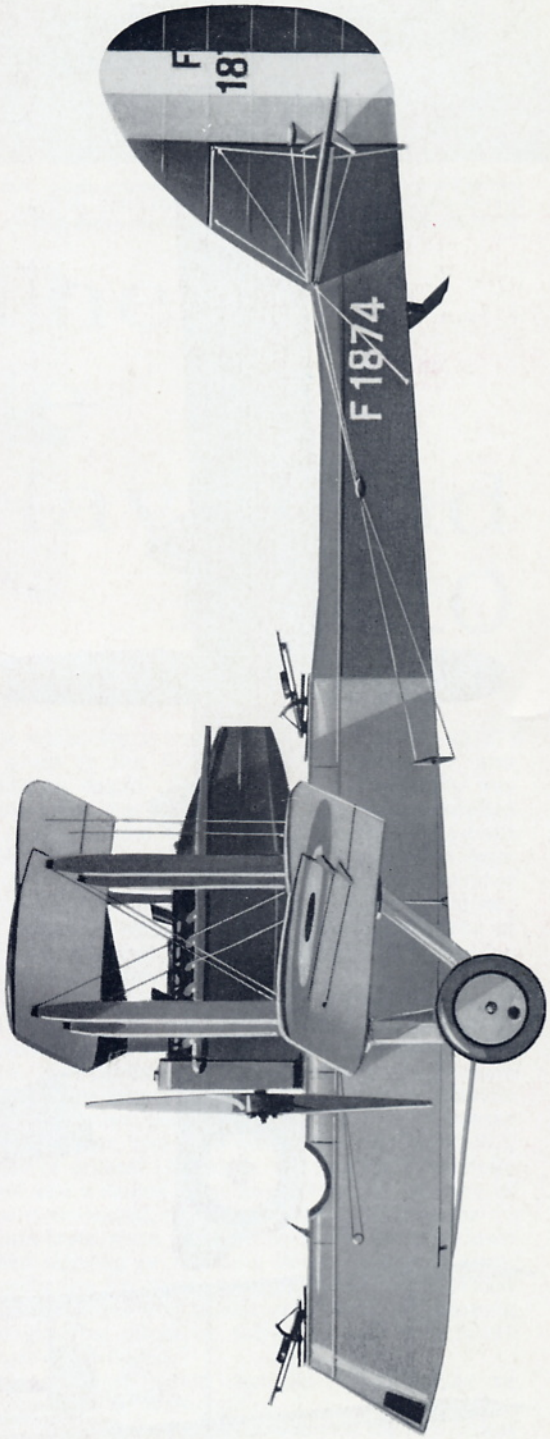
PROFILE PUBLICATIONS

The de Havilland D.H.10



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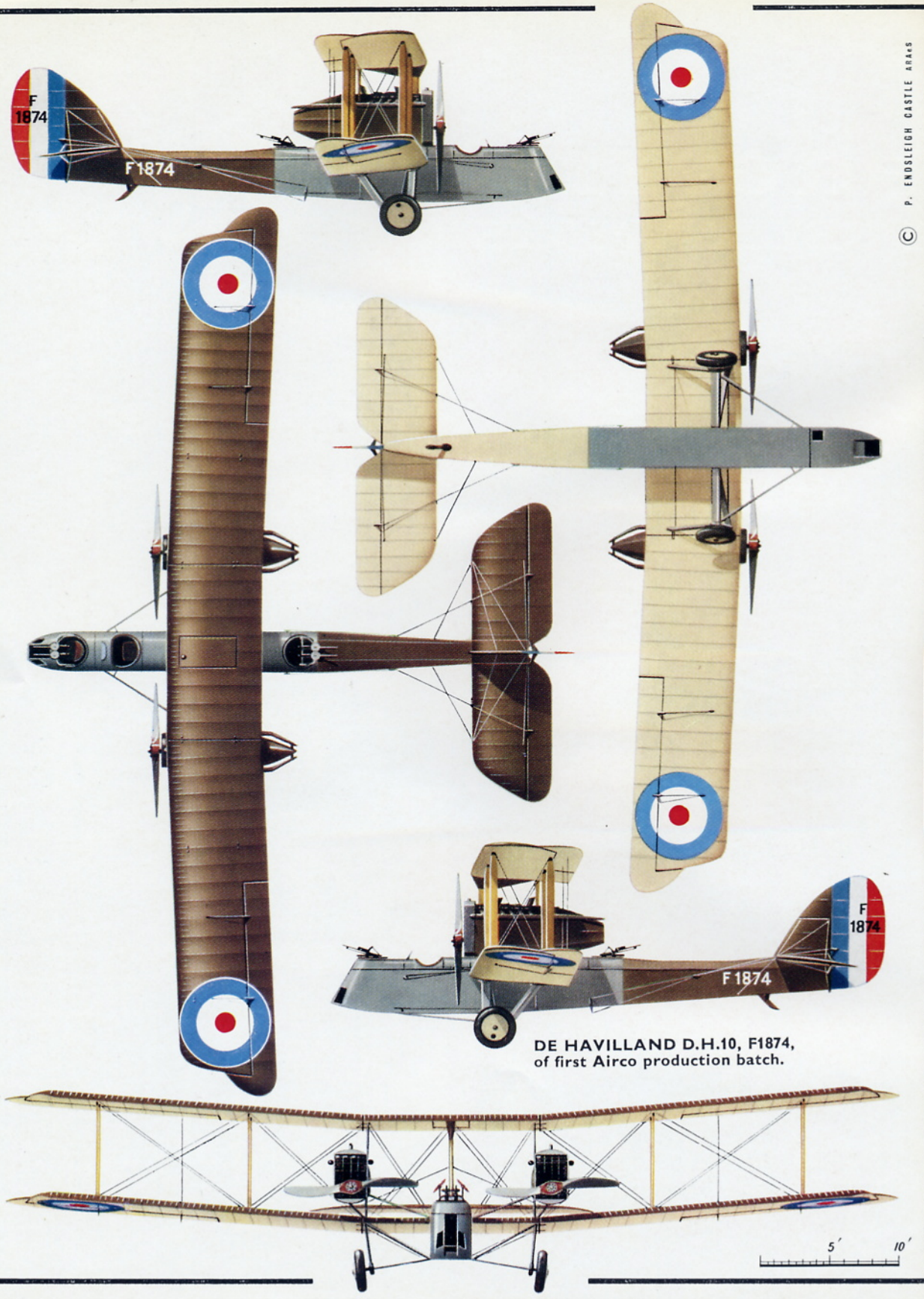
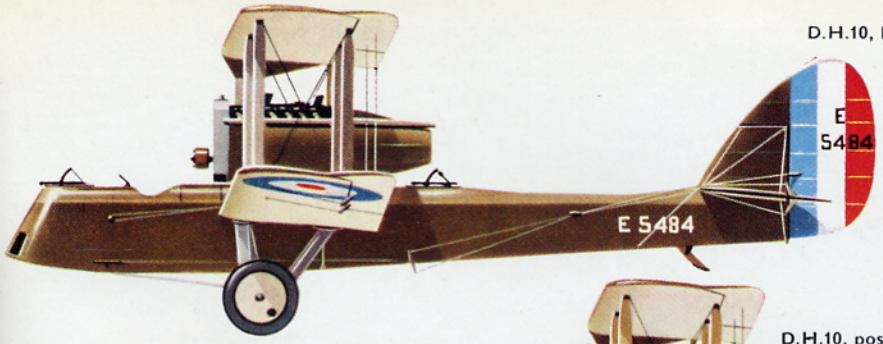


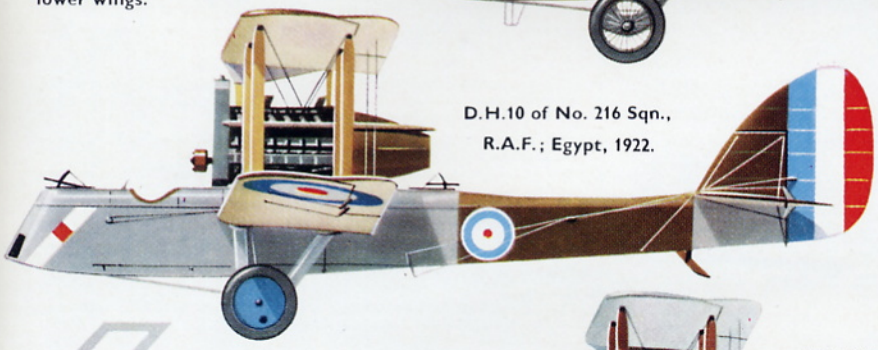
DE HAVILLAND D.H.10, F1874,
of first Airco production batch.



