AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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No. 39

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# LIORÉ-OLIVIER LeO 194 SEAPLANE

From "L'Aéronautique," February, 1927



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Washington
April, 1927

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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# LICRÉ-OLIVIER LeO 194 SEAPLANE.*

This seaplane, piloted by Lieutenant Bernard, of the French Naval Air Service, made the long-distance flight from Berre, France, to Madagascar and return between October 12, 1926, and January 12, 1927, having covered, in three months, a distance of 28,000 km (about 17,400 miles), in 260 hours of flight.

## Description

The fuselage is made entirely of wood, the framework consisting of a keel, chines and upper longerons of ash. The transverse frames are ash, with the exception of certain end frames, which are made of "grisard." The submerged portion is covered entirely with a double or triple boarding of Cuban mahogany, while the part above the water is covered with birch plywood. The deck beams are made of four thicknesses of ash and spruce glued together. The mahogany boarding is protected by a special bituminous dope; the plywood by three coats of "Lionoil" over a special filler, likewise with a "Lionoil" base. This red filler is intended to absorb the ultra-violet rays capable of attacking the fibers of the wood. The three outside layers of "Lionoil" are white.

Under the propeller, the hull is reinforced by sheet metal and by a series of small longitudinal strips, to keep the crew

*From "L'Aéronautique," February, 1927, pp. 37-40.

from slipping on the rounded edge of the hull.

The six duralumin gasoline tanks are all alike and have a capacity of 255 liters (67.36 gallons) each. They weigh only 9 kg (about 20 lb.) apiece. They were made by the "Établissements Poite" and provided with gauges. All the fuel pipes are aluminum with "A.M." connections, cocks, manifold, and fuel-delivery system.

A hand-pump enables the transfer of the oil from the 20-liter (21-gallon) tank in the hull to the 35-liter (9.2-gallon) gravity tank in the engine nacelle, which tank supplies the engine oil pump.

The lines of the hull were designed with special regard to its marine qualities. These qualities have been demonstrated not only on the Madagascar voyage, but also in a very brilliant fashion during the tests for the navigability certificate, in a sea with 4-5 foot waves.

The cell is built on the usual lines adopted for the Lioré-Olivier seaplanes. The box spars are spruce and plywood. The ribs have plywood webs and spruce flanges. The drag wires are piano wires terminated by patented fastenings which have been officially approved. The ties and wing bracing consist of duralumin tubes protected by three coats of "Lionoil." The flying wires consist of two piano wires held together by a fairing. The landing wires are streamlined wires of the current type with Chobert fastenings.

The wing floats, of 300 liters (10.59 cu.ft.) each, are attached to the wing by four small duralumin struts and are covered with birch plywood over a framework of ash. The standard "Avionine" products are used for doping the fabric-covered wings.

The tail group comprises a main fin and two auxiliary fins, one above and one below the stabilizer, which is secured by two duralumin struts and brace wires.

The ailerons, elevator, and rudder have steel frames, autogenously welded and covered with fabric.

The engine nacelle contains a supporting frame attached by four bolts to the spars of the upper wing and to the struts of the cabane. The nacelle itself is situated between the two spars and consists of a steel-tubing framework enclosed in an aluminum cowling. It encloses the S.E.V. magnetos, the oil pump, the two A.M. fuel pumps, the gravity oil tank, the Lamblin 34-fin oil radiator and a "Bouillon" fire extinguisher. There are large inspection ports.

The air circulation between the cylinders and around the crank case was very carefully planned. The temperature of the oil has never exceeded 75°C. (167°F.).

The "Integrale-Chauvière" propeller was wood. It manifested remarkable wearing qualities, so that it was not found necessary to use the spare propeller during the return trip. It had a diameter of 3.1 m (10.17 ft.) with a pitch of 1.95 m (6.4 ft.). Made of beech wood cut and sawed by the firm itself, it is cov-

ered with copper over 90 cm (2.95 ft.) of each blade. The propeller used on the outward trip was lacquered in the factory with the products of the "Société des laques indochinoises"; the one used on the return trip was protected with "Isolémail." Chauvière, when he delivered these propellers, did not know they were to be used on a long voyage.

