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NOTICE

In compliance with the recommendations of the National Advisory Committee for Aeronautics, all data in *D'Orcy's Airship Manual* are expressed in the metric system. For the convenience of readers unfamiliar with the metric system the approximate equivalents of the metric units employed are herewith given in English units:

1 meter (m.) = $3\frac{1}{3}$ feet.
1 kilometer (km.) = $\frac{5}{8}$ statute mile.
1 cubic meter (cbm. or mc.) = $35\frac{1}{3}$ cubic feet.
1 kilogram (kg.) = $2\frac{1}{5}$ pounds.
1 metric ton = 2,200 pounds.

INTRODUCTION

The present volume is the result of a methodical investigation extending over a period of four years in the course of which many hundreds of English, French, Italian, German and Spanish publications and periodicals dealing with the present status as well as with the early history of airships have carefully been consulted and digested. It has thus become possible to gather under the cover of a handy reference-book a large amount of hitherto widely scattered information which, having mostly been published in foreign languages, was not immediately available to the English speaking public.

The information thus gathered is herewith presented in two parts, one being a compendium of the elementary principles underlying the construction and operation of airships, the other constituting an exhaustive, but tersely worded register of the world's airshipping which furnishes, whenever available, complete data for every airship of 500 cubic meters and over, that has been laid down since 1884. Smaller airships are listed only if they embody unusual features.

It has been attempted to furnish here the most up-to-date information regarding the gigantic fleet of airships built by Germany since the beginning of the Great War, a feature which may, in a certain measure, repay the reader for the utter lack of data on the Allies' recent airship constructions, which had to be withheld for military reasons. A revised and enlarged edition of *D'Orcy's Airship Manual*, in which all the airships built during the Great War will be listed and their features duly discussed, will be issued upon the termination of the war.

Ladislas d'Orcy,
New York City (U. S. A.)

ELEMENTARY MECHANICS OF THE AIRSHIP

Definition and Classification.—The airship belongs, with its immediate forerunner, the free balloon, to the family of *static aircraft*.

Static aircraft derive their sustentation from a hull which is filled with a gas lighter than air; free balloons and airships consequently float in the atmosphere, like ships float on the sea, by virtue of buoyancy.

The airship's sustentation is, unlike that of the aeroplane, independent of forward motion, in other words, the airship can stay aloft without expending engine power, in which case it drifts with the prevailing wind like a free balloon.

The airship is the outcome of a century-long endeavor to endow the free balloon with independent velocity whereby it would be able to navigate the atmosphere regardless of winds in any direction desired; hence the now little used terms of "navigable" and "dirigible balloon" under which the airship first became known.

The very nature of the airship's sustentation, which permits to assimilate the airship to the ship of the sea, sufficiently justifies the retention of the term "airship" and the condemnation of the term "dirigible," the customary abbreviation of "dirigible balloon," which may reasonably be applied to the aeroplane too, since it fails to specify the type of aircraft it is supposed to describe.

The hitherto customary division of airships into the rigid, semi-rigid, and non-rigid types, which was based on primitive and now obsolescent conceptions, has been found totally inadequate to express the features of novel sub-types which have more recently been produced; it has therefore been deemed advisable to adopt a new nomenclature, based on the constructional features of the hull which alone permit fundamental differentiation.

Whereas every airship hull presents to the relative wind an essentially rigid body, it follows that the term "rigid" cannot logically be applied to one particular airship type, the same argument barring also the terms "semi-rigid" and "non-rigid." Consequently all airships in which the shape of the hull is rendered permanent by means of a rigid structure, the hull frame, are here termed *structure airships*, whereas all those in which the shape of the hull is maintained through internal pressure are here listed as *pressure airships*.

Structure Airships.—The fundamental principles of the structure airship were first laid down in a patent taken out in 1873 by the Alsatian engineer Joseph Spiess. Twenty years later David Schwarz of Zagreb (Croatia) built at Petrograd a structure airship which was the earliest representative of its kind, but it was a failure. Shortly afterwards Count Ferdinand von Zeppelin, a German cavalry general, emulated Schwarz, whose patents he had purchased, and eventually succeeded in developing by gradual improvement of design the highly efficient modern structure airship. Structure airships are characterized by a rigid hull frame generally built up of longitudinal girders which are connected at intervals by polygonal ties; the resulting framework is covered with a waterproof, but non-gas-tight, fabric skin. On Zeppelin airships every second tie is braced athwartships by a radial wire truss resembling the spokes of a bicycle wheel, through the hub of which a steel hawser runs from stem to stern. Both the hawser and the radial truss wires are fitted with turnbuckles whereby the whole framework may be tightened up when required. The radial, or tie, trusses form the compartments in which from 18 to 24 individual gas-cells are housed; the cells are drum-shaped and are fitted with an inflation appendix and a relief-valve. Owing to the constancy of displacement realized by the hull frame, no deformation will occur through a contraction of the hydrogen, whereas an expansion of the gas will be promptly relieved by the automatic and manually operated valves; but as the latter process may create an explosive mixture between the gas-cells and the outer cover, it is necessary to keep this space constantly ventilated by forced draught, the escaping hydrogen being expelled through shafts leading to the roof. These shafts are fitted with automatic valves which can also be manually controlled.

As a further measure of precaution recent Zeppelin airships have the lower half of the outer skin treated with a gas-proof varnish to prevent its penetration by the heavy and impure gas collecting in the bottom of the gas-cells, which on coming in contact with the engine exhaust might set the vessel on fire.

The portions of the hull which are in the immediate neighborhood of the propellers are protected against possible injury from this source by a plating of veneer.

It has been reported that on the latest Zeppelin airships the gas-cells are connected with a storage tank whither the expanding hydrogen escapes under rising pressure through automatic valves and whence it can be pumped back into the gas-cells when the hydrogen contracts. Whatever truth there be in this so far unverified statement, it is obvious that such a storage tank would greatly obviate the structure airships' great drawback of losing gas and consequently lift in the process of regulating variations of gas-pressure. A similar arrangement incidentally existed on the first Schütte-Lanz airship, where the excess of gas generated by rising pressure was forced by means of a centrifugal pump into two gas-cells which remained empty at sea-level pressure. This system enabled the airship to reach an altitude of 2,000 meters without any loss of gas.

The Hull Frame.—The material employed in the construction of hull frames is either a zinc aluminum alloy or wood. The former is used in Zeppelin airships in the shape of triangular lattice girders, whereas in the Schütte-Lanz airships laminated wood girders are employed. The wooden girders of the Spiess airship were of tubular form, built in halves and glued together.

The longitudinals and polygonals of Zeppelin airships are built up of punch-pressed corner-rails and X-pieces; they are riveted together so as to form triangular girders. The only authoritative statement regarding the strength and weight of these girders is one by Count Zeppelin to the effect that on his first airship "the aluminum which served as the material of construction had a specific weight of 2.7 kg. and a tensile strength of 33 kg. per square meter of surface. The frames proper (longitudinals) were built of angle and T-bars and the bracing girders (polygonals) of angle bars. The weight of these frames, as applied to the construction, was 0.9 and 1.8 kg. per meter length, this being equivalent to 0.516 kg. per cubic meter of volume." On the Zeppelin airship *Sachsen*, built in 1913, the adoption of an aluminum alloy of greater tensile strength and the use of triangular girders resulted in a considerable increase in strength, while the weight per meter of length was reduced by 0.13 kg.

On the first Schütte-Lanz airship the hull frame consisted of a closely meshed lattice-work of laminated wood girders, spirally wound and diagonally

DIAGRAM OF AN 18,000 CBM. ZEPPELIN AIRSHIP, THE *SCHWABEN* (STRUCTURE TYPE).

1–17 gas cells; a_1–a_4 propeller stays; b transmission shaft; d_1 forward car; d_2 after car; d_3 cabin car; h_1, h_2 elevators; k_1, k_2, k_3 radiators. l gangway; m propeller outrigger; n_1–n_4 propellers; o_1–o_3 horizontal planes; o_2 vertical plane; p rudder.

crossed, which were kept under tension by circular ties and an elaborate steel wire trussing. This framework possessed a certain amount of springiness which constituted a valuable asset in the case of a rough landing; unfortunately the time and cost of production of this hull proved to be so great that it had to be abandoned on later ships for the Zeppelin type of construction, though the material remained the same.

Hull Shapes.—One of the most important items of hull design is that of the shape, for this determines the amount of air resistance that must be overcome, the most favorable shape being obviously the one which affords the greatest power economy and develops the least stresses while the airship is under way. The first requirement is primarily one of general efficiency, since the saving of one horse-power reduces, on the average, the dead and live loads (weight of engine, fuel, oil, and cooling water) by 3 kg. per hour of operation. The saving thus effected may advantageously be turned into an increase of fuel, ballast, etc., and is therefore of considerable interest to the airship-builder.

The stresses developed by an airship hull in its progress through the air are of two kinds: *compression* on the bow through impact resistance, and *tension* on the sides and on the stern through frictional resistance and suction, respectively. On structure airships these stresses are, on account of the rigid hull frame, only of relative importance, namely, in so far as they are accompanied by parasite resistance which decreases the power efficiency and by a certain wear of the outer cover. Their value is, nevertheless, considerable enough, for the impact resistance of an airship travelling at a speed of 90 kilometers per hour represents a pressure of 75 kg. per square meter of projected area, that is the area of the cross-section at the master-diameter.

On pressure airships, where the hull retains its shape exclusively through internal pressure, the question of using a hull of "streamline" shape—that is, of easy penetration—is, on the contrary, one of primary importance. According to M. Eiffel, the air resistance which a pressure airship develops in her progress through the air causes a deformation in the hull whereby its volume may increase by as much as 10 per cent. of its displacement. Since to the strain caused by this deformation, which tends to weaken the envelope, must be added those created by the excess of internal pressure as well as by the considerable bending moment existing in all pressure airships (except in those of the tension truss type), it follows that the design of pressure

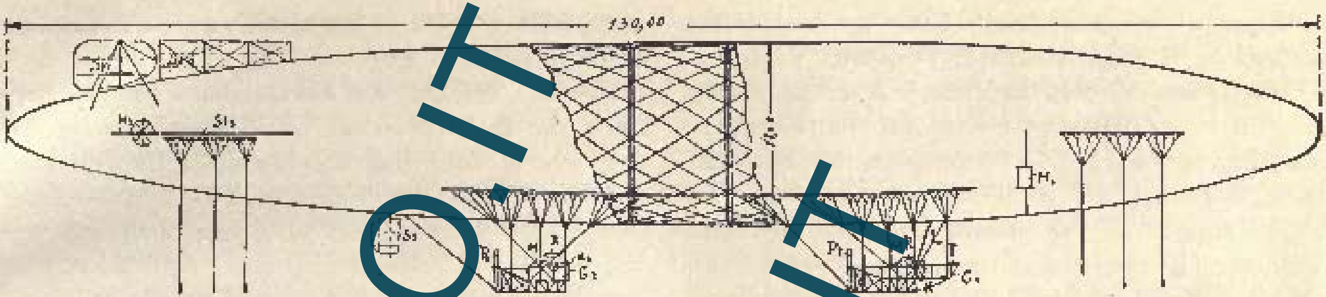
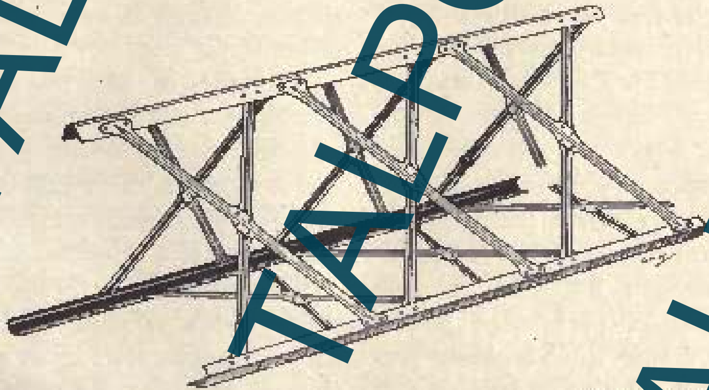


