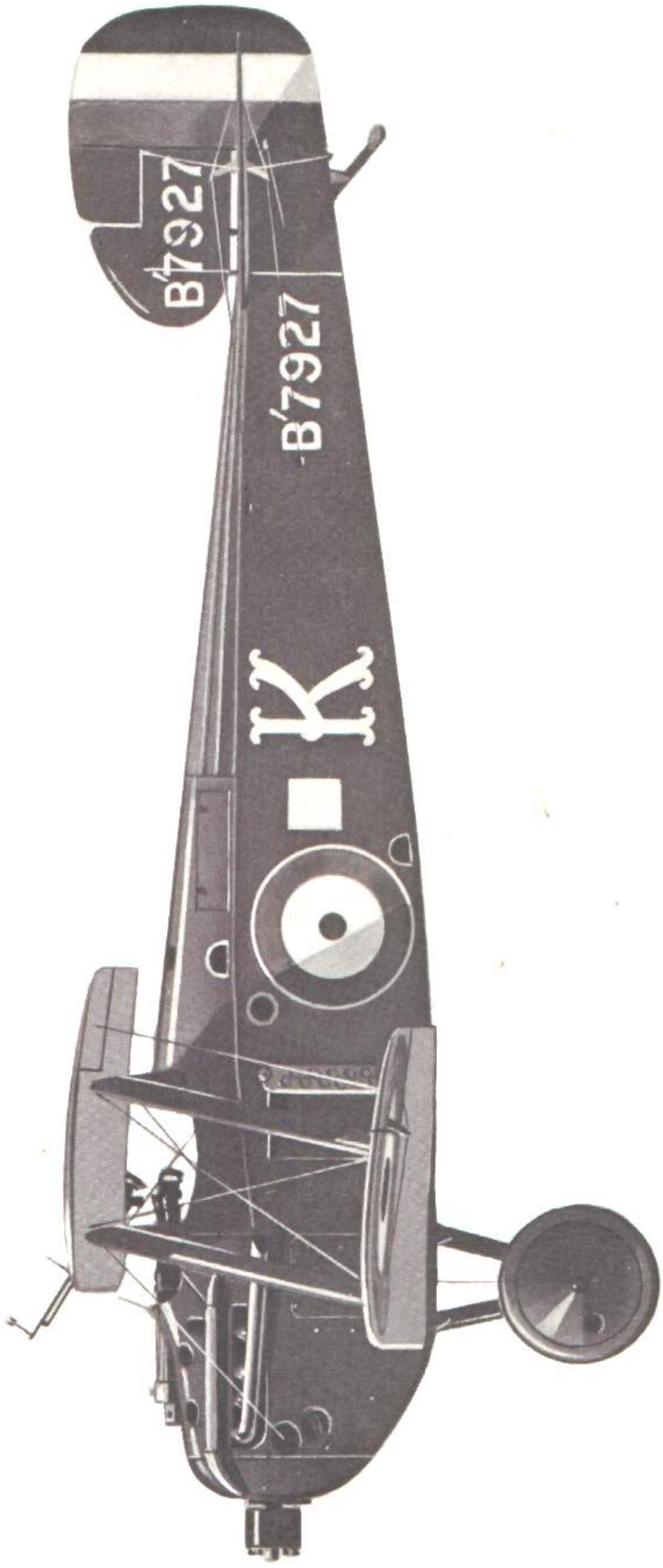
PROFILE PUBLICATIONS

The Sopwith Dolphin



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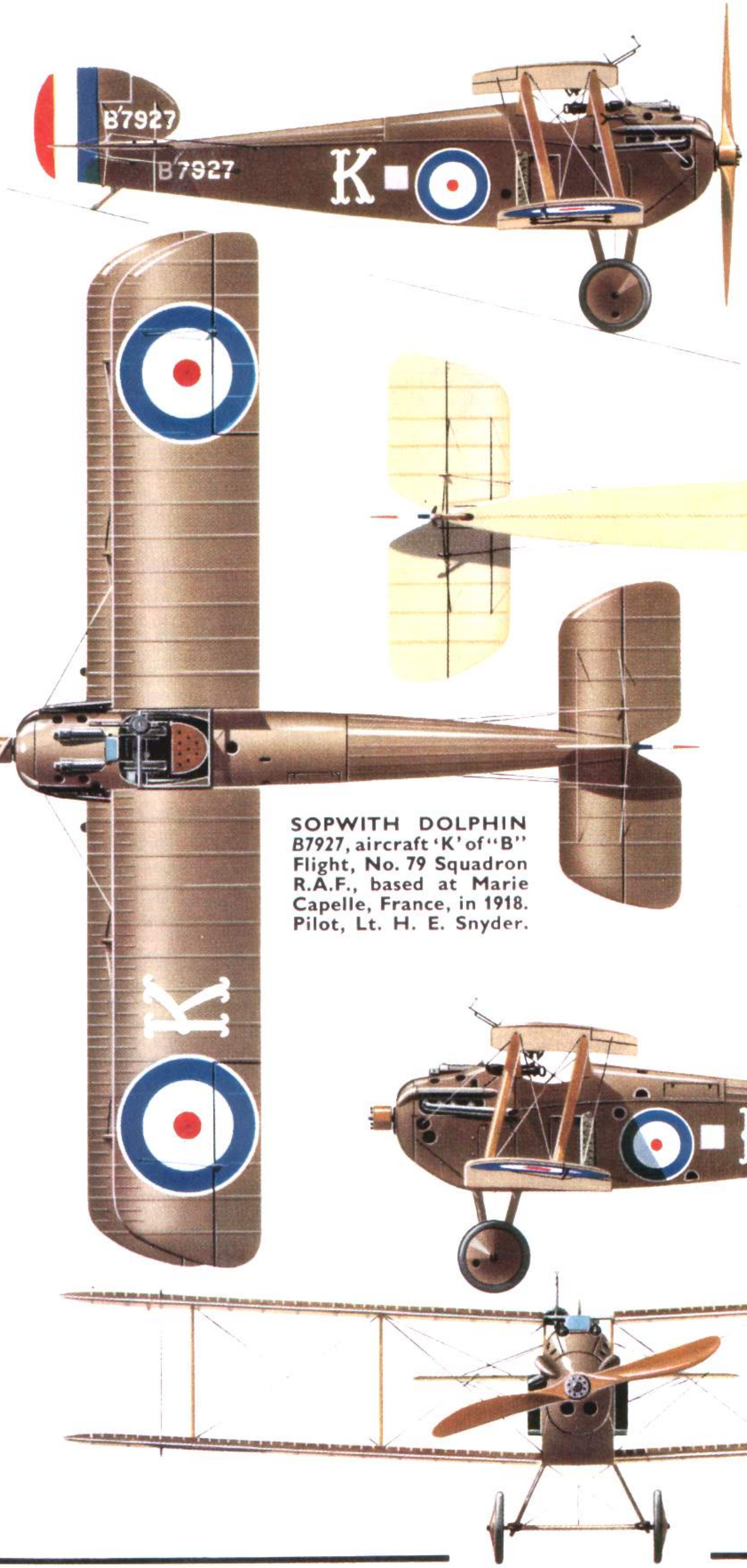
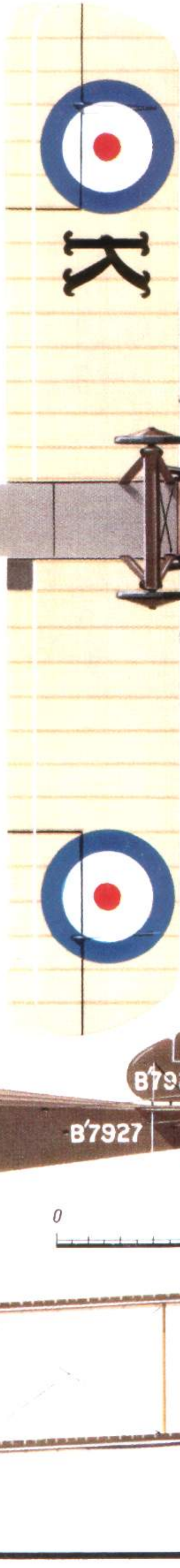
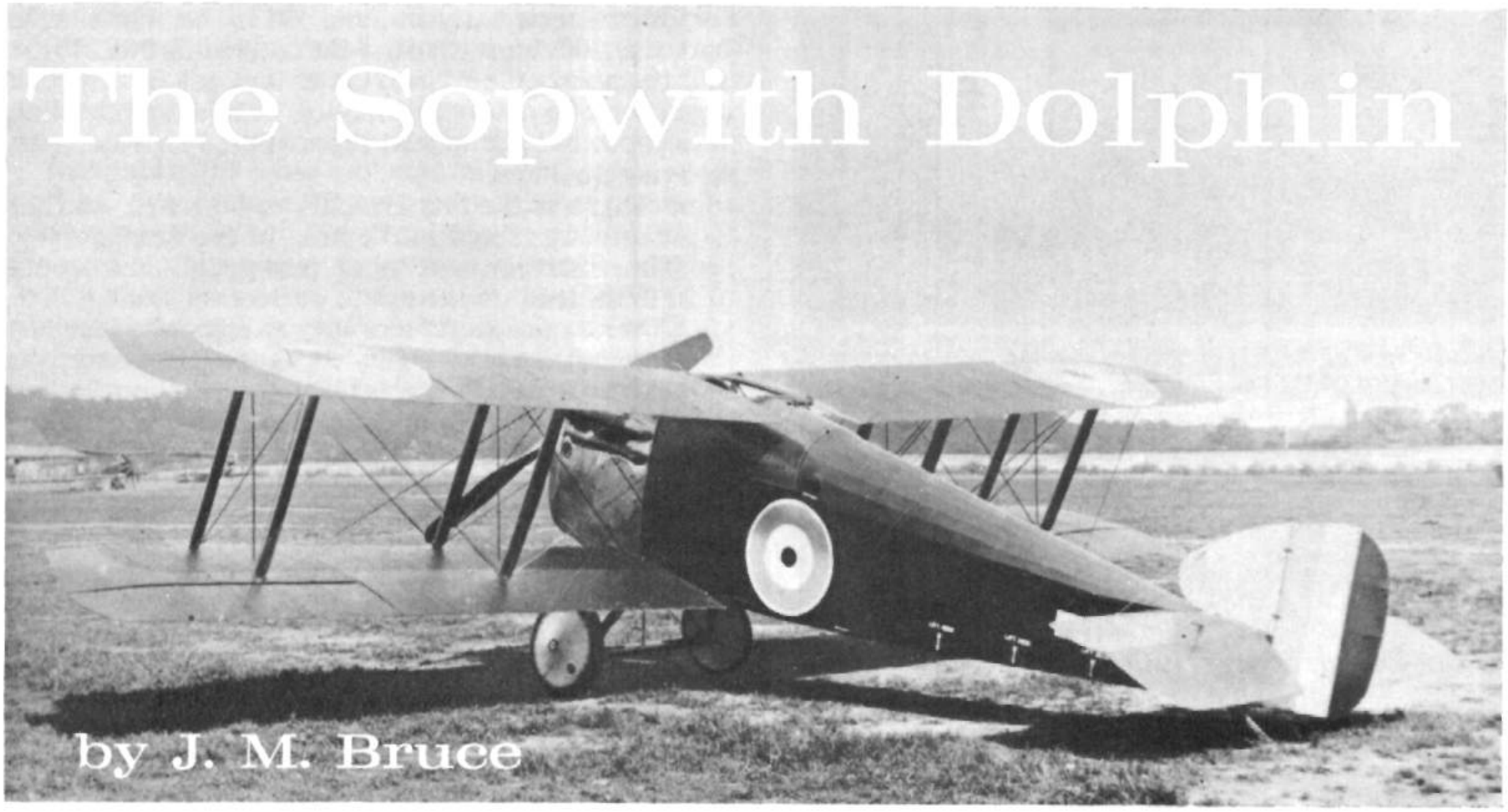


