# AIR TRAILS

A STREET & SMITH PUBLICATION – AUGUST, 1939

15c

WHAT'S THE AIR CORPS MEDICAL EXAM? by ALLAN FINN

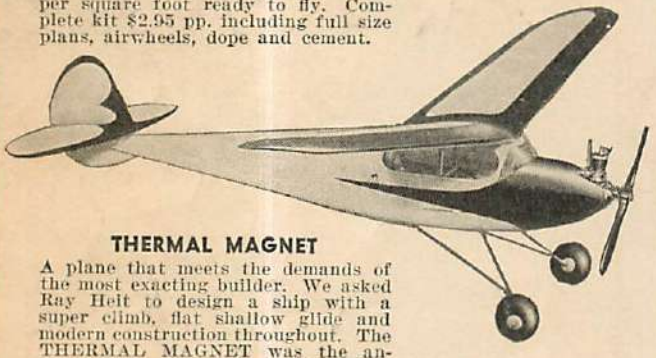
BORDER PATROL by LIEUT. S. P. LYONS — RECORD GAS MODEL by HENRY STRUCK

CASEY JONES - TINSLEY - WHITEHOUSE - ENYART - GARAMI - ALEXIS DAWYDOFF

# NO MIRACLES - - BUT!

### THE DIAMOND DEMON

The newest in the BAY RIDGE line of top flight performers. A ship which set an NAA record the first time it left the starting line. New diamond-shaped fuselage and the most rugged Class B ship you have ever built. No other plane in the field approaches it at the price. Span 46", weighs 10 oz. per square foot ready to fly. Complete kit $2.95 pp. including full size plans, airwheels, dope and cement.



### THERMAL MAGNET

A plane that meets the demands of the most exacting builder. We asked Ray Heit to design a ship with a super climb, flat shallow glide and modern construction throughout. The THERMAL MAGNET was the answer. Taper wing, high lift airfoil, shock-proof landing gear. A Class C record-maker powered by anything from a Baby Cyclone to a James. Special kit $4.95 pp., includes full size plans, dopes, cements, printed sheets. DeLuxe kit with air wheels and covering silk, $7.50 pp.

### THE MIKE

Another ship from the drawing board of designer Ray Heit, who made his reputation on this swell performer. Recent improvements in design have made it one of the most consistent jobs in the Class B field. An outstanding flier for contest or sport flying. Four foot span, weighs less than 10 oz. per square foot ready to fly. Complete kit including airwheels and covering silk $3.50 pp. Full size plans, dopes, cements, wire parts, included.

### *RECORD HOUND SPECIAL*

All wood, balsa, bass, plywood, for Henry Struck's RECORD HOUND complete in kit form, less plans, $1.75 post paid. Complete kit of parts, including metal fittings, dope, cement, bamboo paper and streamlined airwheel, $4.95, post paid. Super materials for a super gas job . . . order now . . . immediate delivery.

We do know that expert model builders in the Metropolitan Area, men who have taken honors in most of the 1939 contests to date, have been among our best customers for years.

They have the utmost confidence in our supplies, our complete kits and our low prices, and we feel proud when they take home top contest awards for in most cases either the material used in constructing the plane was purchased from BAY RIDGE or the plane was built from a BAY RIDGE kit.

We don't say that our kits are miracle performers, but we do know that when the jobs are built properly they will win more than their share of honors in the contest field. We purchase our supplies direct from the sources . . . our balsa is purchased from the importers, our metal parts come from the factories, and we even import our super landing gear wire.

We cater to the contest prize winners and to contest fliers . . . ask them about the BAY RIDGE spirit of cooperation, a spirit that makes for better planes, better flying and higher prizes. . .

*We pride ourselves on our knowledge of the problems of model plane builders. We've grown up with the industry, and we've cooperated with builders in their endeavors. Our supplies are specified by hundreds of enthusiasts and we're proud that we have been able to contribute so much to the industry. Note our specials . . . real SUPER VALUES.*

## *Free*

With every order of $5.00 or over (KITS EXCLUDED): Gas Model TIMER valued at $1.50 OR, if you prefer, one pair of AIRWHEELS, 3" Dia., good for Gas Models weighing up to 5 lbs.

**BALSA**
5 Ft. Lengths
1/8x1/4 ..4 for .10
1/8x1/2 ..3 for .14
1/8x1 ...2 for .15
3/16x3/16
8 for .25
3/16x1/2 ..2 for .10
3/16x1 ..2 for .19
1/4x1/4 ..6 for .25
1/4x1/2 ..4 for .25
1/4x1 ...3 for .25
3/8x3/8 ..3 for .25
3/8x1/2 ..3 for .27
1/2x1 ...1 for .18
1x1 ....1 for .25

**BAMBOO PAPER**
24x36 ..each .05

**Gas Model Cement**
**Clear Dope**
**Colored Dope and Thinner**
1/2 pint can.. .35
1 pint can .. .60

**COVERING SILK**
1 Yd. 36x36 .45

**GAS MODEL BALSA**
36" or 18" length of gas model balsa can be had. See our regular list of model supplies below. Please mention its use.

**SHEET BALSA**
5 Ft. Lengths
1/32x2..2 for .15
1/16x2..2 for .17
3/32x2..2 for .20
1/8x2....2 for .23
3/16x2..2 for .27
1/4x2....2 for .30
1/2x2....2 for .25
Double the 2" price for 3" widths.

**GAS MODEL PROPS**
12" ..... .65
13" ..... .75
14" ..... .75
16" .....$1.00

**AIRCRAFT SPRUCE**
5 Ft. Lengths
1/8x3/16 1 for .04
1/8x1/4 ..1 for .05
3/16x3/16
1 for .07
3/16x1/2 1 for .10
3/16x1..1 for .15
3/16x3..1 for .40
1/4x1/4 ..1 for .09
1/4x1/2 ..1 for .14
1/4x1 ...1 for .17
1/4x3 ...1 for .45

**M & M AIR WHEELS**
3 1/4" pr.....$1.50
3 1/2" pr..... 2.50
4 1/2" pr..... 2.75

**SHEET CELLULOID**
8x10 each....07

**STEEL MUSIC WIRE**
5 Ft. Lengths
1/16 dia. ... .10
3/32 dia. ... .15
1/8 dia. ..... .25

**MIDGET FIRE-CRACKER COIL**
Suitable for any type of engine. Wt. 2 oz. Each $2.50 P.P.

**GAS MODEL TIMER**
Easy to install.can be regulated from 1 to 45 seconds. Each $1.75 P.P.

**OHLSSON AIR WHEELS**
3 1/2" pr. ...$1.50
4 1/2" pr. ... 1.75

**HARD ALUMINUM SHEET**
1/16x3x12... .28
1/32x3x12... .15

**ALUMINUM RIVETS**
1/8" dia. doz. .05

## ORDERING INSTRUCTIONS

Add 15c packing charge on orders for less than $1.50 in U.S.A. All orders over $1.50 sent postpaid. Minimum order for 5 ft. lengths is $1.00. Canadian charges 25c extra. 5 ft. lengths sent express charges collect to Canada.

**BALSA WOOD**
18" lengths
1/16x1/16
....30 for .05
1/16x1/8
....25 for .05
1/16x3/16
....20 for .05
1/16x1/4
....16 for .05
3/32x3/32
....30 for .05
3/32x1/4
....10 for .05
1/4x1/8 30 for .05
1/8x3/16
....14 for .05
1/8x1/4..12 for .05
3/16x3/16
.....8 for .05
1/4x1/4...6 for .05
1/4x3/8...4 for .05
1/4x1/2...4 for .05
1/2x1/2...2 for .05

**18" Sheets**
1/32x2..6 for .09
1/16x2..6 for .10
3/32x2..6 for .12
1/8x2....6 for .13
3/16x2..3 for .09
1/4x2....3 for .10
1/2x2....2 for .10

**BALSA PROP. BLOCKS**
1/2x3 1/4x6 4 for .05
5/8x1x7..3 for .05
3/4x1x8..2 for .05
3/4x1 1/4x10
.....1 for .04
1x1 1/2x12
.....1 for .06
1x2x18..1 for .12
2x2x18..1 for .20
1 1/4x2x18
.....1 for .15
1 1/2x2x18
.....1 for .18

**BALSA PLANK**
18" lengths
1x1....1 for .05
1x3....1 for .15
2x6....1 for .45
3x6....1 for .68
Wood can be had in 36" lengths or 3" widths by doubling the 18" price. We also cut special sizes. Send in for prices.

**FREE**
With every order of $1.00 or more: Full size plans for the "Bay Ridge Mike". Worth 50c. This may be deducted from the Kit if you decide to order it later on.

**JAP. TISSUE**
3 for..... .05

**CEMENT, CLEAR DOPE, THINNER AND COLORED DOPE**
4 oz..... .20
1/2 pint 8 oz. .35
1 pint 16 oz. .60

**WHEELS per pr.**

| Size | Brch. |
|---|---|
| 1/2" | .01 |
| 3/4" | .02 |
| 1" | .03 |
| 1 1/4" | .04 |
| 1 3/4" | .07 |

| Balsa | Celu. |
|---|---|
| 1".... .05 | .07 |
| 1 1/2".. .06 | .09 |
| 1 3/4".. .09 | .15 |

FREE bushings with balsa wheels.

**BROWN RUBBER**
1/16 flat
....20 ft. .05
1/8 flat 17 ft. .06
3/16 flat
....12 ft. .07

**WIRE**
010 & 020
5 ft. ..... .02
028 & 034
3 ft. ..... .02

**REED**
1/16 dia. 3 ft. .02
1/8 dia. 3 ft. .03

**WASHERS**
Small or large, doz. ..... .01

**DOWELS**
1/16 dia. x 12
doz. ..... .05
1/8 dia. 18"
4 for..... .05

**ALUMINUM TUBING**
1/16 dia.. ft. .07
3/32 dia.. ft. .07
1/8 dia.. ft. .08
3/16 dia.. ft. .10
1/4 dia.. ft. .12

**SHEET ALUMINUM**
010.. 6x6... .06
12x12.. .20

**CELLULOID SHEET**
4x5 ..... .03
Model pins per pk..... .05
Dope brushes small .... .03
large .... .05
Nose plugs each ..... .01

**BAMBOO**
1/16x1/4x15
....6 for .05
1/16x12" round bamboo 6 for .04
3/32x15" round bamboo 5 for .03

**BALL BEARING PROP. SHAFT**
1/16" dia. shaft .... .35

**INSIGNIA**
Sheet containing 4 sets of American, French, English and German.
Sheet ..... .06
All colors

**PAULOWINA WOOD PROP.**
5" ..... .05
6" ..... .07
7" ..... .10
8" ..... .12
10" ..... .20

**MODEL KNIFE**
1 for ..... .10
Extra blades
3 for ..... .10

**THRUST BEARINGS**
Small per doz .10
Large per doz .15

**Ordering Instructions**
FREE postage on all orders over 50c. Add 10c on all orders under 50c. Foreign orders add 15c.

## BAY RIDGE MODEL AIRPLANE & SUPPLY CO.

**232-45th Street** **Dept. A3** **Brooklyn, New York**

# *It Will Pay You to Choose Training That Has The Approval of Leaders Like Capt. E. V. Rickenbacker*


*The President and General Manager of great Eastern Air Lines appraises the work of the President of Parks Air College:*

"Oliver Parks, I congratulate you on the sincere and thorough job you have done over a period of years and for your courage in sticking to the job as you have."

In these words Captain Eddie Rickenbacker paid tribute to the purposes and achievements in aeronautical training of the President of Parks Air College. It was during an address made recently before the Air Board of the St. Louis Chamber of Commerce.

## *Increase* Your Opportunities in Aviation with Parks *Thorough* Training!

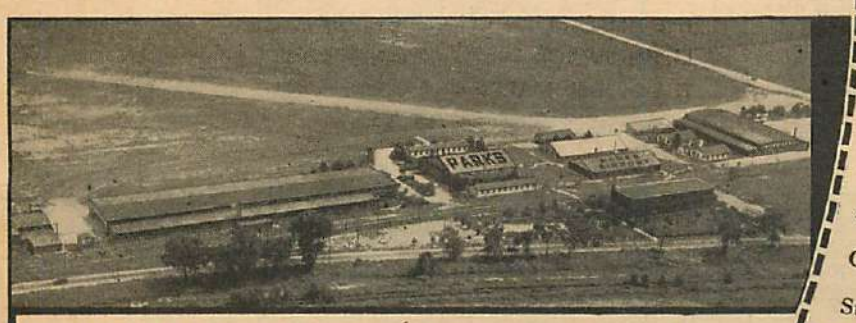
Captain Rickenbacker speaks with the authority of impressive achievement in commercial air transport. In the four years of his executive leadership Eastern Air Lines has doubled route mileage, put into use the most modern 14- and 21-passenger Douglasses, increased daily airplane miles to approximately 31,000, and — in final proof of a healthy vigorous condition — turned losses into consistent profits.

That the Captain's high regard for the "sincere" and "thorough" training service performed by Parks Air College is shared by executives throughout the aviation industry is shown conclusively by their consistent requests for graduates, requests which frequently outnumber the graduates available.

If you are sincere in your purpose to make a career for yourself in aviation, and if you want the acceptance in aviation that graduation can give you, you are invited to acquaint yourself in detail with the four courses of training offered — Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering and Aeronautical Engineering.

Use a post card or the coupon in sending your request for a catalog. It is free.

**PARKS AIR COLLEGE**
East St. Louis, Illinois




Parks Air College has the approval of the Civil Aeronautics Authority as an Advanced Flying and Ground School. The Aeronautical Engineering course is approved by the Illinois Superintendent of Public Instruction.

PARKS AIR COLLEGE
East St. Louis, Illinois Section AT-8

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

Name.....

Address..... Age.....

City.....

State.....

Reg. U. S. Pat. Off.

# AIR TRAILS

## ARTICLES



## FEATURES



## DEPARTMENTS



## MODEL ITEMS





AUGUST, 1939, VOL. XII, NO. 5




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.





