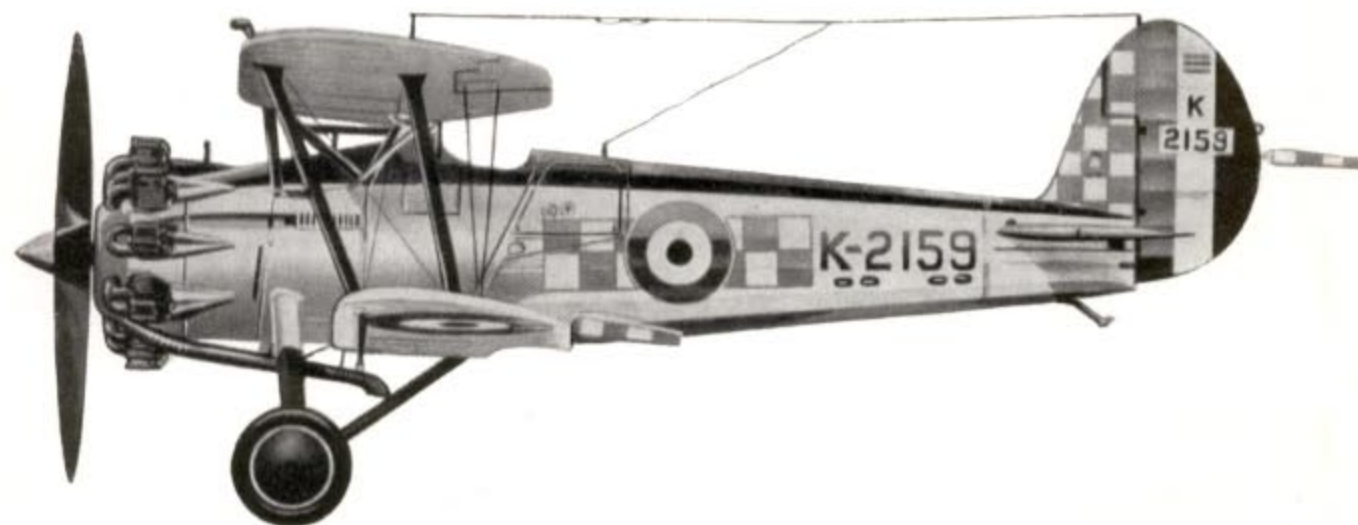


# PROFILE

# 6

## THE BRISTOL BULLDOG





## The Bristol Bulldog

by C. F. Andrews

*Bulldog IIa, K2227, c/n 7446, pictured during its last flight on 13th September 1964. Was originally a demonstration aircraft and registered G-ABBB on 12th June 1930, and powered by a Gnome-Rhône 9ASB engine. See page 4 for original G-ABBB and original K2227. (Photo: Cyril Peckham)*

THE Bristol Bulldog was designed by Captain Frank S. Barnwell as a single-seat, interceptor fighter at a time when British air strategy was undergoing radical change. During the seven years that followed the end of World War I, great reliance had been placed on standing patrols of radio-equipped fighters such as the Gloster Gamecock and the Armstrong Whitworth Siskin, which were able to deal adequately with the lumbering bombers of the period.

These obsolescent fighters served long after they should have been replaced, but the fault did not all lie at the Air Ministry's door, for extreme government economy had forced them to rely upon versatility and serviceability at the expense of performance. A succession of fighter specifications had produced some excellent ideas, but lack of money resulted in the majority remaining as drawing-board designs.

But a change, long overdue, was about to take place. The advent of the private venture Fairey Fox in 1925 brought home the need for a change in air defence. The Fox was a formidable two-seat bomber based on the Curtiss D.12 in-line, liquid-cooled

engine, housed in a low-drag, streamlined cowling, driving a Fairey-Reed metal propeller complete with spinner. The Fox could outpace and outclimb contemporary fighters and caused a major upheaval in military aeronautics. It was a stark reality confronting the architects of British defence policy.

The Bristol Aeroplane Company had, during this period, produced several promising single-seat fighter designs, none of which had achieved the distinction of service. Frank Barnwell's first effort in this class was the Scout F of 1918. Powered by the Cosmos Mercury air-cooled, radial engine, it was ancestor of a number of Bristol designs which culminated in the successful Bulldog.