SOPWITH DOLPHIN
B7927, aircraft 'K' of "B" Flight, No. 79 Squadron R.A.F., based at Marie Capelle, France, in 1918. Pilot, Lt. H. E. Snyder.



The Sopwith Dolphin



by J. M. Bruce

The first prototype Dolphin at Brooklands in its original form.

Considerable though the success of the Sopwith Camel was, it owed no part of it to the view it gave its pilot. At a time when great importance was, rightly and sensibly, attached to a good outlook from the cockpit, especially upwards and rearwards, the Camel sat its pilot under the upper wing and provided him with a limited measure of upward view through a tiny window in the centre section that he usually had to enlarge for himself. His compensation was the Camel's superlative, albeit neurotic and one-sided, manoeuvrability.

Following the F.1 Camel Herbert Smith went on to develop the Sopwith 2F.1 Camel from the abandoned F.S.1 seaplane. In the Sopwith F series this was followed by the 3F.2 Hippo, a massive two-seat fighter in which radical steps had been taken to provide the crew with good all-round vision. By adopting backwards stagger of no less than 27⅜ in. (later reduced to 21⅜ in.) and by fairing the fuselage up to the top wing Smith was able to place the pilot at the leading edge of the upper wing, the observer immediately behind it. The Hippo was not a success: its lateral control was too heavy, its cockpits too far apart for the co-operation between pilot and observer that was so vital in combat; and, ironically, the official report contained criticism of the pilot's forward view, which was somewhat impaired by the bulky cowling of the 200 h.p. Clerget 11Eb engine.

Following the Hippo came the design for the Sopwith FR.2, another two-seater that was intended for fighter-reconnaissance duties. The FR.2 was to embody some Hippo components, but it had conventional positive stagger and was to be powered by a 200 h.p. Hispano-Suiza engine. Again the fuselage was designed to be deep enough for the crew's heads to be level with the upper wing.

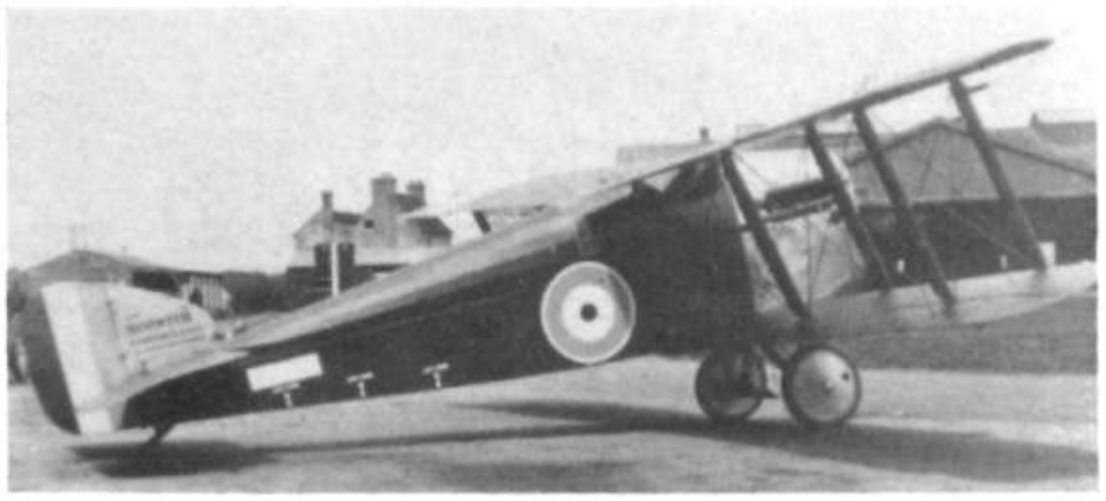
It is doubtful whether the rather uninspired FR.2 design was ever completed; it appears to have been abandoned (possibly owing to the shortage of Hispano-Suiza engines) in favour of the more compact, rotary-powered 2FR.2 Bulldog. The chief points of interest in the FR.2 design, as far as it relates to that of the Dolphin, were its deep frontal radiator and use of fin and rudder surfaces that closely resembled those of the Camel.

References to any Sopwith design with a 4F designation have yet to be found. It is conceivable that the FR.2 may have been thought of first as the 4F.2 and renamed in view of its fighter-reconnaissance function; but that is pure conjecture. What seems reasonably certain is that the 3F.2 Hippo, FR.2 project and the 5F.1 single-seater were all designed at about the same time.

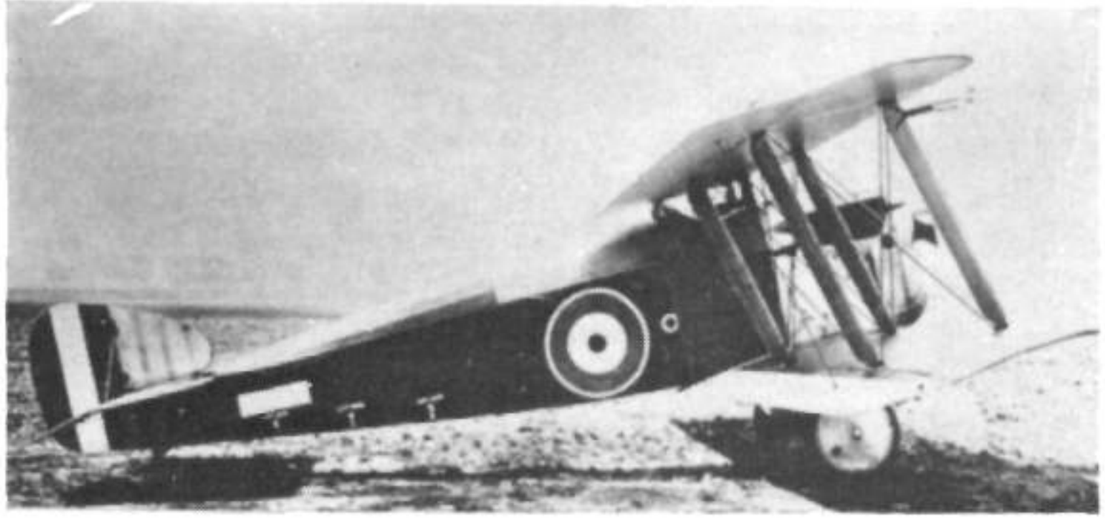
The 5F.1, later named Dolphin, was almost certainly completed before the Hippo. The first prototype was passed by the Sopwith experimental department on 23rd May 1917. It emerged as a clean-lined little aircraft with a tall frontal radiator immediately behind the airscrew and thirteen inches of negative stagger on the mainplanes which, rather remarkably, had two bracing bays. The tail unit was very similar to that of the Camel and the fin and rudder looked too small to balance the side area of the deep forward fuselage.

By using a stationary water-cooled engine Herbert Smith had broken away from earlier Sopwith practice

Harry Hawker with the first prototype. This photograph illustrates clearly the shape of the nose radiator.



Another view of the first prototype, with the Sopwith company's name painted on the fin.



The first Dolphin at Martlesham Heath, with extended plywood decking behind the cockpit. The fin had apparently been re-covered, as the Sopwith name was absent at this time.
(Photo: Royal Aeronautical Society)

but it seems likely that he hoped to achieve a high degree of manoeuvrability by repeating the Camel's basic close grouping of engine, armament, pilot and fuel tanks in the shortest possible proportion of the fuselage length and thus concentrating the greatest masses. In the Dolphin the twin Vickers guns were mounted immediately above the engine (on the first prototype they were wholly enclosed within the cowling); the pilot sat immediately behind the engine with his feet on the rudder bar directly under the rear of the crankcase. The main 20 gallon fuel tank was under the pilot's seat; the 7 gallon gravity tank immediately behind.

The fuselage had a deep top decking that was taken right up to the level of the spanwise members of the upper-wing attachment frame. This was a sturdy rectangular open structure of steel tubing, supported from the upper longerons by four short spruce struts, and the pilot sat with his head in this open "centre section", his eyes level with the span-wise members. Thus he was given an unobstructed view of the entire hemisphere above his aircraft.

This disposition of the pilot and the main masses determined the location of the upper wing. To put the centre of lift in the right place the designer was similarly left with no choice in placing the lower wing: it had to be ahead of the upper.

Structurally the Dolphin was conventional and typical of Herbert Smith's designs. The basic fuselage box girder was of a somewhat unusual shape, but was wholly of wood with wire cross-bracing. The spacers supporting the centre-section struts were made of thicker-section timber than those in the rear fuselage, and the forward spacers were more closely pitched than those abaft the cockpit. Mainplane trailing edges, wing tips and most of the tail unit were made of steel tubing.

The manufacturer's trials were flown by Harry Hawker, and the aircraft went to Martlesham Heath for official tests early in June 1917. At that time it had the 200 h.p. Hispano-Suiza engine No. 10137 and the plywood decking behind the cockpit had been extended aft. Its performance in speed and climb was good, but the official report noted shortcomings in flying qualities:

> "This was the first Dolphin to be tested, and the radiator was fitted in the nose of the fuselage.
>
> The machine was nose heavy and had about 20 lb. of lead on the tail to correct the fault.
>
> There was a slight tendency to spin when turning to the left; controllability was good. Radiator was inefficient. Machine was tiring to fly 'all out' owing to strong left rudder being necessary; a balanced rudder was suggested as an improvement."