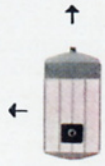
D.H.10, E5484, of No. 97 Squadron, R.A.F.
Bombay to Karachi mail service,
early 1920.

D.H.10, possibly F1868, of No. 216 Sqn.,
R.A.F.; Egypt, 1922.

Repeated under
lower wings.

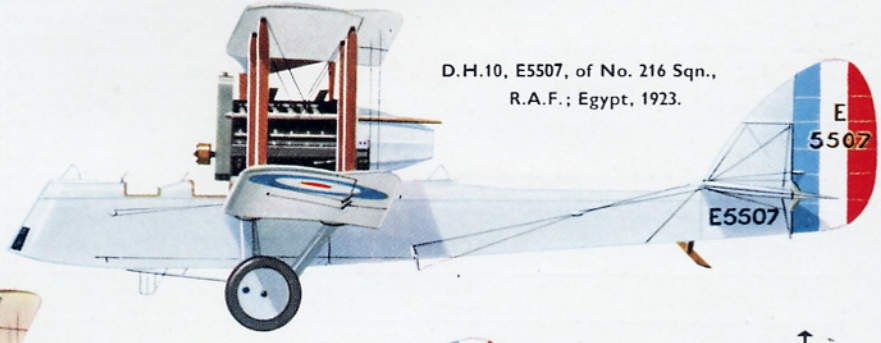


D.H.10 of No. 216 Sqn.,
R.A.F.; Egypt, 1922.

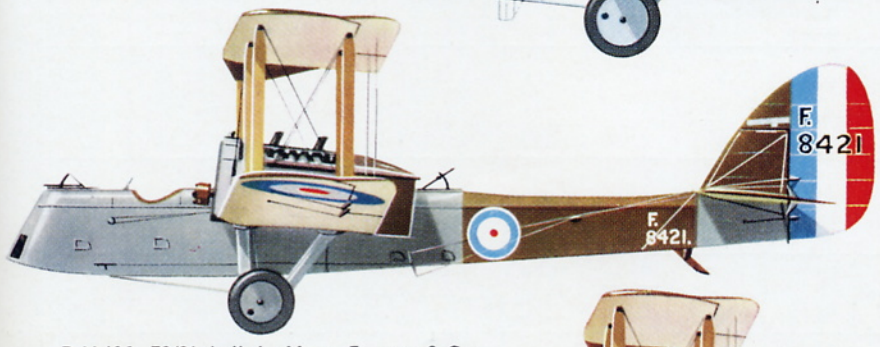


Tropical radiator.

Nose decoration.



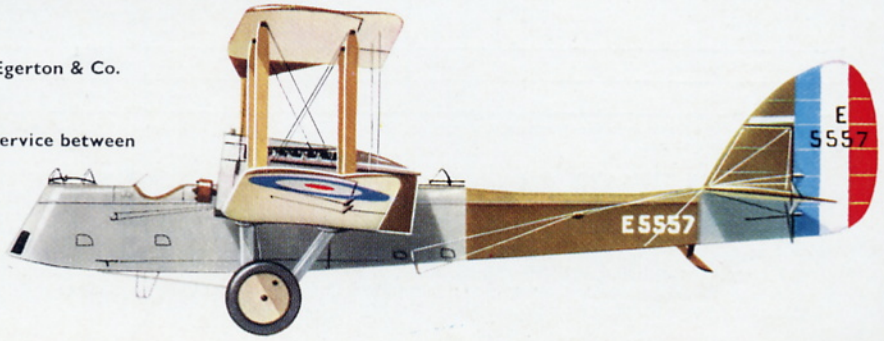
D.H.10, E5507, of No. 216 Sqn.,
R.A.F.; Egypt, 1923.



D.H.10A, F8421, built by Mann, Egerton & Co.

Tropical radiator with
increased shutter area, E5507.

D.H.10C, E5557; operated mail service between
Hendon, Newcastle and
Renfrew during rail strike,
October 1919.



The basic configuration of the D.H.10 was first expressed in the D.H.3 of 1916. This photograph illustrates the D.H.3A with two 160-h.p. Beardmore engines. (Photo: I.W.M. Q67535)

The de Havilland D.H.10

by J. M. Bruce

In 1916 Captain Geoffrey de Havilland designed the D.H.3, a large twin-engine biplane that was quite different from its immediate predecessors, the D.H.1 and D.H.2 (see *Profile* No. 91). In its basic configuration the D.H.3 was generally similar to the Royal Aircraft Factory's F.E.4, but was smaller, neater, and an altogether better-looking aircraft than the ponderous F.E.

The D.H.3 had a long, slender fuselage in which plywood webs largely replaced the more conventional wire cross-bracing of the period. The forward fuselage was plywood-covered; abaft the wings the covering was of fabric. The tail unit introduced the graceful curving fin and rudder that, with only subtle variations in profile, were to characterize all subsequent de Havilland designs, except the production D.H.6, until the Flamingo of the late 1930's. The rudder was horn-balanced; so were the generously-dimensioned elevators. There were three cockpits: the pilot sat in line with the leading edge of the lower wings, and there were gunners' cockpits in the nose and behind the wings, each equipped with two mountings for Lewis guns. Each gunner had dual control.

The spars of the lower centre section passed under the upper longerons of the fuselage; each undercarriage v-strut was attached to the outer end of the lower centre section, thus giving a wide-track undercarriage and making the D.H.3 sit close to the ground. In view of the aircraft's small ground angle and clearance, a pair of auxiliary wheels were fitted under the nose.

To conserve hangar space the mainplanes could be folded. They were of equal span (60 ft. 10 in.), unstaggered, and had two bracing bays outboard of the centre sections. Two 120 h.p. Beardmore engines were mounted in mid-gap at the ends of the centre sections; each drove a two-blade airscrew via a short extension shaft in order to clear the wing trailing edges.

The D.H.3 was tested at Central Flying School in July 1916, when its speed was recorded as 87 m.p.h. at 10,000 ft. That altitude was attained in 54 minutes, and must have been very close to the aircraft's absolute ceiling, for its service ceiling was 8,500 ft. This performance was achieved with a military load of only 40 lb.

Although the test report indicated that the D.H.3 had excellent flying qualities, the aircraft's duties were intended to include bombing and it was clear that the addition of a worthwhile bomb load would so reduce its performance that it would be operationally useless.

The D.H.3 underwent slight modification in its original form. Improved engine nacelles that enclosed the Beardmores completely were fitted, and a tall exhaust stack was fitted to the starboard side of each nacelle.

But more drastic modifications were needed in order to improve the type's performance to an acceptable level. The design was therefore modified to have two 160 h.p. Beardmores; these drove four-blade airscrews without extension shafts, the wing trailing edge being suitably cut away to accommodate the airscrews. A modified rudder with an enlarged balance area was fitted, and the rear central interplane strut was faired out to become a fin surface of appreciable area. In this form the aircraft was designated D.H.3A and was given the serial number *7744*.

