SOUTH PARK COMMISSIONERS
Edward J. Kelly, Pres.
Michael L. Igoe  Philip S. Graver
Benjamin J. Lindheimer  Wm. H. McDonnell


MODEL AIRPLANES

By
B. C. Friedman

Prepared in the
RECREATION DEPARTMENT
V. K. BROWN, Supt.

With the Co-operation of the Following Staff:
R. Russell  Walter Roy  R. U. Nelson  Wm. C. Collins

Grateful Appreciation is Hereby Expressed for the Technical Service and Counsel of the Following, Whose Co-operation Made this Manual Possible:

John Rappold  Frank Kekimken  Tpm Willis
Clarence Krejci  Henry Puccvitz  Chester Klein
John Rosich  Steve Klaazura  Joe Zamora
John Var. Vliet

Copyright
1934

Photographs by James Kearns
Engravings by Metal'O-Graph Co.
THE South Park System dates back to 1869. In 1900, a new development was undertaken, the erection, in small parks added to the existing system, of buildings for community use providing gymnasiums, baths, club rooms and assembly halls, designed at first to maintain vigorous health under city living conditions. The service of these buildings quickly developed into provision for creatively occupying the leisure time of the neighborhood population, and gradually this came to be recognized as an essential public service.

From the first, hobbies in the South Parks Service Program have been items of major appeal. With more than a quarter century spent in serving leisure needs, pioneering experience has established a background for definite contribution toward solving the problem now currently termed the "New Leisure."

The program of the parks has expanded to a degree originally undreamed. It has now resulted in the publication of a series of booklets intended, primarily, for the use of groups using the South Park Field Houses, but through the co-operation of The National Recreation Association, made available also to the country at large, since that organization has volunteered to aid in the distribution of these pamphlets on a nation-wide basis among group workers and individual hobbyists.

These booklets make no pretense of being complete text books. They are prepared for a specific South Park purpose. They are intended to furnish ideas and suggestions presented clearly in picture form, to stimulate creative thinking, and the exploratory pursuit of hobbies for the satisfactions they afford. Experienced recreation experts have supervised the work.

The making of these books continues an adventure in co-operation. Enthusiasts in the several subjects have contributed their experience and counsel. Technical engineers and mechanics have added their critical inspection and advice as experimenting progressed in shop, or club room. Draftsmen and artists have consulted to portray as simply as possible the essentials not only of pattern, but also of process. Editors have striven to avoid the indefiniteness of text, employing instead the simplicity of picture, in presenting each subject.
All have been moved by the feeling that life is carrying us into new dimensions, where what we have lost is perishable possessions may perhaps be compensated in imperishable satisfactions, to be achieved in our increased leisure if only that leisure be wisely employed to capitalize those hours which remain free from controls, and launch ourselves on adventurous voyages toward any new discoveries and new masteries for which we have individual taste and talent.

The Leisure Hobbies Series addresses itself not to the whole cycle of ends to which we may devote this leisure, but only to that segment in which materials, under the hand of the worker, are made to assume new pattern or composition, or are ordered to accomplish new purposes. The Series treats of the creative hobbies only, and even of those it concerns itself with such as best lend themselves to amateur and group attack.

Our presentation contemplates the formation of club groups to undertake together the working out of each project in the congenial company of fellow enthusiasts, equally interested in the matter in hand. Our hope is that such groups, by profiting through one another’s experience and suggestion, may carry accomplishment into new fields of advanced technical development, open up other avenues for exploration, or experiment, and by association of local groups into national federations of clubs pursuing kindred subjects, may develop the means of intercommunication through the National Recreation Association, for exchange of information and experience, necessitating the publication from time to time of supplements to the first series of booklets, adding improved techniques or devices and new subjects for experiment or study. The radio grew that way. We hope that in the workshop of the home, and club room, these other hobbies will grow in similar fashion, until our present pages become obsolete in comparison with the new standards and improvements which developing skill will discover and make available to fellow craftsmen.

Correspondence, inquiry, criticism or suggestion may be directed to the Leisure Hobbies Series, South Park Commissioners, Chicago, or to The National Recreation Association, 315 4th Avenue, New York.
This booklet is the outgrowth of application of tools and materials by boys and young men over a period of fruitful years during their leisure time. Model airplane building and flying formed a part of their recreation program, stimulated by the park management and guided in their craftsmanship by the author. Designing, planning, building, and flying model airplanes lends itself in pleasant participation to all age groups. The pre-school child can find a performing project within the scope of his ability in the simple, solid wood glider, while the expert mechanic can find work to tax his greatest skills in attempting to produce a scale model to satisfy wind tunnel requirements for precision, and feel amply rewarded with a ship of accurate as well as beautiful lines. It is at once a sport, a craft, and an art.

