

AIRCRAFT CIRCULARS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 121

THE CAPRONI "90 P.B." MILITARY AIRPLANE (ITALIAN)
A Giant Biplane of 6000 Horsepower

Washington
July, 1930

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THE CAPRONI "90 P.B." MILITARY AIRPLANE (ITALIAN).*

A Giant Biplane of 6000 Horsepower.

On the thirteenth of October, 1929, the first trial flight was made of the gigantic Caproni "90 P.B." - the largest airplane yet made. It is a technical triumph not only for Italy, but also for world aeronautics, since it demonstrates, despite the skepticism of many, that even landplanes can reach very large dimensions without increasing the difficulty of taking off and landing (Figs. 1, 2, 3, 4, 5, and 6).

As regards weight, this airplane demonstrates the advantage of a landplane over a seaplane. The former has the larger carrying capacity for the same engine power, since its weight is considerably less. The fuselage or hull of a large seaplane is necessarily very heavy. It must be adapted not only to withstand the action of the waves, even in a rough sea, but also the great stresses produced in taking off and in alighting.

The Caproni "90 P.B." is constructed of steel tubing, which is stronger and more elastic than aluminum or duralumin, while the main joints are machined from billets of chrome-nickel steel. For reasons of simplicity and safety the wings are covered

with emallite doped cloth, as also the fuselage, with the ex-

*From Aeronautica, April, 1930, pp. 268-272; and Bollettino Aeronautico, Nos. 1-3, January-March, 1930, published by the Caproni Aeroplane Company, Milan, Italy.

ception of the front portion, where corrugated sheet duralumin is used. Weighing hardly 15,000 kg (33,000 lb.), it has a carrying capacity of 22,000 kg (48,500 lb.), or even 35,000 kg (77,000 lb.), if the German safety factor is adopted.

All the parts of the huge airplane were subjected to the most rigorous tests by the experimental department of the Milan Polytechnic Institute.

The Caproni "90 P.B." with a wing area of about 500 m² (5380 sq.ft.) is exceeded only by the "Transaereo" with its 700 m² (7535 sq.ft.), in three sets of triplane wings arranged in tandem. It has only six engines, arranged in three tandem pairs, as against the eight engines of the "Transaereo" of 1918. Caproni holds that an excessive number of engines impairs the simplicity and the safety of airplanes, by increasing the difficulties of control.

The controllability of the Caproni "90 P.B." does not differ greatly from that of smaller airplanes. In spite of its exceptional size and weight, the plane can be piloted by one man. This feature was the object of careful study and was accomplished by the adoption of special balancing surfaces on the various controls, so as to require only normal effort on the part of the pilot. Furthermore, all the instruments and engine controls are suitably arranged within easy reach. The trial flights have all been made by one pilot, Antonini, of the Caproni Company. He has controlled the airplane and the engines with absolute

safety and declares that the operation of the heavy airplane is as easy as that of an ordinary passenger plane, while special devices have rendered it, if possible, still simpler and less fatiguing. If the future should produce large engines of 2000 hp, their number may be reduced to four and possibly even to three.

Though built especially for bombing, with a radius of action of 2000 km (1243 mi.) with 8000 kg (17,600 lb.) of bombs, the Caproni "90 P.B." is prepared to perform any distant task without escort. It is prepared to repel any attack by pursuit planes, while any spent bullets which might reach it would have very little effect on its powerful structure. It is only necessary to consider the terrific effect of its enormous load of powerful explosives, in order to comprehend the power of such an implement of war.

Its large fuselage can be readily adapted for the peaceful employment of carrying passengers, mail, and merchandise. Its great radius of action enables it to make long nonstop flights. On replacing a small portion of the pay load with fuel, it can easily fly from the shores of the Old World to those of the New.

By making the fuselage water-tight, the Caproni "90 P.B." can alight on either land or water. This will eliminate the uncertainties of departures due to the roughness of the water, which impairs the regularity of seaplane service and often prevents it altogether.

Slight changes in the fuselage would transform it into a robust hull, so that it could be used as a seaplane.

The Caproni "90 P.E." is equipped with six "Asso 1000" Isotta-Fraschini engines. These are standard engines of the most powerful type yet made. Designed by Cattaneo, they combine reliability and strength with a small fuel consumption and a very moderate weight per horsepower. Carbon steel is used for the cylinders, aluminum for the cylinder heads, and elektron for the crank case.

Fuselage.- The fuselage is of square section and forms part of the central section of the lower wing from which it is suspended. It is of large dimensions and can be inspected throughout, from the nose to the tail surfaces. The bow is fitted with a machine gun turret which could eventually carry a small rapid-fire gun. Behind this, another fuel tank is installed and above it is the pilots' compartment, under which there is also one of the main entrances and the compressed-air starting motor. At the rear there are other tanks and the bomb storage room, at the back of which there is the main machine-gun cabin.