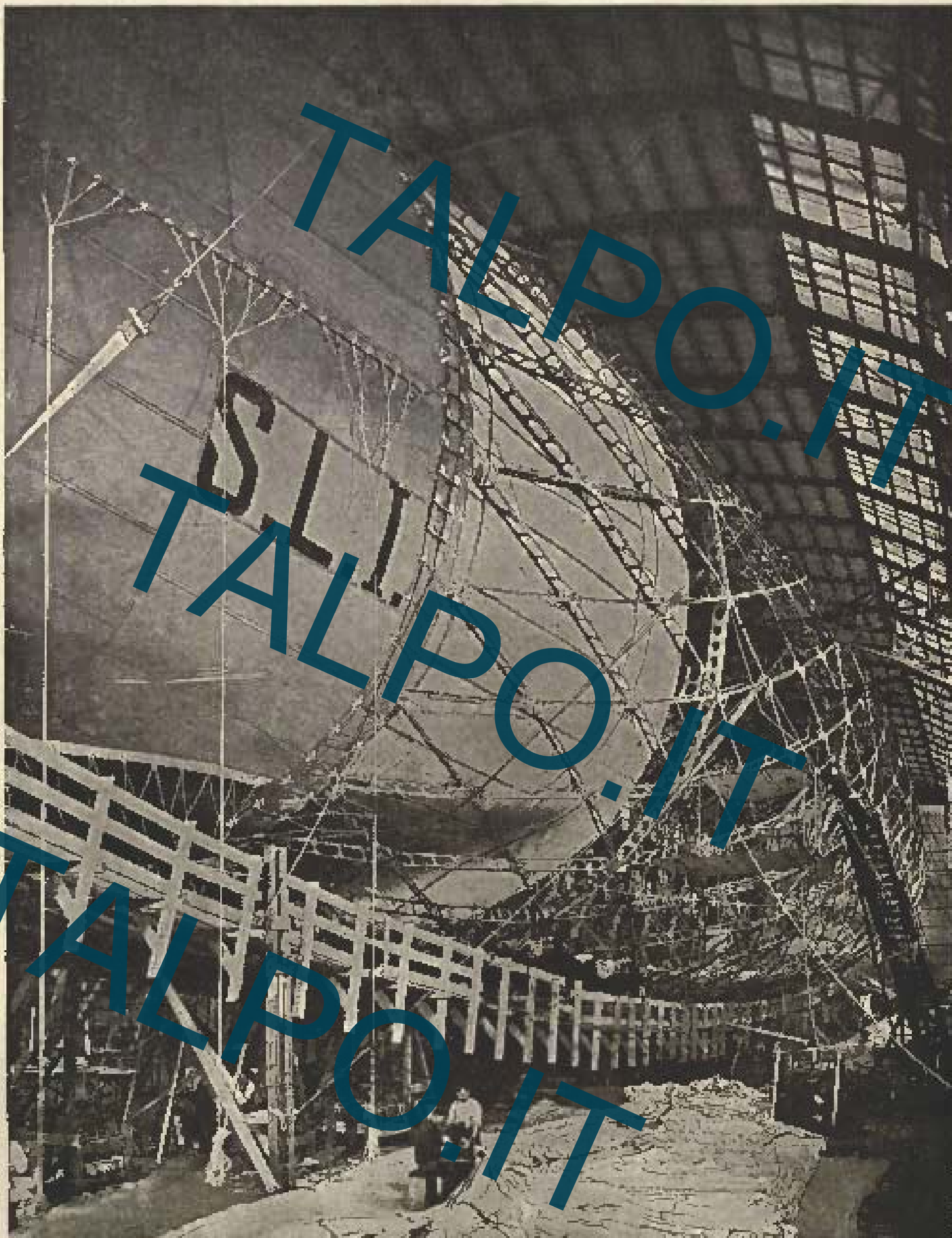
DIAGRAM OF A 19,000 CBM. SCHÜTTE-LANZ AIRSHIP, THE *S. L. I.* (STRUCTURE TYPE).

G_1 forward car; G_2 after car; P_1, P_2 propellers; H_1 forward elevator; H_2 after elevator; St_1, St_2 stabilizer planes; S_1, S_2 rudders.



Courtesy of *The Aeroplane.*

SPECIMEN OF A ZEPPELIN LATTICE-GIRDER.



THE WOODEN LATTICE-GIRDER FRAME OF THE SCHÜTTE-LANZ AIRSHIP *S. L. I.*

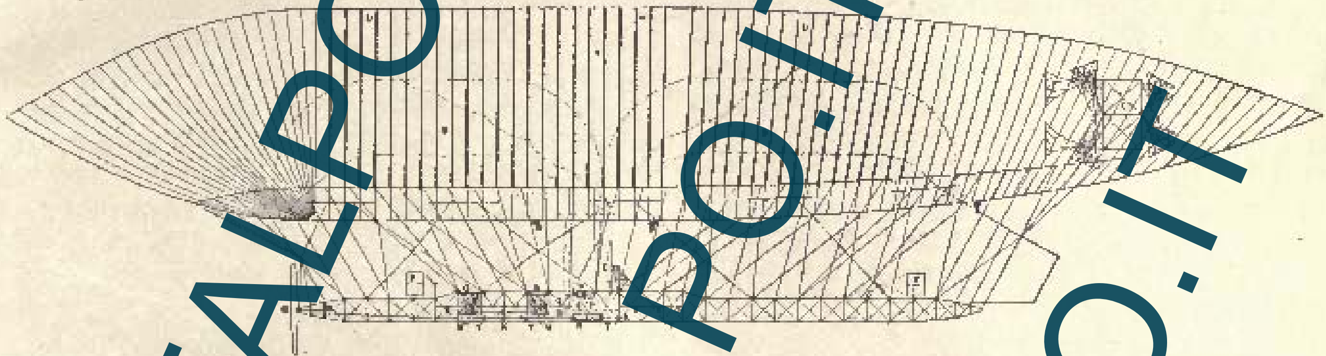


DIAGRAM OF THE 9,000 CBM. ASTRA AIRSHIP *ADJUDANT-RÉAU* (CAR-GIRDER PRESSURE TYPE).

A envelope; B ballonnet; C stabilizer planes; D air valve; E gas valve; F elevator; H tractor screw; I side propeller; K transmission; M engine; N fuel tank; O oil tank; P chart room; Q instrument board; R engine room; S passenger compartment; T landing carriage; U ripping panel.

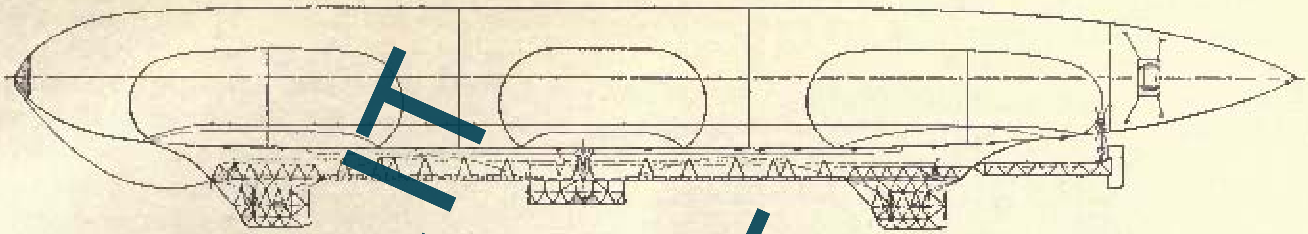


DIAGRAM OF THE 13,000 CBM. SIEMENS-SCHUCKERT AIRSHIP *S. S. I* (GIRDERLESS PRESSURE TYPE; RIGGING BAND REINFORCED BY A FLEXIBLE KEEL OF FABRIC STRIPS).

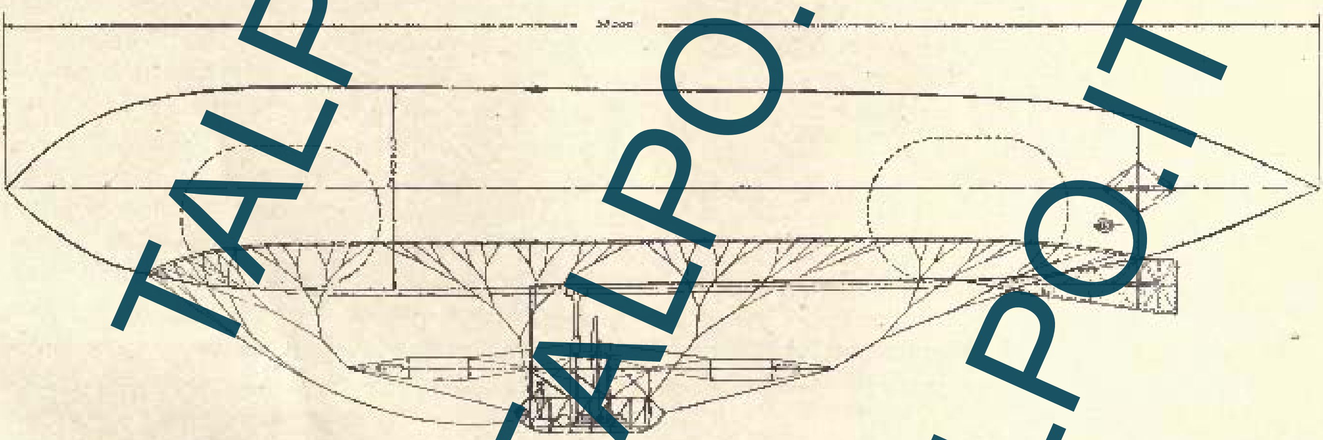


DIAGRAM OF THE 3,600 CBM. KOERTING AIRSHIP *M. III* (CAR-GIRDER PRESSURE TYPE; OUTRIGGER SUSPENSION).

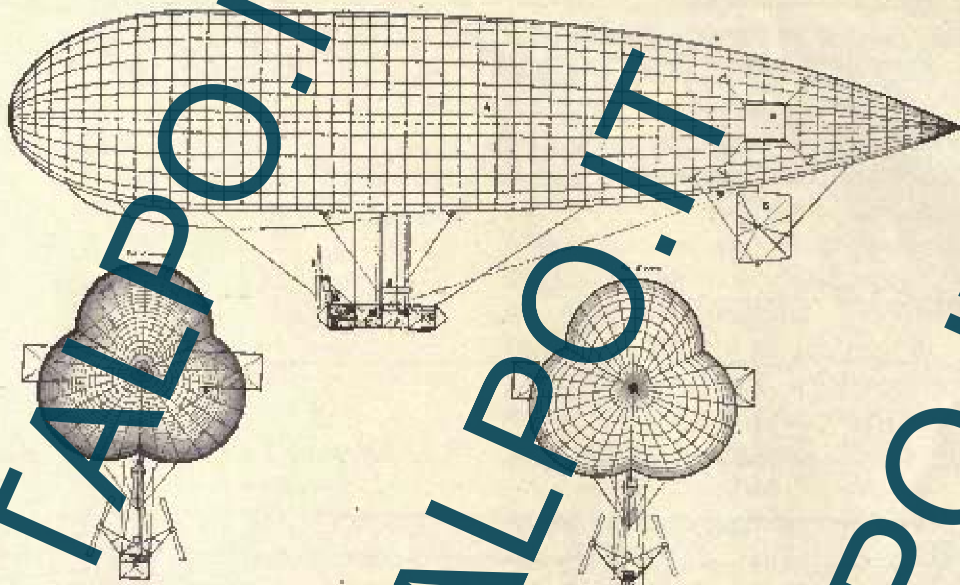
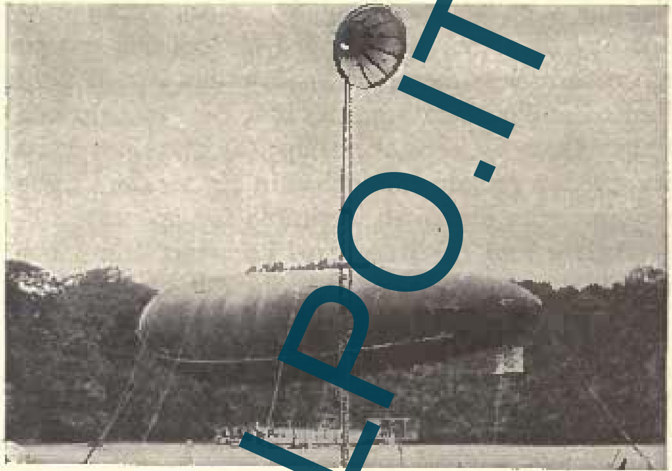
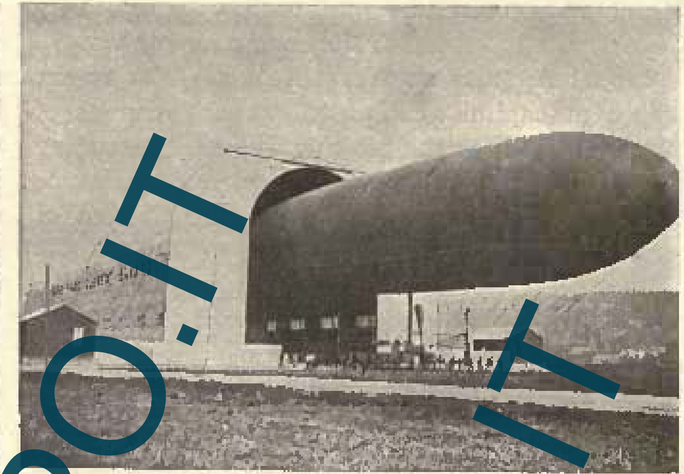
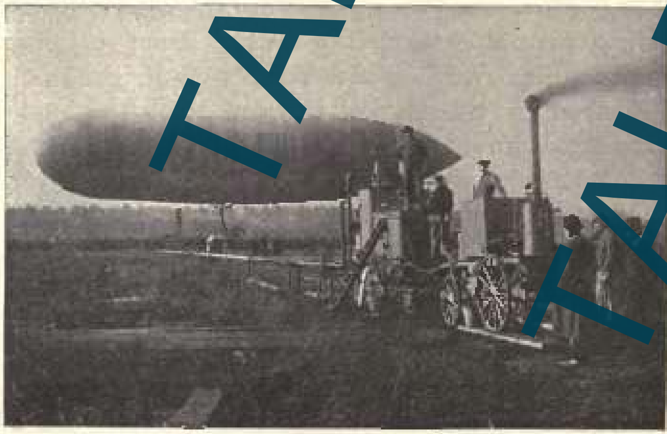