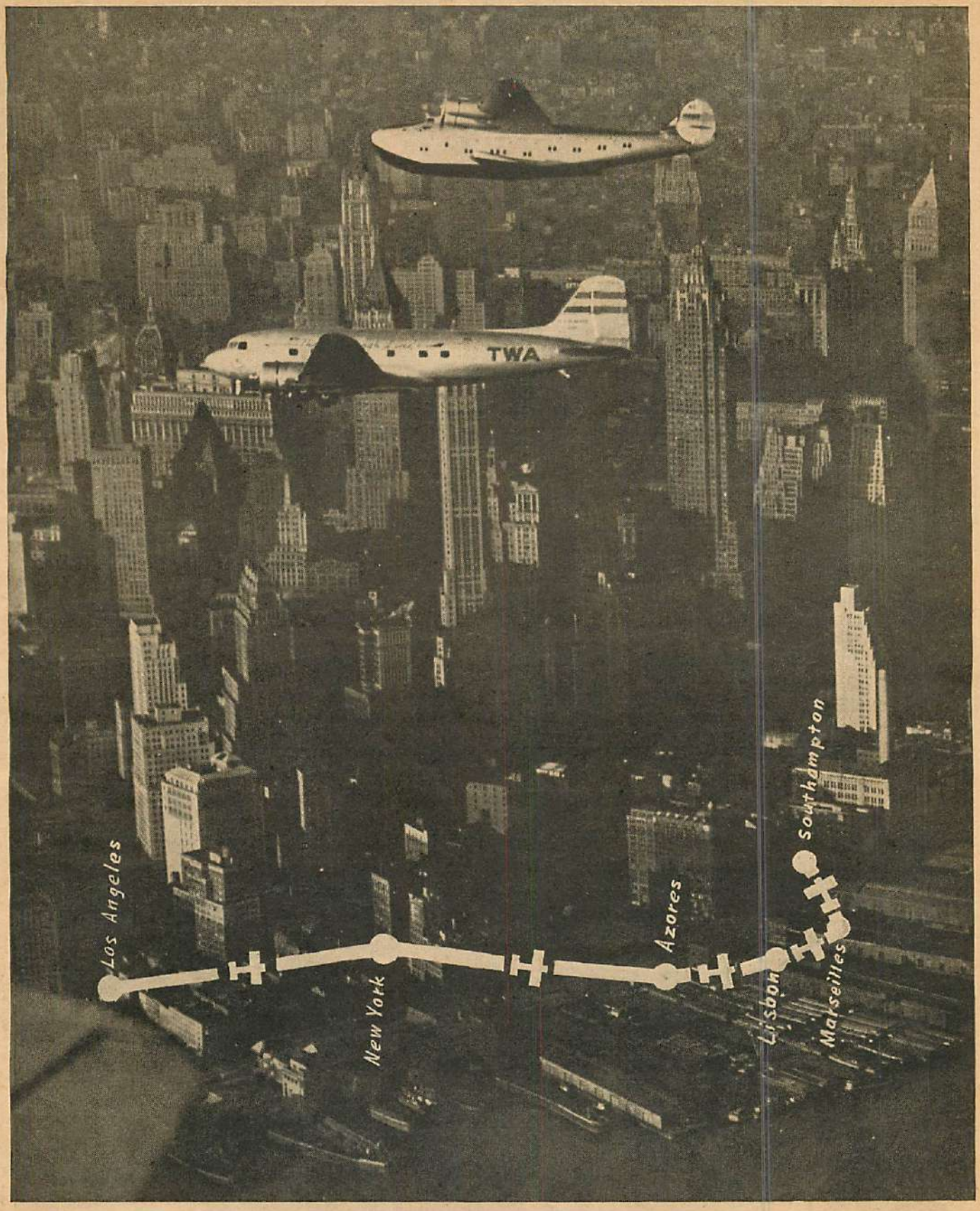
Printed in U.S.A.

16

SINGLE COPY 15 CENTS - YEARLY SUBSCRIPTION $1.50

STREET & SMITH PUBLICATIONS, INC.

79 SEVENTH AVENUE, NEW YORK, N. Y.




**A historic rendezvous over New York, May 20th. Inaugurating the first Los Angeles-England air-mail service, T.W.A. and P.A.A. join hands in success!**

# WANTED-MORE MECHANICS

THE shadow of the glamour and romance that has been attendant on aviation in all its flying branches has caused most people not directly connected with the aviation industry to overlook the fact that there must be a supporting backbone. Without this mainstay the industry could not exist. I refer to the highly trained mechanics.

The army has always required at least eight men to take care of the needs of one pilot. Of these eight at least four must be skilled mechanics. These technicians must be so well qualified that their work will not imperil the ship which they service or the crew or the passengers who fly in it.

It actually takes as long—or longer—to train an aviation mechanic in all the branches of the trade than it does to qualify a pilot.

At the present time there are twenty approved aviation mechanics schools operating in the United States, exclusive of those conducted by the army and the navy. The approved time for a student to complete the course at one of these schools is one thousand five hundred hours. A survey of the industry shows that this is the minimum time required to teach fully the business in all its ramifications.

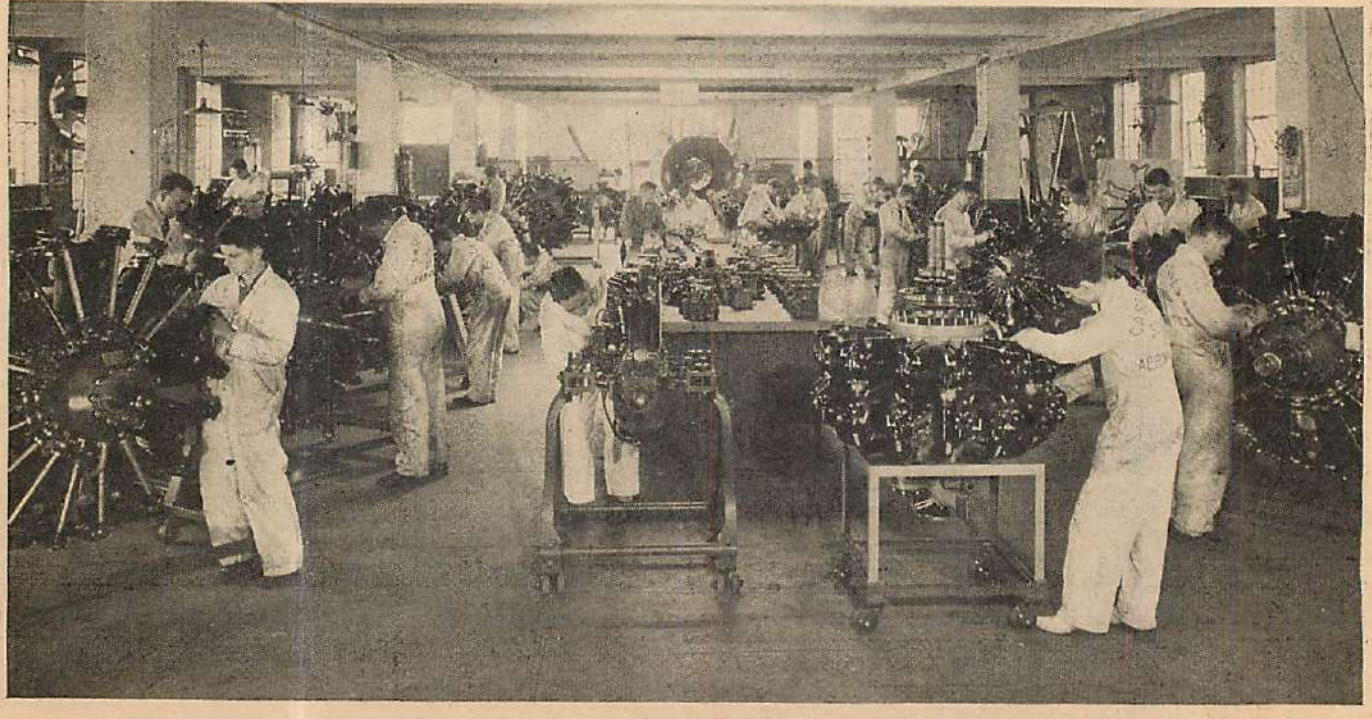
In training personnel, one of the most important things to discover is whether or not such personnel is the right material to make a good aviation mechanic. As the standing of a school is judged by the mechanical ability of the students turned out, it is obvious that an approved school does not want to subject itself to the risk or criticism of graduating students after hurried or improper training.

In the aircraft factories the percentage of semi-skilled labor is relatively high. As models become standardized and are ordered in increasing numbers, more tooling will become possible, and it is reasonable to believe that the bulk of production can be done by men—or even women—trained intensively for short periods.

But in the operations of the air lines and in the military service, the percentage of highly skilled mechanics will always remain considerably larger, for theirs is an operating problem. In addition to the numerous specialists required for the aircraft, engines and accessories, skilled men are needed for other equipment necessary for military operations. These men must be carefully chosen and trained over a long period of time. Such men must be provided by the army and navy technical schools and the approved aviation mechanics schools.

In the twenty approved aviation mechanics schools there is today an enrollment of approxi-

In the splendidly equipped shops of the Casey Jones School of Aeronautics his students learn to practice what he preaches.



## By Captain C. S. "CASEY" JONES, Guest Editor

mately five thousand students, and this number could be doubled without undue expansion or delay. These approved schools have been in existence for an average of over ten years; which, considering the age of the aviation industry and the lag that occurred after the World War, is remarkable. These schools have been the principal source of supply for the aviation industry, with which they work in close harmony.

These schools have an outstanding record for instilling safety in the minds of their students. They are taught, first of all, "safety in the shop"; second, and much more important to the industry, the necessity for accurate and dependable work so that it shall not imperil the lives of the crew and passengers of the aircraft on which they work.

The aviation industry and the military forces absorb about ninety percent of the graduates of these approved mechanics schools.

Aviation has an unusual appeal to the young man. As far as desire is concerned, the number of recruits is unlimited. However, in view of the highly technical nature of aviation it is desirable that the potential mechanic should have a high-school education or its equivalent. Special consideration is usually given graduates of technical high schools and schools giving technical courses in aviation or other technical trades.

There is no place in the aviation industry for the sluggard or the malingerer; the responsibility involved is too great. But for the young man who has the enthusiasm and the technical ability plus the perseverance to stick to the long period of training necessary, the field is unlimited.

On the figures of the present proposed expansion of military aviation and the logical expansion of commercial flying, there are not enough skilled mechanics in the country properly to service them. The field is wide open if the candidate has what it takes.

# MEET CASEY JONES by Tracy Richardson

WHEN you think of Casey Jones it's natural to think—what's in a name? Casey has a title, that of captain, but shout Captain Jones and quite a few gents would hold up their hands. When you say Casey Jones, every man, woman and child in the country at all familiar with aviation knows exactly which one of the Jones family you mean.

And it is not altogether because Casey Jones has been spectacular, but rather because he's been consistent. He is aviation personified.

Casey took up aviation early, while still in college, but abandoned it when his instructor, a fellow student, was killed. That was at Middlebury College where he got his Phi Beta Kappa and had his share of honors on the athletic field. When he finished at Middlebury he attended the Harvard School of Physical Education and followed that with two years as physical director at Montclair Academy, Montclair, N. J.

At the age of twenty-three—he was born in Castleton, Vermont, on January 11, 1894—he enlisted in the army air corps, June, 1917. He attended ground school at Champaign, Illinois, and took flying instruction at Wilbur Wright Field, Dayton, Ohio. In October of 1917 he was ordered to France and graduated from the pursuit school at Issoudun, America's great wartime flying school. He was held at Issoudun as an instructor until the following July, and then was sent to the front with the French Escadrille, Spad 96, and flew with that organization until the armistice ended the show. He was discharged from the army in January, 1919.

Immediately after severing his connections with the army, Casey joined the Curtiss Corporation and organized the Curtiss Exposition Company, which conducted flying schools and a charter passenger service.

For fourteen years Casey continued his association with the Curtiss Corporation, doing commercial flying, test work and instructing. He was president of the Curtiss-Wright Flying Service, operating a chain of forty flying fields. Later he was made vice president of the Curtiss-Wright Corporation.

Casey gained fame through his participation in air races. Immediately after leaving the army he became interested in this phase of aviation and participated in the New York-Toronto races and all the national air races, winning events all over the country—Kansas City, Omaha, Detroit, St. Louis, Dayton, Philadelphia and Chicago. An air race or show without Casey as a participant was not considered an event.

In 1931 the Curtiss-Wright Corporation decided to abandon their flying activities. Many opportunities were offered Casey, *(Turn to page 64)*

# C.A.V.U.

Three Model 18D twin-motored Beechcraft airliners have been ordered by Tata & Sons, Ltd., of Bombay, India, for use over their internal air line. This company's lines link all the important cities of India and is known as Tata Airways. Nineteen hundred and sixty-five miles of air lines are served by the outfit. The reason for the purchase of the Beechcrafts is that these planes have already proven their fine qualities for this type of work, having been in use by the Indian National Airways of New Delhi.

★ ★ ★

Tex Rankin, internationally known as a stunt pilot and aërobatic flier, and present international aërobatic champion, just took delivery on a new Franklin Cub Sport to use in stunt exhibitions. Another topnotch flier to purchase a Cub is Tony LaVier, winner of the 1938 Greves Trophy. His wagon is a Continental Cub Coupé.

★ ★ ★

Mail-order catalogues have always held a fascination for us if for no other than the reason you see so many things you'd like but can't afford. If you want to look at a lot of gadgets ranging from $480 aircraft sextants right down to thirty-five-cent embroidered wing insignia for your flying jacket, send a dime to friend Ort of York, Pa. (No advertisement.) Karl gets out the Sears Roebuck catalogue of aviation; and try to find a gadget in connection with flying of which he doesn't have at least one. What we wonder is where in blazes he keeps all this stuff before he sells it.

★ ★ ★

Over in England they are going in for four-engined land planes, too. In the Short factory, construction is well along on six thirty-one-ton four-engined land planes designed for a top speed of over 330 miles per hour at an altitude of over 25,000 feet, or only a few thousand feet below the summit of Everest, the world's highest mountain peak. These planes are to be used in conjunction with sister ships designed for lower altitudes across England's overseas air routes. A nonstop range of 3,000 miles will make these huge ships invaluable for freight and air-express service as well as for general passenger use.

