# THE BOYS' BOOK OF MODEL AEROPLANES

HOW TO BUILD AND FLY THEM: WITH THE STORY OF THE EVOLUTION OF THE FLYING MACHINE

BY

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# THE BOYS' BOOK OF MODEL AEROPLANES

Launching the Airship.

TO

ARNOLD MILLER COLLINS

(*Aged Ten*)

THAN WHOM NO COLLABORATOR COULD
HAVE BEEN MORE ENTHUSIASTIC

# PART I

# MODELS: HOW TO BUILD AND FLY THEM

# THE BOYS' BOOK OF MODEL AEROPLANES

# CHAPTER I

## THE NEW SPORT FOR BOYS

IN the boy's calendar nowadays the aëroplane season comes in with sledding and runs all through skating, marble, top, kite-flying, and bicycle time. The delights of all the old games seem to be found in this marvelous new toy. The fun in throwing a top cannot compare with that of launching an aëroplane, while kite-flying is a very poor substitute for the actual conquest of the air. To watch one of these fascinating little ships of the air, which you have fashioned and built with your own hands, actually rise from the earth and soar aloft with a swallow's swiftness, is perhaps the greatest boy's sport in the world. Certainly no new game or toy has ever taken such hold of the boy's imagination, and in so short a time enrolled such an army of enthusiasts.

Throughout the country to-day upward of ten thousand boy aviators are struggling with the problem of the air-ship. Among these junior aëronauts the record for height and that for distance in flying are matters of quite as lively interest as among the grown-ups. The great contests of aviators here and abroad are watched with intelligent interest. Let a new form of aëroplane, a biplane or monoplane, appear, and it is quickly reproduced by scores of models and its virtues put to an actual test. If a new wing or new plan for insuring stability is invented, a new thought in the steering-device, or some new application

of power, it is instantly the subject of earnest discussion among the junior aëronauts the country over.

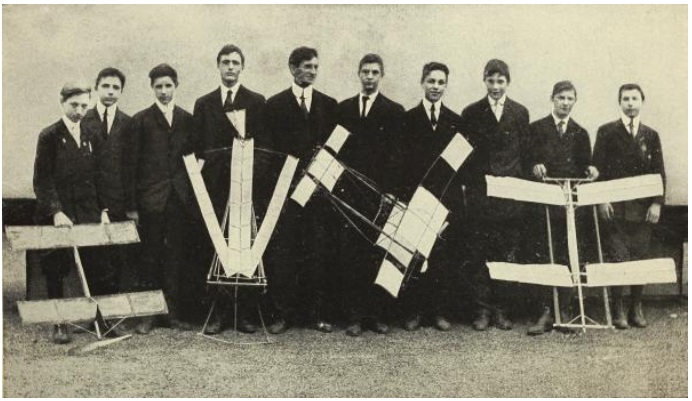
Nor are junior aëronauts merely imitators. The mystery of the problems of the air, the fascination of a new world of conquest, make a strong appeal to the American temperament. With thousands of bright boys working with might and main to build air-ships which will actually fly, there is certain to be real progress. Thousands of different models have been designed and put to actual test. This army of inventors, ranging in age from twelve to eighteen years, some of whom will be the aviators of the future, cannot fail to do great service, as time goes on, in the actual conquest of the air.

Within a few months this army of inventors has become organized into clubs, and a regular program of tournaments has been arranged. The junior aëro clubs are found in connection with many schools, both public and private; they are made features of the Young Men's Christian Association amusements, or they become identified with various neighborhoods. Tournaments are arranged between clubs of different cities or States, while an international tournament is even planned between the United States and Great Britain.

The junior aëro world has its prizes, which are scarcely less coveted than the rewards for actual flight. Some fifty medals have been distributed this year among the members of the New York Junior Aëro Club. Many elaborate trophies will be contended for during 1910 by the junior aëronauts of the country. A handsome silver cup of special design has been presented by Mr. A. Leo Stevens, and a second by Mr. Sidney

Bowman, while similar trophies are offered by Commodore Marshall, O. Chanute, and others.

The toy aëroplane is not limited to any one season, as one's sled, kite, or skates. In the winter months the tests of flight may be carried out in any large room or hall. There is even an advantage in holding such a tournament in a large school-room, riding-academy, or armory, since there is no baffling wind to contend with. Already definite rules have been laid down for conducting these tests and for making official records of flights. It is possible, therefore, to compare the records made in different cities or countries with one another.



A Junior Aëroclub with Its Instructor in One of the New York Public Schools.