The story of model airplane activity is a tale of adventure in a fascinating field. So rapid has been the rise in popularity of model airplane work that it has become extremely difficult to keep up with the development of the craft. While model airplanes were being built and books about them written many years ago it was not until quite recently that the craft took on nation-wide proportions. A few of the important factors which made for the rapid strides in recent years are the following:

1. Introduction of the use of balsa wood as material for construction.

2. Organization of a competitive program of park and other recreation model airplane clubs with individual and group competition.


4. Introduction of national model airplane tournaments.

5. Refinement of materials, methods of construction, and design of models.
(6) Greater sharing of advanced ideas and methods by exchange of plans, and publication of improvements in newspapers, magazines, and books.

We are all familiar with the early model efforts of Leonardo da Vince and the later successful efforts of Langley, the Wright Brothers, Stout, and Laird. Their rise from the ranks of model experimenters demonstrates the practical application and educational merits of model airplane work. It may be safely said that the real aircraft industry has borrowed more from model aviation (and is continuing to do so) than is true in any other similar field.

And yet there is a genuine poverty of instructional material on the subject of dependable model mechanisms called airplanes. Early model work was done only by a few especially gifted craftsmen who worked alone on hunches and guesses. This produced a series of so called freak models.

Later observation and tutoring took their place in the development of model aviation. Today it is practical for an instructor to teach a group the pleasant art of model airplane construction and flying. The more comprehensive the text, plans or graphic instructions the easier the work of learning the craft, the better the product turned out, and the easier it will be to reduce the need for personal instruction.

In an attempt to bridge that gap—between seeing how it is done and doing it, this booklet had its birth. With the aid of this self instructor in model airplanes it should be possible for an inexperienced leader to carry a group through the simple steps in construction, and later to progress with them through the more refined parts of design.

The author enjoys the distinction of having been one of the committee of three who planned the First National Miniature Aircraft Tournament. Boys under his leadership rose to national competitive junior and senior championships.
Flying model airplanes are generally limited by conditions under which they are flown—conditions which are usually out of the control of the model flyer. Models are very sensitive to temperature, humidity and drafts. Obstructions hamper flight. A large auditorium with a high clear ceiling; without exposed beams or chandeliers; warm, dry, and free from drafts will give indoor models an opportunity to perform best. Model builders who live where such an ideal hall is not available are flying their planes under handicaps. Similarly outdoor flying performance depends a great deal upon weather conditions and the terrain. Some localities have natural geographic characteristics favorable to the flight of outdoor model airplanes while other places are flat, lack rising up-currents, and are naturally gusty making them unfavorable for long model flights.

This difference in flight conditions tends to influence the types of planes model builders will produce in various localities. For example, favorable outdoor flying conditions in Los Angeles make large, heavy planes practical, long duration performers, while Chicago “the windy city” (more aptly called the gusty city) calls for light ships with plenty of power. A short outdoor season has resulted in specializing in indoor types of planes.

The models which follow are arranged in step by step sequence—from the simple to the complex. They represent typical sample planes in each class which usually forms a section of a model airplane tournament. These models have been built in large numbers and are the result of experiment and development in the model airplane clubs of the South Parks of Chicago. As new, improved types are perfected we hope to modify these planes and add to them from time to time. Many happy landings.
The Model Airplanes described in this booklet fall into the following classes:

I. As to function.
   1. Display models or non-flying.
   2. Flying models.

II. As to place of flight.
   1. Indoor models.
   2. Outdoor models.

III. Depending on power used.
   1. Rubber strand power.
   2. Other motive power as:
      (a) Compressed air.
      (b) Springs.
      (c) Gasoline.

IV. Structural variation.
   1. Stick models.
   2. Fusilage models. (Wakefield.)
   3. Commercial or original designs.
   4. Scale models.
      (a) Flying scale models.
      (b) Display or nonflying, sometimes called replicas.