DIAGRAM OF A 7,500 CBM. ASTRA-TORRES AIRSHIP (TENSION-TRUSS PRESSURE TYPE).

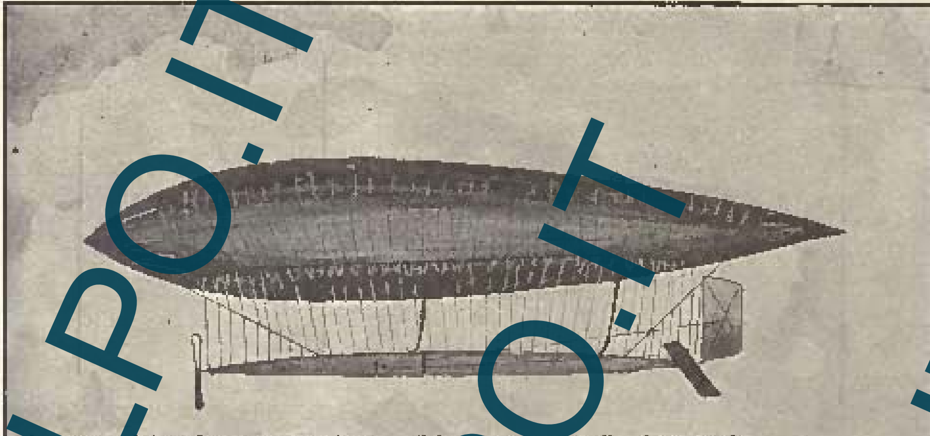
A envelope; B stabilizer planes; C rudder; D engine; E pilot stand; F passenger compartment; G fuel tank; H propeller stays; I propeller.



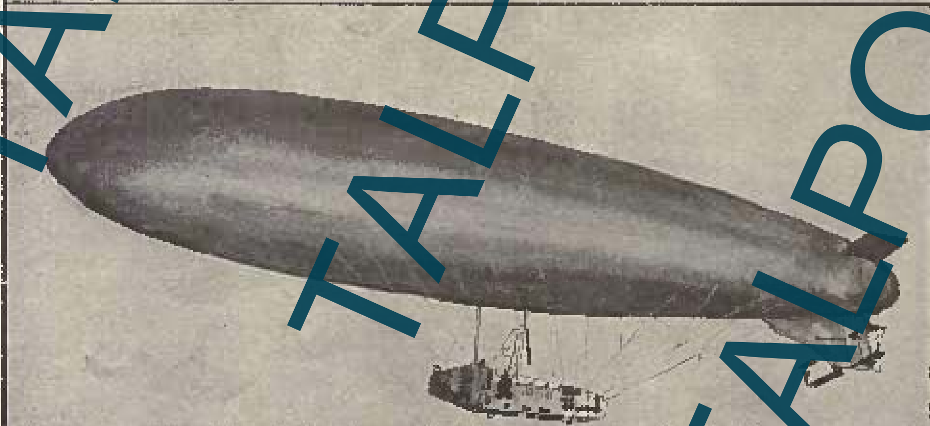




TOP—THE MOORING MAST OF THE ROYAL NAVAL AIR SERVICE—AIRSHIP LEAVING A SHED; *BOTTOM*—INFLATION OF AN AIRSHIP FROM A FIELD GENERATOR—AIRSHIP WEIGHTED DOWN IN A SHED.



Army Airship Works - "La France" (1884)



Army Airship Works - "Fleurus" (1912)

BRAZIL

Patrocinio (José de), Sao Paulo.—Builder of a pressure airship of the keel-girder type. Carton-Lachambre hull. Trim controlled by lifting screws.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Santa Cruz (1903)	45	21	3,900	40		Experimental airship.—One Buchet engine. On the trials the airship failed to leave the ground and was eventually broken up.

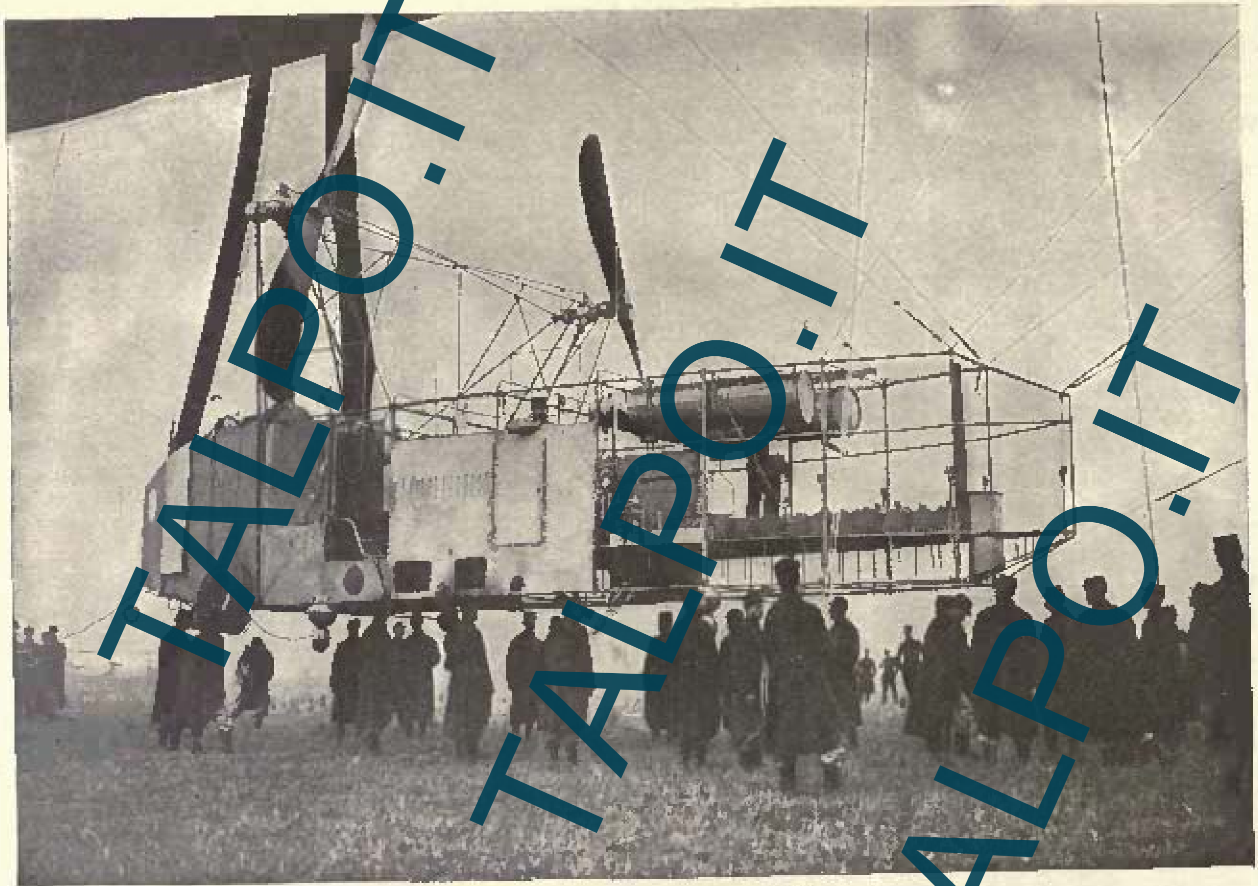
DENMARK

An airship, named **Fionia**, was tested near Copenhagen, in June, 1912. (*Photo or sketch and data wanted.*)

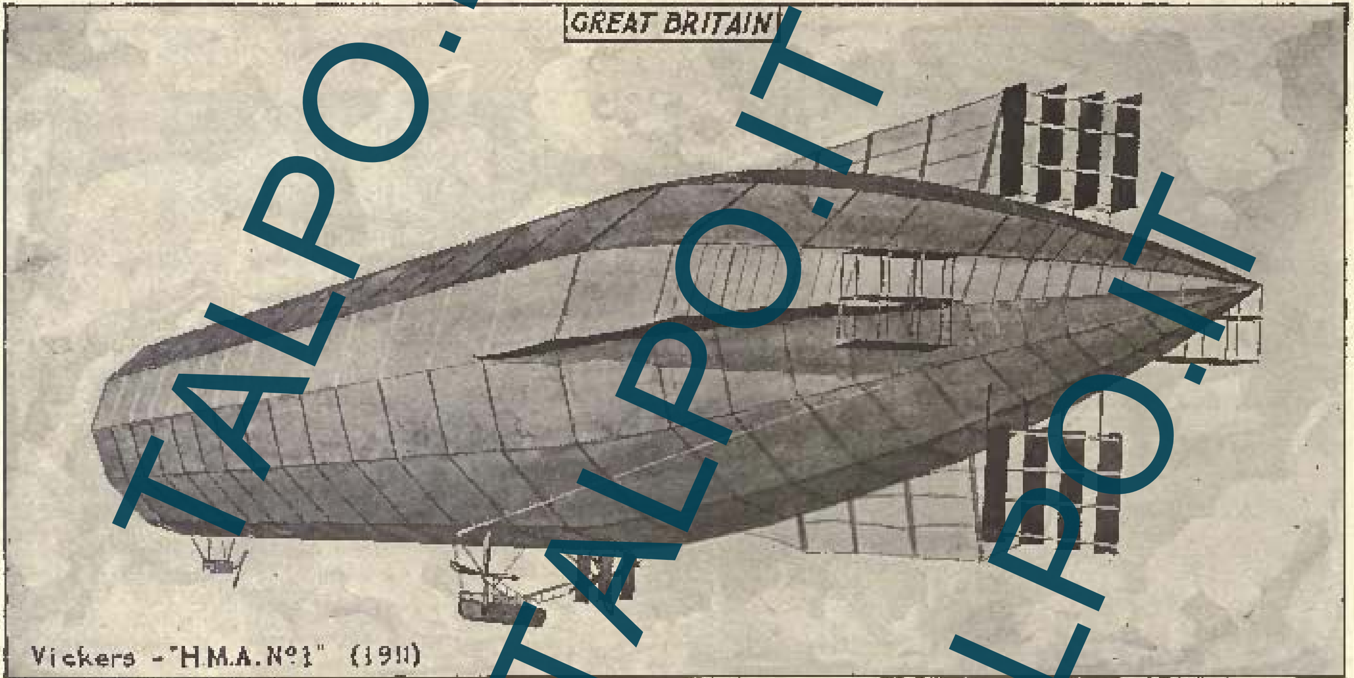
FRANCE

Army Airship Works, Chalais-Meudon (Seine-et-Oise).—Builders of airships to various designs.