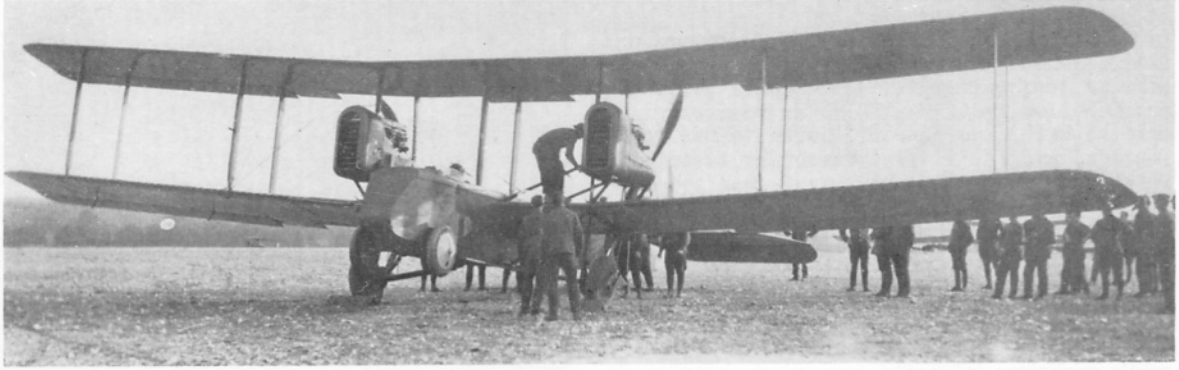
Performance figures for the D.H.3A have yet to be found, but the aircraft must have been considered worth while, for a contract for fifty (*A5088–A5137*) was given to the Aircraft Manufacturing Co. and production began. Before the first of the fifty was complete the War Office changed its mind, cancelled the contract, and the prototype and partly-built *A5088* were scrapped. This was possibly a wise decision: even with the additional power provided by the 160 h.p. Beardmores the D.H.3A would not have been well equipped to enter the aerial arena of 1917. Its successor, the single-engine D.H.4, stood a much better chance of survival.

In April 1917 the Air Board issued a series of specifications for twelve different categories of aeroplanes and seaplanes. The demands made therein for performance and military loads were exacting. Specification A.2b set out the requirements for a day bomber, demanding a 500 lb. load of bombs and bomb gear, two guns and ammunition (150 lb.), a speed of at least 110 m.p.h. at 15,000 ft. when fully loaded and a ceiling of at least 19,000 ft. A crew of two was envisaged, and it was stipulated that the

> "Gun-layer must be able to lie or crouch down when sighting or releasing bombs and easy communication for steering purposes is to be provided between pilots and gun-layer. Means of keeping the machine afloat on the water for three hours are to be provided."

The specification stated that the aircraft might be single-engined or twin-engined.

The de Havilland design team turned their attention to this specification in the autumn of 1917. Taking the D.H.3 configuration as a sensible basis on which

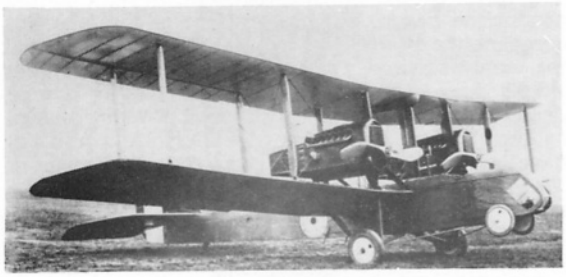


to design a twin-engined bomber they designed an aircraft that was virtually a slightly enlarged D.H.3, powered by two 230 h.p. Siddeley Puma engines installed as pushers. The new type was designated D.H.10 and the fact that it was a three-seater was apparently accepted officially, despite the original specification for a two-seater. Contract No. A.S. 31576 for four prototypes *C8658–C8660* and *C4283* was let with the Aircraft Manufacturing Co. Construction of the first prototype, *C8658*, was well advanced by December 1917; its first flight was scheduled for January 1918.

As the illustrations show, the first D.H.10 bore a strong resemblance to the D.H.3. It differed visibly from the earlier type in having plain elevators, and the gunners' cockpits had Scarff ring mountings. The fuselage structure differed from that of the D.H.3 in having the entire rear portion cross-braced by Rafwires; but again the forward half was plywood-covered and required no cross bracing. The two portions were butt-jointed immediately behind the rear gunner's cockpit. The longerons of both halves were of solid spruce.

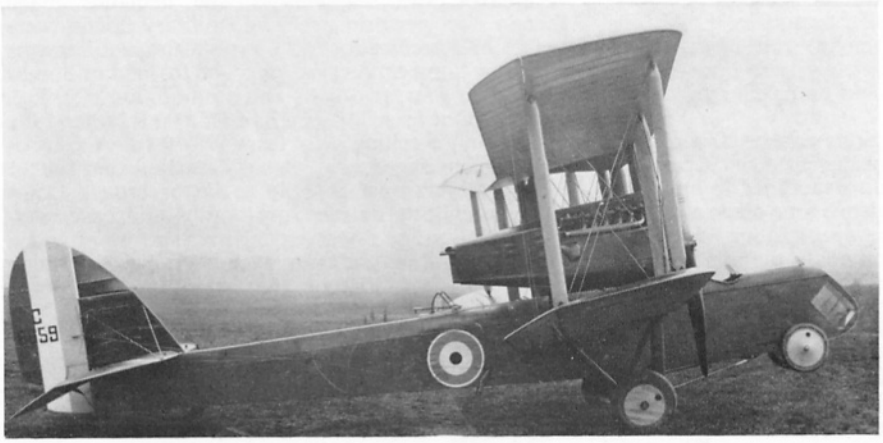
Labour troubles and late delivery of Rafwires

Above: *The first prototype D.H.10*, C8658, *with two Siddeley Puma engines installed as pushers. When this aircraft was tested at Martlesham Heath Scarff ring mountings were fitted to the front and rear gunners' cockpits.*



delayed the completion of *C8658* until the end of February 1918, and it made its first flight on 4th March. When tested at Martlesham Heath in April with a total military load of 581 lb. its performance fell a long way short of the stringent requirements of Specification A.2b. Lightened, with its military load reduced to a mere 73 lb., *C8658* had a service ceiling of 18,000 ft. Someone apparently thought this good enough to justify trying the aircraft on Home Defence duties and it was sent to No. 51 Squadron, then at Marham. How long *C8658* stayed there is unknown, but it paid at least one visit to the armament experimental station at Orfordness on 6th May 1918.

The second prototype, *C8659*, differed from its predecessor in having two Rolls-Royce Eagle VIII engines installed as tractors. As no trailing-edge cut-outs were needed, the wing area was slightly increased; the wings were swept back at an angle of 4 degrees. Transparent panels were fitted in the nose for the bomb-aimer. The second D.H.10 flew for the first time on 20th April 1918 but was still in its makers' hands in June.



Left and above: *The second prototype*, C8659, *with two Rolls-Royce Eagle tractor engines and transparent panels in the nose.*
(Upper photo: I.W.M. Q67081; and lower photo: Don Brown)

Tests with *C8659* led to the decisions that all future D.H.10 aircraft would have tractor engines and that none would have Puma engines; it was also agreed that the nose wheels were not needed.

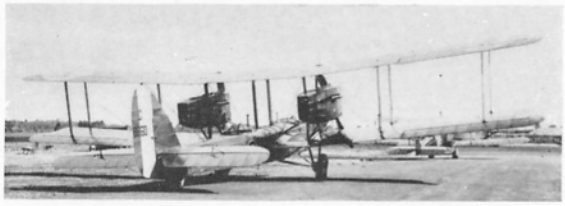
In view of the production and operational difficulties that were besetting the Siddeley Puma (see *Profile* No. 62, the D.H.9) the decision to abandon it as a power unit for the D.H.10 was sensible and, indeed, essential. Moreover, with the creation of the Royal Air Force on 1st April the old Air Board specifications had been superseded by a new series of numbered categories, known as R.A.F. Types. The D.H.10 was considered under two of these: R.A.F. Type IV(a), which was for a Long Distance Fighter (Bombing Escort); and, in a form to be powered by two of the American Liberty 12 engines, under R.A.F. Type VIII, Long Distance Day Bomber.