V. Types of planes as, in real airplanes as monoplane, biplane, etc.

The materials needed for model airplane construction depend on the type of model to be built and are specified in each plan. On the whole, this list contains the most important things to be used.

Balsawood.
Bamboo.
Japan Tissue Paper.
Music Wire. (Piano, Guitar String.)
Model airplane glue or nitro cellulose cement.
Banana liquid. (Pure banana oil.)
Strand rubber.
A complete discussion of each of these materials will not be attempted here since most of them are common enough today and can be obtained in model airplane supply stores.

**Balsa wood** comes from South America, is about half the weight of cork, and is so light and soft as to be easily shaped with light tools as a knife or razor blade.

**Bamboo** is still used on many planes to advantage where great strength and flexibility is needed, as in the landing gear of a commercial model. It may be easily bent.

### MATERIALS FOR MODEL AIRPLANES

**Balsa**

**Advantages.**
1. Light.
2. Easy to cut.
3. Sticks tight with model glue.
4. Long, straight grained may be had.
5. Economical, little waste.

**Disadvantages.**
1. *Porous* open grain does not leave a smooth surface on solid scale models, poor finish.
2. *Brittle*, must be extremely thin to bend, and then should be steamed.

**Bamboo**

1. Strong.
2. Flexible.
3. May be bent into permanent curves rather easily.
4. Heavy.
5. Knots about every fifteen inches or closer.
3. Only part with glossy surface should be used.
4. Ages poorly—dries out and becomes brittle.
5. Does not hold as well with any glue. Should be tied where strong joint is needed.
Advantages (cont.)

1. Good for strong parts of display scale models.
2. Smooth surface takes good finish.
3. Makes good thin, flexible propellers for heavy jobs as for compressed air motors.

Disadvantages (cont.)

1. Too heavy for flying models.
2. Harder carving than balsa, easier than bamboo.
3. Less flexible than bamboo, more flexing than balsa.

COVERINGS. Hakone Tissue. (Japanese.)

1. Easy to apply.
2. Strong.
3. Takes dope well.

SUPERFINE TISSUE. (Japanese.)

1. Light — good for indoor models.
1. Too weak for large outdoor ships.

MICROFILM. (See Instructions.)

1. Lightest covering.
2. Airtight.
3. Least skin irritation.
4. Excellent for indoor planes.
1. Difficult to obtain. Must be made by the user.
2. Difficult to handle and to apply.
3. Fragile—must not be touched, does not last.
4. Too weak for outdoor models.

The tools needed are few and simple. The beginner’s models can be made with merely a razor blade. As the worker becomes more ambitious more tools are needed as, a sharp pocket knife, pencil, ruler, small water-color brush, long nose pliers, diagonal cutters, candle, some straight pins, pin-vise, fine scale. In a group one of each of the more expensive tools may be used in turn by each member.
High Wing Monoplane
An airplane having one main supporting surface placed above the fuselage.

Low Wing Monoplane
An airplane having one main supporting surface placed at the bottom of or below the fuselage.

Bi-Plane
An airplane having two sets of wings, placed one above the other.

Seaplane
A seaplane having two sets of wings, placed one above the other. The span of the lower wings being one half or less of the span of the upper wings.

Triplane
An airplane having three sets of wings, placed one above the other.

Single Pontoon Seaplane
An airplane having a pontoon placed below the fuselage for landing on, and taking off from the water. Wing pontoons are carried near the tips of the wings.

Twin Pontoon Seaplane
An airplane having two pontoons placed side by side below the fuselage for landing on, and taking off from the water.

Flying Boat
A seaplane having a fuselage shaped like a boat for landing on, and taking off from the water. Small auxiliary floats are carried near the wingtips.

Amphibian
An airplane provided with pontoons or a boat-hull for landing on, and taking off from the water, and retractible wheels, carried by the pontoons or boat for landing on, or taking off from the ground.
**Bi-Motor**
An airplane having two motors.

**Tri-Motor**
Any airplane having three motors.

**Tractor**
A type of airplane having the propeller or propellers in front of the wings. The plane being thus "pulled" through the air.

**Pusher**
A type of airplane having the propeller or propellers in the rear of the wings. The plane being thus "pushed" through the air.

**Pusher-Tractor**
A type of airplane having one or more propellers in front, and one or more propellers in the rear of the wings. The engines driving the respective front and rear propellers are usually placed in line.