★ ★ ★

The other day, flying in the cockpit of the huge DC4 with Benny Howard, we were particularly impressed with the ease with which the thirty-two tons and over of sky-hotel handled. Two fingers on the wheel and around she went. Another item that struck us was the position of the "front office" so far ahead of the wing and motors. Looking out and back, one has the urge to pull over and let the "other ship" by. And still another thing that impressed us was the bridal suite. Now don't get us wrong, but the complete luxury of this set of rooms, complete with pictures on the wall, is something to think about. All in all, the DC4 has changed considerably since we saw it a year ago.

★ ★ ★

The other day we stopped in to see friend Gurney Williams, who selects the cartoons for Collier's magazine, and low and behold, he was wading waist-deep in a gas model he had just finished. Neat job, if we do say so. Williams says the only drawback to building gas models is that it takes too long to finish one before you can start the next. Our sympathies are extended to Mrs. Williams herewith.

★ ★ ★

Boeing has perfected a new system of mass production on the formidable B-17B bombers. These are now assembled in stages so that completed bombers roll out of the plant every few days. At each different stage in the production line, other important parts are added to the unadorned fuselage which starts down the line. As each bomber moves down the line, another moves up, and so on, keeping a steady stream of these bombers always in production. This might be of interest to some of those who claim we can't produce aircraft in case of—er, international misunderstanding.

The first four-bladed controllable to be constructed in this country, so far as we know, was recently installed on a Curtiss P-36 used by the United States army air corps for experimental purposes. Incidentally, this is the same ship used for experimenting with the twin props revolving in opposite directions. The reason for these experiments is the need for more effective propeller area because of the greater power of the modern pursuit type of engine. One solution for future power plants of even greater power will be in propellers of four or even more blades.

★ ★ ★

Aëro Insurance Underwriters gets out a mighty interesting and entertaining news letter from time to time. In the last one they brought to our attention the fact that it might be a good idea to look the cabin over for wasps and bees before the take-off. They're telling *us*. We recall once, back in—well, a long time ago—that we discovered a big black mud wasp in our Jenny cockpit. We never could understand why he'd pick a Jenny in the first place, but you'd think there would have been plenty of room for him to leave through. He didn't, and ever since then wasps have been a pet hate of ours. Bear that in mind before the take-off. A "Wasp" on the ship's nose is fine, but not in the cabin.

★ ★ ★

The Peruvian military pilots are going to town with the new Douglas 8A-3P bombers. Lieut. Com. Armand Revoredo recently established a new cross-country record for military planes between Lima, Peru, and Los Angeles, and also set a nonstop record between Panama City and Lima.

This ship, an attack bomber, is a two-place, low-wing, all-metal monoplane powered with a single 1,000 horsepower Wright Cyclone equipped with a three-bladed constant-speed propeller. It has a maximum speed of 250 miles per hour and will cruise at 200 miles per hour, using but sixty-two percent of the power available. The service ceiling is 29,800 feet, and it can get upstairs to 10,000 feet in 6.9 minutes. The armament of the 8A-3P consists of bomb racks and five machine guns.

★ ★ ★

The other day at Newark an airport official proved to us that Newark handles more traffic than Croydon, Templehof and the famous Le Bourget combined. These famous European airports are always thought of as representing the height of traffic, while right here in Air Trails' back yard is the busiest one of all.

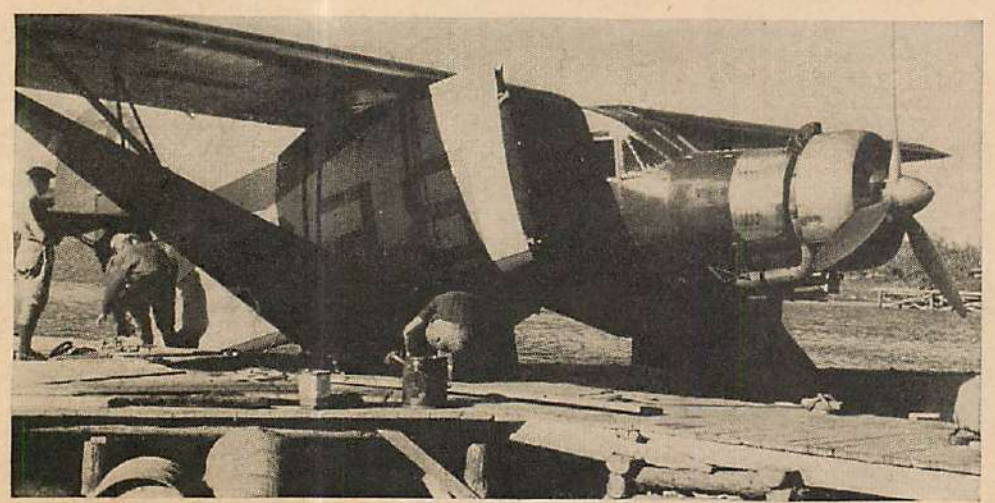
# This Winged World

A veritable "Battleship of the Air," one of Britain's Short Sunderland patrol-bombers gathers flying speed just before the take-off.

Wide World

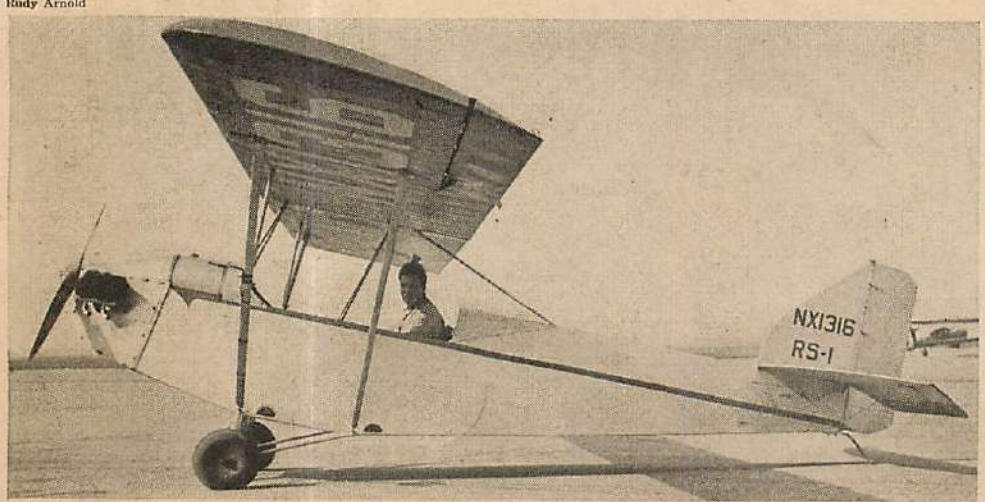
Pennsylvania Central Airlines twelve years old. Jessica Dragonette cuts slice of birthday cake for C. P. Graddick, left, of the U. S. Post Office, and H. Hinkley, right, of the C. A. A.


Famous traveler back from Guiana Jungle. Pete French, of Webster Groves, Missouri, alights from a Chicago and Southern airliner after trip netting color film and 100 zoo specimens.



The only and original flying-wing. Lashed between the pontoons and the wing of this Bellanca Aircruiser, this Stinson wing flew from Yellowknife to Cite City with the Mackenzie Air Service.

Rudy Arnold




A homemade plane that turns in an excellent performance. The Ross sports trainer, familiar to Floyd Bennett Field. This tandem two-seater is powered with a forty-horsepower Continental.


Up in the air! Stewardess Ruth Croman and First Officer Lee Williams met on an airliner, and it was all over but the ceremony. This seems to be the usual ending of air romances.

# This Winged World

**Presenting in pictures interesting personalities and activity in the world of aviation.**

Lights above and below. A T. W. A. Sky Chief drones smoothly over Treasure Island, site of San Francisco Exposition. Camera fans note: this exposure 1/40 sec. at f.2 at 6:35 p. m.

# This Winged World

Right—German students of aerial photography rush training. Unwinding the huge reels of film preparatory to loading the complicated aerial cameras.

Below—An impressive line-up of R. A. F. Spitfires complete with mascot, during a demonstration held at Duxford, England. These are to repel bombers.

Globe Photo

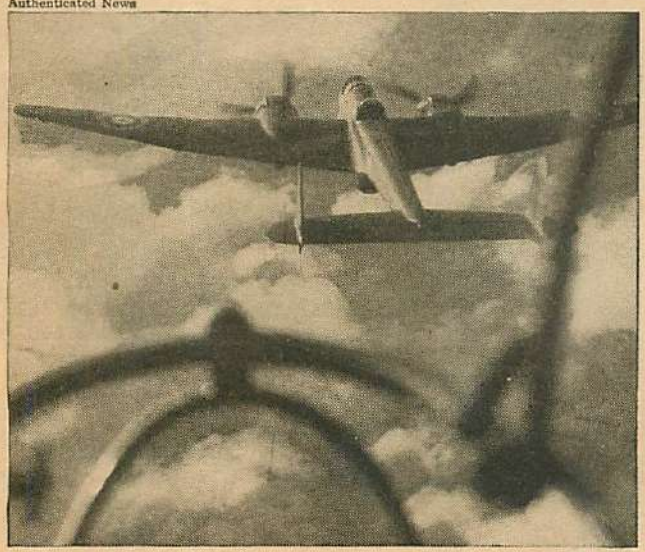


British Press Combine

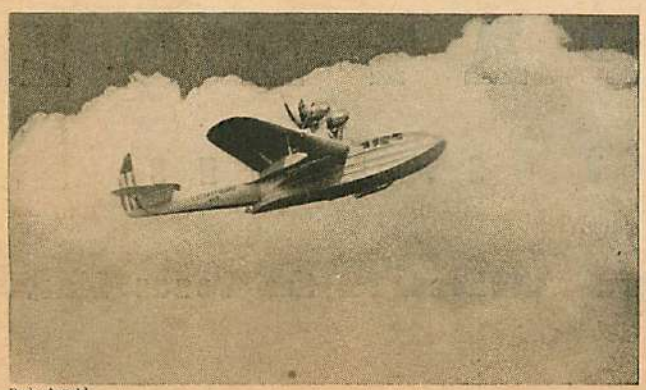
Rudy Arnold

Apparently waving a friendly torch, Liberty salutes the navy's aircraft carrier Ranger as she passes on her way up the Hudson River, her decks teeming with navy fighting planes.

Authenticated News



Follow the leader over England. An unusual view from the bomber-gunner's compartment in the nose of a Handley-Page Hampden bomber of a sister ship in formation, at 200 m.p.h.



Rudy Arnold

Acme

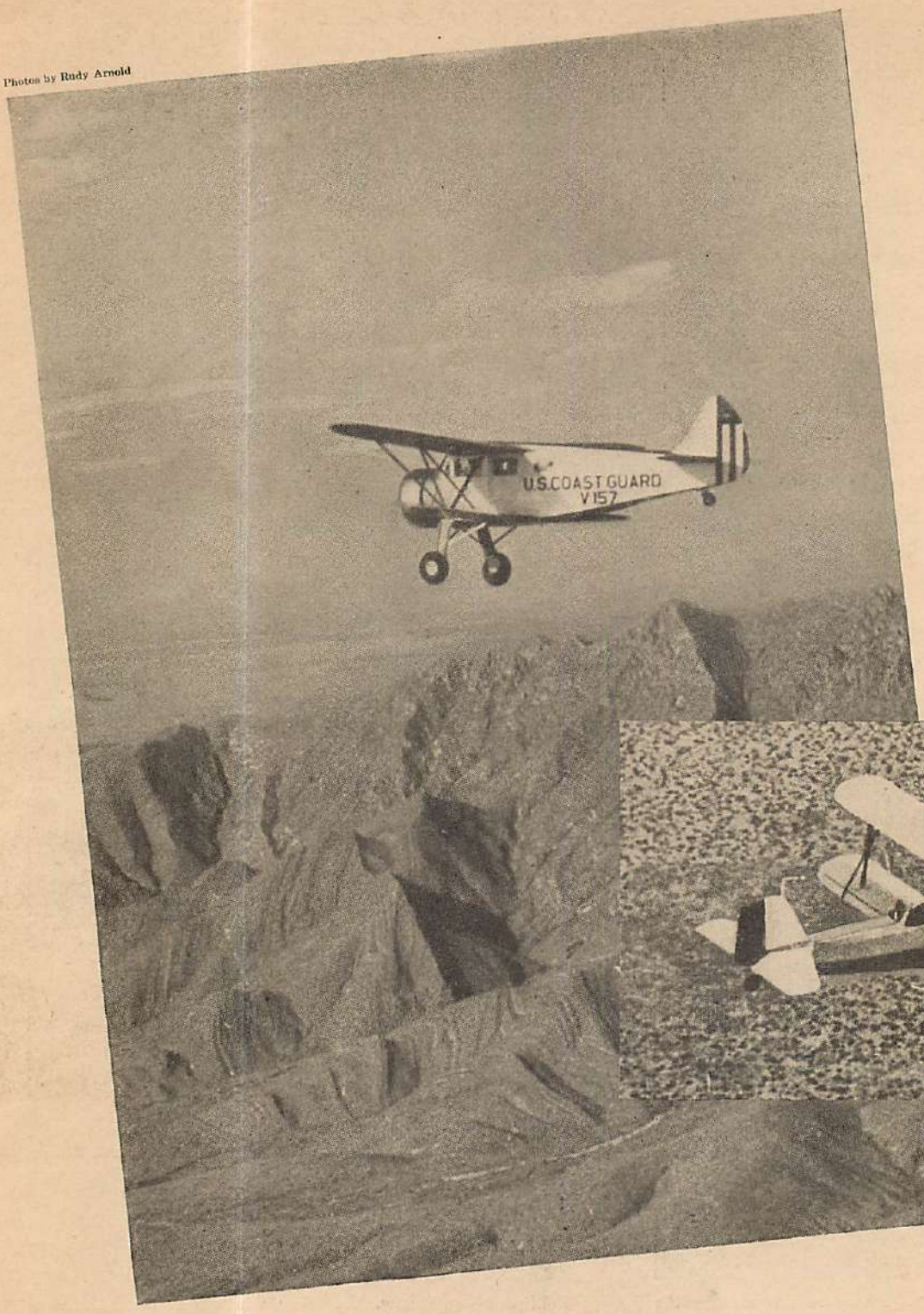
Nope, you're wrong, the trylon isn't missing! What appears to be the N. Y. World's Fair perisphere is really the new high-speed wind tunnel at Langley Field for testing scale models.

Cy Latour & Son

Hold your breath, now. The delicate task of checking the compass of a transport ship calls for accurate calibrations. This check instrument is temporarily mounted far out on wing.