When the Cosmos aero-engine design was acquired by Bristol along with its designer, Mr. A. H. R. Fedden (later Sir Roy), soon after the first World War, an engine division of the Company was created to exploit the air-cooled radial type. Consequently Bristol aeroplane designs thereafter embodied as far as possible Bristol engines, a combination for the British aircraft industry, obviously of great advantage

*Left: Prototype Bulldog I, c/n 7155, with Jupiter VII. First flew on 17th May 1927, with Cyril Uwins at the controls. Right: 7155 with long-span (50 ft. 0 in.) wing and enlarged rudder. Was to be used for an attempt on the high-altitude record in December 1927.*





Left: Prototype Bulldog II, c/n 7235, serial J9480. First flew on 21st January 1928. Right: 11th production Bulldog II, c/n 7332 serial J9576, in No. 3 Squadron colours. No. 3 was the first squadron to operate Bulldogs. Note amended fin shape.



Left: Bulldog II, c/n 7399, SBAC number R.I. Test bed for Mercury III engine fitted with four-blade propeller. Right: R.I with Gnome-Rhône Jupiter VI engine. Registered G-ABAC on 30th May 1930 and destroyed on 4th June.

to the parent Company and indeed to the Air Ministry and other customers.

This was the situation in which Bristols were placed when in 1924 the Air Staff decided on a replacement for the obsolescent Siskin in the form of an interceptor fighter, powered with the Rolls-Royce Falcon X liquid-cooled, in-line engine, to Specification F.17/24. Barnwell and Fedden disagreed on the choice of engine for a proposed Bristol submission to this specification, as the latter naturally wanted to use his radial type. The project was shelved until April 1926, when Barnwell resumed work on a single-seat fighter design to meet either Specification F.9/26 (Type 102A) for a day-and-night fighter, or navalised Specification N.21/26 (Type 102B) for a ship-borne fighter. This design was based on Bristol Type 99, the Badminton racing biplane of 1925.

In the meantime, the interceptor requirement was revived and at the beginning of 1927 Barnwell submitted schemes for a design using the Rolls-Royce F.XI in-line engine or the Bristol Mercury radial. This was in addition to the revised F.9/26 design with a Mercury engine (Type 105) and both offered such promise that mock-ups were constructed for official inspection. Both layouts were similar with equal span wings, but early in the project stage the lower wing of both was reduced in span and chord, thus introducing one of the characteristics of the finalised Bulldog design, the reasons for which change are detailed later. The interceptor was intended to meet Specification F.17/24, but Bristols were then asked to revise the scheme to comply with the later interceptor Specification F.20/27, with the geared Mercury III, then under development by their engine division. This interceptor

Bulldog II, J9591, c/n 7397, as used for flight testing the geared Mercury IV with cylinder-head helmets. Registered G-AATR on 13th January 1930 but reverted to original serial in January 1931 for tests with Mercury IV/A. Entered R.A.F. service in September 1931 with normal Jupiter VIIIF as on standard R.A.F. Bulldogs.





Bulldog 11A, G-ABBB, R-11, c/n 7446, with Aquila I engine in September 1935. Became K2227 in 1961 (see photo page 2). Originally with Gnome-Rhône 9ASB. Stored at Filton until 1939, when presented to Science Museum. Returned to Filton for reconditioning 1957; crashed 13th September 1964. Below: The original K2227 of No. 56 Squadron. Only two Bulldogs had this engine cowling—see side-view colour drawings on page 7. (Crown copyright)



layout found favour and one prototype was ordered as Type 107 (constructor's number 7178, serial number J9051). At the same time, the Air Ministry ordered four competitive prototypes to F.20/27, one each from the Gloster, Hawker, Vickers and Westland aircraft companies. The Bristol design became the Bullpup.

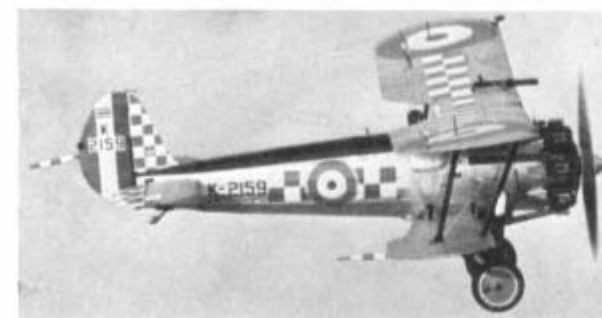
The parallel project, Type 105, showed just as much promise for Specification F.9/26 and Bristols decided to build a private venture prototype (constructor's number 7155), with a Bristol Jupiter VII radial engine, although, as previously stated, preference was intended to be given to designs embodying the Rolls-Royce F series in-line engine. Although an offer in March 1927 to the Air Ministry to build 50 aircraft

if some contribution towards the cost of development was made was declined, the Ministry did agree to test the prototype at Martlesham Heath, where the Aeroplane and Armament Experimental Establishment was located up to 1939.

