanks, this makes little difference. Surprisingly, the vertical tail remains the same size.

The prototype Ching Kuo first flew on 28 May 1989, piloted by Wu Kang Ming. There were however anomalies in the FCS, which caused a spectacular landing accident five months later. These were cleared up, and deliveries started to reach the squadrons in January 1994. Initial Operational Capability was reached a year later.

Originally 250 aircraft had been ordered, but by now US restrictions had been lifted. With F-16s now available, Ching Kuo production was curtailed. The last of 130 aircraft, 28 of them two-seaters, was delivered in 2000. No Ching Kuos have been exported.

AIRCO DH 2

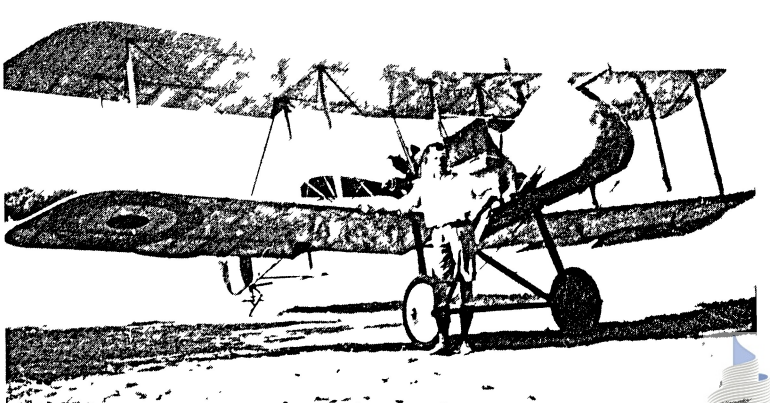
Origin: Aircraft Manufacturing Company (Airco), Hendon, England.
Type: Single-seat, pusher type biplane fighter.
Engine: One 100hp Gnome Monosoupape rotary (most); a few were built with Le Rhone rotaries of similar power.
Dimensions: Span 28ft 3in (8.61m); length 25ft 2.5in (7.68m); height 9ft 6.5in (2.91m); wing area 249sq.ft (23.13m²).
Weights: Empty 943lb (428kg); normal takeoff 1,441lb (654kg).
Loadings (at takeoff weight): Wing 5.79lb/sq.ft (28kg/m²); power 14.41lb (6.64kg) per hp.
Performance: Maximum speed 93mph (150kph) at sea level, 77mph (124kph); sustained climb 12 min to 6,500ft (1,981m); service ceiling 14,500ft (4,419m); endurance 2hr 45min.
Armament: One .303in drum-fed Lewis machine gun.
History: First flight 1 June 1915. Entered service late that year. To the Western Front February 1916. Served also in Macedonia and Palestine. Withdrawn from front line service mid-1917.
User: Britain (Royal Flying Corps).

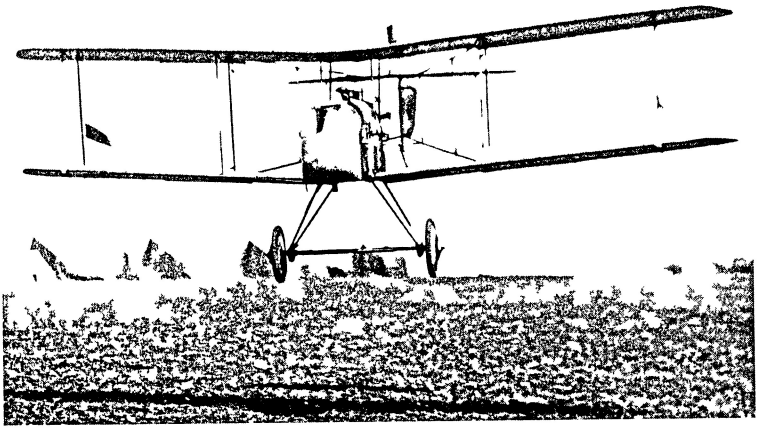
The DH 2 was designed by Geoffrey de Havilland at a time when machine guns could not be reliably synchronized to fire through the propeller without damaging it. This problem was avoided by using a pusher configuration. This had both engine and pilot housed in a short nacelle, with the pilot in front, giving him a clear field of fire in the front hemisphere.

