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SAVOIA MARCHETTI "S 64" AIRPLANE

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SAVOIA MARCHETTI "S 64" AIRPLANE.\*

By Maurice Victor.

The "S 64" was built by the engineer Marchetti in the Savoia factory, which had already turned out a long series of fine airplanes, one of which was flown by De Pinedo in his memorable voyage over the Atlantic and the two Americas. This time the secret was well guarded and the "S 64" was an almost universal surprise.

Of a type closely resembling Marchetti's previous conceptions, the "S 64" is a large monoplane with an aspect ratio of 7. It has a cantilever wing made in a single piece and entirely of wood. The wing has three spars with a covering of plywood. It is thick in the middle and tapers toward the tips.

The horizontal stabilizer is connected with the wing by two girders. The upper member of each girder is a strong duralumin tube directly imbedded in the wing (Fig. 5), while the lower member, terminating forward in a fork, serves to support the landing gear (Fig. 1). The latter is very simple, consisting of two pairs of vertical struts and a divided axle (Figs. 2, 3 and 4). The wheels are mounted on ball bearings and are entirely encased in streamlined cowlings.(Fig. 1).

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From Les Ailes, June 14, 1928.

Each girder carries a tail skid, which can be made to dig into the ground or can be liberated by the pilot. This device enables the pilot to choose the moment of starting and, moreover, was rendered necessary by the elevated position of the engine.

The rudder is unique and is mounted on the center of the horizontal stabilizer. The stabilizer and fin are adjustable during flight.

There is a nacelle below and in front of the central part of the wing. The nacelle is perfectly streamlined and terminates under the middle of the wing. It is heated and comfortable, offers but little head resistance and is not affected by the propeller slip stream.

The pilots, sitting abreast, do not appear to have very good visibility, especially when the airplane is taxiing on the ground with the tail down. In the central part of the wing, which is slightly enlarged and lighted by windows, there is a couch so disposed as to enable comparative rest.

Since the position of the pilots (in the wing under the engine) does not allow them to use parachutes in case of accident, there is a special device which offsets this disadvantage by facilitating their egress.

The engine is mounted quite high over the center of the wing. It is supported by a light framework and the propelling force is transmitted to the airplane by two long oblique struts.

The engine cylinders are not cowled, and the exhaust gases escape directly into the air without any exhaust pipe.

The engine is a water-cooled Fiat A 22 with 12 cylinders in V and developing 550 HP. at 1900 R.P.M. It weighs 410 kg (904 lb.) and drives a 3 m (9.84 ft.) pusher propeller, the hub of which ends in a very pointed spinner.

The radiators are of the honeycomb type and are installed below and behind the central part of the wing (Fig. 1). They can be raised and drawn inside the wing. The pipes are steel and copper covered with rubber and the connections with the movable radiators are made with "superflexible" tubing. The weight of the radiator water, plus the reserve in a supplementary tank, amounts to 74 kg (163 lb.). The fuel is contained in 27 duralumin tanks made by Vincent Andre. They have a total capacity of 7000 liters (1849 gallons) and occupy about three-quarters of the length of the wing. Divided into groups, they supply a central tank from which a Fiat 2 A N pump delivers the fuel to the engine. There is also an auxiliary hand pump. There is an extra fuel pipe through which the fuel can be pumped in case of accident to the regular fuel pipe. This method had previously been employed on the Junkers G 31. Special outlets provide for the quick discharge of the fuel in case of need. Moreover, the various fuel cocks and the reserve pump enable the crew always to preserve a correct balance by modifying the distribution of the fuel.

The 270-liter (71-gallon) duralumin oil tank, with two transverse partitions, is attached to the front of the engine support and serves as a point of penetration. The oil is cooled through the exposure of a portion of the tank to the air. A control, operated by the pilot, enables the regulation of the temperature of the oil by varying the proportion of hot and cold oil admitted. Two remote thermometers enable the supervision of this process.

The "S 64" was obviously designed for a long-distance transatlantic flight. The wing was divided into tight compartments to insure its flotation. It has a radio equipment with a sending range of over 500 km (311 miles). It also has a high-powered searchlight in front of the nacelle to facilitate night landings.

The equipment includes three compasses, two of which are magnetic and one an earth-induction compass; gyroscopic indicators of transverse, longitudinal, and directional equilibrium; and two sextants. The utilization of these instruments is rendered possible by openings in different parts of the wing. A rod projecting in front of the nacelle supports various Venturi tubes (Figs. 1 & 4), and also the windmill of an air-speed meter.

Marchetti solved the problem presented to him by special attention to the fineness of the airplane. This was likewise Couzinet's solution of a similar problem. The best penetration was sought, all structural resistances being reduced to the minimum by cowling and streamlining. According to the wind-tunnel

tests with reduced models, the fineness of the whole reached 15 and even 16 when the radiators were drawn inside the wing. We need not be surprised at this result, because the "S 64" constitutes a very close approach to a wing freed from all accessories which develop eddies and friction.