### THE BULLDOG IS BORN

The third layout of the Jupiter powered Type 105 closely followed that of the Mercury powered Type 107, the chief difference being that it was larger. Both were drawn in detail and built concurrently. Bristol's suggestion for the names Bulldog and Bullpup respectively was readily accepted, both conforming to official nomenclature. The supply of the new Mercury engine was limited so the Bulldog was quickly completed with the Jupiter installation and no delay was experienced on account of official decisions, the project being a private venture. As a consequence, the Bulldog first flew, at Filton, on 17th May 1927 in the hands of Capt. Cyril F. Uwins, Bristol's chief test pilot, whose first prototype flight for the Company had been appropriately in the Cosmos-engined Bristol Scout F.1 way back in 1918. The Bulldog proved very satisfactory in early test flights and went to Martle-

Left: Prototype Bulldog IIA, K1603, c/n 7459. Delivered to Martlesham Heath as D.T.D. installation aircraft. Right: Bulldog IIA, c/o's aircraft, No. 19 Squadron. Note camera-gun on top wing and wing-tip pennants. (Flight photo)





*Prototype Bulldog T.M., two-seat trainer, K2188, originally constructed as single-seat fighter.*

sham in June, making its first public appearance at the Royal Air Force Display at Hendon in July.

Wind tunnel tests had established the advantage of the unequal area wing arrangement, a configuration inherited a long way back from the French Nieuport and German Albatross D.III of World War I, the main purpose in those early designs being to give the pilot a good view downwards. In the Bulldog this desirable attribute still applied, but in the meantime it had been found that advantage could be taken of the arrangement in the introduction of an upper and lower aerofoil of different aerodynamic characteristics. The upper wing of the Bulldog was a special section known as the Bristol IA, jointly evolved by L. G. Frise, Bristol's chief aerodynamicist, and the Royal Aircraft Establishment. From it was later developed more advanced sections leading to the R.A.F. 34. The lower wings of decreased span and chord were of the Clark YH section—the Clark Y so popular with flying model makers but with a reflex trailing edge. Frise-type ailerons, in which the hinges were set back from the rear spar fixings to provide a measure of aerodynamic balance, were fitted to the top wings only. The dihedral angle of both wings, upper and lower, was five degrees. In a general sense, the provision of upper and lower wings of different aerofoil sections enhanced lift/drag characteristics over a wider speed range, although possibly involving spinning problems, which affected the Bulldog and similar types, a phenomenon then becoming the subject of intense investigation.

#### **THE BULLDOG DESCRIBED**

The Bulldog was of high tensile steel strip construction, as developed by H. J. Pollard at Bristol and first used in the Bristol Boarhound two-seat fighter of 1924. Metal airframes were rapidly becoming a priority requirement and from 1926 onwards were mandatory for all new orders from the Air Ministry. In the Bristol system, high tensile steel strips were

rolled into cusped and flanged sections, riveted together lengthways to form longerons and struts, the joints being made by gusset plates, thus avoiding costly machined end-fittings. The spars were fabricated



*Above: Bulldog IIIA, R-5, c/n 7560, prototype. Built as private venture and first flown 17th September 1931. Mercury IVA engine and spats. Below, top: R-5 with Mercury IVS.2 engine, June 1932. Bottom: R-5 without cowling and spats and with Mercury IVS engine.*







Bulldog II of No. 3 Squadron,  
Kenley.



Revised marking of No. 3 Squadron  
on Bulldog IIa, 'C' Flight  
Commander's aircraft.

Tail detail of the Squadron  
Commander's Bulldog IIa,  
No. 19 Squadron.



Bulldog II, No. 17 Squadron,  
Kenley, 1935.



Bulldog IIa, No. 19 Squadron  
'A' Flight Commander's aircraft  
flying one red pennant from the  
rudder. Duxford, 1931.



Bulldog IIa, No. 41 Squadron  
Northolt, 1931.



Revised marking of No. 17 Squadron  
on Bulldog IIa, 'C' Flight  
Commander's aircraft.

Bulldog IIa, No. 32 Squadron.  
'B' Flight Commander's aircraft.



Cowl detail of Bulldog IIa  
K2227 and K2206.



Bulldog IIa, No. 54 Squadron,  
Hornchurch, 1935.



