AIR TRAILS

AVIATION FOR EVERYBODY

SHOULD ARMY AND NAVY AIR FORCES COMBINE?

THE EYES OF WAR • NEW CAMOUFLAGE

Six-Minute Class A Gas Model

DECEMBER
1939

FIFTEEN CENTS
PER COPY
A STREET & SMITH PUBLICATION

Now Ready—The Gas Model Everyone's Waiting For!

DICK KORDA'S "CHAMPION"

DESIGNED BY AMERICA'S NUMBER I MODEL BUILDER

This beautiful class B, red trimmed, yellow (or gray) gas model by Korda is modestly claimed by Dick to be his "luckiest" model so far. Winner in many contests, including the Detroit "Nationals" in '39. Won many first places under severe conditions. With the popularity this design is destined to have, no one can go wrong on it. The "Champ" has made a series of well-known flights, and since it has shown that it has "the stuff it takes" to win contests, we decided it should be manufactured without awaiting further developments, which began when he designed it in November, 1938.

The streamlined model has a span of 48" and a length of 32¼". When powered with a of ¾" bore or under, such as the Ohlsson "23," it will be a great contender in all ...ure class B contests.

The fuselage is planked with 1/16" balsa throughout, the cowling is removable for flight and the wing has a slip-off type cradle in the event of a crash. This removable feature makes it very convenient when transporting the model or repairing it.

What more need we say than it is designed, tested, and approved by America's No. 1 model airplane builder? Order the complete kit (except for power unit) GP-5005, only..... **$2.95**

These easy-to-build, complete kits contain

Full size well detailed drawing; Printed out ribs and parts; Plywood for fire wall; Cut to size wood strips; Colored bamboo tissue; Wood and tissue cements; Formed wire landing gear; Streamlined wheels; Celluloid, nuts, bolts and everything else needed except power unit.

Cleveland's New FLEETSTER Gas Job!

Get one of these inexpensive kits now to start building it and have it ready by the time you order your motor if you do not already have one.

This beautiful, advanced type class "B" monoplane is colored yellow and trimmed in blue, 15½ oz. complete with a bare (covering removed) coil. When powered with an Ohlsson "23" engine, we believe it is one of the lightest gas models designed in its class. It has a span of 42½" and length of 30½". The design of the wing (under-cambered) gives it stability which, together with the highly streamlined fuselage and lifting tail, makes it an excellent contest model. With its beautiful and unusual tapered wing and its general appearance, we believe it makes one of the most beautiful free-lance commercial type gas models ever to make an appearance. Order complete kit GP-5007 (except power unit), only **$2.50**

A Highly Recommended Design For Beginning Gas Modelers!

"The Gas Buy of the Year"

CLEVELAND CLOUDSTER

Redesigned and improved over illustration. A 50" gas model complete with full size drawing, printed ribs, shaped leading edge, cut strip wood, colored covering paper, wood and paper cements, balsa wheels, formed landing gear, etc. (Ohlsson "23" recommended for this model). Kit G-P 5004, complete, only.... **$2.50**

TURNER'S 1938 & 1939 Thompson Trophy WINNER

Fellows, this ship's a real beaut. It's practically the same for either year. It should be authentically colored silver. Comes available in both years' design in each size, ½" (DWARF) and ¾" (SF) kits. D-72 Dry Dwarf 50c. SF-72 Dry $1.75, Wet **$2.50**

RACE CAR KITS

THEIR REAL THRILL COMES ONLY WHEN YOU BUILD AND "DRIVE" ONE

ACTUAL OPERATING MODELS
(Complete kits, except motors)

Speed Demon..$16.50	Rocket $19.00
Mercury Midget $23.50	Alex. C. A. R..$25.00

TINY DISPLAY MODELS OF FAMOUS RACERS

6 internationally famous winners (3 Indianapolis, 3 European) 60c plus 15c postage.

OHLSSON "23" MOTOR

Recommended for the three gas models shown here. It is the most popular type of small gas motor in use today. Develops 1/7 horse power and has a displacement of .23 cubic inches which comes within a B class. The motor complete with coil and condenser, factory tested, for only **$16.50**

Build These Thrilling War Planes

ENGLISH HAWKER LOW WING MERLIN-POWERED FIGHTER

Span 20". Fully retractable landing gear. Suggested coloring—all silver. Fast, furious flights. Dry Kit R-59 (no liquids) only..... **50c**

POLISH P-6 FIGHTER

Span 25¼". Build this historic ship. Suggested coloring—all silver. Dry Kit SF-6 (no liquids) only **$1.95**

ENGLISH HIGHSPEED FAIRY "BATTLE"

Span 20". Trim, sleek, swift. Mainstay of England's Fighting and Bombing Fleet. Fast, long, graceful flyer. Suggested coloring—all silver. Dry Kit R-67 (no liquids) only..... **50c**

HAWKER SUPER-FURY

Span 22¼". England's Interceptor Fighter. Suggested coloring—all silver. Dry Kit SF-20 (no liquids) only $1.75. 12" Span Dry Kit D-20, only **70c**

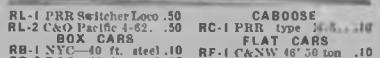
ORDERING INSTRUCTIONS

Send check or money order—cash at your own risk. Include 15c for packing charge and postage under $1.50. C.O.D.'s accepted only when $2.00 deposit accompanies order to insure acceptance of delivery. Shipments outside U. S. add 10%—over $10.00 no additional charge. For P.P. Special Delivery in U. S.—Add 25c.

DEALERS: Write For Business-Building Proposition

Build a C-D Simplified "ALL AMERICAN" Railroad System—the talk of the country

There are more C-D Gage systems under construction today than in any other gage. Don't be sorry later you didn't start in this gage now. All "REP" kits below are 3/16" scale for 2½" gage and are dry (no liquids). Average over all sizes—Locomotives, 12"-17"; Passenger Cars, 15"; Box Cars, 8"; height 2½". Kits are complete with sides, tops and ends printed in authentic colors and lettering. All "REP" (cars only) models may be used in your operating layout later. We also make at $1.25 per kit any of the freight cars to operate, also Locos., less motors, $8.75 and $9.75.



RL-1 PRR Switcher Loco .50	CABOOSE
RL-2 C&O Pacific 4-62. .50	RC-1 PRR type ...10
BOX CARS	FLAT CARS
RB-1 NYC—40 ft. steel .10	RF-1 C&NW 46' 50 ton .10
RB-2 B&O—40 ft. steel .10	RF-2 PRR 46' 50 ton ..10
RB-3 B&O—40 ft. wood .10	RF-3 H&M 46' 55 ton ..10
RB-4 Rock. Is. 40' wood .10	RF-4 L&N 46' 50 ton ..10
RB-5 Wabash—40' wood .10	GONDOLA CARS
RB-6 SP 40' wood furn. .10	RG-1 L&N 41' 50 ton ..10
RB8 T&P 40' wood auto .10	RG-2 NYC 41' 50 ton ..10
RB-9 AT&SF 40' wood .10	RG-3 MC 41' 55 ton ..10
RB-11 U.P.—50' steel .10	RG-4 T&P 41' 55 ton ..10
RB-12 AT&SF 50' auto .10	8000 GAL. TANK CARS
HOPPER CARS	RT-1 Texaco—TCX(wh.) .10
RH-1 CCC&StL RR 10	RT-2 NATX (black) ..10
RH-2 Missouri Pac. RR .10	RT-3 Sinclair—SIDRY..10
RH-3 Southern Railroad .10	RT-4 Gulf—CROX(blk.) .10
RH-4 Illinois Central RR .10	

Catalog the Whole Country's Talking About!

Cleveland's super catalog contains among many other things the following: Wide variety of gas models. Largest assortment of fine rubber-driven model airplanes the world has ever seen in three different sizes to fit all purses. Miniature racing cars in an assortment from 10c authentic Indianapolis winners to models actually driven by gasoline engines. Supplies—all sizes of strip and sheet pine and balsa wood, wheels, cements, colors, special wood parts, metal parts, propellers; and for gas models a wide variety of gas engines, timers, battery holders, starters, spark plugs, coils, switches. Gasoline driven speed boats. Model yachts. Old time sailing ships. Modern war ships. Merchant vessels. Fittings of every imaginable type and size at all prices. Miniature trains of all sizes—and since we are specializing in C-D and HO we have a tremendous variety of kits and parts for these most popular gages. Tremendous assortment of fine rotary cutting tools and grinders, knives, fine drills and taps. All the hard-to-get sizes of wires, tubing, sheet angle and rod materials in various metals, small screws, nuts, bolts and special fittings. Wide assortment of books and drawings. Truly this catalog for all modelbuilders containing many thousands of items will be a revelation to modelbuilders who have never seen it before, for it is larger in number of articles than any dozen other American modelmaking catalogs put together. **You simply can't do without it.** Other in demand items we list are: candid and folding cameras and all necessary sundries, supplies, etc., finished archery equipment, sets, and supplies for the beginner; also handbooks, microscopes, telescopes, field glasses (for chasing models), etc., etc. No modelbuilder can afford being without this "catalog of catalogs"—don't delay having it—get it right now. No Free Copies.

Send 10c for Your Copy Today, Before You Forget!

CLEVELAND MODEL & SUPPLY CO., INC.

4508C89 LORAIN AVE. CLEVELAND, OHIO, U. S. A.

"PARKS TRAINING Gave Me My Best Opportunity"

Says W. C. BURKS

District Sales Manager,
Memphis Office Chicago & Southern Air Lines

CHICAGO AND SOUTHERN AIR LINES, INC.
GENERAL OFFICES
LAMBERT-ST. LOUIS MUNICIPAL AIRPORT
ROBERTSON, MISSOURI

August 25, 1939

Mr. Oliver L. Parks
Parks Air College
East St. Louis, Ill.

Dear Mr. Parks:

At the time I enrolled at Parks Air College I questioned the value of technical training to assist me in carrying out my program to launch a well planned career in air transportation.

To-day, I am confident that it was the wisest thing I could have done.

For nearly a year I have been in charge of traffic and sales for Chicago and Southern Air Lines at Memphis, Tennessee, the "aerial cross roads of the south." One of the best qualifications I presented to Mr. D. D. Walker of Chicago and Southern Air Lines was my record at your school.

Parks training gave me my best opportunity for a responsible and profitable career in the world's fastest growing industry. To men interested in sales and traffic, I recommend a technical course at Parks as a sound background.

Very truly yours,

W. C. Burks

W. C. Burks, District Sales Manager
Chicago & Southern Air Lines, Inc.
Memphis, Tennessee

IF YOU are now planning a successful career in commercial aviation, read this letter of W. C. Burks, a Parks Air College graduate now holding a responsible position with Chicago & Southern Air Lines.

Just as it proved its value to Mr. Burks, technical aviation training will assist you too — not only in obtaining your start in aviation but also in preparing you for subsequent positions of leadership in this great industry.

As a Parks graduate you can be sure that your technical training will be recognized as an important qualification. It is proof of your ability to contribute to aviation's progress. In fact, the industry's demand for Parks trained men often exceeds the available supply.

Today hundreds of Parks graduates, like Mr. Burks, are forging ahead in aviation and winning positions of responsibility — achieving their goal of success — secure in the soundness of their aeronautical education acquired at Parks.

If you are sincere in your desire to enter commercial aviation in any of its various fields, write to Parks at once. The coupon brings you full information on Parks four complete courses. The 60-page catalog is free.

Not only Mr. Burks, but many other Parks graduates as well, are assisting in Chicago & Southern's development. Indicative of their consistent growth and progress, Chicago & Southern Air Lines, "The Valley Level Route" between Chicago and New Orleans, has just ordered six new Douglas DC-3's, the first of which will be delivered early in 1940.

PARKS AIR COLLEGE

EAST ST. LOUIS, ILLINOIS

● *Accredited by the Superintendent of Public Instruction of the State of Illinois. Civil Aeronautics Authority approved as an advanced flight and ground school and mechanics school. Accredited by and cooperating with the United States Army Air Corps in giving flight and mechanics training.*

Parks Air College
East St. Louis, Illinois. Section AT 12

Please send me details of Parks four major courses in commercial aviation training.

Name..... Age.....

Address.....

City.....

State.....

AIR TRAILS

SINGLE COPY, 15 CENTS YEARLY SUBSCRIPTION, $1.50
STREET & SMITH PUBLICATIONS, INC., 79 7th AVE., NEW YORK

DECEMBER, 1939 VOLUME XIII NO. 3

FEATURES

DEPARTMENTS

MODEL SECTION

FULL-COLOR COVER PHOTOGRAPH BY M. TRAUBNER, JR., COURTESY CANADIAN COLONIAL AIRWAYS

Latest military cameras

Two air forces or one?

Record Class A gas model

C. B. COLBY . . . . . Editor
WM. WINTER . . . . . Associate Editor
ALEXIS DAWYDOFF Gliding & Soaring Editor
GORDON S. LIGHT . . . . Model Editor
ALEX D. SNIFFEN . . . . . Art Editor

Monthly publication issued by Street & Smith Publications, Inc., 79-89 Seventh Avenue, New York, N. Y. Allen L. Grammer, President; Henry W. Ralston, Vice President and Treasurer. Copyright, 1939, by Street & Smith Publications, Inc., New York. Copyright, 1939, by Street & Smith Publications, Inc., Great Britain. Entered as Second-class Matter, January 11, 1937, at the Post Office at New York, N. Y., under Act of Congress of March 3, 1879. Subscriptions to Canada, Cuba, Dom. Republic, Haiti, Spain, Central and South American Countries, except The Guianas and British Honduras, $1.75 per year. To all other foreign countries, including The Guianas and British Honduras, $2.25 per year.

Printed in U.S.A.

Courtesy Roosevelt Aviation School

Dual Instruction in a Fleet Trainer Over Mitchel Field

Courtesy Boeing School of Aeronautics

Student's Cockpit in Plane Equipped for Instrument Flying

Courtesy Paul Mantz Air Services

Link Instrument and Radio Beam Trainer

Prepares You for Flight and Written Tests for Any Pilot Rating

"Air Piloting Manual of Flight Instruction"

On Primary and Advanced Training

By VIRGIL SIMMONS

Formerly Flying Instructor at Boeing School of Aeronautics and in the U. S. Army and Navy Air Services

300 Pages, 75 Illustrations, $3.00

WRITTEN to help its users meet the government's requirements as established by the Civil Air Regulations, this book supplies in detail the flight training instructions needed by student pilots and also by pilots, already proficient, who wish to attain higher grades. In addition, it will be helpful to flying instructors and to pilots who wish to obtain that rating. It is also designed as a guide for pilots who wish to correct faults and attain greater skill in precision flying.

AIR PILOTING brings you the cream of what Mr. Simmons has learned in training hundreds of pilots during his twenty years of continuous experience as a flying instructor. Reading his book is like having this veteran instructor at your side to explain the things that puzzle you, to point out your mistakes and show you how to overcome them.

Mr. Simmons supplies a detailed system of instruction from first solo to instrument flying. He analyzes and explains all the flight test maneuvers required for the various pilot certificates and flying ratings. Complete diagrams illustrate every detail of each maneuver and make it clear and easily understood. He also covers fully radio range layout, methods of orientation, private flyer's use of radio, and gives much information on advanced flying techniques—including exhibition aerobatics.

To help you make sure of passing the written tests, too, the book contains lists of specimen questions—totaling 377—taken from official examinations for all grades of pilot certificates, including that of flying instructor. Answers that have been accepted as correct accompany each question.

CONDENSED OUTLINE

Primary Flight Training. Outline of procedure followed by typical schools. Detailed description of first eleven lessons with explanation of maneuvers taught.

Piloting an Airplane. Primary flight training maneuvers: Straight and level flying. Climb and glide. Gentle turns. Turns in glide. Climbing turns. The take-off. Taxying. Landing. Medium banks. Steep banks. Faults made in banks. Stalls. Spins. Base-line glide approach.

Civil Air Regulations. Selected air traffic rules which must be thoroughly mastered by student pilots preparing for government examinations.

Solo Pilot Flight Course. Procedure before and after solo. Factors to observe in primary S's 1 and 2. Advantages of the base-line glide approach. Summary of flight test requirements.

Private Pilot Flight Course. Shallow circular, steep eights. Triangulation spirals. The 180°, 360°, 1080° spirals; vital factors to keep in mind. Practicing stalls, with and without power. Primary and advanced spins. Procedure for the 720° vertical bank. Cross-wind take-offs and landings. Forward and slideslips; slipping turn.

Limited-Commercial Pilot Course. Requirement for higher degree of proficiency in same maneuvers as those in private pilot's flight test. Restrictions and privileges of the limited-commercial pilot rating.

Commercial Pilot Flight Course. Summary of maneuvers in flight test. Possible additions made by inspectors to usual flight test routine. Precision maneuvers recommended for developing highest skill in handling plane near ground, from predetermined exact altitudes. Night flying. How to execute the split-S turn; the chandelle; skyline 8; half roll; barrel roll; loops; falling leaf.

Cross-Country Flying. Map reading. How to lay out a cross-country course. Facilities provided by Federal airways system. Preparation for cross-country flying. A typical cross-country flight with detailed explanation of pilot's procedure.

Airways Radio. Radio-range orientation described and illustrated—90° method, parallel bisector method. Radio compass navigation; fundamental principles explained. How to obtain bearings. Establishing fixes. Magnetic compass deviation. How to prepare a calibration chart of radio compass deviations. "Homing." Combined radio-range and radio-compass navigation. Charts.

Instrument Flying and Rating. Maneuvers that must be performed, solely by instrument, in practical flight test. How radio skill must be demonstrated. Airplane. Link Trainer instruction methods. Flight Plan. Typical practice flight procedure.

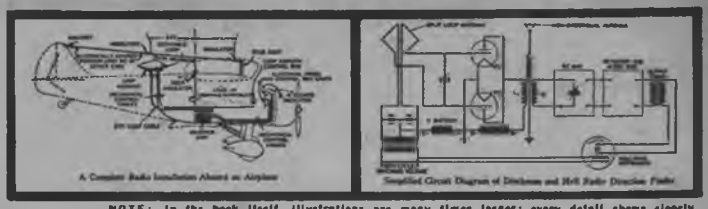
Flying Instructor Rating. Requirements for special competency rating. Latitude given examining inspector to assure himself of candidate's qualifications. Summary of flying school rules and sequence of training maneuvers for primary and advanced students with which prospective instructor is expected to be thoroughly familiar.

Meteorology. Condensed selection of definitions and explanations pertaining to meteorology within scope of examinations given for all ratings above solo pilot.

Miscellaneous. Handling plane having 3-wheel landing gear. Exhibition acrobatics at low altitude: Inverted figure 8. Cuban 8's Nos. 1, 2, 3.

Contains 377 questions and answers that fully cover the government's written examinations for each pilot rating.

THE RONALD PRESS COMPANY, Publishers
15 East 26th Street ESTABLISHED 1900 New York, N. Y.



NOTE: In the book itself, illustrations are many times larger; every detail shows clearly.

Working Drawings and Photographs Make It Easy for You to Understand Every Explanation

Prepares You for Aviation Radio License Examination

"Aeronautic Radio"

PRINCIPLES, SELECTION, INSTALLATION, OPERATION, MAINTENANCE

By MYRON F. EDDY

Lieut. U. S. Navy, Retired; Member, Institute of Radio Engineers; Chief Instructor in Aircraft Radio, Stewart Technical School

502 Pages, 198 Illustrations, $4.50

HERE, at last, is the complete, practical book wished for by everyone who is awake to the amazing increase in the applications of radio in aeronautics and to the accompanying increase in the opportunities for well-paid, interesting careers both in the air and on the ground. This new book covers the material you need to understand to meet the Federal Communications Commission's requirements for a license as a second- or third-class radio operator—the aviation licenses. It also covers the regulations of the Civil Aeronautics Authority as to radio, especially its use by commercial and private pilots. In addition it covers the actual approved usage of existing equipment for both communication and for special purposes, such as course guidance and instrument landing. Over 200 test questions enable you to test your grasp of the material given.

16 CHAPTERS: Aviation Radio Communication. Fundamentals of Electricity. Radio Electricity. Radio Circuits. Radio Tubes. Batteries. Power Supplies. Radiotelegraph Transmitters. Radio Range Beacons. Radiotelephone Transmitters. Receivers. Direction Finders. Instrument Landing Systems. Radio Traffic Control. Installing Equipment. Maintenance.

(Fill in, tear out, and mail)

SENT ON 5 DAYS' APPROVAL

The Ronald Press Company,
Dept. M349, 15 East 26th Street, New York

Send me the books (or book) I have checked below. I will remit at the prices shown, plus delivery charges, within five days after books are received. Or, if they do not come up to my expectations, I have the privilege of returning them within that time. (We pay delivery on orders accompanied by remittance; same approval privilege.)

☐ **Simmons,** AIR PILOTING..... **$3.00**
☐ **Eddy,** AERONAUTIC RADIO..... **4.50**

Name .....
(Please print to insure correct delivery.)

Address .....

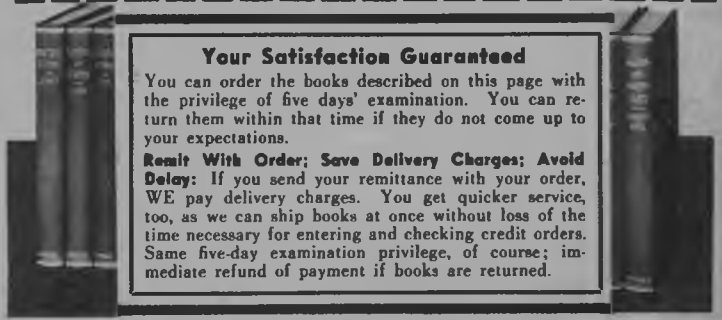
City ..... *State .....

☐ Employed by,

☐ or Reference ..... Address .....
(Above line must be filled in unless you remit with order.)

*Outside continental U. S. remit with order at above prices plus 25c per book for shipping.

☐ **Check here if you wish our Catalog of Aeronautic Publications, FREE.**



Your Satisfaction Guaranteed

You can order the books described on this page with the privilege of five days' examination. You can return them within that time if they do not come up to your expectations.

Remit With Order; Save Delivery Charges; Avoid Delay: If you send your remittance with your order, WE pay delivery charges. You get quicker service, too, as we can ship books at once without loss of the time necessary for entering and checking credit orders. Same five-day examination privilege, of course; immediate refund of payment if books are returned.

WEATHER SERVICE and the PRIVATE FLIER

Radiometeorograph heads for stratosphere to get pressure, temperature, humidity readings. Parachute lowers the instruments after balloon breaks.

DURING the past thirteen years the demands for weather service for scheduled passenger and mail flights over the civil airways have forced rapid expansion of the weather organization, and the weather bureau has never quite caught up with these rapidly growing demands.

The weather reports and advices which are designed primarily for scheduled airways traffic are of course available to the private flier engaged in all types of unscheduled flying. But as this private air traffic increases in volume it is recognized that the present weather service does not always meet the pilot's needs. At times his objective carries him off the regular civil airways into localities where the present service is not set up to give him information on his direct route. He may want to take off between scheduled flights when weather advices are not immediately available, or he may want to take off from some small-town airport where weather news may not easily be obtained by telephone.

Eventually, the civil airways system will become so comprehensive that there will be an established airway and its associated weather service for almost every imaginable cross-country flight. Then, with minor modification, the weather bureau will serve the unscheduled private flier as well as it does the regular mail and passenger flights.

Essentially, what the pilot wants to know is whether he can take off, get through, and land safely. Usually it is not satisfactory for the meteorologist to answer that question. The forecast and data are available for him, but the pilot must be capable of interpreting that data.

In order to utilize the weather service to the greatest extent possible, the pilot must know its possibilities and its limitations. Weather-wise as most experienced pilots are, they often place incorrect interpretations on weather reports and advices. Sometimes they lose sight of the basic distinction between weather reports or observations and weather forecasts. Weather observations are matters of fact and can be one hundred per cent accurate. A forecast is a matter of expert opinion and is subject to the usual errors of human judgment which unfortunately sometimes creep into the calculations in every science and profession. These errors may arise from incomplete or inaccurate data, from incomplete knowledge of the scientific principles involved, or from just plain headache.

The weather bureau now has a widespread organization. With a few improvements which are now in prospect, we shall be able to render excellent weather service to the aviator and to every other occupation and profession. We have plans to meet the deficiencies now found here and there and when the private flier wants weather, and with an understanding by the pilot of the possibilities and limitations of a weather service, and his friendly co-operation, I believe we shall find that we have done something constructive about the weather.

MEET COMMANDER REICHELDERFER
By William Herbert Randall

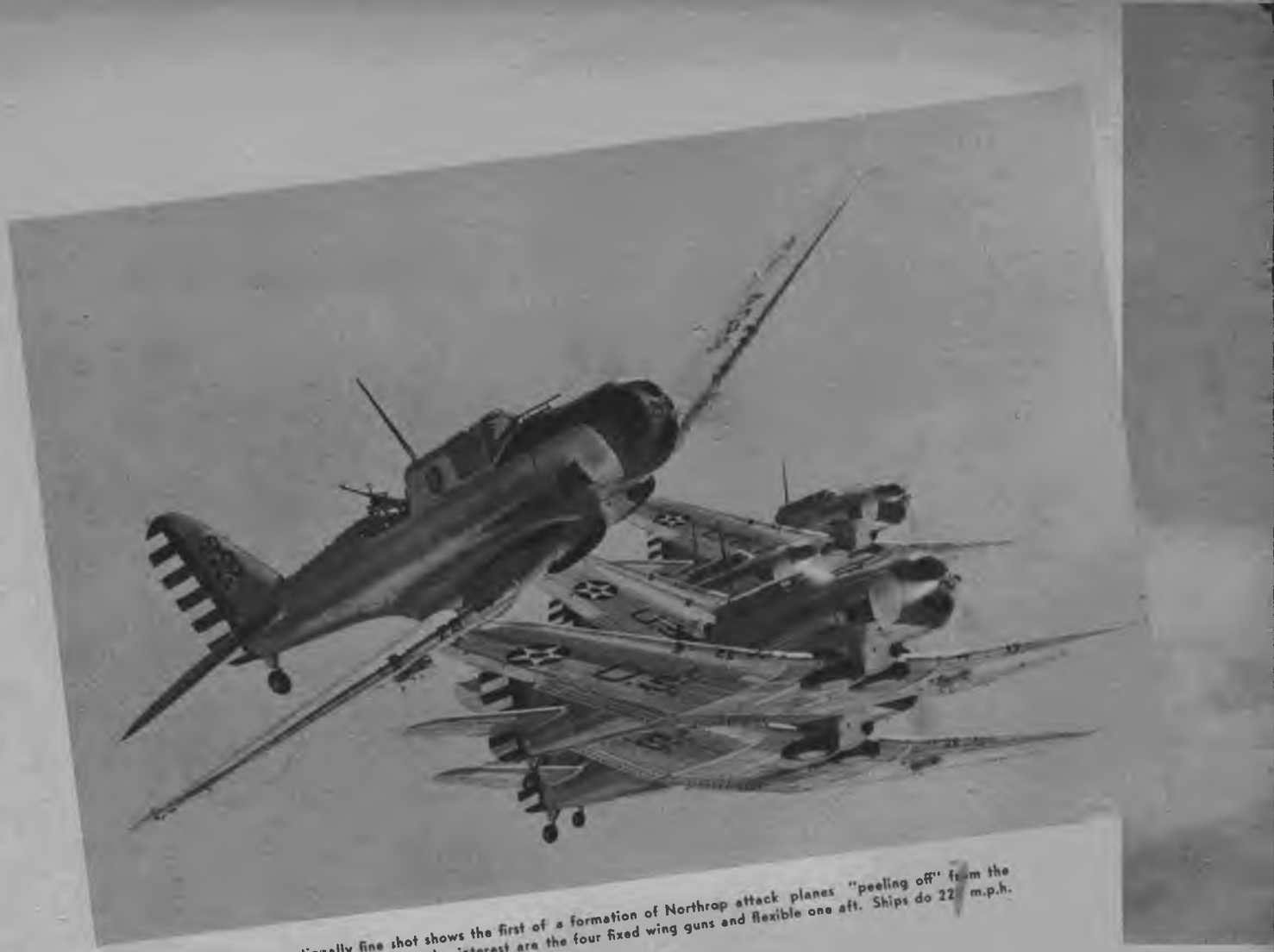
The chief of the weather bureau is a navy man from the very start. In February, 1918, he enrolled in the naval reserve for aviation duty. In May of the same year he was called for active duty under instruction at the naval aviation ground school, Massachusetts Institute of Technology at Cambridge. In August he was commissioned an ensign, U. S. N. R. F.

September, 1918, found him stationed at the naval air station at N. Sydney, Nova Scotia, as aerological officer for the antisubmarine flights. May and July, 1919, were spent aboard the U. S. S. *Shaumut,* and as aerological officer at Lisbon, Portugal, European terminal of the first *(Turn to page 63)*

A GUEST EDITORIAL BY COMMANDER F. W. REICHELDERFER
Chief, U. S. Weather Bureau

THIS WINGED WORLD

England banks on these! This giant Handley Page Hampden bomber, seen in a vertical bank across a sister ship's tail, is one of Britain's best war planes.



Look out below! This exceptionally fine shot shows the first of a formation of Northrop attack planes "peeling off" from the formation to begin a diving attack. Of particular interest are the four fixed wing guns and flexible one aft. Ships do 22[illegible] m.p.h.

THIS WINGED WORLD

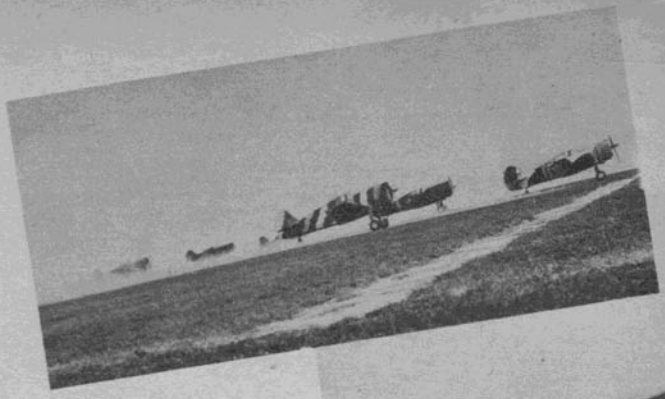
War wings over water. This Wellington bomber of Great Britain with tail turret has apparently quilted wings due to geodetic construction.

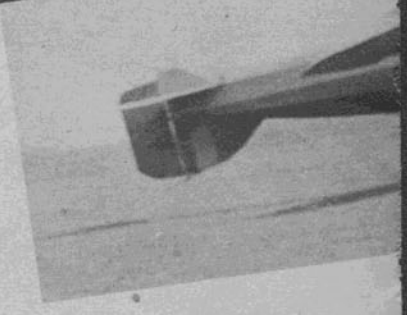
Putting their eggs in several baskets. These basketlike geodetic fuselages of the 3,000-mile Wellington bombers can carry plenty of British eggs.

Top—Graceful as its namesake, this British Percival Mew Gull is flown by Captain Percival high over the clouds. Center—Safety 'chute for planes designed for Pilot James Goodwin of Newport, Ky. This 'chute contains 2,000 square feet of silk. Bottom—Glenn L. Martin, noted plane builder, tries a sailplane. (Left to right) Edgar Bergen, Andy Devine, Glenn Martin, and Hawley Bowlus, builder of sailplane pictured.

THIS WINGED WORLD

The army did its stuff with Curtiss P-36s for the cash customers; and right, Mike Murphy with his precision stunt flying typified the unusual program features of the three-day show.





Left—Wings of the Russian bear tested in flight. The gigantic U. S. S. R. L-760 Maxim Gorky bomber-transport with six liquid-cooled engines. Below—A bright spot against the dark background of warring nations is the new Vultee V-12 attack-bomber of sensational performance.

Were these the last National Air Races to be held in this countr

Three times and out for Roscoe! Col. Roscoe Turner, three times winner of the Thompson Trophy, announces end of his racing career.

Art and the Goon bring home the bacon. Art Chester, popular race pilot, clutches the famed Greve Trophy, won with new course record.

Two for one! A trophy and a new record for Frank Fuller as the 1939 Bendix winner. Vincent Bendix congratulates him at finish.

Army pilot training must be trebled under the intensified air program. These are new Ryan primary training ships at Ryan school, San Diego.

SHOULD ARMY AND NAVY AIR FORCES COMBINE?

The "Saratoga" and the "Lexington," seen from the old carrier "Langley." The navy now has six carriers.

THE Four Horsemen are again riding the winds. Again the old bugaboo of a unified air service is creeping out from under the rock where, since the time of General William Mitchel, it has been hiding like something afraid of the light.

If you don't think it's a touchy subject just try to get a public utterance from some ranking officer of either the army or the navy. Conversely, both services are for it—with restrictions. If there is to be a unified service each wants to have the controlling voice in its affairs. Both services are afraid the control might slip into the hands of some political appointee whose knowledge of things aviation, especially that branch pertaining to the military, would be reckoned as so many votes or so much patronage for his party.

After all, the majority of the personnel of the army and navy *are* Americans who have the welfare of the United States at heart, and they know that the one thing that would most tend to nullify any good of a unified service would be to place it in the hands of a vote-catering politician.

Actually, although they do not express themselves in so many words, this seems to be the greatest stumblingblock to operating the air services under one head. Thus, avoiding the argument that might cost them numbers in the promotion list or actually become the indirect cause of their retirement from the service, the men most involved fight the issue with words which do not at all express their real meaning. And they get nowhere.

Both army and navy men fear for the effectiveness of aviation units if these are under a politician. Why? Because politicians would be inclined to give out contracts for the manufacture of equipment, from planes to gasoline, to the persons controlling the most patronage, regardless of merit. Or perhaps things would hang fire and they would dicker until the enemy was pounding at the door, and then they'd rush willy-nilly and gather up whatever they could to defend the voters. It's no wonder both the army and the navy are wary of such a prospect.

Europe today presents to us the proving ground of aviation in warfare. It will also give us the answer to the unified air service. England, France and Italy have for many years past been using this system. In fact, most of the European nations have adopted this method of handling their air forces, though with the exception of the first three their navy air forces are negligible.

During the World War (the one that was to end all wars), England had two separate air units: the Royal Flying Corps, that was a part of the army, and the Royal Naval Air Service, that was supposed to operate with the Royal Navy.

Right—Brig. Gen. Wm. Mitchel, famous for advocacy of a unified air force. Below—A Brewster shipboard fighter.

