AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 143

THE S.P.C.A. 40 T COMMERCIAL AIRPLANE (FRENCH)

An All-Metal Cantilever Monoplane

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THE S.P.C.A. 40 T COMMERCIAL AIRPLANE (FRENCH)*

An All-Metal Cantilever Monoplane

In the production of this airplane for commercial use, the "Société Provencale de Constructions Aéronautiques" was guided by the two essential requirements of economy and safety (Figures 1, 2, 3 and 4). Economical considerations require durability and easy upkeep. Being designed to fly on a regular day-and-night schedule, this airplane will be subjected to difficult conditions of operation. The metal construction not only of the frame, but also of the covering, would seem to be entirely satisfactory from this viewpoint.

Moreover, the all-metal cantilever wing is practically incapable of getting out of order. The same is true of the tail surfaces. There is the same facility of upkeep of the flight controls, which are rigid and mounted on ball bearings.

The three engines are alike. The tubular engine bearers are each attached by four bolts (Figure 5). The cowlings are arranged to enable easy inspection.

Lastly, the repair of any injury would put the airplane out of commission for only a short time. In fact it is made in separate parts (front, central and rear part of fuselage, two-part landing gear, tail skid, tail surfaces, wing tips, etc.), thus enabling the quick replacement of any part.

In general it may be said that the economy of an airplane depends on the ratio of its useful load to its horsepower. The performances were not considered, however, simply from the record viewpoint, but also in their relation to the cost of commercial operation. The aerodynamic conception of the S.P.C.A. 40 T (wing section, aspect ratio, general lines) is such as to reduce the drag to a minimum, the search for the maximum fineness having been one of the dominating motives.

As regards the matter of safety, the two principal dangers are fire and engine failure. The 40 T is provided with all the modern fire-prevention devices, including automatic fire alarms and extinguishers. The fuel tanks, situated in the wing away

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*From L'Aéronautique, December, 1930, pp. 485-486, and data furnished by the manufacturers.

from the engine and cabin, are of the dump type. Moreover, the all-metal construction of the airplane hinders the spread of fire.

The danger from engine failure is entirely eliminated, since this airplane can fly horizontally with any one of the three engines stopped at an altitude above that stipulated in the certificate of navigability.

In the tests, this airplane exhibited remarkable stability.

The monoplane wing has a central rectangular part, two tapering parts and two rounded tips. The biconvex section is thick in the middle of the wing and grows thinner toward the tips. It has a span of 20 m (65.62 ft.) and an aspect ratio of 7.28. It has two lattice spars supported by ribs (Figure 6). The tapered parts are attached to the central part by four ball joints, which facilitate removal and replacement. The leading and trailing edges (including the ailerons) are covered with smooth sheet metal, the rest of the covering being stiffened by corrugations.

The fuselage structure consists of two transversely braced side girders connected by bulkheads (Figures 7, 8, 9 and 10). The top and bottom consist of longitudinal stringers supported by the bulkheads and in turn supporting the smooth covering. The fuselage is made in three separable parts: the front part containing the pilot's cockpit; the middle part for passengers or freight; and the rear part extending to the rudder post. The door to the cockpit is on the right, while the door to the passenger cabin is on the left.

The central engine is mounted at the nose of the fuselage on a bearer which can turn on a vertical axis. The side engines are mounted in streamlined nacelles attached to the lower side of the wing (Figures 5, 11 and 12). The airplane can be equipped with three 120-150 hp engines, or with a central engine of 230 hp and two side engines of 120 hp each. When equipped with three 120 hp Salmson engines, it can fly with either engine stopped.

The two 170-liter (45-gal.) fuel tanks are mounted in the wing and can be dumped during flight. They supply a tank common to all three engines. The oil tanks are behind the engines.

The tail surfaces are of cantilever structure without external bracing. The horizontal empennage is somewhat elliptical with an aspect ratio of 4.9.

The landing gear is in two separate parts, each with three struts, the vertical strut being provided with a Messier shock absorber. The wheels are provided with brakes and have a track of 5 m (16.4 ft.). The tail skid is provided with an oleopneumatic shock absorber.

The S.P.C.A. 40 T is equipped for night flying. The cockpit is inclosed with two seats abreast, the pilot on the left and the navigator on the right, with radio and navigation instruments. Its static-test coefficient enables it to carry a total load of 3900 kg (8598 lb.). It was designed as a mail carrier and acquired by the French Government. It can be transformed into a seaplane by substituting twin metal floats for the landing gear.