After Martlesham, the Dolphin prototype went to St. Omer for further evaluation by operational pilots and for comparison with the S.E.5s of No. 56 Squadron. It was flown to France by Mr. H. T. Tizard (the late Sir Henry Tizard) and its arrival there was recorded thus by Maurice Baring in *Flying Corps Headquarters, 1914-1918:*

> "June 13th, 1917.—A new machine, the Dolphin, arrived and did its trials."

What Baring probably did not know was that the Dolphin nearly did not arrive at all for, wrote Oliver Stewart in *The Clouds Remember:*

> "Its silhouette was unfamiliar to the British anti-aircraft gunners who, acting apparently on the rule 'if in doubt, shoot', gave Sir Henry a rousing welcome of high explosive and shrapnel."

Martlesham's criticism of the efficiency of the nose radiator seems somewhat surprising. Perhaps even more remarkable is the absence of criticism of the pilot's forward view, which was obstructed by the high top of the radiator. Doubtless an improvement in the radiator's efficiency could only have been achieved by enlarging it and reducing the pilot's view still further, consequently the second Dolphin prototype was built with a completely revised cooling system and nose design.

In this aircraft two separate but absurdly small radiator surfaces were used, one being let into the root of each upper wing panel ahead of the rear spar. Each radiator had a small header tank that protruded on the upper surface of the wing. A cut-out was made in each lower wing, the entire inter-spar and trailing edge portion between the second and third ribs being removed. Presumably this position was chosen because a cut-out at the more usual wing-root position would have done little more than give the pilot a clear view of his aircraft's wheels.

The absence of a frontal radiator allowed the top line of the engine cowling to be taken down at a

Three-quarter front view of the second prototype with extensively modified nose and two small triangular radiator surfaces, one on the underside of each upper wing panel immediately ahead of the rear centre-section strut. This view also shows the clear-view cut-outs in the lower wings.
(Photo: Imperial War Museum Q67557)

steep angle to the airscrew shaft. This exposed part of the barrels of the two Vickers guns. Martlesham's criticism of the first prototype's poor rudder control was acknowledged by the introduction of an enlarged horn-balanced rudder, but the fin area was reduced.

Inevitably, the wing-mounted radiators were not a success. An attempt to improve matters was made by increasing their area and mounting them further forward on the wing, but this too was ineffective. When this was done, the aircraft was fitted with vibration-preventers at the intersections of the flying and landing wires in the inner bracing bay on each side.

In a further attempt to provide adequate cooling for the engine, the wing radiators were replaced by two rectangular blocks, one on each side of the pilot's cockpit and it seems likely that this would necessitate the transfer of the main fuel tank to a position immediately behind the pilot's seat. Certainly it was placed there on all later aircraft. The new radiators were apparently regarded as sufficiently satisfactory for the Sopwith company to submit the modified second prototype to Martlesham in August 1917. The cleaner nose lines improved performance, but the official test report confined itself to rather terse factuality:

"This was the second machine of the type; originally it was to have radiators carried in the top plane, but these were removed, and it underwent above trials with two block radiators, one on each side of pilot's cockpit; these were satisfactory. The abolition of the radiator in the front of the fuselage made it possible to streamline the entry to better purpose. The view upwards from this machine is good, owing to the open centre section of the top planes. There are gaps in the lower planes, but they are of little value and the downward view is very bad. This machine was fitted with a balanced rudder, giving an improvement over the first type. Length of run to unstick, 60 yards; to pull up with engine stopped, 90 yards."

This three-quarter rear view of the second prototype illustrates the revised form of fin and rudder fitted to the aircraft. The streamlined header tanks for the wing radiators can also be seen at the upper wing roots.

(Photo: Imperial War Museum Q56844)

The modified second prototype with enlarged wing radiators mounted further forward, immediately behind the front spar of each upper wing panel. In this photograph the vibration preventers in the inner bracing bays can be seen.

The third prototype at Brooklands. This aircraft had flank radiators on the fuselage sides, twin Lewis guns on the front spanwise member of the wing attachment frame, a small spinner, and a further revision of the fin and rudder.

This second prototype was also tested at this time with a four-blade airscrew to drawing T.28097, one of the types fitted to S.E.5a's with the same geared Hispano-Suiza engine. Performance suffered, however, and two-blade airscrews remained standard on subsequent Dolphins.

While the second prototype was at Martlesham it was modified on 18th September 1917 by having the height of the top decking abaft the cockpit reduced. Two days later its T.28097 airscrew was replaced by one of T.28063 type, which was apparently still fitted when the aircraft was flown back to Brooklands on 25th September.

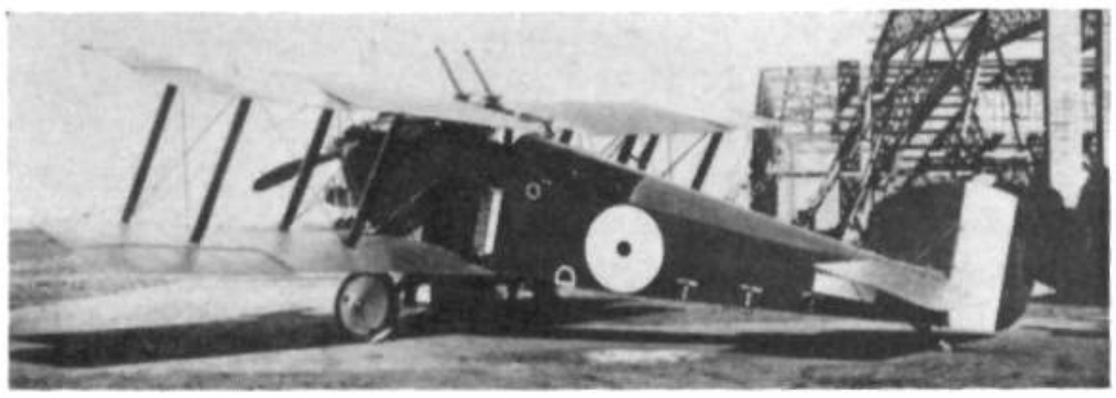
A third prototype was built. It was basically similar to the second, having flank radiators with outward-opening flaps in front of them to act as shutters. The lower wings had no cut-outs, and a new fin and rudder assembly was fitted: the fin had been enlarged and the shape of the rudder revised. Detail changes were made to the fuel system and a small hemispherical spinner was fitted to the airscrew.

Possibly the most significant additions to the aircraft were the two Lewis guns that were mounted on the front spanwise member of the upper wing attachment frame. These guns pointed upwards at about 45 degrees, but had a certain amount of movement. They made the Dolphin the world's first multi-gun single-seat fighter, but they also made the cockpit very cramped and constituted a serious hazard to the pilot, who could hardly hope to escape facial injury in even a relatively minor crash.

Development continued, and the final prototype form of the Dolphin brought it virtually to production standard. This aircraft resembled the third prototype in all material particulars, but the top decking of the fuselage was reduced in height by several inches and the small locker on the port side was moved aft by one bay, suggesting a further modification of the fuel system, for there was a gravity tank under the top decking immediately behind the cockpit.

Official faith in the Dolphin must have been considerable, despite its unconventional layout, for it was ordered in large numbers within a few days of the first prototype's visit to St. Omer. This fact is the more remarkable because the Dolphin had the same engine as the S.E.5a, for which a large production programme was planned. Long before the chain of Dolphin prototype development outlined above had been completed, some nine hundred Dolphins had been ordered from the Sopwith, Darracq and Hooper companies.

The third prototype at Martlesham Heath, showing the flank radiators. When this photograph was taken the aircraft did not have its spinner.



The fourth prototype Dolphin at Martlesham Heath. This aircraft differed from its immediate predecessor in having the top decking behind the cockpit reduced in height; and the small locker in the port side of that decking was moved aft.
(Photo: Real Photographs Co., Ltd.)

Standard production Dolphin with full armament. The production aircraft was virtually indistinguishable from the fourth prototype, but had steel-tube undercarriage V-struts and the structure of the fin and rudder was modified.
(Photo: Royal Aeronautical Society)

The Sopwith contract (A.S.17137, dated 29th June 1917) was for 500 aircraft, to be numbered *C3777-C4276*. From Darracq *C8001-C8200* were ordered under Contract No. A.S.18920 dated 13th July 1917; and *D5201-D5400* were the subject of the Hooper contract (No. A.S.17566) which, in the record, has the doubtful date of 28th June 1917.

The production aircraft were very similar to the fourth prototype. The production-type fin and rudder differed structurally from those of the final prototype but were identical in outline. In the undercarriage, V-struts of streamline-section steel tubing replaced the wooden members that had been used on the prototypes. The small spinner that had appeared on the third and fourth prototypes was not perpetuated, and the stagger was reduced by one inch.