To meet the Type VIII specification the third prototype D.H.10, *C8660*, was powered with two standard 400 h.p. Liberty 12 engines. This prototype appeared in June 1918. The engines were in bulky nacelles of rectangular cross section and considerable side area, 8 ft. 3 in. in length. The long rearward extension of each nacelle was, despite its "chopped-off" rear end, merely a fairing of plywood and fabric over a spruce frame. The radiators were fitted with horizontal shutters. As on *C8659* there was a 19 gallon gravity tank mounted centrally under the upper centre section; fuel was pumped to it by means of two wind-driven pumps on top of the fuselage, one to each of the 98 gallon main tanks.

On *C8660* the wing tips were squared off parallel to the ribs, and horn-balanced ailerons were fitted. The sweep-back of the wings was slightly reduced. There were no transparent panels in the nose of the fuselage, and no nose-wheels were fitted. A new tailplane and elevators were fitted, the former slightly larger than that of *C8659*, the elevators of narrower chord and smaller area. The bomb load was to be carried internally, and between the two main petrol tanks there was a bomb bay in which the bombs were to be stowed vertically. The rear gunner had dual flying controls, engine throttles, altimeter and air-speed indicator. He had a sliding seat, and there was a camera mounting behind his cockpit.

The third D.H.10 prototype was tested in June 1918. It was sent to Martlesham Heath later that summer and crashed there. Damage was not too extensive, and *C8660* was rebuilt.

Official faith in the D.H.10 was surprising, and one can only assume that the aircraft was regarded as having great potential, given engines of sufficient power and reliability. By 22nd March 1918, when the only concrete facts available were preliminary indications of the undistinguished performance of *C8658*, five contracts for a total of 800 D.H.10's had been let, as follows:



The third prototype, C8660, *at Martlesham Heath. Horn-balanced ailerons were fitted, but the extremities of the mainplanes were squared off parallel with the ribs; there were no transparent panels in the nose.* (Photos: I.W.M. Q67541 and Q67542)

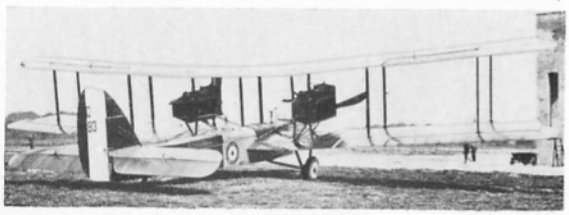
Contractor	Contract No.	Serial Numbers
Aircraft Mfg. Co.	35A/427/C314	*E5437–E5636*
Birmingham Carriage Co.	35A/426/C308	*E6037–E6136*
Daimler Ltd.	35A/423/C313	*E9057–E9206*
National Aircraft Factory No. 2	35A/425/C311	*F351–F550*
Siddeley-Deasy	35A/424/C312	*E7837–E7986*

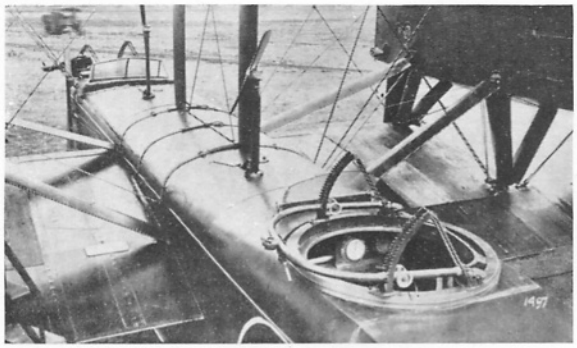
Under the official scheme of nomenclature introduced early in 1918 the D.H.10 was named Amiens. The three prototypes *C8658–C8660* were respectively the Amiens I, II and III, and it was the Mark III that was the subject of the production contracts.

It is unlikely that any of the contractors were able to make an early start on the manufacture of their D.H.10's. A fourth prototype, *C4283*, was built in the summer of 1918, and this aircraft was the true production prototype of the D.H.10. It retained horn-balanced ailerons, but the wing-tips reverted to the basic raked shape of the first two prototypes; and the structure was re-designed in detail. For instance, the rudder, although retaining the original profile, had been revised structurally. The tailplane was mounted at an increased angle of incidence; this produced a small kink in the line of the rear top decking. The engine nacelles were modified: the tail fairings were reduced in size and tapered to a point, and the tops of the engines were uncowled. The engines themselves were two high-compression Liberties that delivered 405 h.p. at 1,650 r.p.m.

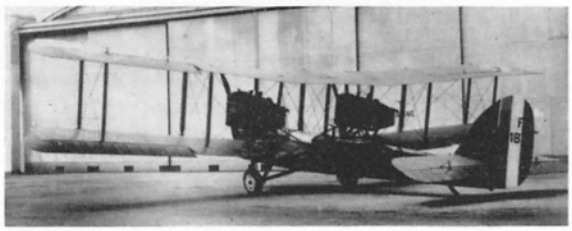
C4283 was at Martlesham Heath early in August and was tested there with various airscrews during that month. On the 29th it was flown to Lympne for

These photographs of the fourth prototype, C4283, *were also made at Martlesham Heath, and provide an interesting comparison with those of* C8660. *These views show the reversion to slightly raked mainplane tips, the smaller and neater engine nacelles, the introduction of transparent panels in the nose, and the slight upward angle in the rear top decking of the fuselage owing to the increased angle of incidence of the tailplane.* (Photos: Royal Aeronautical Society)





The centre fuselage portion of the the third prototype, C8660. (Photo: via Bruce Robertson)



A D.H.10, thought to be F1872, *of the first small production batch, photographed at Bircham Newton in 1919. Like* F1874, *the subject of the five-aspect colour drawing, this aircraft had no roundels on the fuselage sides.* (Photo: via K. M. Molson)

ferrying to the Independent Force, R.A.F.

Three additional major contracts were let in June and July 1918 for a further 475 aircraft. Of these, 200 (*H2746–H2945*) were ordered from the Aircraft Manufacturing Co., and *F7147–F7346* and *F8421–F8495* from the Alliance and Mann Egerton companies respectively.

However, the first production aircraft to appear were those of a small batch of sixteen, *F1867–F1882*, ordered from the Aircraft Manufacturing Co. on 27th April 1918 under Contract No. 35A/509/C385. The configuration of the first two is unknown, but *F1869*, which arrived at Martlesham Heath on 17th August and was thus virtually contemporary with *C4283*, had a revised power installation. Its engines were mounted directly on the lower wings, thus saving the weight and structural complication of the system of supporting struts required on the original design.

This new variant was designated D.H.10A and was officially known as the Amiens Mk. IIIa. *F1869* is the only aircraft of the small batch that is known to have been a D.H.10A, but there may have been others. It is possible that *F1869* was regarded as more or less the prototype D.H.10A, for it was flown to Paris on 15th September 1918.

It seems that few D.H.10A's were built. The first aircraft made by Mann Egerton & Co., *F8421*, was of this type, and it seems possible that the Norwich firm's production was to consist of the D.H.10A.

With the appearance of the D.H.10A larger wheels (1,100 × 220 mm.) were introduced. The wheels fitted to the D.H.10 and to *F1869* were 900 × 200 mm., but the larger wheels were subsequently standardized on all D.H.10 aircraft.

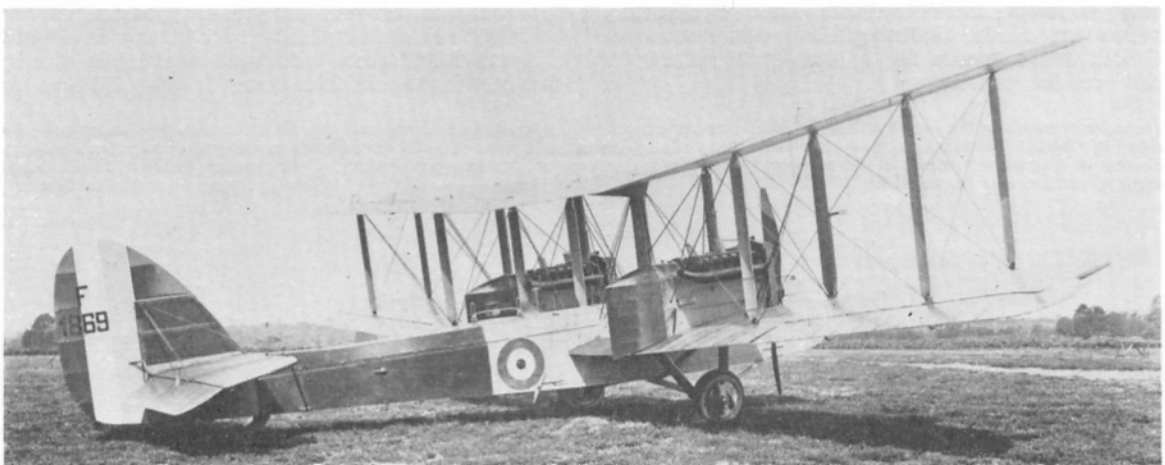
American output of the Liberty engine failed to reach the absurdly optimistic forecasts that had been made when that new, untried and far from perfect engine was put into production in the autumn of 1917. (It had been officially eulogized—in the U.S.A.—as "the perfected engine" before a specimen had been flown.) By January 1918 British orders for the Liberty totalled 3,000; deliveries to Britain were to start that month at a promised rate of 500 engines per month. The full production programme envisaged a total output of 9,420 engines by 31st May 1918.