While this was an obvious advantage, there was a price to be paid. With the propeller rotating just behind the trailing edges of the wings, the tail surfaces had to be carried on four braced tubular steel booms from the upper and lower wings, respectively, starting outboard of the propeller disc. Tapering steeply in to where the tail surfaces were mounted, this was a drag-inducing, aerodynamically inefficient layout, which reduced performance.

There were other drawbacks. Largely exposed to the elements, and with no heat available from the rear-mounted engine, the DH 2 was a very cold aeroplane in which to fly, which affected pilot efficiency. In addition, rearward view, from which direction most attacks could be expected to come, was poor.

Below: Mainly used on the Western Front, the DH 2 also served in Palestine.





Above: Western Front 1916; the frail booms of the DH 2 are evident here.

Finally, in the event of a heavy crash landing, if the engine broke free the pilot might be crushed under it.

Armament was a single rifle calibre Lewis gun, and initially this was given a mounting that enabled it to be aimed over much of the front hemisphere. The problem here was that the pilot was expected to aim the gun accurately while continuing to fly the aeroplane! This was quickly exposed as impracticable, and a new mounting, allowing the gun to move only in the vertical plane, was devised.

In the second half of 1915, the German Fokker Eindecker was rampant on the front, its successes giving rise to the legend of the "Fokker Scourge". To counter it, the Royal Flying Corps started to form squadrons of dedicated fighters late in 1915. One of these was the DH 2-equipped No 24 Squadron, which arrived in France in February 1916.

The DH 2 could handily outfly the Eindecker. Its small size and low wing loading made it agile, but also rather tricky to fly. The rotary engine produced a lot of torque, tending to accelerate any rolling motion in the same direction, making it easy to get into a spin. In the days before spin recovery was put on a sound footing and taught, many pilots were lost as a result.

Like all rotary engines of the period, the Gnome Monosoupape ran at just two speeds: full throttle and off. For power control in the air, a "blip" switch was used, which cut the ignition when pressed. But the main problem was that the Gnome was chronically unreliable. Pistons would seize solid, bearings would break, but worst of all, occasionally the Gnome would shed a cylinder in flight. When this happened, it would whirl off, wrecking everything in its path.

In combat, pilots preferred to use a rigid gun mounting and aim the weapon by aiming the whole aircraft. The Lewis was drum-fed, and changing a drum in the heat of battle while continuing to fly the aeroplane was not easy.

The DH 2, in conjunction with the FE 2 and Nieuport 11 (which see), put an end to the Fokker Scourge by mid-1916, but was outclassed by the new breed of German biplanes which entered service later that year.

Of the 400 DH 2s built, 266 reached the Western Front, where they remained in service until mid-1917.

Albatros D II

Origin: Albatros Werke, Germany.
Type: Single-seat, single-engined tractor biplane fighter.
Engine: One 160hp Benz D.III inline.
Dimensions: Span 27ft 10.67in (8.50m); length 24ft 3.33in (7.40m); height 8ft 6in (2.59m); wing area 263.72sq.ft (24.50m²).
Weights: Empty 1,404lb (637kg); normal takeoff 1,958lb (888kg).
Loadings (at takeoff weight): Wing 7.42lb/sq.ft (36.24kg/m²); power 12.24lb (5.55kg) per hp.
Performance: Maximum speed 109mph (175kph) at sea level; sustained climb 5min 30sec to 3,281ft (1,000m); service ceiling 17,061ft (5,200m); endurance 1hr 30min.
Armament: Two fixed belt-fed 7.92mm Spandau machine guns firing through the propeller disc.
History: In service from September 1916, numbers peaked at approx. 250 in January 1917 but were being rapidly phased out by the end of that year. Flown by Boelcke and Richthofen, among others.
Users: Austria-Hungary, Germany.

Developed from the Albatros D I, which was designed to wrest control of the air from the DH 2 and Nieuport 11, the D II differed from it only in having the upper wing lowered in height and the cabane in front of the cockpit modified. These improvements corrected the worst fault of the earlier fighter, the poor view forwards and upwards from the cockpit.