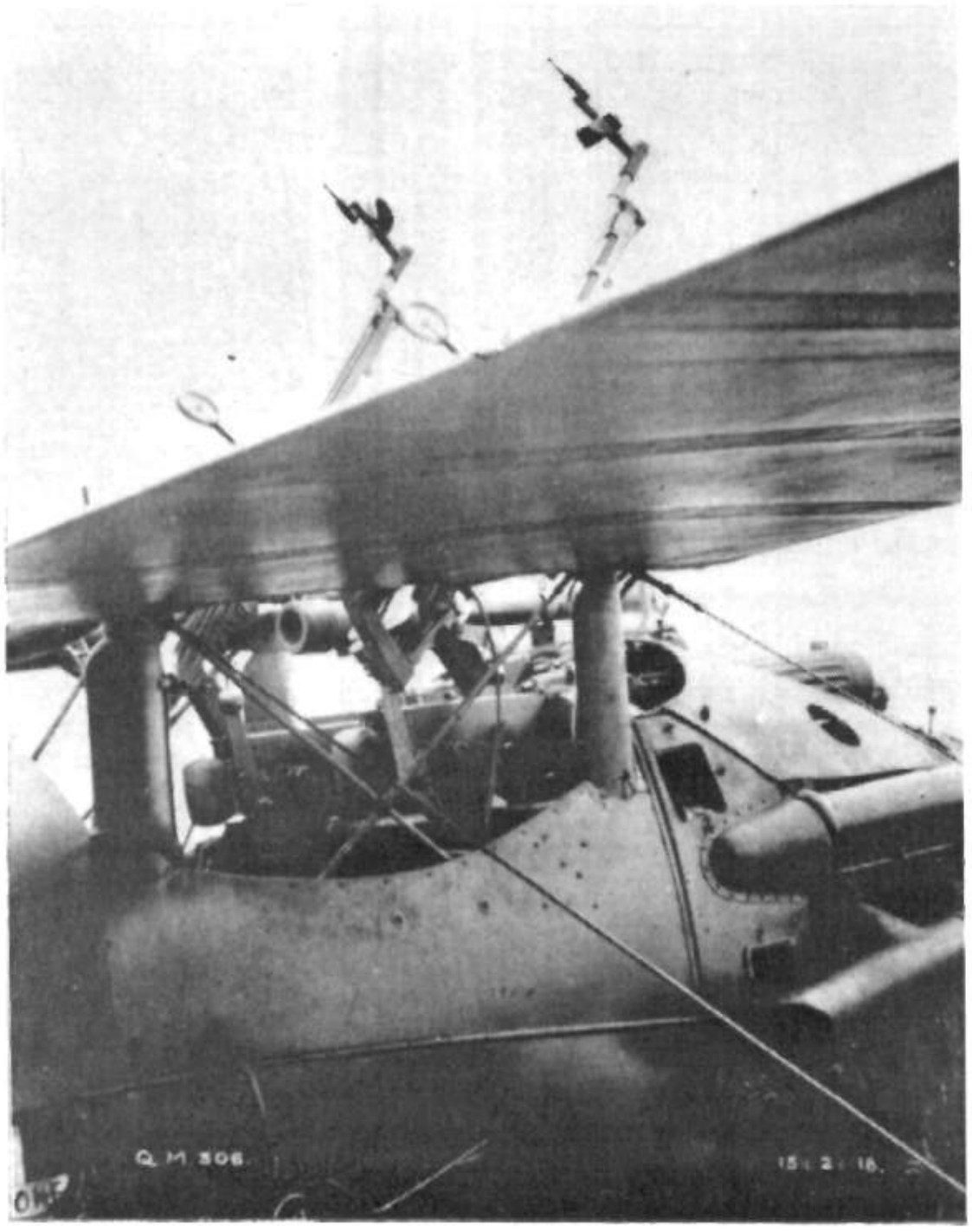
Production Dolphins began to come off the Sopwith production line in the autumn of 1917, and by the end of that year 121 had been delivered. The Sopwith company were asked for a further 200 Dolphins (*D3576-D3775*) under Contract No. A.S. 35977 dated 29th November 1917. Possibly the delivery of Mayen-built Hispano-Suizas early in 1918 encouraged the War Office to order more Dolphins that spring: two contracts awarded to the Sopwith company, 35A/305/C.195 of 13th March and A.S.3294 of 6th April were respectively for *E4629-E5128* and *E4424-E4623*, bringing the total ordered from Sopwith to no less than 1,400 Dolphins. Of these, the first 700 had been completed by 1st June 1918. Another 100 (*F7034-F7133*) were ordered from Darracq on 8th June 1918 under Contract No. 35A/1459/C.1545.

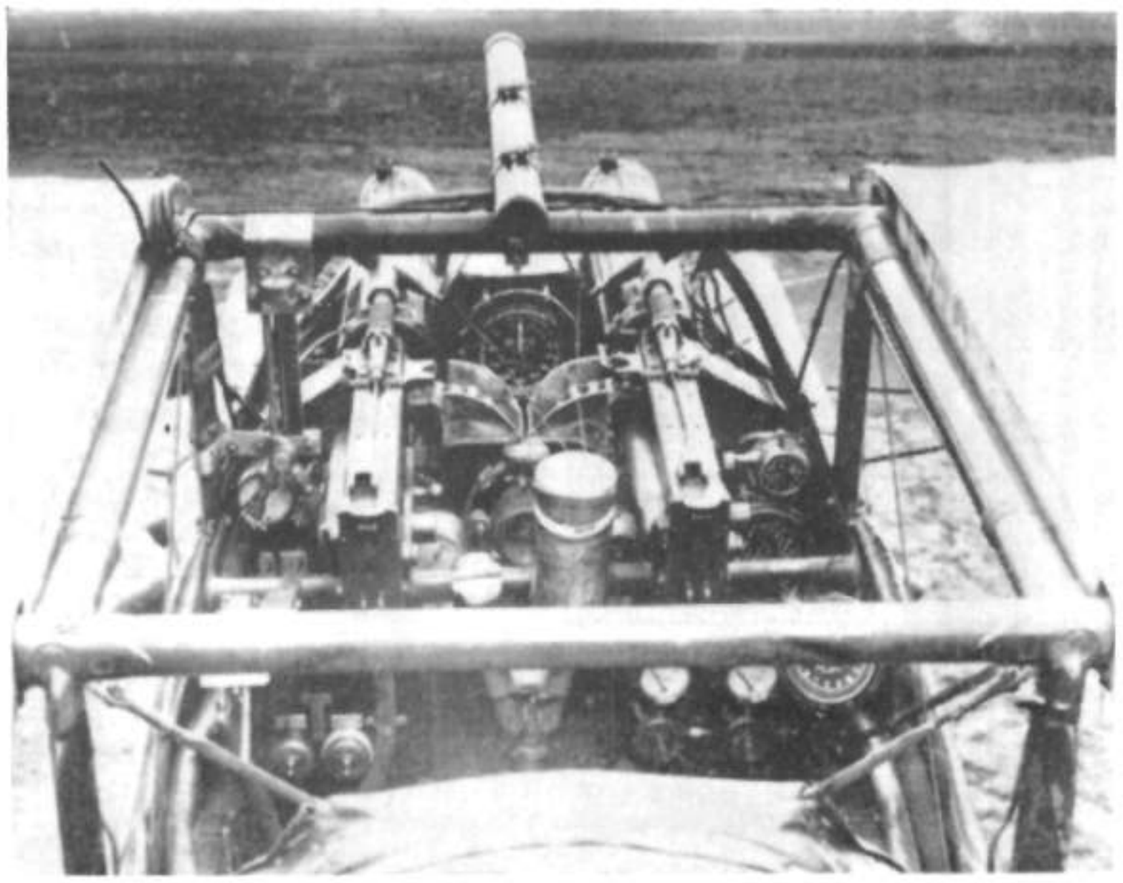
As related in *Profile* No. 1 (the S.E.5a), grave difficulties in the supply and quality of Hispano-Suiza engines had developed at the time when production Dolphins began to appear. There can be little doubt that some at least of the first Dolphins to be delivered to the R.F.C. were fitted with the defective Brasier-made Hispano-Suiza engines that were passed into service with faulty gearwheels and warning notes in their log books.

Thus the Dolphin entered service under several disadvantages. Its negative stagger aroused the distrust of R.F.C. pilots, who had heard a great deal about the faults and shortcomings of the earlier D.H.5 (see *Profile* No. 181) and promptly assumed that these would be repeated in the Dolphin. The reactions of most pilots encountering the Dolphin for the first time are summed up by Oliver Stewart in *The Clouds Remember:*

> "On getting into the cockpit the writer's first remark was, 'This would be an unpleasant machine in which to turn over on the ground.'
>
> That remark is recorded because it expressed a thought which passed through the heads of almost all the pilots who flew the machine and led to one or two minor modifications. The pilot's head came above the top plane, and he was completely surrounded by longerons, spars, cross-bracing

Cockpit of the same aircraft, showing the clamps for the butts of the Lewis guns and the proximity to the pilot's face of the Vickers guns. On this aircraft each Lewis gun had a Norman vane sight, but these were seldom fitted to operational Dolphins.
(Photo: Royal Aeronautical Society)



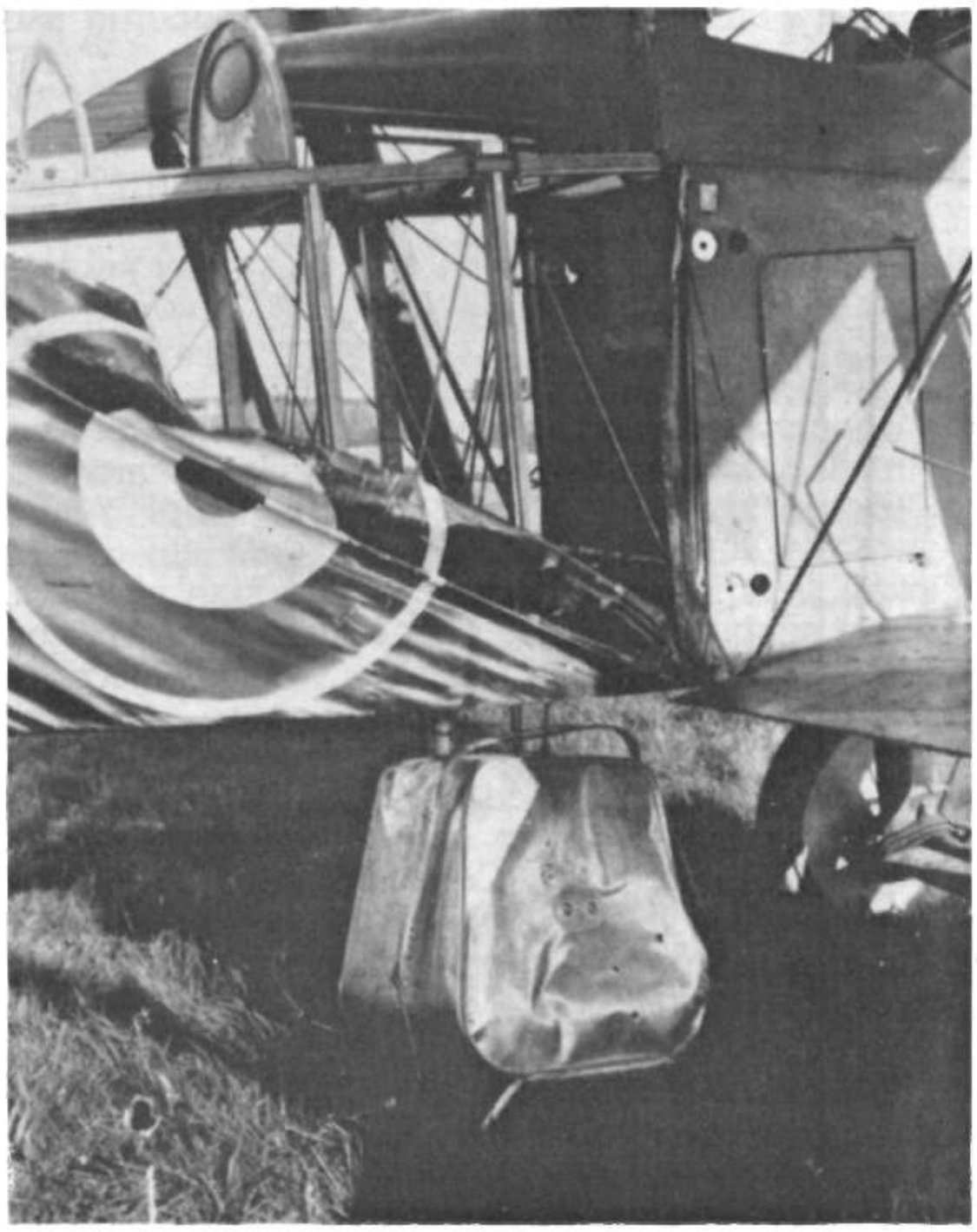


Cockpit of a Dolphin at Martlesham Heath. The thermometer to the left of the port gun and the cylindrical fitting to the left of the starboard gun were not standard equipment, and the Aldis sight was not normally mounted on top of the forward member of the wing-attachment frame.
(Photo: E. F. Cheesman)

wires and tie rods, and the feeling of being boxed in with the head exposed in a vulnerable position was experienced at once. With the engine in his lap and the petrol tanks in the small of his back, it seemed to the pilot that he had little chance of escaping injury in the event of a bad landing."