Bulldog IIa, No. 56 Squadron, North Weald, 1931.



Revised marking of No. 54 Squadron.

(Bulldog squadrons not illustrated, Nos. 23 and 111).



*The second Bulldog IIIA, R-7, c/n 7745, private venture aircraft. Registered G-ABZW on 3rd October 1932 but never carried marks. Narrow-chord ailerons on upper and lower wings as standardised on Marks IV and IVA.*

from rolled section booms and diaphragms following the Boulton and Paul method, in the evolution of which Pollard had been associated with J. D. North, its originator, before joining the Bristol Company in 1921. Following contemporary practice, the whole airframe, with the exception of the aluminium sheet front fuselage, was fabric covered. All the metal components were dipped and stove enamelled to prevent corrosion. Steel construction of aircraft prevailed until the advent of new light alloys capable of controlled heat treatments and of the American Alclad plate which enabled stressed skin surfaces to be developed. Anodising and later processes superseded stove enamelling for the corrosion protection of light alloys, but that came after the day of the Bulldog, which represented in its time sophisticated metal construction in steel, a system claimed to be lighter and stronger than equivalent structures in drawn steel tubes. It was certainly much cheaper.

Apart from its all-steel strip construction, the Bulldog was conventional in its detail design. Fuel was carried in two gravity tanks housed in the upper planes outboard of the centre section, and the lubricating oil tank was located behind the fireproof engine bulkhead and embodied a surface oil cooler. Two Vickers guns were located low on each side of the cockpit firing through the propeller by control of the hydraulic synchronisation gear. A short-wave two-way radio was mounted in a small compartment just aft of the cockpit. The undercarriage was of the long

stroke type, to enable the aeroplane to operate from rough airfields, with oleo damped rubber compression spring legs attached to the top longerons. The inter-plane struts were steel tubes faired with balsa, and the centre section cabane was steel tube strutting.

Although the Bullpup was designed for the pure interceptor rôle, its counterpart the Bulldog was intended as a day-and-night fighter Specification F.9/26. The Bulldog was entered to take part in the competition for the latter requirement. This was held in the summer of 1927 at Martlesham and the Bristol entry was matched against the Armstrong Whitworth Starling, the Boulton and Paul Partridge, the Gloster Goldfinch and the Hawker Hawfinch, all prototype products of reputable stables. After the competition had been in progress for some time, the Bulldog and Hawfinch emerged as rivals on the short list, the Hawker machine being superior in spin recovery only. The manoeuvrability of the Bulldog and its well-harmonised controls earned full marks and it could be dived to its terminal velocity of 270 m.p.h. without damage to surfaces or structure. The fabric covering remained intact in this flight case, a critical condition in aircraft at that time, and no flutter distortion in any flight case appears to have been reported, another phenomenon then becoming apparent with the gradual increase of aircraft performance. The ease of repair of local damage to the structure, without removing fittings or members, also gained the Bulldog a good mark.

*Left: R-7, K4292, with Perseus long-chord cowling, two-blade propeller and tail wheel. Right: K4292 with Mercury VIS-2 in long-chord cowling and Hamilton three-blade, variable-pitch propeller, July 1934.*





*R-7, in its intermediate form with Mercury VIS.2 engine, short-chord cowling and Hamilton variable-pitch, three-blade propeller. Note twin aileron wires instead of strut.*



*The second Bulldog IVA, R-8, c/n 7808. Registered G-ACJN and built to test Mercury VIS.2 engine. Later fitted with this engine, but first used for testing Perseus 1A. Seen here painted ready for the 1934 SBAC Show.*

An attempt was made to improve the spin recovery characteristics of the Bulldog by fitting a larger fin and rudder but this introduced "weathercocking" in a cross-wind during landings and ground handling. In consequence a different solution was sought by lengthening the fuselage in order to increase the control exercised by the original, small vertical tail surfaces. The Air Ministry ordered another prototype with this and other minor modifications in November 1927 as the Bulldog Mark II, Bristol Type 105A, constructor's number 7235, serial number J9480.

### THE BULLDOG II

The Bulldog II first flew at Filton on 21st January 1928, piloted by Capt. Uwins. Soon after it went to Martlesham where it was so closely matched by the Hawker Hawfinch that the A. and A.E.E. reserved their judgment until both had been sent for Service trials by the R.A.F. Fighter Squadrons at Biggin Hill, Kenley, Northolt, Upavon and North Weald. By June 1928 no decision had been reached although the Bulldog was found to be slightly faster. The final choice was therefore made on ease of maintenance, in which the Bulldog scored because of its single bay wing cellule as contrasted with the two-bay structure of the Hawfinch, and the fact that its wing-mounted tanks could be changed twice as quickly as the front fuselage tank of its competitor. This was an important consideration during operation in the field.