But the navy, as far as fighting was concerned, was inactive for the most part, so the pilots of the R. N. A. S. trained on landplanes instead of flying boats. Pilots who were too big or too heavy-handed to handle one of the tiny sensitive scout planes were assigned to the heavy seaplanes and duty with the fleet or coast patrol. Those who qualified as combat pilots were assigned to fighting squadrons in France, usually with the R. F. C. But of one thing you could always be certain—the Royal Naval Air Service, being the senior service, *always* got the best of everything, pay, airplanes and assignments.

Seeing things pulling counterwise, England finally decided to experiment with a unified air service, and so was born the Royal Air Force, taking in every unit of the Royal Flying Corps and the Royal Naval Air Service. And the idea's worked so well that it is still in force today during this second world war. True, until now there has never been another major war to test their modern equipment, but under all peacetime trials it has stood the test.

England placed her air forces in the hands of an Air Minister who can, if deemed expedient, call every plane away from the fleet for service ashore, or, if it were possible for her to engage anything like her equal in naval strength, her landplanes could be assigned to co-operate with the seaplanes, *in toto*.

Today there is still the misconception that fighting over the ocean must be done by seaplanes. Seaplanes, however, are not so fast or maneuverable as landplanes, nor can they carry an equal cargo of bombs. But because they are not equipped with pontoons or boats it is generally considered unsafe for landplanes to venture away from the coast line.

Not so many months ago huge American Flying Fortresses flew seven hundred miles out to sea on an interception problem and accurately picked up an incoming ocean liner which, had it been an enemy, could have been bombed. Did the navy welcome the fact that land bombers in the service of the army could help defend our shores from an enemy? Not for one minute. They roared to high heaven that the army was trespassing on their territory, the sea.

The neutral argument of this question should be not so much that the navy or the army has jurisdiction over certain parts of our domain, but that American airplanes, of whatever service, intercept and destroy any enemy that approaches our shores with hostile intent. It is a great fulfillment of faith that a pilot in a land ship is capable, and willing, to brave the rigors of the sea and fly far beyond the limits of his natural sphere of operations to contact and destroy any enemy that might threaten the security of the United States. A faith like that calls for cohesion of effort and not bickering for choice positions.

Despite the belief that seaplanes are safer over the ocean, landplanes have just about as much chance in case of accident as the strongest seaplane.

The fact that landplanes can and do cross the ocean and are capable of flying hundreds of miles out to sea and delivering their cargo of bombs or engaging an enemy in combat has changed the character of the air service considerably.

Most naval fliers receive their initial flying instructions on land machines, and when they have become proficient they are given instruction on seaplanes. In the army only a small per cent of the fliers ever receive instructions on water craft.

The navy wants its fliers first of all to be sailors, or perhaps a better term would be navy men. They must *(Turn to page 62)*

BY CAPT. TRACY RICHARDSON

We are almost alone in having separate air forces. Does this imperil U. S. defense?

RED FLANNELS FOR AIRLINERS

Even giant winged transports prepare for winter with many items for comfort and safety.

Arrows point to rubber de-icing boots.

BY DICK KIRSCHBAUM

BELIEVE it or not, but the frost is on the pumpkin for the air lines. The pumpkin, in this case, being the leading edge of the wing, tail assembly, prop, carburetor and other vital parts of the big transports which hit altitudes and temperatures the earthbound human seldom contemplates, much less experiences.

In other words, while the average citizen is still wearing his shorts, the maintenance men of the nation's air lines are busily engaged in putting the winter flannels on their charges.

In this case, the flannels, for the most part, aren't flannels at all, as you clever people have doubtless surmised, but are of rubber. Rubber boots are deftly riveted on where they'll do the most good; long, black plasters which curl affectionately around leading edges, throbbing in rhythm with the heart of the engine, doing their job of breaking up particles of ice and sleet which are gathered in flight.

You might think it a little early to take such precautions. Listen to this: A few months ago the writer was slowly navigating around Newark Airport, sweltering in spite of his featherweight slacks, paper-thin sport shirt and open-work Mexican *huaraches*. It was hot, and that statement needs no qualification. The sun was blistering down relentlessly; the field was parched for lack of rain. The runways sent out a dizzy shimmer of heat waves and passengers waiting at the ramps were perspiring diligently.

A huge liner roared over the field, circled and landed. We watched listlessly until it taxied to the ramp. Then we snapped out of it, because in all this almost unbearable heat we saw, of all things, de-icers on the wings of the ship.

We were annoyed at what we believed was carelessness on the part of the shop crew. What right had they to leave de-icers on a ship in such torrid weather? We pushed our way through the heat waves to the hangar and tackled the chief mechanic.

"Pete," we said, "a joke is a joke, but do you think there is anything subtle in putting de-icers on a ship when the temperature is breaking a hundred?"

Pete looked at us in disgust. "Joke, hell!" he said inelegantly. "Those de-icers are there because they belong there. Just because it's hot down here doesn't mean a plane, flying on top, won't encounter an icing condition. They don't care about seasons up there. It gets cold, and when it gets cold and there's moisture, there's gonna be ice! Not a lot of it, to be sure, but we don't fool around with even a little bit. I'll bet if you ask that pilot getting out of the ship he'll tell you he ran into a minor icing condition, at least."

We did, and he did. That is, the pilot told us he had encountered sleet at thirteen thousand feet. Only for a brief moment, but there it was.

Ordinarily, air lines start outfitting their equipment for the winter in September, and every ship on the line is warmly dressed by the first week in October. Even the silver fleet of Eastern Air Lines, which flies to Miami and the South, dons the rubber boots.

Don't think for a moment that the wings *(Turn to page 48)*

Attaching rubber de-icers to edge of wing.

"Even in summer some ships wear 'em."

Air-conditioning unit heating cabin of a transport.

SAND and SPINACH

BY FRANK TINSLEY

Camouflage runs into queer problems when applied to aircraft—here's how it's done.

CAMOUFLAGE?" says John Public. "Oh, yeah; that's the trick of painting cannons and things with crazy stripes of color, so you can't see them. It started during the World War, didn't it?"

The answer is no, John. Camouflage is merely a modern term for a tactical device as old as war itself. It has been employed in one form or another in almost every conflict since history began. The use of colors and broken patterns to imitate the effects of light and shade in nature, for the purpose of deceiving the enemy, has been well-nigh universal.

Protective coloration as applied to army aircraft appeared late in 1916. The Germans seem to have been the first to use it, and their Halberstadts, L. V. G.s and Albatrosses shed their bright colors and replaced them with the dull, crazy-quilt tints of camouflage. Various arrangements of design and color were tried, ranging from regular, geometric patterns applied at the factory, to the wildest sort of daubs executed by field mechanics.

Allied air units quickly followed suit, displaying a tendency toward the irregular, stripe designs of ground camouflage. The prevailing colors used by both sides were tones of green, yellow and brown, with occasional flecks of red. Long-range night bombers were either given an overall coat of dull black, or finished with drab tops and sides and dull-black bottom surfaces. Many of the English fighter squadrons adopted the practice of painting the under surfaces of wings and fuselage a pale, sky-blue color. In all cases, both Allied and German, recognition colors and symbols were of course retained.

During the years following the Armistice the use of camouflage for aircraft was discontinued. With the revival of dress uniforms for the personnel of post-war armies, peace-time color schemes were created for military airplanes. The standard national insignia were augmented by varicolored identification stripes and numerals together with squadron crests and mottoes.

Then the continued crises in various parts of the world had the effect of placing almost every great air force upon a war basis, and this automatically reinstated camouflage as a regulation finish. Practically all protective coloration used today follows standardized patterns, scientifically developed for each particular type and model. They are put on at the factory, leaving only the individual identification markings to be applied by the unit to which the machine is assigned.

In working out these standard colors and *(Turn to page 55)*

Believe it or not, there are fifteen planes in this group of "daubed" P-36s!

This drawing shows relative visibility of ship with and without camouflage.

A neat example of how "sand and spinach" blends with cloud formations.

THE CHINESE LIKE IT STORMY

JACK FRY, president of T. W. A., in an editorial in Air Trails, advocated the introduction of special freight-carrying airplanes to be used in making a study of bad-weather flying. They would be testing laboratories for planes and a school and proving grounds for future air-line pilots. It's an idea we will sometime see carried out here in the United States.

Today this exact condition already exists in the Republic of China, the difference being that it is no longer an experiment but an accepted, proven condition of progressive aviation. A fine example of what can be done in aviation under the spur of necessity.

In China—in that part of the republic still controlled by the Chinese—when it's clear and visibility unlimited the transport planes are hidden away in camouflaged hangars, under trees and in narrow dark ravines. Everywhere except in the regular well-marked hangars visible from the air. The minute the rain comes down, the fog rolls in or the clouds are playing tag with the tree and mountaintops, and the best they can say of the weather is "overcast, visibility limited," the hum of activity resounds and soon transport planes are winging their way over the roughest, most dangerous terrain in the world.

They bore through black storm clouds. St. Joseph's fire rolls along their wings like the never-to-be-forgotten "flaming onions" of World War days. The planes shudder and vibrate under the loads of ice on wings and propellers and finally spiral down out of nowhere to an almost blind landing on a field that would be called a triple threat in any part of the world.

A. L. (Pat) Patterson, who heads the China Airmotive company of Hongkong but makes his personal headquarters in Chungking, the present nationalist capital of China, gives a graphic picture of the world's greatest present-day activity in commercial aviation.

It's a story of grim determination, of dire necessity, of a mighty nation striving to survive against a more modern enemy and arising from chaotic dismemberment to conditions stronger and more advanced than ever before in her history, and setting an example to the world as to what can and is being done by transport aviation. It is, paradoxically enough, the story of a war that has driven the people not so much to military aviation as to the ultimate in proving the worth of transport aviation.

Typical of the young Chinese fliers trained in the U. S. are these three photographed beside their Bird training plane at Floyd Bennett Field. To men such as these is intrusted the vital job of carrying food and supplies over war-infested airways—day after day, month after month.

This line-up of four Douglas DC-2 transport planes in front of the hangar at Hongkong, China, indicates the modern equipment in use today.

Roughly, Japan controls the lines of communication over about one third of the Republic of China. But in between these arteries of communication, railways, highways, rivers and canals, most of the territory is still held by the Chinese, and life goes along as though there was no war blasting away in their front yard. Crops are planted, cultivated and harvested much as they have been for the past thousand years, and much of the ordinary industry is carried on as usual. Transportation, however, is at a standstill, that is, all except air transport. And the crops and industrial products still find their way to the outside markets.

Today, going into the third year of the invasion of China, their commercial air transport is numerically four times greater than it was at the beginning of hostilities. The joint Pan-American-Chinese-owned air lines, the China Airmotive company and the German-Chinese-owned lines continue to function and to expand their business.

Some of the pilots operating on the air lines of China are foreigners, but the majority are Chinese. The mechanical staffs are almost wholly Chinese, but work under the supervision of foreigners.

Patterson claims, and he's a pilot who won his wings in the World War and knows both aviation and China, that he'll back the commercial pilots of China against any commercial pilots in the world.

There is not one first-class commercial airport in the possession of the Chinese, yet they make seemingly impossible flights under conditions that should ground any airplane, and go on to make landings that are little short of miracles. They do it day after day, and commercial aviation is playing a far more important part in the war than military aviation.

The commercial airport at the present national capital of China, Chungking, is located on a sand bar in the middle of the Yangtze River. There they have built a twelve-hundred-foot runway of stone. Here the river rushes through a deep gorge with the banks on either side rising hundreds of feet, and at all times it is a one-way landing. There are approximately twenty-six clear days out of the year at Chungking, and during the rainy season there is a rise of a hundred feet to the river and the runway is often under from thirty to fifty feet of water. Then they have to land wherever they can find a spot.

The landing field at Chungking is one of their best, but even under such adverse conditions they continue to expand and improve. It's hard to say whether the strain is harder on the transport pilots or on the mechanical staff. Like stoics the mechanics work under the constant strain of air raids. Enemy planes roar in from the east and the macs dive for their funk holes. Bombs rain down and blast holes in the landing field and before the picric bite of the smoke of the exploded bombs drifts away crews are busy filling them in. By the time the raiders are out of sight the field is ready for the landing of commercial aircraft.

Bombs blast the repair shops to pieces but the mechanics gather up such tools as they can find, clean *(Turn to page 61)*

Above—A Flying Fortress opens her bomb trap to drop 100-lb. bombs. Left—Various types and weights of army air bombs. With one exception these are demolition and fragmentation bombs, latter for ground-strafing.

Projectiles, fuses, sighting devices—aerial bombing today is a very definite science.

BOMBS AND HOW THEY WORK

BY COLIN KERR CAMERON

THE story of airplane bombs goes back to the "borning" days of aviation. The original eggs used thirty years ago weighed just a few ounces apiece (in contrast to the two-thousand-pounders that are strapped into the racks nowadays). Equipped with spherical, pitted, thin-walled cases that were easily shattered on impact with the ground, they were colored a characteristic yellow, even as modern bombs loaded with TNT are purposely painted yellow for identification today.

A unique fluid of powerful content filled minute cells in these early projectiles. When dropped from airplanes, the spheres did little damage except in the occasional case of a direct hit on some unwary individual. They could hardly be classed as major military weapons. Nevertheless, they served well in allowing the early aeronauts to demonstrate their prowess at simple target practice.

Yep, those original "bombs" were—*oranges!* They made swell projectiles for the barnstorming "peelots" of Early Bird vintage. A few of the lads preferred to use paper sacks filled with flour for their bomb-dropping stunts. Said the flour was more "showy."

Much soup has slipped through the carburetors since those experimental days, and amazing indeed has been the development in bombs, bombers, and bomb-dropping technique. In the army's aircraft ordnance stores at Aberdeen, Maryland, for instance, are monstrous missiles weighing more than two tons apiece. And army plans have even been drawn up for bombs of *five* tons in total weight.

These five-tonners, it is true, have never been built except "on paper," and perhaps they never will be manufactured for actual use. They were designed strictly for experimental comparisons shortly after the World War. The two-ton eggs were developed at the same time. Only a few of

these were made, and tests indicated they were too big to be practical.

Still, in these days of bigger and better bombing planes, they could easily be given another workout. Uncle Sam's newest flying fortress, the Boeing B-17B, could easily handle a five-tonner, it would seem. Successful flight tests were recently made with a B-17 lifting a bomb load of nearly six tons under service conditions; which means carrying also a crew of six to nine men, adequate fuel for the assigned mission, five machine guns and ammunition, and flying at a speed in excess of 250 m.p.h. (By contrast, the army's first plane—the Wright Brothers' Type B—had a top speed of 42 m.p.h., weighed 800 pounds as compared to the B-17B's 22 tons, and developed 25 h.p. with its four-cylinder engine. The four Wright Cyclones of the new bomber develop 4,000 h.p.).

The biggest bomb now built for the army averages 2,000 pounds. A demolition bomb, it is intended primarily for use against enemy battleships, major fortifications, important bridges, and the like. The weight is proportioned about evenly between the forged steel casing and the explosive load of cast TNT.

How would you like to have one of *those* eggs dumped into your backyard?

Well, it could be dumped safely! That is, the tremendous weight and impact of the bomb itself may do some damage, but the explosion would not necessarily have to follow. Provision is made for the "safe" dropping of all projectiles, and they may be released, generally, from altitudes up to about 8,000 feet without fear of detonation.

This safe dumping in emergencies, over friendly territory, is accomplished by combining a simple little device called an "arming wire" with a strong, flawless bomb case that will not shatter or crack under the terrific shock of contact with the ground following a fall. The arming wire can be dropped with the bomb, in which case it acts as a lock and prevents the fuse from functioning. If a "live" drop is intended, however, with the destructive detonation to follow, the bomb-rack mechanism acts to withdraw the arming wire from the projectile, thus allowing the fuse to unlock and "arm" the bomb ready for action.

Bomb fuses are of various types. Some have a simple safety pin that is yanked out by the arming wire. Others, more complicated and somewhat safer, are fitted with small propellers or vanes which spin as the projectiles fall. When the props have made a definite number of revs and the bomb is a safe distance away from the plane, the firing mechanism is freed and the fuse is ready to detonate the main explosive load on impact with any solid object.

Perhaps we should make it clear here that it is not the force of the bomb striking the ground that explodes the charge. Cast TNT is a relatively "dead" explosive and normally will not "go off" on a simple shock. The fuse is loaded with a more sensitive explosive—sometimes even a chain of them. The firing mechanism ignites a primary charge, which in turn starts off a second little explosion. This fires the next link, which finally is potent enough to jar the TNT out of its laziness and produce the Big Boom.

Fuses are "timed" differently. *(Turn to page 59)*

Left—Maintenance crew load 100-lb. bombs aboard Flying Fortress. Below—First aerial bomb and Wright plane of the year 1910.

Right—One of the old experimental 4,000-pounders, contrasted with figure of man. Half weight was TNT.

THE EYES OF WAR

Photographer with camera for vertical or oblique work. Camera takes 110 7x9 shots on 75-ft. film.

Above—Fairchild military camera used with photo flares at night. Left—A Fairchild five-lens takes five photos at once. This makes single composite shaped like a Maltese cross.

BY HERBERT C. McKAY

NOT many months ago a foreign military commander made this startling statement, "The army with the best photographic corps will win the next war!"

Of course aërial mapping and reconnaissance are important, but can they be that important? At the end of the World War cameras served as auxiliary eyes for the army and an excellent tickler for the memory of the observer. In fact, conditions were often such that the camera could not be used, although visual observation could be made. Today, the camera is the super eye, instantly recording details which the observer could not assimilate in a half hour and revealing minute details when the eye encounters only shifting haze.

Try to imagine actual military conditions and you can understand the officer's opinion. A new position has been taken, men are digging into temporary defenses, which are wide open to barrage and aërial attack. The whole corps is vulnerable. The only defense lies in deception. A mile behind the line a false trench is dug, only a few inches deep. It is decorated with hel-

Below, left—Time-lapse effect. Imagine each superimposed dot to indicate gun emplacement; then, middle—second time-lapse shot. Study shows altered dot arrangement. Right—Key photo made by superimposing positive of first photo over second. White dots indicate unchanged emplacements. Black show moved ones.

mets, bayonets and general trench debris. When the enemy flies over their concealed trenches, the true position will not be seen because the false trenches are assumed to be the true ones. Yes, such a defense would probably have been successful in 1918, but today it wouldn't fool the aerial camera a moment.

Modern military strategy depends upon information, accurate information, obtained without loss of time. The enemy move artillery into a new, well-camouflaged position overnight; submarines lie in secret harbors, with motors silent; rapid, mobile combat units move unexpectedly to new positions in the haze of battle; an effective battery is operating from behind a hill, whose height must be determined. Heretofore information about such developments had to depend upon the more or less accurate observation of man. Today the modern military camera answers the question accurately and instantaneously.

The pictures are taken in the air, and by the time the ship is grounded the negatives are developed all ready for rapid examination and for quick printing. Within less than ten minutes after grounding, the staff officers may examine clear photographs of the scene of action! And these photographs will reveal many things not visible to the eyes of the photographer who made the shots.

The penetration of opaque strata is an accomplished fact. U-boats can be photographed when the surface reflection hides them from visual observation, and when ordinary photographs would show the water as a metallic, opaque surface; ground haze can be cut through easily; even light fog and hazy smoke can be wiped away by the magic of modern photography.

During the war of 1914 panchromatic plates were still in the experimental stage, and very poor at that. Today we have a dozen or more different kinds of panchromatic films of excellent quality. Pan film, as it is called, is highly important. Briefly, we must remember that ordinary daylight is made up of all colors. The rainbow is formed when daylight is split up into its component parts. These colors run, in order of wavelength, blue, green, yellow, orange and red. Violet is the shorter component of blue. When light travels some distance the violet and blue rays get lost, are reflected and bounced about until they no longer mean anything to the eye. However, in their confused state they give the appearance of a uniform blue color. The most common example is the sky. There is no color there, nothing but empty, black space. Only the scatter of the blue produces the appearance of a solid blue dome. The same thing causes haze, the great enemy of aerial photography. Haze is simply the amount of "sky" between the ship and the ground!

The red rays are not so easily disturbed, and if we could brush away the interfering curtain of tangled blue rays, we could see right through the haze; in fact, it would disappear.

Ordinary films respond only to the blue part of daylight; panchromatic films react to every color of daylight. Therefore if a sheet of red glass is placed over the camera lens, this glass, which we call a filter, pushes back the blue and green rays letting only the red through. By this means it is possible to make sharp and clear photographs of objects which are completely hidden to the eyes by a heavy curtain of haze. In very bad cases we go even further and make use of the invisible rays below the visible red. Such "infra-red" methods have made possible good photography at ranges of several hundred miles!

Infra-red reveals another important trick of camouflage. The enemy moves artillery into position overnight. By morning the guns are camouflaged by trees and boughs. Dumps and trench openings are concealed beneath rough, green-painted canvas. From the air the new position is absolutely invisible, yet within an hour after daylight they are shelled so heavily that the position has to be abandoned. How was the position discovered? Infra-red films have a peculiar characteristic. Green paint will photograph as dark gray or black, while living foliage photographs snow-white in this curious invisible "light." The guns and dumps are revealed as if they were coal black on a field of snow!

Infra-red has limitations. The writer of detective fiction loves to capture his man by making an infra-red shot after dark, out-of-doors. The idea is fine, but it won't work. You must first have the infra-red, and it is exceedingly rare after dark. After all, infra-red is an old and familiar friend, being merely a fancy name for heat. Daylight has plenty, so have all forms of artificial illumination except gas discharge tubes. A soldering iron will be photographed in total darkness as a white-hot iron. But you can't go aloft and shoot the enemy position at night by infra-red.

However, night photography is not ruled out. So great has been the development in film sensitivity and lens speeds since 1918—and many such developments are not yet commercialized—that effective exposures can be made now with about $^1/_{5000}$ the amount of light necessary twenty-five years ago. Instantaneous photographs will reveal the smallest pinpoints of light, even ones which might be overlooked by a visual observer.

Most people are familiar with the routine of mosaic mapping. A plane flies over a strip of territory, maintaining as nearly constant altitude as is practical. At the end of the trip the ship is turned and flies back a short distance to one side of the original path. Back and forth the flight is made until the whole area has been photographed in a number of narrow strips. The series of photographs thus made are assembled into a great mosaic by cutting the central portion from each and matching it to the next one.

Today multiple-lens cameras make possible the photography of a much wider area, and the fact that the plane *(Turn to page 50)*

Left—Aerial photo of village, showing photographic appearance of terrain when compared, left, center, with map, indicates close relationship of map and photo. Right, center—Oblique shot of mountainous country taken from a low angle. Right—Vertical photograph of the same country. The black lines show same section taken in the oblique shot. If plane is not directly above ground, "rectification" process may be used.

GLIDING AND SOARING

A real glider train. These eight ships coming in for a landing at an airport near Moscow are part of eighteen towed behind a single airplane.

CONDUCTED BY ALEXIS DAWYDOFF

MOST of you have read about altitude flights made by Bob Stanley, Chet Decker and others, and know that in order to attain such heights the pilot had to enter clouds and fly blind in them for quite a while. In blind flying the pilot has to rely entirely on his instruments as his sense of feel is apt to play strange tricks on him. Until recently hardly any of our sailplanes were equipped with instruments and only a few of the pilots knew how to use them. However, more and more of the boys each year acquire them and learn their use.

The greatest difficulty in blind flying is to keep control of direction. The pilot can feel the beginning of a turn, but if he continues turning he loses that feel, and when the turn stops he gets a false impression that he is turning in the opposite direction. The next difficulty in importance is controlling the pitch. In a sailplane this has to be so accurate that it is difficult to avoid large changes in speed. The pitch is controlled by nosing the ship either down or up. Offering the least difficulty is control of the sailplane in a roll. Slight mistakes in that are not as important as errors in turn or pitch.

The instruments for blind flying on most of our sailplanes consist of a turn indicator, which has a needle showing the direction in which the turn is made; a bank indicator similar to a spirit level but equipped with a ball instead of a bubble, showing which wing is down; and an airspeed indicator—which does just that. These instruments are used systematically and in definite order when flying blind in straight flight. The pilot looks first at the turn indicator, and if the needle is not in the center he brings it back by a slight pressure on the opposite rudder pedal. Next he looks at his airspeed indicator, and if it registers more than normal cruising speed it means that the sailplane is diving, so he brings the stick gently back until the needle of the airspeed indicator shows him that he is back to normal cruising speed. Last of all he looks at the bank indicator and levels out the wings, moving his stick sidewise. This is known as the one-two-three system of blind flying. It is advisable, however, that in correcting his turn the pilot use both rudder and stick. A number of our pilots practice this method during distance flights by putting their heads *(Turn to page 53)*

Above—A gliding family! Helen Montgomery, holder of American woman's duration record, takes her two-months-old daughter and her husband for a ride at Frankfort, Mich. Right—This huge weather-observation glider, built in Germany, is equipped with all-important two-way radio phone.

BY the time this issue gets on the stands things may be different, but right now, war or no war, we are still getting our foreign aviation magazines as regularly as ever. *Flight*, the English publication, and *Flugsport*, which is German, arrive sometimes in the same mail, while across the water the very ships described in them are battling each other in grim reality. There has been, however, a noticeable lack of military-ship cutaway drawings in the last few issues.

★ ★ ★

It is always painful to spoil an illusion, particularly a popular one, but then air progress has made many changes in aerolegend, if we may coin a word. No longer, for instance, does the hero of aviation stories have to appear in whipcord riding breeches and boots, helmet and goggles and all the rest of the trappings. Likewise the test pilot has changed. According to the movie version and fiction, he is a hardy soul, prone to wrap his tummy with ten yards of tape, jauntily climb aboard a snorting experimental ship and then all but kill himself and crash the plane trying to tear it apart. Tales of his screaming from pain and pressure in power dives, "blacking out" on split-S turns, and coming down (if he lives) a game though jittery hulk, have been the public's fare for years. Well, *sometimes* all that is true, but lately we've been discovering that test pilots are actually just human beings. They go to the movies if they find time, like music, have families, and testing ships to them is merely a job.

Take one famous test pilot who simply puts on a teddy suit over his business suit for warmth and goes ahead and tests. Or another who dove and pulled out an SBC-4 recently at a G load of 13½, suffering no more than a lame neck, when according to all fiction he should have been very, very dead. Incidentally, this same chap has seven children, so you see he's a real family man besides being one of the best in the business.

And a recent development in testing technique is the installation of dictaphones so that during the test dives the pilot may dictate his reactions rather than try to write them down. A movie camera also takes pictures of the instruments, recording their every bit of evidence. Pretty soft, eh?

★ ★ ★

Apparently anticipating foreign business in sizable chunks, Vultee have released their Valiant 51 (basic combat) for export. This splendid ship may soon be fighting overseas. It will be interesting to see how some of these American ships will act under actual combat. It should be very gratifying indeed to the Curtiss organization to hear from French authorities that the Curtiss 75-A has been more than holding its own on the Western Front. Reliable reports say this ship has been more than a match for the much-flaunted Messerschmitt 109s. This is particularly interesting when you consider that our later models of this same ship can outperform by a wide margin these same 75-As. We refer to the Curtiss P-40 of which we have ordered four hundred and then there are even later models such as the 42, which, while still experimental, are sensational.

★ ★ ★

Miami's All-American Air Maneuvers, January 5, 6, 7, 1940, seem to be the next thing on the air-show program. These annual affairs in the Southland, of which this is the twelfth, are rapidly developing into one of the most important events of the year. Ideal flying weather and real co-operation from the local authorities have gone a long way to make them so.

★ ★ ★

Vultee's United States army air corps contract for Valiant 54 basic trainers has been received in its approved form. These ships will carry the air corps designation BT-13. Hope that doesn't stand to be interpreted as Black Tomcat-13 by the superstitious.

★ ★ ★

It is interesting to hear that the army air corps is planning to take up gliding and soaring as a serious part of its training, and is looking around for a soaring site. Apparently after witnessing the soaring at Elmira, the air corps has the idea that only slope soaring is possible, while in fact slope soaring is decidedly passé. The army would be wise to investigate the broad Texas plains where thermal soaring is at its best, and where all you have to do to make a landing with plenty of room is to point the nose down and land. This is ideal for student training.

★ ★ ★

That soaring is rapidly coming into its own and is being enthusiastically followed and investigated by former skeptics was evidenced recently by an invitation for Lewin Barringer and our soaring editor, Alexis Dawydoff, to show their combined collection of soaring movies to a group of transport pilots and Q. B.s at Newark Airport. From what we hear the boys got a great hand, and the questions were hot and heavy.

★ ★ ★

The long-talked-of idea of carrying all first-class mail by air has been tried out by Great Britain with her empire mail for the colonies with almost terrifying results. For some time folks in this country have been trying to talk this up. Now perhaps they will relax for a moment and cogitate on what happened to the English, which was plenty. In the first place the mail was so heavy that even passengers had to be left behind, the companies involved were practically collapsed for lack of enough equipment, and it finally became so involved that it took longer for a letter to reach the colonies by air than it did by freight because of waiting for a chance to fly.

★ ★ ★

The gigantic new British airdrome being built at Botwood, Canada, is one of the most unusual airports in the world for several reasons. It is hacked out of the Canadian forest so far back from any cities that it is practically isolated. It is an entire city in itself, with movies, stores and all the trappings. Again, it is located at a certain point where because of peculiar weather conditions there is never any fog. This in itself is certainly worthy of note for it is important in year-round operation of huge transports and military ships.

★ ★ ★

Another interesting Canadian fact is that the abundance of salt, which has been one of Canada's oldest products, makes possible its use for runways when combined with clay. At any rate this surface must be *(Turn to page 55)*

SUPERCHARGED SHOESTRINGS

How to buy a light plane though broke—

bright examples of courage and ingenuity.

BY ALMA HEFLIN

HORATIO ALGER had a formula in writing his stories. The poor newsboy with a widowed mother worked hard, finally married the boss' daughter, and lived happily ever after. He never bought an airplane because airplanes hadn't been invented. In a modern sequel he would.

Jimmie Cook is the modern sequel.

Jimmie was a newsboy. By all the rules, he'd be lucky to buy a Model T Ford with its top missing, its upholstery full of holes, its remaining fender flapping; but Jimmie wanted an airplane. It was a foolish ambition. Airplanes cost money. Maintenance is no joke. They need gas and oil, and hangar rent varies from five dollars to thirty dollars. The man the salesmen are gunning for is typically a merchant, a doctor, a business man who can count on a good income. A survey showed they thought $1,500 a year a minimum income. "But, of course," they explained, "it all depends upon how much a man *wants* the airplane!"

Which explains Jimmie.

He took his troubles to various airports, priced the planes which three years ago ranged from $1,200 up (a little less now), and carried his troubles home again. "I'm saving all I can," he said to Midge Ash, his girl friend, "but when it's only a few cents a day, it's pretty discouraging."

"How much do you have now?"

Jimmie brought out his hoard. They looked miserably at the little pile. An airliner, the night mail from Newark, thrummed overhead and Jimmie walked to the window to watch its green and red and white lights trace enchantment across the purple sky. Midge looked past his shoulder, then at the resolution in his face. She smiled suddenly. "We can do it, Jimmie. Look—"

Midge helped a lot. Their dates didn't cost much, because Midge loves airplanes as much as Jimmie does. Day by day the pile grew. It was slow, but when one evening the score tallied 40,000 pennies, they looked at each other in triumph.

All night he and Midge wrapped pennies in the little paper rolls that banks demand when pennies are turned in. All day, sleepy but excited, they wrapped. At dinnertime they had finished. As soon as the bank opened next morning, Jimmie was there trading pennies to a goggle-eyed cashier for $400. At Central Jersey Airport, he took the money to Al Bennett of Bennett Air Service.

"A down payment on the cheapest new ship I have is $419," Al said, "and monthly payments, including insurance and finance charges, will be ninety-three dollars a month."

Jimmie looked sick. "But I can find you a *(Turn to page 44)*

The new auto-type cowling on the latest 1940 model Taylorcraft light plane. Left—Marvin Everett, who had a plan that worked. Below—The new all-metal Luscombe, an increasingly popular ship.

Kitty Hawk Wright Memorial.

KITTY HAWK—

WHERE MAN FIRST FLEW

BY FRANK A. MONTGOMERY JR.

SOUTHWARD from the Virginia capes there lies along the stormy shores of the Atlantic a region of windswept sand and narrow beaches of wild, forbidding aspect. For over one hundred and fifty miles below the Virginia line this lonely shore forms the easternmost rampart of the North Carolina mainland.

Into this barren region, in the summer of 1900, near the little village of Kitty Hawk, North Carolina, there came two brothers from Dayton, Ohio, Wilbur and Orville Wright. And here, near a giant sand dune called Kill Devil Hill, within a stone's throw of the turbulent surf of the ocean, less than three years later there occurred one of the most far-reaching events in the annals of the world: the birth of the airplane. To mark this great feat, there stands today upon the crest of the sand dune, Kill Devil Hill, an imposing granite memorial to those intrepid brothers, a memorial to mark forever the spot where man first flew.

The beginning of the work that reached its successful culmination on the sands of an isolated North Carolina beach really took place in Dayton, for in that city the two Wrights were born and grew to maturity. It was there, too, as boys, and later as young men in their bicycle shop, that many of their earlier experiments connected with flights were carried on. In fact, for years before going to North Carolina the Wrights performed endless experiments with gliders and model airplanes, and the true foundation for their later work at Kill Devil Hill, near Kitty Hawk, was laid there.

The story of the first flight of an airplane really begins when the Wrights, as lads, received as a present from their father a toy helicopter. That was in 1878. When the helicopter was held in the hand and released, instead of dropping to the floor it flew across the room. Understandably fascinated, the boys immediately took time out and built larger ones, making them fly, too. But it was not so very long before they found out that the larger the helicopter, the less it flew, although it was a long time afterward before they learned why—a machine having twice the linear dimensions of another would require eight times the power.

This crude toy undoubtedly aroused the interest of the Wright boys in flying, but it was not until about 1896, at the time of Lilienthal's death in his glider, that they really began to consider the problem of flight. As both of the Wrights have said, they, at that time, began to read every piece of literature on manmade flights that they could lay their hands upon.

Profiting by what they learned through reading of the work of others, Wilbur and Orville early decided that instead of trying to construct a glider which of itself would hold a perfect balance in the air, they would build one that wouldn't tend to right itself at all: they would make it as inert as possible, you might say, and then apply to it some method by which the operator could regulate its balance at will. This brought them, in time, naturally enough, to the matter of control, which they solved in their characteristic manner by inventing the warping wing, forerunner of ailerons on modern wing surfaces. Also *(Turn to page 46)*

This month marks the anniversary of the airplane's birth, ever an engrossing story.

