ABSTRACTS.

The Giant Aeroplane "Zeppelin."

The giant aeroplane, referred to in descriptions by the Press as "Lizenz," was brought down south-east of Soissons on June 4th, 1918. This aeroplane is supposed to have been constructed by the Albatros firm and to be a "Zeppelin" aeroplane. Many characteristics in the construction confirm this point of view, especially the use of aluminium in the ribs, in the tail plane, and elsewhere, and the similarity of the construction of these parts to that adopted in Zeppelins. To account for the construction by the "Albatros" works it is suggested that this machine was built under licence. Continuing, the article proceeds to point out that there is nothing inherently new in its construction except its immense size and the smaller aspect ratio of the wings, the general characteristics of its design being similar to the Handley-Page and other types of bombing machines.

The giant aeroplane, which has four motors in two tandem pairs, is very similar in general type to the A.E.G. double-motor type of bomber of 1916, except for the balancing of the controls. The use of triple rudders and biplane tail is also drawn attention to. Simplification in construction has been obtained by making the leading edges of the centre portions of the wings without any sweep back, and retaining a straight form for the trailing edges, which are normal to the centre line of the machine. Further, only the lower wings are set at a dihedral angle, and there is no stagger. The fuselage has also over a large portion of its length the same width of cross-section. Two eight-wheeled under-carriages, placed under the engines, support the aeroplane when on the ground with the help of a small two-wheeled under-carriage placed under the front part of the fuselage.

The crew consisted of some eight or nine persons. In the front of the fuselage there is a machine-gunner, and directly behind him the two pilots. Between the two mechanics, who are placed near the leading edge of the planes, and the two pilots there is doubtless situated an operator of the T.S.F. Between the tanks placed under the wings is a passage to the rear of the fuselage, where there are probably two machine-gunners in a special turret with facilities for firing downwards through an opening in the fuselage to the rear of the machine.

The writer of the article says the dimensions, etc., of the machine have been given erroneously by most journals, but that the figures given below are approximately correct :—

Dimensions in metres.—Total span of wings, 41 m.; chord at centre, 4.50 m.; chord at wing tips, 3.60 m.; maximum thickness, 0.22 m.; area of wings, 314.50^2 m.; ailerons, 7.10 m. by 1.02 m.; total area of ailerons, 14.50^2 m.; incidence of wing to axis of machine at centre line, 0.45 m. on 4.50 m. (at the wing tips this angle is decreased); front spars from leading edge at centre, 0.51 m.; rear spars from trailing edge, 1.51 m. and 1.005 m.; total length of machine, 22 m. (fuselage, 21.35 m.); area of fuselage at centre, 1.80 m. by 1.68 m.; nose of fuselage to leading edge, 4.75 m.

Engines from centre line of fuselage, 3.40 m.; distances of points of attachment of successive struts from centre line of fuselage: (1) 7.88 m.; (2) 13.08 m.; (3) 18.90 m.; distance apart on bottom plane of engine-bearing beams (front), 1.20 m., (rear) 2.48 m.; width of truck of two large under-carriages, 3.30 m.; of small under-carriage, 0.70 m.; height of fuselage above ground, 1.50 m.

Span of tail plane, 9.00 m.; chord at centre, 1.65 m.; maximum thickness, 112 mm.; chord of elevators, 0.44 m. at centre and 0.72 m. near the tips; gap of elevators, 2.15 m.; area of tail plane, 20^2 m., and elevators, 5^2 m.; area of each small lateral rudder placed 3.25 m. from central rudder 4^2 m. about.

The motors were four 250-300 h.p. Maybach engines with six vertical cylinders. The propellers (12 laminations) were 4.30 m. diameter. The radiator tubes are 0.20 m. thick by 0.40 m. by 0.85 m. long.

The height of the spars is as follows:—Front upper spar, 143 to 149 mm.; front lower spar, 140 to 144 mm.; rear upper spar, 162 to 167 mm.; rear lower spar, 161 to 155 mm.