Sturdy wings for the coast guard. The Fokker FLB with Pratt & Whitney engines is particularly suited to rough weather.

Photos by Rudy Arnold




High over the border mountains of Texas the coast guard Wacos keep a sharp lookout for suspicious cars, horsemen, or unmarked planes.



1

# BORDER PATROL

By LIEUTENANT P. S. LYONS

Late of the Border Patrol Detachment, U. S. Coast Guard.

**Thrilling are the duties of these winged watchers on the Texas Line.**

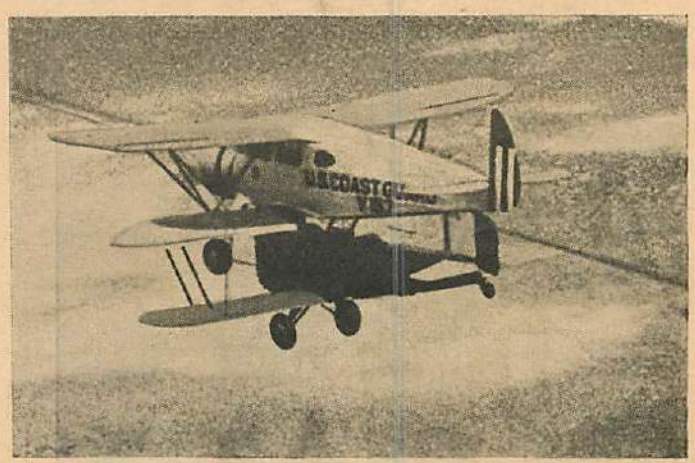
AN exciting panorama can be conjured up by the name Border Patrol. Kaleidoscopic pictures of bandits, sombreroed cattle rustlers, smugglers, border raids; scenes belonging to the heroic past—all become suddenly alive merely at the mention of the term. In the southern boundary area of our country, the grim war between the forces of law and order and those on the opposite side of the fence continues as relentlessly as ever in the past. It is primarily for this reason that the United States coast guard has undertaken the maintenance of a permanent air patrol detachment on the international boundary line.

It will come as a surprise to many to find a coast-guard base, usually associated with the sea or a shoreline, at El Paso, Texas—over eight hundred miles from the nearest coast. Generally speaking, the authority of the service does not extend inland—with the notable exception of smuggling, customs and other specific statutes. Particular attention, the doctrine of the organization states, shall be given to the prevention of smuggling. The coast guard co-ordinates its activities with those of other agencies of the treasury department, to the end that such plans as may be laid down by proper authority are followed. Inasmuch as the coast guard's air force is the only one now existing within the treasury department, it is logical that one of its bases should be situated on the United States-Mexico boundary line.

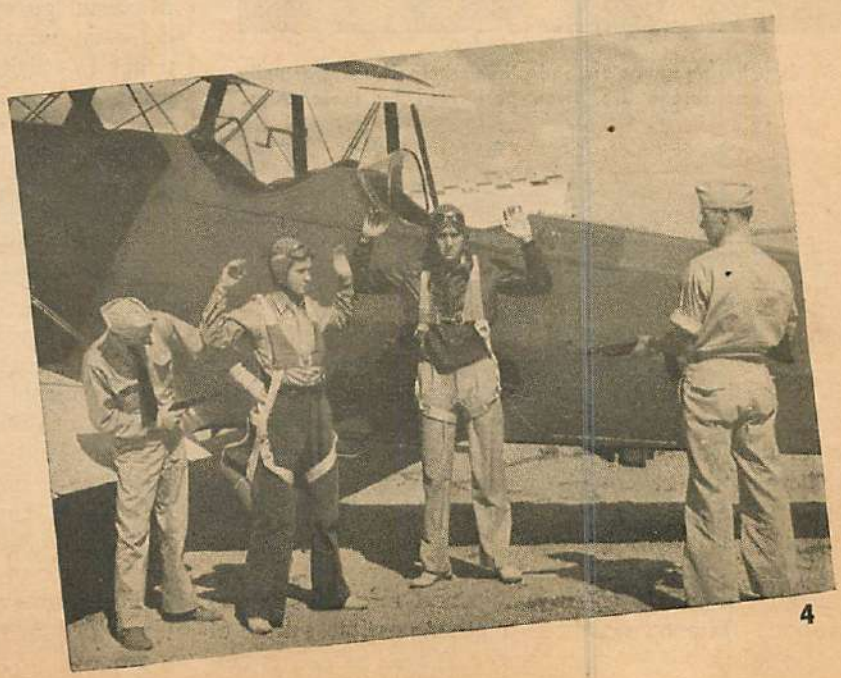
Using El Paso as a central base of operations, this small but extremely efficient unit carries out the truly herculean program of patrolling fourteen hundred miles of border line and covering a territory which includes the States of Texas, New Mexico and Arizona. An idea of the immensity of this offensive against smuggling and other law-evading activities can be gained by noticing the detachment's report for the fiscal year of 1937; showing an area of close to four hundred thousand square miles searched, thirty-eight thousand miles cruised in less than two hundred flights!

This in a land of lonely, mysterious mountain ranges, isolated wastelands and limitless, flat prairies inhabited only by rattlesnakes, lizards and jackrabbits. Obviously, the airplane is an invaluable instrument in country of this nature; to the smuggler as well as to the forces of law and order. It serves the latter as a speedy, far-reaching eye and the former as a safe bridge over a chasm. While most of the smuggling activity being car-

2



3



4

The actual continuity of a capture by the Border Patrol. One, a suspicious plane, with license numbers painted out, is sighted. Two, the Waco comes alongside and a submachine gun makes the landing order official. Three, riding herd on the suspicious plane, the patrolmen force it to land on the Texas plain. Four, while one flying patrolman covers the two occupants of the captured plane, his partner frisks them for weapons. Satisfied that they are unarmed, the plane is searched for contraband, such as dope and precious stones.

# BORDER PATROL


So that's why they tried to get away! A border patrolman checks over the haul of contraband goods taken from smugglers.

Aside from chasing smugglers and other criminals, many errands of mercy and rescue are often performed by these ships.

ried on at present still keeps to the ground, a goodly portion of it has sprouted wings; and it is with this portion that the air patrol detachment is chiefly concerned.

The Border Patrol must exercise its every effort to prevent and stamp out smuggling. Human nature is still the same, and welcomes the prospect of a rich reward gained from the variety of cargoes that can be sold in this country at a profit; cargoes like morphine and heroin, destroyers of humanity; or Mexican gold, which can be sold here at a considerable price more per ounce than is paid anywhere else in the world. Marijuana, or "loco weed," is sometimes brought across, although not nearly as profitable and much bulkier to transport. Human freight is another possible source of revenue, although not prevalently shipped across in airplanes, due to factors of weight and, naturally, difficulty of concealment from ever-alert coast-guard eyes.

Illicit-cargo-bearing airplanes are by no means the only objects of interest to patrolling coast-guard airplanes. Although the courses of all flights—except in emergencies—are carefully laid out and planned in pilots' conferences before take-off, the planes are prepared for all eventualities. The specially built cabin Waco biplanes employed by the Border Patrol detachment constitute a compromise between such divergent factors as speed, maneuverability, cruising radius, weight-carrying capacity and low landing speeds; all salient points which must be considered in view of the diversified nature of the detachment's work and the sharply contrasting type of territory in which it is called upon to operate. In addition to a complete battery of navigational and blind-flight instruments and two-way radio, there are armament racks for machine guns and ammunition, stretchers, blankets, food, water, cargo 'chutes, and medical and first-aid supplies including such things as snake bite and tarantula antitoxins. This does not take into consideration the additional equipment taken on in cases of emergency and special duty.

Out on patrol, the coast-guard airplane must keep a sharp eye open for many things. Isolated roads and trails not leading past the established customs stations are scrutinized for vehicles headed toward the border; planes swoop down low over the Rio Grande to give the "once over" to persons who may prove to be "wet," i. e., aliens attempting to swim or wade across the river from the Mexican side, to enter the United States illegally. Some aliens take ingenious measures to appear like harmless laborers and farmhands; one party clad themselves in tattered clothes, and equipped with fishing poles, were apparently merely trying to add a bit of variety to the usual poor Mexican's dinner. But they made the mistake of all clustering together in the middle of the stream and looking apprehensively around. A radio message to the base soon brought an immigration-office car to the scene.

Cattle smuggling, of a different nature than one would ordinarily expect, is tried occasionally. In addition to the usual import tariff exacted by the United States, the Mexican government imposes an export tax on all domestic animals leaving the country. A successful attempt to spirit across a herd would result in a goodly profit for the individuals who tried it; but such efforts are too easily spotted. However, it has been done.

Pack animals preceded by what appear to be prospectors following some faint and seldom-used trail also come under the discerning eye of the patrolling plane. In wooded and mountainous sections, even innocent-looking columns of smoke—where no smoke should ordinarily be—attract attention on the chance that they may come from the fires of illicit distilleries. Satisfying to state, the coast-guard planes locate innumerable such establishments every year, saving the government many millions of dollars in estimated lost revenue. The plane does not land to make the actual seizure—in most cases a landing is impossible—but notes the exact location and identifiable landmarks around the suspected distillery. A "track" chart made by the pilot when he gets back is turned over to the proper authorities for action.

The country over which the scouting planes soar is diversified and vast. Traveling east from the Pacific, there appear the mountains and farmlands *(Turn to page 66)*

# maintenance men must be game

## by EDWIN LAIRD CADY

**McShark—toughest maintenance manager east of the Rockies!**

Three tons of steel were coming down . . . down over the men in the pit.

PETE STAWSKI'S promotion to the assembly-line gang—the juiciest maintenance job in the works—was bet on this wrestling match. The whole toolroom had heard McShark say so.

"You already skipped two guys over my head," Pete had yelled at him. "Boy, I'd like to get you on a wrestlin' mat—"

"I'll wrestle you," McShark had answered. "My weight against your youth, one fall to decide. If you win, you go up. If you lose, you shut up."

Nearly every man in the works had pried himself into the recreation hall. This bout would make history. Not that bouts were unusual. Settling little tiffs with the gloves or on the mat was traditional at the Blandon Aircraft Plant. Most such contests attracted little attention. But when Fish-blood McShark, the toughest maintenance manager east of the Rockies, went to the mat with a wrench monkey for a stake like that—well, even Old Man Blandon himself had his well-filled britches parked in a ringside seat.

The betting had been heavy on Pete, for both the sentiment and the wise money favored him. And, for the first hour of the bout, it had looked as though he could win any time he got ready.

But now everybody knew that Pete was licked—except Pete. His brother, Tiger Stawski, the champion, knew it, although he pounded Pete's corner of the ring with both fists and screamed hysterical instructions in three languages. The crowd knew it and howled for the kill. McShark knew it as he tightened his arms in the steady pull of a cruel full Nelson. Yet he could feel no quit in the kid. If only, he thought, this mulish bohunk would get wise to himself he'd be a man to have around.

Pete was still sure he would toss this palooka. He was giving away a full thirty pounds—his 180 against 210—but what the hell, didn't he come from the wrestling Stawskis? Who was this Irish donkey from Vermont?

He could feel McShark's hard-clasped hands punishing the nerves in the back of his neck. And those case-hardened, freckled forearms were under his armpits, levering up, levering up. His head was pulled forward onto his chest, and his back was bent in an arch, heaving lungs crowding his pounding heart, sweat stinging and blurring his wide-staring eyes. He could see those long white legs braced and balanced just out of reach. He ought to be bouncing and shrugging that hold off, but the rubber was gone from his thick round shoulder muscles. A black fog formed itself, and its edges were tinged with red. He would dive forward, bridge and get a rest if he had to—he had let himself be rolled and then had bridged out of it three times before, just to give the crowd a thrill. What he would give right now to have those chances back! He dove—tried to twist out of it—heard the referee slap McShark on the shoulder.

Pete got to his feet. He held out his hand. "O. K., boss. You win." He grinned as he spoke. After all, a few more years and he would go into professional grunting like his brothers. He was only eighteen and had to wait. Working in the airplane plant was just a way to get strong.

"Nice fight, kid," said McShark. "You're gonna be good." Pete was glad to see how hard the man was panting. It had been no romp, that hour and a half on the mat.

"Nice going," he heard as he walked up the aisle. And "Next time, Pete; next time." He could feel their eyes on his big-boned, barrel-shaped brown body as they called. They *(Turn to page 70)*

Photographic Dept., Randolph Field, Texas

# WHAT'S THE AIR

## You don't have to be a superman to pass this all-important exam—just a normal young would-be pilot.

By ALLAN FINN

THE army doctor had taken two looks at Bill Smith and shaken his head. "We'll have to turn down your application for flying cadet without going any further. Too bad you came so far."

"But, major—"

"Sorry, there are no buts in the army. You're just not physically fit, that's all."

So Bill Smith, twenty-one years old, husky ex-footballer, just out of college and with adventure tingling in his blood, took the first train home to Iowa bitter and disillusioned. He shuffled down to the corner drugstore where he knew the boys would be waiting for the news.

"Say, they must have given you the medical works from the look of you," someone ventured as Bill flopped into a chair.

"Naw, I didn't even get to first base. The doc took a gander at my teeth and eyes and gave me the thumbs-down sign. Said I had neuropsychic defects, besides. Gee, they only want supermen—Tarzan and Lindbergh rolled into one."

Bill Smith's experience promptly got around town and the result was that a number of youths decided not to bother with going all the way to the army air

Left—In this whirling test given in the Barany chair, applicant is tested and carefully examined for any equilibrium defects.

Photographic Dept., Randolph Field, Texas

Try this one at home. Stand this way, in stocking feet, eyes shut, for fifteen seconds on each foot without unduly wavering.

# CORPS MEDICAL EXAM?

field to take the cadet physical exam. And the military flying service lost possibly four or five potential recruits.

This circumstance was regrettable because actually Bill Smith was all wrong. He was not disqualified summarily because he did not appear to be a superman. He was ruled out because he could not conform to standards of physical fitness, which, however rigid they may appear, are only those of a normally sound and healthy mind and body.

There are scores of Bill Smiths all over the country, and they have heedlessly helped to create a lamentable misapprehension about the requirements for the army cadet flying corps. True, only twenty-five percent of all those who apply are physically acceptable, but that is because of one defect or another which inevitably detracts from the standard of normality.