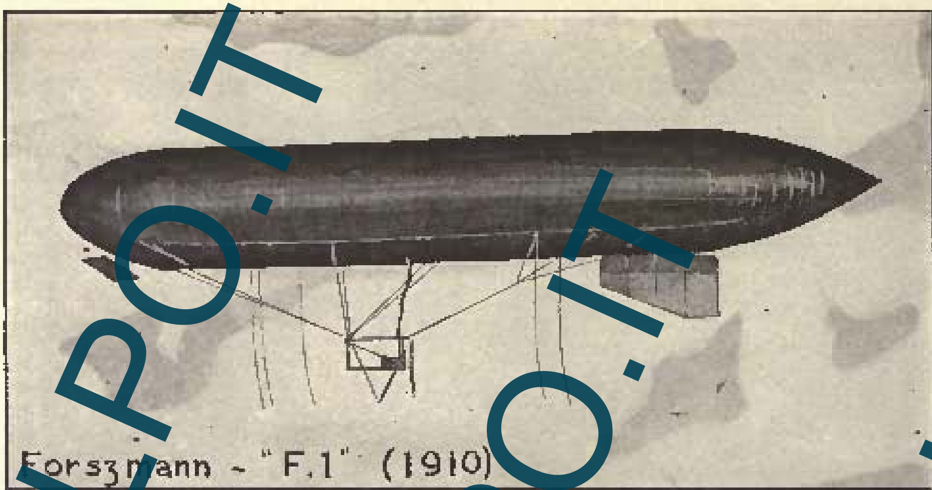
Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	La France (August, 1884)	50.4	8.4	1,864	9	23	Experimental airship, built to the designs of Captain (later Colonel) Renard and Lieut. Krebs. Car-girder, pressure type: ballonet, 438 mc. First airship to be fitted with an elevator. One Gramme electric battery-motor; one tractor-screw. Made seven trips in all and returned five times to her starting place, thus solving the problem of airship navigation. Best endurance: 1 hour in a closed circuit.



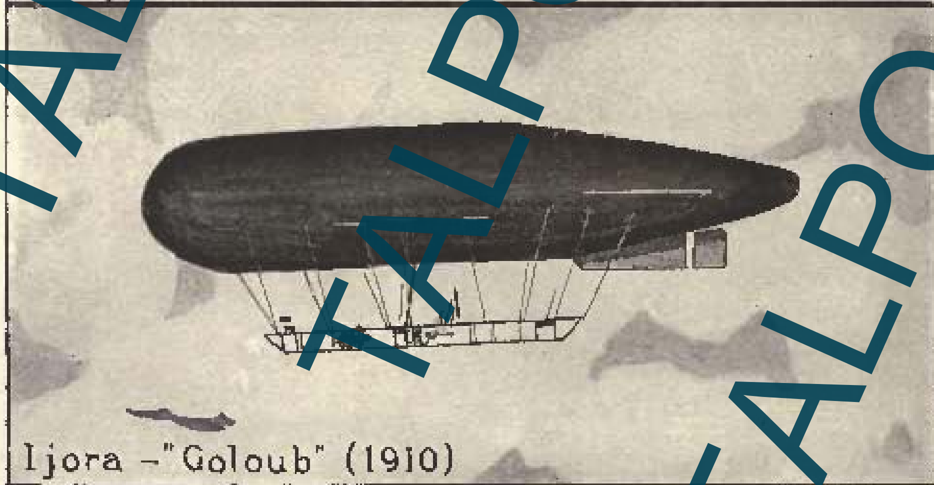
THE CAR OF THE *FLEURUS.*



Vickers - "H.M.A. Nº1" (1911)



Forszmann - "F.1" (1910)



Ijora - "Goloub" (1910)

Duflou & Constantinovitch, Petrograd.—Builders of pressure airships of the car-girder type. Trim controlled by lifting planes.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Kobtchik (1912)	46	9.5	2,150	90	50	Russian Army airship.—Two engines; two pairs of twin-screws. Built to modified designs of the Zodiac Co. (Photo wanted.)

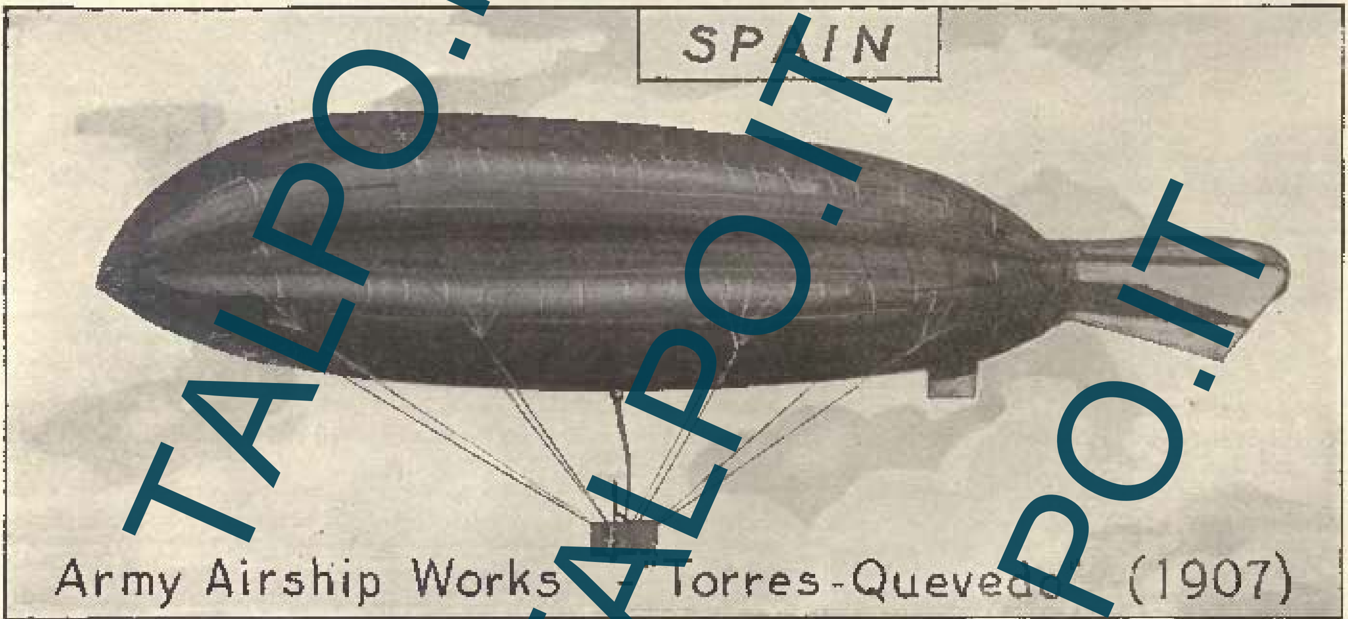
Forszmann (v.), Petrograd.—Builder of pressure airships of the girderless type. Trim controlled by lifting planes. Riedinger hulls.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	F. 1 (1910)	37	6	800	40	37	Russian Army airship.—One Koerting engine; one pusher-screw.
2	F. 2 (1911)	35	6	600	25	35	Russian Army airship.—One Koerting engine; one pusher-screw.

Kostévitch, Petrograd.—Builder of a pressure airship of the keel-girder type, which was tested in November, 1908. (Photo and data wanted.)

"Ijora" Aircraft Works, Petrograd.—Builders of pressure airships of the car-girder type. Trim controlled by lifting planes.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Golub (1910)	46	9.5	2,270	75	50	Russian Army airship.—One Koerting engine; twin-screws.
2	Sokol (1911)	50	10	2,500	80	54	Russian Army airship.—One De Dion-Bouton engine; twin-screws.
3	Albatros (1914)			8,000	300	61	Russian Army airship.—Two Koerting engines; twin-screws. (Data and photo wanted.)



Army Airship Works - "Torres-Quevedo" (1907)

RUSSIA—Continued

Russo-Baltic Aircraft Works, Riga.—Builders of airships to various designs.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	(Building)	80		13,000	320		Experimental airship of the Russian Army.—Structure type, built to the designs of General Kovanko. Two engines; two pairs of twin-screws.

SPAIN

Army Airship Works, Guadalajara.—Builders of airships to various designs.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Torrès-Quevedo (August, 1907)	36	6	960	48		Experimental airship, built to the designs of Sr. L. Torrès-Quevedo and Capt. A. Kindelàn for the Centro de Ensayos Aeronauticos (Aeronautical Experiment Centre), created by the Spanish Chambers.—Tension-truss pressure type; two Antoinette engines; twin-screws. Trim controlled by ballonets and self-shifting car. The trials were sufficiently satisfactory to warrant the purchase of Sr. Torrès-Quevedo's patents by the Astra Co.
2	Alfonso XIII (1915)						Spanish Army airship.—Torrès-Quevedo type. Blew up on Aug. 10th, 1915, in the airship harbour of Guadalajara. (Data and photo wanted.)

THE U. S. ARMY TRAINING AIRSHIP *No. 1* (1908).

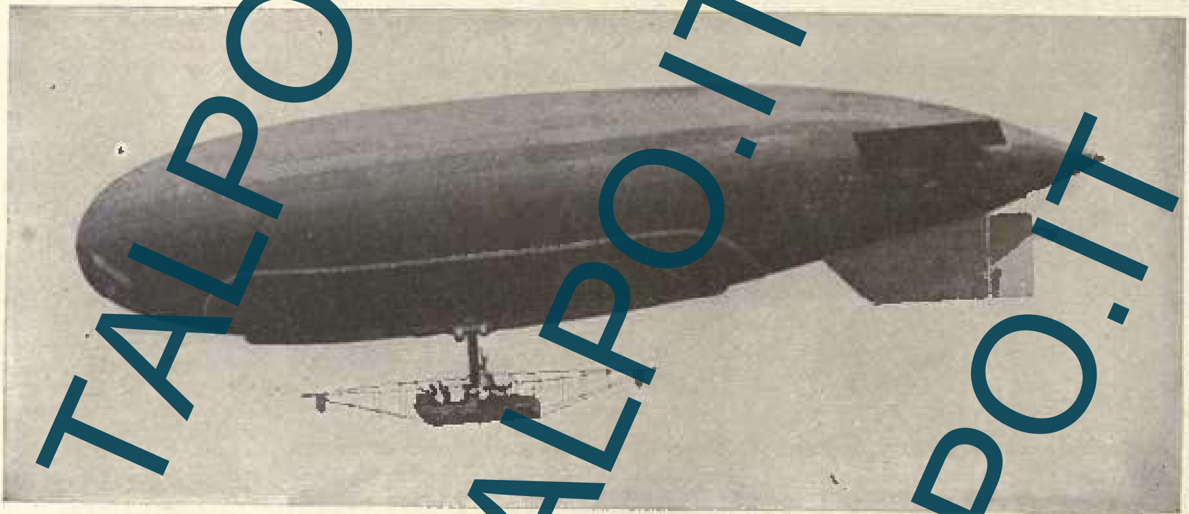
UNITED STATES

Baldwin (Thomas Scott), New York.—Builder of pressure airships of the car-girder type. Trim controlled by lifting planes.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
6	**Baldwin-6** (1908)	29.1	5.8	580	20	25	Exhibition airship. Owner: Thos. S. Baldwin.—One Curtiss engine; one tractor-screw.
7	**H. 1** (1908)	29.1	5.8	580	20	28	Touring airship of Capt. Hildebrandt, Berlin.—*Baldwin-6* type.
8	**No. 1** (1908)	36	6	800	20	31	Training airship of the U. S. Army Signal Corps.—One Curtiss engine; one tractor-screw. Made only a limited number of ascents and was dismantled in 1910. Cost: $10,000.
9	**Baldwin-9** (1909)	26.2	6.1	530	20	35	Exhibition airship. Owner: Thos. S. Baldwin.—One Curtiss engine; one tractor-screw.
10	**Tomlinson** (1909)	26.2	5.5	500	20	36	Exhibition airship. Owner: C. Tomlinson.—*Baldwin-9* type. The *Tomlinson* and the *Baldwin-9* participated in the Hudson-Fulton Celebration of Summer 1909.