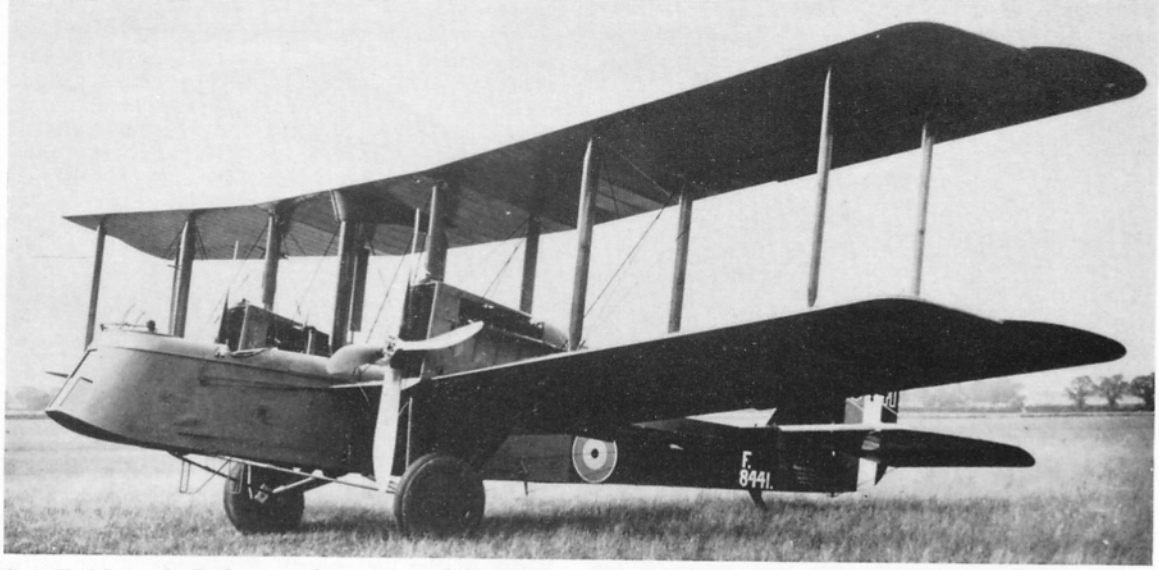
In reality the Liberty proved, rather inconsiderately, to be no more perfect than any other prototype aero-engine of the period and to need quite as much development and modification. By 25th May only 1,100 engines had been made; and by the end of June 1918 only 410 had been delivered to Britain out of the 3,000 that should have been received by then. Deliveries to Britain stopped in July, when a further 620 engines had arrived.

This enormous shortfall in deliveries must have created a critical situation, for the Liberty was to be the standard engine of both the D.H.10 and the D.H.9A, the sorely-needed replacement for the D.H.9. Moreover, the D.H.9A and D.H.10 were to be key aircraft in the expansion of the Independent Force, R.A.F.; and the only suitable alternative engine, the Rolls-Royce Eagle, was itself not available in sufficient quantities to meet existing demands for it.

A good deal of uncertainty has always attached to the designation D.H.10B, but it seems most probable that the Liberty débâcle led to the re-design of the D.H.10 and D.H.10A to take the already-scarce Rolls-Royce Eagle. It is known that the designation

Probably the first D.H.10A, F1869 *is here seen at Martlesham Heath. It still had the original small wheels.*

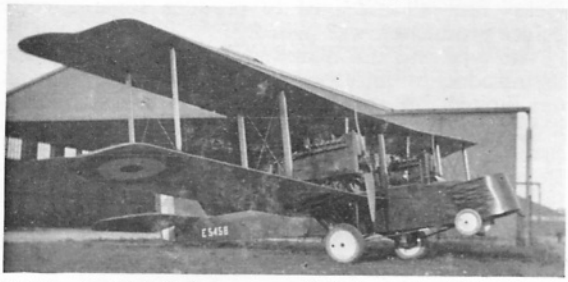




The D.H.10C was the Eagle-powered counterpart of the D.H.10A. This example, F8441, *was built by Mann Egerton & Co. Ltd., and was fitted with the enlarged wheels that were standardized for all D.H.10 variants.* (Photo: I.W.M. Q67977)

D.H.10C applied to the Eagle-powered counterpart of the D.H.10A: it is logical to assume that the D.H.10B would bear the same relationship to the D.H.10 (that is, its engines would be in the mid-gap position). In this connection it is noteworthy that Mann, Egerton and Co., whose production had started with the D.H.10A, built at least one D.H.10C, *F8441.*

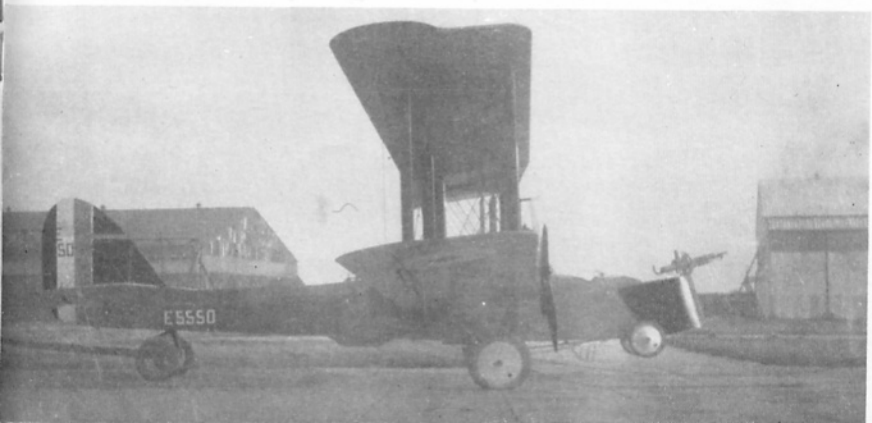
Very few D.H.10C's were built because the Armistice prevented any of the D.H.10 variants from going into squadron service. The first R.A.F. unit that was intended to have the type was No. 104 squadron of the 41st Wing in the VIII Brigade, one of the squadrons of the Independent Force, R.A.F., and it was probably with this unit that the two D.H.10's recorded as on the strength of the Independent Force on 31st October 1918 were in service. By that date only eight D.H.10's had been delivered to the R.A.F.