The fuselage can be adapted for carrying about 350 kg (772 lb.) of mail or other freight; for carrying four passengers, with lavatory; or as an ambulance plane with two stretcher cases, seat for attendant, table and medicine chest. With this equipment, the airplane weighs about 2900 kg (6393.4 lb.) in flying order.

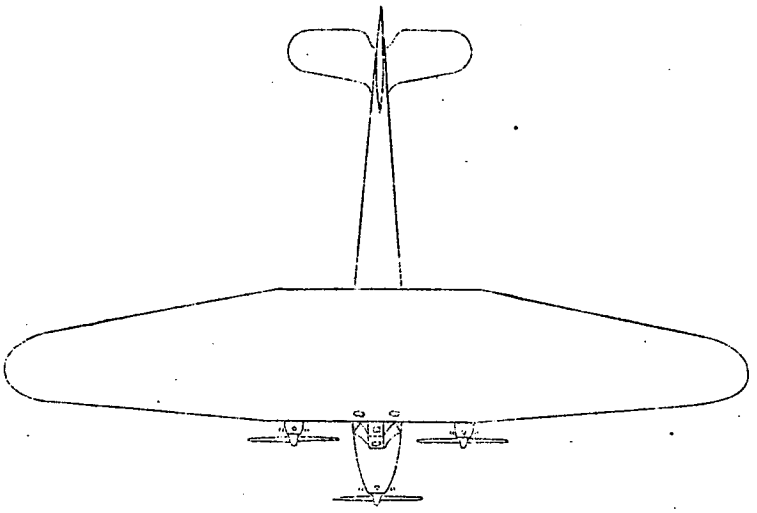
Characteristics
(With three 120 hp Salmson AC 9 engines)

Span	20.00	m	65.62	ft.
Length	13.05	"	42.81	"
Height	3.25	"	10.66	"
Wing area	55	m^2	592	sq.ft
Power	360	hp		
Weight empty	2160	kg	4762	lb.
Useful load	990	"	2182.6	"
Weight loaded	3150	"	6944.6	"
Wing loading	57.27	kg/m^2	11.73	lb./sq.ft.
Power loading	8.75	kg/hp	19.03	lb./hp

Performances

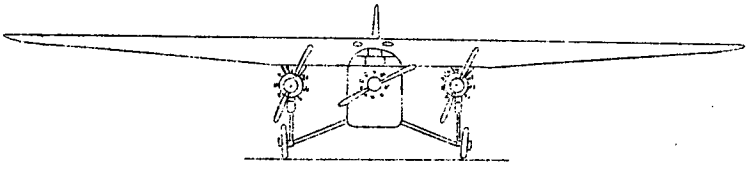
Maximum speed,	about 180	km/h	111.8	mi./hr.
Practical ceiling	" 4000	m	13120	ft.
Range	" 500	km	310.7	mi.

Translation by Dwight M. Miner,
National Advisory Committee
for Aeronautics.

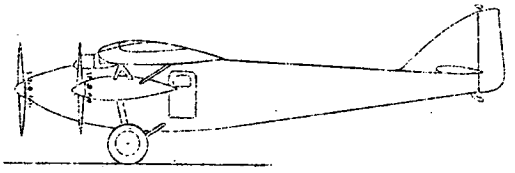


Span 20 m (65.62 ft.) Height 3.25 m (10.66 ft.)

Length 13.05 m (42.81 ft.) Wing area 55 m^2 (592 sq.ft.)



Three Salmson
AC 9
120 hp
engines



0 1 2 3 4 5 m
0 4 8 12 16 ft.

Fig.1 General arrangement drawings of the S.P.C.A. 40 T airplane.

Fig.2

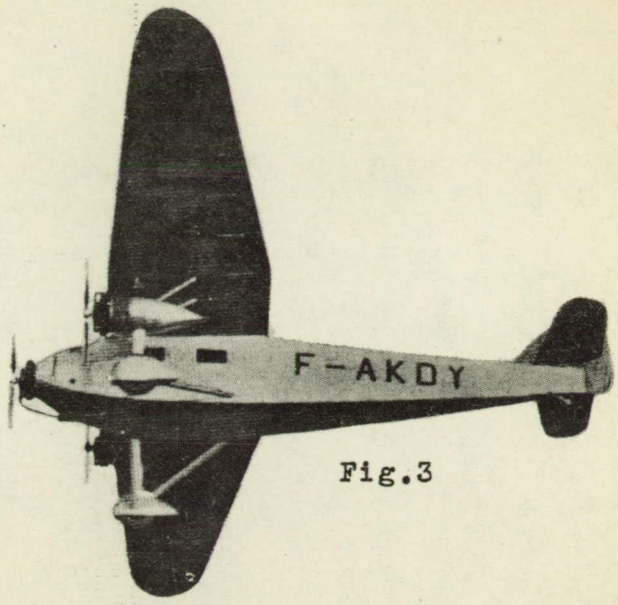


Fig.3

Figs.2,3,4 Views of the S.P.C.A. 40 T airplane.