Howard Holliday, of Regina, Sask., sends in this fine shot of R. C. A. F. Grumman.

Cold in the nose? Charles Esler of Marion, Ind., snapped this N. A. O-47A.

And another North American! This BC-1 was snapped and sent in by Air Adventurer Russell Scott, of Dallas, Texas.

All dressed up. "Corrigan's Clipper" as it looks at the Frisco Fair. Charles Peterson, of Cakota, Minn., sent it in.

(MEMBERSHIP COUPON)

To the Flight Commander, Air Adventurers,
79-89 Seventh Avenue, New York, N. Y.

I am interested in aviation and its future developments. To the best of my ability I pledge myself to support the principles and ideals of AIR ADVENTURERS and will do all in my power to further the advance of aviation.

Please enroll me as a member of AIR ADVENTURERS and send me my certificate and badge. I inclose ten cents to cover postage.

Name _____ Age _____

Address _____

☐ Check here if interested in model building

Air Adventurers, a neutral meeting place.

GREETINGS, Air Adventurers!

Your Flight Commander is in a very unenviable position these days attempting to greet both American members and our loyal overseas friends. As you all know, this grand organization of ours is composed of aviation enthusiasts all over the world. We have no specific requirements as to nationality, but are all bound together regardless of race or creed through the support and principles of the Air Adventurers Club, which is only interested in the advance of aviation.

Many of our members are Canadians, Australians and Britons, and they naturally are keenly and vitally interested in the new world war their empire is at present waging with the Nazi German government. We can feel for them and all have our personal opinions in the matter, but owing to the official stand of the United States to remain neutral, we cannot allow this department to take up any particular stand in the great conflict. We are of course intensely interested in the possible outcome, and as aviation enthusiasts it is natural we show more than passing interest in the aviation development and the air-war action. Yet as neutrals it does not become us to air personal opinions in the pages of this department.

Your Flight Commander, then, takes this opportunity of attempting to clarify our position in this matter, both for our American members and those who reside across the border or overseas. We hope that all members when writing to this department will fully recognize and understand our position. We hope to hear from our British Empire friends just as we have in the past, and we want news about themselves and what they are doing. We are sure, however, that in their reports they will respect the state of neutrality which our government has decided upon.

Nor do we think it necessary to remind our American members that as Americans they are neutrals and should conduct themselves as such. Let us aim to keep Air Adventurers a world-wide meeting place for all who are sincere in their desire to further the progress of aviation.

Your Flight Commander,
ALBERT J. CARLSON.

CLUB NEWS

And now to the happier side of our department. The mail bag bulges with news this month, Air Adventurers!

First out of the bag comes from far-away Australia. We have a new Aussie member, T. E. Matthews of Adelaide, who boosts Australian commercial aviation to the sky. And he says they have a lot of American Douglas and Lockheed Electras down there now, since most of the British firms are too busy building military planes to get into the export commercial market. Matthews is an interested model builder, too, having completed a Grumman XFS-2. He is now building a Flying Fortress, a DC-4, and the new Boeing 314 flying boat. Quite an undertaking, we'd say, but that's how the Aussies do things.

All the way from Puerto Rico, Hector U. Benny sends in two swell photographs of military types used down there. One is a Consolidated PBY-1 drawn up on the apron, and the other a Sikorsky S-43 amphibian. Lots of swell detail, too. We wonder how long we shall be able to get military pictures of this kind.

(Turn to page 66)

MODEL PLANE OBEYS RADIO

This latest wrinkle is of international use for antiaircraft gunnery practice.

Left—This successful model was built by Joe Raspante, of Brooklyn, N. Y., here shown testing four-tube receiving set. Heavy-duty batteries are used for testing to preserve the plane's own, smaller batteries.

Middle—Close-up of receiver and selector units. The receiving set weighs 15 ounces. Right—Tuning the receiver to the 5-meter ground transmitter. A bakelite screw driver is used to adjust the condensers.

Left—The detachable tail assembly is provided with control wires, coordinated with the selector unit mounted in nose of ship. Engine and rudder controls are all that are necessary to control the plane.

Middle—These batteries energize the magnets that control ship. Right—Ground-control selector enables operator to choose maneuver desired. The telephone-dial arrangement actuates six different maneuvers.

Setting up the control units. Transmitter is in the center, ground-control selector right. Latter does the actual controlling.

WHAT'S YOUR QUESTION

QUESTION: Would you kindly send me a list of all the standard ships in the air corps of the following classes: bombardment, attack, pursuit, fighter, observation and others? Where could I obtain pictures of these ships? R. W. O., Cambridge, Mass.

Answer: Sorry, but space does not permit us to list all the types of ships in the air corps. For photographs write to the Chief of Air Corps, Washington, D. C.

Question: Where can I get plans for a plane that is cheap to build? What are the five fastest pursuit planes in the world? M. J. S., Gerard, O.

Answer: For such plans write to Heath Airplane Co., Benton Harbor, Mich. With all countries designing and building new models of pursuit planes constantly, it is hard to say which are the fastest. Germany has Messerschmitts and Heinkels, England Hawker Hurricanes and Supermarine Spitfires. We have the Bell XP-39, Seversky P-35, and XP-41, Curtiss YP-40. France has the Morane and the Dewoitine.

Question: Could you tell me if a pilot can get a transport license if he has to wear glasses to bring his vision up to normal? C. H., Dallas, Tex.

Answer: If your vision in either or both eyes is not poorer than 20/50 and can be brought up to normal, which is 20/20, with glasses, you may be qualified for a commercial license provided that glasses are worn while piloting the aircraft.

Question: What are the requirements necessary to hold a position as a radio dispatcher for an air line? How much salary does he receive? What are the chances of getting a job? J. S., Memphis, Tenn.

Answer: For requirements about this job write to the Civil Aeronautics Authority, Washington, D. C. It is a very difficult job to obtain as requirements are very strict and the applicant has to have served as a first or second pilot for a certificated air line for at least one year previous to application for dispatcher's position.

Question: Will you kindly tell me the minimum educational and aeronautical requirements for a commercial license? G. T., Chicago, Ill.

Answer: The applicant for a commercial license shall be able to read, speak, write and understand English. The aeronautical requirements are two hundred hours of solo flight, of which the last five hours were logged within the last sixty days; ten hours of solo cross-country flight which shall include at least one flight of not less than one hundred miles with at least three full-stop landings at different points on such course.

Question: Could you tell me which is the faster and more maneuverable plane, the Grumman XF4F-4 or the Curtiss YP-37? E. L., Manchester, Okla.

Answer: Sorry, but no information is available as to the performance of these two ships.

Question: I am a young colored fellow and am aeronautically inclined. I contemplate entering the design branch of aeronautics after going through some technical school. Is a great knowledge of mathematics necessary for this phase of work? What would be my chances of securing a position with an aircraft concern upon completion of school? J. W., Jr., Salt Lake City, Utah.

Answer: Mathematics and physics are most important in design work. If you show promise at the time of finishing the engineering school, you doubtless will have no trouble in securing a position in the design department of some aircraft manufacturing concern.

Question: What is meant when an airplane propeller is fully feathered? What does 10G mean in connection with a power dive? What is the apron of a landing field? G. S., Warren, Pa.

Answer: When an airplane propeller is fully feathered its blade is at an angle of approximately 80 degrees to its flat-pitch position. 10G is the force exerted on the plane in a pull-out from a terminal-velocity dive, which is ten times greater than the normal pull of gravity. G is the symbol of gravity, and 10 indicates the power to which it is raised. An apron is a concrete strip in front of the hangars on which airplanes are parked.

Question: Where can I secure full information concerning the requirements necessary to become an air stewardess? M. E., Franklin, Pa.

Answer: The applicant for that job has to be single, a registered nurse and a high-school graduate. She must be not more than 5 feet, 5 inches tall and weigh between 100 and 120 pounds and be in perfect health.

Question: I would like to get some information on the M. U. A. L. apprentice plan for entering aviation. Is this a reliable method for a young man to start with? What are the qualifications and the usual pay? How long will it take to get a license this way? W. E. H., Thomaston, La.

Answer: I suggest that you write to the M. U. A. L. regarding their apprentice plan. It sounds good and ought to give you a right start in aviation. According to the Air Line Mechanics Association wage scale, the apprentice receives 42 cents per hour for a period of six months with a subsequent increase of 2 cents per hour each following six months. After two years, when they reach their maximum of 48 cents per hour, they are promoted to junior mechanics. A number of organizations which do not belong to the A. L. M. A. pay less. Apprentices must be at least 16 years old. You can get your license whenever you pass your written test, provided you are over 18 years of age and have had at least one year of practical experience.

Question: Will you please send me a list of the ten best universities or colleges teaching aeronautical engineering? J. C. M., Jr., Jackson, Miss.

Answer: Write to the Civil Aeronautical Authority, Washington, D. C., for a list of these institutions.

This department will attempt to answer any questions concerning aviation. Those of general interest will appear on this page; others will be answered by mail. Inclose a three-cent stamp to insure a reply. ★ All inquiries regarding appointments for U. S. army air corps flight training should be addressed to the Adjutant General of the Army, Washington, D. C. Those concerning application for naval aviation training should be addressed to U. S. Navy Bureau of Navigation, Washington, D. C. ★ Persons interested in applying for air corps ground training, such as that for airplane and engine mechanics, riggers, instrument and radio men, as well as aerial photography and parachute work, should address the Commandant, Aircraft Technical School, Rantoul, Ill.

MODEL BUILDING

AIR TRAILS MAGAZINE

Trophy-winning contest models • High-performance gas jobs

Informative articles by experts • Interesting photographs

DECEMBER 1939

Frank Nekimken with one of his classes organized by Chicago Park District. Many groups now recognize value of proper instruction for beginners.

THE MOLECULE

BY LOUIS GARAMI

Above—Garami and the Molecule. Left—Start of the record flight at Hadley Field, where the Molecule outflew larger ships. The monocoque fuselage and wing installation are points to note. Nose detaches.

WITH the advent of improved tiny engines, Class A gas models are coming into their own in aeromodeling. As with everything in life, competition results in improved products for the ultimate benefit of the consumers—that's us, the model builders.

Having used many engines, the writer has found much satisfaction with the Atom, the smallest and lightest production engine. The Molecule was designed specifically for this superlight engine, and this accounts for the low total weight of twelve ounces.

At the official Eastern States Gas Model Championship the ship proved itself by spectacular performance. By winning first place and setting a sensational record, the ship lifted Class A modeling to a new level and gave it the respectability and recognition on par with other classes of powered model flying. It wrote finish to flights of a few seconds that were predominant hitherto.

The influence of this method of sheet balsa monocoque construction is being felt in all modeling circles. Several commercial models have adopted this system, and the Molecule is the latest example employing several new wrinkles.

While the engine used is responsible for a greater rate of climb, the inherent characteristics of the Molecule make possible the flat glide and soaring ability.

BODY

Make the lower half of the body first. Study the top view and fuselage detail and assemble the two longerons with all the cross braces. Although the plan does not show a cross brace at the very front, cement one in to bring the total width up to 2⅝". This will be removed when the body is completed.

Cut out the two blanks, pin them together and sandpaper to uniformity. Look over the two curves and see that there are no wavy or uneven sections left in the outline. Shape two of each of all the formers out of ⅛" sheet balsa.

Now lay the two blanks down so that the underslung rudders "toe" together, and brush clear dope on the entire surface up to the point where the rudders begin. Make sure that the dope covers evenly. A second coat is applied after ten minutes.

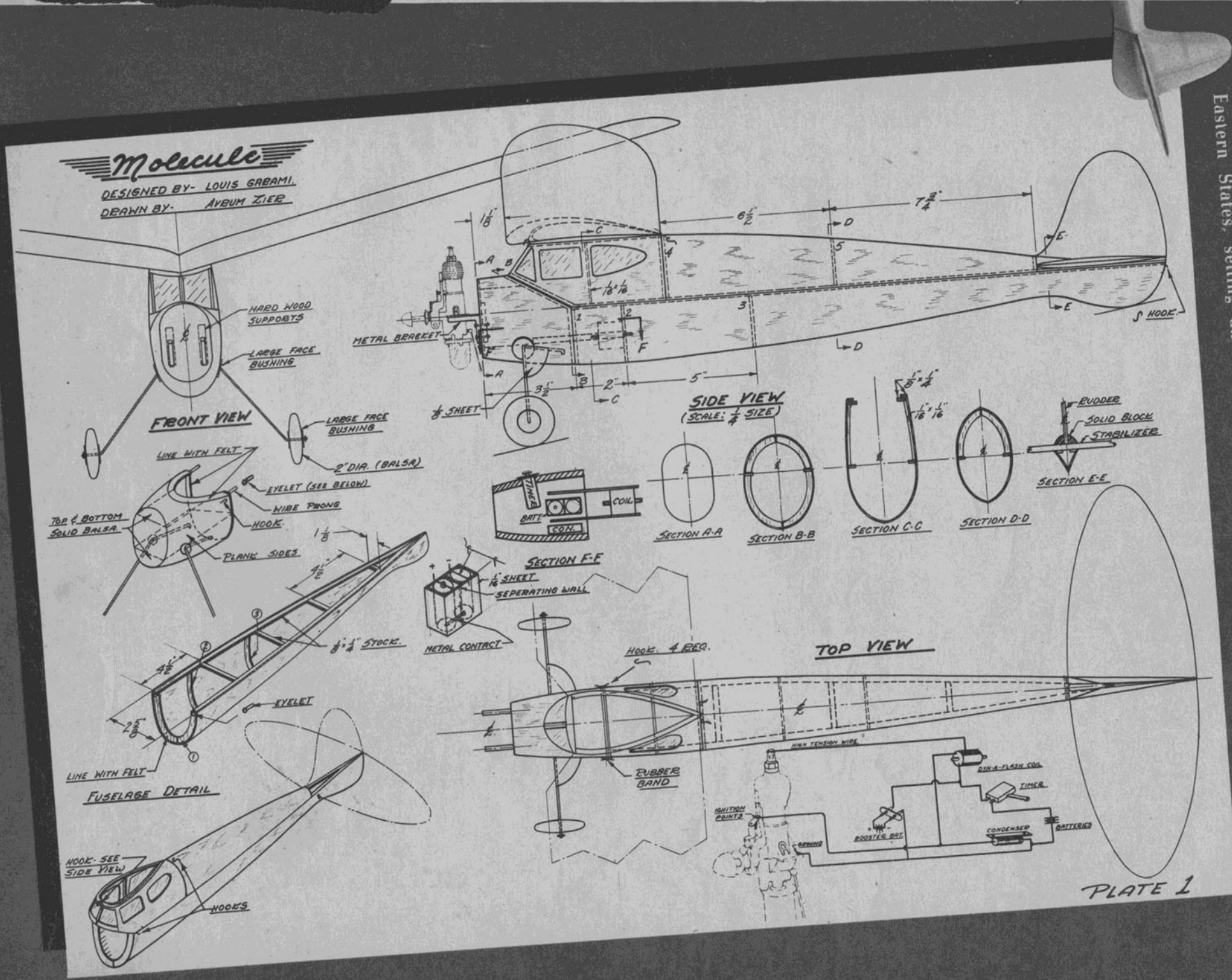
From this time on the two blanks will slowly curl up. The longer the drying period the more curve will be acquired. Experiments showed that this gradual warping will go on for days and days if it is not stopped. Our purpose is to get only a sufficient curve to fit the formers, so when the curvature is slightly less than Former 1, glue and pin in this part and follow up with 2 and 3.

Never dope a pair of blanks before you are about to take part in a long game of checkers, unless you expect to see a balsa pretzel when you get back to your model. In fact you should not stop working until the whole lower half is completed.

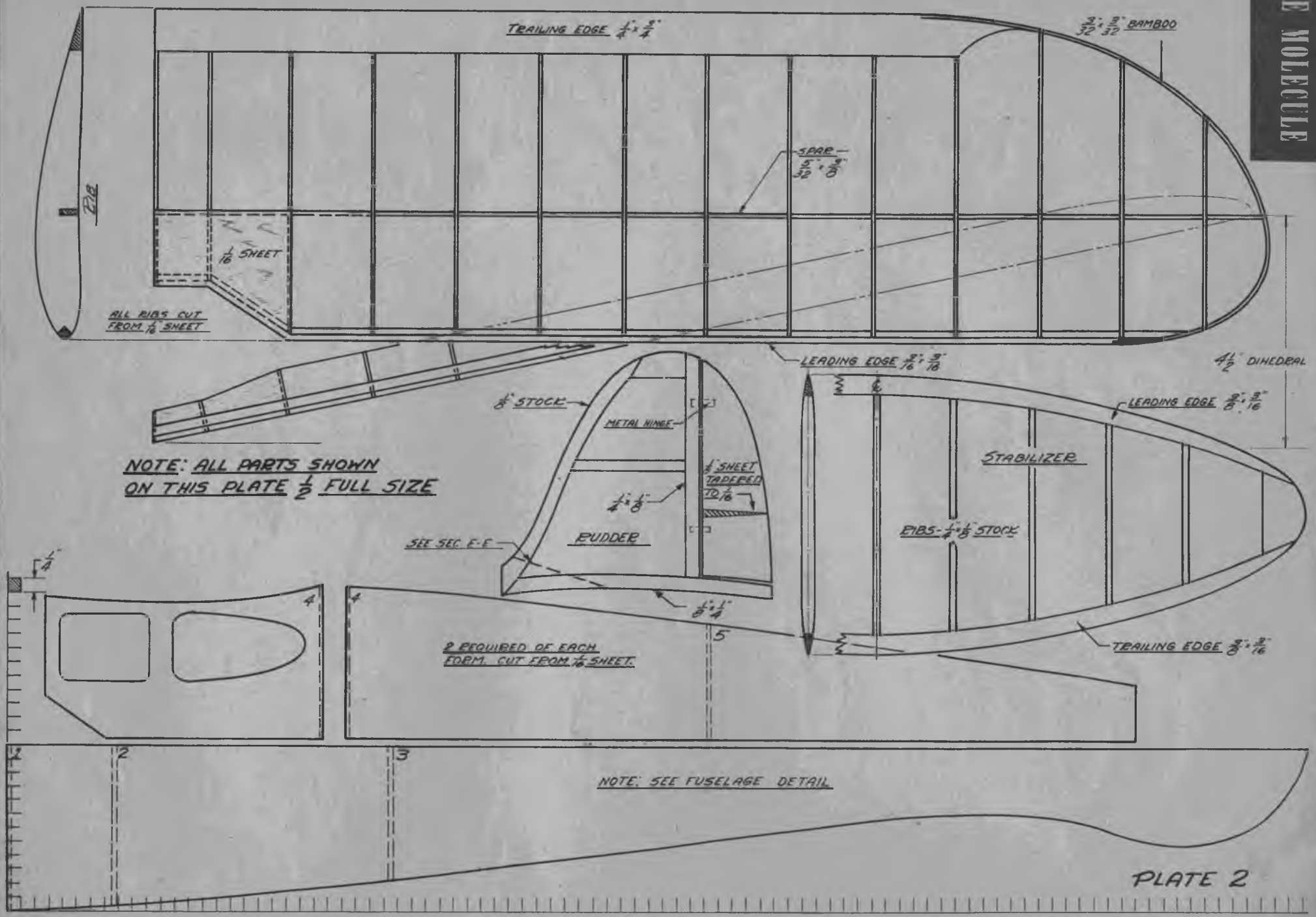
Now take the two blanks and cement them to the side of the longeron assembly. Use plenty of pins and do not forget that the longeron is only halfway in (1/16"); the other half sticks out to accommodate the top half of the body. Next pull the bottom seam together. Although you may be able to do it with pins, we strongly recommend the use of cellulose tape for a perfect job. About ten 3"-long pieces will hold the seam together. Cement on the *inside* of the body, except the rudder part, which is cemented on the outside.

Use this same method in creating the top half of the body. Naturally this seam is very hard to cement on the inside, so we will do it on the outside. On any outside cementing be very careful not to spill cement on the surface—and use it sparingly so as not to spoil the appearance of the body.

Build up the cabin roof out of ⅛" balsa. (Three pieces—the two sides and a front cross piece.) Cut out the tilted former in front of the cabin, which is the same as two No. 1 formers in one piece. Pin and cement this former at the same angle as shown. Notch in the body top behind the cabin roof about ¼" deep and cement the roof into place. Now fasten the three cabin struts, paying special attention to the line-up of the roof from every direction. The cabin blanks need only one coat of dope, since the bulge at this point is very little. *(Turn to page 54)*



To prove Class A ships can soar, the Molecule made longest flight of the day at the Eastern States, setting an N.A.A. record and flying out of sight in six minutes.



NOTE: ALL PARTS SHOWN ON THIS PLATE 1/2 FULL SIZE

PLATE 2

model matters

Send in your photos, dope on your models.

THE DOPE CAN. (By Gordon S. Light.) Need we remind you to give model material foremost position on your Christmas list when you compile that worthy document? Give the bewhiskered gentleman the lowdown on what items you need to complete your equipment. . . . Gas Modeler Maxwell Bassett has gone big-time. He started at Glenn L. Martin Co. in Baltimore in September—graduated from University of Pennsylvania last June with a degree in engineering. He's still mighty interested in the model hobby. . . . Cold weather will soon drive all but the hardiest modelers inside. But the boys who continue winding them up throughout the winter prove their ability to take it. Is there anything more painful than having your cold-numbed finger clipped by a gas prop? . . . The latest information about the annual fall meeting of the Academy of Model Aeronautics is that it will be held the week end following Thanksgiving, November 25th and 26th, at Langley Field, Virginia, under the sponsorship of the Virginia Model Association.

While in Philadelphia for the annual Q. C. G. M. A. meet, we had a nice talk with Norman Bean and a close inspection of his latest radio-control model. Dead batteries prevented his giving demonstration flights at the contest. His model is small (six-foot span and five pounds total weight) and readily flown in any field large enough for a gas model. The transmitter is portable—readily carried by the operator, who is then free to move around and follow the model. Control at present is limited to the rudder. But a method of throttle control has been practically completed. Both controls are handled through a single channel. Bean has promised an article on radio control for our favorite aviation magazine. He is especially well-qualified—takes time out from model building to hold a very responsible position with Philco Radio and Television Co. Included in his work of development of radio for aircraft was the design and construction of the portable transmitter used by the late Clem Sohn some years ago in describing his sensations during a twelve-thousand-foot delayed parachute drop during the air maneuvers at Miami.

Above—Scale model of a Martin B-10B, by Roger Parkhill, Nichols Field, P. I. Left—Tom Peerey, Fulton, Ky., and Wakefield contender, from March, '39, issue.

Right—Hewitt Phillips, United Aircraft.

Winners of the grand contest of the National Aero Reserve in Rochester. The N. A. R. was organized by Gannett papers.

Prospects seemed quite bright for us during the summer months. Alas, our luck failed again and we're continuing to work for a living. Our hopes were based on chances we took on a Cub coupe given away by a Baltimore fire company, a dozen automobiles by the Detroit Fire Department, a gas model at the Galt (Ontario) contest and a gas motor at the Philadelphia contest. One by one we waste-basketed the stubs as the drawings were made and the mail failed to bring us the good news. . . . Model Airplane Club meetings over Station WOR, Newark, are broadcast every Saturday morning at ten thirty. There's always a short talk on some phase of construction along with a question-and-answer period. Jimmy Condon has been giving out sound advice in his short talks. He's followed the hobby closely and his advice is well worth considering.

Air Youth of America is a new national organization designed to encourage and promote junior aeronautical activity throughout the country. It is headed by Winthrop Rockefeller, and has an impressive list of aviation personages on the governing council. A thorough survey conducted by A. Y. A. revealed there are close to two million boys and girls actively engaged in model building. The new organization is planned to co-ordinate and encourage aeronautical activity. Reduction of juvenile delinquency was pointed out as one of the chief advantages of promoting a worth-while hobby for youngsters to follow. The work of the model-minded city of Wichita can be held up as a perfect example of such constructive work. Here's a sample of their work: Boys who have come to the attention of the Wichita police are invited to attend classes in model building. They meet in the police station and are driven in cars to the clubhouse on the Arkansas River in the northern section of the city. The clubhouse is large enough for seventy-five students and instructors. It was donated by the Parks Department. Instruction is given from two to five p. m., with time out for bull *(Turn to page 50)*

Left—Dewey Bonbrake, Houston, set an N. A. A. three-flight average of 22:33. Below—from Scalp Level, Pa., M. Markovich and Comet Clipper.

Left to right—J. C. Williams, Bud Warren, Danner Bunch, and H. Broughton, prominent Coast builders.

Bob Toft. Has won a second in gas, first in rubber at Nationals.

1939 STOUT TROPHY WINNER

This model's 36-minute flight won the Stout Trophy and qualified the builder as captain of the American Moffett team.

BY BOB TOFT

THIS is a typical American model. It was finished at five o'clock in the morning, a few hours before it won first place in the Minneapolis Model Aero Club's eliminations for the Nationals. It won for the builder an all-expense air-lines trip to Detroit, where he gained the Stout Trophy. The 12¾-minute average of three flights that the model hung up was one of the outstanding marks of the contest. The model is extremely simple, and the inclusion of full-size parts in the plans should make every beginner reach instinctively for his favorite razor.-

CONSTRUCTION

Fuselage. A plan view of the fuselage should be drawn up. All measurements are given on the plans, but any not supplied may be had by multiplying the size of the part on the plan by four, the plans being one-quarter full size. Two sides of the fuselage should be built simultaneously to insure duplicate shapes, and after the cement has dried they should be removed from the drawing and checked. If one or both of the fuselage sides has warped out of line, insert one or two diagonals in the proper places to straighten it out. The two fuselage sides should be connected at the extreme rear and the cross braces added. If rubber bands are stretched around the fuselage after two opposite braces have been added, the next two may be cemented in without waiting for the last set to dry. The landing gear is bent to shape and embedded between the full-size gussets given on the drawing. After the nose and tail ends of the fuselage have been filled in with $^1/_{16}$" sheet balsa, the corners of the longerons are sanded slightly round and the fuselage covered with tissue.

Wings. After nineteen ribs have been cut from $^1/_{16}$" balsa, bamboo wing tips are bent to the outline shown on the full-size plate. After assembling the entire wing, the bottom spar, leading, and trailing edges should be cracked slightly for dihedral. The top spar and sheet covering will have to be cut out a little to provide the necessary gap to be taken up by the wing when the tips are raised. When covering, make sure that the wing does not warp. If the shrinking of the tissue after it has dried causes a warp, it can be removed by holding the wing in the proper position while doping.

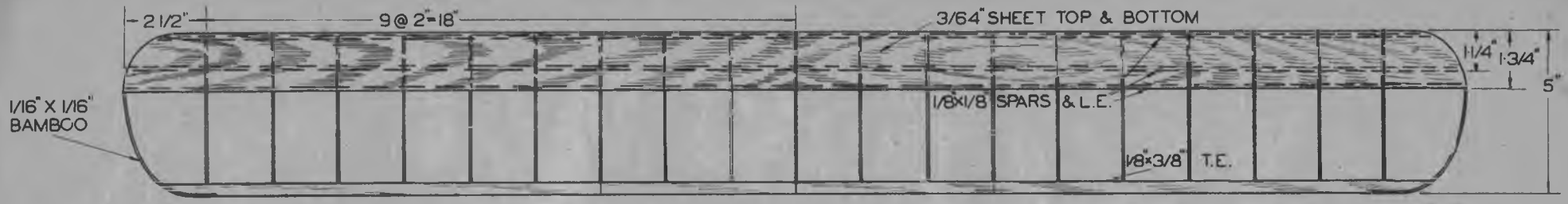
Tail. The stabilizer is made in much the same manner as the wing, and it also should be free from warps. After it has been assembled and covered, cement it to the tail plug at the proper angle, a small incidence block being cemented under the leading edge. The incidence block should be slightly more than ⅛" thick. The rudder is flat, having been built up from ⅛" square and ⅛ x ⅜". When cementing the rudder to the top of the stabilizer, offset it slightly, as the model is intended to fly in large circles.

The wing mount and nose plugs are illustrated in detail. Be sure to brace the tail plug securely, and the cross pieces it is cemented to should form a T section.

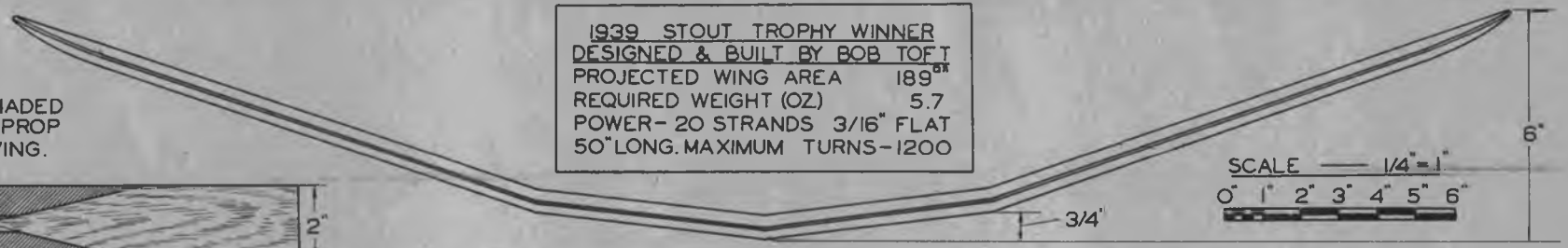
Propeller is carved from a medium-hard 2 x 2 x 9¾" block and should be doped and then sanded with successively finer grades of sandpaper. After the hinge parts have been carefully cut and bent to shape, they are cemented to the prop in the proper position and bound with thread. Three or four coats of cement should follow on the bound portions to insure long use with little fraying or wear. The counterweight should be oversize, so that it may be trimmed down to balance. In cutting the prop at the point at which it folds, a very fine jig or scroll saw will not rip the wood excessively. In positioning the prop for folding, the nose plug should be inserted so that the stop is in such a position that the prop folds flat against the left upper fuselage side (looking from the rear).

The motor used in the original was composed of twenty strands of $^3/_{16}$" rubber, 50" long. A good grade of lubricant should be used, and it is necessary to employ rubber tubing on the prop hook and rear hook. *(Turn to page 57)*

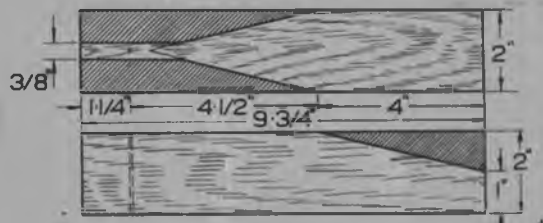
1939 STOUT TROPHY WINNER



1939 STOUT TROPHY WINNER
DESIGNED & BUILT BY BOB TOFT
PROJECTED WING AREA 189 sq in
REQUIRED WEIGHT (OZ.) 5.7
POWER - 20 STRANDS 3/16" FLAT
50" LONG. MAXIMUM TURNS - 1200



CUT AWAY SHADED PORTION OF PROP BEFORE CARVING.