The engine group comprised a 420 HP. Gnome-Rhone "Jupiter" engine, "Claudel" carburetors, "Amyot" oil-pressure indicator, "Farman-Sabathé" cartridge starter, "Viet" starter, "S.E.V." starting magneto, "Jaeger" revolution counter, "Fournier" aerothermometer, "K.L.G." spark plugs, "Corset" gauges, and "Aéra-Daviet" throttle and fuel regulator.

The seaplane was equipped with a "Badin-Pionner" flight controller, a "C.P.A." cinemo drift meter, "Richard" altimeters, an "Aéra" liquid inclinometer, and two compasses: a standard "Morel" (made by Krauss) and a "Vion," type A.M.

The aviators also had a "Bourdereau-Cinex" motion-picture camera operated by a 12-volt electric motor, which enabled them to make film records of the most interesting landscapes.

The endurance of the materiel was remarkable. The same engine covered the whole 30,000 km (186,411 miles). The subsequent official examination at Paris showed that the 270 hours of flight, in spite of the greatly differing fuels and lubricants used, had not entailed any great wear. The cell was intact and the fabric as taut as at the start. The hull, which had struck

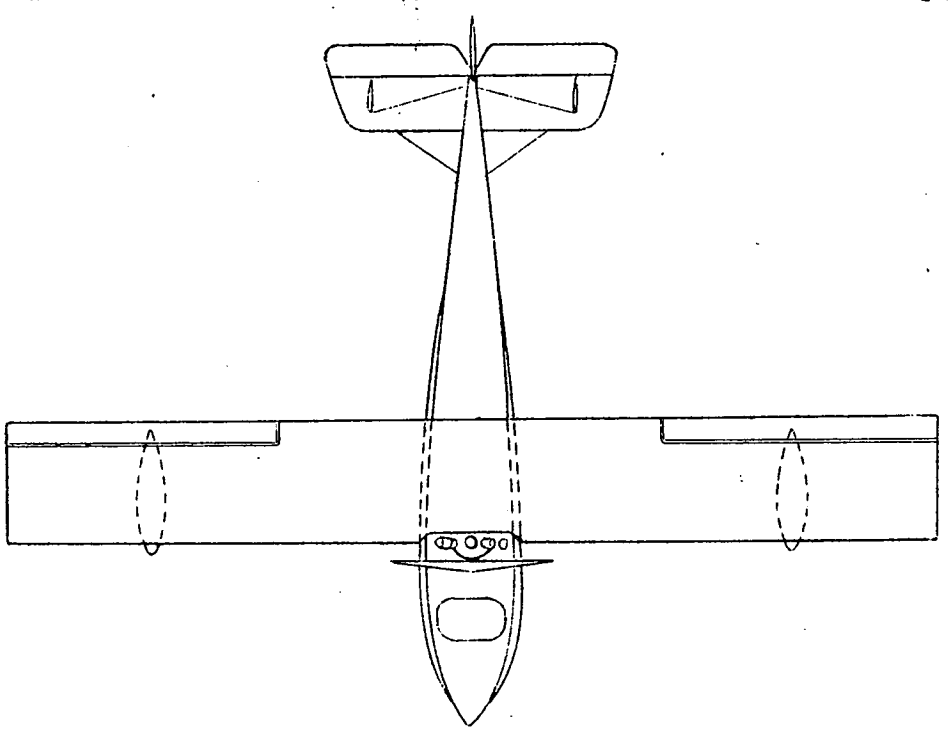
a submerged obstacle near Lissala, had been repaired by the means on board and had covered nearly 20,000 km (12,427 miles) more without further accident. The only upkeep during the trip consisted of applications of ordinary boat paint, heavy but sure. It was in very good condition, which is especially remarkable, considering that there was only one opportunity to raise it out of the water for inspection.

The condition of the duralumin parts was perfect in spite of its long sojourn in brackish water. The steel fittings, on the contrary, although protected by baked enamel, were quite seriously damaged.

