

THE SECRETS OF AIR FLIGHT

THE LANGLEY FLYING MACHINE.

Several hundred miles away with its load of high explosives to attack a hostile fleet nations will pause before hazarding their fleets against such terrible risks. And when the time comes when every nation has its fleet of aerial destroyers peace conferences will be compelled to declare an absolute edict against warfare.

According to my opinion the aeroplane of the future will have numerous supporting surfaces, a narrow spread, great length, and will fly with high velocity.

Everything will be spindle shaped—that is to say, of a form so fashioned as to offer little resistance to the wind. All the parts except the wings will be hidden from the wind; that is, to be a form somewhat like a winged torpedo, and passengers and pilot will be placed on a sort of car with glass windows which offers very little resistance to the air.

Most probably a multicellular design, with one, two or three series of cubes, will be adopted for the supporting surfaces, or also a series of wings in separate sets, arranged like the steps of a staircase, which are fastened to the front, middle and rear.

By Carl Dienstbach

expert of the Aero Club of America. All present shortcomings are certain soon to be corrected.

NEVER before have attempts to subjugate the atmosphere into an obedient medium of travel as land and water been so numerous or earnest as at present. Many parts of the civilized world are witnessing demonstrations of air craft, and results have been obtained which are so fascinating in their promise of complete success that the consequent shortcomings, which are quite inseparable from pioneer efforts, are truly distressing. No more pathetic spectacle could be found in the annals of invention than the giant Zeppelin IV, the victim of an electrical storm after the most triumphant voyage of a real ship of the air in history. The trivial lack of staying qualities in its machinery is an everyday occurrence during the first few years of automobile, and easy to remedy when once disclosed by the actual endurance test.

New York recently a great crowd which had assembled to see the flight of the winged, birdlike machine with which Henri Farman had just before flown in France for 30 minutes without any balloon or gas, flying steadily in any chosen direction, had to renounce its hope on account of a wind storm, which still was not violent enough to prevent small boats from sailing in perfect safety on the water.

The question of what the aircraft of the future, if it is to be exempt from such mishaps and limitations, will probably be like becomes then one of the greatest interest at the present time. In the case of the gas-supported airships it can safely be said that the Zeppelin system has by its last trip proved such qualities of dirigibility, speed, and, not the least, endurance that its design will require no radical future change. Careful scientific computations have recently established the fact that to transport comparatively heavy loads through the air, power supported flight finds certain well-defined limitations, while support by gas becomes the more efficient the larger the size of the vessel to contain it. Only very big balloons can stand the wear and tear of everyday use.

This question was settled long before the days of the "dirigible" by Goddard's giant captive balloon of the Paris Exposition, which also disclosed superior carrying power and gas-retaining qualities. For such large sizes it becomes, in the case of the dirigible, especially if a slender form and high speed is the object, simply a logical conclusion to enclose the necessary stiffening frame in the bulk of the balloon itself, apart from the consideration that the needed dividing of the gas space into numerous separate compartments is so brought about in the most natural way, and that the gas bags themselves are thus most efficiently protected from the strain of propulsion and the influence of the sun or the weather. That the propellers and rudders may thus be carried where they have the best effect, and that cars and cabins, navigating devices, etc., may thus be arranged very conveniently and comfortably seem all but a natural consequence of the fundamental correctness of the system.

THE last objection against the rigid construction, its supposed inability to withstand without damage the shock of alighting on land, has been most brilliantly disproved by the unfortunate craft's last trip. Not even tearing from the moorings seems to have done immediate harm. Moreover, it is well within the bounds of possibility to secure the rigid "Zeppelin" so firmly to the ground that no storm could hurt it. Its great length in proportion to its diameter is very favorable to that end. There are 15 points where the frame is especially strong—namely, at the intersection of its longitudinal pieces with the 15 rings or hoops, which, through their strong inside bracing, like the spokes of a bicycle wheel, divide the interior of the hull into

15 separate compartments. Fifteen strong, light steel beams slung over the hull could, by means of eyelets, be made to bear right against these rings, and if only fastened firm enough to the ground (eventually to pieces of timber buried in the earth and heavily weighted) would render even a side gale powerless. Similarly, securing the ship fore and aft would be very simple. In the next Zeppelin such hawsers will no doubt form an integral part of the framing, being interwoven with the latter in such a way as to distribute the strain over the whole structure. After all, the Zeppelin IV has only repeated the experience of the Langley on the plateau of Chalons on a larger scale, not to mention the Patrie.