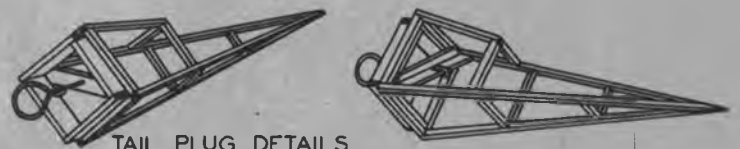


MAXIMUM UNDERCAMBER SHOULD BE 1/4"

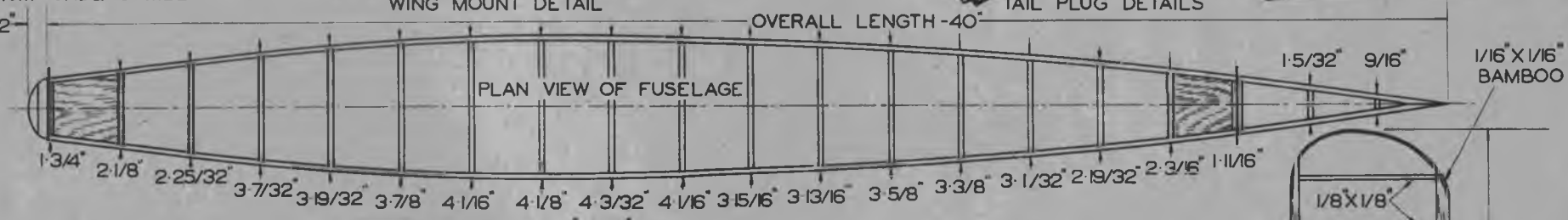
WING MOUNT DETAIL

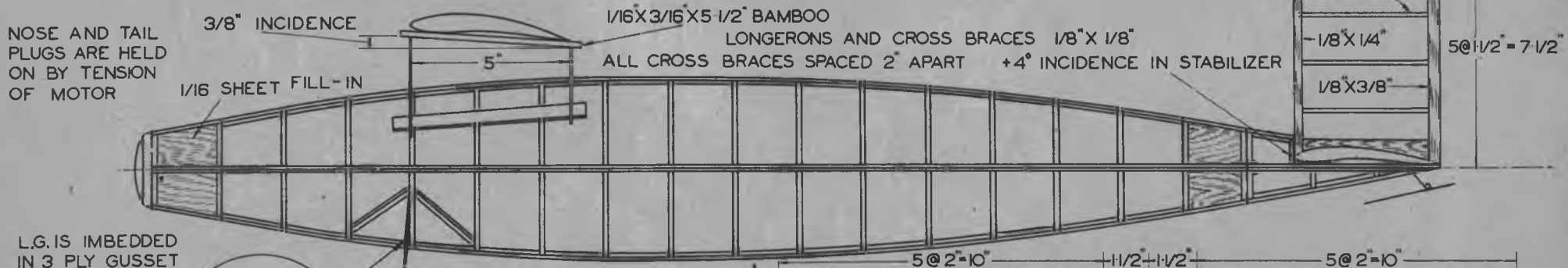
SHORT LENGTH OF RUBBER TUBING TO PROTECT FUSELAGE

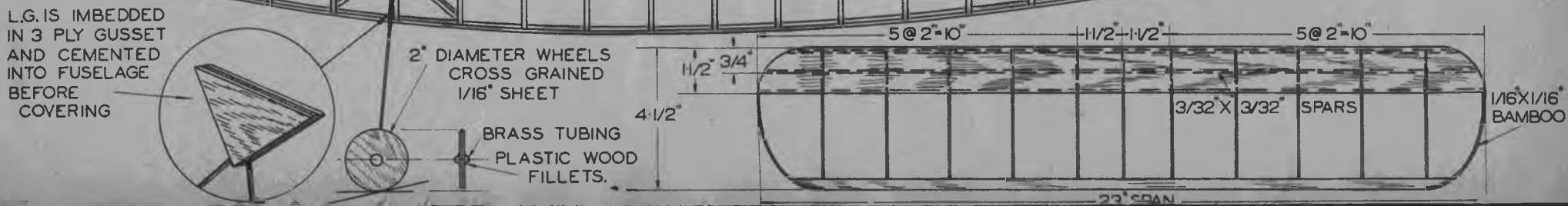
1/16" X 3/4" X 6" STRIPS CEMENTED TO WIRE



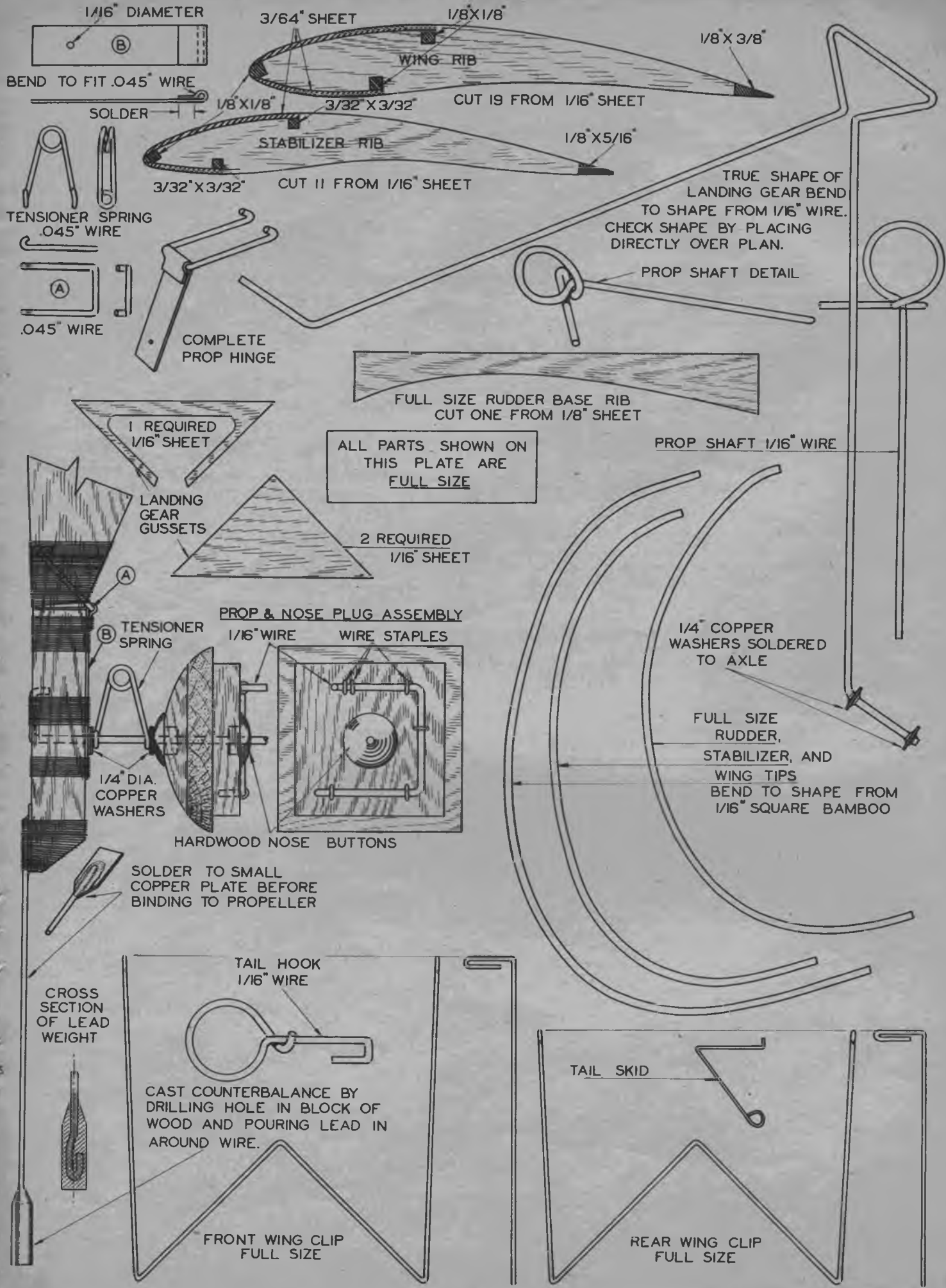
TAIL PLUG DETAILS







1939 STOUT TROPHY WINNER



JUNIOR n.a.a. NEWS

PREPARED BY WILLIAM R. ENYART, Sec. N.A.A.

N. A. C. A. HIRES MODEL BUILDERS

THE nation's No. 1 group for aeronautical research, the National Advisory Committee for Aeronautics, recently held a civil service examination to secure the services of experienced model aircraft builders at its Langley Field, Virginia, headquarters.

The examination was restricted to young fellows from the fourth civil service district, which includes the District of Columbia, West Virginia, Virginia, Maryland and North Carolina. An optional qualifying requirement called for participation in official model meets, and the N. A. A. Model Division headquarters was swamped with requests from model builders for evidence of their entry in sanctioned competitions. There was also a last-minute rush to enter contests before the filing date for application papers rolled round.

It is hoped that future civil service examinations for the position of model aircraft builders at Langley Field will be extended to include more area than the fourth civil service district. It is anticipated that because of the present plans to establish a Western research center for the N. A. C. A. and the meeting of the Academy of Model Aeronautics scheduled for Langley Field in November, that the civil service commissioners will come to recognize the fact that model builders are also active in other sections of the country. Keep an eye on these columns; news of future examinations will be relayed on as soon as received.

SMILES IN SKYWRITING

The printed newssheet *Skywriting,* which is the official publication of the Milwaukee (Wisconsin) N. A. A. Model Chapters, has some very humorous notes occasionally sandwiched between its more important and always interesting news articles. Several that the Model Division has chuckled over:

PROP VERBS

Two blades on the prop are worth one in the hand.
Many brave parts are asleep on the heap.

Then the editors of the publication received a most informative letter from an anonymous local flier who wrote:

Dear sir,

I seen in yr. paper where this here fellow Vik Krueger is supposed to have flun the first gas model in Milwaukee and vicinity. Mr. Editor, it seems to me you sure got took in on that yarn, on account of a gas job was flun by me about 20 yrs. before Vik ever flun any model a-tall.

My gas job was pretty big, but not too streamlined. It was hand launched on its 1st flite, and it clum strait up like I ain't seen no gas model climb yet. I don't know where it landed, exactly, on acct. it made an out-of-site flite.

My gas job was all red. It was bought one Sunday afternoon for me in 1913 by my pop, and was lost the same day. It cost 10c. Pop was awful sore when he found out I had flun it and lost it.

Mr. Editor, I hope this here letter will put you strait abt. who flun the 1st gas job around here.

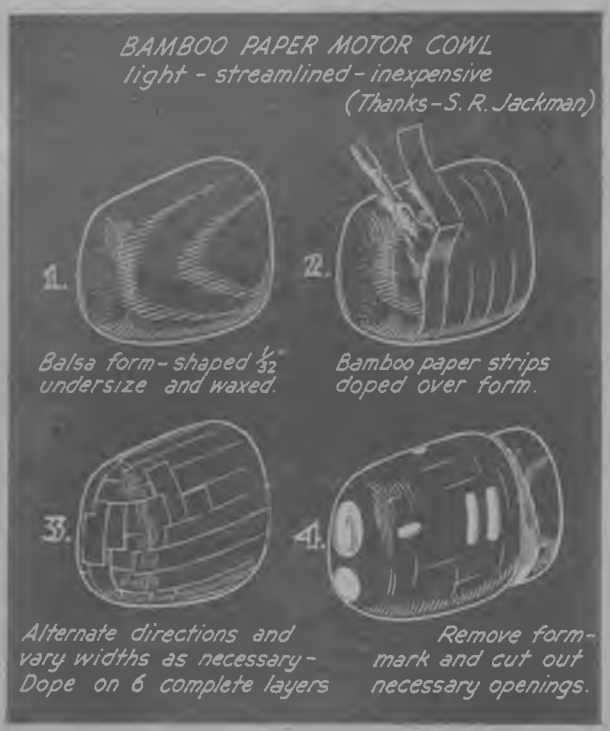
COMING CONTESTS

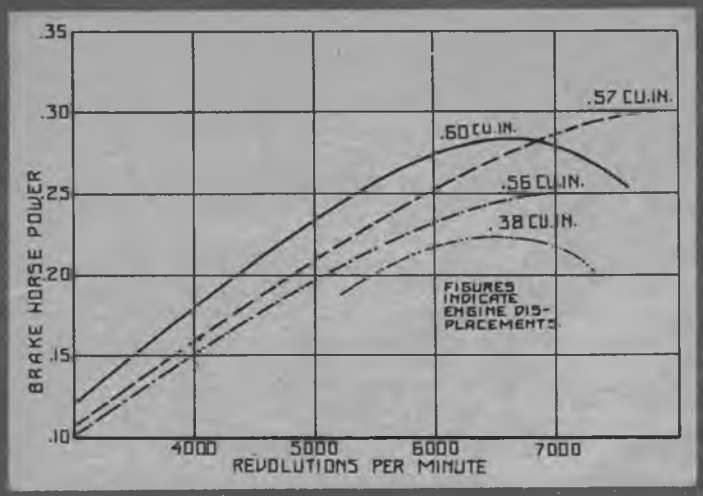
A usual failing with contest directors (those hard-working chaps who receive so little praise) is to delay requesting sanctions for model-plane meets until it is too late to include a notice of their contests in these columns in Air Trails. However, we take off our hat to L. B. Bush of Omaha. So enthusiastic was he and the Omaha *World-Herald* after their first combined annual gas contest this summer, application was made and granted for the following meet:

Omaha, Nebraska. July 21, 1940 (rain date, July 28th). Second Annual Midwest Gas Model Airplane Contest at Benson Park. Trophies, cash and merchandise. Write: L. B. Bush, 610 Redick Tower Building, Omaha, for entry blanks.

Now back to the present, we list meets for:

Boston, Massachusetts. Indoor meets by Jordan Marsh-Boston Traveler Junior Aviation League in State South Armory, Irvington Street, Back Bay, Boston, Massachusetts. From 9:30 a. m. to 12:30 p. m. on the following Saturdays: November 18th; December 2nd; December 16th. Everything but gas, says Gunnar Munnick, contest director. Write him at 101 Alstead Street, Quincy, Massachusetts, for full information. This organization will also *(Turn to page 59)*





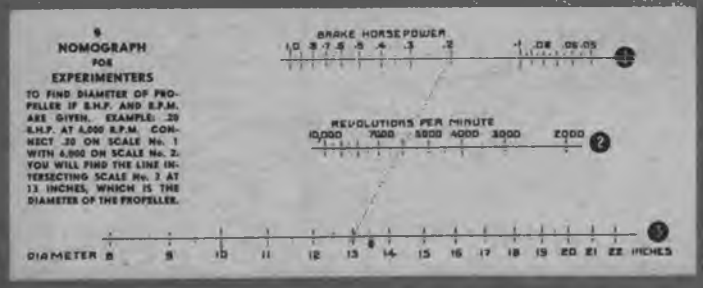
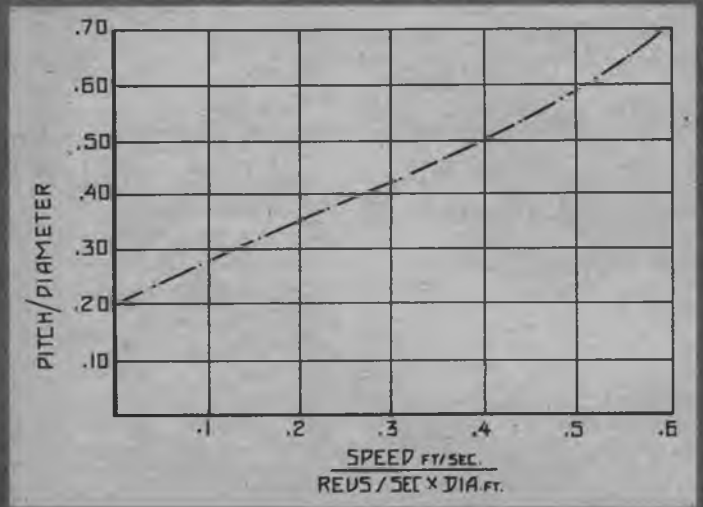


TABLE FOR SELECTING DIAMETER AND PITCH OF PROPELLER

FIRST FIGURE INDICATES DIAMETER, SECOND FIGURE PITCH OF PROPELLER

ENGINE \ WEIGHT	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7 OZ.
BROWN		13 12	14 10	14 10	14 8	14 8	14 8	14 8	14 8	14 8	14 8	14 8	15 6
BANTAM	9 8	9 8	10 8	10 6	10 6	11 6	11 6	11 6	11 6				
BRAT	9 8	9 8	9 8	9 6	9 6	10 6	10 6						
CYCLONE "BABY"		13 10	13 8	13 8	13 8	13 8	13 8	13 8	12 10	12 10	12 8	13 6	13 6
DENNYMITE		13 12	13 10	13 10	13 10	13 8	13 8	13 8	13 8	13 8	13 8	13 6	14 6
ELF	10 8	10 8	10 6	10 8	10 6	11 6	11 6						
FORSTER			16 12	16 12	16 12	16 10	16 10	16 10	16 10	16 10	16 10	18 10	18 8
GWIN AERO		12 12	12 10	12 10	12 8	12 8	13 8	12 8	12 8	13 8	13 8	13 8	13 6
ATWOOD HI-SPEED	12 8	12 8	12 8	12 8	12 8	12 8	12 6	12 6	12 6	12 6	12 6		
MUSKY	10 8	10 8	10 8	10 6	10 6	11 6	11 6	11 6	11 6	11 6			
MADEWELL MITE	11 8	11 8	11 8	11 8	11 6	11 6	11 6	11 6	12 6				
M. & M.		12 8	12 8	12 8	11 8	11 8	11 8	11 8	11 8				
OHLSSON GOLD SEAL		13 10	13 10	13 8	13 8	13 8	13 8	13 8	13 8	13 8	13 6	13 6	14 6
OHLSSON "23"	11 8	11 8	11 8	11 8	11 6	11 6	11 6	11 6	11 6	11 6			
HERKIMER O-K		13 12	14 10	14 10	14 8	14 8	14 8	14 8	14 8	14 8	14 6	15 6	
PEE-WEE	9 8	10 8	10 8	10 6	10 6	10 6	10 6						
SYNCRO "ACE"		13 10	13 10	13 10	13 10	13 8	13 8	13 8	13 8	13 8	13 8	13 6	14 6
SYNCRO "BEE"	9 8	9 8	9 6	9 6	10 6	10 6							
TROJAN	10 8	10 8	10 8	10 6	10 6	11 6	11 6	11 6	11 6				



Choosing the Right Gas Prop

BY RAOUL J. HOFFMAN

AND BOB ROBERTS

Whether you prefer finished propellers or like to puzzle out and carve your own, you will find this article full of the things you did not know before. Propeller design looks mighty technical but it is something we all could easily know. If you want to know what makes some props more efficient than others, what diameter or pitch to use, what to look for in selecting a prop that is best suited for your particular job, this authentic discussion contains valuable dope. Of course, a formula now and then slips into any article in design. But there is no reason why formulas should be derived when understandable ones exist and can be applied with accuracy to your ship and its propeller. And so, the authors, authorities on the subject, have soft-pedaled mathematics. The charts do all the necessary dirty work.

FROM an engineering standpoint, the most interesting complex problem in gas modeling is the design of the propeller, for the final success of a model will depend on the efficiency of the propeller. The propeller is usually designated by its main factors: the diameter and the pitch; less important within certain limits are the layout and the thickness ratio of the blade.

To design a propeller one has to know the power output of the engine at variant revolutions and the advance speed of the model possible with that engine. The advance speed, flying horizontally or climbing vertically, will be a function of the propeller operated by the engine used.

The power output is generally taken to be proportional to the displacement of the piston: the area of the bore times the stroke. Only a few power curves are available; some of them are shown in Fig. 1 with their respective piston displacements.

From the diagram the power output may be roughly estimated to be equal to four-tenths of a horsepower for each cubic-inch piston displacement at about 5,000 revolutions per minute.

A formula that uses the displacement and the revolutions per minute gives the power output to be equal to the bore times bore times stroke times r. p. m. divided by 20,000. This equation should not be used beyond the 6,000 r. p. m. to insure a high efficiency of the propeller.

The efficiency of the propeller is the ratio of the theoretical thrust possible and the actual thrust delivered at a certain speed. For example, take an engine that could deliver a theoretical thrust of ten pounds at a certain speed and the propeller gives only a seven-pound thrust at that speed, the propeller then has only seven-tenths or seventy percent efficiency. The efficiencies of propellers of the present high-speed engines and vertical climbing models are low.

Usually two-blade propellers have the highest efficiencies if the tip speed does not reach the speed of sound, which would make about 18,000 revolutions per minute for a one-foot propeller. Some tests, however, show that three-bladers may have an advantage over the two-bladers in tight circling flights.

Detailed enumerations are required to estimate the flying speed of a model for normal flight. Calculations, however, for a streamlined, highly powered ship that could perform a vertical climb are easier. The calculation assumes that thirty-five percent of the total brake horsepower is available for the climbing ability of the model; then the climbing speed in feet per second is equal to 192 times the total brake horsepower divided by the weight of the model in pounds. For example, if the model weighs two pounds and the engine delivers *(Turn to page 64)*

PICK-A-BACK

BY HERBERT K. WEISS

The glider cuts loose to soar on its own.

THE British Short-Mayo pick-a-back airplanes were the inspiration for the R. O. G.-glider combination presented in this article. As you'll remember, the full-scale pick-a-back consisted of the four-engined seaplane *Mercury* which perched atop the flying boat *Maia* and was released after the composite aircraft had lifted the *Mercury* with a heavier load than she could have managed alone.

Our own combination serves a somewhat similar purpose, in that the R. O. G. carries the glider to a much higher altitude than the glider could attain alone after hand or catapult launching. When the power of the R. O. G. is exhausted, the glider is released, and each component goes its own way from then on.

Construction was purposely made very simple so that full attention could be paid to the adjustment of the release spring. Both the glider and the R. O. G. also perform very well alone.

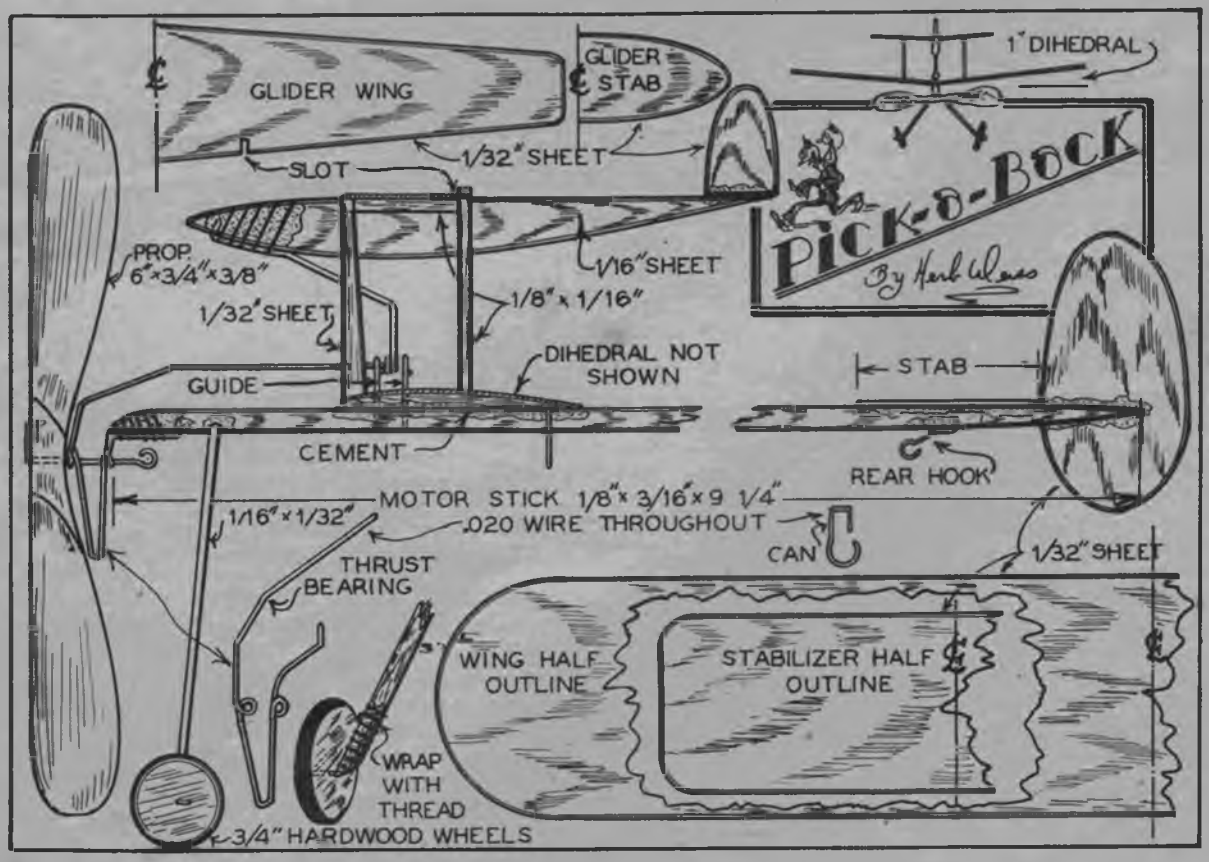
GLIDER

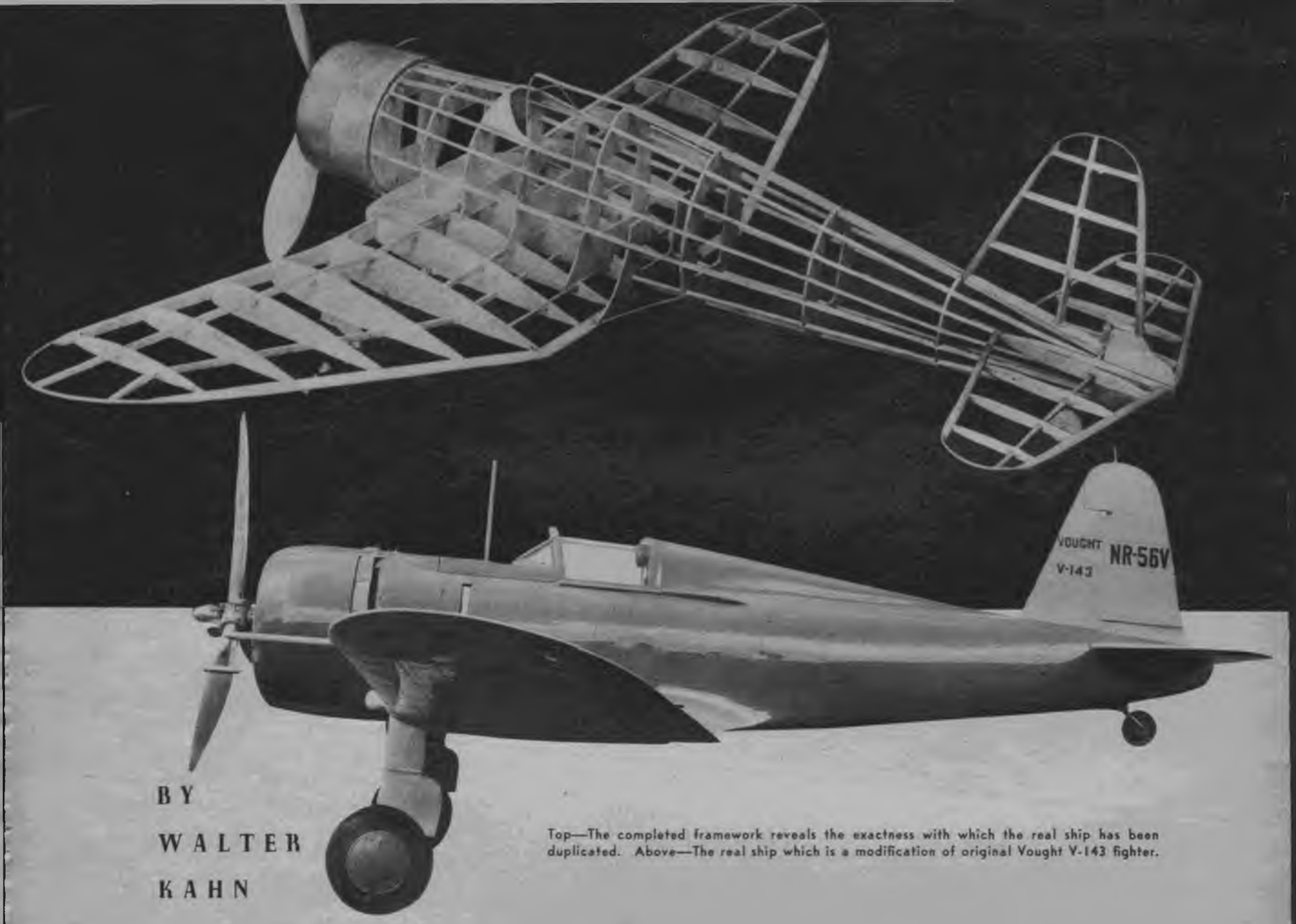
The glider can be assembled in a few minutes from scraps. The wings have about a half inch dihedral at the tips. The wire release hook should be about right to balance the glider; if the model dives, warp the trailing edge of the stabilizer up; if it stalls, add clay to the nose.

R. O. G.

Cut the R. O. G. wing and tail from 1/32" sheet balsa and sand the parts smooth. The wing is made in one piece, as is the stabilizer.

The motor stick is 1/8 x 3/16" hard balsa. Cement the tail surfaces in place. *(Turn to page 65)*





BY
WALTER
KAHN

Top—The completed framework reveals the exactness with which the real ship has been duplicated. Above—The real ship which is a modification of original Vought V-143 fighter.

DESIGNED to conform with the United States army specifications and listed by the manufacturer, Chance Vought, as an export model, the V-143 is a challenge to any other ship within its class. Capable of doing close to three hundred miles per hour, the V-143 is easily maneuvered and can ably defend itself.

The construction of the model is simple, entailing only the primary steps of model-aircraft building. Before attempting to build the model it is advisable to read and thoroughly digest the directions. By doing this, costly mistakes will be avoided.

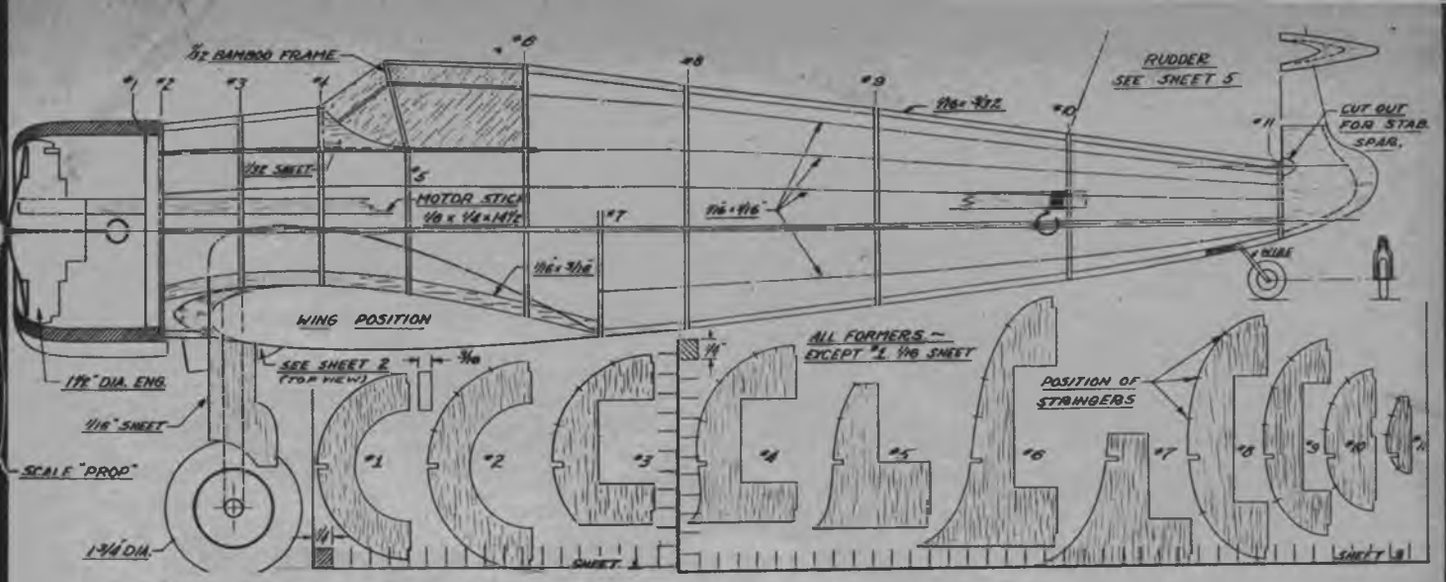
CONSTRUCTION

Fuselage may either be constructed in two halves or else with complete bulkheads. The bulkheads are, all except #1, cut from $^1/_{16}$" sheet with the grain running vertically. In cutting out the bulkheads only the four main notches need be cut. The position of the intermediate stringers should be marked. This procedure is suggested to enable proper alignment of the stringers. After the four main stringers are secured in place the notches for the intermediate stringers are cut with a sliver of a two-edged razor.

The complete cockpit cover frame is made from $^1/_{32}$" square bamboo. This frame is covered with a sheet of celluloid. The portion between #4 and #5 is covered with $^1/_{32}$" sheet, and made to fit as shown on the top and side view.

The tail block is cut to the shape shown on 3. It is hollowed out to as thin a wall thickness as possible. The wood for the tail block must be the lightest obtainable. The block is not cemented in place until the stabilizer is secured.

Wing construction follows the same general procedure for building most model wings. The wing is constructed in one panel. Because of this it is necessary to trace the half of the wing shown and use it as the other half. The complete layout of half the wing is gotten by connecting Sheet 2 with Sheet 4. The ribs are all cut from $^1/_{16}$" sheet. The wing is constructed on the plan itself with the various parts held in place by pins until the cement has set. As the wing is tapered, both top and front, it is necessary to taper the leading edge and spars accord-



Plans are half scale. Draw in squares over formers and ribs and then double to make templates. Top and front views are one-quarter scale.

ingly. It is suggested that the parts first be roughly shaped and glued in place. After the wing is removed from the plan the parts are then sanded to a smooth finish. The wing tips are of bamboo and can best be formed over a flame. If desired they can be wound with thread at the leading and trailing edges.

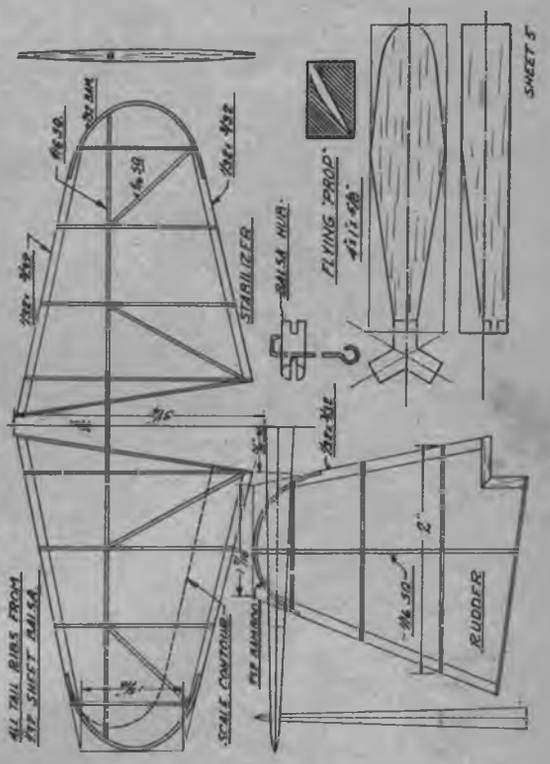
Special attention should be given to the center block. The block is not hollowed out as the bulk is required to balance the completed model. The cross-sectional shape is shown on the plan. It follows that of the wing section, except it is extended farther forward of the leading edge.

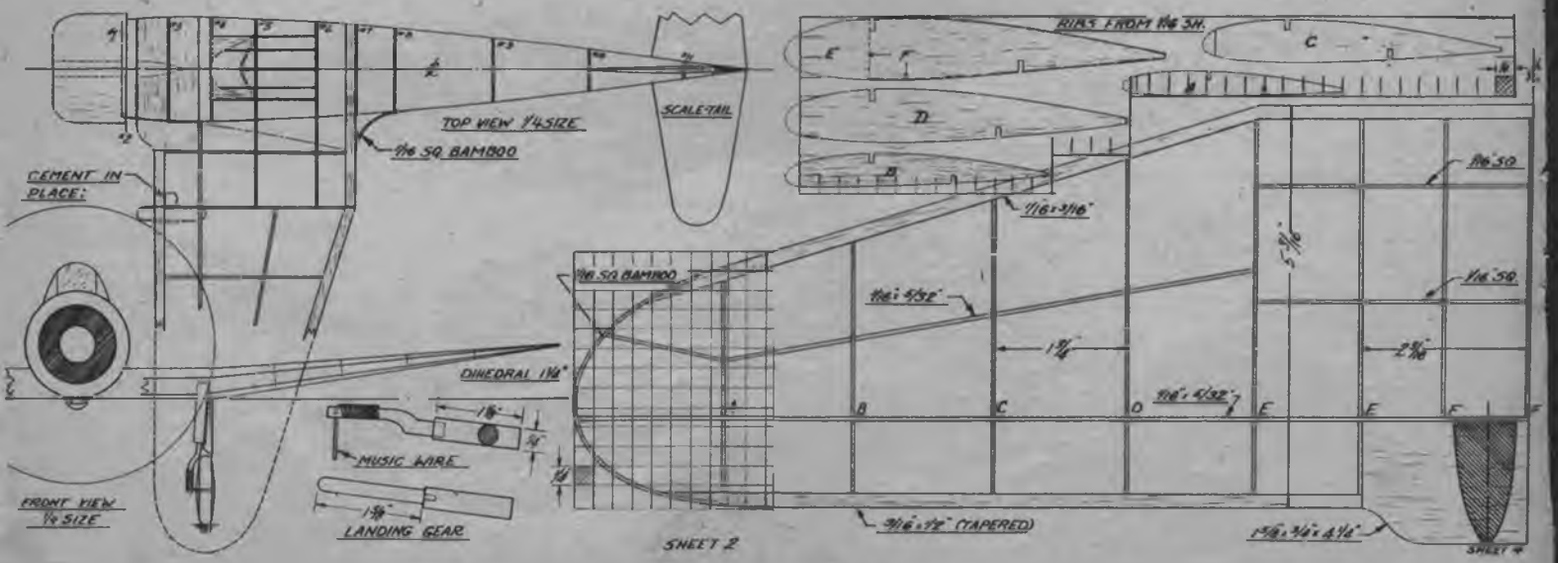
After the wing is completed, the outer wing panels are broken at the point of the solid center block to form the 1¼" dihedral. The joints are reglued.

