SOPWITH CAMEL . . .

that height a slightly leaner mixture was needed. Inexperienced pilots seldom reacted swiftly enough in this emergency; the Camel, tail heavy and at a low forward air speed, stalled almost immediately and spun in.

These difficulties probably led to the installation of Monosoupape engines in Camels, which were then used for training purposes. Official tests of the Monosoupape Camel were made in August 1917.

A development of even greater value was the dual-control version of the Camel. One of the first dual Camels was made about the middle of 1918 in the Aeroplane Repair Section of the 23rd Training Wing at South Carlton. It was converted from a standard single-seat aircraft by Capt. W. R. Roche-Kelly and was flying in the summer of 1918. By September 1918 dual-control conversions had appeared at several training stations, and their use effectively reduced the number of training accidents on Camels. The second cockpit was made immediately behind the normal one, and necessitated the removal of the main petrol tank. Since the rear seat was fitted at the point where the longerons began to converge, the cockpit was rather cramped. A head rest was fitted.

Camels were widely used for experimental purposes, and several experimental versions existed. One of the most interesting of these was a modified F.1 which had tapered wings. This consisted of a standard F.1 fuselage fitted with tapered mainplanes which were connected on each side by a single plank-type interplane strut reminiscent of the struts of the Sopwith Triplane. The taper-wing Camel was tested in May 1917 with the 130 h.p. Clerget engine, but its performance was not appreciably better than that of the standard Clerget Camel. It was also considered that its tapered wings would give rise to production difficulties, since all the ribs were of different sizes. The design was therefore abandoned.

The Camel was used so extensively for ground-attack work that it was only natural to build a special version for that particular job. The F.1 Camel B.9278, originally built by Boulton and Paul, was converted into the Sopwith TF.1 by removing the Vickers guns and replacing them by a pair of Lewis guns which fired downwards through the floor of the cockpit. A third Lewis gun was mounted above the centre section, and armour plate was fitted for the protection of the pilot. The designation TF signified "Trench Fighter." Although the Sopwith TF.1 did not go into production, it paved the way for the later Salamander.

In December 1917 official tests were carried out with an F.1 Camel powered by the 150 h.p. Gnôme Monosoupape engine. This powerplant was a development of the widely used 100 h.p. Monosoupape, and had an unusual form of control. A multi-position ignition switch was provided; this enabled varying numbers of cylinders to be cut out and thereby controlled the power output of the engine. This Camel was purely experimental.

Another experimental engine installation was that of the 180 h.p. Le Rhône rotary engine, which was also made in an F.1 airframe. This Camel was tested in February 1919, but its performance proved to be inferior to that of the B.R.1 Camel.

In experimental flying the Camel broke new ground in 1917 when it carried out the first tests to be conducted in the technique of dive-bombing.

During investigations into the spinning of aeroplanes, Camels powered with B.R.1 and 130 h.p. Clerget engines were used. For these experiments a Clerget Camel was fitted with a rudder of increased area, and the elevator area was later increased also.

Two interesting developments of the F.1 Camel were built in 1918. Both were monoplanes, the first aircraft of that configuration to be built by the Sopwith company. The first of the two machines was originally known as the Sopwith Monoplane No. 1, and appeared in June 1918. It was named the Scooter, and was powered by a 130 h.p. Clerget engine.

The Scooter consisted of an F.1 Camel fuselage fitted with a parasol wing which was mounted very close to the fuselage. Bracing was by Rafwires; the landing wires were attached to a tall pyramidal cabane. The machine provided Harry Hawker with an aerobatic mount, and after the Armistice it appeared on the Civil Register, first as K.135 and later as G-EACZ.

From the Scooter was developed the Swallow, a single-seat fighter originally designated Sopwith Monoplane No. 2; it appeared in October 1918. Like the Scooter, the Swallow was a parasol monoplane with a Camel fuselage (that of B.9276), but the armament was retained and the engine was the 110 h.p. Le Rhône. The Swallow's wing was of slightly greater span and area than that of the Scooter and was rather higher above the fuselage in order to give the pilot access to his guns, which were fully exposed and not partially covered as on the Camel. The centre section struts were longer than those of the Scooter and had a more pronounced outwards rake when seen from the front. The central portion of the wing was reinforced, and the ailerons were of longer span than those of the Scooter.

The Swallow arrived too late to be developed for Service use. The official trials conducted in May 1919 showed no improvement in performance over the Camel. *(To be concluded)*

SPECIFICATION

Power Plant.—*F.1 Camel:* 110 h.p. Clerget; 130 h.p. Clerget; 110 h.p. Le Rhône; 150 h.p. B.R.1; 100 h.p. Gnôme Monosoupape. *Experimental:* 150 h.p. Gnôme Monosoupape; 180 h.p. Le Rhône. *2F.1 Camel:* 130 h.p. Clerget; 150 h.p. B.R.1. [power figures are nominal.—Ed.]

Manufacturers.—Sopwith Aviation Co., Ltd., Canbury Park Road, Kingston-on-Thames.