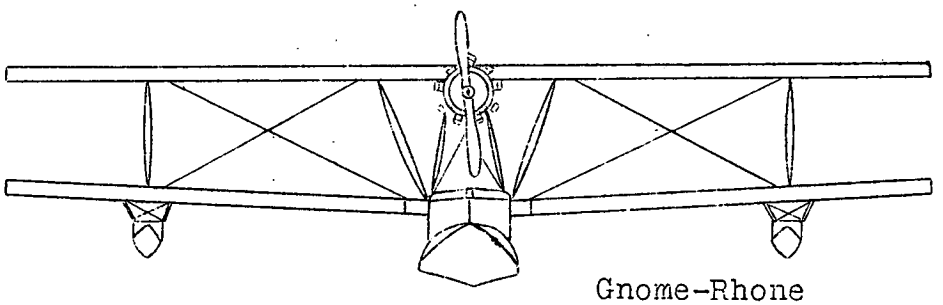
Characteristics

| | | | | |
|---|---|---|---|---|
| Length | 12.5 | m | 41.01 | ft. |
| Span | 16.0 | " | 52.49 | " |
| Height | 4.1 | " | 13.45 | " |
| Wing area | 64.0 | $m^2$ | 688.89 | sq.ft. |
| Engine, Gnome-Rhone "Jupiter" 9 Ab, 420 HP. | | | | |
| Weight empty | 1720 | kg | 3791.95 | lb. |
| Total normal weight | 3150 | " | 6944.55 | " |
| Actual weight on starting trip (49% being useful load) | 3350 | " | 7385.48 | " |
| Wing loading | 52 | $kg/m^2$ | 10.65 | lb./sq.ft. |
| Power " | 8 | kg/HP | 17.40 | lb./HP. |
| Power per $m^2$ | 6.5 | $HP/m^2$ | 0.6 | HP./sq.ft. |

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



Length 12.5m(41.01 ft.)
Span 16.0m(52.49 ft.)
Height 4.1m(13.45 ft.)
Wing area 64m$^2$ (688.89 sq.ft.)



Gnome-Rhone
"Jupiter" 9Ab
420 HP.
engine.