Tail surfaces. The construction of both the rudder and stabilizer is like that of the wing. It is important that the lightest balsa wood be used in its construction. (Due to the large moment arm of the model a heavy tail will throw it out of complete balance.) The spars used are $^1/_{16}$" balsa rounded and are made to run through the ribs as shown. The ribs of the tail are first cut roughly to a streamline shape. After the tail is completed they are sanded smoothly. The tips are of bamboo. The bamboo used should not be greater than $^1/_{32}$" square.

Landing gear construction is extremely simple, as it consists entirely of a single strut attached to the wing as shown. The shape of the strut is shown on Sheet 2. The strut is made in two parts and attached by inserting the lower part into the top. The axle is a piece of music wire bent to the shape shown; it is glued and wound with thread for security. The side cover of the strut is cut from $^1/_{16}$" sheet balsa and cemented to the strut.

Cowl shape is shown on Sheet 1. It is hollowed out *(Turn to page 64)*

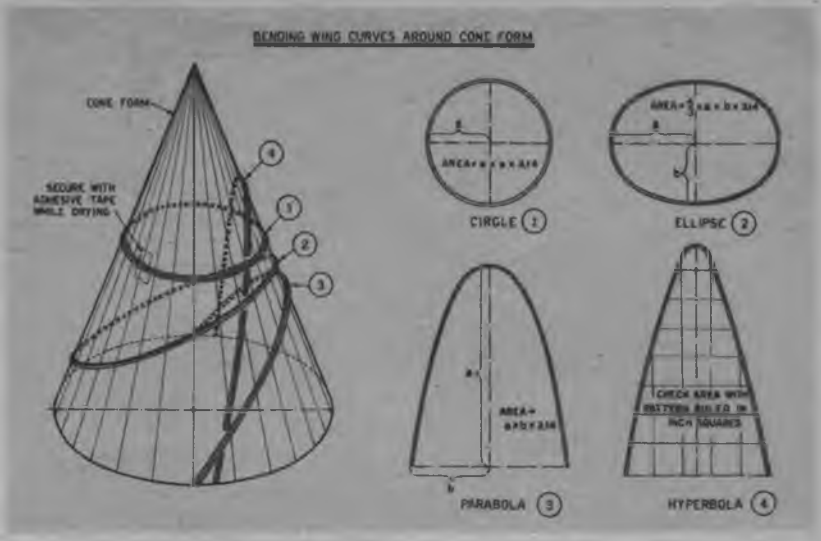




NEW CURVES

BY ROY MARQUARDT

A time-saver for indoor model builders.



MOST of us dislike the chore of bending circular and elliptical wing tips. Even more irksome is the task of plotting shapes and cutting patterns around which to bend the tips. The method suggested here offers a short cut without detracting from the pleasant appearance of a well-shaped wing tip.

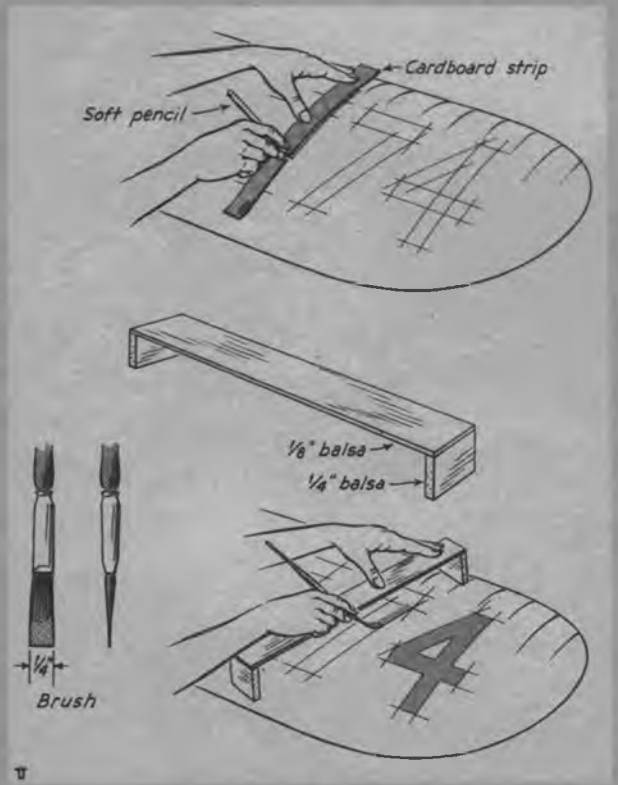
All of the commonly used shapes—circle, ellipse, parabola, and hyperbola—are shapes formed by the intersection of a plain surface and a circular cone. Look at the illustration and you'll see that a straight cut across the cone forms a circle; a cut parallel to a side, a parabola; perpendicular to the base, a hyperbola; and cutting the cone in any other direction forms an ellipse.

Of course, it's not practicable to cut the cone every time you want a different shape. But the tips can simply be bent by bending the wood around the outside surface of the cone to form any desired shape. All bent pieces—tips, entire rudders, elevators, and fuselage formers—can be soaked until pliable, bent around the cone, secured with adhesive tape, and allowed to dry. (Drying can be speeded by *(Turn to page 57)*

PAINTING GAS MODEL LICENSES

BY H. A. THOMAS

Don t spoil a neat job with shoddy lettering. Here's a clever trick.



THAT part of the N. A. A. regulations which requires license numbers to be prominently displayed on gas models has no doubt caused its share of grief among gas-model builders who happen not to be artistically inclined. The beautiful, and expensive, decal transfers which come with your N. A. A. membership card are extremely difficult to duplicate neatly.

One successful way of lettering the numerals is to use masking tape. This is quite tedious and requires a good deal of skill in applying the tape. Another way that is much simpler and quicker is shown in the accompanying drawing. Since the type of numerals suggested by the N. A. A. are composed of straight lines entirely, and since all parts of the letters are of constant width, a strip of cardboard of proper width can be used to make a soft-pencil layout on the wing. By simply holding the strip in the various positions and drawing on both sides of it, the letters can be very easily formed.

The balsa guide is merely to afford a straight edge along which the brush can be drawn in straight strokes. A flat, flexible brush of one-fourth-inch width is recommended. It is best to use lacquer of *(Turn to page 53)*

KORDA'S Wakefield INTERNATIONAL CHAMPIONSHIP WINNER

New World's Record
43 Minutes, 29 Seconds
AUGUST 6, 1939

Dick Korda, his Model Airplane and the Wakefield Trophy

. . a MEGOW KIT
complete, ready to build $1.00
By mail, 10c extra for postage

Send 5c Postage for your copy of the
MEGOW CATALOG
• 100 pages, showing scores of gas-powered, rubber-powered and scale model airplanes. Also ship models, HO-Gauge Railroads, equipment and supplies.

To surpass today's records, start with today's BEST. Don't backstep. Use ALL the principles found in *this year's* champion! Equal it—and you will beat all the others. Improve upon it, even in some small detail—and you may be the next international champion!

Megow's Kit for building Korda's latest model contains Korda's original and official plan, and material specially selected for the purpose. It conforms exactly to official requirements, and enables you to construct a model of marvelous performance and rare beauty . . . the thrill of a lifetime.

It puts you in line for the BIG CASH PRIZES to be offered exclusively to Megow Model Winners during the coming year!

See your Megow Dealer . . . or order direct from nearest address below.

Megow's

Department AT
Howard and Oxford Streets, Philadelphia, Pa., or 217 N. Desplaines Street, Chicago, Ill., or Great Western Merc. Co., 718 Mission Street, San Francisco

S. Guiterman & Co., Ltd., London, Eng. Aer-O-Kits, Sheffield, Eng. A. Warnaar, Voorburg, Holland.

American Products, Tienen-Tirlemont, Belg. K-Dee Pty., Ltd., 561A George Street, Sydney, Aus.

WORLD'S LARGEST MANUFACTURER OF MODEL AIRPLANES • SHIPS • HO-GAUGE RAILPOADS

Supercharged Shoestrings

(Continued from page 24)

used ship," Al said quickly, "if that's too much."

"Will it be dependable?"

"A ship is checked and adjustments made regularly. I never heard of one wearing out. Maintenance is too strict. I'd recommend a new one if you could afford it because improvements are always being made, and, of course, upkeep is higher on a used plane, but I'll find one with logbooks in order, and you'll be satisfied. Come back in a day or two."

He found a secondhand Cub for $700 that Jimmie liked. A payment of $400 down left twelve payments of thirty dollars that covered insurance and financing, too. It meant saving, but Jimmie had plenty of practice. Upkeep was zero that first year. The ship was too old to depreciate. Gas and oil, including changes, cost him seventy-six cents an hour. Instruction cost him one dollar and fifty cents an hour until he soloed, and then Al gave him check time free. He tied the plane down behind the hangar, when he wasn't flying. Two hundred solo hours, a commercial and an instructor's licenses were Jimmie's within a year. Midge soloed, too, and was getting in time. One of his brothers soloed.

At the end of the year Jimmie traded his bargain plane for $600 on one that was three years newer, and time continued to accumulate. Jimmie is now a Bennett instructor, Midge has her private, one of his brothers has a hundred hours, the other has soloed on this second plane. An income of $1,500 a year minimum, if you want to fly bad enough? Jimmie grins. He leaves out the first clause. It's just how bad you want to fly.

Marvin Everett wanted to fly, but his dad was all washed up. Hadn't he given him money for flying lessons, given him money for an old OX Travelair, given him encouragement? And what happened? Marvin cracked up the lumbering old crate that was admittedly in its dotage, and if he flew again he'd have to earn his own money.

It takes a long time to earn a new airplane, and Marvin had no job. Then at Clinton, N. J., where he lived, a shining airplane at $1,270 was displayed in front of a theater that was showing an aviation picture. Marvin looked and coveted. He sat down on the base and appointed himself attendant. As people came by, he told them about it. "I won't have a new ship," he explained further, "but I expect to have one of the same kind soon, and I'm taking orders for flying time now."

It sounds incredible to the cautious, but Marvin cut sleep to a few before-dawn hours when not even one straggler was abroad, and by the week end he had sold enough time for a down payment on a used plane.

A farmer leased him a field. He didn't have an instructor's rating, but had figured that in the price he set on lessons, and by the end of the summer, fourteen weeks later, Marvin had turned in the used plane on a new one, and had a Packard besides. Marvin's field, the Northwest Jersey Airport near Clinton, is now one of the most active in the State.

Al Bennett figured in another success story, too. He is famous for his finagling to help penniless kids into the air, and if ever a man needed help it was Al Schachterle. He was out of gas when he wheezed into Hightstown with an old Ford that had seen its better days twelve years before. It looked its age, too, and Al looked more than his. Thin, underfed, flat broke, he had been sleeping in a hangar at Mainline Airport, Paoli, Pa. His wife had gone home to her folks. He hadn't an asset in the world except his few clothes, his rickety car, a pilot's license with instructor's rating that was treated with more consideration than his stomach, and a burning ambition.

Bennett didn't like the idea of giving him gas money outright. Besides, he wouldn't take it. But neither could Bennett see a fellow pilot so down on his luck. He checked him around the field. "How about flying for me a couple of days?" he asked.

The students liked him. Unconsciously, they confirmed Al's good opinion, so when Schachterle thought he could buy a plane with student fees if Al would let him take it to Mainline Airport two days for demonstration, Al said O. K.

He had to work fast. Two days! The garage man who sold him gas for his rattling jellopy found himself practically kidnaped for a demonstration. He bounced to a landing and turned loose of the stick with a sweating hand. His check was practically on its way to Hightstown right then. The iceman was next, and two customers from the garage. The hamburger-wagon man and several others followed, and on Tuesday Schachterle flew back to Bennett with a down payment on a $1,395 plane. On Friday he landed again at Hightstown. Bennett went out quickly.

"Anything wrong?"

"Wrong?" crowed Schachterle. "Never righter. I don't need terms! I have $1,100 here in advance fees." He had his wife back home with him, too, and now has three planes at Mainline and a growing business.

Success stories? There's Gordon Cahill, who saved $300 as a laborer in the DuPont factory at Gibbstown, N. J. He bought a secondhand plane, learned to fly, and swapped it for a newer plane, built up more time, and traded again on a new ship.

Flying clubs have brought both grief and pleasure to their members. Planes are as low as $995. The largest-selling light plane costs $1,098, with a down payment of $416. With ten members the initiation fee is less than $50, weekly dues around one dollar and sixty-five cents. Flying time, including a pilot wage of one dollar an hour for both solo and dual, runs about two dollars and thirty cents.

It sounds wonderful. It works, and works well, when the director is hard-boiled and everyone is careful both of the plane and his fellow members' feelings. Never will I forget, though, my feelings each Sunday as I watched a member in a club into which for a year I had sunk every cent of my spending money. He flew the plane in a number of unorthodox maneuvers. And when one day the motor choked from too much oil and too little gas while upside down, I died thirty deaths before he got it rolled over and down.

In an operator's club, the plane belongs to one person. Like Marvin Everett, he is usually someone who wants to own a plane and can't raise the money. Members pay initiation fees of thirty dollars. Dues are four dollars a month. Flying time costs three dollars an hour. For the operator, advantages are obvious. Initiations bring him a down payment. Dues make monthly payments. Flying time covers operating expenses. Resale of the ship is clear profit.

There are member advantages, too. In a self-owned club, in an accident the pilot involved usually pays the first twenty-five dollars, the rest is prorated. This may be burdensome with a show-off flier—and you don't know your best friend as you think you do until you've watched him fly when his best girl is at the field! In the operator's club, the students, always subject to grounding, are kept in line; but if accidents happen, the owner pays from insurance or maintenance funds assured by lesson charges. Members don't worry about administration, keeping up the plane, overhauling it, or washing it when you'd rather be flying. A hundred hours of flying time costing an average of $665, cost only $378, including initiation and a year's dues in an operator's club.

The members have the fun of club events—informal meets, spot-landing contests, solo parties, hangar dances. The ambitious fledgling who wants to start an operator's club will probably find eager members.

The down payment is hardest, but if you've the gumption of sixteen-year-old Bob Mulligan of Bellerose Terrace, N. Y., it isn't too impossible to get flying experience which can sometimes be put up as your share with a partner who may have some cash.

Bob was a model builder, but he said making models was as expensive as flying, so he started saving money for lessons when he was fifteen. His dad got him a job as pin boy in a bowling alley. He worked till two or three a. m., then got up at seven to go to school. On week ends he caddied at the Garden City Country Club, and worked as order boy in a delicatessen. Two weeks after his sixteenth birthday, he soloed under Sig Uyldert at Roosevelt Field. Eleven months later he won his private, the last before the new ruling that private pilots must be eighteen.

He knows all about flying on a shoestring, and sees no reason to worry about owning his plane. That will come later. In the meantime, the shoestring business is booming Pilots all over America are learning that airplanes can be flown on them—and owned as well.

SEND FOR TODAY'S STORY OF AVIATION AT WORK

Direct from the Aviation Capital of the World

A NEW 64 PAGE CATALOG AND VOCATIONAL GUIDE

. . . Sent free to those seriously interested . . . *fill in coupon and mail today*

Hailed by leading aeronautical authorities for its accurate reporting of today's aviation opportunities, California Flyers new 64-page catalog offers a complete, up-to-the-minute picture of the aviation industry at work.

Coming to you from Los Angeles, aviation capital of the world, where aviation activity has increased more than 700% in the last two years, more than 50% in the last five months —this fascinating story tells in words and pictures what such vast increases mean to the young man planning an aviation career.

It gives you more than the picture of aviation's amazing progress, more than a story of this leading aviation school, for it is a complete authentic aviation vocational guide as well. It deals with past history, with the present opportunities and future outlook in every single field of aviation endeavor. Piloting, Engineering, Mechanics, Production Mechanics, Instruments, Drafting, and their opportunities for a career are covered in detail so that you may carefully analyze the entire field of aviation.

This new catalog clearly shows just why this internationally recognized aeronautical school enjoys such an outstanding record of graduates who have stepped from training directly into the industry. And even more important, it points out the reasons for the impressive record these men are making in the aeronautical world.

If you are seriously interested in making aviation your career, you will find this catalog most helpful in your selection of a vocation and your choice of training. You owe it to your future to read this catalog before you reach a decision. Simply fill out this coupon and mail it today. You incur no obligation and no salesman will call.

CALIFORNIA FLYERS, INC.

GOVERNMENT APPROVED

SCHOOL OF AERONAUTICS

LOS ANGELES MUNICIPAL AIRPORT, INGLEWOOD, CALIFORNIA

LEARN ABOUT THIS COMPLETE RANGE OF PRACTICAL CAREER COURSES

CALIFORNIA FLYERS, INC., School of Aeronautics, Dept. AT-12
Los Angeles Municipal Airport, Inglewood, California

Please send me your catalog and complete information on training, tuition, living conditions and employment opportunities. I am over 16 and interested in the subjects, checked:

Aeronautical Engineering and Design ☐ *Airline Piloting* ☐
Production Mechanics(Aircraft sheet metal) ☐ *Airplane Drafting* ☐
Instrument and Radio Beam Flying ☐ *Master Mechanics* ☐
Instrument Technician ☐

Name_____ Age_____

Address_____

City_____ State_____

APPROVED BY THE CIVIL AERONAUTICS AUTHORITY IN ALL DIVISIONS IN WHICH APPROVAL IS EXTENDED

Kitty Hawk—Where Man First Flew

(Continued from page 25)

they devised what they called "rudders," which they mounted in front of the wing plane. Their "rudders," however, were really elevators, and as such are found on all flying machines in use today. These two developments have, without doubt, made possible the controlled flight of an airplane, for without them control would be virtually nonexistent.

Shortly after discovering these principles, the Wrights decided that if they were to try out their ideas under the best conditions possible it would be necessary to go to a region where winds of steady velocity could be found, along with suitable open space near some sort of elevation where they could proceed to put their theories to the test. The United States weather bureau was consulted, and their advice that there was a region in the vicinity of Kitty Hawk, N. C., hard by the sea, where "winds of eighteen miles per hour were almost constantly sweeping across the flat, open beachlands," decided their choice of a location to complete their work.

Accordingly, in the summer of 1900, the brothers brought their glider to the barren coastal section near Kitty Hawk, on the lonesome Carolina "banks." At that time the isolated region on the coast was completely cut off from the mainland by huge sounds, Albemarle and Currituck, and the only means of access was by boat. In such a manner, therefore, they reached Kitty Hawk, where, shortly after their arrival, they began construction of their hangar for holding the glider and for carrying on experimental work connected with it.

As readily admitted by them, their first summer at Kitty Hawk yielded less results than they had hoped for, but by launching their glider down the sandy slopes of the one-hundred-foot-high Kill Devil Hill, the tremendous pile of wind-blown sand just down the beach from their camp, they found out a whole lot of things that they diligently worked on after they returned home to Dayton for the winter.

In 1902, in the autumn, the Wrights came back to Kill Devil Hill again, this time with a brand-new glider and a lot wiser in the ways of flight. In September and October of that year the two brothers made, all told, over a thousand flights in their contraption from the sandy sides of the hill, and damaged their machine only slightly once. Time after time they would land in a little hollow on the beach near the base of Kill Devil Hill, using the tips only of their glider to break the fall in the soft sand.

All during the winter of 1902 and far into the summer of 1903 the Wrights worked on the problem of power for their airplane: a motor and two propellers. To nearly every manufacturer in the country they carried their problem, but none of them had the answer. The motor they finally used was, therefore, a tiny gasoline engine they rebuilt in six weeks' time, and which developed twelve horsepower. Because its power was four horsepower more than they had figured on receiving after rebuilding the engine, they promptly added about 150 pounds to their glider through strengthening it at doubtful points. All told, their first airplane weighed 605 pounds empty and about 750 pounds with the operator.

The brothers now had a glider they knew could be controlled in the air, a motor light enough and strong enough to power it, and propellers suitable for the task of shoving the craft forward. There remained, therefore, but one thing left to do: Try the combination out and see if it would work. This was late summer, 1903, in Dayton, Ohio.

In the closing days of September, 1903, three months before achievement and glory were destined to be within their grasp, Wilbur and Orville came back to their camp on the sands near Kitty Hawk, in the shadow of Kill Devil Hill.

The days slipped by that fall with great rapidity. Indian summer, with its bluish haze and lazy days, came and went, almost before the brothers realized it, so engrossed were they with their problem. Still they were not ready, and, in early December, winter settled down upon the Outer Banks. On the 14th they made a premature attempt to fly their craft, but it failed to do what was expected of it. For December 17th, therefore, three days hence, they set the date for their ambitious attempt.

Dawn broke that day on a gray, stormy expanse of ocean and deserted beach, and lowering clouds raced overhead, whirled along by a twenty-seven-mile-per-hour wind. The somber, sullen boom of the surf mingled with the shriller, singing cry of the wind as it whipped around the weather-beaten structure which housed the frail machine destined to conquer and explore the heavens. On arising, the brothers looked with misgiving upon the weather outside, but after waiting until ten o'clock for a lull, decided that, despite its disagreeableness, they would make the attempt.

Shortly before, they had signaled their friends down at Kill Devil Hill Coast Guard Station on the beach nearby to come up and act as witnesses, and before long several of the men arrived. These were W. S. Dough, A. D. Etheridge, J. T. Daniels—all living today—and W. C. Brinkley, deceased. A boy, Johnny Moore, was also present.

Preparations for the flight, methodical and unhurried, were carried forward in the face of the unfavorable weather and soon the little forty-foot track of rails that was to serve for the airplane's runway was laid out along a level stretch of sandy beach. Willing hands soon lifted the fragile, boxlike machine from its weather-beaten hangar, and as it stood at the upper end of the runway, swaying and trembling in the near-gale, held only by the slender wire attaching it to the launching weights, its seeming inability successfully to combat the elements was strikingly apparent to the little knot of spectators.

The tiny twelve-horsepower gasoline motor seemed pitifully inadequate to lift the several hundred pounds of machine and pilot into the air; but, with sublime confidence in their creation, the quiet, serious-faced brothers continued their careful scrutiny of the ship and its apparatus. In another moment all seemed to be in readiness, and because Wilbur Wright had been the one to pilot the ship on the first attempt on the 14th, Orville Wright was the one to climb carefully aboard the lower wing and lie there prone.

What happened from this point on is best told in the words of Orville Wright himself:

"After running the motor a few minutes to heat it up, I released the wire that held the machine to the track, and the machine started forward into the wind. Wilbur ran at the side of the machine, holding the wing to balance it on the track. Unlike the start on the 14th, made in a calm, the machine, facing a twenty-seven-mile wind, started very slowly. Wilbur was able to stay with it until it lifted from the track after a forty-foot run. One of the life-saving men snapped the camera for us, taking a picture just as the machine had reached the end of the track and had risen to a height of about two feet.

"The course of the flight up and down was exceedingly erratic, partly due to the irregularity of the air and partly to lack of experience in handling this machine. The control of the front rudder was difficult on account of its being balanced too near the center. This gave it a tendency to turn itself when started, so that it turned too far on one side and then too far on the other. As a result, the machine would rise suddenly to about ten feet and then as suddenly dart for the ground. A sudden dart when a little over a hundred feet from the end of the track or a little over 120 feet from the point at which it rose into the air, ended the flight. As the velocity of the wind was over thirty-five feet per second and the speed of the machine over the ground against this wind ten, the speed of the machine relative to the air was over forty-five feet per second, and the length of the flight was equivalent to a flight of 450 feet made in calm air. This flight lasted only twelve seconds, but was, nevertheless, the first in the history of the world in which a machine carrying a man had raised itself by its own power into the air in full flight, had sailed forward without reduction of speed and had finally landed at a point as high as that from which it started.

"At twenty minutes past eleven, Wilbur started on the second flight. The course of this flight was much like that of the first flight, very much up and down. The speed over the ground was somewhat faster than that of the first flight, due to the lesser wind. The duration of the flight was less than a second longer than the first, but the distance covered was about seventy-five feet greater.

"Twenty minutes later the third flight started. This one was steadier than the first one an hour before. I was proceeding along pretty well when a sudden gust of wind from the right lifted the machine up twelve to fifteen feet and turned it up sidewise in an alarming manner. It began a lively sliding off to the left. I warped the wings to try to recover the lateral balance, and at the same time pointed the machine down to reach the ground as quickly as possible. The lateral control was more effective than I had imagined, and before I reached the ground the right wing was lower than the left and struck first. The time of this flight was fifteen seconds and the distance over the ground was a little over two hundred feet.

"Wilbur started the fourth and last flight at just twelve o'clock. The first few hundred feet were up and down as before, but by the time three hundred feet had been covered, the machine was under much better control. The course for the next four or five hundred feet had but little undulation. However, when out about eight hundred feet the machine began pitching again and, in one of its starts downward, struck the ground. The distance over the ground was measured and found to be 852 feet; the time of the flight, fifty-nine seconds. The frame supporting the front rudder was badly broken, but the main part of the machine was not injured at all."

The years drifted inexorably by since that bleak December day at Kitty Hawk when man first flew, and many people neither knew nor cared that this isolated, barren stretch of coast in North Carolina was the birthplace of aviation.

But in 1927, during August, there met a group of North Carolinians near the scene of the famous experiments of the Wrights who concluded that the government of the United States should take steps to perpetuate the memory of those painstaking and tireless aviation pioneers. Consequently, the Kill Devil Hill Memorial Association was organized, with the end in view of having a suitable monument erected to the spectacular achievement of the Wright brothers.

The plan captured the imagination of Congress, which body appropriated the sum of $225,000 for the work. The cornerstone was laid on the 17th of December, 1928, on the twenty-fifth anniversary of the first flight of man, and construction was immediately begun on the granite shaft chosen as the memorial.

Today, this great memorial, built of granite from the hills of North Carolina, stands atop Kill Devil Hill, the giant sand dune from which so many of the Wrights' glider flights were launched. One hundred and sixty-five feet from the plain at its base the crest of the memorial towers into the sky, an undying tribute to the brothers who lifted man's feet from the earth and set him free to conquer and explore the skies.

Red Flannels For Airliners

(Continued from page 14)

are all that receive the attention of the boys in the white coveralls.

The propellers are cared for by a huge conical-shaped cap called a slinger ring. This cap is attached to the hub of the prop and in flight discharges a spray of fluid which completely coats the whirling blades, making them impervious to the affectionate ice film which tries ever so hard to attach itself to the metal. The fluid is a mixture of alcohol and glycerine, eighty-five percent of the former and fifteen percent of the latter. This gooy concoction is sprayed automatically by the action of the prop itself and is most efficient in its purpose.

In the first paragraph we mentioned the carburetor, most important unit of the power plant. If we implied different carburetors are put on exclusively for winter flying, we retract. The carburetors are the same all year round, because they are of a special design and can be adjusted from the cockpit to function smoothly in any kind of weather.

These little gadgets are equipped with an intensifier tube (sometimes erroneously referred to as "intense fire," which isn't such a bad name at that). This tube draws in the cold air from the front of the airplane, passes it through the exhaust stacks, which heats it, and from there into the carburetor proper. There are little openings, similar to tiny doors, which may be opened or closed to regulate the temperature of the air. By means of these carburetors it is practically impossible for an icing condition to exist in this part of the engine's vitals. Foreign air lines are fast becoming aware of the value of this gadget and are installing the American-built instrument in most of their ships.

Another precaution taken is the windshield de-icer, which in no way resembles the wing de-icer.

So the smart boys who dope out these things and the hard-working lads who install them put a small tubing around the windshield from which pure alcohol is forced on the surface of the glass. The tube is copper and a special tank furnishes the pressure. The ice simply can't stand the effect of alcohol and dissipates.

The oil lines are covered with asbestos. This is to keep the oil from congealing. The cold air cools the oil, which is not so good, because engines need warmth. The asbestos covering takes care of that.

Don't think, however, that the maintenance bunch think only of the engine. That, of course, is their main concern, because there are pretty stewardesses and handsome stewards to take care of the passenger inside the cabin. They can turn on the cabin heat or supply blankets when necessary, but before the ship takes off, these inside-maintenance aids are not on the job. So it is again up to the boys in the hangar to get the ship's innards comfortable for the cash customer.

All summer, you who have visited major airports, have noticed huge, clumsy-looking motor cars with long, thick nozzles emerging from their sides, sneak up to the off side of a parked plane, and seen mechanics quickly connect the hose to a special opening in the ship. In summer this weird-looking contraption blows frigid air into the ship, keeping the temperature at a comfortable degree. But what good, you ask, is frigid air in winter?

What good, indeed? But here's where they fool you again. There was some mythological bozo, who (don't bother stopping me if I'm wrong) marveled at man's ability to blow hot and cold. In other words, he saw some lad blow on his food (beastly manners!) to cool it, and with the same breath, blow on his hands to warm them. So do these air-conditioner trucks blow hot and cold, merely by the deft manipulation of a few switches and pet cocks. The huge fans inside the trucks may be converted to blow either hot or cold air, and in winter, naturally, the heat is on. Which takes care of the passenger.

This might be a good spot to explain the working of the rubber boot, as the wing and tail assembly de-icers are known.

The long black patch which fits snugly over the edge of the wing covers a series or network of smaller tubes which run from the innards of the engine. By merely applying his hand to a small lever in the cockpit, the pilot sets this in motion. Air pulsates through the network of tubing, causing it to throb with each beat of the engine, expanding and contracting, continuously. The action is so fast that it would hardly be visible to the naked eye, but it does the job. Ice, it has been demonstrated, does not readily form on a moving surface, and the constant throbbing of the boot breaks up the film before it gets a chance to form.

There is, at present, before the board of scientists at Langley Field, a formula of sticky substance which is said to be the perfect de-icer. It has never been tested on a transport, but last winter tests were made on a small ship and the results are said to be most promising. This mixture would be smeared on the wings, antenna, struts or other parts of the plane exposed to weather, and while it is a messy and tiresome procedure, if it answers the purpose it will be well worth the time involved.

There have been many other concoctions which claimed to dispel or prevent ice. Few of them were found practical. Experimentation is constantly going on by the air-line laboratories, scientists of the rubber companies, chemical concerns and private inventors who realize there is a fortune to be made in perfecting an infallible de-icer. So far, the rubber boot, slinger ring and alky solution have been found best.

Icing conditions, long the favorite topic of the movie writers and a regular menace in the early days of aviation, are no longer feared by the air lines. They are being coped with.

Pardon me while I go out and buy some wool socks.

Winter's around the corner!

About the SOLO CLUB and how to become a member

Feeling that there is a definite need for a means of recognizing those pilots who have experienced the supreme thrill of their first adventure alone into the blue on man-made wings, Air Trails has formulated and founded the SOLO CLUB.

This club is open only to those who have actually made a solo flight in heavier-than-air craft, either motorless or powered. It does not matter when or where such flight was made. Applicants must furnish the membership committee with satisfactory proof of their qualification for acceptance. There are no dues. Once a member, always a member.

To obtain your sterling silver SOLO CLUB lapel wings and life membership identification card, comply with any of the following requirements and sign. Send with fifty cents to the SOLO CLUB, Membership Committee, Air Trails, 79 7th Ave., New York City.

Proof of Qualification as a SOLO CLUB Member

1. Dept. of Commerce license and number if held _____
2. F. A. I. license and number if held _____

Or attach any of the following:

3. Evidence of military or naval air corps service.
4. A letter from your instructor testifying to your solo flight, giving his rating and license number.
5. A notarized statement, preferably with witnesses, giving all details and data of solo flight and plane used.

In submitting the above for membership in the SOLO CLUB, I certify my willingness for the Membership Committee to investigate my application.

Applicant _____ **Age** _____
(please print)

Street _____ **City or Town** _____ **State** _____

Merry Christmas

EXTRA VALUES, MORE FOR YOUR MONEY

C-B Model News

ORDER YOUR MODELS NOW!

"Realism in Miniature"

VOLUME—BIG, NUMBER—UNLIMITED MORGANTOWN, W. VA., DECEMBER, 1939 PRICE—YOUR PATRONAGE

ACTUAL PHOTOS OF OUR MODELS

A DELUXE 13" model of this Boeing P-26A with miniature pilot, imitation wing ribs, cockpit interior, squadron insignia, etc., is offered to you for only $3.00. A 6½" model of this ship finished is priced at only $2.00.

THE NAVY'S old "reliable" Vought SBU-1 is now offered to you in a finished scale model, complete with machine guns, pilot and observer, detailed built-up motor, wing-step, imitation wing ribs and many other details in a 17" job at $12.00. A 9" model at only $2.75.

HERE'S the British Hawker Fury with a wealth of detail and having a wingspread of 8½" only $2.00. A deluxe model with a 17" wingspread is only $7.00.

IN A WORLD WAR "atmosphere" we have two of our models posed in a dogfight—the 7" Pfalz Triplane attacking a 10" Salmson two-seater. Priced at the lowest for finished models, the Pfalz Triplane only costs $1.75 and the Salmson $2.75. In our deluxe line, a 12" Pfalz is listed at $7.00 and the Salmson $10.00.

SPEEDY, streamline, is the way to describe this 9" finished model of the Vickers Jockey. A nice addition to anyone's miniature airdrome for only $2.00.

NO COLLECTION is ever complete without the Fokker Triplane and so we offer this ship with a wingspread of 6½" for only $1.75. If you want a deluxe model with pilot, wing ribs, motor and cockpit detail, etc., a 12" finished model is priced at $7.00.

Finished Solid Scale and Gas Models Solve This Year's Christmas Gift Problem

Ideal Presents For Modern Youth

Dad, Mother, or relative. This message is addressed to you. There is nothing more appropriate as a gift than a finished solid scale model airplane—nothing more timely. Many models to choose from and priced extremely low. If you may desire, we can enclose a Christmas greeting card with your name and ship to any address that you may designate. There is absolutely no charge for this service.