"The idea, which is all too current, that we seek only supermen is absurd," Lieutenant Colonel Robert K. Simpson, senior flight surgeon at Mitchel Field, Long Island, told me. "On the contrary, we want normal young Americans who combine the qualities of physical composure and mental alertness. Of course, they must be physically and mentally unimpaired, free from all disease and defects, with bodily functions and reactions —blood pressure, heart action, nervous states—which affect the competence of a flying man.

"I wouldn't even say we seek superior men. They only have to be young, intelligent, with nothing wrong with them, so to speak. The men who qualify here every day are the ordinary normal youths you meet in the street or see on the college campus. What a flier needs are nervous and muscular co-ordination, quick and accurate reflexes, normal courage, sound judgment and emotional stability. These are not the attributes of supermen. Maybe they are those of the ideal type of normal man, but it is only natural that we should prefer the best available material. Modern flying demands it."

Stripped of all its compound medical terminology, the flying examination is not so complex and bugabearish as it appears. Generally speaking it is the regular army physical test plus more rigid requirements for the fitness of the eyes, the heart and nervous system. To be sure, it is far more exhaustive and penetrating that any other given in military or civilian life.

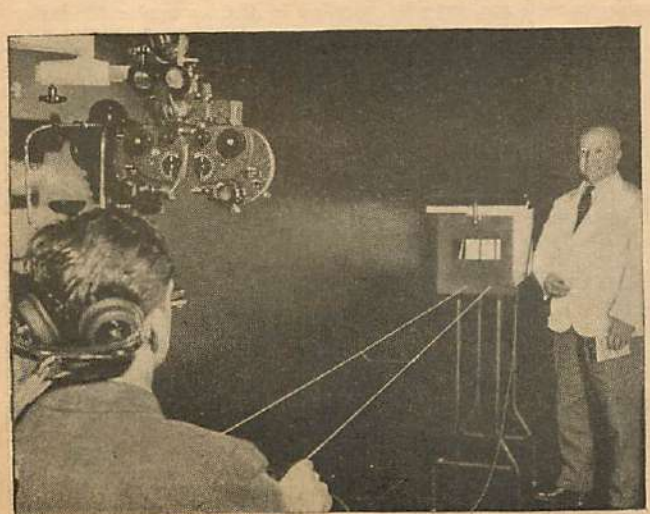
This explains why there are so many embittered Bill Smiths; young, husky fellows, with the courage of a lion and the digestion of a sword-swallower, who possess defects which either are unknown to them or not considered significant in ordinary life but which are mighty important when steering a pursuit plane in war formation at three hundred miles an hour.

Colonel Simpson, a genial, kindly soldier, who probably knows more about the eye than any man in the army, informs me that many strapping young would-be cadets are turned down even after they have passed family doctor and insurance check-ups. "The most confident can't be sure of themselves until they've been through our preliminary once-over. We don't overlook anything, and we can't afford to."

Of course, prospective applicants can save a lot of time by first consulting their family doctor. From him they may be able to learn of the more obvious defects and diseases which would place them automatically below the physical standards of normal *(Turn to page 74)*

Photographic Dept., Randolph Field, Texas

**Right—Testing the applicant's eyes for width of vision. Looking straight ahead, applicant must "see" white ball to side.**



Photographic Dept., Randolph Field, Texas

**Above—By pulling strings, student tests his depth perception by aligning two vertical rods seen through instrument opening.**

# BUILT-IN HORSESHOES

## By ALMA HEFLIN

PILOTS had a habit of carrying a mascot during the early days of aviation. With slow, inefficient, undependable planes, charms seemed in order. If a pilot carries one today, other pilots mark him as an amateur whose ideas of aviation come from the movies. Today's "horseshoes" are structural principles making built-in safety, but the C. A. A. went still further a short time ago. It set up certain standards which will entitle a pilot to a premium in form of reduced required training for a license if trained on a ship meeting them.

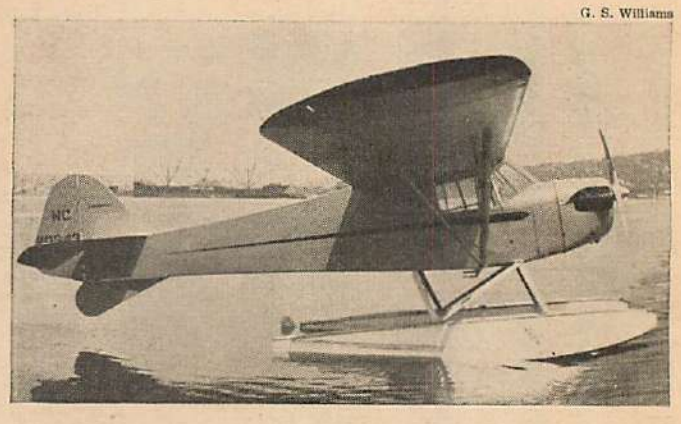
Such a plane must be able to land at twice its minimum landing speed without leaving the ground after contact. That is, a plane landing at thirty miles per hour normally must also be able to land at sixty. No plane can do that at present unless it might be a three-wheeled "tricycle" plane in which the wings meet the air at a flat angle when the wheels touch ground.

Full application of brakes to the point of skidding the tires throughout the landing run shall be possible without nosing over. That is now true of some planes at normal landing speed, but at high speeds only a tricycle plane might be braked in this fashion.

The airplane shall be able to land over a fifty-foot obstacle in a straight glide without wind and stopped within 500 feet. This is possible now only if flaps are used.

The landing gear shall withstand a landing with a descent of 900 feet per minute, three times the normal landing glide of an airliner, and shall stand a straight glide to the ground in still air with elevator control full

G. S. Williams

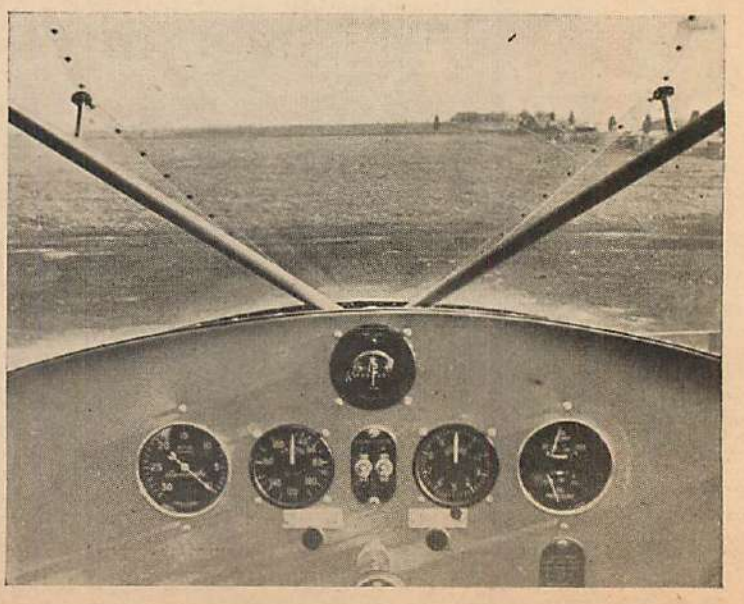


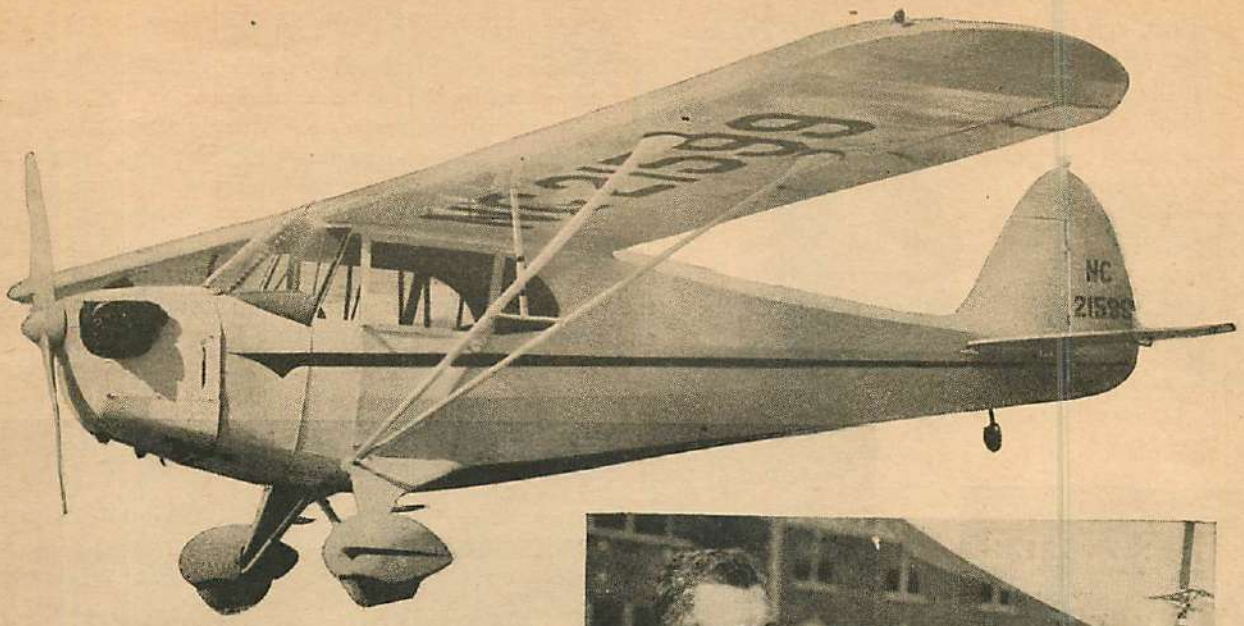
Embodying many safety features typical of the modern light plane, the Taylorcraft A appears dressed up with pontoons.

Two well-known personalities in the light-plane field are Carl I. Friedlander of Aeronca and his Chief 50.

**In the not-so-good old days the boys carried good luck charms, but now—**

The demand for better visibility in the sport or pleasure plane has been well and expertly handled in the Luscombe 50 design.





Piper Aircraft Corp. may well be proud of the performance and safety record of their famous Cub. Right, a new safety feature in a tail wheel with a built-in brake making for safe and easy taxiing.

Rudy Arnold

back. Assuming that through flaps or other means a plane could be brought down from a thousand feet under these conditions, the landing gear would have to have an unusual shock-absorbing system.

The plane must be able to taxi in any direction under complete control in winds up to thirty miles per hour. Only the heavier ones could, at present.

The plane shall not spin through any acrobatic maneuver or at steepest possible climb. In that condition, it shall be possible to keep the plane level without danger of falling off on either side. A dampener on the flippers to keep it from climbing into a spinning position or wing slots would help attain this objective.

Only one control column shall be needed to operate both the climbing and the turning of the plane, and stability should make the plane take the correct bank for turning without slipping or skidding and without the necessity of using a directional trim-adjusting device. When such devices are used, they should be merely auxiliary. No independent readjustment or horizontal stabilizer or tab shall be required. That requirement of single control has been met in a few "experimental" ships.

The pilot shall have an unobstructed level view straight ahead and a sweep of ninety degrees to each side and within twenty feet ahead of the airplane.

For this requirement pusher motors or tricycle gears would be helpful to bring forward vision that close to the nose, though present planes have fairly good visibility ahead. The pusher has several advantages, such as adding quietness and cleanness. If nosed over, which is unlikely because the weight is well behind the nose, propellers are saved. However, aërodynamically they are inefficient because of difficulty of streamlining, and the center of thrust is so high that the ship is difficult to balance.

All in all the program is a big order! For a while the growing "air fever" will depend on the light plane. It is easy to fly, familiar in appearance, below $2,000, which seems to be top for mass sale, but the quest will continue for added safety.

Groundlooping is a representative problem. What causes it? A fast cross-wind landing, a one-wheel landing, uneven pressure in tires—yet some planes groundloop rarely, others at the shrug of a shoulder.

Position of the landing gear is the most potent factor in the tendency. The center of gravity marks the vertical axis around which the plane turns. Force applied at the wheelpoint multiplied by the distance from the vertical axis determines the tendency to groundloop. In other words, a plane with the normal landing gear landing in cross-winds provides less leverage to a cross force than a plane in the same wind with the forward landing gear. Move it back of the CG so the bulk of weight is slightly ahead of the wheels and you cut the chance of groundlooping still lower, or put the wheels in direct line with the CG and groundlooping tendency drops to zero.

Why not do that? Putting the wheels behind or at the CG puts the weight in the nose of the plane. Soft ground, a tail-high landing, brake pressure, even a slight bump would make nosing over certain. Move the landing gear to the nose, place all weight behind it, and nosing over would never happen—but groundlooping would!

Today's planes strike an average between extremes. Slots and flaps to reduce spin tendencies or stalling are other problems, but each is a subject in *(Turn to page 68)*

Bill Strohmeier, left, and Bill Enyart, right, on their light-plane tour, visit Carl Friedlander, Aeronca president.

# OFFICIAL SENIOR N.A.A. NEWS

Prepared by

William R. Enyart, Sec. NAA.

Proof of interest in aviation is evident by this crowd enrolling for flight training with Cleveland Women's N. A. A. Chapter.

This collection of planes parked at the Shreveport airport are participants in the Third Annual Louisiana Air Tour.

## AIR PROGRESS PLANS TAKE FORM

THE idea of a National "Air Progress" celebration, announced by the N. A. A. in April, has already met with enthusiastic response. Already sixty cities have indicated that they will participate. The beginning date is September 11th, and the celebration will probably last over a period of two weeks.

Air Progress for 1939 offers to aviation an unusual opportunity to consolidate public interest and to bring the people of many communities up to date in the aims and accomplishments of American flying. The program that is being prepared will deal both with national defense and civil aviation.

Details are being developed by national leaders in aëronautics. The plan will be so flexible that it can be adapted to a large city or a small one. The individual community will select the day or days during the period on which it will stage its own events.

Already a calendar of local events is taking form. The immediate objective is to be the staging of valuable activities in at least a thousand American cities. The co-operation of civic clubs, airport and air-transport operators, colleges and flight instructors will be enlisted.

## PRIVATE LICENSE AGE UPPED

Stressing the fact that the change was made in the interests of safety, the Civil Aëronautics Authority increased the age limit at which private pilots may be licensed from sixteen to eighteen years.