Add to this feeling the probability that the aircraft's engine was one of those that were virtually certified to be unreliable and the likelihood of a forced landing more than usually great, and the anxieties of the pilots of the early Dolphins can be thoroughly understood.

Dolphin D3747 *with Lott jettisonable petrol tank.*



The first operational squadron of the R.F.C. to be equipped with the Dolphin was No. 19, which relinquished its Spads in exchange for the new Sopwith in January 1918. Only three of the British aircraft types used during the 1914-18 War have had their names perpetuated by heraldic representation in the badges of R.A.F. squadrons. Of these three the Dolphin is one: a dolphin is the central feature of the badge of No. 19 Squadron. At Beaulieu, No. 79 Squadron had begun to receive Dolphins as early as 15th December 1917 but did not go to France until 18th February 1918. This unit did not reach Estrée Blanche until 22nd February, but moved to Champion on 5th March, whence it started its operational career.

In April No. 23 Squadron was re-equipped with Dolphins (like No. 19 Squadron it had previously had Spads), and on 26th April No. 87 Squadron arrived in France as a Dolphin unit.

In spite of the large orders for Dolphins, no more squadrons were equipped with the type. It had been intended to make No. 90 Squadron a Dolphin unit, and early in 1918 some engineless aircraft were sent to Shotwick (now known as Sealand) to form the squadron's equipment. Possibly owing to the engine-supply difficulties then prevailing the squadron was disbanded (to be re-formed later as a Home Defence unit), and the aircraft and pilots were sent elsewhere.

The failure to create more Dolphin squadrons provides one of the several aviation mysteries of the war, for the Dolphin was by no means a bad fighting aircraft. Oliver Stewart described its flying qualities thus:

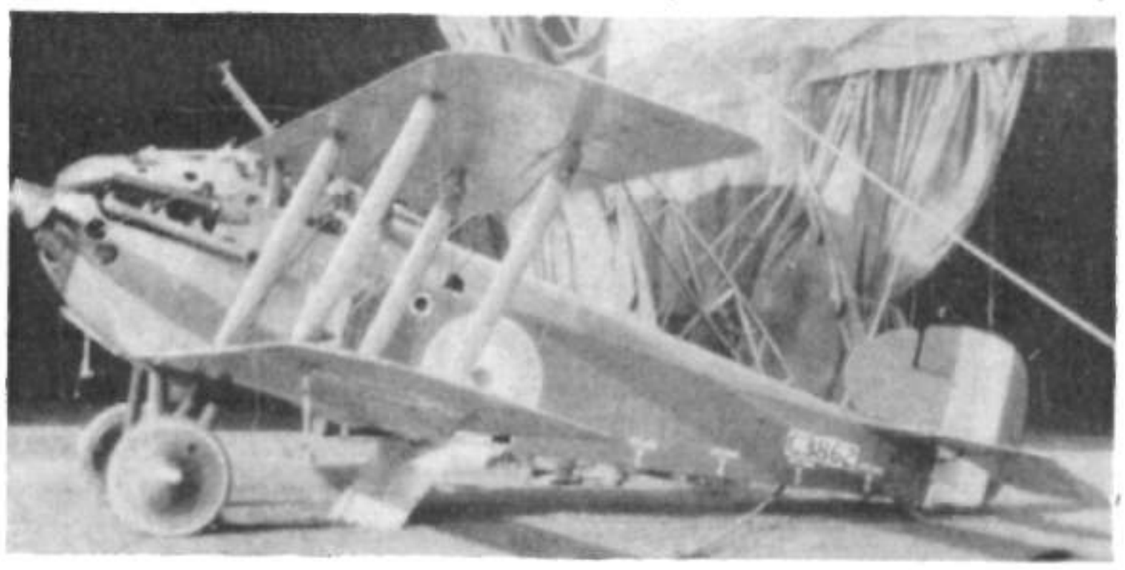
"On the controls the Dolphin, though not showing any great sensitivity, was satisfactory and reasonably well balanced. There were rumours and counter-rumours about it at first, but in fact the machine showed itself to be fairly well balanced on the controls."

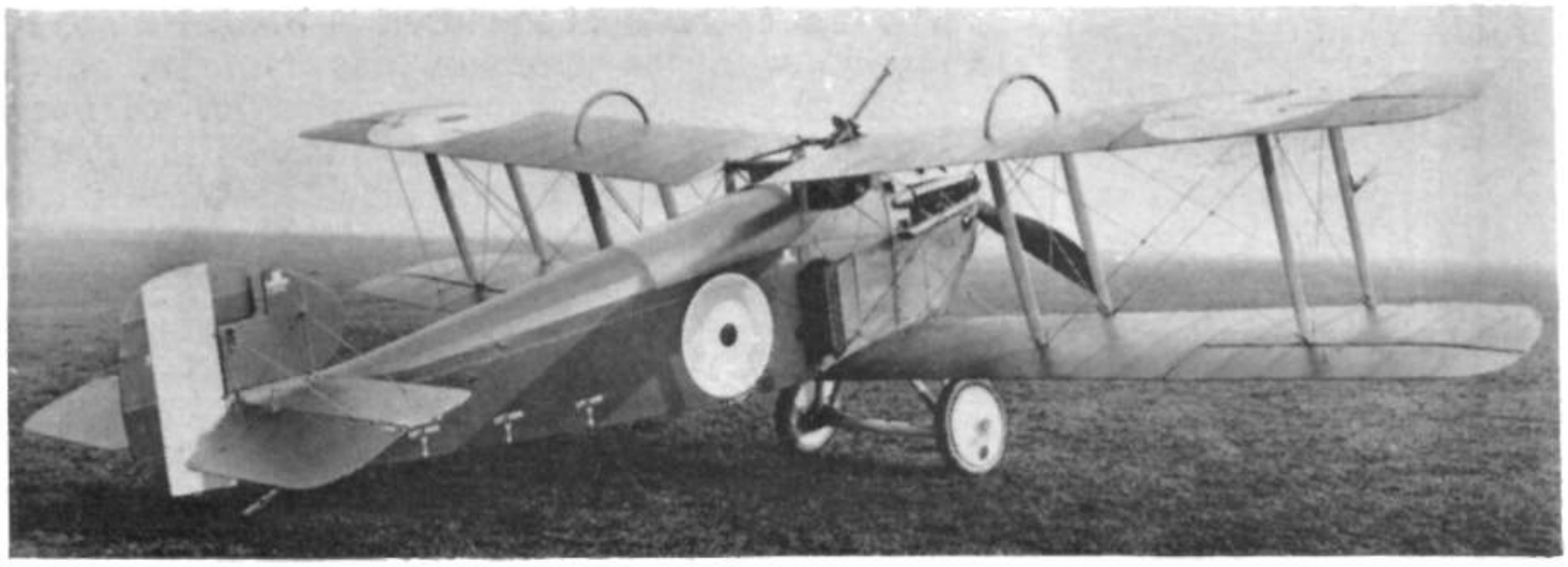
But when properly rigged the Dolphin could do better than Major Stewart's words suggest. The following quotations are taken from an article written by L. J. Delaney, a former member of No. 19 Squadron, who had at first disliked Dolphins and had no wish to fly them operationally.

"I can still remember the thrill I experienced when I saw the Camels and Dolphins sitting back down each side of the hangar (at Scampton). The backward stagger of the latter craft immediately conveyed to me the impression of a lion or tiger crouched back on its haunches ready to spring, and I took a dislike to it at once.

As might be expected, I was eventually posted to Dolphins, and when I returned from my first solo I was told that the flight commander and everyone

One of the few Dolphins to be used by No. 141 Squadron at Biggin Hill for Home Defence duties was C3862. *Flare brackets were fitted under the lower wings and a single Lewis gun was carried.*
(Photo: E. F. Cheesman)





(Left) C3858 *modified for night flying by the Sopwith company. The half-hoops above the inner interplane struts were intended to act as crash pylons in the event of overturning on landing, and a variable-incidence tailplane was fitted.*

(Below) *A crash pylon of a different type was experimentally fitted to this Dolphin.* (Photo: Aeromodeller)

else on the aerodrome had been suffering from heart failure, as I had stalled the bally thing in and should have died dozens of times. But I got away with it !

So to Marske, where, after only seven hours' solo on Dolphins, I was informed on arrival that I should not be permitted to fly that particular machine as the only one there was in pieces in the hangar and 'there it could stop'. An instructor had apparently been killed in it, and the C.O. was having no more Dolphins. I was put on S.E.5a's . . .

True to the traditions of the Service—or to the luck which dogged me—I was posted to a Dolphin squadron, No. 19 . . . At Abscon I saw what a real service machine looked like, and what a difference from the old Dolphins at Scampton! On my first flight after nearly two months away from Dolphins my experiences may be imagined. The machine was so sensitive that I do not remember making the first few turns. It seemed that one had only to think of a right turn and you were round. The slightest movement of the joy-stick and the machine rocked like a cork on a rough sea. I was intrigued by the convex mirror which was fitted to the centre section in place of one of the Lewis guns—remember in the Dolphin there were two Vickers forward, and normally two Lewis's on movable mountings, fitted to the centre section to fire upwards. I don't know who managed to use both of these guns, as well as the forward one (*sic*), and control the machine and open and shut the radiator during a scrap—but I certainly did not!"*

The risk of serious injury in the event of overturning in a Dolphin was obvious and real, and efforts to reduce it were made in January 1918, when a Dolphin was tested at Martlesham Heath, fitted with a form of crash pylon built on to the upper wing attachment frame. This aircraft was flown with a single Lewis gun on the cross-bar of the crash pylon, a position in which it must have interfered seriously with the pilot's forward view.