**Glider**
A type of airplane without a motor, capable of soaring in rising air currents.

**Ornithopter**
A machine capable of rising and moving forward by means of flapping wings, like a bird.

**Autogiro**
A flying machine provided with narrow revolving wings which are turned by the air as the machine is driven forward by the propeller. The autogiro is capable of steep ascent and descent at a very low speed.

**Helicopter**
A flying machine capable of vertical ascent, sustentation, and vertical descent.
MODEL AIRPLANE NOMENCLATURE
STICK MODEL RG6 TYPE

1 - Wing - The main surfaces of an airplane for supporting the plane in the air.
2 - Leading edge - The front edge of a surface, such as a wing or elevator.
3 - Trailing edge - The rear edge of a surface, such as a wing or elevator.
4 - Wing - The main members of a surface, such as the wing or the elevator.
5 - Rib - The lateral members of a surface such as the wing or the elevator which connect the leading edge and trailing edge and to which the wing covering is fastened.
6 - Wing tip - The extremity of the wing.
7 - Chord - The line at right angles from leading edge to trailing edge.
8 - Span - The dimension of the wing or elevator from tip to tip.
9 - Wing clip - The clips or clamps used to hold the wing to the fuselage or motor stick at the front and rear spars.
10 - Fuselage - The main body of an airplane containing crew, motor and useful load.
11 - Elevator - A horizontal surface carried by the rear end of the fuselage and hinged so as to show the plane up or down.
12 - Stabilizer - A fixed horizontal surface carried by the rear end of the fuselage to which the elevators are hinged, to make the plane stable longitudinally.
13 - Rudder - A vertical surface placed to the rear of the vertical stabilizer or fin to steer the plane to the right or left.
14 - Fin - A vertical surface placed over the horizontal stabilizer or whatever portion the plane is stable directionally.
15 - Motor - Base or motor stick - A member taking the place of the fuselage on a stick model and carrying the rubber motor.
16 - Propeller - A narrow bladed screw carried by the fuselage or motor base and made to revolve to pull the airplane forward.
17 - Propeller shaft - The shaft on which the propeller is mounted and which turns with it.
18 - Thrust bearing - The support and bearing for the propeller shaft.
19 - Washer - A small washer on the propeller shaft, placed between the thrust bearing and the propeller to lessen the friction.
20 - Motor - A device that makes the propeller turn.
21 - Rubber motor - A twisted rubber band or strands fastened to the propeller shaft and the rear motor hook of the motor base to make the propeller turn.
22 - Rear hook - The hook carried by the motor base or fuselage to which the rear end of the rubber motor or 3. hook is fastened.
23 - Can - A support for the rubber motor carried by the fuselage or motor base. Used to keep the motor base straight and free from breaking.
24 - Tail - A general name for all stabilizing surfaces located on the main wings.
25 - Tail boom - A member fastened to the motor base on which the controls and stabilizing surfaces are mounted.
26 - Tail stick - A member projecting downward below the elevator to prevent damaging the tail of the plane in landing.
27 - Landing gear - The device which supports the airplane on the ground and is used for landing and taking off.
28 - Landing gear wheels - Wheels or rollers carried by the landing gear for moving on the ground.
29 - Landing gear struts - Members extending below the fuselage which carry the wheels.
30 - Landing gear axle - The axle connecting the struts and carrying the wheels.
31 - Covering - The material used to cover all wings control and stabilizing surfaces as well as the fuselage.
32 - Wing - Dihedral - The angle which a wing makes with the horizontal when viewed from the front.
33 - S-hook - The hook fastened between the rubber motor and the rear motor hook. Used for winding with a converted egg beater or other mechanical winder.

17B.6-100

South Park Commissioners
GAGE PARK

MODEL AIRPLANE NOMENCLATURE
STICK MOTORS
RG6 TYPE
MODEL AIRPLANE PROPeller CARVING
SHOWING STEPS OF CONSTRUCTION.

STEPS IN CONSTRUCTION
As shown in details from 1 to 17

MATERIALS

<table>
<thead>
<tr>
<th>Qty</th>
<th>Size</th>
<th>Material</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/4 x 1/2 x 3&quot;</td>
<td>Balsa</td>
<td>propeller</td>
</tr>
<tr>
<td></td>
<td>1 1/2  No. 8</td>
<td>Music wire</td>
<td>Shaft</td>
</tr>
</tbody>
</table>

Propeller shaft.