Curtiss Aeroplane Company, Buffalo, N. Y.—Builders of airships to various designs.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1 2 3	**DN-4** **DN-5** **DN-6** (Building)	46.8	9.6	2,180	100	72	Coast patrol airships, U. S. Navy.—Girderless pressure type. Trim controlled by trimming tanks, lifting planes and ballonets (545 mc.). One Curtiss engine; one tractor-screw. Designed endurance: 10 hrs. at full speed; altitude: 2,300 m. Cost: $40,750 each.



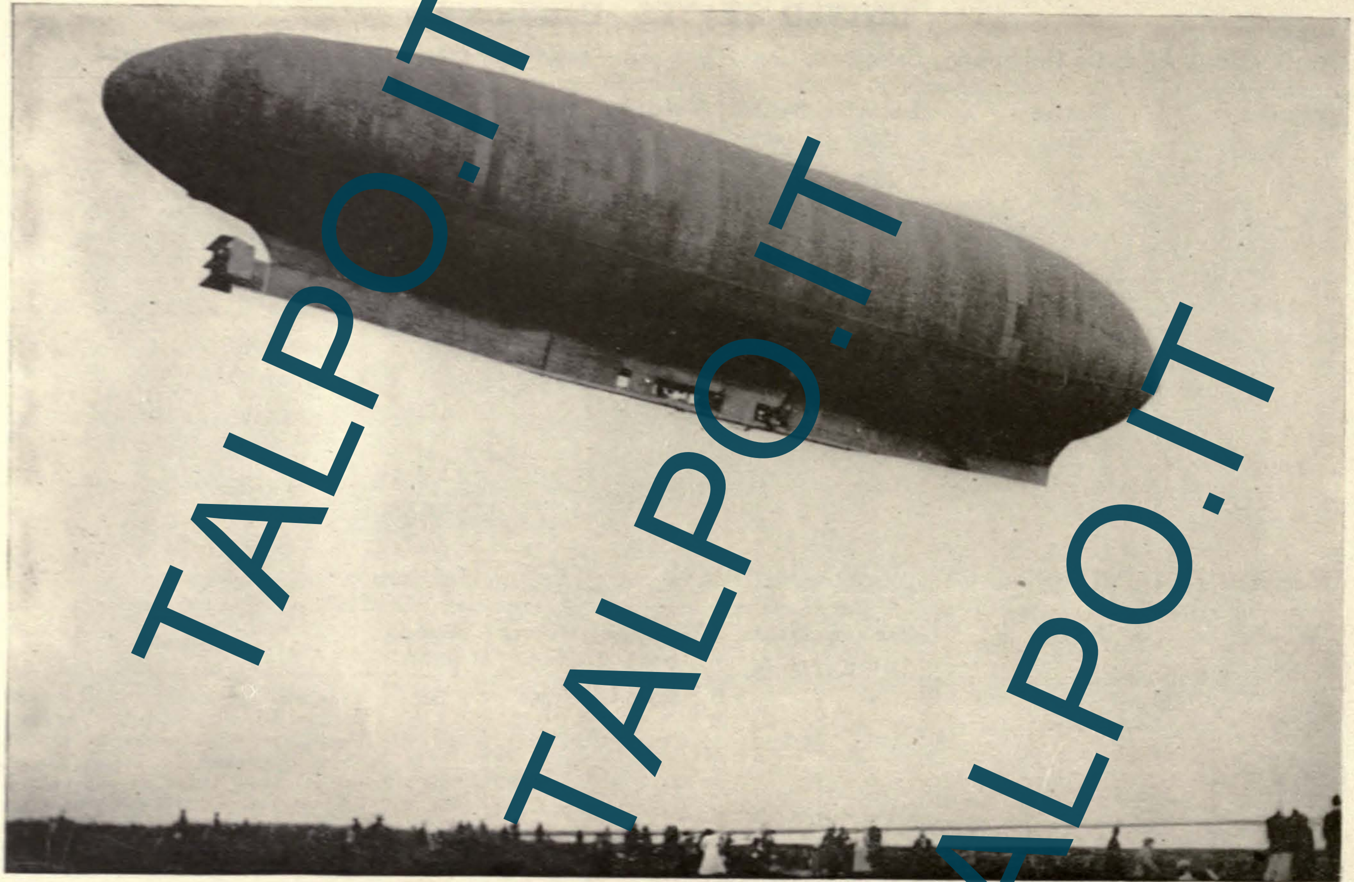
THE U. S. NAVY TRAINING AIRSHIP *DN. 1* (1917).

Connecticut Aircraft Company, Bridgeport, Conn. (U. S. A.).—Builders of pressure airships to various designs.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	DN-1 (April, 1917)	53.4	10.7	3,315	140	40	Training airship, U. S. Navy.—Car-girder type. Ballonet: 425 mc. One Sturtevant engine; twin-screws. Trim controlled by ballonets and lifting planes.—Authorized in 1915. Cost: $46,000.
2 3	DN-2 (Building) DN-3 (Building)	48.8	9.6	2,180	100	72	Coast patrol airships, U. S. Navy.—Girderless pressure type. Trim controlled by trimming tanks, lifting planes and ballonets (545 mc.). One Curtiss engine; one tractor-screw. Designed endurance: 10 hrs. at full speed; altitude: 2,300 m. Cost: $42,000 each.

Goodyear Tyre and Rubber Company, Akron (Ohio, U. S. A.).—Builders of airships to various designs.

Works No	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Akron (May, 1912)	88	15	9,800	280	50	Transatlantic airship, built to the designs of Mr. Melvin Vaniman. Keel-girder type pressure airship. Trim controlled by lifting planes, compensating ballonets and swivelling screws. "Hydrolevitor" for taking on water ballast. Two 100 h.p. and one 80 h.p. engines each driving one pair of twin-screws, the middle and rear pairs being

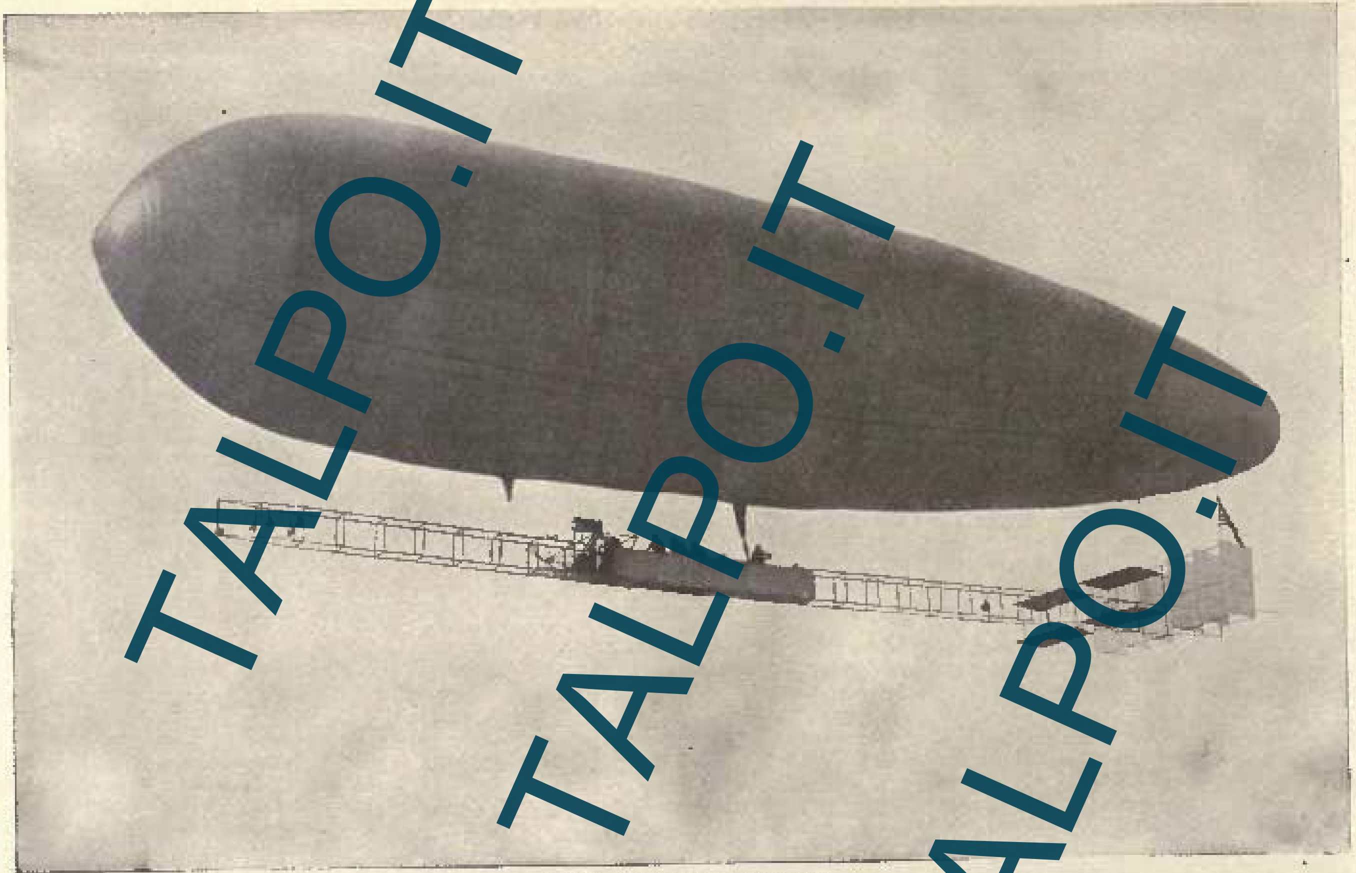


THE *AKRON* (1912).

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
							mounted to swivel. One 17 h.p. auxiliary engine driving the ballonet blowers and a dynamo working the wireless plant. Fitted with the lifeboat of W. Wellman's *America*. Blew up on July 2nd, 1912, over Atlantic City, owing probably to the insufficient capacity of the balloon valves. The crew of five, including Mr. Vaniman, were killed in the [illegible]
2—10	DN-7—DN-15 (Building)	45.8	9.6	2,150	100	72	Coast patrol airships, U. S. Navy. —Girderless pressure type. Trim controlled by lifting planes, trimming tanks and ballonets (545 mc.). One Curtiss engine; one tractor screw. Designed endurance: 10 hrs. at full speed; altitude: 2,300 m. Cost $40,000 each. Best endurance for *DN-7* (May, 1917): 640 km. in 26 hrs.

Goodrich (B. F.) Company, Akron, Ohio.—Builders of airships to various designs.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	DN-16 (Building)	45.8	9.6	2,150	100	72	Coast patrol airships, U. S. Navy.—Girderless pressure type. Trim controlled by lifting planes, trimming tanks and ballonets (545 mc.). One Curtiss engine; one tractor-screw. Designed endurance: 10 hrs. at full speed, altitude: 2,300 m. Cost $41,300 each.
2	DN-17 (Building)						



THE *PASADENA* (1913).