It seems that few, if any, operational Dolphins had the crash pylon, but similar structures were sometimes fitted to aircraft of training units. A modification was, however, introduced to provide some hope of escape from a crashed Dolphin. This was reported to be a quick-release device for the cross-bracing of the centre-section struts and was supposed to allow the pilot to escape sideways. The possibility that the removal of the bracing might bring about the collapse of an overturned Dolphin was apparently accepted as a reasonable risk.

The Lewis guns were more trouble than they were worth. The production aircraft were delivered with the two guns or mountings for them, and clamps were devised to hold the butts and prevent the guns from swinging about during combat. Martlesham tested a Dolphin with one Lewis gun mounted on the upper wing, but ultimately the standard armament came to be the two Vickers guns with one Lewis gun on the front spanwise member of the wing attachment frame. Official publications listing the Dolphin's standard equipment mention only a single Lewis gun; for it, a Norman vane sight was specified but seldom fitted. That many Dolphins fought thus armed is confirmed in several combat reports, such as those of the following officers of No. 19 Squadron: Major A. D. Carter on 2nd May 1918, Lt. J. D. de Pencier on 20th May, and Lt. G. B. Irving on 17th June. Captain F. I. Lord of No. 79 Squadron had one Lewis gun on *C4131* on 7th June, and *C3807* of No. 23 Squadron was similarly armed on 20th May when Lt. C. A. Crysler rammed one of three enemy fighters that had attacked him. Both Crysler and his opponent, a Fokker Dr I, fell in flames.

Nevertheless, some pilots preferred to rely only on the twin Vickers guns and removed the Lewis gun. In No. 87 Squadron, however, some Dolphins had two Lewis guns, one on each lower wing outboard of the airscrew. Reloading was not possible, of course.

In operational use the Dolphin was by no means a failure. In his novel *Winged Victory*, Victor Yeates repeatedly indicates that Camel pilots envied the Dolphin's ability to fly and fight at high altitudes. Several pilots built up appreciable victory scores on the type. Captain F. W. Gillet, D.F.C., an American member of No. 79 Squadron, shot down 14 enemy aircraft and three kite-balloons. Captain R. B. Bannerman of the same squadron destroyed 14 enemy aircraft, drove one down out of control, and shot down one kite-balloon. Captain F. I. Lord, also of No. 79 Squadron, had nine victories; and Major A. D. Carter of No. 19 Squadron destroyed six enemy aircraft, sent three others down out of control, and shared in the defeat of two others while flying Dolphins. His earlier victories had been won on Spads.

In No. 87 Squadron, which claimed a total of 89 victories, more than 50 were attributed to five pilots:

* *From the magazine* Popular Flying, *August 1938, pp 260 & 262.*

Captain H. A. R. Biziou, D.F.C., Lt. L. N. Hollinghurst, D.F.C. (later Air Chief Marshal Sir Leslie Hollinghurst), Captain H. Lakin, D.F.C., Captain A. A. N. D. Pentland, M.C., D.F.C., and Captain A. W. Vigers, M.C., D.F.C.

Apart from air combats, the Dolphins took their share of ground-attack duties during the German offensive of 1918, bombing as well as machine-gunning the enemy troops. For this purpose the aircraft were fitted with under-fuselage racks for four 25 lb. Cooper bombs.

As all Hispano-Suiza engines came up for overhaul they were converted to have the higher compression ratio of 5·3 to 1. This raised the output of the 200 h.p. engine to 220 h.p. In this connection the Dolphin *C8073* has been recorded as having the 220 h.p. engine, but it seems unlikely that this is of special significance as all Dolphins fitted with overhauled engines would benefit from the increased power output.

Further proof that the Dolphin must have acquired a good reputation as a fighter is provided by the fact that large-scale production in France was planned. The French-built version was to be powered by the 300 h.p. Hispano-Suiza engine, and production was intended to supply Dolphins to French and American fighter squadrons. The U.S. Air Service bought five standard Dolphins (*E4642*, *E4643*, *E4646*, *E4647* and *E4650*) in October 1918 and sent at least four of them back to the U.S.A. for evaluation.

The first installation of a 300 h.p. Hispano-Suiza was made in *D3615*, which was test-flown in France. It has been recorded that the conversion of this aircraft was done in Paris, apparently in some haste. In her book *H. G. Hawker, airman: his life and work* Muriel Hawker quoted from a letter sent to her by Mr. Alan R. Fenn, who was at that time the Sopwith company's representative in France. Fenn wrote:

> "One other little thing that occurs to me is concerned with the Dolphin. You will remember that we converted the 200 h.p. Hispano-Dolphin to take the 300, and this work was done in Paris, all more or less by rule of thumb. I then asked Harry to come over and look the job over and fly it, if he thought well, and generally to see if it was all right.
>
> When Harry arrived and I pointed out to him that he must not be too particular, explaining to him the very serious position of matters, he did not hesitate for a moment, but took the machine straightaway in the air, and as there was some little question as to its strength, he gave it a thorough good rolling, spinning, and diving, just to make sure it was all right.
>
> It was so characteristic of the man in showing his complete absence of fear, even when there might be a doubt in his mind as to the capabilities of the machine. As a matter of fact, when this machine was stressed, it was found to be very seriously weak, and before it was put into production if was, of course, stiffened up."

The 300 h.p. Dolphin had a more commodious engine cowling than the standard machine, enclosing the Vickers guns completely, and long exhaust pipes were provided. These had to be provided with a "step" to clear the tops of the radiator blocks. This version of the type was designated Dolphin II.

At some time the aircraft was fitted with auxiliary mid-bay flying wires in the inner bracing bay on each side, but it is uncertain whether this modification followed or preceded the discovery of its structural shortcomings.

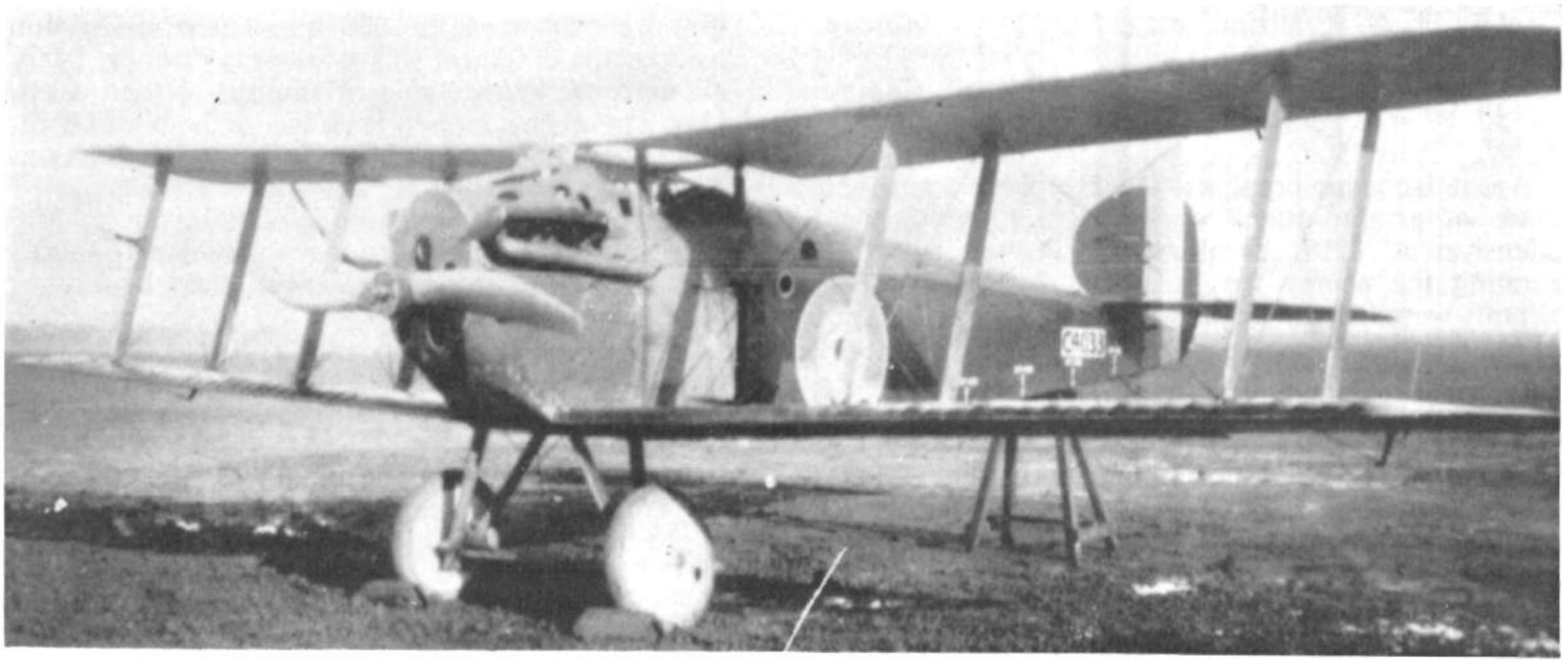
The Dolphin II's performance was excellent and it could hardly have failed to be a potent weapon if it had been available before the Armistice. It seems possible that a few aircraft may have been built in France, but the war ended before they could be introduced operationally.

The designation Dolphin III was allotted to a variant that was powered by a modified version of the 200 h.p. Hispano-Suiza. As this engine's troubles lay in its reduction gearing someone had the sensible idea of removing the gears and converting the engines to have direct drive. The change in the level of the thrust line necessitated a new nose cowling of modified shape, and the engine drove a right-hand airscrew. Dolphins III were issued in numbers apparently to all four squadrons. Martlesham had tested a specimen in October 1918. Its performance was somewhat inferior to that of the Dolphin I, but this might have been attributable to the use of an unsuitable airscrew.