Other Contractors.—*For F.1 Camel:* Boulton and Paul Ltd., Rose Lane Works, Norwich; British Caudron Co., Ltd., Broadway, Cricklewood, London; Clayton and Shuttleworth, Ltd., Lincoln; Hooper and Co., Ltd., St. James's St., London; March, Jones and Cribb, Ltd., Leeds; Nieuport and General Aircraft Co., Ltd., Cricklewood, London, N.W.; Portholme Aerodrome, Ltd., St. John's St., Huntingdon; Ruston, Proctor and Co., Ltd., Lincoln. *For 2F.1 Camel:* Wm. Beardmore and Co., Ltd., Dalmuir, Dunbartonshire.

Dimensions.—*Span:* F.1, 28ft; 2F.1, 26ft 11in *Length, F.1:* With Clerget, 18ft 9in; Le Rhône, 18ft 8in; B.R.1 and 150 h.p. Monosoupape, 18ft 6in; 100 h.p. Monosoupape and 180 h.p. Le Rhône, 19ft. *Length: 2F.1:* 130 h.p. Clerget, 18ft 6in; B.R.1, 18ft 8in. *Height, F.1:* 8ft 6in with Clerget, 110 h.p. Le Rhône, B.R.1 and 150 h.p. Monosoupape engine; 8ft 9in with 100 h.p. Monosoupape; 8ft 8in with 180 h.p. Le Rhône. *Height, 2F.1:* 9ft 1in. *Chord:* 4ft 6in. *Gap:* at fuselage (F.1) 5ft, (2F.1) 4ft 11$\frac{1}{16}$in. *Stagger:* at fuselage, 18in; at interplane struts, 18$\frac{5}{16}$in. *Dihedral:* Upper, nil; lower (F.1) 5 deg, (2F.1) 5 deg 30 min. *Incidence:* 2 deg. *Span of tail:* 8ft 2$\frac{1}{2}$in. Wheel track: F.1, 4ft 8in; 2F.1, 4ft 5$\frac{1}{8}$in.

Areas.—*F.1:* Wings: 231 sq ft. Ailerons: each 9 sq ft, total 36 sq ft. Tailplane: 14 sq ft. Elevators: 4.9 sq ft. *2F.1:* Wings: 221 sq ft.

Armament.—*F.1 Camel:* Standard armament consisted of two fixed, synchronized Vickers machine-guns mounted side-by-side on top of the fuselage and firing through the airscrew arc. Four 25-lb bombs could be carried in external racks under the fuselage. On at least one occasion the Camels of No. 213 Squadron each carried one 112-lb bomb, and 40-lb phosphorous bombs were also used occasionally. The Home Defence version of the F.1 Camel had two Lewis machine-guns above the centre section, firing forward over the airscrew. These Lewis guns were carried on a double Foster mounting.

TF.1 Camel: Two Lewis machine-guns in the floor of the fuselage, their barrels lying between the undercarriage vees. These guns fired downwards and forwards. A third Lewis gun was mounted above the centre section and fired forwards over the airscrew.

2F.1 Camel: One fixed, synchronized Vickers machine-gun mounted on top of fuselage, firing forward through the airscrew. One Lewis gun on Admiralty top plane mounting above centre section. At least one 2F.1 of the R.N.A.S. Station, Felixstowe, had twin Vickers guns as on the F.1 Camel. The 2F.1 Camels which bombed Tondern each carried two 50-lb bombs.

WEIGHTS AND PERFORMANCE

	F.1 Camel								Taper-wing	2F.1 Camel	
	130 h.p. Clerget	130 h.p. Clerget (long stroke)	110 h.p. Le Rhône	150 h.p. B.R.1	B.R.1 (compression ratio 5.7:1)	100 h.p. Gnôme Monosoupape	150 h.p. Gnôme Monosoupape	180 h.p. Le Rhône	130 h.p. Clerget	130 h.p. Clerget	150 h.p. B.R.1
Weight empty (lb)	929	—	889	977	—	882	930	1,048	950	956	1,036
Military load (lb)	281	—	281	281	281	281	281	281	280	281	271
Fuel and oil (lb)	243	—	252	250	—	224	230	238	252	286	223
Weight loaded (lb)	1,453	1,452	1,422	1,508	1,470	1,387	1,441	1,567	1,482	1,523	1,530
Maximum speed (m.p.h.) at:											
Sea level	—	—	122	—	—	—	—	—	—	—	—
6,500ft	115	—	—	116.5	—	—	—	—	—	—	124
10,000ft	113	—	118.5	111	121	110.5	—	113	112.5	114	122
15,000ft	106.5	113.5	111.5	103	114.5	102.5	113	108.5	106	104	117
Climb (min and sec) to:											
6,500ft	6 0	5 0	5 10	5 30	4 35	6 50	5 5	5 30	6 0	6 25	6 0
10,000ft	10 35	8 30	9 10	9 50	8 10	11 50	8 50	9 35	10 35	11 40	11 30
15,000ft	20 40	15 50	16 50	20 0	15 55	23 20	16 5	17 30	21 5	23 40	25 0
Service ceiling (ft)	19,000	24,000	24,000	18,000	22,000	18,500	22,000	21,500	19,000	19,000	17,300
Endurance (hr)	2$\frac{1}{2}$	—	—	2$\frac{1}{2}$	2$\frac{1}{2}$	2$\frac{3}{4}$	2$\frac{1}{2}$	—	2$\frac{3}{4}$	3	—