From Les Ailes
Feb.3,1927

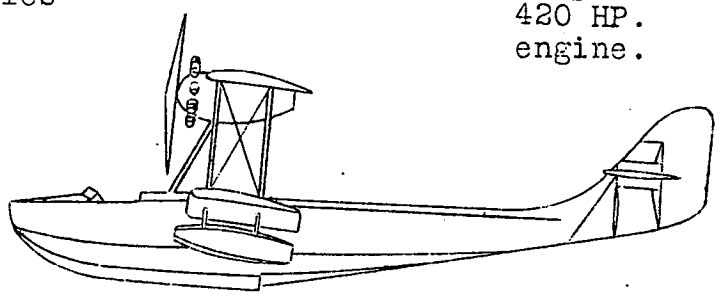
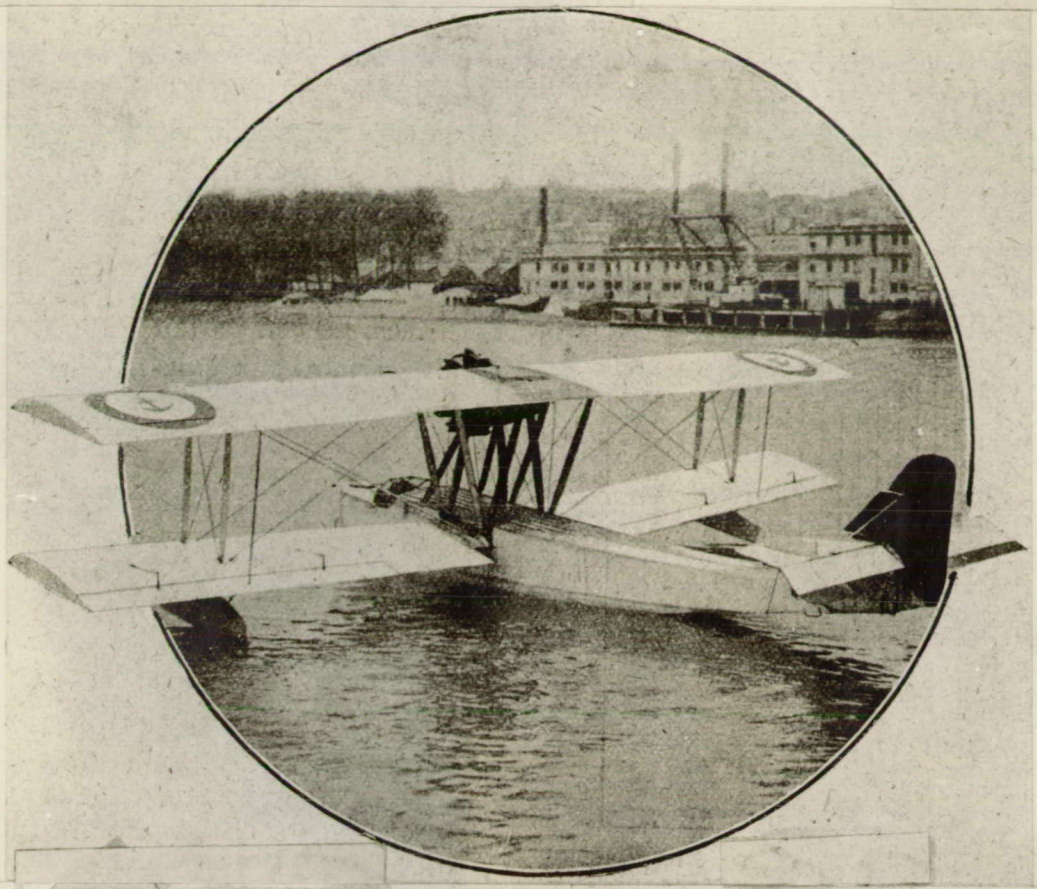
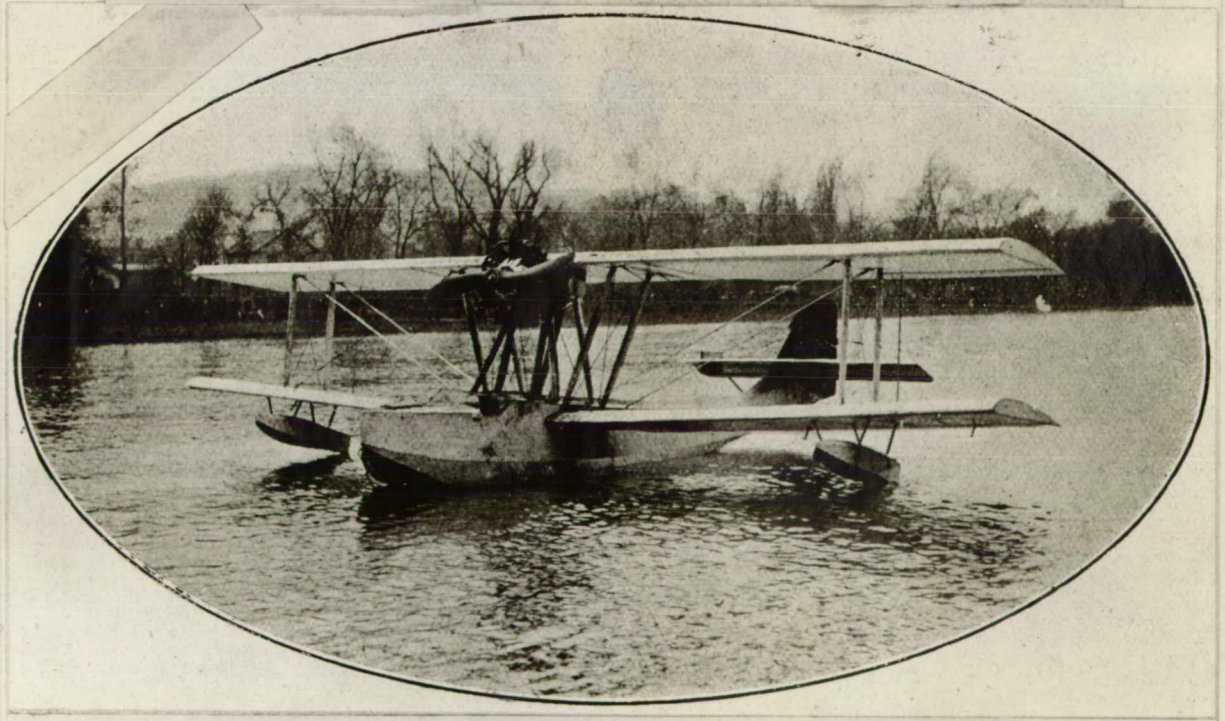