The junior aëro tournaments are likely to be the most thrilling experience in a boy's life. The feats which the world has watched with such breathless interest at aviation meets at Rheims, Pau, or Los Angeles are reproduced in miniature in these boys' contests without loss of enthusiasm. The weeks or months of preparation in scores of little workshops are now

put to an actual test. The model air-ship, which has cost so many anxious and delightful hours in the building, is to spread its wings with scores of similar air-craft. The superiority of the monoplane or biplane forms is to be tested without fear or favor.

For the young inventors, even for the mere layman in such matters, the scene is extremely animated. On every hand one sees the inventors tuning up their air-craft for the final test. There are lively discussions in progress over the marvelous little toys. The layman hears a new language spoken with perfect confidence about him. The boys have already made the picturesque vocabulary of the world of aviation their own. The discussion ranges over monoplanes and biplanes, cellular types, and flexed planes, or of rigid and lateral braces. To hear a crowd of these enthusiasts shout their comments as the air-ships fly about is in itself an education in advanced aëronautics.

Directly the floor is cleared, the judges take their position, and the junior sky-pilot toes the mark, air-ship in hand. “One, two, three,” shouts the starter, and with a whir the graceful air-craft is launched. The flutter of the tiny propeller suggests the sudden rise of a covey of partridges. The little craft, at once so graceful and frail, defies all the accepted laws of gravitation. It darts ahead in long, undulating curves as it floats over the invisible air-currents. As in the aëroplanes of larger size, the length of the flight is dependent almost wholly on the motive power. As the little engine slows down, the craft wavers, and then in a long curve, for it can do nothing ungraceful, it glides to rest, skidding along the floor like a bird reluctant to leave the sky.

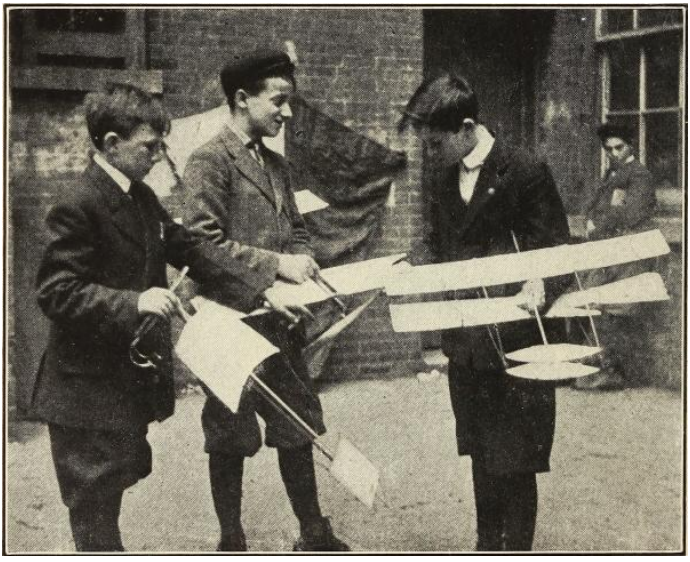
When the time comes for the races between the air-craft, enthusiasm runs high. Naturally these contests are the most popular features of the tournament. A line of inventors, with their air-craft, usually six at a time, take their positions at the starting-line. Each air-craft has been tuned to its highest powers. The labor of weeks, the study of air-craft problems, the elaboration of pet inventive schemes, are represented in the shining model. And the problem before the young inventors is most baffling. There are few models to work from, the science is still so young, and the inventor may well feel himself something of a Columbus in launching his frail craft upon this uncharted sea.

At the signal half a dozen propellers are instantly released, a whirring as of innumerable light wings fills the air. The curious flock of mechanical birds rises and falls, dipping in long, graceful curves as they struggle toward the goal. Some graceful little craft perfectly reproducing to the last detail the famous Wright machine shoulders along beside a glistening monoplane which resembles a great hawk with wings outspread. The next craft is perhaps a complicated arrangement of planes of no registered type, while the craft made familiar by the photographs of the famous aviators are reproduced.

The thrill of an aëroplane race is a sensation peculiarly its own. It seems so astonishing that the graceful little craft should remain aloft at all, that they are a never-failing delight to the eye. The varying fortunes of the race, the temporary lead gained by one craft, to be lost the next moment to another, which a second later itself falls behind, and the final heat

between the survivors in the race as they approach the goal, are enough to drive the average boy crazy with delight.

A Young Inventor in His Workshop.



Boys Comparing Models.