These dimensions are maintained to within 0.6 or 0.7 m. of the wing tip; though on each side of the interplane struts the width of the spars, and not their height, has been thinned down by 6 mm. for almost a third of their length.

This width is normally as follows:—78 mm. for the upper front spar; 91 mm. for upper rear spar; 62 for the lower front spar; and 89 mm. from the lower rear spar.

The leading spar is parallel to the leading edge and the rear spar to the trailing edge. The ribs are placed perpendicular to the two last, and make an angle with the swept back leading edge of the wings. The spacing between the ribs, which is very great, varies between 0.565 m. and 0.43 m., and is least in the neighbourhood of the propellers. In the middle of the bay formed by the interplane struts two ordinary ribs are much closer together than the others, being 0.15 m. apart. They act as compression ribs to the secondary cross-bracing.

Except in the outermost bay there is a double cross-bracing of wires between the struts, consisting of cable varying in size from 2.7 c. to 2.4 c., attached to the spars of the interplane struts, and piano wire of 3 mm. joined to the ends of the twin ribs which are placed halfway between the interplane struts, as mentioned above. For the interplane bracing the longitudinal wires are fixed, but the transverse wires form an endless cable analogous to a system applied on the Zeppelin airships.

Ailerons are found on the upper wings only, and are of rectangular form. Their construction is entirely of metal: they are built up of steel tubes, with the ribs spaced at 0.50 m. apart.

The tail plane is a biplane of large span with the leading edges swept back, but with no stagger. The section is the same as that of the main planes, but it is reversed in position with an incidence of 0.17 m. on 1.57 m. The two spars of the tail plane are made of spruce and the ribs of poplar and spruce, similar in construction to those of the wings. The ribs of the elevators have the same cross-bracing construction as other ribs, but are made of duralumin of U section.

The rudders are mainly constructed of duralumin and the two lateral ones—trapezuim shaped—are partly balanced by areas placed in front of the hinges on which they turn.

The fuselage is of rectangular section, and shows the same general characteristics as older types of German fuselages in contrast with later types, which are monocoque. The upper longerons are of spruce and the lower of ash, each being composed of six pieces assembled as shown in the diagrams illustrating the article. The method of attachment of the cross-struts to the longerons and of the cross-bracing is also illustrated.

All the under-carriages of V type are of simple construction and need little

comment, except to note the enormous size (tube 110/120) of each of the axle trees carrying the eight wheels. ("L'Aérophile," August 1-15, 1918.)

Aeroplane Performance.

The relation of maximum and minimum speed to maximum altitude (ceiling) and to horse-power are explained and curves are given showing these relations. In one set of curves the engine or plane speed as a percentage of the speed near the ground is plotted against altitude. The maximum speeds are shown for engines having a mechanical efficiency of 100, 90, 80, and 70 per cent. The first is a horizontal straight line and the last drops rapidly with altitude. The minimum speed curves for various ratios of maximum to minimum are given, and rise with altitude. The intersection of the maximum and the minimum speed curves gives the "ceiling." Other groups of curves are engine and propeller power plotted against altitude, and ceiling height plotted against the ratio of maximum to minimum speed near the ground. Some important deductions are made from these various groups of curves; for instance, it is shown that a 10 per cent. decrease in mechanical efficiency of the engine reduces the ceiling by 4,000ft. There are suggestions in connection with lubrication of bearings in order to reduce friction. Suggestions are also made for supercharging by the compression of air supply, and as to the possibility of using steam-engines to obtain a greater ceiling height. (G. B. Upton, "Journal of the Society of Automotive Engineers," October, 1918.)

Physics of the Air.

In an appendix the wind velocity at a height of from 1 to 2 km. above the ground is considered, and lengthy tables are given, from which for certain latitudes between 25 deg. and 60 deg. and for various barometer gradients the wind velocity can be ascertained. This wind velocity is expressed in metres per second, kilometres per hour, and in miles per hour. Two sets of tables are given, one for cyclonic and the other for anti-cyclonic movements. (W. H. Humphreys, "Journal of the Franklin Institute," October, 1918.)