No such fineness values had yet been attained by record airplanes. On the other hand, the position of the pusher propeller, particularly free and isolated and without interferences, made it possible to obtain a net propeller efficiency of 0.8. When we consider that the ratio of the weight of the cell to the full load is only 0.34, we must admit that the brilliant results obtained by Ferrarin and Del Prete demonstrate that important progress has been made in aerodynamic efficiency and in the science of construction.

The only possible criticism of the "S 64" lies in the lack of protection for the crew in the event of upsetting. Some protection is rendered desirable by the presence of the engine high above the wing. Perhaps it would suffice to move the nacelle back to the leading edge of the wing.

For comparison, we give the following characteristics of two other Savoia-Marchetti airplanes, the "S 63" being a seaplane with a central hull and the "S 55" being a twin-float seaplane used by De Pinedo for his transatlantic flight.

	<u>S 63</u>	<u>S 55</u>	<u>S 64</u>
Span (m)	27.32	23.70	21.5
" (ft.)	89.63	77.76	70.5
Wing area (m <sup>2</sup> )	105	91	60.0
" " (sq.ft.)	1130	980	645.6

It was on April 10, 1928, that the "S 64" was flown by Ferrarin and Del Prete from the factory at Cameri to Montecelio to undergo its tests. A committee, composed of Colonel Fiore, chairman, and Majors Guglielmetti, Biondi and Goeta, all aeronautic engineers, verified the empty weight, tested the instruments, determined the take-off distance with progressively increased loads, and measured the altitude attained by the "S 64" at the end of the take-off track.

A cement track designed for the take-off of heavily loaded airplanes, had been made on the Montecelio aviation field. Due to the initiative of General Guidoni, recently killed in a parachute test, this track, begun three months ago, was the first one constructed in Italy. It had a length of 1300 m (4265 ft.), an average width of 3 m (9.8 ft.) and a slope of 7% at the beginning, which gradually fell to zero at the end. A wide white stripe was painted along its center. This track was absolutely necessary for the endurance record. In fact, the take-off and landing of the Savoia "S 64" were made at a speed of 150 km (93 miles) per hour, which indicates a smooth taxiing surface.

After a systematic investigation of the output and con-

struction of the engine, which consisted principally of an endurance test of 104 hours, 52 hours being at full throttle, and 52 hours at progressively reduced throttle, the endurance flight began at Montecelio, at 5:15 a.m., May 31, 1928, with 6500 liters (1717 gallons) of gasoline.

Ferrarin and Del Prete directed their course toward Torre Flavia, a distance of 57 km (35 miles) and continued along the Tyrrhenian coast for a distance of 74 km (46 miles), to the beacon of the port of Auzio.

Nine emergency landing fields, measuring at least 300 m (4265 ft.), had been prepared and equipped with electric signaling devices and searchlights for night landings.

Ordinary radio stations were installed on the principal fields and a powerful one at Fiumicino. Moreover, communications were made with the airplane by means of panels of white cloth. A permanent control on each field was assured by aeronautic officers. For the first 24 hours, Ferrarin and Del Prete together held the controls. Then they alternated with each other at the controls, while one rested on a couch. They landed at 3:52 p.m., June 2, after having flown 58 hours and 34 minutes, covering a distance of 4763.7 miles.



## C h a r a c t e r i s t i c s \*

Span	70.5 ft.
Length	29.5 "
Height	12.1 "
Wing area	645.6 sq.ft.
Weight empty	5290.0 lb.
Useful load	10,140 "
Total weight	15,430 "
Wing loading	24 lb./sq.ft.
Power "	30.8 lb./HP.
Ratio of weight empty to total wt.	0.34
Capacity of fuel tanks	1717 gal.
Capacity of oil tanks	53 "
Maximum speed	146 M.P.H.
Radius of action	7150 miles

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\*Data received from Paris Office, N. A. C. A.

Chronology of the Transatlantic Flight of Ferrarin and Del Prete,  
Which Won for Them the World Distance Record  
for a Non-Stop Flight\*

July 3.

The "S 64" took off from the Monte Celio field at 6:51 p.m.,  
July 3, 1928, and flew over Capo Fernando at 8:28 p.m.

July 4.

3:15 a.m.- Cape Degata;

5:07 " - Crossed the Strait of Gibraltar;

0.15 p.m.- Cape Juby;

2:50 " - Villa Cisneros;

4:40 " - Was signaled 560 km (348 mi.) north of St. Vincent  
(Cape Verde Islands).

July 5.

12 noon (Greenwich time).- Was seen off the coast of Brazil;

4:27 p.m.- Flew over Port Natal (Brazil);

6:18 " - The Italian ambassador in Brazil sent a message  
to the aviators;

6:46 " - After encountering a storm, the "S 64" landed  
at Natal, having won the world non-stop flight  
record of over 6600 km (4100 mi.)

Translation by Dwight M. Miner,  
National Advisory Committee  
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\*From Aeronautica, July, 1928, p. 570.