The F.9/26 competition was, therefore, won by the Bulldog II and a contract was placed for 25 production aircraft to Specification F.17/28, revised according to special Service requirements from F.9/26. In addition an extra airframe was built to serve as a demonstration machine. Deliveries to the R.A.F. began in May 1929 and were completed the following October, the first 18 going to No. 3 Squadron and the rest to No. 17, both

of these units having specialised in night fighting with Hawker Woodcocks, which the Bulldogs replaced.

Constructor's numbers for the first batch of Bulldogs were 7322 to 7347, serial numbers J9576 to J9591, machine 7331 being the Company's demonstrator. It was fitted with a Jupiter VIA engine instead of the standard Jupiter VI and registered G-AAHH. Its finish was silver with a green decking and a green stripe along the sides of the fuselage, similar to No. 3 Squadron's markings. Number 7341 was taken out of the Air Ministry contract and sent to Bristol's agents in Japan for prospective sales promotion. It was replaced by 7397, serial number J9591, which was retained at Filton to serve as a test bed for the geared Mercury IV engine.

The immediate success of the Bulldog in R.A.F. service soon attracted foreign attention and in September 1929 five aircraft, constructor's numbers 7353 to 7357, were delivered to Latvia, changes being the installation of French-built Gnome-Rhône Jupiter VI engines and Oerlikon guns. In October 1929 Bulldog Mark II, 7358, with a Jupiter VIIF, was sent to the United States Navy for evaluation as a dive bomber but during a terminal velocity dive an aileron failed and the machine crashed, killing the pilot, Lt. Cuddihy, well known as a Schneider Trophy pilot. A modified Bulldog, 7398, was sent out as a replacement, American serial A-8607, and was one of a new batch of 40 Bulldogs produced at Filton.

Of these 40, 23 were delivered to the R.A.F. in 1930, constructor's numbers 7364 to 7386, serials K1079 to K1101. Nine went to No. 17 Squadron and the rest to No. 54. Numbers 7387 and 7388 were sold to the Royal Siamese Air Force. The next eight went to the Royal Australian Air Force in January 1930, powered with Jupiter VIF engines. These were C/N's 7389 to 7396, Australian serials A12-1 to A12-8. Three Bulldog IIs were delivered to the Royal Swedish Air Force in August 1930, their serial numbers being 1201, 1202, 1203 (C/N's 7400 to 7402).

A third production batch of 20 aircraft was laid down and from this seven were delivered to Latvia (C/N's 7439 to 7445) in July 1930. The first five had the Jupiter VI but the other two were fitted with Gnome-Rhône 9ASB supercharged engines, the French equivalent of the Jupiter VII. The same engine was fitted to the next airframe, 7446, which was built as a second demonstrator. It was registered as G-ABBB\* and finished silver overall except for the royal blue decking. The remaining 12 Bulldogs of this third batch, numbers 7447 to 7458, were sold to Estonia fitted with the French Jupiter VI engines.

### THE MARK IIA

Although all the users of Bulldogs in the various air forces were completely satisfied with the aeroplane, it was inevitable that after a period in service various improvements in detail should be indicated. These were developed on the Company machine, G-ABBB and included standardising the Jupiter VIIF engine, revising wing spars and ailerons and other details and increasing the all-up weight to 3,530 lb. In this form the Bulldog was redesignated Mark IIA and Bristols

\* This particular aeroplane is referred to later in the section dealing with special Bulldogs.

received a contract for 92 aircraft in May 1930 to the revised Specification F.11/29. Production of 100 airframes was planned for parallel lines, one for 36 complete aircraft and the other for 64 airframes less engines, although engines were fitted to the latter for half an hour's test flying. Delivery of 92 aircraft (7459-7550, serials K1603-K1694) was completed in a year, most of them going to Nos. 32, 54 and 111 Squadrons. The remaining eight were purchased by Sweden as a repeat order, constructor's numbers 7582 to 7589 (Swedish serials 5211 to 5218). The Swedish Bulldogs gave satisfactory service and three survivors were given by Sweden to Finland at the end of 1939 as advanced trainers.