In 1918 extensive experiments were conducted in attempts to minimize the risk of fire following hits on aircraft petrol tanks. A remarkable variety of

(Above) *The first Dolphin II*, D3615, *with 300 h.p. Hispano-Suiza engine. This photograph shows how the extended exhaust pipes of this version were cranked over the radiator blocks. The presence of a Morane-Saulnier M.S.30E-1 clearly indicates that the photograph was taken in France.*
(Photo: Imperial War Museum Q66291)

(Right) *A specially decorated Dolphin, believed to be of the School of Aerial Fighting at Marske. It bore the additional identification number 124 in large characters in white on the fuselage sides and in black under each lower mainplane.*
(Photo: Flight International 0508)



Dolphin III with direct-drive engine. The right-hand airscrew and low thrust line of this Mark of Dolphin can be seen in this photograph of C4033.

allegedly fire-proof or self-sealing tanks were made and tested, including a jettisonable main tank designed by Lt. Lloyd Lott. One was fitted to the Dolphin *D3747* and was successfully jettisoned in flight at Brooklands on 25th June 1918. The aircraft subsequently went to Orfordness, where shots were fired at the tank; it was then found that the distortion of the attachment fittings prevented the jettison mechanism from functioning. The Sopwith company were asked to design an installation of self-sealing tanks, but it is not known whether this was completed before the Armistice.

Experiments were also made with the installation of parachutes in Dolphins, and an aircraft of this type, fitted with a Calthrop A.1 Guardian Angel parachute went to France in 1918 and was demonstrated to the G.O.C., R.A.F. in the Field.

Apart from its relatively limited use on the Western Front the only other sphere in which an abortive attempt to employ the Dolphin was made was that of Home Defence. The first Home Defence Dolphin was allocated to No. 141 Squadron at Biggin Hill in January 1918. It was in fact the squadron's only aircraft at that time and its career was brief, for it was crashed by Lt. Langford-Sainsbury (later Air Vice Marshal T. A. Langford-Sainsbury, C.B., O.B.E., D.F.C., A.F.C.). Enough additional Dolphins were supplied to No. 141 Squadron to equip one Flight, but the type was cordially disliked for night flying and it is doubtful whether they were in fact flown much (if at all) at night, but flare brackets were fitted under the lower wings and Hutton illuminated gun sights were provided.

In February 1918 the Sopwith company modified *C3858* specifically for night flying. To reduce the risk to the pilot in the event of overturning two half-hoops of steel tubing were mounted on the upper wings directly above the inner pair of interplane struts on each side. This Dolphin also had the non-standard refinement of an adjustable tailplane, its angle of incidence being varied by the pilot by the use of a handwheel in the cockpit. Apparently development of this variant was abandoned when the Dolphin was withdrawn from Home Defence duties.

After the Armistice No. 79 Squadron continued to operate its Dolphins I and III from Bickendorf, near Cologne, until the unit was disbanded there in July 1919. The type then disappeared almost completely.

During its brief wartime existence, No. 1 Squadron, Canadian Air Force, was at one time equipped with Dolphins, but the war ended before the unit could become operational. In February 1919 sixteen very assorted aeroplanes, said to have been subscribed for by the Overseas Club and Patriotic League for presentation to Canada, were handed over in a ceremony held at Hendon. Of the sixteen, three were Dolphins.

Apparently the remaining war-surplus aircraft were not all scrapped immediately after the Armistice. A few were reported to have gone to Poland in the summer of 1920 for use in the Polish war against Soviet Russia, and are believed to have been operational in that conflict from August onwards.

Only one Dolphin acquired a British civil registration. This was *D5369*, which became G-EATC as late as 7th May 1920. The registration was in the name of Handley Page Ltd., owners of the Aircraft Disposal Company Ltd., by whom the Dolphin was used for demonstration purposes in the hope of winning a few orders.

It is doubtful whether even the Dolphins used at the R.A.E. Farnborough remained in use for long. In January 1919 *C4191* was the subject of experiments on the rotation of the slipstream that were the subject of Reports & Memoranda No. 643. During February *D8194* was used in tests of the Rotoplunge fuel pump, and was still at Farnborough in July. On 6th September *C3747* and *C4191* left Farnborough for Waddon, presumably to join the Aircraft Disposal Co.'s array of wares.

PRODUCTION

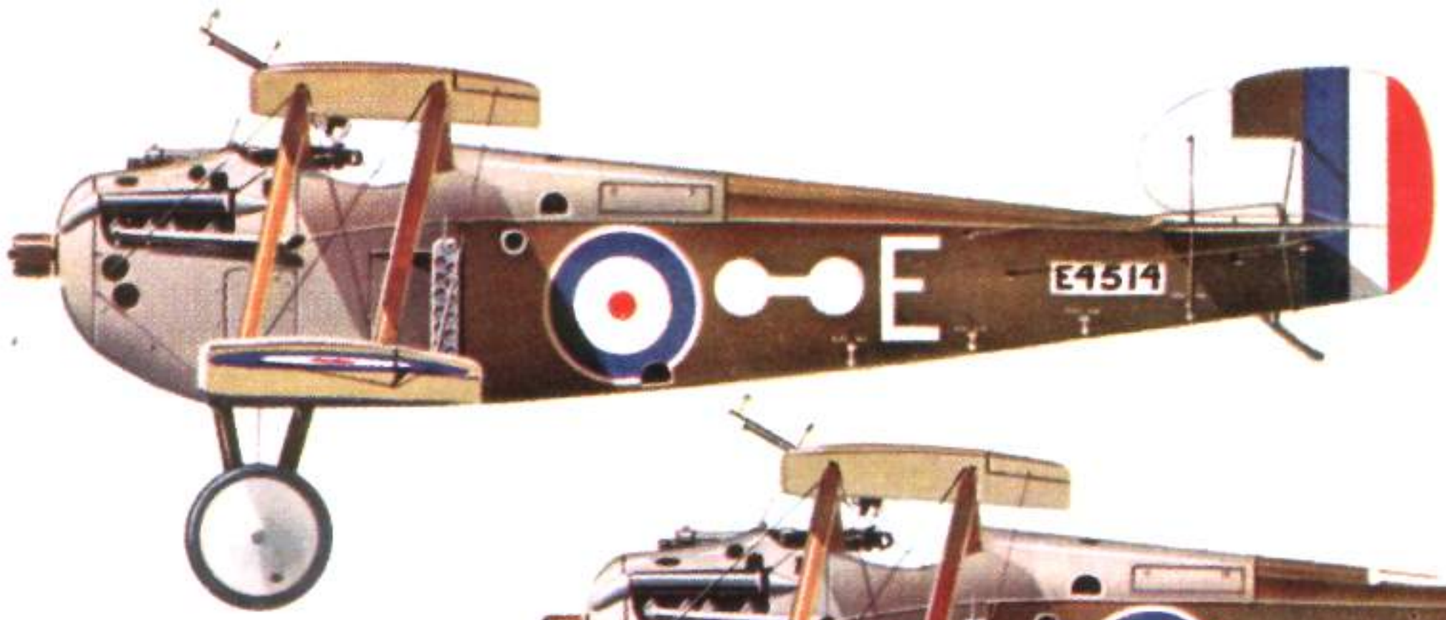
Under wartime contracts a total of 2,150 Dolphins were ordered. According to official statistics, 1,532 aircraft passed inspection for service with the R.F.C. and R.A.F.; consequently the total number actually built was probably something in excess of that figure before production finally ceased. Contractors for the type were as follows:

Sopwith Aviation Co., Ltd., Canbury Park Road, Kingston upon Thames.—C3777-C4276, D3576-D3775, E4424-E4623, E4629-E5128.

Darracq Motor Engineering Co., Ltd., Townmead Road, Fulham, London, S.W.6.—C8001-C8200, F7034-F7133, J151-J250 (cancelled).

Hooper & Co., Ltd., St. James's Street, London, S.W.1.—D5201-D5400, J1-J150.

Dolphins rebuilt by Aeroplane Repair Depots.—B7849, B7855, B7927, B7928, B8189, F5916, F5961, F6144, F6145, H7245.



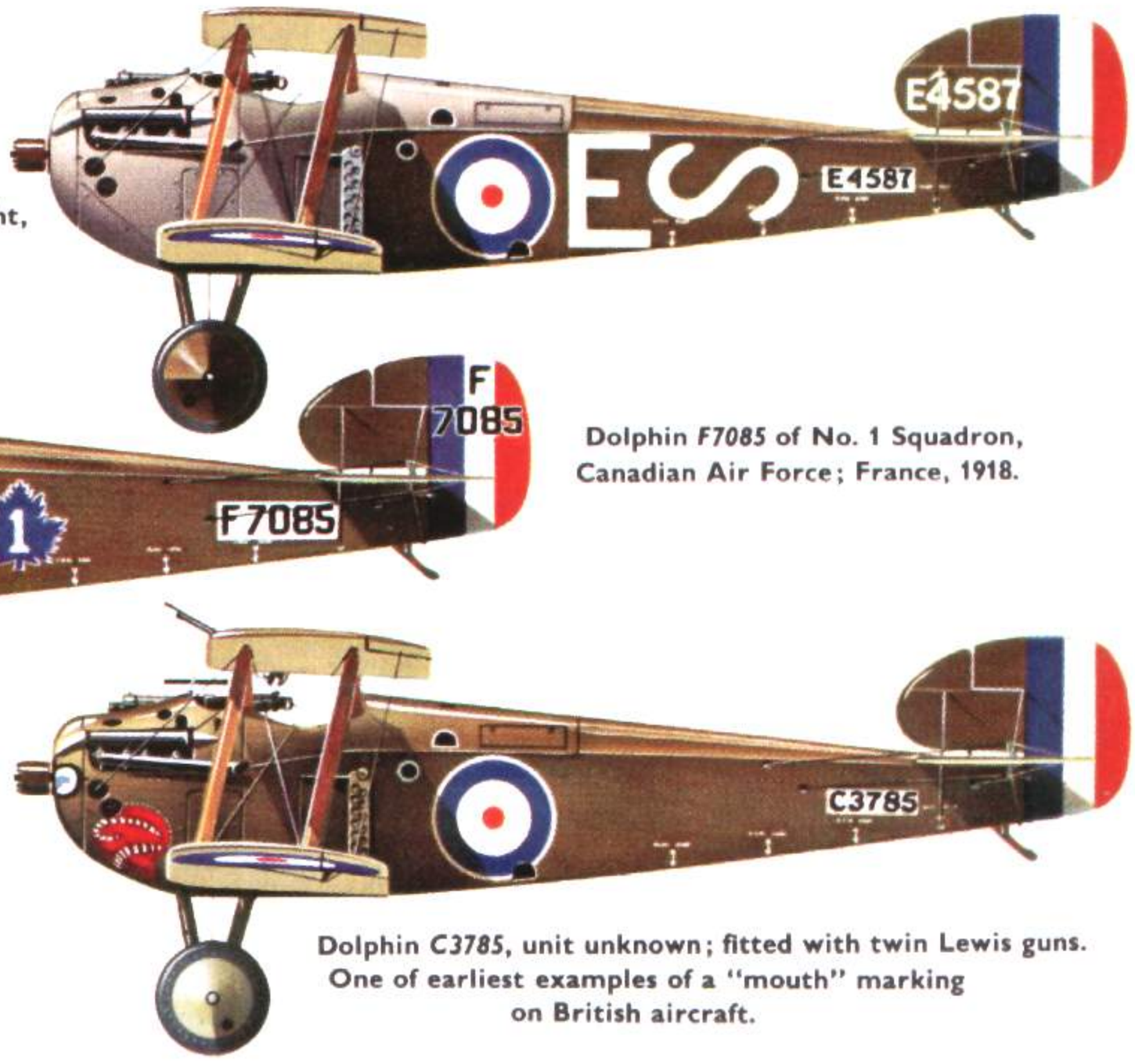
Dolphin *E4514*, aircraft 'E' of No. 19 Squadron; France 1918. Single (starboard) Lewis gun.