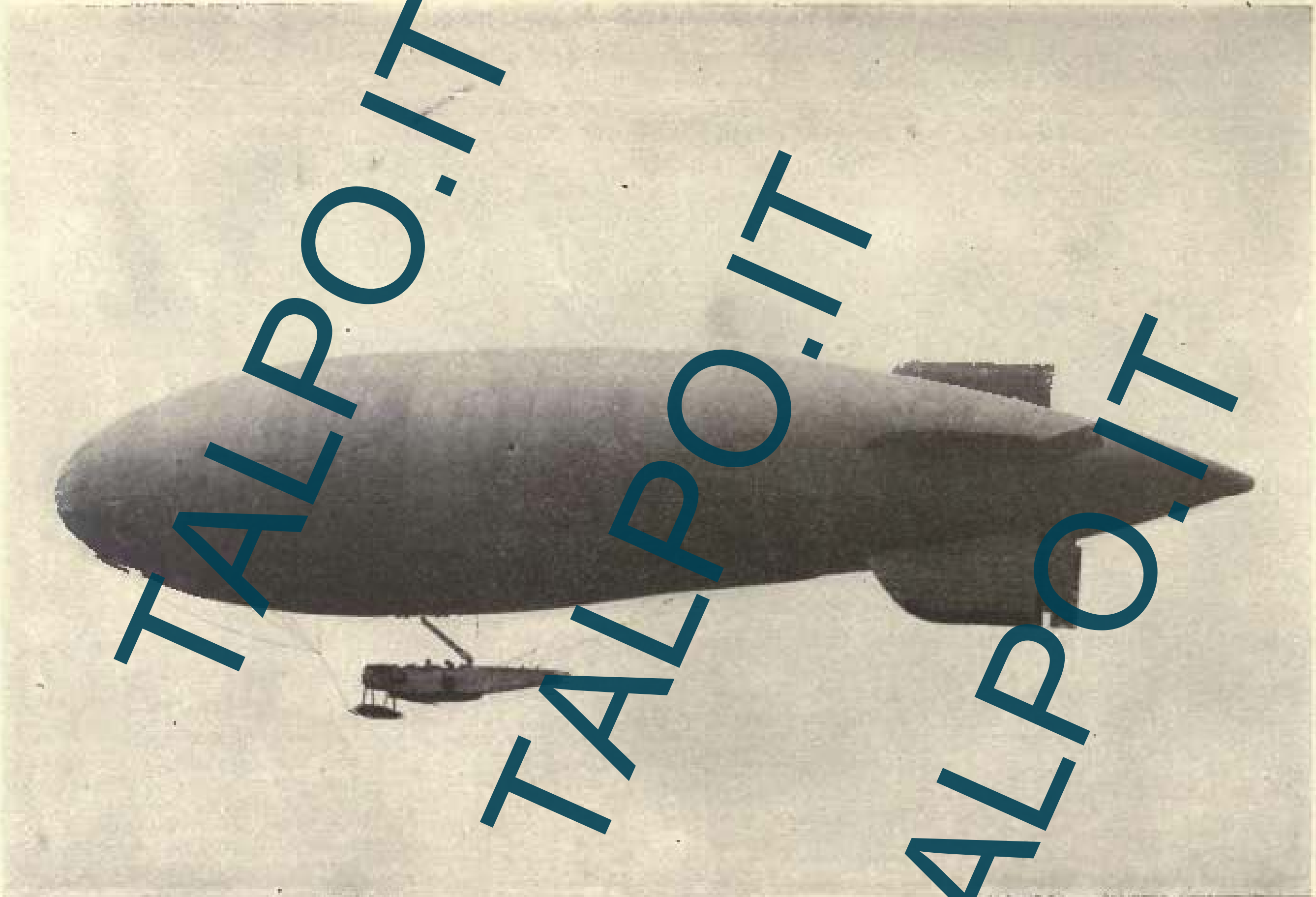
Knabenshue (Roy), Pasadena, Cal.—Builder of numerous airships of the car-girder, pressure type, all of which served exhibition purposes but one which is listed herewith.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
	Pasadena (1913)	45.8	9.2	2,130	50	50	Excursion airship.—Designer: Mr. Charles F. Willard. One Hansen engine; twin-screws. Trim controlled by lifting planes. The *Pasadena* made in 1913 and 1914 numerous trips with passengers in California and near Chicago.

Knabenshue Aircraft Corporation, New York.—Builders of pressure airships.

National Airship Company, Berkeley, Cal.—Builders, to the designs of Mr. Morrell, of a girderless pressure airship.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Morrell (May, 1908)	157.5	10	12,580	180	?	Six Hansen engines; six pairs of twin-screws. No ballonet. Six cars. Disastrous trials: the airship lost her shape in mid-air and stranded on a row of houses, killing three and injuring six of the crew. Cost: $40,000.



A U. S. NAVY SCOUT AIRSHIP (1917).

Rekar Airship Construction Company, Portland, Ore.—Builders of a structure airship.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Preble-Rekar	76.3	7.6	4,000			Was not completed.

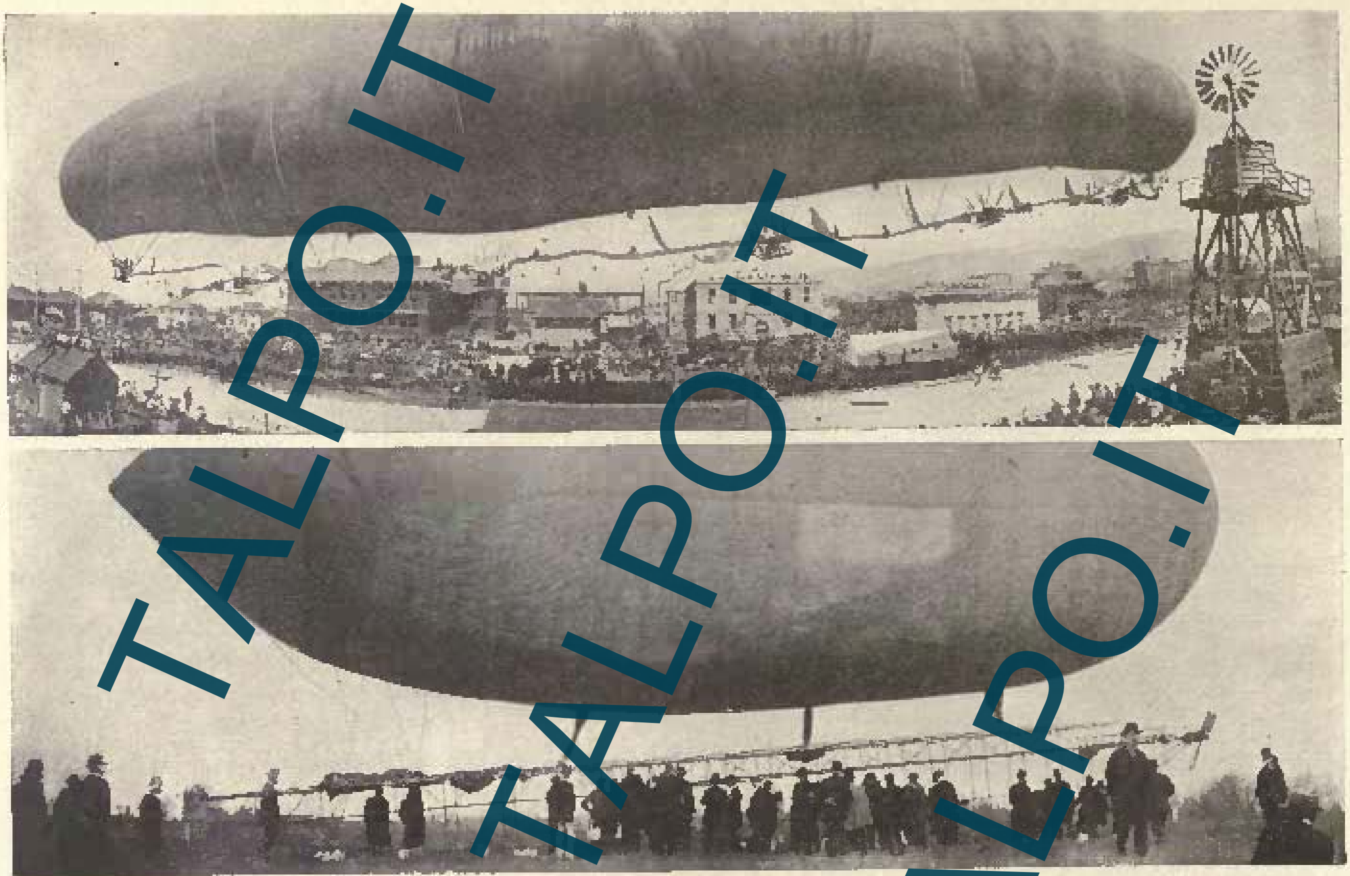
Riggs & Rice, New York.—Builders of a pressure airship of the car-girder type. Designer, A. Leo Stevens.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	American Eagle (November, 1909)	30.5	7.6	880	35		Experimental airship.—One Hansen engine; twin-screws and one tractor-screw. Was not successful, although short ascents were made.

Toliver Aerial Navigation Company, San Diego, Cal.—Builders of a pressure airship of the keel-girder type. Trim controlled by lifting planes.

Works No.	Name Trials	Length (m)	Beam (m)	Volume (mc)	Power (h.p.)	Speed (km)	Notes
1	Toliver (Laid down 1911)	76.3	12.2				Was not completed.

U. S. Army & Navy Joint Board, Washington, D. C.—The construction of an experimental structure airship, called the *DR-1*, has been decided upon in 1917.



TOP—THE *MORRELL* (1908); *BOTTOM*—THE *AMERICAN EAGLE* (1909).

II. THE WORLD'S AIRSHIP PRODUCTION

II. THE WORLD'S AIRSHIP PRODUCTION

(VOLUME IN CUBIC METERS)

Country	1901	1902	1903	1904	1905
Austria	....	....	....	....	....
Belgium	....	....	....	....	....
Brazil	....	....	3,900	....	....
France	5,230	7,464	3,440	2,100	3,400
Germany	....	....	....	....	10,400
Great Britain	500	1,820	840	....	6,440
Italy	....	....	....	....	1,200
Japan	....	....	....	....	....
Russia	....	....	....	....	....
Spain	....	....	....	....	....
United States	....	....	....	....	....
Total	5,730	9,284	8,180	2,100	21,440

II. THE WORLD'S AIRSHIP PRODUCTION—Continued

(VOLUME IN CUBIC METERS)

Country.	1906	1907	1908	1909	1910
Austria	....	....	....	3,150	4,800
Belgium	....	....	....	2,700	....
Brazil	....	....	....	....	....
France	3,930	10,700	7,540	21,950	43,155
Germany	13,730	16,600	39,500	25,720	50,350
Great Britain	....	2,400	....	1,200	4,140
Italy	....	....	2,750	5,065	8,780
Japan	....	....	....	....	1,400
Russia	....	....	1,800	....	5,570
Spain	....	960	....	....	....
United States	....	....	14,540	6,010	....
Total	17,660	30,660	66,130	65,795	118,195

II. THE WORLD'S AIRSHIP PRODUCTION—Continued

(VOLUME IN CUBIC METERS)

Country	1911	1912	1913	1914	1915
Austria	11,750	2,750	....	*	*
Belgium	....	....	....	....	*
Brazil	....	....	....	....	*
France	37,005	24,850	41,400	*	*
Germany	125,210	104,265	230,000	594,000**	1,031,000**
Great Britain	....	25,530	1,400	*	*
Italy	4,400	21,400	38,800	*	*
Japan	3,000	3,000	....	*	*
Russia	8,780	2,150	....	....	*
Spain	....	....	....	....	*
United States	....	9,800	2,130	....	....
Total	190,145	193,745	313,730	....	....

* No reliable information available.

** Approximate estimate, based on the productive capacity of the Schütte-Lanz and Zeppelin factories only.

II. THE WORLD'S AIRSHIP PRODUCTION—Continued

(VOLUME IN CUBIC METERS)

Country	1916	1917	1918	1919	1920
Austria	*	....	....	....	....
Belgium	*	....	....	....	....
Brazil	*	....	....	....	....
France	*	....	....	....	....
Germany	1,329,000**	....	....	....	....
Great Britain	*	....	....	....	....
Italy	*	....	....	....	....
Japan	*	....	....	....	....
Russia	*	....	....	....	....
Spain	*	....	....	....	....
United States	....	....	....	....	....

* No reliable information available.

** Approximate estimate, based on the productive capacity of the Schütte-Lanz and Zeppelin factories only.

III. THE MILITARY AIRSHIP FLEETS

III. THE MILITARY AIRSHIP FLEETS *

On August 1st, 1914

BELGIUM

2 SCHOOL AIRSHIPS

La Belgique (1909–14), 5 tons; 120 h.p.; 52 km.—Vivinus.
Zodiac (1910–14), 2 tons; 50 h.p.; 40 km.—Zodiac.