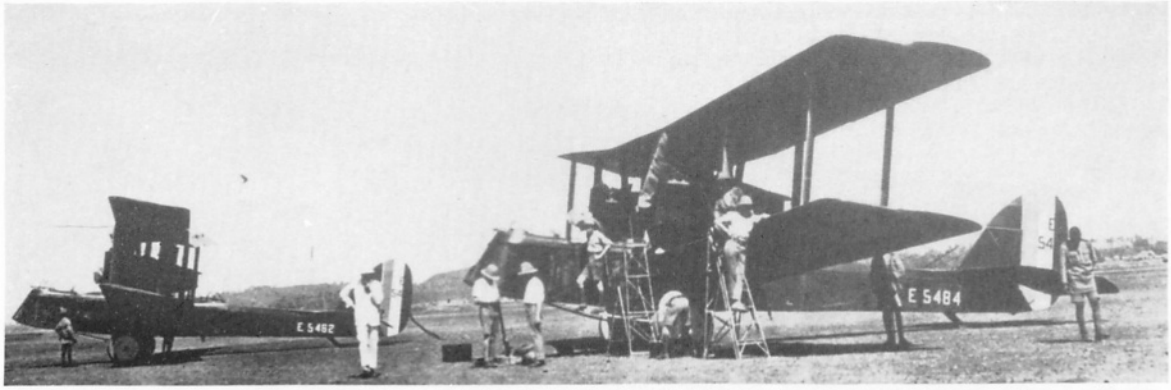
E5458, *the D.H.10 that was modified for trials of the 1½-pdr. Coventry Ordnance Works quick-firing gun. It is here seen at Orfordness. The extended nose cockpit was plywood-covered, and nose wheels were fitted.*

The planned strength of the Independent Force for 1919 envisaged a total of eight D.H.10 squadrons. In addition to No. 104 Squadron, a unit of the 88th Wing (also of the VIII Brigade) was to be equipped with the aircraft; so also were two squadrons in the XI Brigade and four squadrons in a projected new Wing. None of these D.H.10 squadrons had been identified when hostilities ceased.

It seems probable that the consideration given to using the D.H.10 as an escort fighter was the reason underlying the installation of a 1½-pounder Coventry Ordnance Works quick-firing gun that was designed in the summer of 1918. To accommodate the mounting for the big gun the front cockpit of each aircraft had to be enlarged. This resulted in a lengthened nose, to which nosewheels were fitted; and the modifications did nothing to improve the aircraft's appearance. In September 1918 the Independent Force asked the Ministry of Munitions to examine the possibility of installing a C.O.W. gun in the rear cockpit, but



Companion to E5458 *was this D.H.10C,* E5550, *which was similarly modified. When this photograph was made the C.O.W. gun was in position on the front cockpit. The small blister under the rear gunner's cockpit suggests experimental housing of a Calthrop A.1 parachute.*



Two D.H.10s of No. 97 Squadron at Juhu during the brief period, early in 1920, when the squadron operated a mail service between Bombay and Karachi. Both aircraft in this photograph still have their original radiators. (Photo: Ministry of Defence)

whether as an alternative or as a supplement to the front gun is not known.

The nose-position installation was made on the D.H.10 *E5458* and the D.H.10C *E5550*, both of which were sent to the armament experimental unit at Orfordness for trials.

One of the pilots concerned with the C.O.W. gun tests was Squadron Leader C. A. Rea, who recorded the following note* on the aircraft:

> "I had heard adverse criticisms of the D.H.10 before going to Hendon to take delivery, but I gained a very favourable impression of it on the flight back to my Unit; it had a high performance for those days and was quite pleasant to fly, but I soon found out why it had a bad reputation in some quarters.
>
> We made up a suitable mounting, installed the gun and set off on a trial flight with observer in the rear cockpit and gunner in front. Just after taking off I was climbing steeply with both gravity feed and fuel pumps working when one engine suddenly failed, resulting in a violent swing induced by the pull of the live engine. We were only a few hundred feet up, had insufficient height to turn back to the aerodrome and the ground below was intersected with dykes. I closed both throttles, 'straightened out', put the nose down to maintain speed and had just time to shut off the pump feeds, leaving the gravity tanks in action, when both engines picked up again and we climbed to a safe height.
>
> Here a test while flying level with the gravity tanks shut off proved that at high speeds the pumps worked perfectly but when the air speed fell to about 70 m.p.h. one engine would starve.
>
> A pair of new pump airscrews of coarser pitch were a great improvement but it was safer always to take off on gravity feed and change over when a safe height had been reached.
>
> We had no further engine trouble and were getting promising results with the D.H.10 when I had to hand it over to another pilot as I was called away on other duties for a few days."

* *From "The Cannons are coming!"*, Aeronautics, *October 1940, p .62.*

During Squadron Leader Rea's absence one of the two aircraft crashed just after take-off. The peculiarity of the fuel system mentioned in the extract above was responsible for several crashes at take-off. Even as late as May 1920 a new aircraft of No. 60 Squadron, then in India, crashed in circumstances that strongly suggested temporary fuel starvation of the port engine.

A further request made by the Independent Force in September was for increased endurance. A forty-gallon auxiliary tank was hurriedly designed for installation in the bomb bay and a sample was sent to France in October 1918.

Inevitably, the production of the D.H.10 and its variants was drastically reduced after the war ended. Nevertheless, the Alliance Company, Birmingham Carriage Co., the Daimler Co., Mann Egerton & Co., National Aircraft Factory No. 2 and the Siddeley-Deasy firm all managed to produce some aircraft before production was halted.

The type was not abandoned by the R.A.F., but its introduction into the Service was leisurely and its use limited. A regular air-mail service from Hawkinge was operated from 1st March 1919 to convey mail to the British army of occupation in Germany. Initiated with D.H.9's, the service originally operated in stages, with No. 120 Squadron responsible for the Hawkinge-Maisoncelle leg.

D.H.10 of No. 216 Squadron in Egypt in 1922. The aircraft has enlarged tropical radiators with shutters of the original length, and the engine cowling panels have been removed. At this time some of No. 216's D.H.10s bore markings of hearts, spades, clubs, diamonds and swastikas. (Photo: Ministry of Defence)

A D.H.10 of that squadron was the first aircraft in the world to carry air mail by night. With Captain Barrett, Lieutenant Fitzmaurice and Lieutenant Oliver as crew, the D.H.10 left Hawkinge at 10.15 p.m. on 14th May 1919 and flew non-stop to Cologne, where it arrived at 1.30 a.m. next day.

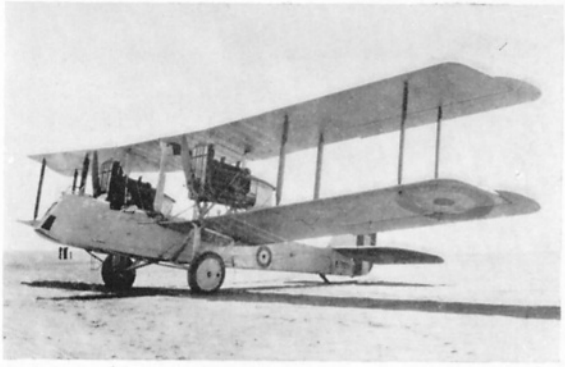
D.H.10's were taken to India in 1919 as the equipment of No. 97 Squadron. They were used initially on the frontier of Waziristan, and for about six weeks, early in 1920, they operated the abortive Bombay-Karachi air-mail service, the first in India. No. 97 Squadron was renumbered No. 60 on 1st April 1920, and in that month the squadron had to send a detachment to Rajkot to counter the activities of refractory tribesmen. The D.H.10's returned to Risalpur on 3rd May, by which time the trouble seemed to have died down; but the Squadron was ordered to carry out height and endurance tests in hot-weather conditions in preparation for possible operations. It was found, inevitably, that the heat affected the aircraft's performance, the best recorded ceiling with unknown load being only 12,500 ft.

Bombs were dropped by D.H.10's of No. 60 Squadron in the Tilli area between 12th and 16th November 1920 during the activities associated with the re-occupation of the Wana Post. It seems that the D.H.10's played only a minor part, the bulk of the punitive work falling to the Bristol Fighters and D.H.9A's of Squadrons No. 20 and 27. On 12th November two D.H.10's dropped eight 112 lb. bombs each; two again bombed Tilli two days later, and on the 15th and 16th a single D.H.10 attacked.

Early in 1922 No. 60 Squadron sent four D.H.10's to make a punitive raid on Datta Khel. The raid was successful but one D.H.10 had to make a forced landing at Kohat while on the return flight to Risalpur and crashed. But by April 1922 No. 60 was so short of spares that only one D.H.10 could be provided in response to a request for air action against Wana, which had then been seized by hostile Wazirs. A sortie on 7th April proved abortive, but on the 11th the D.H.10 bombed a small encampment in the Bhomai Valley.