11 12 13 14 15 16 17

Propeller finished. Shaft from stage 14 inserted.

Shaft at plane end bent to hook and priming coat of glue put on hub.

Shaft hook anchored into propeller and glued in place.
MODEL AIRPLANE
PROCESS OF CARVING PROPELLER

1. Cutting to diagonal lines and guide lines
2. Cutting to diagonals on one side
3. Cutting to diagonals on other side
4. Sandpapering to lines
5. Sanding a camber propeller block
6. Propeller sanded showing the thickness
7. Cutting out hub
8. Placing propeller shaft
 METAL FITTINGS

Front Motor Hook for Twin Pusher

Rear Hook - Stick Model

5 - Hook

Front Wing Clip - Indoor Tractor

Front Wing Clip - Stick Model

Designed by Doe

Drawn by Doe

Scale in inches

South Park Commissioners
GAGE PARK

METAL FITTINGS

17A-4-125
MODEL AIRPLANE
PROCESS OF WING TIP CONSTRUCTION

THE PARTS OF BAMBOO USEFUL FOR MODEL AIRPLANE WORK

SPLITTING BAMBOO FOR WING TIPS

BENDING BAMBOO WITH CANDLE FLAME WING TIP CONSTRUCTION

BENDING BAMBOO HORSE SHOE SHAPE

WING TIPS

MORTISE FOR WING TIP

WING
DIFFERENT TYPES - DOUBLE SURFACE WING TIPS

1. Round Bamboo Tip
2. Rake Bamboo Tip
3. Square Tip
4. Round Balsa Tip

DIFFERENT TYPES - SINGLE SURFACE WING TIPS

1. Flat Wing - Tapered Straight Tip
2. Flat Wing - Tapered Round Balsa Tip
3. Flat Wing - Round Bamboo Tip
4. Cambered Wing - Square Tip
5. Cambered Wing - Tapered Tip
6. Cambered Wing - Round Balsa Tip
PROCESS OF MAKING RIBS

1. Sheet of balsawood cut to size.
2. Sheet penciled for cutting strips.
3. Strips are cut.
5. Strips collectively pinned together.
7. Rear upper side cut and pared smooth.
8. Nose rounded and pared smooth.
9. Nose and top sanded smooth.
10. Rear edge finished.
12. Top and bottom marked for grooving.
13. Grooves cut with razor blade to fit spars.

Designed by
Drawn by
Checked by
South Park Commissioners
GAGE PARK

1785122
**PROCESS OF MAKING DOUBLE SURFACE WINGS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heavy center spar Light leading and trailing edge Simple construction</td>
</tr>
<tr>
<td>2</td>
<td>Two medium center spars Light leading and trailing edge Tends to distribute strains</td>
</tr>
<tr>
<td>3</td>
<td>Two light center spars Leading and trailing edge Rather weak</td>
</tr>
<tr>
<td>4</td>
<td>Three center spars Leading and trailing edge Strong - Distribution of strains</td>
</tr>
<tr>
<td>5</td>
<td>Five center spars Leading and trailing edge Strong great distribution of strains</td>
</tr>
<tr>
<td>6</td>
<td>One center spar Leading and trailing edge Very light and strong but tends to twist</td>
</tr>
</tbody>
</table>

**PROCESS OF MAKING SINGLE SURFACE WINGS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simple flat rib construction Easy to make Weak - apt to warp</td>
</tr>
<tr>
<td>2</td>
<td>Cambered rib construction More difficult to make but strong and efficient</td>
</tr>
</tbody>
</table>
PROCESS OF MAKING DOUBLE SURFACE WINGS.

1. Ribs arranged ready for use.
2. Spars arranged ready for use.
4. Two bottom spars glued to ribs.
5. Center top spar added to.
6. Front top spar added to.
7. Rear top spar added to.
8. Leading edge added to.
9. Trailing edge added to.
1. Take a piece of Balsa or plywood and draw to actual size a side view of the fuselage.

2. Cut two pieces of Balsa longer than necessary and place them together as shown.

3. Cut Formers to length as shown (two of each, one for each side).

4. Apply a full drop of glue to the Balsa. Ends of all Formers, but do not apply glue to the Longerons. One Former is shown glued to Longerons. Stick Pins in board to hold Longerons and Formers together.

5. Place Bottom Longerons parallel to the Top Longerons and glue the Former (a) to both Longerons. Stick Pins in board to hold Longerons and Formers together.