The rules for these contests are rigidly observed. Each air-craft is sent aloft by its inventor or owner. The start must be made from a mark, and of course each aëroplane must toe the mark. There must be three judges for each event. One stands at the starting-line and gives the word of command for the start of the race or flight, as the case may be. A second judge stands midway down the course, and the third at or near the finishing-line. Each young aviator winds up his craft, adjusts the power with his own hands, and sets the rudder for the flight.

The miniature air-craft must act in flight exactly the same as the great working air-craft which carry men aloft. A toy air-ship must make its flight in a horizontal position, and if it turns over in flight, even though it flies farther and faster than any other, it is disqualified. The craft must also fly in a reasonably

straight line toward the goal, and should it be deflected for any reason and go off at a tangent, the flight, no matter how successful otherwise, will not be counted. In case of a collision between air-craft, the race is repeated. The responsibility for adjusting the power, arranging the steering-gear, and giving direction to the flight at the start is entirely in the hands of the young engineer himself.

In measuring the length of the flights, again, the point at which the air-ship first touches the ground is fixed arbitrarily as the end. Often the little craft merely grazes the ground to rise and skid for many feet, but in the official count this secondary flight is not considered. First and last, no one but the owner of the little craft is permitted to touch it. The grace with which the ship lands is also taken into consideration in granting the prizes. Each boy is permitted three trials. As in the regular aviation world, these records rarely stand for more than a few days at a time.

These air-ships are driven by ropes of rubber bands which are turned on themselves until they are tightly knotted, when in unwinding they serve to drive the propeller around some hundreds of times. The rubber is so light that it adds little to the weight of the craft. The motor is of course a makeshift and at best only serves to keep the propeller in motion for a fraction of a minute. Experiments have been made in driving the propeller with compressed air, which is carried in an aluminium rod fastened beneath the planes. But the force of thousands of youthful inventive geniuses is certain to bring forth some new motive power.

It is characteristic of the American boy that our young aviators should feel themselves disgraced to fly a model not of their own make. As a result, miniature craft of amazing ingenuity and workmanship are being turned out by the amateur aviators all over the country. The materials employed, such as rattan, bamboo, or light lath, and the silk for covering the planes, or the wires for bracing the frame, cost but a few pennies. Toy aviation is one of the most democratic of sports.

# CHAPTER II

## WHY THE AEROPLANE FLIES

THE aviator must venture in his frail craft upon an unknown and uncharted sea. The great problem is to ride the shifting air currents and keep the machine right side up. Although we cannot see the air currents, we know that they are constantly ebbing and flowing, piling themselves in great heaps, or slipping away in giddy vortices. There is much beautiful scenery, high mountain peaks, deep valleys, and level plains formed by these ever shifting air currents through which the aviator must steer his course blindly as best he may. A great bank of whirling clouds driven before the wind shows how rough and tumbling a sea he must navigate.

The air being a much thinner medium than water is, of course, far more unstable and baffling. Its supporting power is not only very small but constantly varies. The flying machine which will navigate successfully in a perfectly quiet atmosphere may be unseaworthy, or rather, unairworthy, when a wind springs up, or the shifting of the wind may spoil all the air pilot's plans. To add to his troubles, the aviator must move among air currents which change and change again in a moment's time. As we study the difficulties of air navigation we will appreciate, more than ever, the wonderful patience, skill, and daring of the successful aviators.

The action of the air currents had first to be carefully studied before flight became possible. Although the air is invisible we now know exactly how the air currents act upon the wings or planes. When a plane surface, such as the wing of an aëroplane, moves horizontally through the air, the air is caught for a moment underneath it and is pressed down slightly and a moment later slips out again from under the other edges at the sides and back. It is this air under pressure which yields a slight support.

It has been proven by many experiments that this supporting power varies with the shape of the plane or surface driven horizontally through the air. A long narrow surface driven sideways gains much more support from the air than the same area in the form of a square or any other shape. In other words, a square surface ten feet square containing 100 square feet will not travel as far as a surface twenty feet long and five feet wide.

The explanation is very simple. As the square surface moves along, the air is momentarily compressed under the front edge, but instantly slips off at the back and sides. As the broad surface of the rectangular plane cuts the air, however, few of the air currents can escape at the sides while the most of them are crowded together and held in place until they slip off at the back. The supporting power of the plane is therefore in direct proportion to the length of the front or, as it is called, the entering edge of the plane.

Here we find one of the secrets of the flight of birds. The spread between the tips of their outstretched wings is much greater than the width of the wings themselves. It also explains why the Wright model, for instance, should be so oddly shaped and