Meanwhile the attributes of the aeroplane were still attracting foreign interest and Denmark ordered four Bulldog IIAs to their special requirements while the production mentioned above was proceeding. Airframe numbers of these were 7564 to 7567 and their original Danish serial numbers were J-151 to J-154. They differed from the R.A.F. Mark IIAs with their unblown, high compression Jupiter VIFH engines, their Viet gas starters, and their Madsen machine guns, which were installed lower in the fuselage body than the Vickers guns in the British Bulldogs.

While Bulldog production at Filton was still continuing, the Air Ministry placed a further contract for 100 Mark IIAs\*. Of these No. 19 Squadron received K2155 to K2169 and No. 41 Squadron K2176 to K2187—while the rest were sent, after flight test and less engines, to stores depots. Bulldog K2188 was retained for conversion into a dual control prototype and K2476 to K2495 were followed in production by K2858 to K2872 to the end of 1932. The two-seat K2188 had been evaluated by the Central Flying School to their satisfaction as an advanced trainer and an order was placed for an initial 17 aircraft named Bulldog Type TM to Specification T.12/32. Increased rudder area and slight swept-back wings were incorporated to improve spin recovery. A further 38 Bulldog IIA fighters were produced at Filton for the R.A.F., serials K2946 to K2963 and K3504 to K3513; K3512 was modified before completion with a wide

\* At this stage the airframe numbers became involved and reference should be made to the tabulation at the end.

*Cockpit of Bulldog IIA. Legend on dash states: "engine revolutions normal full speed 1775. Max. permissible for not more than 5 minutes 1950".*



*Bulldog II prototype with lengthened fuselage, experimental engine helmets and head-rest.*

track undercarriage, Dunlop disc wheels and Bendix brakes. At Martlesham the tail skid was found wanting and a castoring tail wheel was substituted, while the fin area was increased to improve directional stability. The gross weight by then was 3,660 lb. These modifications were applied retrospectively to all R.A.F. Bulldogs during 1933.

In the early nineteen thirties Bulldog Mark IIAs were the standard equipment of 10 of the 13 fighter Squadrons forming the Air Defence of Great Britain. These Home Fighter Squadrons were No. 3 (Upavon and Kenley), No. 17 (Upavon and Kenley), No. 19 (Duxford), No. 23 (Kenley and Biggin Hill), No. 29 (North Weald), No. 32 (Kenley and Biggin Hill), No. 41 (Northolt), No. 54 (Hornchurch), No. 56 (North Weald) and No. 111 (Hornchurch and Northolt). This was a small force indeed but the Bulldogs performed with great credit by day and by night in the annual Air Exercises of the Home Command of the Royal Air Force and in addition earned a popular reputation at public air shows. The coloured smoke trail formation aerobatics of Nos. 3, 19 and 54 Squadrons were especially memorable.

The final Air Ministry order for Bulldogs was for 42 two-seat trainers, K3923 to K3953, K4566 to K4576, the first 18 for the R.A.F. College Cranwell and Nos. 3 and 5 Flying Training Schools. The last Bulldogs built in quantity were 17 Mark IVAs for Finland with Bristol Mercury VIS.2 engines. They were the only Bulldogs to fire their guns in anger and that was in the Russo-Finnish war of late 1939. They were operated with ski undercarriages as well as with wheels and put up a gallant show in the early stages of those little-remembered hostilities. Their Finnish serial numbers were BU59 to BU75 and the first of these has now the distinction of being the only Bulldog surviving since the crash of the Shuttleworth Trust's Mark IIA G-ABBB (K2227) at the Farnborough Air Display of 1964. BU59 rests in the museum of the Finnish Air Force at Vesivehmaa.

Mark IVA Bulldogs were the only Mercury-engined variants of the basic Bulldog/Bullpup design to be produced in any quantity. Although the Bullpup with a Mercury IIA put up a reasonable show in the F.20/27 interceptor competition at Martlesham in 1929 nothing further came of it as regards production contracts. A Mark I airframe 7399 served as a test bed for the Mercury III under the SBAC markings R-1 and had a four blade propeller. The geared Mercury IV was tested in number 7397 airframe (serial J9591) later registered as G-AATR for cowling trials, including drag-reducing cylinder helmets, reverting to its Service serial marking for testing the Mercury IVA.

### THE BULLDOG IIIA

Although the Mercury-powered Bulldogs failed to achieve any success comparative with that enjoyed by the Jupiter-engined types, the history of the two Mark IIAs built is of interest.