Protection against the electric discharge which caused the final catastrophe would indeed belong to an as yet remote chapter of practical aeronautics, and had hardly been thought of up to that time, although there were some accidents on record. Not to provide for an absolutely secure fastening to the ground in case of an unforeseen landing might be indeed called an oversight, excusable under the circumstances. There had been some fear of the frequent German thunder storms, especially on account of the ship's vast expanse of metal, but as in the air these storms are seen forming from afar, and have been successfully "eluded" or "navigated" by experienced pilots even in drifting spherical balloons, there was confidence in the powers of a speedy runner like the Zeppelin.

Perfectly reliable machinery against a "panne" will be, as with an auto, only a matter of sufficient number of practical tests. But the future will undoubtedly be in the airship, which is anchored with one unbreakable bow cable to the top of a tall, strong steel tower after having been sufficiently lightened, and a flexible cable connection, like a weather vane. Such "anchorage" will have to be provided everywhere. There will also be a series of lightning conductors, placed at points where the electrical charges, along its back, and all metal parts will be in good connection with the ground, while a ventilator will instantly draw up any gas that might escape into the protecting air space around the internal gas bags beyond the point where it remains inflammable.

To become truly practical, airships will first have to get rid of their cumbersome, except for repairing purposes. With their necessarily large size they possess so tough an outer skin as easily to be damaged by the wind, that many numerous separate compartments they may be inflated, when suitably lightened, bag after bag, while floating in the air, while the rigid construction, which may safely be predicted that the future development of the winged power supported flying machine, as represented by the most successful public exponent, the Voisin-Farman type, will involve more changes than that of the airship.

THE limitations of its possibility to fly in the wind are at present clearly defined, and Farman himself, even in the direction from a different design. He has, however, brought it under a truly wonderful degree of control. To fly seems to him like playing. He invariably leaves the ground after a short run, seems perfectly certain of what turns he can make, how high he may go and come safely down again, when to shut off power while landing, and many more practical details which insure efficient flying. There seems really no reason why in favorable weather and over suitable grounds he could not fly for hours on end.

In skill he surpasses without any doubt all his European competitors. The question only remains why he is not so much familiar to many more eyes. He has repeatedly stated that he believes practice with a power machine sufficient and considers a motorless glider as rather dangerous.

The two important points become apparent in the tardiness of the "new school" of flying apprentices to take up gliding. Practically all the gliders, which are so uninteresting and extremely tedious and laborious when there is no wind, are the "old generation" of navigators, from Kato's on, and did not have the modern marvellous light motors at their disposal. They had to glide, and they had by force to learn to control the machine in the wind. The modern flyers, on the contrary, the wind means more trouble than the calm meant to the "gliders" and they shirk as much as possible. The result, not only as to their own experience, but also especially as to the design adapted for the machines, will clearly be shown by a comparison of the one power machine, which is known to have developed from a glider, that of the Wright brothers, to that of Farman. For instance, the horizontal rudder in front, which seems so much of a common feature of both machines, is in Farman's case deprived of power through the excessive leverage of the rear cell in connection with its own position near the front cell. It more than suffices to steer in a calm, but lacks power to force the machine back to an even keel if struck by a gust.

The Wrights' devices for increasing or diminishing the supporting effort on either side and forcefully right the machine if it attempts to capsize are entirely absent. Preserving the longitudinal balance by a rear cell and the side balance by slightly upturning the wing tips, the Wrights, does, as devices which are known to give excellent results in a calm or a very steady moderate breeze, but which become actually a hindrance when there are gusts. Identical did real wonders when he rode his primitive gliding surfaces through gales, like a "bucking broncho," throwing his weight instantly to the side which happened to be up.

The Wright brothers developed a system of rudder and surface movements by which the same skill might be more

efficiently applied, and which would control very large machines as certainly as a smaller one. They could hardly have thought of it, if they had begun their experiments in a calm with a power machine, for their very system would then have made flight much more difficult than with any other type. There is also a "dark horse" in the race for supremacy in mechanical flying. Mr. A. M. Herring, about whose recent work nothing is known, but who may do all the tricks of the Wright brothers and more by an automatic mechanism. The flying machine of the aerial experiment association at Hammondsport, which began with practically a duplicate of the Farman type, is now more and more tending toward the Wrights.

There will soon be no more rear cell, and a more powerful front rudder. Side controlling had been introduced even earlier. Nothing, indeed, seems lacking but the Wrights' several years of experience in the air. Farman's own future type seems as yet problematical. He aims at providing for lateral stability in gusts by decreasing the sideways extent of the supporting surfaces, substituting a number of smaller superposed or staggered ones for his two wide main surfaces, and by the long and narrow motive "articulating" the whole surface and turning some of the supporting planes themselves in place of a separate rudder. He believes strongly in a large fore and aft dimension, and he has adopted the long cloth-covered body of Bleriot and others to contain the machinery. It will be seen that in this respect there is a variance with American tendencies. Farman does not believe in gas-supported airships.