The new regulation does not increase the sixteen-year-old age limit at which student pilot permits may be issued. The effect of the change will be to prevent pilots from carrying passengers until they reach eighteen years.

"The Authority cannot be too careful," said Oswald Ryan, member, "in making certain that *(Turn to page 65)*

# THE TIPSY

by BURTON KEMP

SOME months ago Air Trails presented a three-view outline drawing and descriptive information concerning the Tipsy S. Because this was only a one-place airplane its usefulness was quite limited, and although a fine ship in its class, it has now given way to what is practically a sister ship, but one that has been carefully designed for two persons.

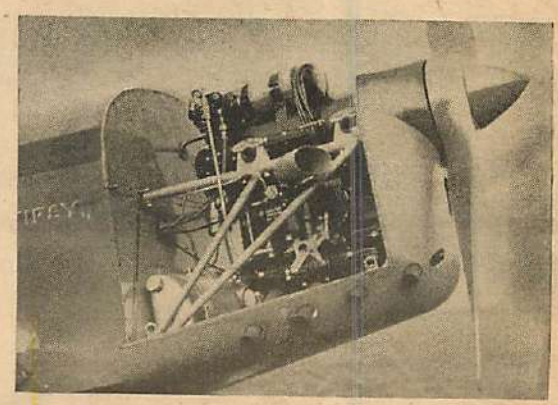
Strictly in the light plane class, the new Tipsy nevertheless presents many features that would suggest a craft of much more power. The sixty-two horsepower which this plane does boast is produced by a four-cylinder, inverted, in-line, air-cooled engine known as the Walter


Many of the interesting characteristics of the Tipsy are evident in this photo. Note one-piece elevator and staggered seats.

Mikron II. Two thousand eight hundred revolutions per minute are necessary to produce this power, and dual ignition is used. The ship is now in quantity production after over two years of planning and research.

The plane is quite conventional in most all respects. One novel innovation, however, is the slight staggering of the side-by-side seats. In order to make the plane a little more roomy, the right seat is situated eight inches behind the other, this necessitating an uneven windshield which extends slightly farther back on the right side.

Many Tipsys are being put into use to train pilots for Britain's Civil Air Guard (C. A. G.), which was recently formed and closely resembles military reserve units of this country. The Tipsy is being built in England under license from Mr. E. O. Tips, who is connected with Avions Fairey, a Belgian company building English-designed Fairey airplanes also under license. Rather a roundabout way, but it certainly has produced a trim and remarkably performing little job. A one-piece wood wing attaches to the fuselage with a bolt at four points. This allows the removal of the entire wing and control column in only four minutes. Structure holding the ribs contains a front and rear spar with pyramidal bracing between to produce tortional stiffness. All of this structure is glued and screwed together and the metal fittings used are extremely simple and easy to produce in large



The Walter Mikron II four-cylinder, inverted, in-line, air-cooled engine responsible for Tipsy's performance.

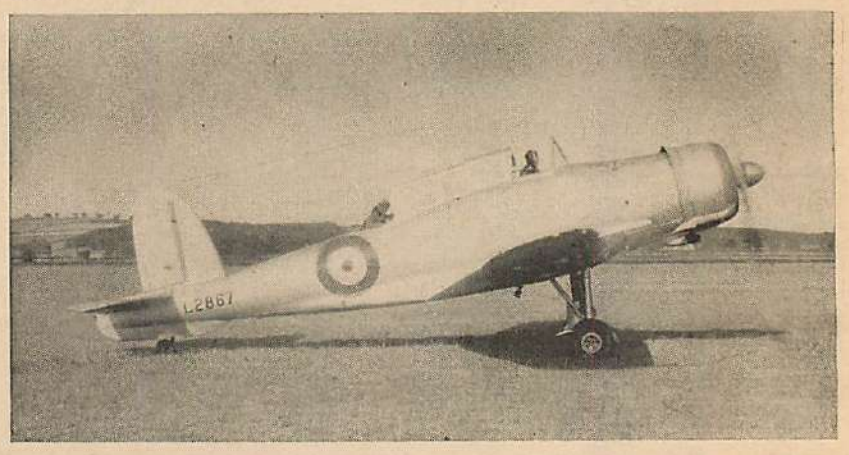
quantities. The nose portion is plywood-covered and reinforced with a leading edge member. Fabric is then used to cover the entire full-cantilever structure.

A box-type fuselage of spruce longerons is plywood-covered on the bottom and sides, while a fairing of aluminum alloy tubing is firmly lashed together to form the rounded top. Built integrally into this fuselage is the plywood-covered fin, and stretched fabric is used for fairing at the root. Mass balances are *(Turn to page 82)*

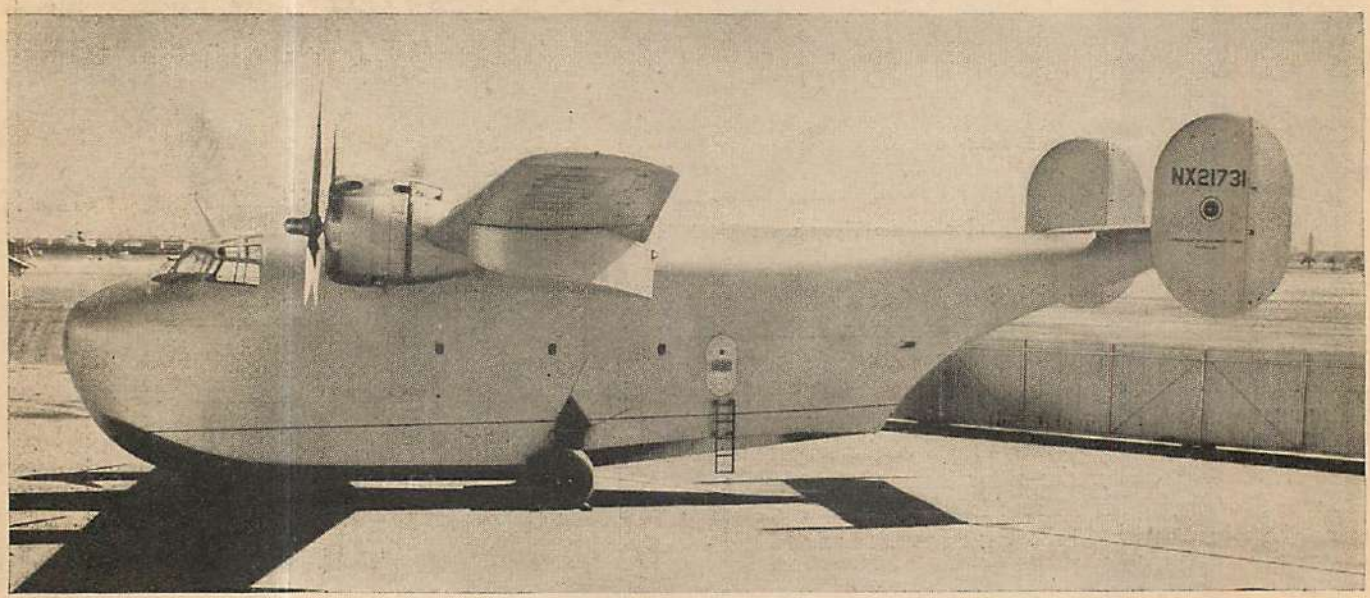
# AERO ALBUM


International

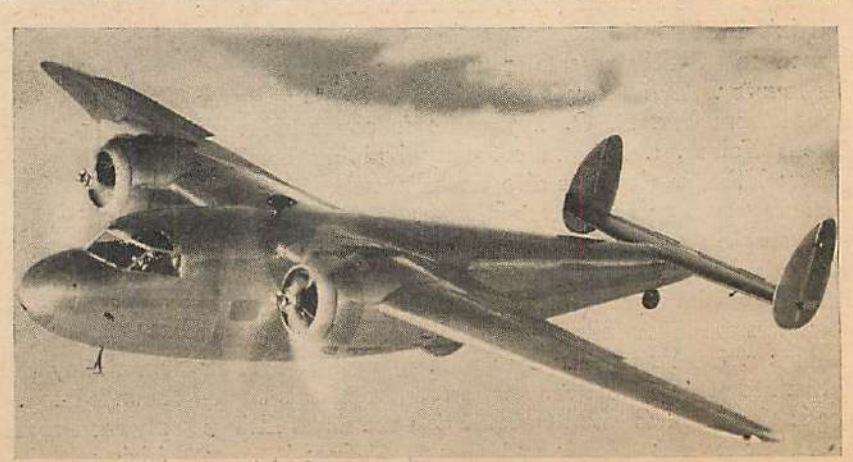
Top—A contender for 1939 Thompson is this latest Folkerts racer. Tiny wings span but 16 ft. Speed is 360 m.p.h., 400 h.p. Menasco.



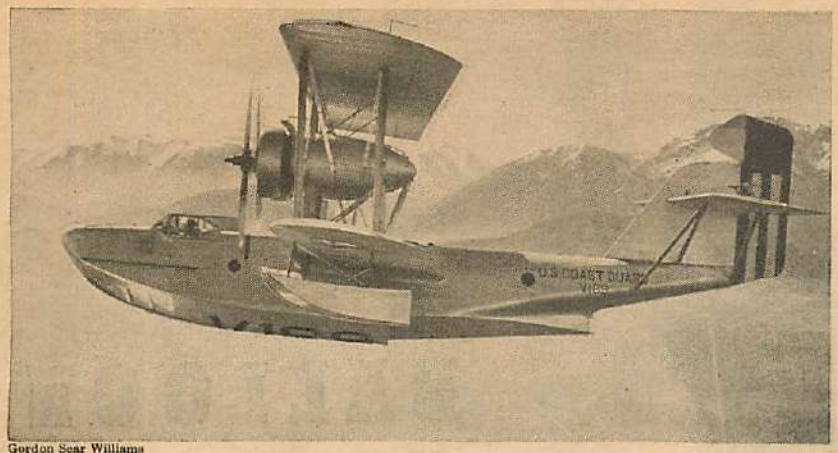

The Blackburn Skua, Britain's shipboard dive-bomber, has watertight fuselage compartments. Engine is the 900 h.p. Bristol Perseus.




Consolidated's sensational 25-ton flying boat is powered by two 2-row, 18-cylinder, 2,000 h.p. Wrights! Span, 110 ft.; ship, 57-place.

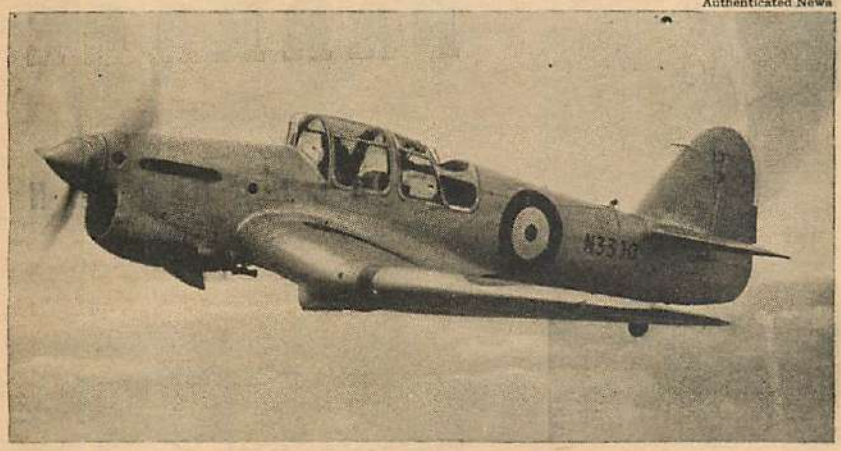


DeHavilland Flamingo, a British bid for world markets, is expected to rival the new DC-5. Speed over 200 with 12-17 passengers.



Gordon Sear Williams

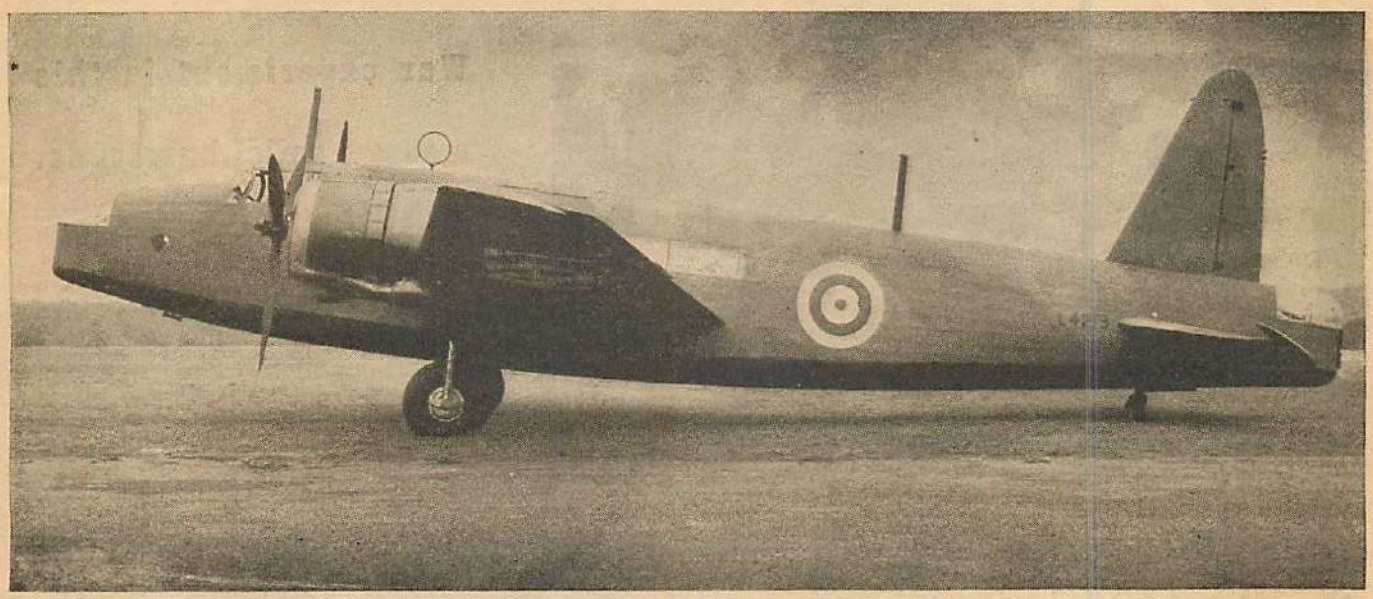
Authenticated News

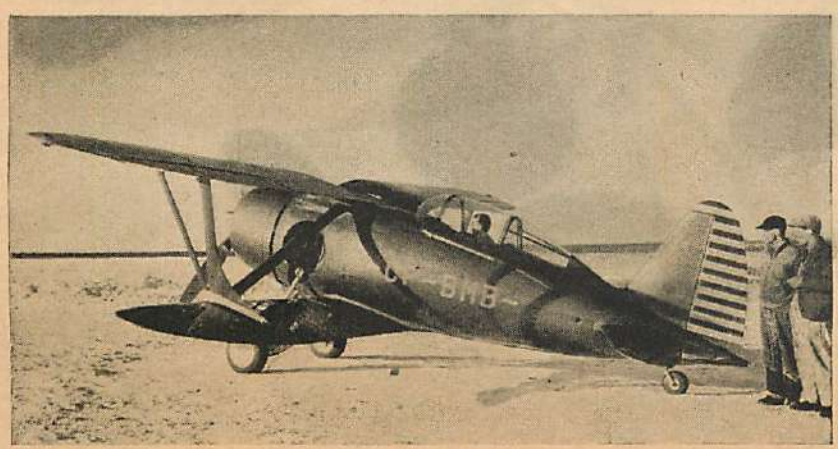


# Presenting the world's most interesting and unusual airplanes—each unique for its purpose.

Top—Coast Guard Hall-Aluminum PH-2 from Port Angeles base flying over the Olympic Mountains. Max. cruising range 2,242 miles.

