

AVIATION AND ITS FUTURE

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Aviation and Its Future by Various

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**AVIATION
AND ITS FUTURE**

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INSTRUCTION PAPER

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DIRIGIBLE VS. AEROPLANE

While interest, to a great extent, is monopolized by the achievements of the aeroplane, opinion is still more or less divided as to the merits of the two methods of navigating the air—the lighter-than-air (the dirigible) or the heavier-than-air (the aeroplane). Though greatly in the minority, those who contend for the advantages of the dirigible are none the less convinced that, in the final analysis, it will be the airship rather than the flying machine which will reign supreme. From this standpoint, the aeroplane is regarded as a mere scientific toy of rather doubtful utility. The advocates of the flying machine, on the other hand, look upon the dirigible as a huge, unwieldy, and prohibitively costly construction, the futility of which as a successful means of navigating the air will be fully realized by reason of the development of the aeroplane within the next few years. Between these wholly irreconcilable opinions, there is a middle ground taken by those who regard both as being of value in their particular spheres, and who think further that both will endure and develop contemporaneously. By briefly summarizing the advantages and disadvantages of each, the reader will be given an opportunity to judge for himself.

Dirigible. Advantages. One of the chief advantages claimed for dirigibles is their ability to take aloft comparatively heavy loads—weights far beyond the capacity of the largest aeroplanes so far constructed. This great carrying capacity permits of transporting large quantities of supplies and fuel and a large crew, with the added advantage of permitting the latter a certain range of movement about the airship while it is in flight—the aeroplanist or his passenger naturally can not stir from their seats. But of greater value than this—particularly for military purposes, to which the dirigible is almost wholly adapted at present—is its ability to remain motionless over the field of action in a calm, or by using its engines to coun-

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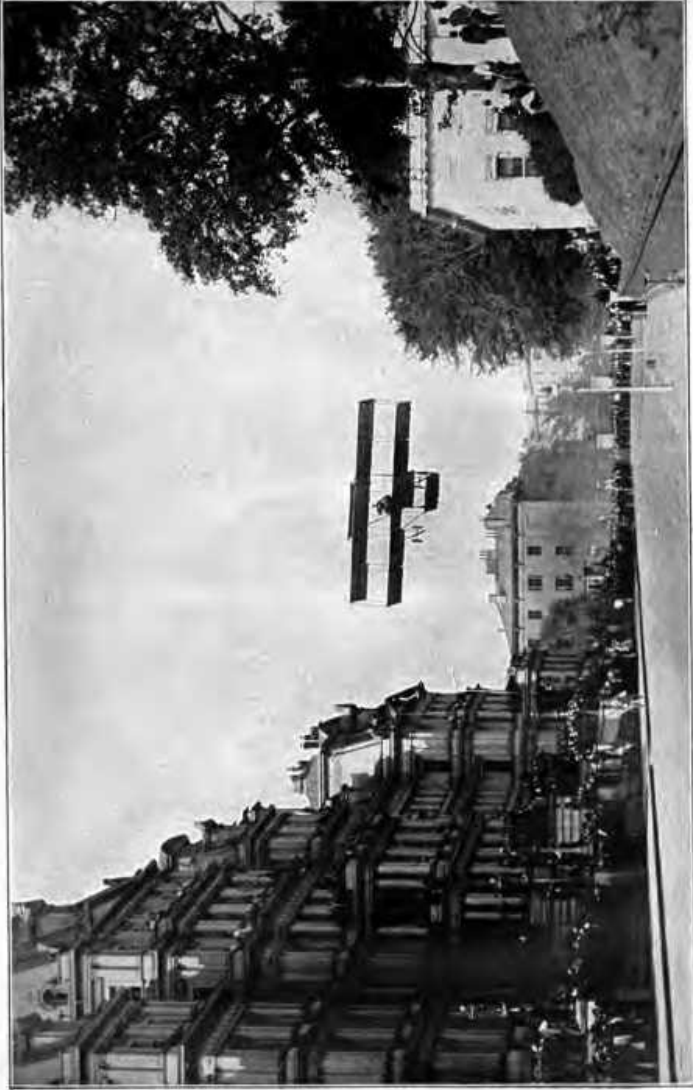


Fig. 1. Claude Grahame White Landing in the Streets of Washington, D. C. An Example of an Aeroplane's Ability to Land or Ascend under Almost Any Conditions

teract a head wind which is within its capacity to resist. Moreover, it is capable of remaining aloft and of traveling with the wind even after its fuel supply is exhausted, and in fair weather it can keep to the air for a much longer period than the aeroplane.

Disadvantages. In the first place, the initial cost of building a dirigible of sufficient size to be of any practical use is so great as to limit its utilization largely to military operations, though a number of dirigibles are being built in Germany by commercial companies for passenger carrying. Few but national governments can afford to build dirigibles. Wellman's ill-fated America, which was small as compared with the military dirigibles of the European governments, cost something like \$100,000 to build and equip. Its maintenance is even more costly. The temporary shed to house the America cost \$10,000 to erect and \$5,000 was spent in inflating the airship once. To propel it, using full power, about 200 gallons of gasoline a day was necessary, with a proportionately large supply of oil. As its speed was low, there would be frequent occasions when the engines would have to be run at their full capacity, simply to prevent it from being carried away by the wind, while there would also be a number of days in the year when it could not safely be taken out of the shed.