In 1931 the improved Mercury IV engine went into production as the Mercury IVS.2 and a new Mark of Bulldog was developed to take advantage of the increased power. The rear fuselage was stiffened by increased depth at the sternpost and the gauge of the steel strip longerons was made heavier. The Bristol IA section of the upper wings was changed to the R.A.F. 34, which apart from better aerodynamic efficiency facilitated the enclosure of the wing tanks within its

biconvex profile. Pilot's view was improved by reducing the lower wing chord by seven inches, and other improvements included the fitting of a short-chord Townend ring around the engine and a new exhaust collector ring of low back pressure. This effort to improve performance with the Mercury IVS.2 raised the speed at 15,000 feet from 175 m.p.h. for the Mark IIA to 208 m.p.h. for the Mark IIIA, as this variant was identified.

The private venture Mark IIIA with R.A.F. roundels and the S.B.A.C. identification R-5 was flown by R.A.F. pilots in 1932 in extended trials against the Gloster SS19B (production name Gauntlet) to decide on a successor to the Bulldog IIA as a



*Line-up of Swedish Bulldog IIAs, c/ns 7582 to 7589, May 1931. Serials 5211-5218.*



*Left: Estonian Bulldog II, August 1930. Twelve delivered c/ns 7447 to 7458. Right: Latvian Bulldog, c/n 7439, with Jupiter VI. Delivered July 1930.*



*Left: Bulldog IIA, Danish Air Force. Note gun blister under cockpit and position of trough (0-300 Madsen m/gs). Right: Finnish Bulldog IVA, BU59, Mercury VIS.2 engine, similar to R-7, illustrated on a previous page.*



*Siamese Bulldog II, delivered January 1930, c/ns 7387/8. Right: Bulldog Type 105J, first machine built by Nakajima for Japanese Navy (J.S.S.F.) with helmets on Jupiter VII engine.*

day-and-night fighter. The Gauntlet was superior in performance, largely as a result of Harry Folland's extreme attention to reduction of drag in detail design and it received the contract.

A second Bulldog IIIA was built for the Paris Show in 1932 and eventually was converted to a new standard, the Mark IVA, to meet the F.7/30 Specification, in which it had to compete with its Gloster rival, the Gladiator, which had 26 m.p.h. advantage in speed. Various engine trials were carried out with this Bulldog and ultimately it finished up as a trial horse for the Hamilton three-blade variable pitch metal propeller, and was equipped with a short-chord N.A.C.A. cowling.

Among the many variants and conversions of the Bulldog, mention must be made of the high altitude Mark I with high aspect ratio wings of 50 feet span.

It was intended for attempts on the height and climb-to-height records in 1927 which were frustrated by a successful Italian attack by Donati. One airframe, 7744 (K4189) was constructed in stainless steel which proved inferior to the standard high tensile steel and was abandoned.

The two Japanese variants labelled J.S.S.F. (Japanese Single Seat Fighter) were built by Nakajima in Tokyo, who were manufacturing Bristol Jupiter engines under licence. Nothing came of this attempt to acquire business except that Bulldog features appeared in subsequent Nakajima designs.

Bulldogs remained the foremost front line fighters in the R.A.F. until 1937 when they were replaced by Gladiators. One of their final services was when No. 3 Squadron's Bulldogs were sent to the Sudan during the Abyssinian crisis to act as watchdogs!

*Acknowledgment is made to Chris Barnes and the wealth of material from his book Bristol Aircraft since 1910 (Putnam).*

