

MODEL

AIRPLANES



ACKNOWLEDGMENT

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For a hobby that can take you sky high, you can't beat building model airplanes. You might start out with a simple model airplane and wind up flying the real thing. Every step of the way, there is an exciting phase of aviation to learn about.

Flying can take you places — to the mountains, to the seashore, to the big football game. Building model airplanes can launch you toward a career in the aviation field.

IS IT FOR YOU?

Everyone is affected by aviation. Much of your family's mail travels across the country on an airplane. Planes also carry food from one part of the country to another. Perhaps you have taken a trip on a passenger plane. An airplane takes off or lands in the United States every one-half second.

It took a long time for aviation to become so popular. When Wilbur and Orville Wright made the first air flight in 1903, some people just laughed. But as time went on, it became clear that aviation was not a laughing matter.

Although the laughing has stopped, some people will not fly because they feel it is "risky" or "dangerous." They ground themselves before looking at the facts. For example, there are more people killed each year in motorboats or motorcycles than in small airplanes. In aviation, there are only 1.25 accidents per million miles flown.

AT THE STARTING LINE

The best way to learn about aviation and flight principles is to build a model airplane. The forces that cause large aircraft to fly apply to the smallest model. By constructing your own model, you can learn about these forces firsthand.

But before you construct a model, you must make several decisions. First, you decide which type of model to make. Some models are scale models used for demonstrations. Other models can be thrown into free flight. Still other designs can fly under the control of a line or radio. If you want to learn about flight, your model should fly.

If you decide on a flying model, you'll need to decide how to power it for flight. Glider models don't need an engine. Other models are powered by twisted rubberbands. More complex models run by small en-

gines. If you are a beginner, you will be wise to select a glider or a simple rubberband-powered model. An advanced junior pilot might try an engine-powered model.

You must decide how much help you will need to design your model. Beginners have better luck if they stick to model kits available in hobby shops. Experienced model builders design their own planes or buy the plans and materials.

THE BIG FOUR

As important as airplanes are, few people know what makes an airplane fly. Actually, the explanation is simple. The principles that keep your model up in the air apply to the largest aircraft, too.

There are four forces that work together to make a plane stay in the air:

LIFT is created by air flowing over the wings. The air lifts the plane upward. You can see lift at work if you hold a piece of paper in front of your mouth and blow across the top of it. The paper will rise.

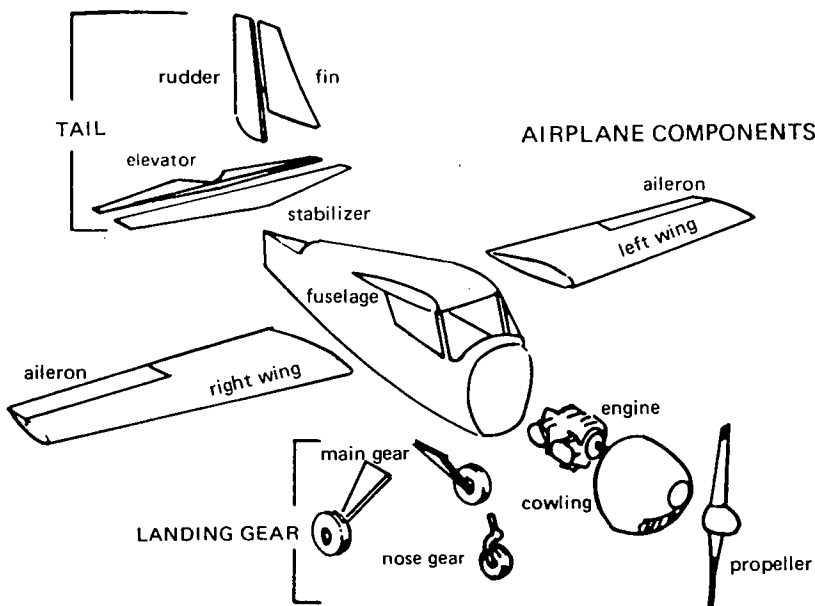
GRAVITY is expressed as the total weight of the loaded plane that must be lifted.

THRUST is the forward pull of the propeller.

DRAG is the friction of the air pulling the plane back.

These four forces always affect a moving airplane.





WHAT'S WHAT

Whether as an airplane manufacturer or a model builder, you need to be familiar with the parts of an airplane before you can construct your plane.

An airplane has five major parts — power plant, wings, tail, landing gear, and fuselage. Each part works with the others to help the plane fly.

Power plant — the engine. In a rubberband model, the rubberband is the power plant.