6. Bend Bottom Longerons up in front and glue in the Front Former (b). Add Pins to hold Longerons and Formers together. The bottom Longerons will spring out back of (a) as shown.

7. Bend Bottom Longerons up back of Former (a) and glue in the rear Former (c). Add Pins to hold Longerons and rear Former together.

8. Glue in the Formers (a) and (c), intermediate (a) and (b). Add Pins.
Glue in Former h back of c and add pins. This Former must be put in first to correct the bellying out of the lower Longeron.

Glue in successively all intermediate Formers between h and e and add Pins for each Former

All Formers glued in. Set aside to dry.

When glue is dried Pins are removed and the ends of the Longerons are trimmed with a Razor Blade

One Side Frame of Fuselage completed

The second Side Frame must be exactly like the first. The Longerons of the second Side Frame are placed on top of those of the first Side Frame and process 6 to 12 is then repeated. Stage 7 is here shown.

All Formers have been glued in the second Side Frame. It is set aside to dry.
When second Side Frame is dry, the Pins are removed and the Longerons are trimmed at the ends with a Razor Blade.

After trimming both Side Frames completed are exactly alike. The excess glue on the Formers makes them stick together.

The Frames are now pried apart by inserting a Razor Blade between the Longerons and Formers.

The two Side Frames are separated and have been touched up with glue.

Take a piece of Beaverboard or 3 Ply wood and draw to actual size a Top View of the Fuselage.

Place Side Frames together on edge and hold them together with Pins. Then cut top and bottom Formers to size. Two Formers should be cut for each of the Formers shown.

Place Side Frames on edge opposite each other and glue on top and bottom Formers a and a’. Add Pins to keep Frames and Formers together.

Plan
Bend Side Frames together in front and glue in Front Formers. Add Pins to hold Formers together. They will spring outward beyond Formers a-a, as shown.

Bend Formers together Back of Former a-a, and glue in the Rear Formers. Add Pins to hold Frames together.

Glue in Formers intermediate front and a-a, and add Pins.

Glue in the Formers b-b, back of a-a, in order to give Frames the proper initial curvature. Add Pins.

Glue in consecutively all remaining Formers from b-b, back and add Pins. Set aside to dry.

After drying remove all Pins. Fuselage Frame is now complete.
MODEL AIRPLANE
PROCESS OF MAKING FUSELAGE — ADVANCED TYPE

Sheet #5

1. Outlines of FUSELAGE are made on sheets of ply wood or balsa board and the FUSELAGE is constructed in the same manner as for the simple FUSELAGE illustrated on sheets 1, 2, 3, and 4.

2. The main structure of the FUSELAGE completed with Longerons and formers glued together.

3. The turtle-back formers are drawn on a sheet of 1/4 balsa cut out and notched for Longerons.

4. The turtle-back formers are glued in place.

5. The turtle-back Longerons are cut to size, placed in position, glued in the notches of the formers and after drying, trimmed at the ends.

PROCESS OF MAKING COCKPIT — ADVANCED TYPE

6. Layout outline of Cockpit cover on sheet of 1/8 sanded balsa and cut out.

7. Cut out turtle-back Longerons between formers in Cockpit section of FUSELAGE and glue the Cockpit cover over the formers and to the outside of the upper FUSELAGE Longerons.

8. Side view of FUSELAGE frame complete with Cockpit.

17B-6-136
Bill of Material

1. Piece balsa, 1/8" x 1/8" x 10 1/2" for motor base
2. Piece balsa, 1/16" x 1/2" x 10 1/2" for fuselage
3. 2 pieces balsa, 1/16" x 1/8" x 12" for wing spars
4. Piece balsa, 1/2" x 2" x 3" for ribs
5. Piece balsa, 1/8" x 1/2" x 2" for wheels.
6. Piece balsa, 3/8" x 3/8" x 5 1/2" for propeller block
7. Piece bamboo, 1/32" x 1/16" x 5 1/2" for landing gear
8. Japanese tissue paper for fuselage, wing & tail covering
10. Piece rubber, 1/32" x 1/32" x 20" for motor.

Thrust washers, model glue & banana liquid.

Note: Japanese tissue is to be placed on 1 side only. This aero plane was designed 
& built by B.C. Friedman, South Park Commissioners, Chicago, ILL.
Model Aeroplane Details - S.R.C. - M.10

Progressive steps in carving the propeller.