Fig.1 Liore-Oliver LeO 194 seaplane.





Figs.2 & 3 Lioré-Oliver LeO 194 seaplane.

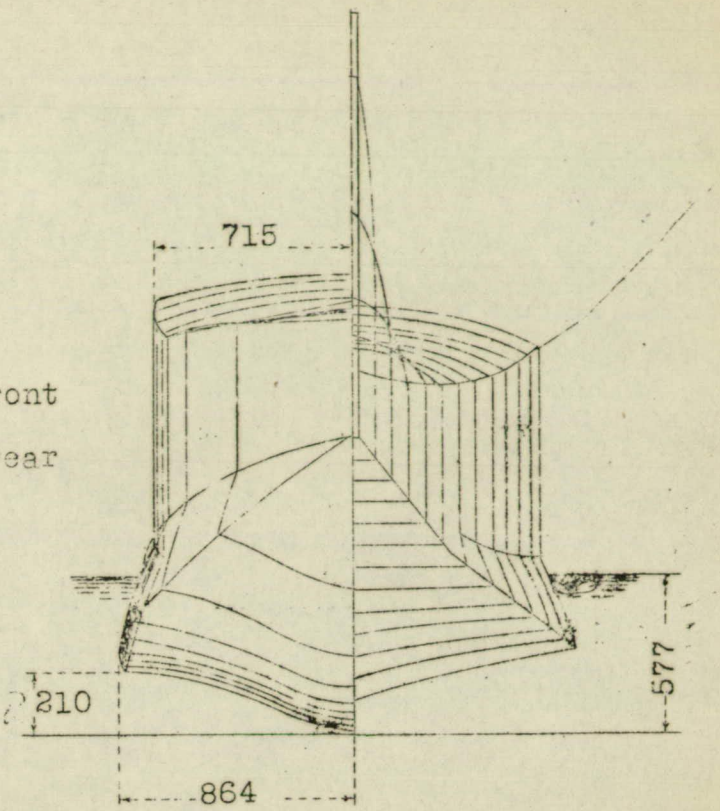



Fig.4 Hull lines of LeO 194.