Tail.- The tail is of monoplane type and all the control surfaces are balanced. The balanced surface of the rudder also serves for vertical fin corrections during flight.

Landing gear.- The landing gear has a very wide track gauge to facilitate landing on rough ground. It is composed of

two independent pairs of large wheels mounted on ball bearings, the springs being of the oleo-rubber type. A spring and dirigible tail wheel are also fitted under the rear terminal unit of the fuselage.

Engine installation.-- The power plant, as previously mentioned, is composed of six 1000 hp Isotta-Fraschini water-cooled engines, arranged in three tandems: one on each side on the lower wing above the landing gear struts, and the third amidships, between the wings. The two-bladed propellers are direct-driven by the front engines, while the rear propellers, also direct-driven, are of the four-bladed type.

The fuel is carried partly in the wing and fuselage tanks. The oil is stored in opposite tanks in the middle of each tandem. The water radiators are provided with air scoops controlled from the pilots' compartment.

The controls.-- These are of the dual side-by-side variety, and their transmissions are by means of flexible steel cables. The engine controls are provided with rigid transmissions and are grouped together between the two seats.

Armament.-- The position and number of the machine guns render the armament of extraordinary power, being such as to allow heavy firing in all directions. There are seven machine guns in all.

The bomb racks are designed for 800, 500, 250, and 100 kg (1764, 1102, 551, and 220 lb.) bombs, totaling 8000 kg (17,637 lb.) of explosives for normal ranges.

Characteristics of the Caproni "90 P.B."

Length	26.94 m	88.39 ft.
Height	10.80 "	35.43 "
Span (upper wing)	34.90 "	114.5 "
" (lower ")	46.58 "	152.82 "
Area:		
Total lifting	496.70 m ²	5346.43 sq.ft.
Aileron	22.00 "	236.81 "
Stabilizer	10.20 "	109.79 "
Elevator	5.00 "	53.82 "
Rudder	5.50 "	59.20 "
Weight, empty	15,000 kg (approx.)	33,070 lb.
Useful load	15,000 kg (approx.)	33,070 lb.
Total weight	30,000 kg (approx.)	66,140 lb.
Wing loading	60.5 kg/m ²	12.39 lb./sq.ft.
Power "	5.0 kg/hp	11.02 lb./hp

Performances

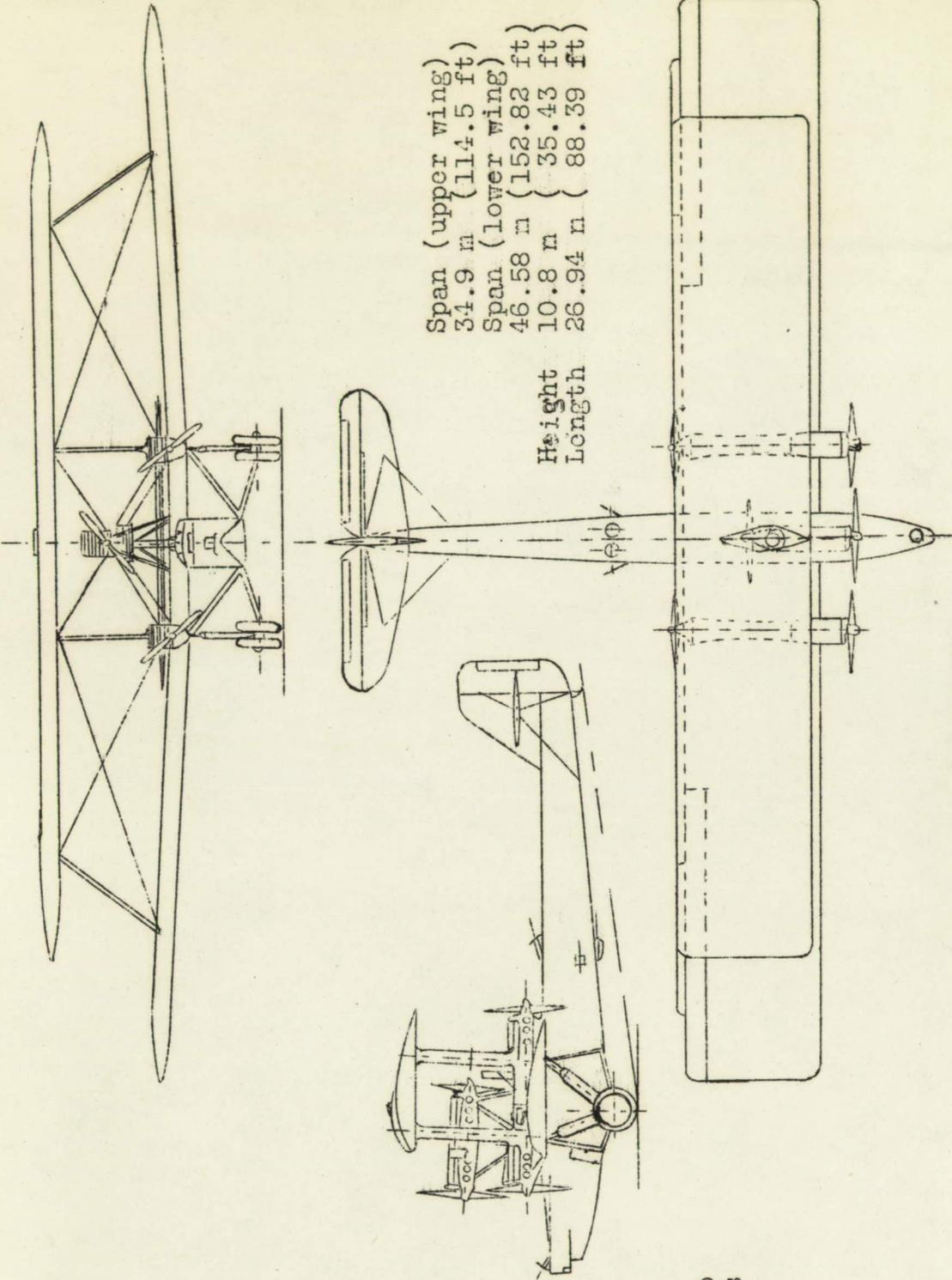
Speed (high)	205.0 km/h	127.4 mi./hr.
Speed (low)	90.0 "	55.9 "
Ceiling	4500 m	14,764 ft.
Endurance, 7 hours		