All models listed below are completely finished, include many details as, movable controls (not from cockpit), wire riggings, insignias, machine guns where needed, painted in colored, glossy lacquers, rubber tired wheels, etc.

UNITED STATES MODELS

8½"	Aeronca, Taylorcraft or Taylor Cub	$ 2.00
7½"	Boeing P-26A or Flt-4	2.00
8½"	Beechcraft or Waco cabinplane	2.25
12"	Lockheed Electra	5.00
12"	Vultee Attack-Bomber	4.00
8"	Seversky or North American	2.50
32"	NC-4 Navy Seaplane	35.00
7¾"	Curtiss P-6E, P-37 or P1C-2	2.00
25"	Boeing Flying Fortress	25.00
22"	Douglas Transport	15.00

FIRST WORLD WAR MODELS

11"	Breguet or Rumpler two-seater	2.75
7"	Sopwith Camel or Albatross D-3	1.75
7½"	Fokker D-7 or D-8 monoplane	1.75
11"	L.V.G. or D.H.4 two-seater	2.75
18"	Gotha or Friedrichshafen Bomber	7.50
24"	Handley-Page or Vickers Bomber	15.00
6½"	Spad, S.E.5 or Nieuport 17	1.75

SECOND WORLD WAR MODELS

10"	Breguet or Lysander two-seater	2.75
8"	Hawker Hurricane or Spitfire	2.00
8"	Polish PZL or Heinkel	2.00
9"	Messerschmitt or Dornier	2.00
24"	Handley-Page Night Bomber	15.00
8"	Dewoitine D-27 C1 or Potez	2.00
10"	Fairey Battle plane or Magister	2.75
8"	Nieuport 161 or Caudron	2.00

OFFICIALS INSPECT MODEL TRANSPORTS

Three company officials are shown in the above photograph inspecting two models of the Boeing Clipper just off the assembly line and ready to be shipped to a large industrial design company. This same firm has purchased 30 models during the past few months to be used in their work.

MODEL KITS, SUPPLIES

We can give prompt service on kits and supplies of the PEERLESS MODEL AIRPLANE CO. Catalogs 5c. To dealers—Write in for discounts on your letterhead. No post card inquiries, please. Pittsburgh and vicinity dealers may buy through our branch there and save shipping charges. Write for full particulars.

All Gas Jobs Test-Hopped

To you gas job fans we offer the following ready-to-fly gas models which all will be test-hopped before shipment is made. These ships come complete in all details, painted, air wheels, timers, batteries, switch, propeller and the motor wired, and MOUNTED READY TO RUN!

The large gas models are powered with the Ohlsson "60" and the small ones with the Ohlsson "23". We can substitute any other motor if so desired. In the event no motor is wanted, deduct for the price of the motor and we will send the finished model only. We can supply you with any motor on the market. Send correct amount and we will send any motor postpaid and insured.

COMET GAS MODELS

72" Clipper or 54" Zipper	$43.00
57" Golden Eagle or 48" Mercury	30.00

MEGOW MODELS

52" Piper Cub or 54" Cadet	30.00
72" Commander or 60" Soaring Eagle	40.00

PEERLESS GAS MODELS

48" Pippin or Rocket	30.00
70" Black Hawk or Taylor Cub	40.00

CLEVELAND GAS MODELS

50" Cloudster, Fleetster or Playboy	25.00
57" Korda Champion	35.00

IN 'PLANE' FUN

No newspaper is complete without any column devoted to humor and for your amusement we offer the following.

"Well, Pat, do the twins make much noise?"

"Noise! Shure, each wan cries so loud yer can't hear the other."

Gently he pushed her quivering shoulders back against the chair. She raised beseeching eyes in which faint hope and fear were struggling. From her parted lips the breath came in short, wrenching gasps. Reassuringly, he smiled at her.

Bzzzzzzzzz, went the dentist's drill.

Refrain from the enumeration of the common gallinaceous birds before they have emerged from the mechanical progressive process of incubation. All which means:

"Don't count your chickens before they're hatched."

"That will be enough out of you," the doctor said as he stitched the patient together.

"How did you get that red on your lips?"

"That's my tag for parking too long in one place."

"There's a fly in my soup."

"That's no fly. That's one of those vitamin bees you've heard about."

"When does the next plane leave for Chicago?"

"Two-fifty, sir."

"Make it 2:48 and I'll take it."

Happy is the mosquito that can pass the screen test.

"How are my chances, Doc?"

"Oh, pretty good, but I wouldn't start reading continued stories if I were you."

"How did you get that bump on your head?"

"A thought just struck me."

"How many passengers does your plane carry?"

"It depends how well acquainted they are."

It's funny how this world can be so complicated when there are so many simple people.

And so, all good jokes to a punny end must come.

Special Services, Many Uses Found For Ready-Built Models

The most common questions that we are asked is why we have specialized in finished models when there are so many model builders in the country, and why we do not concentrate all of our efforts in selling kits and supplies like so many other companies?

Our answer is, we have specialized in this branch of model work because there was a need for it. Prior to the inception of this firm there wasn't any company that anybody could turn to for a finished model.

During the past years we have constructed models for many of the leading kit manufacturing companies who in turn supply their dealers with exhibition models as part of their promotion, advertising and merchandising work. . . . Manufacturers of the real planes use our models to give to their salesmen and distributors in putting over their selling points to the customers. . . . Many of our customers are pilots—private, in the service, or commercial—who like to have a model of the ship they fly to show to their friends, or to decorate their dens.

In many cases there are aviation fans who are interested, or are connected in this field who do not have the time to build models themselves. . . . Often, builders themselves, use our models as a basis for their construction work. . . . In schools and universities, models are used by instructors to point out some important phase in the theory of flight. . . . Managers of toy, hobby and department stores, procure finished models for advertising and window displays—as nothing attracts attention like a finished gas job or a finished solid scale or rubber powered model.

Women, too, use models as bridge gifts or in the home to give it that "modern touch." And there are many other uses too numerous to mention.

We can be of service to you. Won't you give us your problem and give full particulars? We will be glad to make any model from any stock kit in this country or we can refer to our own library of over 7,000 plans. Our trained staff is at your disposal.

May we hear from you?

U. S. LINE-UP: FIGHTING, RACING, TRANSPORTING

ONE OF Uncle Sam's top-notch fighters in model form—the Grumman Fighter. This 7" finished model makes a very attractive model on any desk, mantel piece or on a radio top. Only $2.00. A deluxe 14" version of this ship with pilot, interior cockpit details, wing rib imitation, etc., $8.00.

AND NOW we give you racing fans a break by presenting you with a 5" Gee Bee racer at $2.00. On request we will be able to make any racing craft that you may designate.

IT IS ONLY natural that we present this historic model to you solid scale fans . . . graceful in appearance, the 22" China Clipper ranks high with the aviation enthusiasts. This model has a hollowed out hull, built-up motors, China Clipper color scheme and details at only $20.00.

Ordering Instructions

Please read carefully. All orders shipped F.O.B. Morgantown. Remit by postal or express money order, check, cash sent by registered mail. Prompt service. All orders sent insured. Because of limited space it is impossible to list all the types of models we make. However: "YOU NAME IT—WE'LL MAKE IT." When desiring correspondence, enclose self-addressed, stamped envelope for a return reply. We will not answer post card inquiries.

Address your orders to—

CHRISTIE BATLAS
DEPT. AT-2 POST OFFICE BOX 106
MORGANTOWN, W. VA.

SOLID SCALE KITS

These complete kits include full size plans, liquids, cowlings, cut out parts, wire, etc., and packed in a sturdy and attractive box. Orders over $1 sent postpaid—Under $1, add 10c for postage.

12½"	Vultee Attack-Bomber	$1.00
17"	Bristol Fighter	.50
11"	Fokker Triplane	.50
11½"	S. E. 5	.50
12"	Sopwith Camel	.50
12"	Nieuport 27C-1	.50
13"	Pfalz D-3	.50
18"	Ryan S-C Cabinplane	.50

"The Phone-Booth Special"—A microfilm stick model kit complete with full size plans, microfilm solution, cement, wire, 1/64 and 1/32 sheet and strip balsa, etc. An excellent indoor flying model for 25c.

Dealers write for discounts on your business letterheads. No post card inquiries will be answered.

Model Matters

(Continued from page 33)

games or similar exercise. During the summer classes are held five days a week. All material is furnished without expense by the Junior Chamber of Commerce.

These Kansas people have the solution for keeping the youngsters interested in worth-while things. Can you imagine anything more conducive to self-control than the ability to start all over with the broken pieces of a gas model that has just spun in, or a model whose breaking rubber has carried away most of the fuselage? And before we end the sermon for this month, how about the feeling when a new model finally turns in its first good flight? It sort of gives you courage to tackle anything—models or otherwise.

Model Builder Walter Lees made his first solo flight recently. He's been one of the stalwarts of the Philadelphia Model Airplane Association for the past nine years. His flight instruction was part of the training course awarded to him under the Taylor Memorial Fund. He was chosen by the Aero Club of Pennsylvania as the 1939 winner of this annual award. . . . By way of keeping track of model builders who have made good, it's good news to know that William Stout is back in the airplane business. He had spent the last half dozen years or so building cars, trailers, and trains. His last designs were the Ford Tri-motor and Stout Sky Car. His new design is a light plane intended for mass production. Incidentally, the two Stout national trophies are evidence of Bill Stout's interest in model airplanes.

J. L. Sadler of Little Rock, Ark., continues to win contests with his low-wings. At the second annual meet last September his model disappeared on the first official flight. Sadler drove the eighty-some miles to his home to get an old low-wing and was back in time to put in two more flights to hang up the highest average of 4:26. Plans for this remarkable model are scheduled for an early issue of A. T. This model was using the original propeller after more than one hundred flights. Unfortunately, Sadler is still hunting his wandering job. . . . We chuckled when learning that Myrt Thomas is still keeping the Little Rock boys on their toes. She threw a scare into their ranks when she came within a second or so of winning the elimination contest last spring. At the recent meet she was also a serious threat—taking third place. A sort of feud is developing since Sadler placed first in both these meets. Come on, gal, we're rooting for you.

More and more model clubs seem to be developing their own private flying fields where the boys can click off flights without any handicaps other than gravity and air currents. The Aero-Craftsmen of Baltimore have their private airport at Model Haven at Loch Raven, outside Baltimore. Their first contest was held there last August. Robert Wiehle of Washington, D. C., won the large-bore event. He has been grinding out excellent models for many years. But what's even better is his mighty pleasant nature. . . . Richard Barber of Utica, Warren Boardman of Albany, and Charles Uht of Danville, Ill., were the winners of the National Aero Reserve contest held in Rochester and were flown to the National Air Races in Cleveland in the Lockheed 12 owned by Gannett Newspapers and piloted by Lieutenant John L. Scherer, director of the N. A. R. Thomas Hogan of Hartford was declared N. A. R. champion, but unfortunately declined to make the trip to Cleveland. Hogan is physically handicapped and thought it would be too much of a strain. But this handicap didn't interfere with his making the winning flight of 8:40 in the rubber-powered event. Gannett Newspapers have been consistently model-minded in their policy. They have done excellent work in promoting the hobby throughout upstate New York. Modelers can learn about the complete program by writing National Aero Reserve, Rochester Airport, Rochester, N. Y.

Estimated daily attendance at the two-day meet at the Second Annual Gulf States Model Meet in New Orleans was 15,000 people, with 5,000 cars in the parking lot. This is the only Southern meet that invites interstate competition. One hundred and seventy-five model builders from all parts of the South accepted the invitation. Kenric Hunter of Mobile, Ala., took the Open Gas; Asbun Wilds of Port Arthur, Texas., the Rubber Endurance; and Roger Jones of Baton Rouge, La., the Flying Scale. Senior gas-model winner was Ray Hubbard of Dallas, Texas. Mr. Jumonville of New Orleans is responsible for much of the work required in raising funds and putting the meet across.

Writing in the Virginia Model Association bulletin, Phillip Pepoon reveals the research he's done on model coverings. One particularly interesting item is that "medium bamboo paper weighing .51 ounces—per square yard—with one coat of dope—one half red dope and one half acetone—weighs .91 ounces, increasing the weight by .40 ounces per square yard." The problem of how much weight dope does add arises frequently. Pepoon has worked out a complete list of various materials and the weight added by dope of varying consistency. Pepoon works in the National Advisory Committee for Aeronautics laboratories. His research is accurately and thoroughly compiled. We're looking forward to learning more about his work in the hobby when we see him at the meeting of the academy this Thanksgiving. Modelers interested in learning more about model covering material are invited to write Phillip Pepoon, 141 Melrose Ave., Hampton, Va.

It's unlikely there will be any sweeping changes in the 1940 contest rules. The few items which will be exposed to possible revision are continuance of the three-flight average or return to best of three flights, dropping of the Open Class gas events, possible increase of the maxi-

mum wing area for Class A gas models to 250 square inches. (Maximum now is 225.) . . . A Brown-powered Zipper flown by Bud Lindsley, Sioux City, Iowa, won the annual Sioux Falls, N. D., contest. A strong, gusty wind made flying difficult, but Verne Snyder of Sioux Falls did 2:50 with a rubber fuselage—another case of rubber models outflying gas . . . A trip to Mars has become a reality! It was a Zipper and not a rocket that made the trip. John Eberle of Pittsburgh sent his gas model off the boards on the first official flight of the Fourth Allegheny Mountain Area Meets—it caught a thermal and landed at Mars (of course, we refer to the small town in western Pennsylvania and not the planet). The model was launched at about 12:30 and landed at 2:45. The farmer who watched it land called up the model airport immediately upon its landing. Eberle won the Open Gas with 6:22 average. Pete Bila took the Senior Gas with 2:49.

Harry G. Vogler, Jr., continues to give the boys in the Pittsburgh area bigger and better contests through his capable work as contest director. . . .

CHICAGO SKY LINES. (By Frank Nekimken.) Continuing its line of novel contests, the Chicago Park District Model Airplane Association offers the latest—a gas-versus-rubber affair. This is the first event of its kind since Maxwell Bassett cleaned up at the 1933 Nationals flying his gas model against rubber. At that time the rubber builders complained. Now they are asking for it—a battle to the finish with no holds barred. Both types must conform to N. A. A. rules. Modelers must decide before the contest which side of the fence they are on—whether they're putting their hopes in gas or in rubber. Fifty dollars and considerable merchandise are at stake. And since I'm the one with whom all contestants check their peeves—sometimes called contest director—I'll be able to give you a first-hand account of the brawl.

Chicago means business when we threaten to be host to the national meet in 1940. A bid from Chicago was placed with the N. A. A. in which the Chicago *Daily Times* and the Chicago Park District agreed to cosponsor the Nationals. Maurice Roddy, aviation editor of the *Times*, and myself—representing the C. P. D.—were assured that definite word as to the locality would be forthcoming before the end of the year.

Carl Goldberg has hit the trail. The gas-model wizard of the Comet company is completing a swing through Wisconsin, Pennsylvania, New York and points east. Like the traveling Indian medicine salesman, he stops at each hamlet, town, and village, pulls open his trailer, and out comes an exhibition of scale, rubber, and gas model. A movie projector is set up to illustrate the Goldberg talk on the pitfalls and trials that await the model builder when he tries to build and fly a model. I went along with Carl on a "sample" trip to Batavia, Ill. We found plenty of enthusiasm. I hope Carl managed to visit your home town. We're proud of him here in Chicago, but don't begrudge you a chance to meet him.

Here's a contest we suggest you try. Chicago boys liked it. Last year we conducted a model "Fun Fest." This year we repeated it with even more success. The contest is held in a large parking lot adjacent to the Riverview Amusement Park from 10 a. m. to 1 p. m. Gliders and rubber models are flown. There are no restrictions or rules of any kind. Each contestant—there were over 200 at this year's meet—may fly as many gliders and as many rubber models as he wishes. As many flights are allowed as the contestant can make during the scheduled time, and the best three flights are added together.

At 1 o'clock the contest ends and the entrants receive free admission and free rides in the amusement park. Later in the afternoon prizes are awarded. The contest is sponsored by the Chicago *Times* Air Cadets, Riverview Park, and conducted by C. P. D. craft instructors.

CALIFORNIA NOTES. (By Elbert J. Weathers.) All is quiet on the western front. Modelers are digging in for the three big meets scheduled for the near future. In the meanwhile, Eastern readers should be interested in the precision-type contest which we've developed out here. We're proud of this development and feel that builders in other parts of the country would do well to include it on their contest program. It has many advantages over a strictly durational contest, since it obviously makes for much better engineered gas models.

A typical precision contest is the annual Chancellor Midget Air Races. A possible fifty points are awarded on the plane itself without consideration of its flying. Another fifty-five points are granted on flying. Here is the breakdown of the points awarded:

	Pts.
A. Construction	
a. Originality and general design	10
b. Paint job	10
c. Covering	10
d. Woodwork	10
e. Metalwork	10
B. Flying	
a. Take-off	10
b. Flight	20
c. Glide	10
d. Landing	10
e. Time of flight within allowed 10- to 20-second limits	5

Each contestant is allowed two official flights—points being awarded for each. Thus there is a total of 160 points to shoot for.

KANSAS NEWS. (By Leo Rutledge.) Organization is the keynote to the successful operation of any program, whether it be recreational, educational, or industrial. An example of the effectiveness of organized effort is Wichita's model aeronautic program. Incorporating new ideas in youth education, this community has produced some very outstanding results. Some few years ago a group

of men in Wichita had the foresight to recognize the value of model building. Operating under adverse conditions, these men staged contests, conducted experimental work, and endeavored to create general interest.

In June of 1938 these sponsors came in contact with an organization of young men who were dedicated to a program of civic improvement. The Wichita Junior Chamber of Commerce, of whom I speak, agreed to sponsor and promote the program started by the first group.

Organizing a model aeronautics committee headed by two capable youth leaders, plans were drawn up. Methods of financing, selection of personnel, youth-contact procedure, publicity, methods of both practical and theoretical work, and many other vital points were incorporated into a workable program. This committee established a laboratory for the study of theory and actual constructional phases. To complete a well-rounded program a flying field of 147 acres was obtained for experimental work and for the staging of meets.

It was felt that the general program would be helped by a mutual exchange of ideas and a certain amount of social and recreational activity. Hence the Model Division of the Kansas State Aviation Association came into being.

Many other organization steps which have been adopted could well be presented, but time and space prohibit. Detailed information on our program is available to all model enthusiasts. Address Leo Rutledge, 2115 E. Kellogg, Wichita, Kan.

NORTHWEST MODEL NEWS. (By Glen Chambers.) Mr. Harry N. Fosbury, senior advisor and contest director of the Portland (Ore.) Gas Model Club, reports on their unique organization. Most of the boys like Class A ships—225 square inch maximum area and .20 cubic inch displacement. (The Elf factory is located there.) Not only is a large percentage of their jobs Class A, but out of twenty-three members, seventeen are busy on original designs. This seems like some sort of record.

Via Dick Megorden comes the good news that Chuck Lamb, Jr., model builder of long standing in this territory, was promoted from Boeing Aircraft's sheet-metal department to the model-building department. Who said model building is a waste of time? Dick Megorden is doing very well with Boeing. As president of the Northwest Gas Model Association he's still busy plugging models.

Here in Yakima we're putting the finishing touches to a new and exclusive Y. M. C. A. airplane clubroom. It's large enough for a conference or lecture class. In true aviation style, pictures and photos of model work will decorate the walls. We'll initiate it with the Third Conference of the Northwest Gas Model Association in October.

Flying a Class C job, U. J. Mustapa of Seattle won the Olympia meet with 327.3. The contest was held at Raineer Gas Model Field, which includes more than 200 acres of flying area. H. A. Long directed the meet. Everyone had a good time. More than thirty prizes were awarded, so practically everyone had something to take home other than broken models.

Vancouver, British Columbia, was host at an international meet held on Lulu Island at Vancouver. However, the visitors from Seattle took home the first seven places. Mr. Churchland of the Vancouver club states the case clearly when he writes: "With hardly an exception the visitors were flying small, high-powered ships that zoomed up at nearly 1,000 feet per minute, reaching a high altitude for an extended flight." A dinner followed the contest in honor of the visiting modelers. Prizes were awarded by the chairman of the aviation committee of the Vancouver Junior Board of Trade, Jack Burns.

Winners of the contest were F. Panett, Seattle, 4:03, first, and Don Loughridge, Seattle, 3:12, second. Frank Tourner, the best of the Vancouver entrants, won the Irving trophy and an air-line trip.

EASTERN FLYING. (By Carroll Moon.) Air meets have been few and too far between for the majority of Eastern fliers during the past month. Transportation problems have prevented many of the best builders from participating, and strange as it may seem, the times for the various events have not been as good as anticipated.

The Philadelphia meet in the early days of September proved another triumph for Comet Zippers, which zoomed and plowed their way to a majority of the prizes. In the Trenton meet, held September 24th, much the same result was seen, though a Clipper was the lucky plane in the big event. The outstanding performance of both contests was made by Herb (Honest) Friedlander of the Sky-Scrapers, who turned in a single Class B flight of 17:30 out-of-sight, and lost the ship in the hills of Pennsylvania.

One of the most unique and most interesting air meets to be held so far this year in the East was conducted on Sunday, October 1st, at Creedmore, L. I., by the Metropolitan Model Airplane Council. The meet was aptly called a Marathon meet, but at the close of the flying day—determined by torrents of rain—the question arose as to whether the Marathon was calculated on the endurance of the planes or the endurance of the fliers.

Class A planes used a fifteen-second motor run, any flight of over thirty seconds constituting an "official" for meet purposes. Ray Arden, designer of the Mighty Atom motor, took first in this event with fifteen flights, his tiny ship performing in excellent fashion despite the wind and rain.

Jim McPheat, of the Queens Aero Model Association, took first in the larger ship class. Ships in this category used a fifteen-second motor run and were obliged to fly for a minute or more to register a flight.

The meet was conducted under the direction of Irving Polk, president of the council, assisted by council members. It marked another step in the council's program to afford metropolitan builders with opportunity to participate in the newer phases of the game whenever possible.

Gliding And Soaring

(Continued from page 22)

inside the cockpit and watching only the instruments.

As soon as straight flying has been learned, the next step can be tried—gentle turns. Here the needle of the turn indicator has to be held slightly off-center by the rudder, and when applying bank one has to watch that the ball on the bank indicator is in the center, as in an improper turn the ship will either skid or slip; in the skid the ball will be on the side of the high wing, while in a slip the ball will be on the side of the low wing, while in a perfect turn it will be in the center. Steep turns are a bit more difficult, as the bank must be held off, and some backward pressure is usually necessary on the old stick.

It is also very important for the sailplane pilot to know how to get out of a spin on instruments. If he finds himself in such a predicament, he should use opposite rudder until the turn-indicator needle comes out of its corner and goes into the opposite one, neutralize the rudder immediately, and ease the stick forward to the central position. What happens is something as follows: When opposite rudder is kicked, the spin stops and the needle of the turn indicator comes out of its corner. The ship is considerably slowed up with the stick back, and noses up rapidly. The turn indicator becomes unstable and the needle starts going into the opposite corner; at that moment the rudder is neutralized and the stick is eased forward to prevent nosing up and stalling.

With the advent of the Link trainer it became a fairly simple matter to learn instrument flying. The student can practice all its steps on the ground. We do not recommend trying to fly blind without the knowledge of instruments and practice in their use, as the uninitiated pilot has a great tendency to believe his "feel" rather than the story on the dials—and many an expert pilot has got himself into a tough spot from just that.

U. S. NEWS AND ACTIVITIES

This year the Associated Glider Clubs of New Jersey threw open their yearly contest to pilots residing outside of the State. The event was named the Eastern States Meet and was held at the Schley Glider Field, Liberty Corners, N. J., over Labor Day and the following week end. Unfortunately the weather was far from favorable for soaring and no spectacular flights were accomplished. Altogether, six ships were entered: the Hudson Valley Glider Club's Schweizer utility, christened the *Flying Cruller* by its pilot, Herbert Sargent; the S. S. A.'s two-place Schweizer sailplane and Franklin utility; the Airhoppers' Schweizer, flown by Jack Brookhart and Lew Barringer; Don Lawrence's Lawrence sailplane and Cadet utility. The program consisted of endurance flights, spot-landing contests and stunting exhibitions. Jack Brookhart won first prize and the title of Eastern States Champion; Lewin Barringer was second.

For the second year in succession a caravan of three sailplanes made its way from different points to the National Air Races at Cleveland. Chet Decker of New Jersey, Emil Lehecka of New York City, and Ted Bellak of Frankfort, Mich., put on their famous Glider Trio act at the races. Emil flew his Rhoensperber, while Ted and Chet were at the sticks of their Minimoas. Every day the boys were towed aloft by the same plane, and after releasing on signal, put their graceful sailplanes through a series of formation aerobatics.

Captain J. S. Charles of the American Airlines, who recently built himself a Baby Bowlus Albatross, certainly went to town with it. Having been towed up recently by a 65-h.p. Cub, he soared for over five hours and reached an altitude of 10,200 feet. The flight was made in Atlanta, Ga.

Our friend Don Mitchell of the Bowlus Sailplane Co. writes us another one of his interesting letters regarding Bowlus activities. "To date," he says, "thirty-nine Baby Albatross sailplane kits have been sold; fifteen of them have been set up and the rest are in various steps of construction. For the past three years Hawley Bowlus has been designing a super Albatross. We built one in four weeks' time and test-flew it seven days before the national meet. However, knowing nothing about its performance, we thought best not to send it East and kept it here to play around with. We plan to turn it out in kit form beginning the first of the year. It will be sold as a complete ship, also, if desired. The ship's specifications are as follows: Span, 42 feet; area, 120 square feet; airfoil at root, modified Goettingen 549 12-percent section; airfoil at tip, NACA 2409; washout, 3 degrees; dihedral, 4 degrees; wing, elliptical, full cantilever, shoulder-high; fuselage is the pod type, molded under 80,000-pound pressure, the same size as the Baby Albatross except it has no neck; boom tail; total weight, 240 pounds; wing loading, 3.5 pounds per square foot; take-off speed, 30 m.p.h.; landing speed, 27 m.p.h.; minimum sinking speed, 2.5 feet per second; maximum gliding ratio, 30 to 1 at 67 m.p.h. The ship can be assembled in four minutes by three men."

Gas Model Licenses

(Continued from page 42)

dark color, black preferred. This should be thinned until it flows easily but still retains its opacity. Should the paint loosen the foundation color of the wing in places, causing it to mix into the color being used, simply give it time to dry before finishing. Benzine or a soft eraser will easily remove the pencil lines.

The Molecule

(Continued from page 30)

The cabin windows are cut after the blanks have been cemented into place. A small brace between windows will help to stiffen this spot. Use heavy celluloid for the windows.

Smooth out the entire body with fine sandpaper Finish by brushing one or two coats of microfilm solution on the surface first, followed up with one coat of varnish. It is important to have some finish on the body which will withstand the rotting effect of gas and oil. But stay away from dope and paint, as they will put the body out of shape in time. The microfilm solution and varnish are absolutely harmless in this respect.

Make the nose the following way: Copy the two front formers onto a piece of paper. Cut each piece $^{3}/_{32}$" smaller all around. Cut ½" off the curvy part of each in a straight line. These cut-offs will be filled in with a solid block. Cut out the formers of ⅛" sheet and leave them solid. Now cement the two together at the same angle as the front of the body. While an auxiliary ¼"x¼" holds the front former in place, plank the sides with $^{3}/_{16}$" soft balsa and put solid blocks on top and bottom. Carve and sandpaper to shape. Use clear dope and paint inside and out in order to make it gas-proof. Two bamboo tracks anchored in the bottom of the nose support the coil. The battery box is made of hard $^{1}/_{16}$" sheet balsa and cemented firmly. The landing gear is of $^{1}/_{16}$" piano wire faired in and reinforced with a large-face brass bushing on each side of the nose.

The motor is mounted on two aluminum brackets which in turn are screwed to the front former. I have used a sawed-off Austin timer—but, shifted a little forward, even a full-size one will fit in.

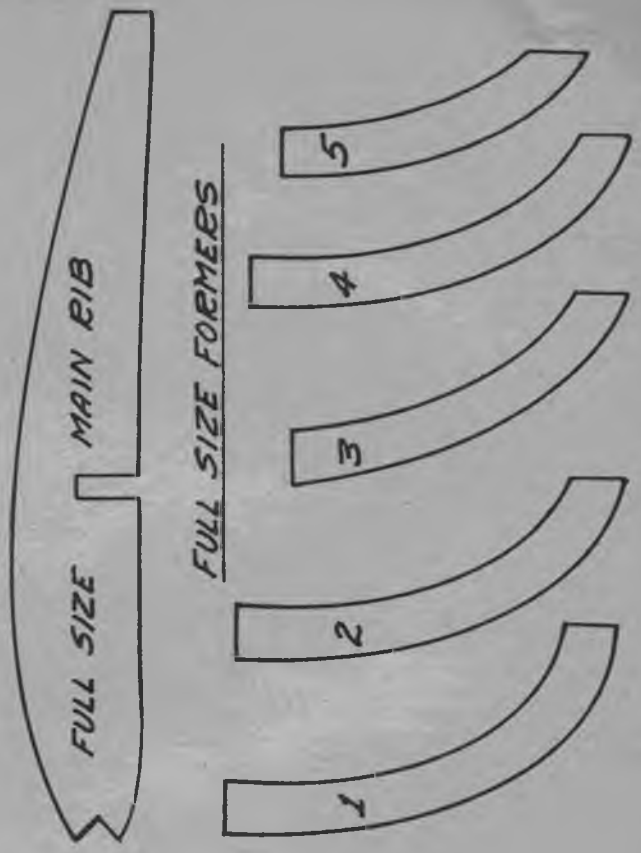
Solder all the connections into a firm joint. To avoid losses through interference, the high-tension wire is brought through a slot between the nose and the cabin front. The whole nose is held firmly to the body by rubber bands on each side. Provide piano-wire hooks for this purpose, both on the nose and body.

WING AND TAIL

The wing is made in two halves. Cut out all the ribs for the straight part of the panel. Pin the trailing edge down and butt-joint the two end ribs. Now slide the spar through the notches and fasten the leading edge. Follow with the rest of the ribs. Bend the bamboo tips above the gas range, and notch them in place. Fit in the smaller tip ribs, which are sanded lower and lower toward the tip.

The front cut-out ring may look odd to some, but it is the only way to preserve the cabin position.

The tail employs no spar. The outline is cut out to shape and as-



sembled. Flat balsa ribs are set in, whereupon the edges are sandpapered into a streamlined section. The rudder tab is solid balsa hinged with small aluminum pieces. Cover all the surfaces with single Jap tissue. A couple of coats of dope should make it water- and gas-proof to a reasonable degree. The wing and tail units are fastened with rubber bands.

FLYING

Glide the model without the prop, whose weight is replaced with a rag bundled around the motor. If there is any incidence change necessary, do it on the elevator. When the hand glide is perfected, leave the rudder in straight position, open the motor to about seventy-five percent and hand-launch the model ten to twenty degrees off the wind to the left. If it does not continue to turn in the same direction and stalls around under power, give it one-eighth-inch left rudder the next time. All adjustments should be carefully considered before being put into effect.

My original model has made hundreds of flights without damage.

Sand and Spinach

(Continued from page 15)

patterns, we find that the designers employed by the various powers have arrived at substantially the same answers. The planes of Germany, France and England, therefore, now resemble each other closely as far as color is concerned, and can be identified only by means of their national insignia and differences in structural design. The topsides of pursuit ships are painted with a camouflage design of olive-green and yellow-brown, nicknamed "sand and spinach" by Britain's airmen. The undersides of the little fighters are done in white or sky-blue. This same general color scheme is also used on day bombers, observation and ground-attack machines. Night bombers and fighters substitute a nonreflecting black paint for the sky-blue tints and partially obscure their insignia.

How effective is aerial camouflage? Can it really make a plane invisible? The answer is no. We can no more make a plane invisible with paint than we can make a man invisible with a trick coat. However, if a man blackens his face and hands and wears black clothes, he becomes practically invisible in a dark room, even in the beam of a flashlight. Ski troops dressed in white coveralls are almost invisible against a background of Alpine snow fields. Both of these are examples of good camouflage.

The same principle applies to aircraft. Against a light sky, the opaque shadow of the underside of a plane is at least partially neutralized by painting it white. Viewed from above, the recognizable outlines of the ship are broken up by good camouflaging, which tends to melt it into the varicolored landscape below.

There are two distinct types of camouflage, each with an entirely different function. So far, we have confined ourselves to the protective-coloration type, which tends to make an airplane difficult to see. It is employed to disguise long-range craft operating over enemy territory. The second type is called "dazzle camouflage." This type breaks up the outlines of a plane and reduces it to a bewildering maze of weirdly colored angles, something like cubist art. The idea is that when a dazzle-painted ship flashes across an opponent's sights, it is almost literally impossible for him to make head or tail of it.

Dazzle camouflage is intended primarily for short-range, local-defense fighters. These ships, assigned to the protection of strategic and industrial centers, have no need of disguise or fear of enemy ground batteries. Their camouflage aims at increasing their combat efficiency in dogfighting and in readily distinguishing them from the hostile raiders.

C. A. V. U.

(Continued from page 23)

pleasanter to fly from than the kind *we* used to take off from at certain fields we could mention.

★ ★ ★

We asked the author of "Should Army and Navy Air Forces Combine?" to give an account of himself. Here's his dossier:

Born in 1892 in sod house on prairies of Nebraska, during a cyclone. Started soldiering in revolution in Nicaragua, 1909. Commanded machine-gun unit before he started shaving. Followed that with revolutions in Venezuela, Brazil, Honduras and Mexico.

In 1914, while serving with the U. S. Intelligence at Vera Cruz, Mexico, took first airplane ride with Naval Lieutenant Towers—now an admiral. Joined Canadian infantry—P. P. C. L. I.—August, 1914. Wounded and invalided from service, September, 1915. Joined Royal Naval Air Service. Trained in France and England. Service in France, defense of London and Channel patrol. Invalided from service on account of wounds, 1917.

Joined American air service with rank of captain, rating J. M. A. Assigned to Selfridge Field and built School of Aerial Gunnery and was school commandant until transferred to France. Took courses at Issoudun and then was assigned as school commandant of aerial gunnery with post of duty at St. Jean de Mont. Remained there for the duration of War.

Discharged from American army, March, 1919, into the reserves. Commanded observation squadron, reserve, at St. Charles, Missouri, for five years. Subsequent to World War, took part in revolutions in Guatemala and Cuba. Went into business of commercial exploration engineer in Mexico, Central and South America. Used first airplane ever to be operated in Mexico for commercial exploration, photographing tropical timber tracts.