To erect a permanent building to shelter one of the large European military dirigibles involves an outlay sufficient to pay for a whole fleet of aeroplanes, and the huge gas bag is never safe outside of its home. While an aeroplane can land on a city street and rise again, Fig. 1, nothing short of a twenty-acre field provides a safe landing place for a dirigible, and the operation is a delicate one even under the most favorable conditions, so much so, that the shed to house the various Zeppelin airships was anchored at first on Lake Constance in order that the dirigible always might enter it against the wind. In view of the great expense involved in providing accommodation for it, the airship is usually compelled to operate from a limited number of fixed bases, to one of which it must return. In case a high wind should spring up when it is aloft, it is equally dangerous to stay in the air or to attempt to land, and it may frequently happen that the force of the wind is so great that the airship can not reach its base at all, or it is blown away from its landing place before the numerous attendants necessary can get it under shelter. This

last has happened to French military airships on two occasions, while the Zeppelin dirigibles that have come to grief through being blown to pieces against the ground form a striking illustration of one of the chief dangers to which the tremendously unwieldy apparatus has been subject, but which is now greatly reduced by improved methods of handling.

Aloft, it is surrounded by perils, both from within and without. The close proximity of such a huge quantity of highly inflammable gas to the gasoline engines or other sources of fire renders its operation risky, to say the least, while it is equally exposed to fire or explosion through being out in an electrical storm, it being the general consensus of opinion that lightning, or an electrical discharge caused by the high difference of potential between the atmosphere and the gas bag and metal parts of the airship, caused the explosion which ended the lives of Oscar Erbsloh and his five companions in one of the German military airships in the summer of 1910. As explained under "Wireless on Aeroplane and Airship," it is not necessary that the airship itself should be actually struck by lightning to bring about this discharge, although it offers a powerful attraction; its mere presence at a height where the atmosphere is heavily charged, being sufficient to create electrical discharges capable of setting fire to the gas or to the envelope.

Mention has already been made of the fact that to be of any use, the dirigible must be planned on an enormous scale, with a correspondingly disproportionate increase in the amount of gas required to inflate it and the power needed to drive it. Consequently, it has been found impossible to attain speeds in excess of 43 miles an hour, and only one airship at present in use abroad is capable of going that fast. Even with the most impermeable fabrics that can be manufactured there is more or less leakage of gas, but more serious than this by far is the loss attendant upon ascending and descending. Skillful and rapid manipulation is frequently necessary to prevent rising suddenly to great heights through temperature changes, which occasions the loss of considerable hydrogen in order to return to earth again, while cloudy weather and particularly the sudden advent of rain brings about an alarming contraction in the envelope. Reference to Wellman's experiences with the *America* will reveal how precarious an undertaking the keeping an airship aloft over

night is, the loss of lifting power through the drop in the temperature being so great as to seriously imperil its safety. Add to this the necessity of returning to its base of operation in order to be safely housed against the wind when on the ground, and it will be apparent that the dirigible is very much of a fairweather craft, though the German army dirigibles are said to be used frequently for night trips.

Large Radius of Action. To offset this formidable list of weaknesses and disadvantages, it may be pointed out that the airship has accomplished some wonderful trips, seemingly all the more wonderful because at the time of their execution there were no other performances to compare them with. But upon referring to the circumstances under which they have been carried out, it will be found that they were usually under the most favorable conditions. The weather was favorable, the wind never in excess of 35 miles an hour, and the entire trip was of necessity completed during daylight, usually between dawn and 8 p.m., when the temperature range is not so great as seriously to affect the lifting capacity. While capable of carrying aloft a greater number than can as yet be approached by the aeroplane, it is likewise necessary to carry a much greater crew, so that the actual passenger-carrying capacity is much less than that of the aeroplane in proportion to size. Whether the latter has, as its sole freight, the aviator himself, or carries eight passengers, as in the case of the Bleriot "bus," the entire control is centered in one man. However, the dirigible has the inestimable advantage of providing direct access to the motors, so that they can be restarted, and the further advantage of being able to stop its motors and still remain aloft.

Aeroplane. Cost. In summarizing the advantages and disadvantages of the aeroplane in a similar manner, the first consideration is naturally that of *cost*—both initial and subsequent. Taking the cost of a good two-man machine as \$5,000, the price at which the Wright biplane lists in this country, it will be seen that 100 of these machines can be placed in the field for the price of but a single Zeppelin dirigible, which is said to cost \$500,000. The expense of the initial inflation of such an airship represents the equivalent of another aeroplane, while its bill for fuel would keep a great many of them in the air, and the cost of a shed for housing it would mean