Miscellaneous

Fuel consumption:

Gasoline	910 kg	2006 lb.
Oil	90 "	198 "
Cylinders (18 in W formation)		
Cylinder bore	150 mm	5.91 in.
Piston stroke	180 "	7.09 "
Direct-drive propellers		
Power at 1700 r.p.m.		1000 hp
Weight with propeller boss	803 kg	1770.00 lb.

Translation by
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for Aeronautics



Span (upper wing)
 34.9 m (114.5 ft)
 Span (lower wing)
 46.58 m (152.82 ft)
 Height
 10.8 m (35.43 ft)
 Length
 26.94 m (88.39 ft)

Six
 1000 hp
 engines

Fig.1 General arrangement drawings of the Caproni "90 P.B." military airplane.

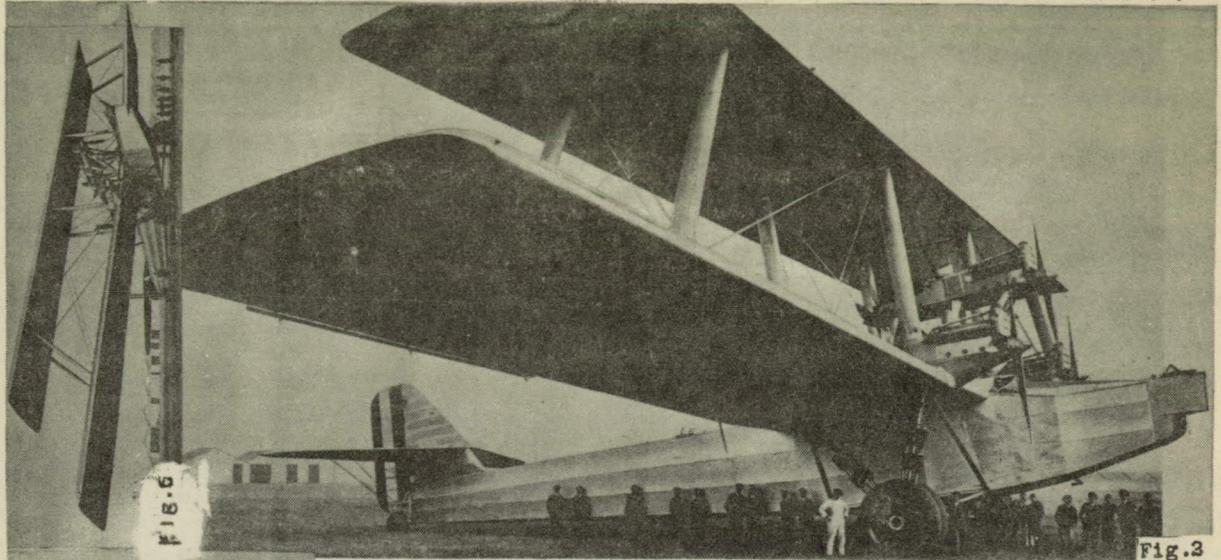
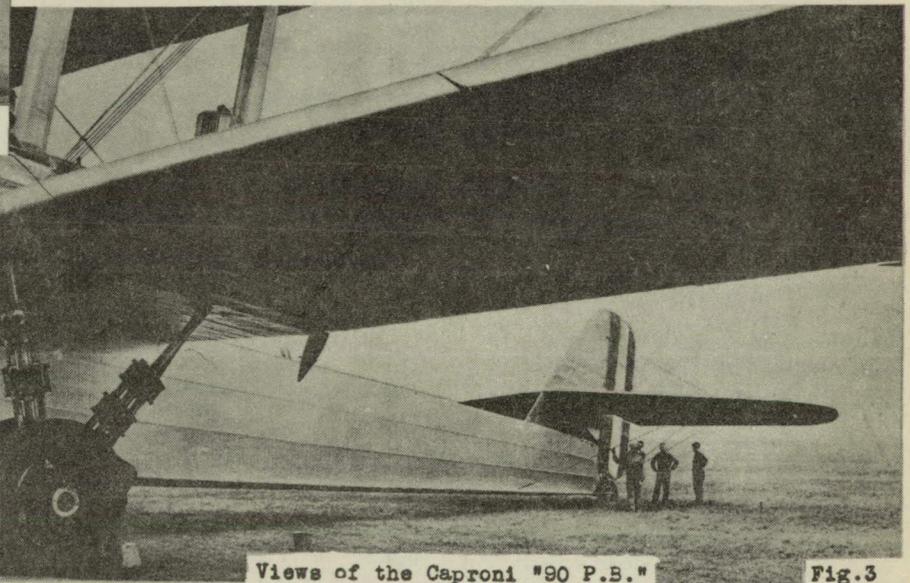