Fastest trainer in the world! A 715 h.p. Rolls-Royce Kestrel drives this Miles Master faster than some fighters—about 270 m.p.h.





Vickers Wellington, long-range heavy bomber, famed for geodetic or "basket weave" construction. Tail turret is typically British.

Canada's high-speed fighter, the all-metal Gregor, has two 50-caliber guns. Speed over 300 m.p.h., engine 750 h.p. Twin Wasp.

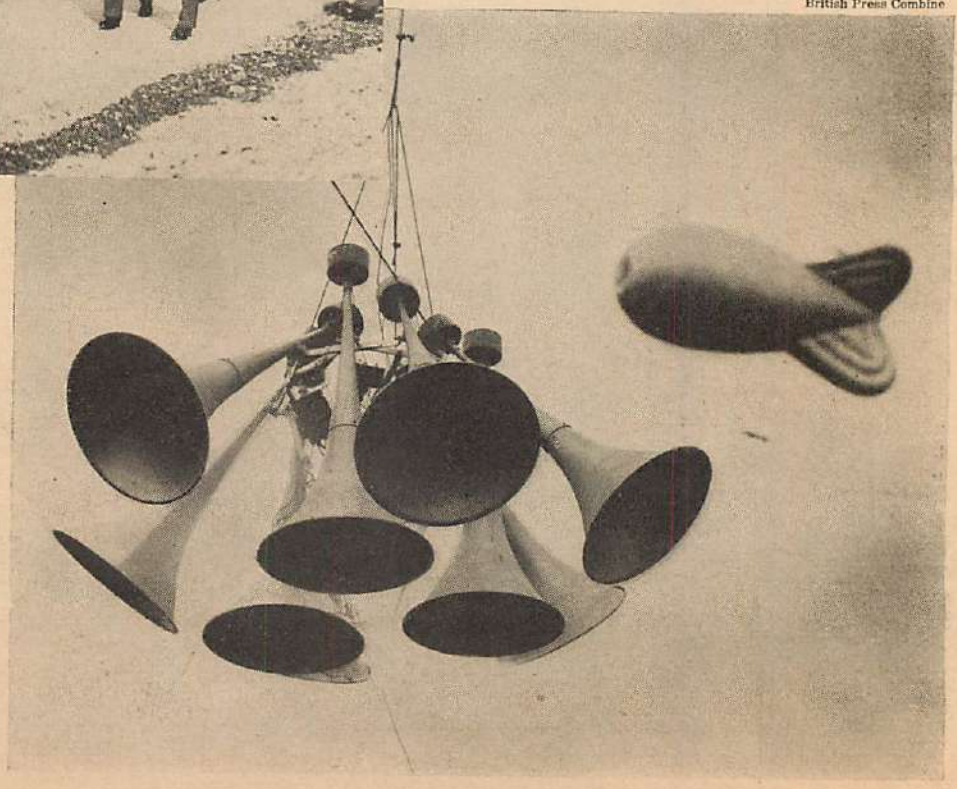
# BALLOON BARRAGE

BY ALLAN FINN

**The outgrowth of a World War experiment is this modern aerial barricade.**

British Press Combine

Above—Fit for a king! Number two unit of the English Balloon Barrage Corps is inspected by king and queen. Note winch screen.



British Press Combine

Right—A warning from the sky! These loudspeakers are hoisted aloft during air raids to warn citizens for precaution measures.

FIVE THOUSAND balloons, capable of raising two men each, could not cost more than five battleships of the line; and where is the prince who can afford to cover his country with troops for its defense as that ten thousand men descending from the clouds might not in many places do a great deal of mischief before a force could be brought together to repel them?"

Benjamin Franklin, who knew something about balloons, made that prophetic warning one hundred and fifty-six years ago. Today, his warning seems to be approaching realization, but ironically in reverse.

Europe's powerful air fleets are preparing to raid the great, swarming capitals not in Franklin's clumsy devices, but in two-hundred-and-eighty-mile-an-hour bombers; and it is the "five thousand balloons" that will attempt to throw up a defense. The men, of course, will be on the ground directing them, not up inside.

The balloon barrage, it is called, and it is the talk and hope of millions of European civilians fearing war. The idea was conceived on a small scale in the World War, a tandem contrivance called an "aërial apron," but it never got a real workout.

It was in the fall of 1936 that Britain, shocked from its lethargy by the growth and menace of the new German air fleet, suddenly decided to revive the barrage system. At first there were few enthusiasts for the project; it smacked too much of pseudo-science. David Low, the cartoonist, humorously suggested the balloons pay their way by carrying advertising. But serious-minded Britons were desperate for some new form of protection from raining death. Barrage experimentation was vigorously pushed, and the early success that attended it won over many head-waggers. Rush orders were placed for hundreds of the ungainly-looking sausages. The balloons were gradually sent up from ten thousand to forty thousand feet, the latter height being obtained with a new French type. By the spring of this year the air ministry was able to announce that the barrage was "practically up to the required standards." An inexpensive balloon with a light, powerful cable had been devised. The authorities showed their confidence in the system by earmarking $439,172,000 for a nationwide network of barrages in the new air estimates.

In France the barrage scheme already was making similar progress. Now Germany, Italy, Belgium, Russia and other countries adopted it without delay.

The French general staff began early in 1936 to plan a steel spider web across the skyways of Paris and other vital centers. Balloons attached to lethal cables and capable of ascending forty thousand feet were an immediate contribution to the project. Paris now reportedly has one thousand five hundred of these blimps. They are eighty-two and one half feet long and made of two layers of silk and one of rubber. Their gas capacity is four hundred and fifty to seven hundred and eighty-three cubic meters.

Ranged in tandem, covering between each from one thousand five hundred to two thousand feet of airway, these balloons are operated in units of ten trucks, which are equipped with ten winches and twenty balloons. A formidable barrier, this system of air traps will ring the entire northern and eastern borders of Paris in tight concentric formations, promising almost certain death to the audacious sky raider. The air defenses of the Maginot Line, along the Rhine, also have been heavily reinforced with these barrages.

Peering with opera glasses, Parisians saw their first enemy airplane, a doughty Taube, an August 30, 1914. A race of pioneer aëronauts, they quickly saw the value of sky-flung nets to ensnare the invader. Crude aërial aprons were hastily suspended, but the serried ranks of archies and combat planes at the front *(Turn to page 62)*

Globe Photo

A German balloon. Note what appears to be a wind-driven generator at bottom.

Wide World

Four of Germany's barrage balloons float over the streets of Berlin in demonstration.

Acme

Switzerland, too, with all her mountain barriers, builds her balloon-barrage units.

# GLIDING and SOARING

CONDUCTED BY

ALEXIS DAWYDOFF

## We thank you, Colonel Lindbergh!

SPEAKING before the Civil Aëronautics Authority in Washington, D. C., Colonel Charles A. Lindbergh recently said: "You should promote interest in gliding. There is very little of that here. In Germany glider clubs are all over the place." We have been saying as much in these pages ever since this department was inaugurated. The government must do something to help the movement. There is plenty of enthusiasm but practically no way of helping the enthusiasts to realize their ambition. Altogether too much stress has been laid upon accomplished and experienced soaring pilots and high-performance sailplanes, while hardly anything has been done for the boys from Podunk who are anxious to start a club but cannot afford to buy a six-hundred-dollar utility, though they can get enough money together for a primary.

This same little primary glider, sneered at by many, was responsible for a lot of the boys becoming Silver "C" pilots and champions. A group of fellows who cannot afford a relatively expensive secondary, often cool off and turn to some other sport or endeavor before even starting, but if they can get a good primary ship and taste the thrill of flying it they will try to enlarge their group to obtain more money in order to buy a better ship, in which they can accomplish soaring flights. In this way most of our bigger and better clubs were formed.

Another shortcoming in our glider movement is a lack of instructors. This is the greatest evil of all. There ought to be a special school for trainers. Again, our aëronautical authorities know comparatively little about gliding, and until they find out more about it they are "leery" of giving any material assistance. It has been suggested to them by the S. S. A. that they purchase sailplanes and gliders in order to get better acquainted with the subject.

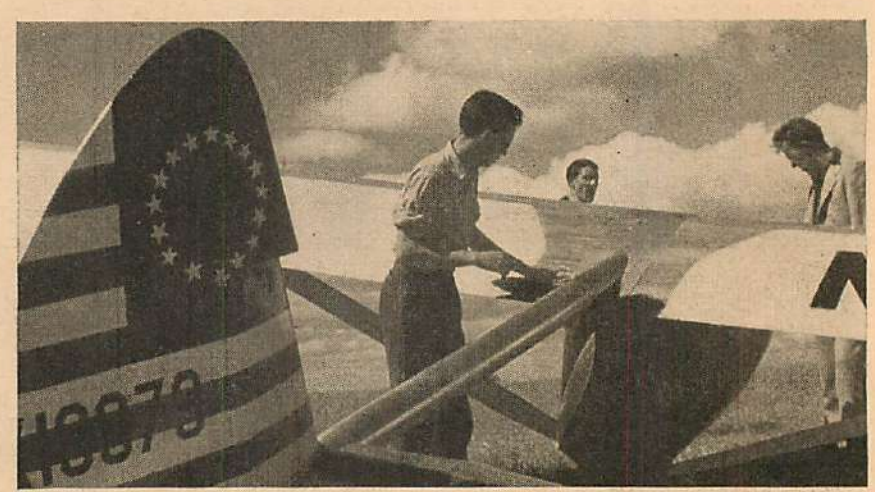
We sincerely hope that Colonel Lindbergh's words will take effect. Coming from him, no doubt they will. It certainly is gratifying to know that gliding has such a booster as Charles Lindbergh.

### NEWS AND EVENTS

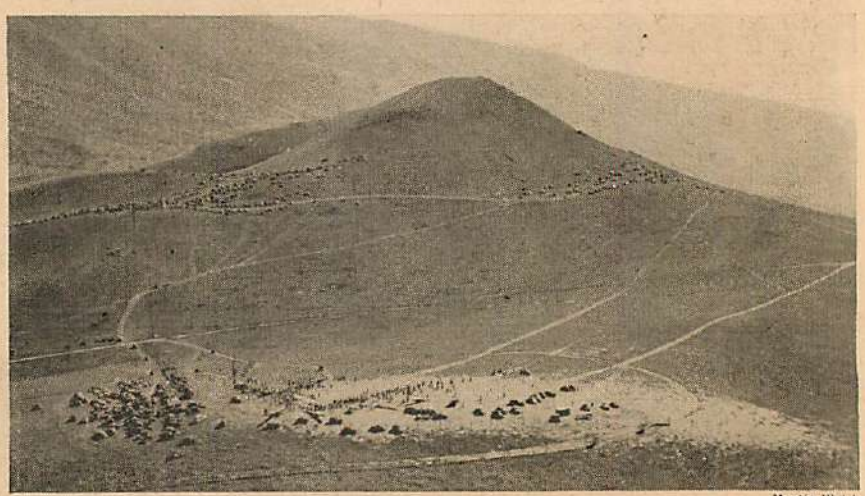
Dick Randolph of Akron, O., and Randy Chapman of Detroit, Mich., sailed recently for France to participate in the International Glider Aërobatic Contest sponsored by the French newspaper *Le Petit Parisien*. Dick will do all the flying, while Randy will act as crew chief. The *Laister* sailplane, loaned by the Lawrence Institute of Technology, will be used by Randolph for his exhibition.

---

Emil Lehecka has sold his *Gloria* to Dana Darling of Greenfield, Mass.

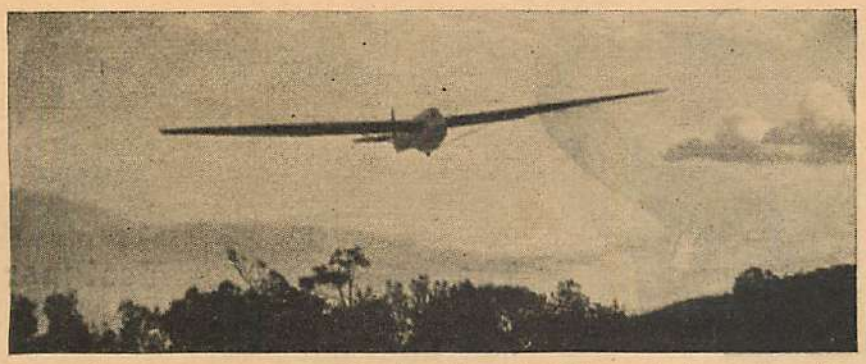


What's the matter, Jack, bored or bawling someone out? Jack O'Meara, former champion, supervises polishing his Baby Albatross before the take-off at Elmira, N. Y.