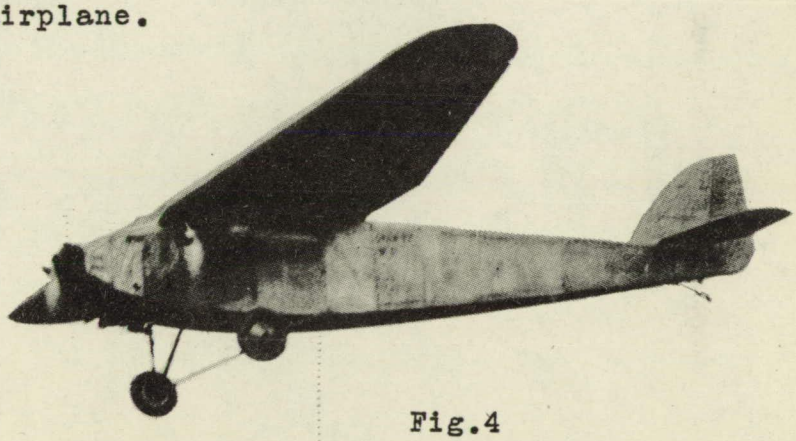


Fig.4

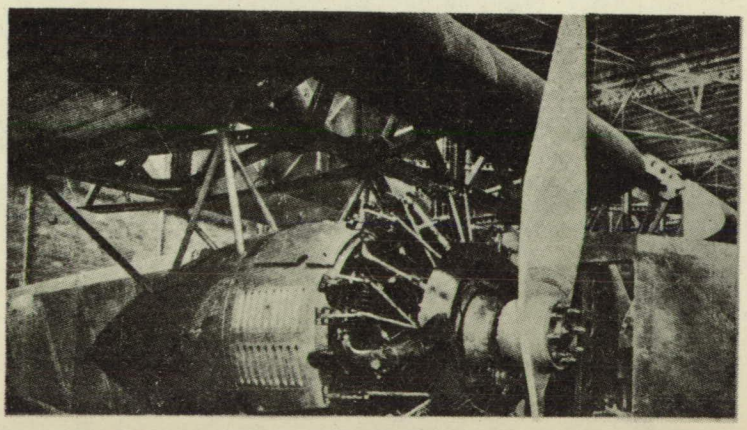


Fig.5 Attachment of side-engine nacelle to wing.

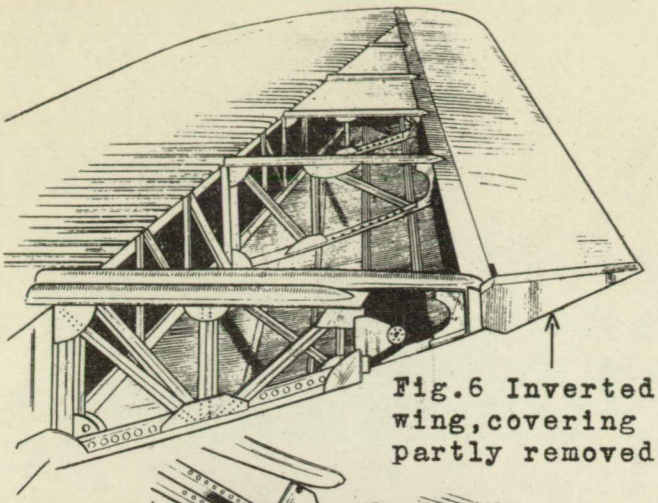


Fig.6 Inverted wing, covering partly removed.