Fig.3



Fig.7 The Caproni 33 airplane, 1914.



Views of the Caproni "90 P.B." military airplane

Fig.3

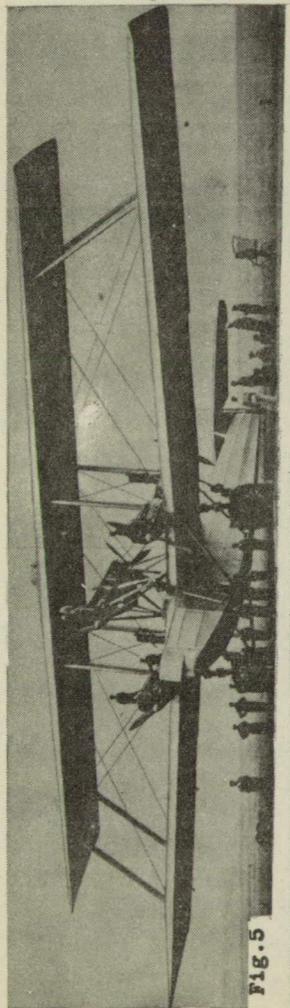


Fig.5

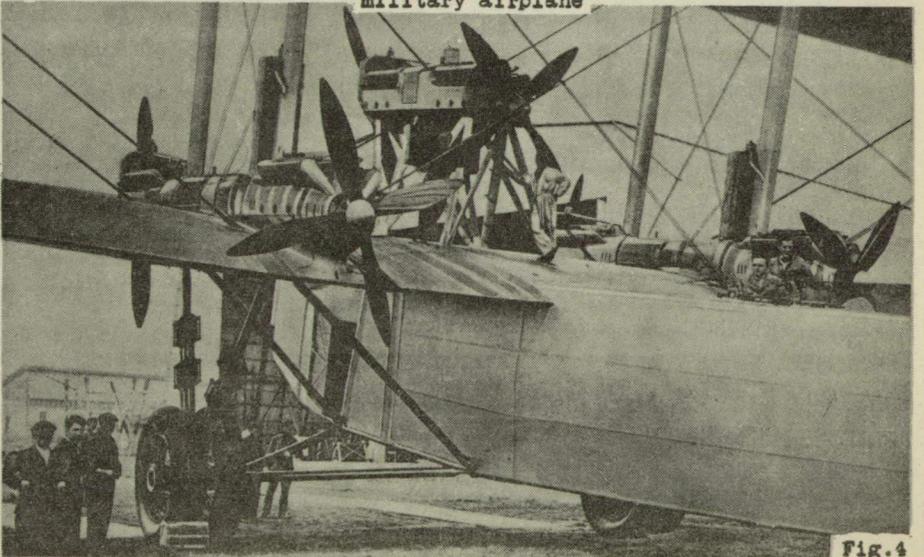


Fig.4