When a reprisal action against the Abdur Rahman Khel was ordered in August 1922, so enfeebled was No. 1 Indian Wing that Squadrons No. 27, 28, 31 and 60 could between them put only six aircraft into the air. One of these was a D.H.10 that flew sorties from Dardoni on 11th, 14th and 16th August.

Another of No. 216 Squadron's D.H.10s, E7851, *photographed at a later date. This aircraft had the additional cockpit in line with the leading edge of the lower wing and shutters were fitted over the full depth of the tropical radiators.*



The only D.H.10 to bear a British civil registration was G-EAJO, seen before and after the name of the Aircraft Manufacturing Co. was painted on the sides of the front fuselage.
(Photo below: *Flight International* No. F483)

The Lahore depot received some replacements shortly after the Dardoni operations and in time for the Razmak operations of 1922-23. For these, two* of No. 60 Squadron's D.H.10's were attached to No. 27 Squadron and made occasional sorties between 26th December 1922 and February 1923.

By that time No. 60 Squadron were not receiving replacements for their D.H.10's, and A. E. Cowton recorded that the unit then had only three aircraft, of which ". . . one had crashed on the aerodrome, one had been returned to Risalpur for dismantling for workshop overhaul, as its engines had finished their time, and the third was being used as a transport plane."

In its eastern and middle-eastern service the D.H.10 was fitted with enlarged radiators. Those aircraft of No. 216 Squadron that operated the desert air-mail service between Cairo and Baghdad were provided with an additional cockpit in line with the leading edge of the lower wing. The D.H.10's air-mail service started on 21st June 1921 and continued until 1923.

A. E. Cowton's reference to D.H.10A's being with No. 60 Squadron at the end of 1922 (see footnote below) seems questionable, for the D.H.10A, 10B and 10C had all been declared obsolete in September 1921, and the D.H.10 was then specified as the only standard service version. The D.H.10 itself was finally declared to be withdrawn in April 1923.

For the transport of civilian air mail Aircraft Transport and Travel operated the D.H.10 *E5488* with the civil identity G-EAJO and a D.H.10C, *E5557*, which never acquired a civil registration. The D.H.10 was demonstrated at the ELTA exhibition at Amsterdam by Gerald Gathergood in August 1919. The civilian use of *E5557* had begun in June 1919 when, flown by Captain H. Shaw, it was used for passenger flying at Hendon. From 30th September 1919, during the railway strike, G-EAJO and *E5557* operated a regular air-mail service between Hendon, Newcastle and Renfrew.

* *But according to A. E. Cowton in his book* With the first in the field *"No. 60 Squadron sent four D.H.10's and 10A's from Risalpur."*

Captain Gerald Gathergood with the D.H.10C E5557 *operated by Aircraft Transport and Travel, Ltd. in 1919.*
(Photo: via C. C. H. Cole)

A passenger-carrying conversion of the D.H.10 was sketched out in 1919. This would have provided accommodation for four passengers, but it is doubtful whether the idea was taken further than some pencil sketches on an existing blue-print.

Another project that came to nothing was a 1920 proposal by the Aircraft Manufacturing Co. to set up a factory in Canada for the assembly of D.H.10's. Had it matured this might have been a worthwhile venture, for the D.H.10 would have served well as a transport or patrol aircraft. The project did not materialize, doubtless because the Aircraft Manufacturing Co. closed down.

The last D.H.10 to remain in service was *E6042* of the R.A.E., Farnborough. This aircraft was used for a variety of experiments, including those that were the subject of R. & M. No. 908, *Experiments with rudders on two twin-engine aeroplanes*. The reasons for the enquiry were especially important in the case of the D.H.10 for they "aimed at making level flight possible on one engine and reducing the danger if one engine failed near the ground."

The D.H.10 was tested in four main configurations, as follows:

(*a*) with standard fin and rudder;
(*b*) with twin fins (each 9·5 sq. ft.) and balanced rudders (each 19·5 sq. ft.) of more-or-less de Havilland outline

SPECIFICATION

Power. *C8658*, two 230 h.p. Siddeley Pumas; *C8659*, two 360 h.p. Rolls-Royce Eagle VIII; *C8660*, two 396 h.p. Liberty 12; *C4283*, two 405 h.p. (high-compression) Liberty 12. Production D.H.10 and 10A, two Liberty 12; D.H.10B and 10C, two 375 h.p. Rolls-Royce Eagle VIII.

Dimensions. Span (*C8658–C8660*) 62 ft. 9 in.; (*C4283* and production) 65 ft. 6 in.* Length, (*C8658* and *C8659*) 38 ft. 10⅛ in.; (*C8660*) 39 ft. 6 in.; (*C4283* and production) 39 ft. 7$\frac{7}{16}$ in. Height, 14 ft. 6 in. (15 ft. with 1,100×220 mm. wheels). Chord, 7 ft. Gap, 7 ft. 6 in. Stagger, nil. Dihedral, 4 deg. 30 min. Incidence 7 deg. Sweepback, 4 deg. on *C8659*, 2 deg. 30 min. on *C8660* and subsequent aircraft. Span of tail 22 ft. Wheel track 13 ft. Tyres, originally 900×200 mm., later 1,100×220 mm. Airscrew diameter (Type A.M. 5019) 10 ft. 3 in., (Type X.3012) 10 ft.

Areas. Wings, (*C8658*) 787 sq. ft.; (*C8659*) 834·8 sq. ft.; (*C4283* and production aircraft) 837·4 sq. ft. Ailerons, (*C8659*) each 30·2 sq. ft., total 120·8 sq. ft.; (*C4283* and production aircraft) each 29·5 sq. ft., total 118 sq. ft. Tailplane, (*C8659*) 71·6 sq. ft.; (*C8660* and subsequent aircraft) 75·5 sq. ft. Elevators, (*C8659*) 46 sq. ft.; (*C8660* and subsequent aircraft) 33·08 sq. ft. Fin, 10 sq. ft. Rudder, 25·75 sq. ft.

Armament. The bomb load could consist of up to six 230 lb. bombs stowed internally (with normal fuel tankage), but various groupings of smaller explosive and incendiary bombs could be carried. Standard defensive armament was two 0·303 in. Lewis machine-guns on Scarff No. 2 Ring Mountings, one on the front cockpit, the other on the rear; both guns fitted with Norman Vane Sights. Occasionally double-yoked Lewis guns were fitted.

* *This was the total lineal span of the two wing panels and centre section. The projected span, allowing for the dihedral angle, was approximately 65 ft. 4 in.*

(i) mounted parallel to the aircraft centre line,
(ii) toed-in at 7 deg. 30 min., and
(iii) toed-in at 15 deg.;

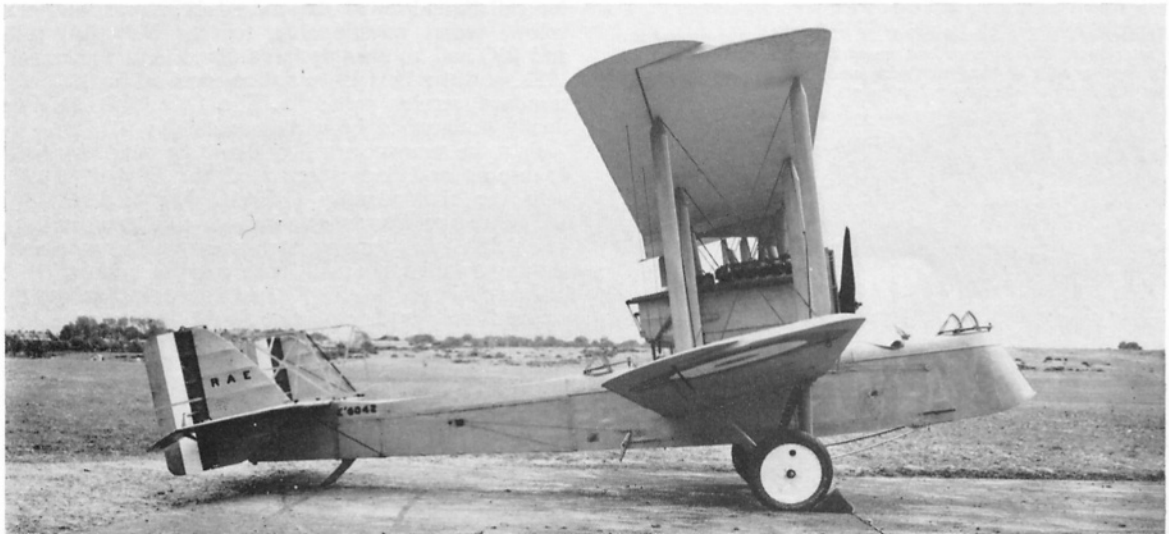
(*c*) with a large rectangular fin (19 sq. ft.) and horn-balanced rudder (39 sq. ft.); and
(*d*) with twin fins (each 12·5 sq. ft.) and plain high-aspect-ratio rudders (each 12·5 sq. ft.) toed-in at 7 deg. 30 min.