Dolphin *C3824*, aircraft 'U' of No. 23 Squadron; France, 1918. Single (starboard) Lewis gun.

Dolphin *C3898*, aircraft 'D' of "A" Flight, No. 79 Squadron; France, 1918.

Dolphin *D3578*, aircraft 'B' of "A" Flight, No. 79 Squadron; France, 1918.

Dolphin *F7052*, aircraft 'R' of "C" Flight, No. 79 Squadron; France, 1918.

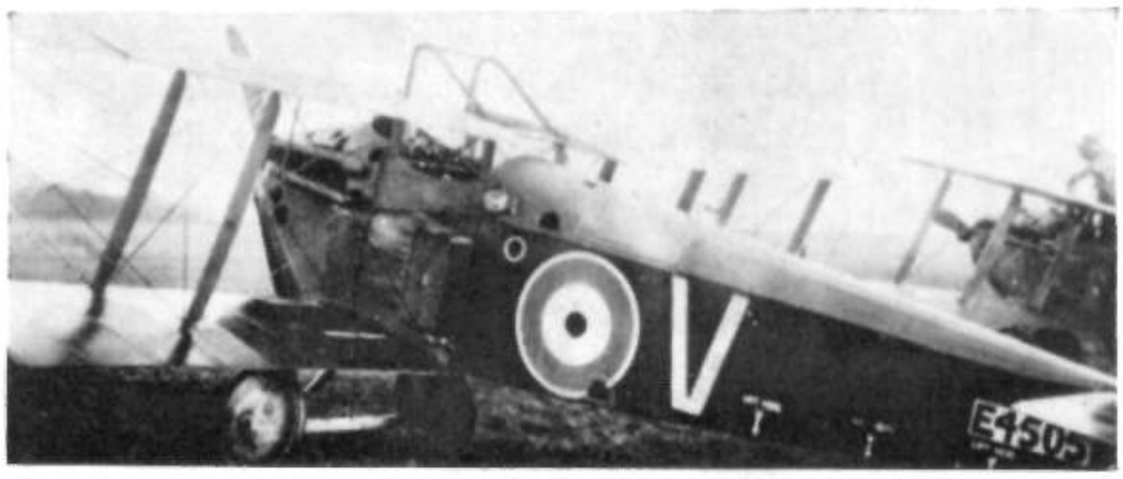


Dolphin *E4587*, aircraft 'E' of "A" Flight, No. 87 Squadron; France 1918.

Dolphin *F7085* of No. 1 Squadron, Canadian Air Force; France, 1918.

Dolphin *C3785*, unit unknown; fitted with twin Lewis guns. One of earliest examples of a "mouth" marking on British aircraft.

Insignia of No. 1 Sqn.; colour of maple leaf varied from aircraft to aircraft, possibly in Flight sequence, but details not known.



Dolphin III E4505 *of a training unit at Hooton Park with yet another form of crash pylon over the cockpit.*

Dolphin III of No. 87 Squadron with a Lewis gun on each lower wing, firing outboard of the airscrew.

SERVICE USE

Western Front.—Squadrons Nos. 19, 23, 79, and 87.
Home Defence.—No. 141 Squadron, Biggin Hill.
Training.—Central Flying School, Upavon; Schools of Aerial Fighting at Freiston, Marske, Sedgeford and Turnberry; 23rd Training Wing, South Carlton; training squadrons at Cranwell, Gosport, Hooton Park and Scampton; No. 1 Squadron, Canadian Air Force.

EXAMPLES OF DOLPHINS USED BY R.F.C. AND R.A.F. SQUADRONS

No. 19 Sqn.—C3788, C3792, C3796, C3799, C3818, C3826, C3828, C3829, C3837, C3990, C4017, C4130 (Aircraft 'V'), *C4132, D5237, E4501, E4514* ('E' of A Flight), *E4729* ('P').

No. 23 Sqn.—C3807, C3871, C3905 ('C'), *C8070, C8074, C8110* ('B'), *D3646, D3669, D3691, D3749, E4492, E4717* ('M' of B Flight), *F5916, F5961, F7063* ('E').

No. 79 Sqn.—B7927 ('K'), *B8189* ('N'), *C3849, C3859, C3879* ('Q'), *C3887, C3892* ('G'), *C3898* ('D'), *C3944* ('N'), *C4046, C4059, C4127, C4131, C4176, C4182, C4186, C8075, C8121, C8122* ('A'), *C8189, D3578* ('B'), *D3584, D3727, D3745, D3771, E4425, E4585* ('J'), *E4589, E4712, E4716, E4756* ('Q'), *F7052* ('R').

No. 87 Sqn.—C4136 ('J'), *C4155, C4156, C4157, C4158, C4159* ('C'), *C4230, C8072, C8109, C8163, C8165, D3719, D3764, E4451, E4493, E4587* ('E'), *E7048* ('L').

No. 141 Sqn.— C3862, C3942.

No. 1 Sqn., Canadian Air Force.—E4764, F7076, F7085, J3, J12.

SPECIFICATION

Power: Dolphin Mk. I, 200 h.p. Hispano-Suiza 8E and 220 h.p. version of that engine with increased compression ratio; Dolphin Mk. II, 300 h.p. Hispano-Suiza, 320 h.p. Hispano-Suiza 8Fb; Dolphin Mk. III, 200 h.p. direct-drive Hispano-Suiza.

Dimensions: Span 32 ft. 6 in.; length 22 ft. 3 in.; height 8 ft. 6 in.; chord 4 ft. 6 in.; gap 4 ft. 3 in.; stagger (negative) 13 inches on first four aircraft, 12 in. on production Dolphins; dihedral 2 deg.; incidence 1 deg. 45 min.; span of tail 10 ft. 10¾ in.; wheel track 5 ft.; tyres 700×75 mm.; airscrew diameter (Lang 3500) 9 ft. 6·1 in.

Areas: Wings 263·25 sq. ft.; ailerons, each 9·5 sq. ft., total 38 sq. ft.; tailplane 17 sq. ft.; elevators 13·5 sq. ft.; fin (production Dolphin) 3·5 sq. ft.; rudder (production) 8 sq. ft.

Armament: The official standard armament consisted of two fixed 0·303 in. Vickers machine-guns with Constantinesco C.C. interrupter gear Type B and Hyland loading handles Types A and B, and one 0·303 in. Lewis machine-gun on the forward spanwise member of the upper wing attachment frame, firing forwards and upwards over the airscrew. Aldis and ring-and-bead sights were specified for the fixed guns, a Norman vane sight for the Lewis (but this sight was seldom fitted in service). Night-fighter Dolphins had Hutton electric sights. Early Dolphins had two upward-firing Lewis guns. In No. 87 Squadron some aircraft had two forward-firing Lewis guns, one on each lower wing. Four 25 lb. Cooper bombs could be carried in a rack under the fuselage for ground-attack duties.

The author acknowledges gratefully the information relating to pilots and aircraft of Squadrons Nos. 79 and 87 provided by Mr. Norman L. R. Franks and incorporated in this history.

WEIGHTS AND PERFORMANCE

Aircraft	First prototype	Second prototype		Dolphin Mk. I					Dolphin Mk. II		Dolphin Mk. III
		with 2-blade airscrew	with 4-blade airscrew	with 2 Vickers guns only	with crash pylon and Lewis gun	with 2 Vickers guns only	with 2 Vickers and 1 Lewis on upper wing	with 2 Vickers and 1 Lewis on crash pylon	British figures	French official figures	
Engine	200 h.p. Hispano-Suiza (geared)	200 h.p. Hispano-Suiza (geared)		200 h.p. Hispano-Suiza (geared)					300 h.p. Hispano-Suiza	320 h.p. Hispano-Suiza 8Fb	200 h.p. Hispano-Suiza (direct-drive)
Airscrew type	Lang 3500	Lang 3500	T.28097	Lang 3800		Lang 3610			—	—	A.B. 7673
Weights (lb.)											
Empty	1,350	1,406	1,406	—	—	—	—	—	1,566	1,540	1,466
Military load	101	101	101	101	136	101	139	149	108	198	101
Pilot	180	180	180	180	180	180	180	180	180	176	180
Fuel and oil	249	194	194	—	—	—	—	—	504	373	253
Loaded	1,880	1,881	1,881	1,911	1,959	1,970	2,008	2,018	2,358	2,287	2,000
Max. speed (m.p.h.)											
at 6,500 ft.	—	131·5	—	—	—	—	—	—	—	—	—
at 10,000 ft.	123·5	128·5	121	127·5	121·5	119·5	111·5	111·5	140	139	117
at 15,000 ft.	116	124	112	119	114	—	—	—	—	—	110
at 16,500 ft.	113·5	—	—	—	—	—	—	—	133	132	—
Climb to	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
6,500 ft.	5 30	4 55	6 25	6 5	7 5	5 30	6 30	6 30	5 10	5 27	6 20
10,000 ft.	9 25	8 15	10 50	10 30	12 5	10 20	11 40	11 40	8 20	8 35	11 20
15,000 ft.	17 20	14 40	19 55	19 30	23 0	— —	— —	— —	— —	— —	21 50
16,500 ft.	— —	— —	— —	— —	— —	— —	— —	— —	12 10	17 33	— —
Service ceiling (ft.)	21,500	23,000	21,500	21,000	20,000	19,000	18,500	18,500	24,600	26,000	19,000
Endurance (hours)	2¼	1¾	—	—	—	—	—	—	—	2	—

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