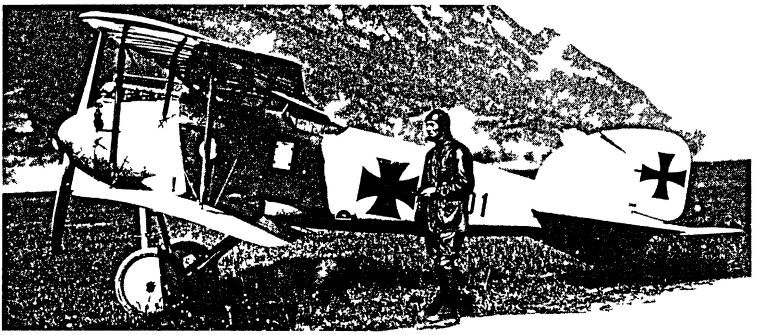
A biplane with the lower wing having slightly less span than the upper, the early

Albatros D III

Origin: Albatros Werke, Germany.
Type: Single-seat, single-engined tractor biplane fighter.
Engine: One 180hp Mercedes D IIIa inline engine.
Dimensions: Span 29ft 8in (9.04m); length 24ft 0.05in (7.62m); height 9ft 9.25in (2.98m); wing area 220.66sq.ft (20.50m²).
Weights: Empty 1,457lb (661kg); normal takeoff 1,953lb (886kg).
Loadings (at normal takeoff weight): Wing 8.85lb/sq.ft (43.22kg/m²); power 10.85lb (4.92kg) per hp.
Performance: Maximum speed 108mph (165kph); sustained climb 3min 45sec to 3,281ft (1,000m); service ceiling 18,046ft (5,500m); endurance 2hr.
Armament: Two fixed belt-fed 7.92mm Spandau machine guns firing through the propeller disc.
History: A direct development of the Albatros D II, the D III prototype first flew in August 1916, and entered service early in the following year. In the summer of 1917, outclassed by the Allied SE 5a, Camel and Spad, it began to be superseded by the Albatros D V. Numbers peaked in November of that year at 446, and a few remained in service until the end of the war.
Users: Austria-Hungary, Germany, post-war, Poland.

Albatros designer Robert Thelen did not rest on his laurels. With the

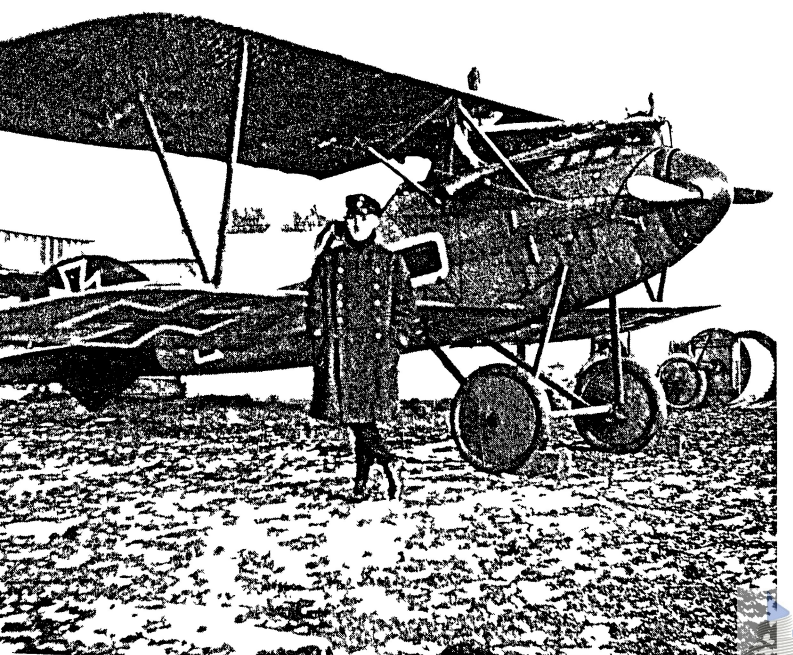
Right: The V-struts of the AlbatroS D III distinguished it from the D II.



Above: This Austrian AlbatroS D II served with Flik 21 as late as June 1917.

Albatros series was innovative in having a sleek semi-monocoque wooden fuselage instead of the braced box frame widely used at that time. In 1916 it was also unusual in having synchronized twin machine guns firing through the propeller disc, but the large and powerful inline engine easily coped with the increased weight and drag of the second gun without significant loss of performance.

The Albatros D I/D II series was effectively the first of the performance fighters, its superiority over the DH 2 and Nieuport 11 demonstrated by a higher top speed, rate of climb, ceiling, and dive. While it could not match either of the Allied scouts in rate of turn or rate of roll, it could force battle on them, or if need be, disengage at will. And with double their firepower it was far more deadly in the attack.



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