Motor Base

10 1/4" x 10 1/4"

Fuselage

1/2"

Stabilizer & Elevater

Trailing Edge

1 3/8" - 1 3/8" - 1/16" x 1/16"

Leading Edge

Fin & Rudder

1 1/2" - 1 1/8"

1/4"

Top of Wing

Leading Edge

2 1/2" - 2 1/2" - 1/16" - 1/16" - 2"

Ribs

Front of Wing

1/16"
Pattern on picture is reflected onto glass screen where it is enlarged to any desired size for copying.

**Diagram**

**Table**

<table>
<thead>
<tr>
<th>Required Material</th>
<th>Size</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Veneer Panel</td>
<td>9/8 x 7/8 x 1 1/4</td>
<td>Sides</td>
</tr>
<tr>
<td>1 &quot;</td>
<td>10 x 13 x 14</td>
<td>Front</td>
</tr>
<tr>
<td>4 &quot;</td>
<td>10 x 7/8 x 13</td>
<td>Top</td>
</tr>
<tr>
<td>1 &quot;</td>
<td>3/4 x 7/8 x 1 1/4</td>
<td>Bottom</td>
</tr>
<tr>
<td>4 &quot;</td>
<td>3/8 x 2 1/4 x 4 1/2</td>
<td>Lens Box</td>
</tr>
<tr>
<td>4 Moulding</td>
<td>1 x 10 1/2</td>
<td>2 Veneer Pan. 9/8 x 7/8 x 1 1/4 Sides.</td>
</tr>
<tr>
<td>2 Pine</td>
<td>1/2 x 1 x 8 1/4</td>
<td>Braces</td>
</tr>
<tr>
<td>1 Piece</td>
<td>1 x 1 x 7/8</td>
<td>Gluing Box</td>
</tr>
<tr>
<td>2 Ventilation</td>
<td>3 1/2 Dia</td>
<td>2 Veneer Pan. 9/8 x 7/8 x 1 1/4 Sides.</td>
</tr>
<tr>
<td>2 Veneer Panel</td>
<td>1 1/2 x 1 1/4 x 2</td>
<td>Top &amp; Bottom</td>
</tr>
<tr>
<td>2 Veneer Panel</td>
<td>9/8 x 2 1/2 x 2 1/2</td>
<td>Sides</td>
</tr>
<tr>
<td>1 Veneer Panel</td>
<td>9/8 x 12 x 12 1/2</td>
<td>Support</td>
</tr>
<tr>
<td>4 Pine Strips</td>
<td>1/4 x 1 x 2 1/2</td>
<td>Frame</td>
</tr>
<tr>
<td>2</td>
<td>1 x 1 x 3 1/2</td>
<td>Frame Sides</td>
</tr>
<tr>
<td>2</td>
<td>1 x 1 x 3 1/2</td>
<td>Frame Sides</td>
</tr>
<tr>
<td>2</td>
<td>1 x 1 x 3 1/2</td>
<td>Frame Sides</td>
</tr>
<tr>
<td>1 Block</td>
<td>3/4 x 3/4 x 2</td>
<td>Extension Cord &amp; Socket</td>
</tr>
<tr>
<td>2</td>
<td>3/4 x 3/4 x 2 1/2</td>
<td>Glass Frame</td>
</tr>
<tr>
<td>1 Glass</td>
<td>9/8 x 12 x 2 1/2</td>
<td>Veneer Pan. 9/8 x 12 x 2 1/2</td>
</tr>
<tr>
<td>1 Glass</td>
<td>3/4 x 3/4 x 2</td>
<td>Veneer Pan. 9/8 x 12 x 2 1/2</td>
</tr>
<tr>
<td>1 Glass</td>
<td>9/8 x 12 x 2 1/2</td>
<td>Veneer Pan. 9/8 x 12 x 2 1/2</td>
</tr>
<tr>
<td>1 Glass</td>
<td>3/4 x 3/4 x 2</td>
<td>Veneer Pan. 9/8 x 12 x 2 1/2</td>
</tr>
</tbody>
</table>
Tack original to the sliding object panel. Fasten sheet of tracing paper on screen-box glass with gummed stickers. Very distance between projection box until image appears on screen. Move sections of projection box to make image distinct. Adjust lens to sharpen image. With the aid of mirrors the enlarged image may be thrown on a horizontal screen.