FRANCE

7 FIRST CLASS AIRSHIPS

Tissandier (bldg.), 31 tons; 1,300 h.p.; 80 km.—Lebaudy.
Pilâtre-de-Rozier (bldg.) } 27 tons; 1,000 h.p.; 97 km.—Astra.
III (bldg.) .... }
IV (bldg.) } 23 tons; 1,400 h.p.; 85 km.—Clement-Bayard.
V (bldg.) }
VI (bldg.) } 25 tons; 1,000 h.p.; 80 km.—Zodiac.
VII (bldg.) }

6 SECOND CLASS AIRSHIPS

VIII (bldg.), 19 tons; 1,200 h.p.; 80 km.—Army Works.
Spiess (1913), 18 tons; 400 h.p.; 70 km.—Zodiac.
Commandant-Coutelle (1913), 11 tons; 400 h.p.; 62 km.—Zodiac.
Dupuy-de-Lôme (1912), 10 tons; 260 h.p.; 55 km.—Clément-Bayard.
Adjudant-Vincenot (1911–13), 10 tons; 260 h.p.; 56 km.—Clément-Bayard.
Lieut. Selle-de-Beauchamp (1910), 11 tons; 200 h.p.; 45 km.—Lebaudy.

* The airships herewith listed are divided into vessels of *first class*, corresponding to the French *croiser* class and to the Italian *grande* (large) class; *second class*, corresponding to the French *éclaireur* (scout) class and to the Italian *medium* class; and *third class*, corresponding to the French *vedette* class and to the Italian *piccolo* (small) class.

4 THIRD CLASS AIRSHIPS

E. Montgolfier (1913), 7 tons; 160 h.p.; 69 km.—Clément-Bayard.
Fleurus (1912), 8 tons; 160 h.p.; 60 km.—Army Works.
Capitaine-Ferber (1911), 7 tons; 220 h.p.; 56 km.—Zodiac.
Capitaine-Marchal (1910), 8 tons; 160 h.p; 45 km.—Lebaudy.

GERMANY

15 FIRST CLASS AIRSHIPS

L. 4, L. 7 (bldg.), 33 tons; 1,080 h.p.; 80 km.—Schutte-Lanz.
L. 3 (1914), **L. 5, L. 6** (bldg.); 30 tons; 800 h.p.; 85 km.—Zeppelin.
S. L. II (1914), 25 tons; 720 h.p.; 87 km.—Schütte-Lanz.
Z. VII (1913), **Z. VIII, Z. IX, Z. X** (bldg.); 24 tons; 600 h.p.; 80 km.—Zeppelin.
Z. IV, Z. V, Z. VI (1913), 22 tons; 540 h.p.; 77 km.—Zeppelin.
Z. III (1912), **Z. II** (1910–11), 20 tons; 450 h.p.; 76 km.—Zeppelin.

4 SECOND CLASS AIRSHIPS

P. V (1914), 13 tons; 400 h.p.; 75 km.—Parseval.
M. IV (1913), 14 tons; 450 h.p.; 75 km.—Army Works.
P. IV (1913), 11 tons; 360 h.p.; 71 km.—Parseval.
P. III (1911), 11 tons; 400 h.p.; 65 km.—Parseval.

2 THIRD CLASS AIRSHIPS

P. II (1910), 9 tons; 360 h.p.; 51 km.—Parseval.
M. I (1912), 7 tons; 150 h.p.; 45 km.—Army Works.

GREAT BRITAIN

2 FIRST CLASS AIRSHIPS

No. 15 (bldg.), 27 tons.—Armstrong.
No. ? (bldg.), 25 tons; 1,500 h.p.—Vickers & Maxim.

9 SECOND CLASS AIRSHIPS

Three of 13 tons; 200 h.p.; 72 km.; building.—Armstrong-Forlanini.
Three of 13 tons; 360 h.p.; 75-80 km; building.—Vickers-Parseval.
No. 3 (1913) and one building; 10 tons; 400 h.p.; 82 km.—Astra.
No. 2 (1913), 11 tons, 360 h.p.; 68 km.—Parseval.

4 SCHOOL AIRSHIPS

Delta (1912), **Eta** (1913), 5 tons; 200 h.p.; 45 km.—R. Aircraft Factory.
Gamma (1910); 2 tons; 100 h.p.; 45 km.—R. Aircraft Factory.
Willows (1912); 1 ton; 35 h.p.; 45 km.—Willows.

ITALY

3 FIRST CLASS AIRSHIPS

G. 1-G. 2 (bldg.), 22 tons; 800 h.p.; 80 km.—Army Works.
One, unnamed, building, 27 tons; 1,000 h. p.; 100 km.—Forlanini.

6 SECOND CLASS AIRSHIPS

V. 1 (bldg.), 16 tons; 400 h.p.; 90 km.—Army Works.
M. 5, M. 4 (bldg.), **M. 3, M. 2** (1913), **M. 1** (1912); 13 tons, 500 h.p.; 70 km.—Army Works.

2 THIRD CLASS AIRSHIPS

P. 4 (1912), **P. 5** (1913), 5 tons; 160 h.p.; 62·65 km.—Army Works.

JAPAN

1 SECOND CLASS AIRSHIP

Yubi (1912); 10 tons; 300 h.p.; 66 km.—Parseval.

RUSSIA

3 FIRST CLASS AIRSHIPS

Three 25 ton, 1,000 h.p. airships building at Astra, Clément-Bayard and Zodiac respectively.

6 SECOND CLASS AIRSHIPS

Albatros (1914), 10 tons; 300 h.p.; 61 km.—Ijora.
"B" (1913), 11 tons; 400 h.p.; 63 km.—Astra.
"C" (1913), 11 tons; 300 h.p.; 67 km.—Parseval.
"D" (1913), 10 tons; 360 h.p.; 55 km.—Clément-Bayard.
Two building, at Ijora and Russo-Baltic, respectiv ly.

2 THIRD CLASS AIRSHIPS

Kretchet (1911), 6 tons, 200 h. .p.; 50 km.—Army Works.
Griff (1910), 8 tons, 220 h.p.; 59 km.—Parseval.

6 SCHOOL AIRSHIPS

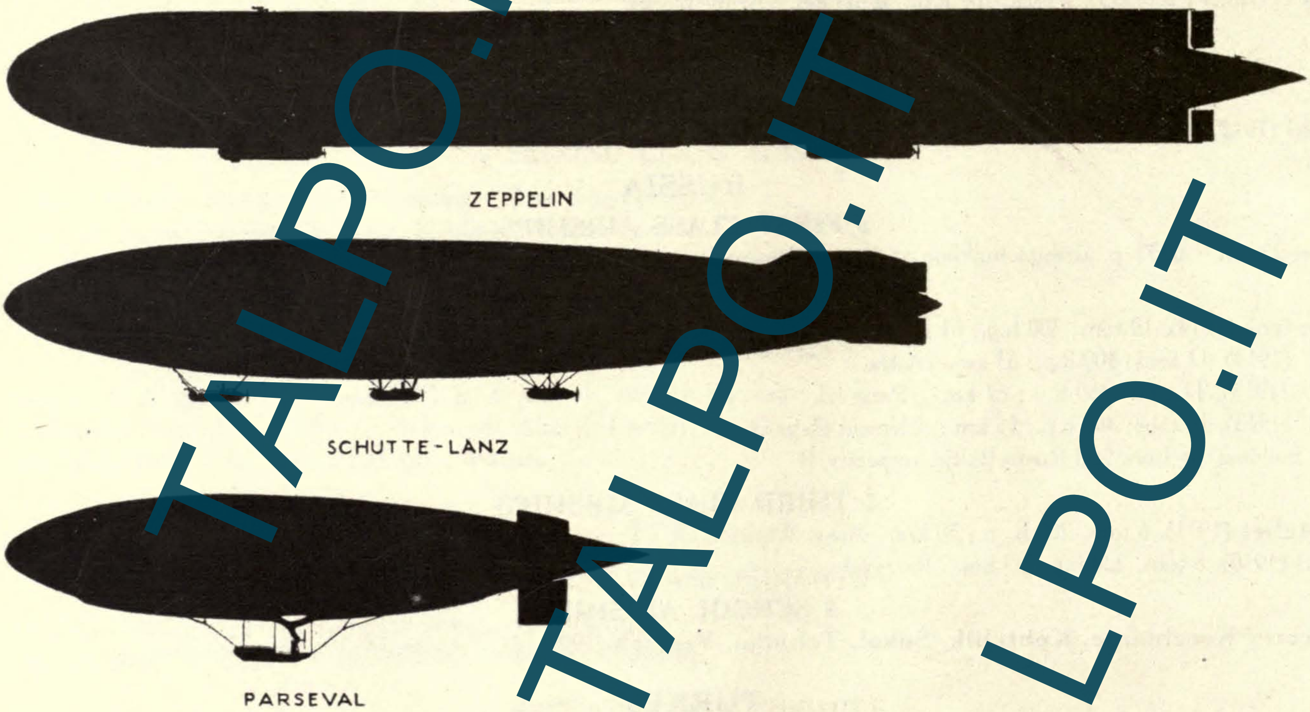
Bercout, Korchoune, Kobtchik, Sokol, Tchaïka, Yastreb (1909–12), 2–4 tons, 60–105 h.p.; 47–54 km.

TURKEY

1 SCHOOL AIRSHIP

No. 1 (1910–13), 2 tons; 50 h.p.; 40 km.—Parseval.

SCALE-DRAWN SILHOUETTES
OF THE PRINCIPAL GERMAN AIRSHIP TYPES



IV. COMPARATIVE STRENGTH OF THE MILITARY AIRSHIP FLEETS

IV. COMPARATIVE STRENGTH OF THE MILITARY AIRSHIP FLEETS

On August 1st, 1914

Germany	13 airships of 237 tons, commissioned.
	8 airships of 211 tons, building.
France	9 airships of 90 tons, commissioned.
	8 airships of 200 tons, building.
Russia	12 airships of 74 tons, commissioned.
	5 airships of 95 tons, building.
Italy	5 airships of 49 tons, commissioned.
	6 airships of 113 tons, building.
Great Britain	6 airships of 34 tons, commissioned.
	9 airships of 140 tons, building.
Japan	1 airship of 10 tons, commissioned.
	No airship building.
United States	No airship commissioned
	No airship building.

V. AIRSHIP LOSSES OF THE ALLIES

V. AIRSHIP LOSSES OF THE ALLIES

August 1st, 1914—June 1st, 1917

(Compiled from Official Data)

FRANCE

No.	Name	Date	Place	Cause of Loss
1	D. . .	Sept., '14	France	Accident.
2	Alsace	10-3-'15	Rethel, France	Shot down by German guns.
3	T. . .	5-13-'16	Porto Torres, Italy	Caught fire and blew up, killing the crew of six.
4		2-25-'17	Sarreguemines, Lorraine	Shot down by German guns.