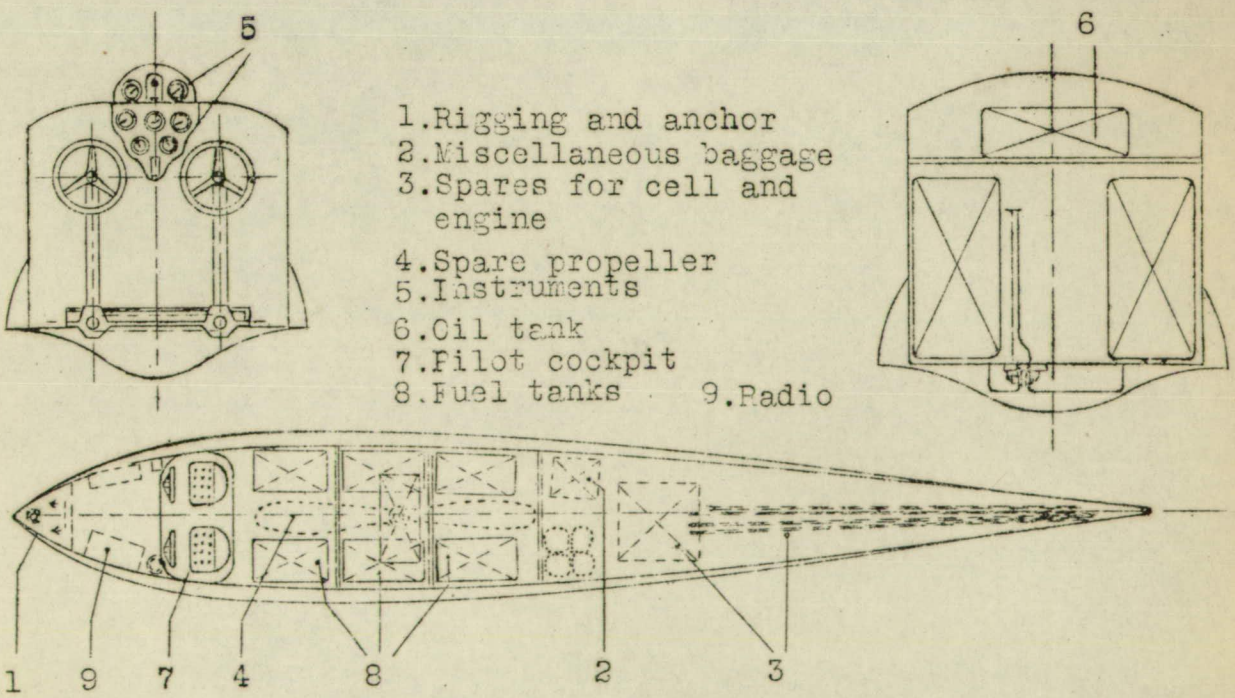



Fig.5 Hull of LeO 194 - Left, section through pilot cockpit. Right, section through tanks. Bottom, plan view of hull.

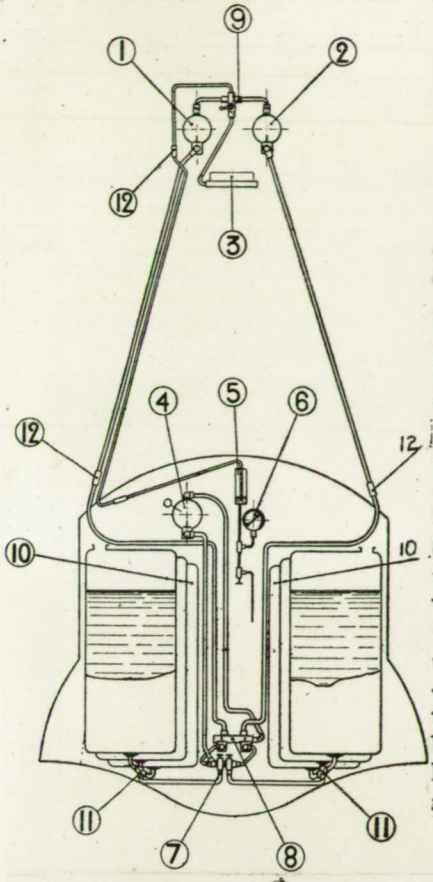



Fig.6 Liore-Jupiter Fuel system. 1,2 Self-regulating pump; 3, Carburetor of 420 HP eng., "Jupiter"; 4, Hand pump; 5, Damper with plunging tube; 6, Fuel-pressure guage; 7, Simple manifold with 2 cocks and 3 connections; 8, Manifold with 2 flap valves; 9, Cocks ¼ turn with 4 branches; 10, Fuel tanks; 11, Cross branches; 12, Flexible metal connections