Projection Box:

Sliding Object Panel:

Projection Lens
14" Focal length
Bausch & Lomb or similar
catalog # 41-53-44 model # 4044
Kitecraft and Kite Tournament. Miller, Charles M. Manual Arts Press
Peoria, Ill. 1914. 144 Pp. $2.00.

43 pictures
56 diagrams

Glider Pp. 108-111
Self Propelling air devices Pp. 112-114
Airplane model Pp. 115-117
Airplane model—favorite Pp. 117-123
Propellers, motors and gears Pp. 121-126
Model airplane tournaments Pp. 127-139

Pp. $2.00.

85 pictures
910 diagrams

Paper glider P. 109
Aeroplane kite, and
Tandem aeroplane glider Pp. 11-112

Outdoor Sports the Year 'Round. Popular Mechanics Press, Chicago,
Ill. 1930. 336 Pp. $2.00.

412 pictures
147 diagrams

Model airplanes, making of Pp. 154-172

Popular Mechanics Blue Prints Series Nos. 500-750, Inc. Popular

Page size: twenty-two by sixteen inches.

185 pictures
250 diagrams

Catapult-rubber, to launch model plane P. 517
Winder for model planes P. 556
Tractor plane model, simple P. 558
Plane, long flight model P. 559
Plane, commercial model P. 541
Biplane or monoplane, model P. 513
Model plane, scale—Ford tri-motor P. 721
Model plane, transport P. 704
Helicopter, twin-propeller P. 674
89 pictures
46 diagrams
Model airplanes, simple  Pp. 307-308

93 pictures
156 diagrams
(a) Monoplane, the  Pp. 75-83
(b) Model aeroplane, the  Pp. 68-74

52 pictures
163 diagrams
Toy kites, gliders and aeroplanes  Pp. 249-259

518 pictures
117 diagrams
Monoplane, indoor model  Pp. 218-222
Model airplane, Tudor Morris  Pp. 227-236

42 pictures
28 diagrams
Airplane, an air-mail  Pp. 17-18
Airplane glider, model  Pp. 16-17

77 pictures
65 diagrams
Airplane and glider model,  Pp. 100-101

17 pictures
61 diagrams
Model airplane  Pp. 136-137
MESSENGER (PARACHUTE TYPE)

Note: band over pin, eyelets made from pins.

Rubber band

See detail 1 for wheel support.

Detail 1 made from paper clip 2: red:

Release

Hook one end here

Parachute:
Tissue paper 9 sq.
Thread tied to each corner 12" long. Small piece of lead for ballast

Note: parachute attached to messenger. When trip strikes disc, it automatically releases parachute.
A FOUR ROOM WREN HOUSE
FOR HANDICRAFT PROJECT

Isometric View

Assembly of Part A

Front view of cone

Drill 1/4 hole

Drill 1/4 hole

Drill 1/4 hole

Drill 1/4 hole

Drill 1/4 hole

Note: All discs of part A to be 1/8" Thick
SUGGESTIONS FOR A FLOAT

When coloring this float, use as many colors as possible.

Tops should be covered with paper or cloth. Left open to show framework.

Use 1\"x2\" for frame.

Use 1\"x3\" for uprights.

Cut semi-circles from 1\"x12\" boards.

No. 10, Armour Square

E.G. Melin 3-22-34
Fig. 1
1. Green-flesh
2. Blue-purple
3. Blue-green
4. Red-purple
5. Black
6. Crimson
7. Outline in
8. Green-brown
9. Silver

Fig. 2
1. Light flesh
2. Deeper flesh
3. Vermillion
4. Deep purple
5. Light purple
6. Yellow
7. White
8. Black
9. Deep red
10. Olive

Add braids of bright red raffia.

Fig. 3
1. Light Orange
2. Deep Orange
3. Vermillion
4. Light purple
5. Deep purple
6. Dark purple-blue
7. Turquoise
8. Yellow-green
9. White
10. Black
11. Gray green
12. Blue

PAPIER-MÂCHÉ MASKS
Quilt Patterns
Traditional and Historic - Single Block and Assembled

(Class 1)

Enigma
Martha Wash Star
Doves in the Window
Star of Many Points

Indian Canoes
Mexican Star
St. Louis Star
Providence

Black Beauty
Linked Diamonds
Old Maid’s Puzzle
Single Irish Chain