Wings — the section that provides lift for the plane.

Tail — the section at the rear of the plane that helps control its flight.

Landing gear — the understructure that supports the plane on the ground, like a car's wheels.

Fuselage — the body of the plane, like the passenger section of a car.

BRING ON THE TOOLS

The first step to a well-built airplane is using high quality materials. High in quality does not mean high in cost. High quality but low cost paper, wood, metal, and plastic are on sale at hobby shops. Of course, if you choose a kit, the materials will be included.

Full-scale manufacturers build their planes from metal. However, this material is too heavy for your model. Balsa wood, light in weight and easier to work with, is more suited to models. Other woods, such as pine, spruce, and basswood, are used when strength is necessary. Your hobby shop dealer can help you select the best materials for your design.

You also will need the right tools for the job. Beginners will find the necessary tools around the house: pins, waxpaper, rubberbands, glue, pincher clothes-

pins, pliers, a hobby knife, scissors, a pencil, and a ruler. As models become more complicated, so do the tools. More advanced designs might call for wire cutters, coping saws, or drills.

AND NOW TO BUILD

Each model airplane is made differently. However, there are hints to help you no matter which design you are making.

All good workmen — even the professional manufacturers — assemble their tools and materials in one spot before they begin to work. You'll find building easier if you follow this example.

If you are working with other model builders, put your name or initials on every piece of your equipment.

Start by reading the plans — or instructions — with care.

Before you glue, locate each part mentioned in the plans.

Follow the plans closely. Your plane will look sharper, fly better, and be safer if you follow directions.

Sanding balsa is easier if you sand a large sheet of wood before cutting. Always sand with even pressure in the same direction.

To glue, stick the end of the piece you are gluing into the airplane cement. Give the wood time to soak up some glue.



THE FINISHING TOUCHES

Most model builders paint their models. Paint makes the airplanes easier to spot in the air or on the ground. And a well-painted model is prettier, too! But remember, no amount of paint will cover up some mistakes.

Before they are painted, many models are covered with lightweight fabric or paper. The covering protects the frame and helps lift the plane into the air. Most rubberband-powered models are covered with lightweight paper. Your plans may call for a covering on the wing and tail only.

Some directions will tell you to seal the wood or covering before you paint it. A few coats of sealer will keep the surface from soaking up the paint. Follow your directions.

The first thin coat of paint should be brushed quickly across the grain. The second coat, a thicker coat, should be brushed with the grain. Allow the paint to dry before adding more coats.

Some modelers paint their planes a dark color on the underside and a light color on the upper surfaces. The dark color will help you see the plane in flight while the light color helps you see the plane when it lands.

You can decorate your model with a variety of special decals. Make sure the surface is dry before applying.

THOSE ALL-IMPORTANT TESTS

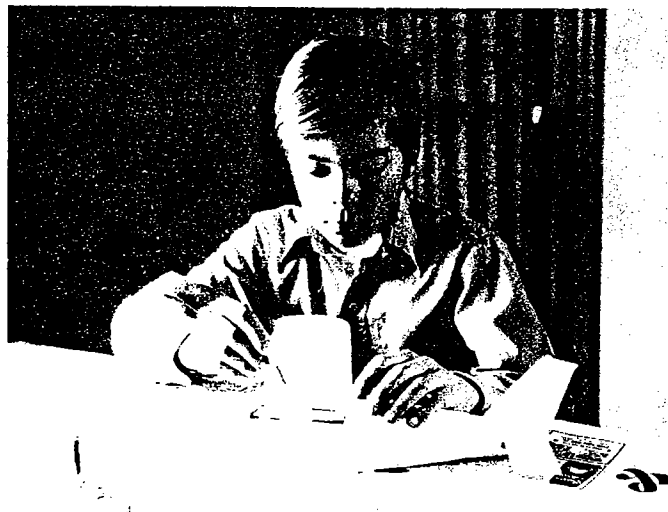
Safety is a big word in aviation, no matter how large or small the plane. Even the model pilot has to be concerned with safety. Because they care about safety, model builders as well as manufacturers must test their products before flight. A huge transport

might go through testing for more than 6 months, but a model plane can be tested in just a few minutes.

If you are constructing a rubberband-powered plane, there are several preflight and safety measures for you to observe:

Cover the rubberband hooks with adhesive tape or rubber tubing. This covering will help keep the rubber from breaking.

Before attaching the rubberband, stretch it as far as possible and bring it slowly back to normal size sev-



eral times. Then, wipe it with glycerine or rubber lubricant.