GREAT BRITAIN

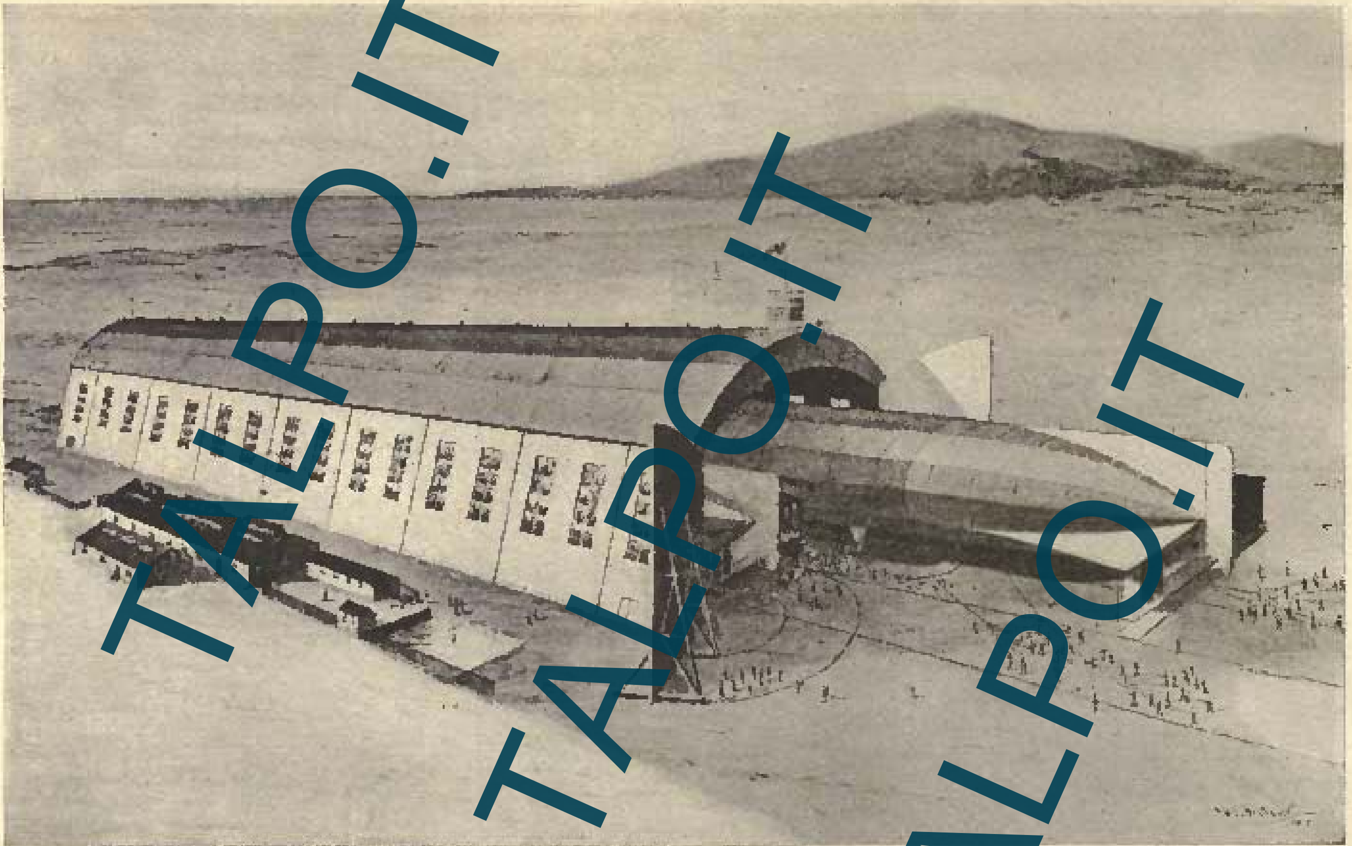
No.	Name	Date	Place	Cause of Loss
1		7-28-'15	Wormwood Scrubs, England	Blew up in shed during inflation.
2		4-21-'17	Strait of Dover	Shot down by German seaplane.

ITALY

No.	Name	Date	Place	Cause of Loss
1	M. 2	6-8-'15	Fiume, Hungary	Shot down by Austrian seaplane.
2	P. 4	8-5-'15	Pola, Austria	Shot down by Austrian seaplane.
3	M. 3	5-4-'16	Gorizia, Italy	Caught fire and blew up, killing the crew of four.
4	P. 5	8-12-'16	Campalto, Italy	Destroyed in shed by Austrian seaplanes.

RUSSIA

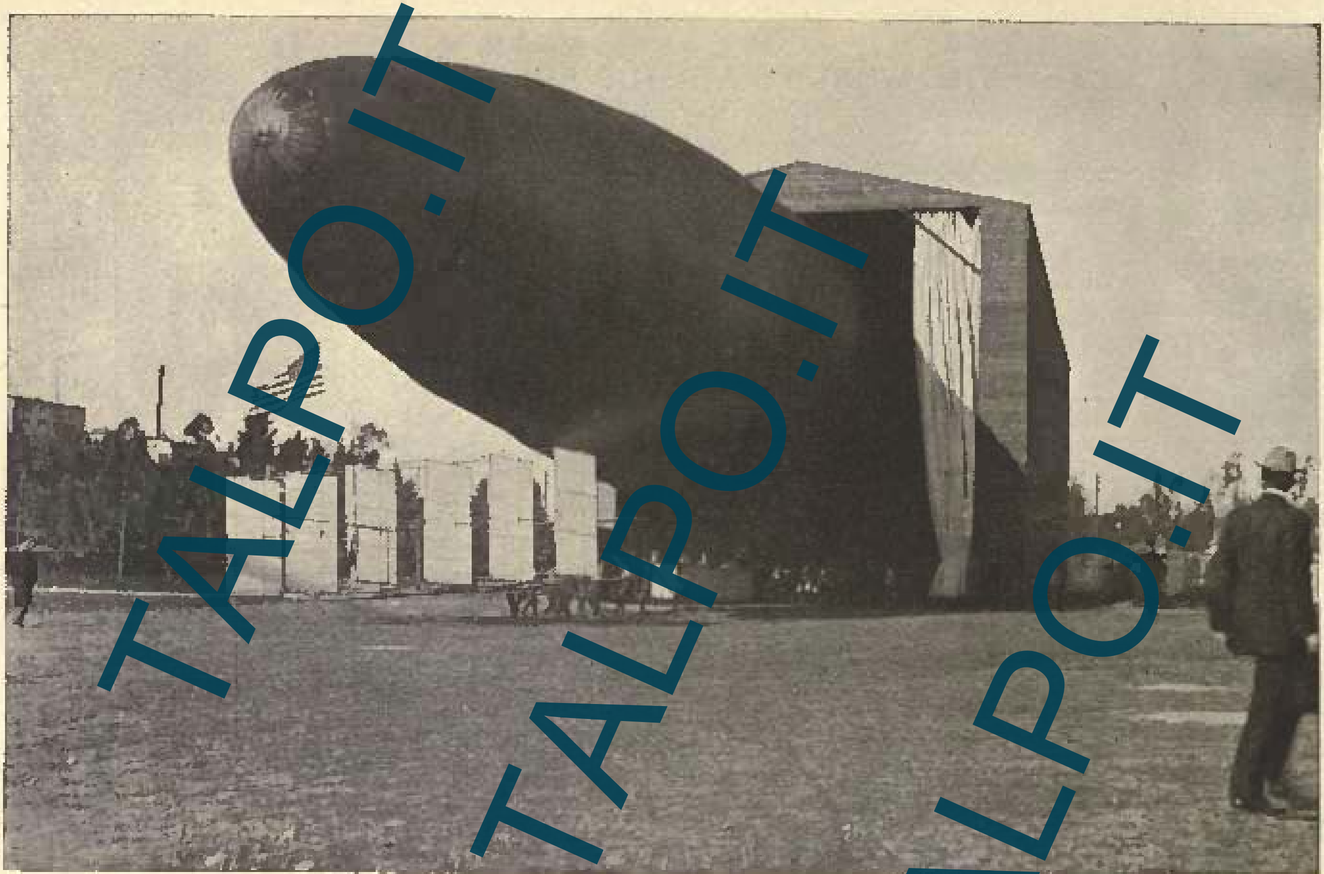
No.	Name	Date	Place	Cause of Loss
1		Apr. 27, '17	Stanislawow, Galicia	Shot down by Austrian guns; fell in Russian lines. Crew saved.



AIRSHIP SHED AT BARROW-IN-FURNESS (GREAT BRITAIN).

RUSSIA

Place	Owner	Length (m)	Width (m)	Height (m)	Type	Year
Berditcheff	Army	70	20		Sta.	1911
"	"	166	48		"	1914
Brest-Litovsk	"	80			"	1908
"	"	80			"	1908
"	"	166	48		"	1914
Dvinsk	"	166	48		"	1914
Homel	"				"	
Kieff	"	70	20		"	1911
Kovno	"				"	
Libava	"	70	20		"	1911
Lutsk	"	100	25	25	"	1912
Minsk	"				"	
Moscow	"	80			"	
"	"	80			"	
Petrograd	"	80			"	
"	"	80			"	
"	"	50			"	
"	"	166	48		"	1914
Reval	"				"	
Riga	"				"	
"	"				"	
Salisi-Gatchina	"				"	1909
"	"				"	1911
Sebastopol	"	70			"	
Sveaborg	"	80			"	
Vitebsk	"				"	
Vladivostok	"				"	
Worsaw	"	70			"	



THE SHED OF THE *PASADENA* AT PASADENA, CAL.

SPAIN

Place	Owner	Length (m)	Width (m)	Height (m)	Type	Year
Guadalajara	Army	80	15	20	Sta.	1908
"	"				"	1914

SWITZERLAND

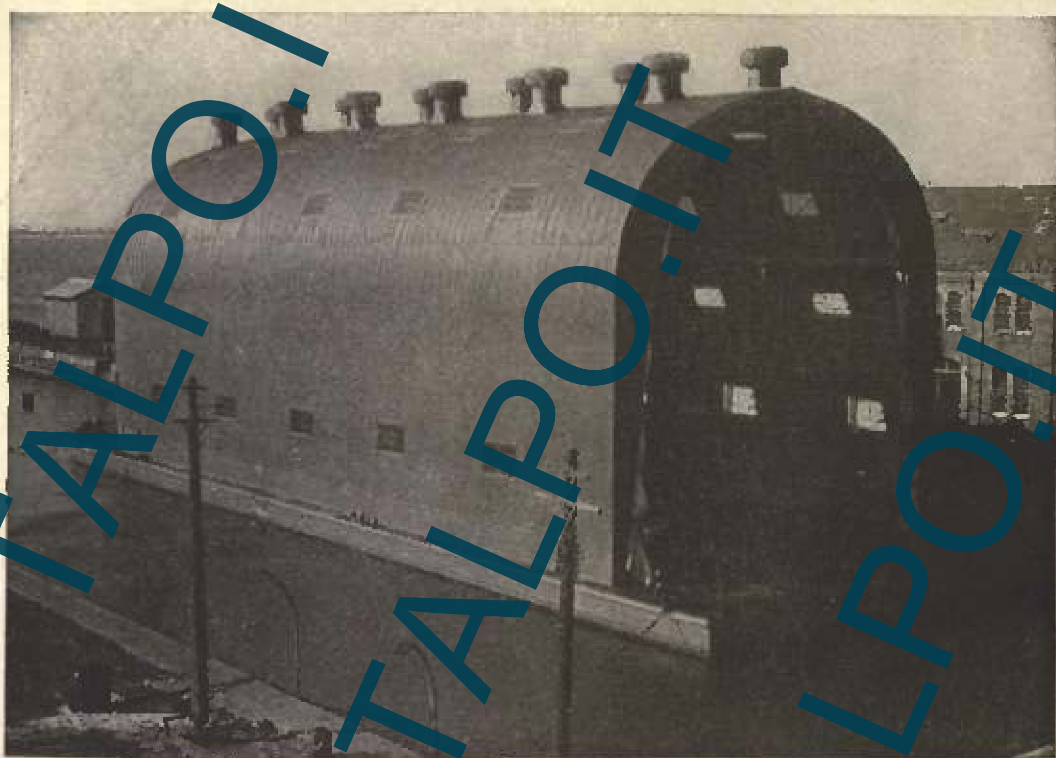
Place	Owner	Length (m)	Width (m)	Height (m)	Type	Year
Lucerne	Astra Co.	90			Sta.	1910

TURKEY

Place	Owner	Length (m)	Width (m)	Height (m)	Type	Year
San Stefano	Army	52	15	18	Sta.	1913
"	"	150			"	1915

UNITED STATES

Place	Owner	Length (m)	Width (m)	Height (m)	Type	Year
Fort Omaha, Neb	Army	60			Sta.	1908
Pensacola, Fla	Navy				Flo.	1915



THE U. S. NAVY FLOATING SHED AT PENSACOLA, FLA.

INDEX OF THE WORLD'S AIRSHIPS

NOTE.—The letter, or group of letters, bracketed after each airship's name indicates the latter's registry, regardless of the builder's nationality or of the country in which the airship was built. "The registry of an aircraft is determined by the nationality of its owner." (Code of the Air, Article III.)

ABBREVIATIONS.—B, Belgium; BR, Brazil; D, Germany; DM, Denmark; E, Spain; F, France; GB, Great Britain; I, Italy; J, Japan; NL, Netherlands; OE, Austria; R, Russia; T, Turkey; US, United States