By Nikola Tesla

Calm comparison of balloons with aeroplanes to the former's advantage.

PROGRESS in aerial navigation is essentially dependent on the perfection of a process of producing great mechanical effort with light machinery. Viewing the possibilities, near at hand, and many more practical details which insure efficient flying. There seems really no reason why in favorable weather and over suitable grounds he could not fly for hours on end.

By Augustus Post

Secrecy of American inventors has retarded development of airships.

NOTHING has so astounded the public mind in generations as the recent development of the flying machine. Successful flights have been made repeatedly abroad as well as in America. Today the flying machine is a marvel of mechanical achievement. For many years action was dormant. The time was not ripe, progress in the elements that go to make up the wonderful combination in the flying machine was not sufficiently advanced. The gas engine was strong, but not light; the propeller was not sufficiently light; the rudder was not sufficiently strong; the dirigible balloon, however perfect, supported in air against the force of gravity by buoyancy, dynamic effort or otherwise, can never equal in speed a machine which derives its support from land or water.

By Charles M. Manly

Consulting engineer of the Aero Club of America.

WE are accomplishing more in a month nowadays in aeronautics than we did in a year half a decade ago. The slow, discouraging preliminary work is largely a thing of the past. Within two years such will be the progress that there will be from 20 to 30 aeronautic contests a year in New York alone. We will see races in mid-air, feats in staying aloft for long periods and similar contests. Such contests, by the way, will not take place over the city of New York, for cities are dangerous localities for aeronauts. The high buildings are aerodynamic snags in air and other disturbances of the atmosphere which the mariners of the air wish to avoid. But we will

see great fields just outside the city set aside for them. Perhaps, however, racetracks will be used for this purpose.

With the present development of the flying machine two fields are open. Our airships are valuable in warfare to carry 50 people to a point of the front. These two fields is enough to stimulate their development. Their value in war is certainly a sufficient incentive for us to devote our time and our money to their development. If you ask me if they will have a practical commercial value in five years, I should say no. In 10 years it is very likely they will be utilized; certainly they will have a very wide application within the next 20 years. The development of the locomotive and the steamboat was slower and in its day more discouraging than that of the flying machine in our own day.

By A. M. Herring

Builder of an aeroplane for the United States Government.

THE airship has actually arrived; its practical utility is assured. It is possible to construct aeroplanes which will carry two men and will operate within a radius of 600 miles by following the present forms. It has come to be largely a question of expense how large or how far such airships will be made. By utilizing a machine of this size to carry fuel and with but one or two passengers the radius of its operation is increased. It is inconceivable that such a machine could cross the ocean.

By A. Leo Stevens

Aeronaut who built and operated the first flying machine in America.

NEW YORK is destined to be the great air port of the world. The magnificent harbor, which has attracted the ships from all parts of the world, will serve equally well when we navigate the air. We will be crossing the Atlantic Ocean in three or four hours. At first it will be done by some adventurous sportsman, but as our airships are improved and we grow more confident and skilled in handling airships their practical commercial value will appear. Some day we will see great airships, after making the trip from Europe in incredibly short time, hovering over our harbor and lowering their great boat-like baskets or cabins into the water, while tugs will bring them alongside the docks to land their passengers and freight.

By Israel Ludlow

Inventor of an aeroplane, member Aero Club.

THE arrival of Henry Farman in this country with his aeroplane provides an opportunity to see a mechanical contrivance which will ultimately take a place similar to the automobile runabout of today. I mean to say that the aeroplane will in time be a popular vehicle for one or two persons for cross-country flying. Above the airships they will speed at a rate between 30 and 40 miles an hour, and in an air line direction take their course, hurrying trees and houses in the way and altering against the wind or turning in the four directions will be given up to them or large open spaces will be provided as landing places.

By Augustus Post

Secrecy of American inventors has retarded development of airships.

THE lifting powers of balloons may be increased indefinitely by building larger bags. As we learn to control them better there is no reason why they should not be used as commercial machines. There is today a very general terror of the balloon and aerial navigation in general, but this will disappear largely as the airship becomes more familiar. I have made 1250 ascensions and taken up nearly 600 persons without serious mishap. In time aerial navigation will grow safer as in the case of any other means of locomotion.

(Continued on Page 11.)

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ORVILLE WRIGHT, LEO STEPHENS, ALAN HAWLEY, S.M. MANLY, NICOLA TESLA

THE BELL TETRAHEDRAL KITE

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