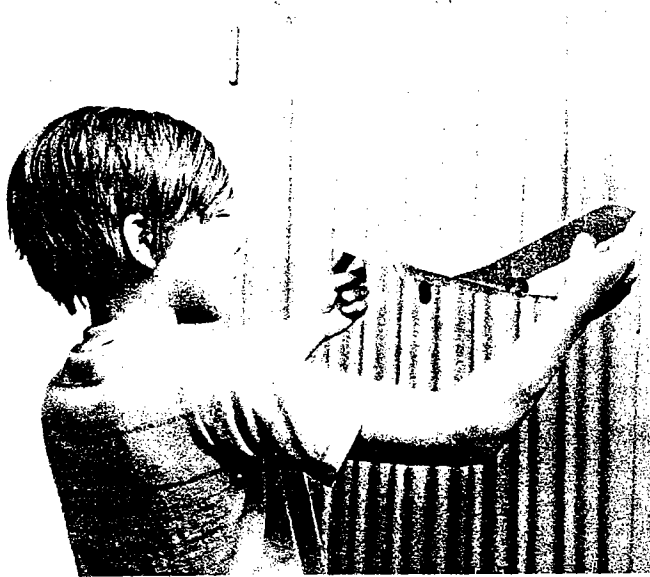
Wind the rubberband motor and release the propeller several times. To correct vibrations caused by an unbalanced propeller, sand the heavier blade slightly.

Hold the model in front of the wings and wind the rubberband with 50 turns of the propeller. Let it run down to make sure that the propeller and rear hooks remain secure. Repeat several times.

Rubberband-powered planes, as well as other planes, must be properly balanced to fly well. To test

for good balance, support the plane by two fingers, one near each wing tip and about one-third of the way back from the forward (leading) edge. (This is the center of gravity.) The balanced plane's nose will rise just a bit.

The actual flight test is best made where the weather will not affect the flight. A gym or other large



building would be ideal. If there is no such building available, make your test flight on a calm day.

Hold the plane near the center of gravity of the fuselage portion with one hand. With the other hand, wind the propeller and hold it in position. Point the nose of the plane slightly downward and release the propeller. Then let go of the plane's body. Never throw the model with great force.

The test might reveal some problems. For your safety, correct any problems before you fly the plane again. You should try the solutions one at a time, testing after each adjustment.

PROBLEM	SOLUTION
Plane dives sharply or sinks	<ol style="list-style-type: none"> 1. Remove as much weight as possible from nose. 2. Add a thumbtack weight to the tail. 3. Adjust elevators upward if necessary.
Plane rises sharply, then dives	<ol style="list-style-type: none"> 1. Add a paperclip or thumbtack weight to the nose. 2. Adjust elevators downward if necessary.

Too rapid climb and inside loop

1. Use lighter rubberband.
2. Adjust elevators downward if necessary.

Propeller unwinds too fast

1. Use smaller rubberband.

THE FLIGHT

Send your plane into the air the same way you did for the test flight. Remember these pointers:

Never fly a small rubberband-powered plane in wind of more than 10 miles per hour.

Models fly better in warm weather than cold weather.

Fly your model in an open space; gas-powered models should be flown away from houses because of noise.

Models perform best when they fly over surfaces that reflect heat. Grain fields, beaches, gravel surfaces, and cement areas will reflect heat.

All pilots have a responsibility to follow safety rules — no matter what size their plane.

A START

Model airplanes have given many people a start in aviation. But did you know that models gave aviation its start, too? Before the Wright brothers made their first flight in 1903, they constructed models to help them learn. Since then, models have been an important part of aviation progress.

As model builders experimented, they came up with new ideas for full-scale aircraft. Manufacturers hired model builders to help improve current designs. If it weren't for model airplanes, aviation probably wouldn't be as advanced as it is today!

Pilots have made these accomplishments, with the help of model aviation, of course:

- 1909 — Flight across the English Channel
- 1918 — Regular air mail service established
- 1923 — First coast-to-coast flight (nearly 27 hours!)
- 1927 — First solo, nonstop flight across the Atlantic
- 1931 — First nonstop flight across the Pacific

As jets came into being after World War II and the aircraft industry boomed, even more headlines were made. Flying became important to many people — from the traveling business person to the family going on vacation.

SOMETHING FOR EVERYONE

Studying aviation can be a hobby now and grow into a career. Or perhaps it will always be a hobby for

you. That's the nice part about studying aviation — there's something for just about everyone at every level.