| Type                        | 102          | 105A<br>Bulldog I | Bulldog<br>(High Altitude) | 105A<br>Bulldog II                                                                                         | 105A<br>Bulldog IIA                                                                                                                                                                     |
|-----------------------------|--------------|-------------------|----------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power plant                 | Jupiter VI   | Jupiter VII       | Jupiter VII                | Jupiter VII                                                                                                | Jupiter VII F                                                                                                                                                                           |
| Span                        | 30 ft.       | 34 ft.            | 50 ft.                     | 33 ft. 10 in.                                                                                              | 33 ft. 10 in.                                                                                                                                                                           |
| Length                      | 21 ft. 7 in. | 23 ft.            | 24 ft.                     | 25 ft. 2 in.                                                                                               | 25 ft. 2 in.                                                                                                                                                                            |
| Height                      | 8 ft. 8 in.  | 8 ft. 9 in.       | 10 ft.                     | 8 ft. 9 in.                                                                                                | 8 ft. 9 in.                                                                                                                                                                             |
| Wing area                   | 290 sq. ft.  | 307 sq. ft.       | 480 sq. ft.                | 307 sq. ft.                                                                                                | 307 sq. ft.                                                                                                                                                                             |
| Empty weight                | 1,815 lb.    | 1,987 lb.         | 2,000 lb.                  | 2,200 lb.                                                                                                  | 2,222 lb.                                                                                                                                                                               |
| All-up weight               | 2,720 lb.    | 3,250 lb.         | 3,000 lb.                  | 3,490 lb.                                                                                                  | 3,530 lb.                                                                                                                                                                               |
|                             |              |                   |                            |                                                                                                            | (later 3,660 lb.)                                                                                                                                                                       |
| Max. speed                  | —            | 173 m.p.h.        | 150 m.p.h.                 | 178 m.p.h.                                                                                                 | 178 m.p.h.                                                                                                                                                                              |
| Service ceiling             | —            | 27,000 ft.        | 40,000 ft.                 | 29,300 ft.                                                                                                 | 29,300 ft.                                                                                                                                                                              |
| Accommodation               | 1            | 1                 | 1                          | 1                                                                                                          | 1                                                                                                                                                                                       |
| Production                  | nil          | 2                 | (1)                        | 92                                                                                                         | 268                                                                                                                                                                                     |
| Constructor's Airframe Nos. | nil          | 7155 7267         | (7155)                     | 7235<br>7322-7347<br>7353-7358<br>7364-7403<br>7439-7445<br>7447-7458                                      | 7446<br>7459-7550<br>7564-7567<br>7582-7589<br>7691-7710<br>7713-7726<br>7744<br>7746-7773                                                                                              |
| Serial Nos.                 | —            | —                 | —                          | J9480<br>J9567-J9591<br>K1079-K1101<br>America<br>A-8607<br>R.A.A.F.<br>A12-1-A12-8<br>Sweden<br>1201-1203 | K1603-K1694<br>K2135-K2234<br>K2155-K2169<br>K2176-K2187<br>K2475<br>K2476-K2495<br>K2858-K2872<br>K2946-K2963<br>K3504-K3513<br>K4189<br>Sweden<br>5211-5218<br>Denmark<br>J-151-J-154 |

| Type                        | 105A<br>Bulldog IIIA | 105A<br>Bulldog IV | 105A<br>Bulldog IVA           | 105J<br>J.S.S.F.        | Bulldog TM                                         |
|-----------------------------|----------------------|--------------------|-------------------------------|-------------------------|----------------------------------------------------|
| Power plant                 | Mercury IVA          | Mercury IVS 2      | Mercury VIS 2                 | Nakajima<br>Jupiter VII | Jupiter VIF H                                      |
| Span                        | 33 ft. 8 in.         | 33 ft. 8 in.       | 33 ft. 8 in.                  | 33 ft. 8 in.            | 34 ft. 2 in.                                       |
| Length                      | 25 ft. 4 in.         | 25 ft. 4 in.       | 25 ft. 4 in.                  | 25 ft. 6 in.            | 25 ft. 3 in.                                       |
| Height                      | 9 ft 1 in.           | 9 ft. 1 in.        | 9 ft. 1 in.                   | 9 ft.                   | 8 ft. 9 in.                                        |
| Wing area                   | 294 sq. ft.          | 294 sq. ft.        | 294 sq. ft.                   | 300 sq. ft.             | 309 sq. ft.                                        |
| Empty weight                | 2,800 lb.            | 2,810 lb.          | 2,690 lb.                     | 2,400 lb.               | 2,200 lb.                                          |
| All-up weight               | 4,000 lb.            | 4,100 lb.          | 4,010 lb.                     | 3,350 lb.               | 3,300 lb.                                          |
| Max. speed                  | 208 m.p.h.           | 218 m.p.h.         | 224 m.p.h.                    | 196 m.p.h.              | 168 m.p.h.                                         |
| Service ceiling             | 31,000 ft.           | 31,700 ft.         | 33,400 ft.                    | 30,000 ft.              | 28,000 ft.                                         |
| Accommodation               | 1                    | 1                  | 1                             | 1                       | 2                                                  |
| Production                  | 2                    | (1)                | 18                            | 2                       | 59                                                 |
| Constructor's Airframe Nos. | 7560 7745            | (7745)             | 7808<br>7810-7826             | —                       | 7727-7743<br>7777-7807<br>7828-7837                |
| Serial Nos.                 | —                    | —                  | Finland<br>K4292<br>BU59-BU75 | —                       | K2188<br>K3170-K3186<br>K3923-K3953<br>K4566-K4576 |