The Eyes Of War

(Continued from page 21)

is not directly above the ground is compensated by "rectification." This is a process which is an elaboration of the amateur's trick of straightening out converging lines by tipping the enlarging easel.

The five-lens camera is a favorite among multiple-lens cameras. This has one lens pointing straight down and four others set at an angle pointing front, rear and both sides. The photographs, when assembled, have the form of a Maltese cross, but even such extreme angles offer little difficulty to the engineers who derive exact measurements from these peculiar photographs.

If you set a common collar button on a table and look at it directly from above, it forms a circular pattern. Now look at it from above but move your eye six inches to one side. You will see the familiar form of the collar button. This demonstrates the great difference between the theoretically correct vertical position and the shot which is only slightly oblique. Rectification would enable you to produce the circular-pattern view from the angular view!

The value of mosaic mapping is to show the general terrain. The time required for assembly prevents its use for the study of day-to-day and hour-to-hour changes; these are revealed by single shots. One interesting application to reconnaissance work is the time-lapse photograph.

A new sector has been opened by the enemy. The defenders know there is intense activity which the scouts cannot observe. A ship goes up and makes a shot of the suspected area at a known elevation, the lowest from which operation is practical. The use of telescopic lenses, special films and filters make this operating elevation much greater than was the case in the last war. The important thing, however, is to have the elevation as definite as possible. If there is strong sunlight, it is also important to know the time.

At a later time, usually the next day at the same hour and from the same elevation, a second shot is made of the same area. In the meantime a positive on film has been made from the first negative. As soon as the second negative is developed and dry it is placed over the first one. The same objects are brought into the same position. The positive and negative cancel each other to produce a more or less uniform gray tone. However, *any object which is present in the second film which was not present in the first one shows up as an unmistakable area much lighter or darker than the background tone.* The way in which even pin points show up is truly amazing. Discarded oil cans, pieces of equipment and other objects are revealed. Any major difference is shown in shape, so that study of an enlargement from that part of the negative will unmistakably show up the camouflaged gun, emplacements, concealed dumps or anything which has come into existence or been altered during the interval.

About the most startling phase of aerial photography is in the field of stereoscopic photography. This is based on the same principle as the old-fashioned double picture cards and the hooded viewer which adorned every parlor table forty years ago. The startling realism of a scientifically produced three-dimensional photography never fails to enthrall the spectator. The effect is produced because *the image which is produced upon the retina of the eyes is identical with that produced by the real object.* The method is always to make such pictures from two negatives, one made for each eye. To show you how real the stereo effect is, just try this experiment. Place a coin, such as a quarter, on the edge of a table so that about two fifths of the coin extends over the edge of the table. Walk back about six or eight feet. Cover one eye with one hand. Extend the forefinger of the other hand, walk up to the table and without hesitation knock the coin off the table by striking it with the forefinger without touching the table. It is perfectly easy to do this with both eyes open, but with one eye closed most people miss the coin by inches.

When the photographs are made, they are examined by a viewer which is an elaboration of the old parlor viewer. The bad part is that ordinary stereo photographs show depth only to a distance of a thousand feet or so, so that depth value is lost at great altitudes. However, by separating the two lenses, the depth range is extended. By making two shots of the moon at several hours' separation, the rotation of the earth provides the distance and good stereo photographs of the moon are possible. By suspending two cameras from the wings of the ship, sufficient separation is obtained, not only to reveal depth on the ground, but to exaggerate this depth so that the difference between the height of a man and that of a child is easily seen, even when the shot is made at several thousand feet elevation. By having a known separation of the lenses and making the shot from a known altitude if possible, by careful measurement with special instruments, to determine the height of even small objects on the ground, the fake trench wouldn't fool the stereo camera a second.

And now, if you want to get into the actual exercises of aerial photography, consider this problem.

The enemy has a new type of aircraft, the external design of which must be studied. The only chance is to make a shot of the ship, in the air, when passing. A daring flier may get within 1,000 feet. Assuming that both ships fly at 300 miles an hour, and your camera is equipped with a lens of 12-inch focal length, what exposure must be given to obtain a clear, sharp photograph?

The ships' speed is 300 m.p.h. Meeting and passing makes the relative speed 600 m.p.h.

M.p.h. x 1.467=feet per second (f.p.s.).

Ratio of image motion on film to that of original is the same as the ratio of lens focal length to distance of original. Distance is 1,000 feet, lens focal length is 1 foot, so the image moves 1/1,000 as fast as the actual ship. The exposure must be such that the image will travel approximately 1/100 inch or less.

Solution:

600 (m.p.h.) x 1.467=880.2 f.p.s.

880.2/1,000=0.8802 feet per second, image-on-film speed.

0.8802 x 12=10.5624 inches per second.

10 inches is 1,000 times the limit of 0.01 inch, so the time is divided by 1,000.

10.5624/1,000=0.010562⅘, or 5/10,000 over the limit, which is not a significant error. Therefore the exposure time is 1/1,000 second under the conditions stated.

1939 Stout Trophy Winner

(Continued from page 34)

FLIGHT

The original model was adjusted by setting the wing and tail at a definite angle to each other—two degrees angular difference—and maintaining that relation during all adjusting. The wing was shifted to produce the best glide possible. The center of gravity was about an inch behind the trailing edge of the wing when the best glide was had. The wings were perfectly straight with no warps for adjustment. The rudder was warped slightly for a right turn. The nose plug was offset to produce the correct climb adjustment. The model did not climb very fast, but a long motor run gave it more time to strike a thermal. Even without the help of thermals, the glide stretched out the time pretty well. The model circles to the right under power and in the glide. The circles are about one hundred feet in diameter, because the designer thinks that too tight a circle will induce an unnecessarily steep glide. The maximum turns are twelve hundred, a few of which remain after the prop has folded.

BILL OF MATERIALS

5 pcs. 1/8 sq. x 36", longerons
8 pcs. 1/8 sq. x 36", cross braces
1 pc. 1/16 x 3/16 x 11", bamboo wing runners
1 pc. 1/16 x 3/4 x 12", wing mount
1 pc. .045 x 36" wire, wing mount
2 pcs. 1 3/4 sq. x 1/4" hard balsa, nose plug
1 pc. 1 1/4 sq. x 1/4" hard balsa, nose plug
4 pcs. 2 x 2 x 1/16", wheels
1 pc. brass tubing, 1/16" hole x 1" long, wheel hub
1 pc. 2" x 1/16 x 16", balsa fill-in

Wing

3 pcs. 1/8 sq. x 36", leading edge and spars
1 pc. 1/8 x 3/8 x 36", trailing edge
1 pc. 1/16 x 2 x 36" balsa, ribs
2 pcs. 1/16 sq. x 12" bamboo, wing-tip strips
1 pc. 1/20 x 3 x 36", leading-edge covering

Stabilizer

1 pc. 1/16 x 2 x 12", ribs
2 pcs. 3/32 sq. x 36", spars
1 pc. 1/20 x 3 x 36", leading-edge covering
1 pc. 1/8 x 5/16 x 36", trailing edge
2 pcs. 1/16 sq. x 12", bamboo stab tips

Rudder

1 pc. 1/8 sq. x 36", rudder ribs
1 pc. 1/8 x 1 x 36", leading edge, trailing edge, rudder base rib
1 pc. 1/16 sq. x 12", bamboo rudder tip

Miscellaneous

1 pc. 1/16 diam. x 36", landing-gear prop shaft
1 pc. 1/32 x 3/8 x 2", brass prop hinge
1 pc. 2 x 2 x 9 3/4" prop block
1 pc. rubber or cambric tubing for shaft
4 1/4"-diameter copper washers
4 sheets colored tissue paper
Solder for prop counterbalance
Cement, dope, thread, plastic wood

New Curves

(Continued from page 42)

placing in a medium-hot oven, over a gas flame if your cone is metal, or over a soldering iron.) Swept-forward ellipses, which are widely used at present, can be made by bending two complete ellipses—each of the required aspect ratio. Cut them along the long axis and join alternate halves to each other to form the swept-forward ellipse.

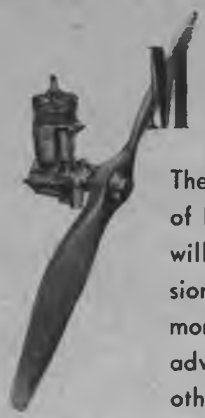
Another use for the cone form is in the shaping of fuselage bulkheads for elliptical cross section. Take a piece of soft iron wire or solder wire and bend it around the cone. Place the wire on the cone so that the axes (*a* and *b* in illustration) correspond to those required by the particular bulkhead. Remove the bent section of wire from the cone and trace the curve on the balsa sheet and cut out the bulkhead.

The size of cone you want will depend upon the size of your models. Indoor needs usually can be filled with a small cone whereas outdoor models will require a larger size. Large funnels are satisfactory and are available in a variety of sizes. The cone-shaped metal vases used in florists' shops are excellent. If a lathe is available a cone can be quickly turned out of wood to practically any proportions.

It will be convenient to mark off various sizes of curves on the cone indicating and labeling with a pencil where the wood must be placed on the cone to produce the desired size of tip. This will be helpful in duplicating curves when more than one is required for a model.

The areas of the various types of curves have been indicated in the drawing. The value "3.14" which appears in the formula for the area of the circle, ellipse, and parabola, is constant and does not change regardless of the size. The area of the hyperbola cannot be conveniently calculated. In checking its area, hold it over a piece of paper ruled off in inch squares. Add the total of squares and parts of squares inclosed by the hyperbola. It is ofttimes convenient to use this method of checking areas regardless of the type of curve used.

When selecting wood for bending do not pick soft-grade balsa. It will be easier to bend, but the finished wing is much more likely to warp. Select the hardest grade that it will be feasible to use for the particular type of curve you are bending. For outdoor work best results are obtained by cementing together several thin strips rather than using a single heavier one.



MODEL MART

The purpose of this department is to provide our readers with the most complete directory of Manufacturers of Model Airplanes, engines, parts and accessories. Your name and address will be listed in this directory for $1. per listing. Your name may be shown under any or all divisions as you request. Copy for your listing must reach us not later than the fifteenth of the second month preceding the month of publication. In all cases cash must accompany order and new advertisers are asked to give references. Advertisers whose display advertisements appear in other parts of this issue are indicated by capitals and are listed without cost.

MOTORS

Reginald Denny Industries, Inc. (Dennymite)
5751 Hollywood Blvd., Hollywood, Calif.

Dallaire Model Aircraft Co. (Poo-Woo)
9836 Wyoming, Detroit, Mich.

OHLSSON MINIATURES
630 North Alvarado St., Los Angeles, Calif.

Forster Brothers
521 Lake St., Maywood, Ill.

G. H. Q. MOTORS
40 East 21st St., New York, N. Y.

Hi-Speed Division (Hi-Speed)
6408 McKinley Ave., Los Angeles, Calif.

Phantom Motors (Phantom)
800 E. Gage Ave., Los Angeles, Calif.

Herkimer Tool & Model Works (O. K.)
Herkimer, N. Y.

M & M Model Wheel Co. (M & M)
325 North 79th Street, Seattle, Wash.

Aircraft Industries (Cyclone)
Grand Central Terminal, Glendale, Los Angeles, Calif.

Kenwood Hobbies (Rebel)
735 Commerce St., Nashville, Tenn.

The Great Western Airplane Company, Inc. (James)
1700 W. Adams, Los Angeles, Calif.

Avion Model Aircraft Mfg. Co. (Mercury)
P. O. Box 906, Woonsocket, R. I.

Trojan Miniature Products Co. (Trojan)
6826 Sunset Blvd., Hollywood, Calif.

Kaydet Products (Kaydet)
312 Exchange Bldg., Nashville, Tenn.

Bunch Model Airplane Co.
5009 So. Hoover St., Los Angeles, Calif.

Synera Devices, Inc.
523 Baydell Bldg., Detroit, Mich.

Husky Miniature Motor Co.
1408 North 45th St., Seattle, Wash.

Warren Sales & Service (Tom Thumb)
412 Brett St., Inglewood, Calif.

JUNIOR MOTORS CORPORATION
2545 N. Broad St., Philadelphia, Pa.

INTERNATIONAL MODELS
(G-9), 254 West 55th St., New York City

Hurleman Distributing Co. (Aristocrat)
1438 W. Hunting Park Ave., Philadelphia, Pa.

MICRODYNE
P. O. Box 245, General Post Office, New York City

Belmont Miniature Motors, Suite 710-711
68 Devonshire Street, Boston, Mass.

TRAINS, BOATS AND RACING CARS

Aero Marine Model Lab (boats)
359 East 62nd St., Los Angeles, Calif.

Marine Model Co.
174 Worth Street, New York, N. Y.

Mead Gliders (boats)
15 S. Market, Chicago, Ill.

Aircraft Manufacturing Company (racing cars)
152 West 42nd Street, New York, N. Y.

Sportcraft Kayaks
185 Pearl St., Paterson, N. J.

B. B. Korn Specialty Mfg. (racing cars)
7520 Melrose Ave., Los Angeles, Calif.

Wasp Model Supply (racing cars)
4128 Wade Ave., Venice, Calif.

Bunch Model Airplane Co. (racing cars)
5009 So. Hoover St., Los Angeles, Calif.

Reginald Denny Industries, Inc. (racing cars)
5751 Hollywood Blvd., Hollywood, Calif.

MEGOW'S (boats)
At Howard & Oxford Streets, Philadelphia, Pa.

WESTLAKE MODEL CO. (boats)
Erie, Pa.

CLEVELAND MODEL & SUPPLY CO., INC. (trains & racing cars)
4508-C29 Lorain Ave., Cleveland, Ohio.

World Wide Hobbies (racing cars)
2739 South Greeley St., Milwaukee, Wis.

Model Parts Manufacturing Co. (racing cars & parts)
109 E. 129th St., New York, N. Y.

IDEAL AEROPLANE & SUPPLY CO., INC. (boats)
28-24 West 19th St., New York, N. Y.

A. A. E. Co. (racing cars)
Box 874, Inglewood, Calif.

COMET MODEL AIRPLANE & SUPPLY CO., Dept. T-12
129 W. 29th Street, Chicago, Ill.

LIONEL CORP. (trains)
Dept. AC. 15 East 26th St. New York, N. Y.

WHEELS, PROPELLERS, COVERING MATERIALS

MODELCRAFT (Props)
7306 S. Vermont Ave., Los Angeles, Calif.

Margell Superior Products Co. (Wheels)
6408 Victoria Ave., Los Angeles, Calif.

Floyd Bros. Model Supplies (Mirro-flm covering)
1388 Carr Avenue, Memphis, Tenn.

M & M Model Wheel Co. (Wheels)
325 North 79th St., Seattle, Wash.

SELLEY MFG. CO. (balsa props)
1373 Gates Ave., Brooklyn, N. Y.

Howes Propeller Co.
Fairview Ave., Stamford, Conn.

Planeflm Division
Lock Box 166, Dayton, Ohio.

Ace Model Shop (racing car wheels)
808 E. Colorado St., Pasadena, Calif.

Royal Standard Propellers
3 Balcom St., Nashua, N. H.

Avion Model Aircraft Mfg. Co. (props)
P. O. Box 906, Woonsocket, R. I.

Harwit Industries (props)
1814 N. Burnett Ave., Louisville, Ky.

Tru-Pitch Propellers (also wheels)
2188 Pitkin Ave., Brooklyn, N. Y.

Pioneer Propellers,
Lock Box 7182, Cap. Hill Station, Denver, Colo.

Whitfield Paper Works
76 Varick St., New York, N. Y.

Austin-Craft (props)
431 E. Victory Blvd., Burbank, Calif.

INTERNATIONAL MODELS (props, wheels)
254 W. 55th St., New York, N. Y.

MIDWEST MODEL SUPPLY (props)
445 West 69th St., Chicago, Ill.

Model Parts Manufacturing Co. (racing cars & parts)
109 East 129th St., New York, N. Y.

Lawrence Propellers
2106 Llewelyn St., Baltimore, Md.

IMPERIAL MODEL AERO SUPPLY, Dept. 9A
263 Main St., Hackensack, N. J.

ALL AMERICAN HOBBIES (Rite Pitch)
Dept. AT, 4490 Broadway, Gary, Indiana

Tony Carrara
1752 Sycamore St., Cincinnati, Ohio

COMET MODEL AIRPLANE & SUPPLY CO., Dept. T-12
129 W. 29th Street, Chicago, Ill.

MODEL KITS

COMET MODEL AIRPLANE & SUPPLY CO.
Dept. T-5, 129 West 29th Street, Chicago, Ill.

Lloyd Dittman
Box 238, Norwalk, Wis.

Dallaire Model Aircraft Co.
9836 Wyoming, Detroit, Mich.

J. L. Wright Inc.,
1447 Merchandise Mart, Chicago, Ill.

Model Crafts Co.
1603 K Street, N. W., Washington, D. C.

Superior Model Company
Box 1994, Tulsa, Okla.

NEW CYCLONE AIRCRAFT CO. (Gas only)
168 Richards Street, Brooklyn, N. Y.

POLK'S
429 7th Ave., New York, N. Y.

HEATHE MODEL AIRPLANE CO. B-5 (Gas only)
260 Troy Ave., Brooklyn, N. Y.

The Korff Co. (Gas only)
807 East 39th Street, Indianapolis, Ind.

IDEAL AEROPLANE & SUPPLY CO., INC.
2024 West 19th Street, New York City.

Pineyhirst Aircraft (Gas only)
Mays Landing, N. J.

CAPITOL AIRCRAFT & SUPPLY CO.
1613 East New York Ave., Dept. 9, Brooklyn, N. Y.

PARAMOUNT MODEL AIRPLANES
59-61 Liberty Ave., Brooklyn, N. Y.

BAY RIDGE MODEL AIRPLANE & SUPPLY CO. (Gas only)
232A 45th Street, Brooklyn, N. Y.

New Construct-a-Plane Co. (Rubber only)
71-83 Beaver Street, Brooklyn, N. Y.

Paul K. Guillow (Rubber only)
Wakefield, Mass.

Radio Cycle Company (Gas only)
2725 Delaware Ave., Buffalo, N. Y.

Douglas Model Aircraft Co. (Rubber only)
1400 North 45th St., Seattle, Wash.

Miniature Aircraft Corp.
65 Law Terrace, Staten Island, N. Y.

INTERNATIONAL MODELS
254 West 55th Street, New York City

HAWK MODEL CO., T-69
3521 West Fullerton Ave., Chicago, Ill.

MODELCRAFT
7306 South Vermont Ave., Los Angeles, Calif.

Berkeley Model Supplies
236 Steuben St., Brooklyn, N. Y.

Jay's Model Shop (Gas only)
7902 Beverly Blvd., Los Angeles, Calif.

Charlotte Model Aircraft Co. (Gas only)
Professional Bldg., Charlotte, N. C.

G. H. Q. MOTORS, INC.
40 East 21st St., New York, N. Y.

Continental Model Airplane Co.
1129 Myrtle Avenue, Brooklyn, N. Y.

Aircraft Industries
Grand Central Terminal, Glendale, Los Angeles, Calif.

Sea Aero Company (Rubber only)
854 Eddy St., San Francisco, Calif.

Ewing Model Shop (Gas only)
31 New Hillcrest Ave., Trenton, N. J.

Kenwood Hobbies
735 Commerce St., Nashville, Tenn.

Fli-Rite (Rubber only)
P. O. Box 148, South Gate, Calif.

Elliot Aircraft Co. (Rubber only)
5671 Lake Blvd., East St. Louis, Ill.

Reginald Denny Industries, Inc.
5751 Hollywood Blvd., Hollywood, Calif.

Bunch Model Airplane Co.
5013 South Hoover St., Los Angeles, Calif.

The Peerless Model Airplane Co.
3068 W. 106th, Cleveland, Ohio.

Scientific Model Airplane Co. AT-3
218-220 Market St., Newark, N. J.

MEGOW'S MODELS
At Howard and Oxford Streets, Philadelphia, Pa.

The Great Western Airplane Company
1700 W. Adams, Los Angeles, Calif.

CLEVELAND MODEL & SUPPLY CO., INC.
4508-C29 Lorain Ave., Cleveland, Ohio.

Burd Model Airplane Company (Rubber only)
2113-2117 E. Oliver St., Baltimore, Ohio.

Avion Model Aircraft Mfg. Co. (Gas only)
P. O. Box 906, Woonsocket, R. I.

SELLEY MANUFACTURING CO., INC., (Rubber only)
1373 Gates Ave., Brooklyn, N. Y.

Kansas City Model Airplane Supply (gas only)
4033 Bellefontaine Ave., Kansas City, Mo.

Tru-Pitch Propellers (gas only)
2188 Pitkin Ave., Brooklyn, N. Y.

Eastern States Model Co. (gas only)
890 Bellevue Ave., Trenton, N. J.

Washington Institute of Technology
McLachlen Bldg., Washington, D. C.

CHRISTIE BATLAS
Box 160, Morgantown, W. Va.

IMPERIAL MODEL AERO SUPPLY, Dept. 9A
263 Main St., Hackensack, N. J.

MERCURY
1592 Lincoln Place, Brooklyn, N. Y.

H. & F. MODEL AIRPLANE CO.
273 Van Sinderen Ave., Brooklyn, N. Y.

IGNITION SPECIALTIES AND RADIO CONTROL

Nathan R. Smith Mfg. Co. (Coils & radio)
1814 West 8th St., Los Angeles, Calif.

Cadet Model Co. (self starter)
1220 Airway, Glendale, Calif.

Roosevelt Model Aeroplane Supply Co. (self starter)
Hangar B, Roosevelt Field, Long Island.

Austin-Craft (timers & battery boxes)
431 E. Victory Blvd., Burbank, Calif.

Kaydet Products (coils & condensers)
311 Exchange Bldg., Nashville, Tenn.

Hurleman Distributing Co. (plugs, coils, carburetors, replacement timers)
1438 W. Hunting Park Ave., Phila., Pa.

The Aero-Spark Company (coils)
37-38 81st St., Jackson Heights, N. Y.

POLK'S (coils)
429 7th Ave., New York, N. Y.

Radio Aircraft Co.
189 Utica Ave., Brooklyn, N. Y.

Mohawk Model Co. (ignition kit)
4170 Germantown Ave., Philadelphia, Pa.

NATIONAL CARBON COMPANY, INC. (Eveready batteries)
30 East 42nd Street, New York, N. Y.

Burgess Battery Co.
Freeport, Ill.

Bright Star Battery Co.
200 Crooks Ave., Clifton, N. J.

United States Electric Mfg. Corp. (Unalite batteries)
222 W. 14th Street, New York, N. Y.

COMET MODEL AIRPLANE & SUPPLY CO., Dept. T-12
129 W. 29th Street, Chicago, Ill.

Pittman Electrical Developments Co. (Geared radio control electric motors)
127 Nippon St., Philadelphia, Pa.

Radio Control Headquarters
Granby, Conn.

SUPPLIES AND DEALERS

HEATHE MODEL AIRPLANE CO., B-5
260 Troy Ave., Brooklyn, N. Y.

Model Airplane Utility Co.
5307 New Utrecht Ave., Brooklyn, N. Y.

PARAMOUNT MODEL AIRPLANES
59-61 Liberty Ave., Brooklyn, N. Y.

JUNIOR AERO SUPPLY CO.
160 E. 10th St., New York, N. Y.

BAY RIDGE MODEL AIRPLANE & SUPPLY CO.
232B 45th Street, Brooklyn, N. Y.

SELLEY MFG. CO., INC.
1373 Gates Ave., Brooklyn, N. Y.

SKYWAY MODEL AIRCRAFT SUPPLY CO., Dept. A
383 Seventh Ave., Brooklyn, N. Y.

IMPERIAL MODEL AERO SUPPLY
263 Main St., Dept. 9A, Hackensack, N. J.

Hedgman Rubber Co.
261 Fifth Ave., New York, N. Y.

Triangle Model Supply
31-35 42nd St., Long Island City, N. Y.

Scientific Model Airplane Co., AT-11
218-220 Market Street, Newark, N. J.

Diamond Model Mfg. Co., B-5
260 Troy Ave., Brooklyn, N. Y.

Reliable Dealers Supply
416 Gravesend Ave., Brooklyn, N. Y.

Capital City Model Shop
71 E. Arch at Jackson, St. Paul, Minn.

POLK'S MODEL CRAFT HOBBIES, INC., AT
429 Seventh Ave., New York, N. Y.

CLEVELAND MODEL & SUPPLY CO., INC.
4508-C29 Lorain Avenue, Cleveland, Ohio.

Country Club Aero Supply Co.
3328½ Troost, Kansas City, Mo.

TRIBORO MODEL SUPPLY CO.
3521 32nd St., Long Island City, N. Y.

D D X A Sales Co. (fuel)
285 Madison Ave., New York, N. Y.

Model Research Laboratory
3531-T North Western Ave., Chicago, Ill.

Waterbury Model Builders Supply
119 Cherry Street, Waterbury, Conn.

Logan Model Aircraft
818 Windsor Avenue, Windsor, Ontario

MERCURY or (American Sales Co.)
1592 Lincoln Place, Brooklyn, N. Y.

Jack Litwin
474 East 98th St., Brooklyn, N. Y.

CHRISTIE BATLAS
Box 160, Morgantown, W. Va.

Leader Model Airplane
5130 So. Damen Ave., Chicago, Ill.

HOBBY LOBBY, INC.
371 Main St., Hackensack, N. J.

CAPITOL AIRCRAFT & SUPPLY CO.
1613 East New York Avenue, Dept. 9, Brooklyn, N. Y.

LANGE'S MODEL SUPPLIES
20 East Jackson, R.714, Chicago, Ill.

NEIL'S HOBBY SHOP
7644½ So. Halsted St., Chicago, Ill.

TROST MODEL AIRPLANE SHOP
3111 West 63rd St., Chicago, Ill.

MIDWEST MODEL SUPPLY
445 West 69th St., Chicago, Ill.

COMET MODEL AIRPLANE & SUPPLY CO., Dept. T-12
129 W. 29th Street, Chicago, Ill.

SPEEDWAY MFG. CO. (Electric tools)
1834 S. 52nd St., Cicero, Ill.

WEST TOWN'S HOBBY SHOP
5727 W. Lake St., Chicago, Ill.

CRAFTSMAN (Scroll saw)
Dept. 14, St. Charles, Ill.

DREMEL MFG. CO. (Electric tools)
Dept. M259-M, Racine, Wisc.

(See list of advertisers on page 66)

Junior N. A. A. News

(Continued from page 37)

conduct indoor meets throughout the early months of 1940.

For further information on model meets in your vicinity which were sanctioned too late to appear here, write to the National Aeronautic Association, Model Division, Dupont Circle, Washington, D. C., inclosing a three-cent stamp.

A MODEL MODEL CLUB

Aviation leaders have acclaimed the National Air Races which are conducted each year at Cleveland under the sanction of the National Aeronautic Association as one of the best-managed shows of its kind in the world. Right now, we'd like to warn the promoters of that annual classic to watch their laurels, for there's a new personality looming on the horizon who bids fair to steal their glory.

Permit us to introduce Jimmy Metchicas of Greenville, S. C. Jim is the spark plug behind the Torque Fliers Model Airplane Club down there, an N. A. A. affiliated modeling organization.

Late last summer, the Torque Fliers put on a two-day meet called the Tri-State Model Airplane Contest that was a knockout. First of all, the club secured the cosponsorship of the Greenville Exchange Club. Four events were held for rubber and gas entries, and prizes were given for both duration and appearance winners.

Here's what Jim wrote those who entered: "We have *acquired* the Hotel Greenville for one dollar per person per night. . . . All contestants will attend a free picture show after the first day's flying is completed. . . . After the second day's flying is completed everyone will attend the banquet where the prizes will be awarded."

How's that for the first annual meet put on by a new model club?

But, really, that's nothing. You aren't fully aware of the capabilities of these Metchicases. In order to put on a bang-up competition and present cash awards, Jim & Co. went out and rounded up $400. Yes, sir, $400. Jim tells you how it's done: "First, I would get up early in the morning, about eight a. m., and take another member of the club with me. He would carry a very good-looking gas model with a smooth-running engine. We would call upon every eligible merchant in town and ask each one to sponsor a model in the meet, the cost to be ten dollars, and the merchant's name would be painted on the ship. Look at the publicity he'd get in the local papers if 'he' won!"

As a result of their "advertising" campaign, the club collected the $400 from forty merchants and created an unprecedented interest in their contest. More than 125 participants turned out from South Carolina, North Carolina and Georgia. And to prove that he's a real booster for model aviation, Jim compiled a list of all the entrants with their home addresses and offered the list without charge to all club officials in the South to enable them all to invite the entire crowd to their own meets.

ODDITY IN THE NEWS: GAS MEET IN MASSACHUSETTS

It's not often that we are privileged to present contest reports on Massachusetts gas meets. Up there one finds little open country, and it seems that most available space has already been cornered for airports or codfish-drying grounds.

But here is a competition conducted by the Massachusetts Gas Hawks, who bill themselves as "New England's Most Active Gas Club." We'll wager some of the Connecticut N. A. A. Gas Model Chapters will challenge that statement; but, seriously, the Gas Hawks are a grand band of model builders. A meet was held on September 24th with a twenty-second engine run, and out of the chill New England dawn, Gordon Sampson of Lynn, Mass., emerged victorious with a :62.3 average.

The competition was directed by Irving Day, N. A. A.'er of Danvers. Officers of the Gas Hawks are Charles Sanborn, president; Arthur Jackson, vice president; and Ina Brennan, secretary. The Hawks were instrumental in leading the battle to have a State ban on gas jobs lifted several years ago. At one time the entire band of intrepid fliers trooped into the historic old State Capitol on Beacon Hill to sit down with the legislators in an effort to have the laws amended which prohibited gas flying. The club took along gas models to the session, and the solons were much interested by the ships. The Hawks' efforts were largely responsible for the ban being lifted.

Bombs and How They Work

(Continued from page 19)

Some will detonate the bomb almost instantly, while others are calculated for specific, split-second delayed action. A heavy demolition bomb would be equipped with a delay fuse to postpone the explosion until after the projectile has crashed through the top of its target, in order that the full "upward and outward" shove of the explosive might undermine and rip the target completely apart.

Fragmentation bombs, on the other hand, are always fitted with instantaneous fuses. These bombs are used against personnel exposed aboard ships or in the field, gun crews, and the like. Here, for best efficiency, the bomb must hurl its jagged fragments before any are lost by burial in the ground.

Oh, no! Bomb dropping no longer is the friendly, playful sport it was back in those citrus-casting days. Now it is a grim game of death played with cold, calculating, merciless precision. Take these "frag" bombs

again—their designers can tell you exactly what will happen when one is dropped under given service conditions. They know how many men should be killed, how many injured, how many of the injured should later die.

They'll tell you, too, that the "ideal" segment from the average "frag" bomb weighs one fifth of an ounce and will completely penetrate a three-quarter-inch spruce board—or a man's vital organs!

Airplane projectiles as used today can be divided into three general classes: explosive, chemical, and dummy. The "demos" and "frags" naturally fall into the explosive class, together with the comparatively harmless practice type that carry a simple load of black powder for smoke puffs.

Among the chemical bombs are smoke-screen, incendiary, and poison-gas types. As used in our army today, chemicals are chiefly "hider-outers." The official training regulations say:

"At present the formation of smoke screens is employed to mask known enemy observation posts, to conceal and protect the front flank of attacking troops from enemy observation, and to blind hostile machine guns."

For straight smoke effect, a liquid called titanium tetrachloride is used in the bombs. Released into the air, it forms a dense white smoke which is comparatively harmless. In other types of smoke bombs, white phosphorus is used. This chemical is definitely dangerous, since it takes fire immediately upon being exposed to the air, produces a very heavy white smoke, and frequently sets fire to property.

The United States army at present has no chemical bombs other than these. Certain armies, however, notably the Japanese and Franco's forces during the late Spanish war, have been charged with the use of poison-gas bombs.

Other chemical bombs used by European armies include liquid oxygen and thermite types. The oxygen projectiles have created a great deal of tenseness among military men and reporters. Reputedly used in Spain, they are said to possess tremendous powers of blast and have admittedly caused much havoc. Drawbacks seem to be the difficulty and uncertainty of transportation and preservation of the liquid oxygen.

Thermite bombs, also used in Spain, according to reports, are of great incendiary value. Filled with a compound capable of producing an almost inextinguishable conflagration at a temperature of nearly 6,000° Fahrenheit, they are light in weight and can easily be transported by air in great numbers.

But let's get back to American aërial bombs. And next on the list are "dummies." Dummy bombs, of course, are just that. Used for instruction or practice purposes, they may merely be empty shells of standard or obsolete types filled with water or sand. They are not explosive. Some dummy projectiles are cylinders cast in concrete and equipped with wood or steel tail fins.

From the military standpoint, of course, explosive bombs are the most important and best known. "Demos" now in service run from 100 to 2,000 pounds, although these figures do not indicate the actual weight of the bomb. One model of the army's Mark 1 bomb, for instance, really weighs 2,121 pounds, but it's far easier to refer to it as just a 2,000-pounder. In the demolition types, the explosive filler usually runs slightly more than fifty percent by weight. The cases are made as light as possible in order to get the most explosive in.

The amount of *blast* resulting from a "demo's" detonation is of more moment than the number or weight of fragments scattered. In the "frag" type of projectile, however, seldom does any structure have to be destroyed; therefore, they contain only enough explosive to burst open the case and fling the segments within a limited radius. "Frag" bombs vary in weight from seventeen to thirty pounds, and the "live" filler may be as little as ten percent of the total weight.

Bombs are carried aboard planes in two ways—in exterior bomb racks fitted beneath the wings, or in racks built within the fuselage. The newer planes, particularly those built expressly for bombing, are mostly equipped with the interior racks.

During the World War the eggs were dumped over the side by hand or were released from simple exterior racks. The actual art of bombing was pretty much of a hit-or-miss proposition, but even that was hell for those unfortunate enough to be on the receiving end.

Today, American bomb sights are reputed to be the best and most accurate in the world. Bombing today is a real science, and the instruments used are simply remarkable, combining as they do intricate timing and optical devices. Before our air-corps pilots and bombers are given a chance to use them, they serve an "apprenticeship" in bombing from a simulated altitude of fifteen thousand feet in a little silolike building only eighty-five feet in height!