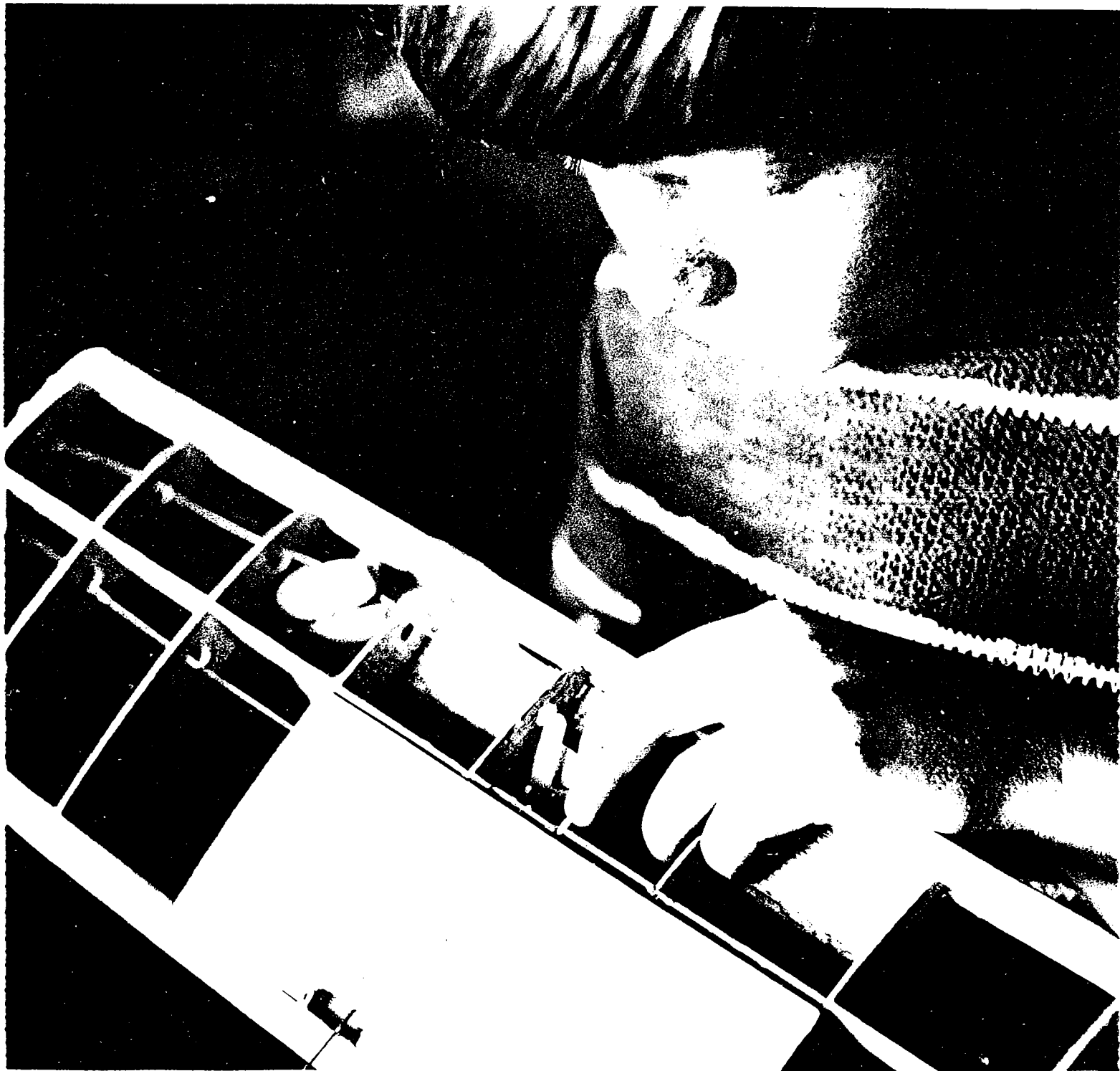
One thing you might do now would be to start a project group to build, fly, and learn about airplanes together. Many groups get together to have contests with their models. Whose will climb the fastest? Whose is built the best? Whose will fly the longest?

Many skilled private pilots consider themselves hobbyists. They fly because it is fun. They find it exciting to take pictures from their airplanes, to beat the

heavy vacation traffic, or just to take a sightseeing tour by air. Some private pilots belong to clubs and organizations that help them get the most out of flying.

Other pilots are commercial pilots. Some spray fields for farmers or fight forest fires from the air. Others conduct aviation research. Many fly airplanes for the major airline companies or businesses.

How will you fit in the picture? Only time — and you — can tell. Remember, aviation may have an opportunity waiting for you!



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