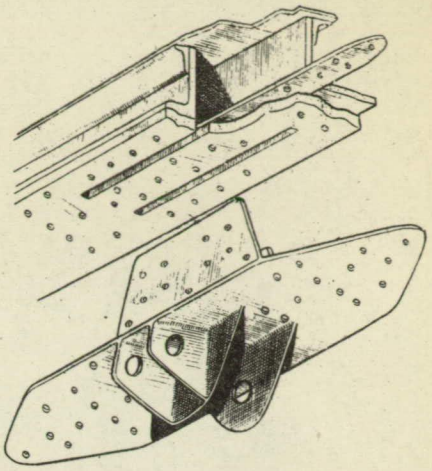


Fig.8 Rear attachment of fuselage to middle part.

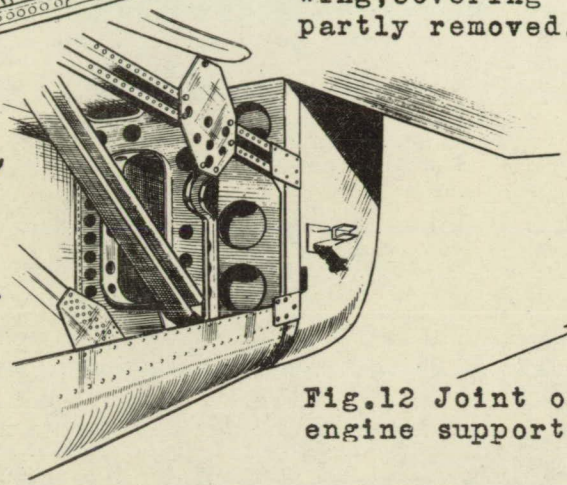


Fig.7 Rear end of fuse-lage.

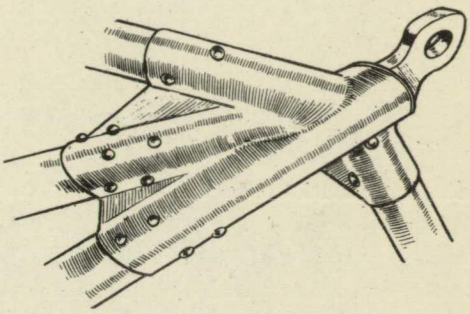


Fig.12 Joint of engine support.

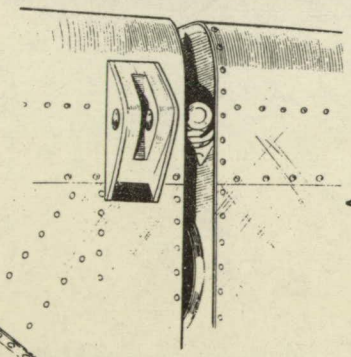


Fig.11 Removable attachments of a side engine bearer.

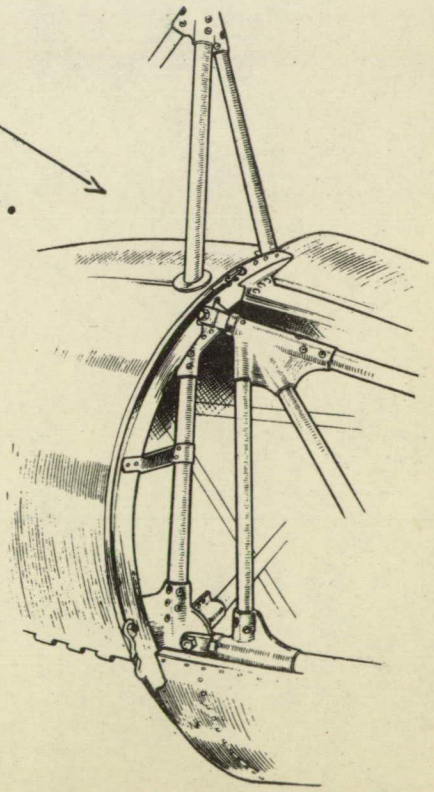


Fig.9 Attach-ment of front part to central cabin.

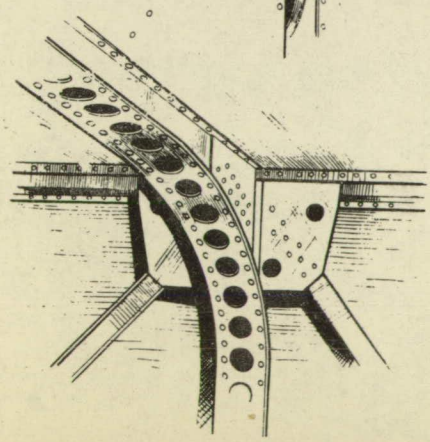


Fig.10 Fuselage joint viewed from inside of cabin.