This miniature bombing range at the air corps' Advanced Flying School at Kelly Field, Texas, is unique indeed. The bombers-to-be take their positions in seats resembling cockpit seats arranged on circular platforms near the roof. Each student is supplied with a radio key and is in contact with an operator stationed out of sight. The op has control of a huge switchboard connected with a set of six hundred lights installed beneath the floor of the building. The lights shine up through holes to simulate bomb or shell bursts in a huge diorama which, painted to scale on the floor, represents the San Antonio section as seen from fifteen thousand feet. Troops and artillery emplacements, and the like, are represented on the floor by traditional "tin soldiers."

The radio man switches on the lights as directed by the students, and valuable practice is gained in correcting for errors of speed, aiming, et cetera. The equipment is also used by the air corps for instruction in artillery observation.

The Chinese Like It Stormy

(Continued from page 17)

them of dirt and blood, and go to work again, knowing full well they'll have the same thing to do all over again tomorrow, or perhaps even in an hour or two. But the show goes on. Much of the mechanical work is done under the shelter of trees to prevent spotting from the air, and repair units are widely separated to prevent a single lucky bomb from annihilating everything at one blast. Like the pilots, the mechanics get in their best work when the skies are overcast and the bombers and attack planes cannot see their objectives.

When the weather is clear and visibility unlimited the pilots loaf and watch the Japanese raiders unload their bombs. They gamble on the percentage of duds and hits and sometimes they have to run for their lives to escape the fires that rage with greedy fangs through the wooden buildings that have stood for centuries in peaceful security against all invaders, until the coming of the airplane. At times when they get sufficient advance warning of a raid the pilots take off with their transport planes and fly to concealed spots in the mountains and there wait until the raids are over. Then they return and take on their loads and fly them to their destinations, carrying on the traditions of this new industry of China.

It's when the clouds hang low or the rain lashes down in torrents and they know the enemy bombers and attack planes will remain snug in their nests at home that the China air transport comes into its own. Relegated to the background are the blasting of the bombs, the spraying of machine-gun bullets and the anguished cries of the wounded. They have no time for the raid that's over; it's the one tomorrow they have to beat. It's a case of sky overcast, visibility poor or zero, and there's work to be done.

Up from the field pockmarked with recently filled-in bomb holes, soggy with teeming rain, the DC-3s, the Junkers and other transport planes soar into the air to be at once lost to sight in fog, rain or the clouds.

It's blind flying at its best, or perhaps its worst. There are no radio beams to help them find their way through the overcast to their destination. Their only aid is a two-way voice radio of German manufacture, a radio that to date has never let them down through failure. The pilot knows his destination but is never sure what he will encounter on the way. They fly high and follow a compass course. Up above the murk and rain they sometimes encounter a lurking Japanese air fighter and have to run for it, dive into the clouds, twist and turn or use methods of their own that have been developed through necessity. The criterion of their success in these mad flights is that to date only one DC-3 has been brought down by the Japanese aircraft, and the German-China company has lost three Junker planes.

Many of the Chinese pilots were trained in the United States, and the fact that they get through and deliver their cargoes of freight, passengers and mail, day after day and month after month, attests to their being good, a credit to their trainers.

War has solidified China as a nation as nothing else in the world could have done, and aviation is drawing them closer together commercially. They have discovered that the provinces drained by the Yangtze River are the logical commercial centers of China. Commercial airplanes have proved to them that it is possible to keep their lines of communication open and to transport freight, passengers and mail to and from the outside world under the most trying conditions ever attempted in the history of aviation.

Tucked away in the mountain fastnesses of these western provinces of China are fertile valleys that have the oldest irrigation systems in the world. Here for centuries the people have tilled the soil and manufactured everything they needed as a community project, all crops going into the common granaries for the benefit of everyone. Today the airplane is tapping these rich storehouses and bringing out their products to feed and clothe the armies and millions of homeless, starving Chinese. Were it not for the transport airplane these natural depositories of riches would still be as inaccessible as though in the possession of the Japanese themselves.

Not only has aviation aided China by expanding its aërial transport, but it has instigated the building of thousands of miles of motor roads. Today China is undergoing the greatest road-building program of any country in the world. The miracle of transportation is there to stay. Never again will these countless valleys be secluded from the rest of the country and the world. Hundreds of thousands of coolies are laboring in the mountain fastnesses of the provinces of Szechwan, Sikan, Yunnan, Kwangsi, Kweichow and others, building motor roads to tap these rich reserves heretofore inaccessible, and on across the borders of India and Indo-China and so to a new route to the outside world.

This road-building program is a natural follow-up of the aërial transport system that has carried much of the road-building material and machinery into the impassable mountain regions. Wherever there is room enough they have already built landing fields, and the inhabitants of these valleys no longer flee in terror when a huge transport plane roars out of a cloud and spirals down to a safe landing.

China accepts this new era with a sang-froid that is as stoic as China itself. They have no fear of airplanes and now they are positive that aërial transport will finally be the means of frustrating their enemy. They have accepted the war planes as their curse and the transport planes as their salvation. Regardless of weather conditions, every transport plane is always loaded to capacity. Large training centers have been established in the fastnesses of the western prov-

inces, but even though the war rages it is mostly transport pilots and mechanics who are being trained.

The territory served by the commercial transport planes in western China is as rough as anywhere in the world. Altitudes of sixteen thousand feet and more must be reached to cross the ranges. They land in narrow gorges with a mountain stream on one side and the sheer sides of a cliff on the other, discharge their passengers, mining machinery or road-building equipment, and soar away again into the clouds with a return payload of foodstuff or manufactured products.

Mountain streams are being harnessed to supply electricity to towns and factories, and all the equipment has been flown in by plane. To such an extent has commercial aviation brought out the possibilities of this heretofore undeveloped — commercially—portion of the Republic of China that the Chinese themselves declare they will never again center their commerce in large cities on the coast where they are defenseless against a powerful navy. They will keep them back in the hills, nearer their base of natural supply and where they will always be able to utilize their new system of aërial transport.

As is to be expected, the average flier is not fitted for this type of transport flying, or rather bad-weather flying. It's the case of many being called but few chosen. It takes a peculiar temperament to stand up under the constant strain of bad weather, the eternal vigilance necessary to outguess and outmaneuver an enemy only too happy to pounce down upon a defenseless transport plane, for none of them is armed and their only defense is the speed and the skill of the pilots. Nothing speaks better for these pilots flying the China transport planes than that they *do* take the dare.

It is a strange paradox that through war, China, which has always been one of the most peace-loving nations in the world, should rise to greater heights as a nation by the use of a peaceful instrument—the transport airplane. It is the first time in the world's history that the fighting and commercial forces of aviation have been so arrayed against each other, and it is not to be accepted as a criterion of what would happen in any other country. It was the condition of China and the Chinese people that has made this change all the more remarkable, and it will be interesting to watch the next two years to see if guile and commercial transport can win over force and the death and destruction that is being rained down from the skies by aërial armadas.

It is the most interesting and progressive experiment the world has ever seen in the way of aërial transportation, made all the more impressive by the almost unsurmountable conditions under which it is being carried out. It is to be hoped the rest of the flying world may learn a valuable lesson from the history now being made by the transport pilots of the airways of China.

May they survive to see the day when they, too, will welcome C. A. V. U.

Should Army And Navy Air Forces Combine?

(Continued from page 13)

know and understand fleet maneuvers and be able to co-operate with them. The belief is that if naval fliers do not have a thorough grounding in naval tactics they will be handicapped in case of a major naval engagement.

The navy wants its fliers to be naval men and under the direct supervision of naval officers, subject to navy rules and the navy lists of promotion. Naval promotion is slow. And then there is the plucking board that sits and passes on the ability of an officer—which includes social qualifications—and throws him out because he does not meet its ideas of proper material for promotion to the higher grades. That sticks in the craws of the career naval fliers.

The army command insist that a flier, especially in observation, must be trained with the army and assigned to combat units. They can't conceive a flier being trained to co-operate with field artillery or heavy guns being able to do good work with a naval unit. Before the days of two-way radio this might have been true to some extent, but voice radio has changed all that.

All of which brings in the training of pilots for service with the American armed forces, army or navy.

The essentials of flying are the same, regardless of what craft is used. The mission the individual pilot is assigned to carry out is something else again. The strongest argument for a unified air service seems to be based on this point.

At the present time the United States government has under way plans for the training of twenty thousand pilots for service with our armed forces. Shall they be trained in part for duty with the navy and part for the army, and if so in what proportion? First of all, they must have a thorough grounding in the basic principles of aëronautics in all its branches, from mechanical to theory. There is no valid reason why the navy can teach navigation or aërodynamics better than can an army instructor. The army fliers use navigation just as much as do the navy fliers.

There must be pilots for various types of aircraft assigned to various duties. Under the unified system all pilots would be trained under the most approved system, either in one large central school maintained along the lines of West Point or Annapolis, or, after doing their ground work at this school, be sent to schools in various parts of the country for their flying instruction. They would all receive the same prescribed course and would be equally good fliers within the limits of the personal element. One pilot naturally takes to the fast,

light fighting plane. Another develops a natural aptitude in the use of bomb sights or the machine gun or perhaps photography.

As they are graduated under this system, the daily record of the student is studied, his aptitude for any certain branch of flying and his natural desires are all taken into consideration, and he is assigned to that branch of service and type of work for which he is best qualified. It is understood, of course, that in an emergency he can be shifted into any other field of the air service.

If he should be assigned to the battle fleet of the navy, as a matter of course he comes under direct command of the naval officer of the fleet's aircraft. If a flier be assigned to an artillery unit, he will operate under the direct supervision of the brigade, divisional or army command to which he is attached, and any orders concerning that flier or group of fliers would not come from the high command of the air forces but from the officer in charge of the immediate command in which he is serving.

Capt. Tracy Richardson

The value of the individual pilot is not so much that he is a good army or navy pilot, but that he has the training that would make him available for either type of service—the kind of training advocated by proponents of a unified air service.

One thing preached by every branch of service is *esprit de corps*. It has been said that if you took a man away from established branches of the service, with all their traditions, and assign him to a purely flying unit, he would not have this spirit. Is it thinkable that an American could not be just as loyal to a unified air service? The air service is certainly one to be proud of. It requires the highest type of men to fulfill all its requirements, and these must be constantly on their toes.

Four years is the required course at West Point and Annapolis. After that, if a graduate of the line school wishes to enter the flying service, he must put in years of additional training. A school of the air devoted entirely to the technical training of fliers would shorten this period of training by at least two years. In case of an emergency it would be still further reduced. A pilot can't fly all the time. During the period of instruction there would be plenty of time to train the student flier in all the essential principles of army and navy maneuvers and at the same time eliminate a great deal of technical study that is of no value to a flying fighting force.

The navy and the army each has its own traditions. The air service is new and still encumbered with growing pains and supervision of nonfliers. But in its comparatively short life it, too, has developed an *esprit de corps* that would be greatly enhanced were it not compelled to be called army or navy spirit. Why not the air-corps spirit?

The first naval attack of the present war in Europe was carried out by land bombers. Not by planes of the army or the navy but by planes of the Royal Air Force acting under orders of the air minister in co-operation with the navy. Therein lies the great argument for a unified air service. If either the army or the navy is carrying out a plan of attack, it can be assisted, if necessary, by the entire forces of the unified air force.

Weather Service and the Private Flier

(Continued from page 6)

transatlantic flight, made by the NC-4. In September, 1919, he took balloon training at Akron, Ohio, and qualified as a pilot.

From October of that same year until June, 1922, he was aerological officer and airplane pilot at the naval air school, Hampton Roads, Virginia. He was commissioned as a lieutenant, U. S. N., in 1921 while on this assignment.

From 1922 to 1928 he was in Washington, D. C., as officer-in-charge of the naval aerological organization. From 1928 to 1931, he served as aerological officer on the dirigible *Los Angeles*, at Lakehurst, New Jersey.

March to October, 1931, found him in Europe, assigned to duty at meteorological institutes.

In 1932 he was promoted to lieutenant commander and assigned to the U. S. S. *Oklahoma* for general studies until 1934, in June, when he took over as officer-in-charge, airship training school, Lakehurst, New Jersey.

He served as executive officer of the air station at Lakehurst from 1935 to 1937, and then went to the post of construction, repair and damage-control officer on the U. S. S. *Lexington*. June of 1938 found him promoted to commander and assigned as executive officer of the U. S. S. *Utah*.

December 15, 1938, brought him back to Washington for assignment to the department of agriculture as acting chief of the weather bureau. On January 1, 1939, he was removed from the active list of the navy, and the next day appointed chief of the United States weather bureau.

One can't help feeling after reading his history that he *is* a natural for his job.

Vought Export Fighter

(Continued from page 41)

to house a 2½"-diameter celluloid engine. The cowl is held to the model by slipping onto a special Bulkhead #1 cut from 3/16" stock.

Flying propeller is shown on Sheet 5. It is a three-bladed propeller. Each blade is carved separately and inserted into a three-bladed hub as shown. Care must be taken to see that all the blades are attached with the same pitch angle, otherwise the propeller will not track. If desired, a scale propeller may be used. The side view of such propeller, a Hamilton Standard, is shown on Sheet 1. The front view is of conventional metal propeller shape.

Motor stick is 1/8 x 1/4" stock. It is attached to the celluloid engine as shown. The engine is held to the cowl by small drops of cement on each cylinder. The propeller shaft is then passed through the rear of the engine. A ball-bearing washer is placed on the shaft. Following this the propeller is placed on. The shaft is bent to the shape shown on Sheet 5 and forced into the hub of the propeller. A drop of glue will secure the shaft to the prop. It is important that the shaft be lined properly. This should be checked.

The rear hook is bent as shown. It it attached to the motor stick by inserting the prong end of the hook into the stick, wound and glued.

COVERING THE MODEL

Because most of the parts are attached directly to each other they can be covered separately. The model is covered with superfine tissue. The portion of the fuselage adjacent to the wing incorporating the fillet should be covered with the wing in place. This will result in a neater fillet. The manner of covering is left to the builder, for no two builders will agree as to the correct manner. However, this might be said: The grain of the paper should run in one direction. After the parts have been covered a thin spray of water should be applied to shrink the paper taut. A few coats of banana oil will preserve the tautness of the paper and protect it from changes in weather.

ASSEMBLY

The wing is first attached. It attaches directly to the fuselage, with Formers #5, #6, and #7 lining up with the center-section stringers. A piece of bamboo, as shown on Sheet 2, is used as a fairing strip from the wing to the fuselage. With the wing set, the center section can now be covered with the portion of the fuselage adjacent to the wing.

The rudder is next attached. It is glued directly to the top stringer. To counteract torque the rudder should be offset slightly to the left—looking from the cockpit.

The stabilizer is next glued in place. It is advisable not to secure it permanently until the model has been flown. The tail block is now glued in place and finished off to a smooth surface.

FLYING THE MODEL

The model is powered with four to six strands of 1/8" flat rubber. The model is first glided to determine its balance. If it stalls, weight must be added to the cowl. If it dives, which it is likely not to do, weight must be added to the tail. The stabilizer setting should be zero. With the model balanced, give the propeller about thirty winds and hand-launch. If the model tends to stall, increase the stabilizer angle; if it dives, set it at a negative angle. The settings should be slight as they will be found most effective. The model should be fully powered to about 150 winds on four strands, somewhat less for six.

Choosing the Right Gas Prop

(Continued from page 38)

2 h.p., the climb in feet per second will be 192 x .2/2 or 19.2 feet per second, or 1,152 feet per minute.

Most of the factors entering the gas-model-propeller calculations usually vary in a straight line, which results in simple equations. They are valid if the pitch ratio, the ratio of pitch to diameter, is not higher than .70; then the nomograph in Fig. 2 may be used for estimating the diameter of the propeller.

The nomograph indicates that the propeller diameter is not influenced by the speed of the model; only the pitch will be different with variant speeds. On the other hand, the efficiency will not change materially if the same pitch is retained and the diameter is changed. For ready selection of diameter and pitch of a propeller for a model in straight flight having a certain weight and a standard engine, a table is illustrated in Fig. 3 which will be a great aid to the designer. For maximum climb, use propellers in the last two columns, propellers with lower pitch than they should have in straight flight.

The pitch of a propeller is the advance per turn a propeller would make if it slides up a slope on its flat working side.

The pitch obtained from the slope of the working side is called the nominal or geometrical pitch; this pitch can be measured with a protractor, usually at the three-quarter distance from the axis and then graphically or mathematically enumerated.

Propellers having the same geometrical pitch on all blade elements give the highest efficiencies, but if the slipstream of the propeller is obstructed by the proximity of the engine or by an oversized fuselage the efficiency is greatly reduced; in such case the pitch is decreased toward the hub.

The diagram in Fig. 4 may be used for estimating the pitch of a propeller or finding it from the equation that the pitch of the propeller to be two tenths of the diameter plus three

quarters of the advance per turn. For example, the diameter is fourteen inches, the flying speed thirty feet per second and the revolutions eighty per second; then the pitch will be .2 x 14 plus $\frac{3}{4}$ x $\frac{30}{80}$ or 2.8 inches plus .28 feet or 6.2 inches.

Another question is the blade width, which is measured at the three-quarter distance from the hub. Durand's tests show that for increasing blade width the efficiency decreases and the power coefficient increases; but the increase in power coefficient is less than the increase in blade width.

The blade width should be from eight to ten percent of the diameter if a two-blade propeller is designed; the blade width for a three-blade propeller is the same, except the diameter is only ninety percent of the two-blade propeller.

The weight of the propeller is another problem; the propellers should be light enough to break without injury to the engine but heavy enough to give uniform power delivery; most of the manufactured propellers are satisfactory for the two-cycle engines, but for the increasing popularity of the four-cycle engines we suggest a heavier propeller.

Metal propellers should not be used for contest work, because of the danger to the spectators and possible damage to the engine shaft.

Owing to the variant contest rules, model builders should carry a few propellers of different diameters and pitches best suited to the flying qualities of their individual model.

Pick-a-Back

(Continued from page 39)

The stick is slit at the rear to hold the rudder. Landing-gear struts are bamboo, the upper ends sharpened and pushed into slits which have been cut in the motor stick with a sharp knife.

Carve the prop from the size block indicated, or buy a ready-cut six-inch prop, which will prove entirely satisfactory if sanded smooth with the excess weight cut away.

Pin the prop to the nose, add two strands of $\frac{1}{8}$" rubber in the proper place, and find the point at which the model balances without the wing. Then cement the wing in place so that a point at one third of its chord is over the point of balance. Note the little lift block cut from a scrap of $\frac{1}{8}$" sheet balsa which cambers the center of the wing and raises the leading edge $\frac{1}{16}$". At this time crack the wing at the center and recement it so that there is an inch of dihedral at each tip.

RELEASE ATTACHMENT

The frame which supports the glider is very simple. Important points to watch in assembling it are to cement all joints securely, and to make sure the upper projections of the rear struts coincide with the slots in the glider wing. The struts are pushed right through the R. O. G. wing for rigidity.

You're now ready to make the prop spring. This is pretty much a cut-and-fit proposition. However, use a good pair of small-nosed pliers and some patience and you won't have any trouble with it.

The method of operation is as follows. The long end of the prop spring pushes back when the rubber is wound tight, and passes through the front guide, through the wire end from the glider, and through the rear guide. When the rudder unwinds, the tension decreases, and allows the spring to pull forward so that the glider hook is released. The wire from the glider should be normally a little high so that it has to be sprung down to reach the end of the prop spring. This will cause the glider to leap upward upon release.

FLYING

And that's all there is to the construction. Make the prop shaft, can, and rear hook and cement them in place. Then install the prop. You may have to bend the spring a little to line up the thrust line. Don't forget a couple of washers between prop and spring. Put a couple of strands of $\frac{1}{8}$" rubber on the model and try gliding it without the glider. Bend the trailing edge of the stabilizer up or down until the model glides smoothly.

Then wind the rubber just enough to engage the glider hook and attach the glider. Hand-launch the model. If it spirals too sharply apply opposite rudder and warp the trailing edge of the inside wing down. If it stalls bend the prop spring to give downthrust. If it dives, warp the stabilizer trailing edge up slightly or apply upthrust. When the model flies smoothly under a few turns, give her plenty of room and use a winder.

And don't forget to take your pick-a-back along to the next contest that has a stunt event!

Photo Credit List

The following list shows the sources from which credited photos were obtained. Abbreviations: Bot., bottom; T. top; U.L., upper left; U.R., upper right; L.C., left center; R.C., right center; L.L., lower left; L.R., lower right; Cen., center; T.C., top center; B.C., bottom center.

Page 6—U. S. Dept. of Agriculture Weather Bureau photos.
Page 7—British Press Combine.
Page 8—T., International News; L., British Press Combine; R., Wide World.
Page 9—T., British Press Combine; C., Wide World; Bot., Wide World.
Page 10—U.L., Sorfots; Bot., Yales photo; T.L., Harold Kulich; T.R., Harold Kulich.
Page 11—L., H. M. Brockway; T., International News; C.R., International News; L.R., International News.
Page 12—T., Ryan photo; Bot., Official U. S. navy photo.
Page 13—T., International News; Bot., Official U. S. navy photo.
Page 14—T., T. W. A.; Cen., American Airline photo; Bot., American Airline photo.
Page 15—T., Official U. S. army air corps photo; Bot., Official U. S. army air corps photo.
Page 16—L., Rudy Arnold; R., Pan American Airways photo.
Page 17—T., Pan American Airways photo.
Page 18—T., Wide World; Bot., Official photo U. S. army air corps.
Page 19—L., Wide World; Cen., Official photo U. S. army air corps; R., Ordnance Dept., U. S. army photo.
Page 20—T., Official photo, 2nd Air Base Squadron Photo Section; L., Fairchild Aerial Camera Corp. photos; Bot., H. C. McKay.
Page 21—Photos by H. C. McKay.
Page 23—T., Sorfots; L.L., International News; L.R., Pix photo.
Page 24—T., Taylorcraft photo; Bot., R. Richard Meyers.
Page 25—T., Official photo U. S. army air corps.
Page 27—All photos by Rudy Arnold.
Page 29—Chicago Park District photo.
Page 30—All photos by Harold Kulich.
Page 34—Photos by Al Daraghy.
Page 40—T., Harold Kulich.

Air Adventurers

(Continued from page 26)

June Blackford of San Mateo wins a Photography award for a splendid shot of a Fleet trainer owned by the Summit Flying School, which operates out of the San Francisco Airport. Miss Blackford uses the Eastman box Brownie and Gevaert film, which seems to produce some very sharp negatives.

Then from Luke Field, Honolulu, we get a letter from C. W. Beech, who is a member of the Seventeenth Air Base Squadron out there. He appears to be a great model builder and he sends us two pictures of an amphibian which he has built. One shows the uncovered framework in rare detail and the other shows the little ship resting on the water of a swimming pool.

Nace Mefford of Covington, Va., gets around plenty and recently he visited the air base at Langley Field, where he was told that the U. S. army air corps plans a great publicity campaign to get pilots and mechanics for the new and vastly improved air force. He was allowed to inspect an army Lockheed and saw a Boeing B-15 and had further opportunity to look over some A-17s and B-18s which greatly impressed him. Nace also sent in four very fine pictures of some of the planes there.

Hubert Smales of Hinton, West Virginia, sends in a long letter about his activity and the work his club is doing for model builders out there. He has induced a local store to put in a full stock of model supplies, and, as Hubert says, "that is doing something in a small town like this." Hubert is quite an artist, too. We expect to see him among the topnotchers in a few years if he sticks to comic cartoons.

William J. Crone, Box 367, Simcoe, Ontario, Canada, is a new hard-working member who advises us that he is the boy to come to if you want to obtain the unusual or hard-to-get model plans. Bill seems to have some trick of being able to draw plans from photographs, and if any of our members have some special plan they would like they should contact Bill and he'll try to help them out. He is now working on a new bomber model in which he plans to use two Brown Junior engines. Wow!

We have many other Photographer's awards. Richard Ehrler of Dormont, Pa., sends in a neat shot of a T. W. A. transport at the Allegheny County Airport. Jerry Cohen of Brooklyn got an unusual shot of the military planes displayed at the New York's World Fair. John Deubel of Rochester bags an award for two prints of Douglas observation ships taken at the Rochester Municipal Airport. Lonnie Neal of East Wanatchee, Wash., discovered an old Ford tri-motor job out at his local airport. Irwin Spandau of Sunnyside, N. Y., clicks for his award for a print of the *Nordmeer*, the German transatlantic seaplane mounted on the catapult of the mother ship. This is a very interesting shot, but unfortunately not sharp enough to assure good magazine reproduction.

And that's all for this month. Let's hear from you, Air Adventurers. We'll be glad to publish anything that will be of interest to the club.

AIR TRAILS

79 Seventh Avenue Dept. D-Q
New York, N. Y.

Inclosed, please find 10c for my booklet on How to Organize a Model Plane Club.

Name .....

Address .....

City .....

State .....

Air Trails Advertisers—December, 1939

In every field- COMET *leads!*

COMET *Leadership* STARTS IN THE DRAFTING ROOM

Carl Goldberg sketched while at work.

Model-builders agree that Comet Model Airplanes lead in design, fly-ability and sturdiness. There is a good reason for this superiority — the Comet drafting room!

In this drafting room, a staff of experienced designers, each a model-builder himself, works day after day to produce planes which will make thrilling flights and stand up in use. The most distinguished member of the staff is Carl Goldberg, recognized everywhere as a genius in the field of model airplane design. Mr. Goldberg is the designer of the sensational Comet Gas Models, including the Comet Zipper, which recently took three first places at the Detroit Nationals.

Before any Comet model is released, hundreds of test flights are made to discover and eliminate weaknesses. No matter what Comet model you buy, you have the assurance that it is a proven flyer, and that its design and construction measure up to the most rigid standards. You can't go wrong on any Comet kit—thanks to the Comet designing staff!

No. L7 Curtiss Pursuit, 37¼ in.—50c

Flying Models

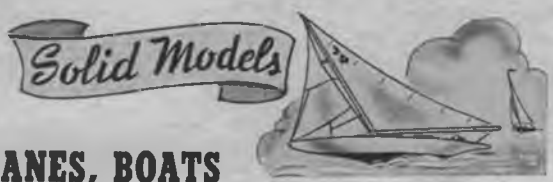
10¢ to $1.00

No. P6 Aeroneer, 40 in.—$1.00

Big wingspans — big values — that's what you get in Comet flying models. Think of it—big 16" models at only 10c—giant 25" models at 25c; super-detailed models with working shock-absorbing landing gear and other startling features at 50c and $1.00! Get them at your dealers—and enjoy real model-building thrills!

No. E21 Whippet (balsa fuselage) 18 in.—25c

No. A17 Art Chester Racer, 16 in.—10c



Solid Models

No. K4 Enterprise, 12 in.—25c

No. C6 Seversky, 8 in.—10c

PLANES, BOATS 10¢ — 25¢

Comet solids almost "build themselves"! Amazing new construction saves time and effort — no block to carve! All the new planes and old favorites; famous sailing ships and modern ocean liners. Get them at your dealers — and save postage!

No. J1 China Clipper, 12 in.—25c

No. D1 Old Ironsides, 8 in.—10c

Gas Models

No. T11 Mercury, 42 in.—$2.95

No. T10 Zipper, 54 in.—$3.95

The COMET ZIPPER

CHAMPION GAS MODEL OF ALL TIME!

Carl Goldberg designed them all; the sensational Zipper; the Mercury, made for small motors, and the new and improved Clipper. The rubber-powered Clipper, Jr. looks, sounds and flies like a gas model — patterned after the big Clipper! Get them from your dealer!

Postage on gas models, 25c; none if ordered from dealer. Send 5c for big new catalog!

A Folder "How to Adjust and Fly Gas Models" by Carl Goldberg, free with each gas model kit.

No. P5 Clipper, Jr., 36 in.—$1.00

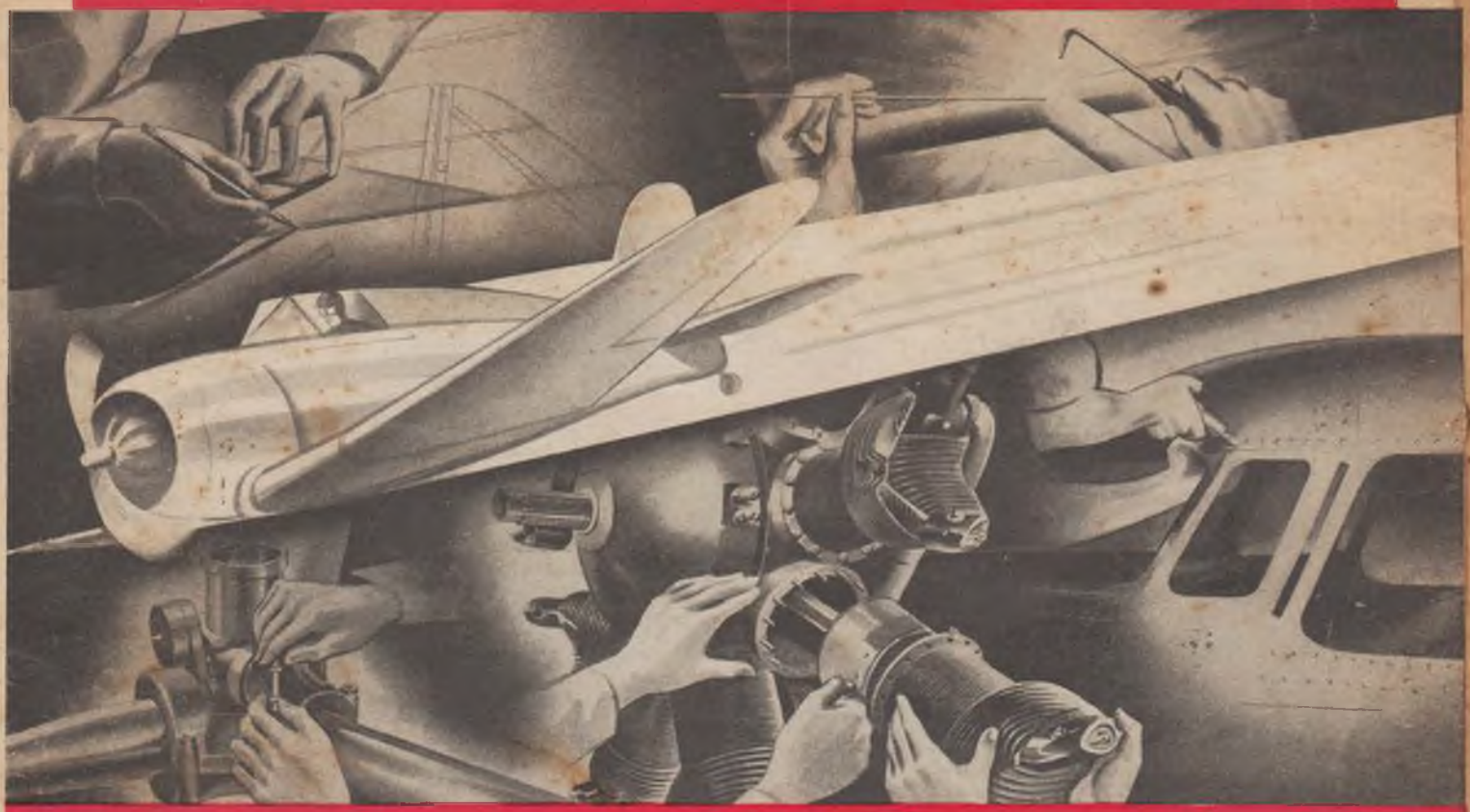
No. T7 Clipper, 6 ft.—$4.95

COMET MODEL AIRPLANE & SUPPLY COMPANY

NEW ADDRESS: 129 West 29th Street, Chicago • Dept. T-12 • Eastern Branch: 688 Broadway, NEW YORK

COMET maintains distributors in many cities throughout the United States and other parts of the world. Foreign distributors include: F. P. Sweeten, Blackpool, England, E. J. Hyams and Son, Wellington, C. I., New Zealand. PACIFIC COAST DISTRIBUTORS: Edw. Kapitanoff, 4546 Hollywood Blvd., Los Angeles, Calif.; Smalley Paint and Paper Co., 5300 Ballard Ave., Seattle, Wash. Exclusive Distributor Detroit Area: Airco Model Supply, 13329 Charlevoix Ave., Detroit, Mich.

BACK OF EVERY PLANE . . .



are hands like YOURS—Trained Hands

WITH TRAINED HANDS . . . AND A TRAINED MIND . . . YOU, TOO, CAN HELP DESIGN • BUILD • MAINTAIN TODAY'S AND TOMORROW'S PLANES

How can you possess the trained hands and trained mind needed for a career in Aircraft Mechanics or Aeronautical Engineering? The answer found by hundreds of men now in Aviation is Aero I. T. I. training . . . training that gives you an abundance of advance experience in actual "on-the-job" duties . . . training that puts into your mind the practical knowledge you need, and into your hands the practical ability you MUST possess before entering Aviation. If you could go through great aircraft plants and see Aero I.T.I. graduates at work you would appreciate the value of their training . . . the same training open to you. You would see Aero I.T.I. men at their drawing boards in engineering departments . . . you would see other Aero I.T.I. graduates helping build great military craft and transports in production departments, . . . and still others working on engines and planes in maintenance shops . . . all doing things they learned right in Aero I.T.I. classrooms and shops. Find out about this superior training from which 591 men have stepped into the industry in the last year alone. Find out which of the Aero I.T.I. courses they took will best fit your needs and circumstances (you may start at home or take a full-time course at the school). For complete information, send the coupon NOW.

MANY TRAINED HANDS NOW IN AVIATION ARE THERE BECAUSE THEY FILLED OUT A COUPON LIKE THIS ONE!

AERO INDUSTRIES TECHNICAL INSTITUTE

5257 WEST SAN FERNANDO ROAD, LOS ANGELES, CALIF.

Aircraft Mechanics :: Aeronautical Engineering

Offering U. S. Civil Aeronautics Authority Approved 12 Months Aircraft Mechanics Training

EXECUTIVE BOARD

ROBERT E. GROSS, President Lockheed Aircraft Corporation
JOHN K. NORTHROP, President Northrop Aircraft, Inc
C. A. VAN DUSEN, Vice-Pres., Consolidated Aircraft Corporation

Aero Industries Technical Institute
5257 West San Fernando Road, Los Angeles, California

Please send information on Aviation careers and Aero I.T.I. training. I am interested in the branch of Aviation checked below:

☐ Aircraft Mechanics ☐ Aeronautical Engineering
☐ Undecided. Please send more information.

Years of High School: None ☐; 1 ☐; 2 ☐; 3 ☐; 4 ☐

Name _____ Age _____

Address _____

City _____ State _____ a-24-t