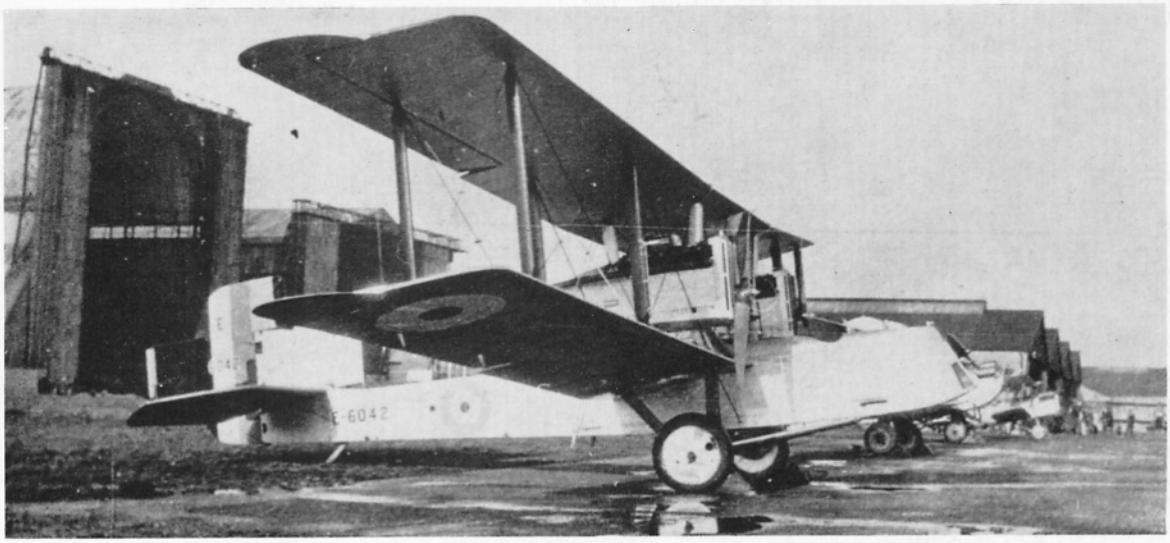
With the last installation, despite some inadequacy of balance, it was found that "the aeroplane could, for the first time in the experiments, be flown level with one engine throttled right back."

These experiments extended over a considerable period. Flown by Squadron Leader Roderic M. Hill, *E6042* appeared at the R.A.F. Aerial Pageant at Hendon in June 1922, fitted with the large rectangular fin and 39 sq. ft. rudder. In June 1923, when photographed with the final twin fins and rudders, the stripped framework of the rectangular fin was still in place; and by November 1924 this framework had been re-covered and the big rudder replaced, this

(*continued on page 12*)

The Royal Aircraft Establishment's D.H.10 E6042 *that was fitted with several experimental tail units. It is here seen on 22nd June, 1923 with the final twin-fin tail unit that was tested during the experiments that were the subject of R. & M. No. 908 mentioned in the text. The stripped framework of the large rectangular fin that had been tested earlier was still in position at this time.*
(Photo: Crown Copyright)





E6042 *at Farnborough on 21st November, 1924 with the rectangular fin and balanced rudder restored, but with the addition of a servo rudder.*

time with a servo rudder attached. Testing of the servo rudder continued until at least 22nd May 1926.

In 1920 the Aircraft Manufacturing Co. were advertising surplus D.H.10A's and 10C's for sale. It may have been one of these aircraft that went to the U.S.A. that year and helped pioneer the United States air-mail services. Bearing the number 111, this D.H.10 is known to have been used on the New York—Cleveland—Omaha route in June 1920.

The author gratefully acknowledges the contribution made to this history by Bruce Robertson.

PRODUCTION

Four prototypes and 1,291 production D.H.10, 10A, 10B and 10C aircraft were ordered, but production was drastically curtailed in 1919 and it is not possible to determine the total actually built. Known serial numbers indicate that at least 223 production aircraft of all sub-types were built, in addition to the four prototypes.

Aircraft Manufacturing Co., Ltd., Hendon, London, N.W.—C4283, C8658–C8660, E5437–E5636, F1867–F1882, H2746–H2945.
Alliance Aeroplane Co., Ltd., Cambridge Road, Hammersmith, London, W.14—F7147–F7346.
Birmingham Carriage Co., Birmingham—E6037–E6136.
Daimler Co., Ltd., Coventry—E9057–E9206.
Mann, Egerton & Co., Ltd., Norwich—F8421–F8495.
National Aircraft Factory No. 2, Heaton Chapel, near Stockport—F351–F550.
Siddeley-Deasy Motor Car Co., Ltd., Park Side, Coventry—E7837–E7986.

Service Use.
Western Front: No. 104 Squadron. *United Kingdom:* No. 120 Squadron. *India:* No. 97 Squadron, later renumbered as No. 60 Squadron. *Egypt:* No. 216 Squadron.

Examples of D.H.10's used by squadrons.
No. 60 Sqn.—E5450, E5453, E5456, E5464, E9081.
No. 97 Sqn.—E5462, E5484.
No. 216 Sqn.—E5507, E7847, E7851, E7854, E9061, E9090, F1871, F1877.

WEIGHTS AND PERFORMANCE

Aircraft	C8658		C8659	C8660		C4283		D.H.10A F1869	
Engines	Pumas		2×360 h.p. R.-R. Eagle VIII	2×396 h.p. Liberty 12		2×405 h.p. high-compression Liberty 12		2×405 h.p. high-compression Liberty 12	
Load	With bombs	Without bombs*	—	Normal load	Reduced load	Normal load	Reduced load	Normal load	Reduced load
Weights (lb.)									
Empty	5,004	5,004	—	5,600	5,600	5,585	5,585	5,750	5,750
Military load	581	73	—	1,425	925	1,165	665	954	454
Crew	540	360	—	540	540	540	540	540	540
Fuel and oil	825	377	—	1,435	1,435	1,710	1,710	1,756	1,756
Loaded	6,950	5,814	8,500	9,000	8,500	9,000	8,500	9,000	8,500
Max. speed (m.p.h.)									
At ground level	109	—	117·5	—	—	—	124	—	131
At 6,500 ft.	—	—	—	—	—	116·5	117·5	126	128
At 10,000 ft.	100·5	—	—	—	113·5	112·5	115	121	124
At 15,000 ft.	89·5	—	—	—	105	106	110	112	117
Climb to	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
6,500 ft.	11 25	8 40	— —	10 5	9 20	9 0	8 10	7 5	6 25
10,000 ft.	20 55	15 10	— —	18 30	16 35	16 5	14 35	12 25	11 0
15,000 ft.	50 30	29 50	— —	— —	35 20	34 20	29 55	24 30	20 30
Service ceiling (ft.)	15,000	18,000	—	15,000	16,000	16,500	17,500	17,500	19,000
Endurance (hours)	3½	—	—	—	4	5¾	6	5¾	6

** Described in the official performance report summary as "Home Defence Machine". The weight quoted for the crew indicates that the aircraft was flown as a two-seater for this test.*

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