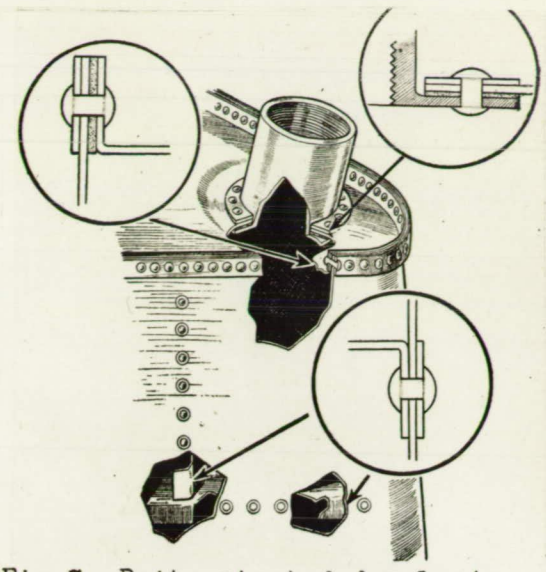
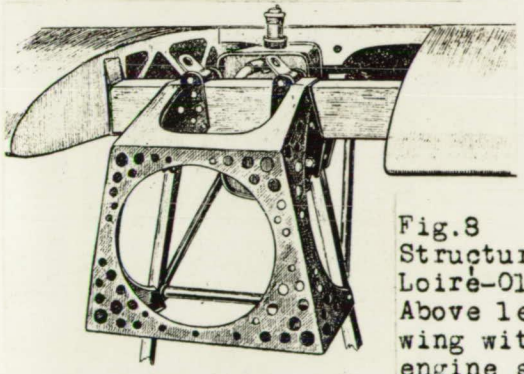
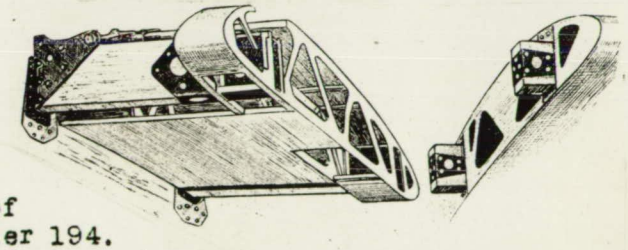
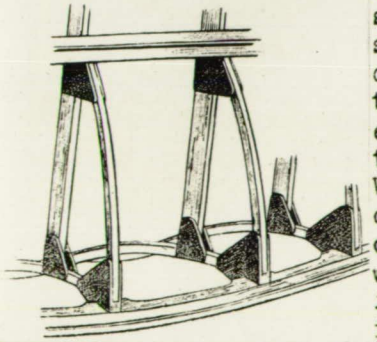


Fig.7 Poite riveted duralumin fuel tank. Upper left, Top and bottom joints: sheet of varnished paper between the end and an exterior reinforcing strip of duralumin. Upper right, Attachment of cocks, necks, outlets, etc: interposed paper ring and duralumin reinforcing ring. Below, Attachment of partitions, each rivet provided with a washer. Rivets very close. Thickness of walls exagerated for sake of clearness.







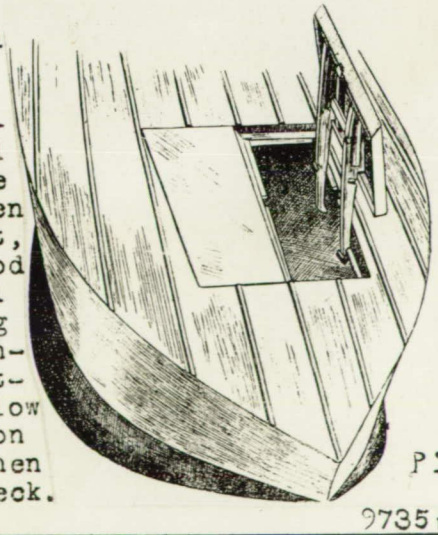


Fig.8 Structure of Loire-Olivier 194. Above left, Center of wing with sheet-steel engine support. The spars carry sheet-steel supporting saddles. The gravity oil tank, supplied by the engine pump, is between the spars. Upper right, Wing stub with plywood covering and marginal caisson; hull fitting with plate for attaching brace wires. Junction of lower wing. Below left, Structure of chine. Below right, Hatch on hull in two parts to facilitate anchoring. When closed, it is perfectly flush with top of deck.

P.S.