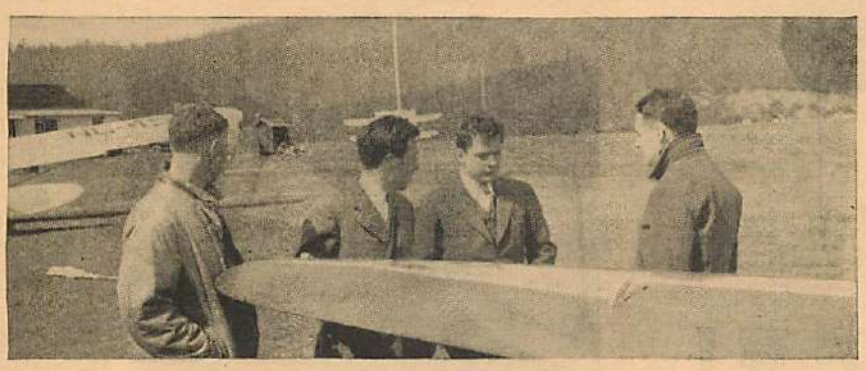


Martin-Walsh

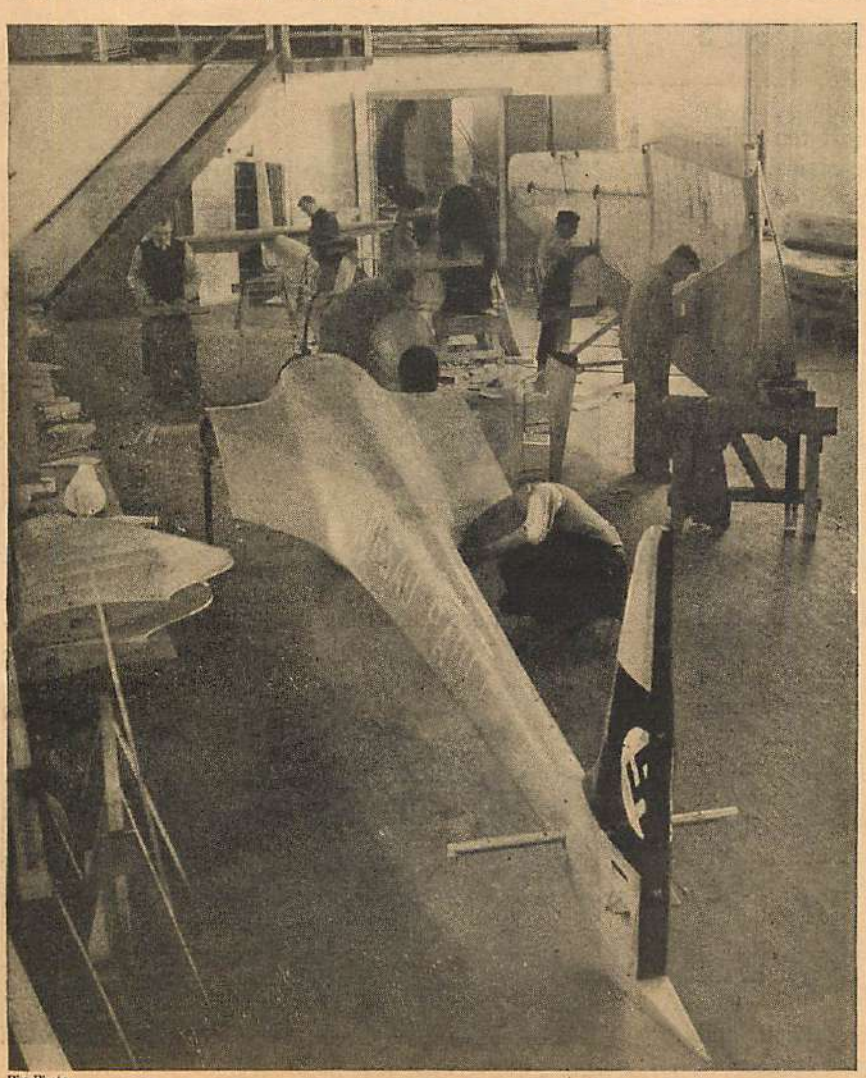
An unusual view of an unusual soaring site. The Arvin-Sierra Gliderport seen from air, looking in the direction of the San Joaquin Valley. Note parked cars on cone.



Coming home to roost at sunset. This photo shows the Airhoppers' all-metal two-place sailplane, built by the Schweizer brothers, coming in for a landing at Wurtsboro, N. Y.



An international incident at Wurtsboro. Left to right: G. S. E. Howard, of England, Wistar Brown, Henry Wightman, manager of the S. S. A., and L. B. Barringer.



Pix Photo

In the German Research Institute for Glider Flying at Darmstadt-Griesheim, the famous "Sao Pauto" sailplane and holder of many records, undergoes a general overhaul.

*Gloria,* by the way, is Emil's Cadet Special, which he used for aërobatics at various air shows. It is probably the best-known glider in the country.

---

The Airhoppers Gliding and Soaring Club has moved all its flying equipment from Wurtsboro, N. Y., to Hicksville, L. I., where all its flying is now being done. Lewin Barringer, former general manager of the S. S. A., and Mrs. Barringer have joined the club as members. Airhopper Herman Kursawe is putting finishing touches on his Kirby Kite sailplane which he is building from English plans. When finished the ship will be one of the best-looking and best-constructed planes in the country. Art Ramer is collecting solid scale models of all sailplanes and gliders flown by him. He already has a model of the Schweizer two-place and a Cadet. Stan Orzcek of Framingham, Mass., builds them for Art. Another new member of the Airhoppers is George Tabery of Long Island City, who is well known among the local model builders.

---

Captain J. F. McBlain of the army air corps is representing the army as an official observer at the Tenth National Soaring Contest.

---

Maurice L. Waters, "C" pilot, has succeeded Earl Southee as manager of the Elmira Area Soaring Association. Southee is connected now with the Private Fliers Division of the C. A. A.

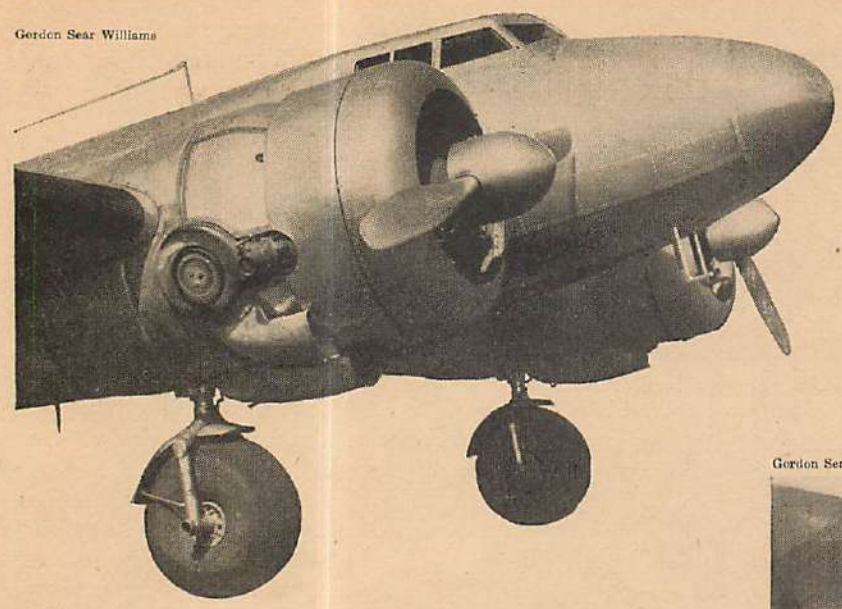
---

The Frankfort Sailplane Manufacturing Co. of Frankfort, Mich., is making rapid strides with its line of ships. The first sailplane to come off the line was a two-place job similar in appearance to Stan Corcoran's *Cinema.* The next ship will be a utility, almost finished at the time of this writing.

Seventeen students have enrolled in the Frankfort School of Soaring. They all are members of a club from Manistee, Mich.

Eleven members of the Purdue University Glider Club spent their spring vacation at Frankfort. Three of the members qualified for their "C" license. The Frankfort Soaring Association recently qualified the same number for the same license. The club has built its own winch, which will be available to any visiting glider pilots. *(Turn to page 72)*

Gordon Sear Williams



In this Lockheed XC-35 experimental substratosphere ship, turbo superchargers are attached to the two 550 h.p. Wasps. Speed over 300 m.p.h.

# SEA LEVEL— MILES HIGH!

**By GORDON SEAR WILLIAMS**

**The supercharger designer has kept pace with aviation.**

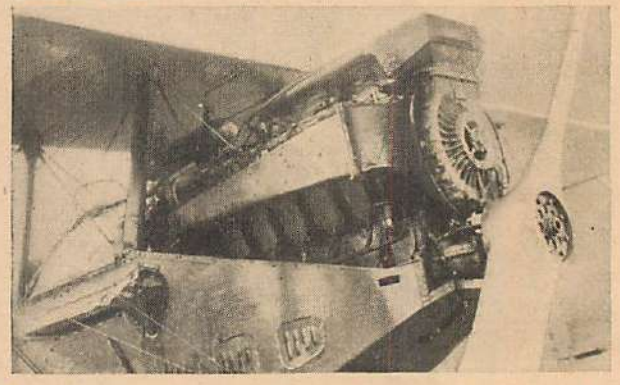
WITH man flying at heights of almost ten miles, in this amazing age, and making practical plans to use the substratosphere as a lane for aërial transport and military flights, it is interesting to trace the events that have made these startling advances possible. Without a doubt the most important single development in high-altitude flying has been the advent of the engine supercharger, which through a series of compressors, or blowers, builds up sea-level pressure for carburetor feed in the thin upper air.

The maximum ceiling of an airplane is actually that height where the generated horsepower equals the horsepower necessary to sustain flight. As the power of the internal-combustion engine depends directly on the weight of fuel and air drawn into the combustion chamber with each suction stroke, it may be seen that the engine's actual power output will be directly affected by either a lack or oversupply of air or fuel. Air is only about half the weight at twenty thousand feet that it is at sea level, so some means must be provided to supply more than an ordinary amount of air at such a height.

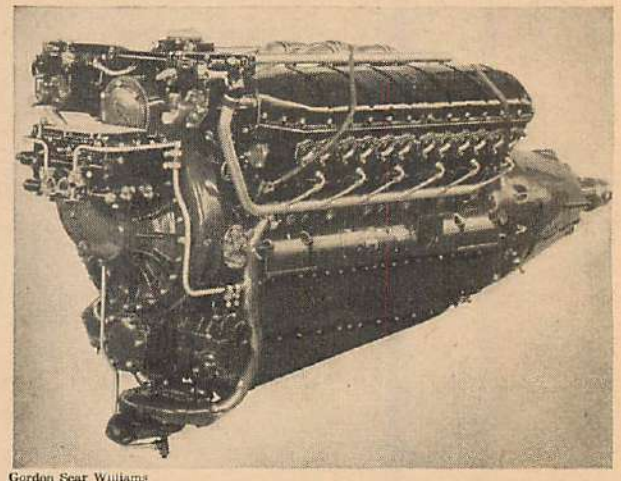
Early aircraft designers got around this dilemma by using high-output, and consequently heavy engines in their ships, actually much larger than were needed for ordinary operations. Their fuel consumption and upkeep made them quite uneconomical, however, and they proved of little practical use. To remedy this situation the supercharger was turned to as a means of enabling the engine to develop sea-level horsepower in the upper air.

Two methods of supercharging were first tried, and so far the second has proved by far the more successful. The first method is for the cylinder to take an overrich fuel mixture, which is then raised in *(Turn to page 56)*

Gordon Sear Williams

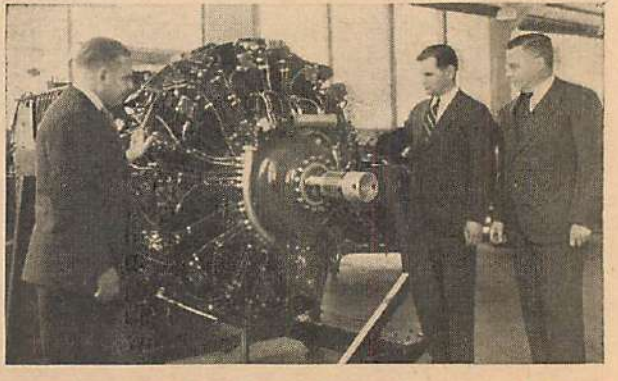


Typical of the early type of supercharger and crude installation is this Le Pere biplane equipped for high altitude. This ship was used in many record experimental altitude flights.



Gordon Sear Williams

The famous Allison V-1710-C liquid-cooled engine, developing up to 1,000 h.p. Note the built-in gear-driven supercharger at rear of engine below the high-speed carburetor.



The world's largest and most powerful air-cooled engine is the new 18-cylinder 2,000 h.p. Wright Duplex-Cyclone. This type of engine also incorporates built-in supercharger.

# Observation Planes

## THE WORLD REARMS PART V

**This important phase of military aviation requires special equipment.**

**BY FRANK TINSLEY**

EVER since the dawn of organized warfare, fighting men have recognized the tactical value of surprise. The sudden attack, the ambuscade, the slashing raid, the unexpectedly strong defense, all have been used since the days of the caveman and all are based on the simple device of surprising one's enemy. How is this invaluable advantage secured? By two basic means. The first and most important factor in surprising a foe is a knowledge of his position and plans. The second is to prevent him from learning yours.

This knowledge of an opponent's movements is obtained in various ways. Spies in the enemy's camp may learn in advance of his intentions and communicate them to you. This, however, is both dangerous and unreliable. The spy may be serving two masters and there is always the chance that you may find yourself the hunted instead of the hunter. Even if your spy is honest and successfully gathers the desired information, he still faces the problem of getting it to you in time to be of value. This last necessity has always been the weak link in espionage. In fighting, the hasty local actions that make up the bulk of all warfare, a spy, unless unusually equipped, rarely succeeds in transmitting his information rapidly enough to be used. Hence we find a disinclination on the part of most troop commanders to rely upon espionage except in special cases.

A simpler and more satisfactory means of securing information of an enemy's movements is through direct observation by qualified members of your own forces. Until recent years this was done by means of scouts who penetrated into the enemy country, and by observers posted on hilltops, watch towers or other high spots commanding a view of the enemy terrain. They relied upon smoke and heliograph signals, bonfires and messengers to pass on their information to headquarters. The messages were either written or oral and were frequently accompanied by rough sketch-maps.

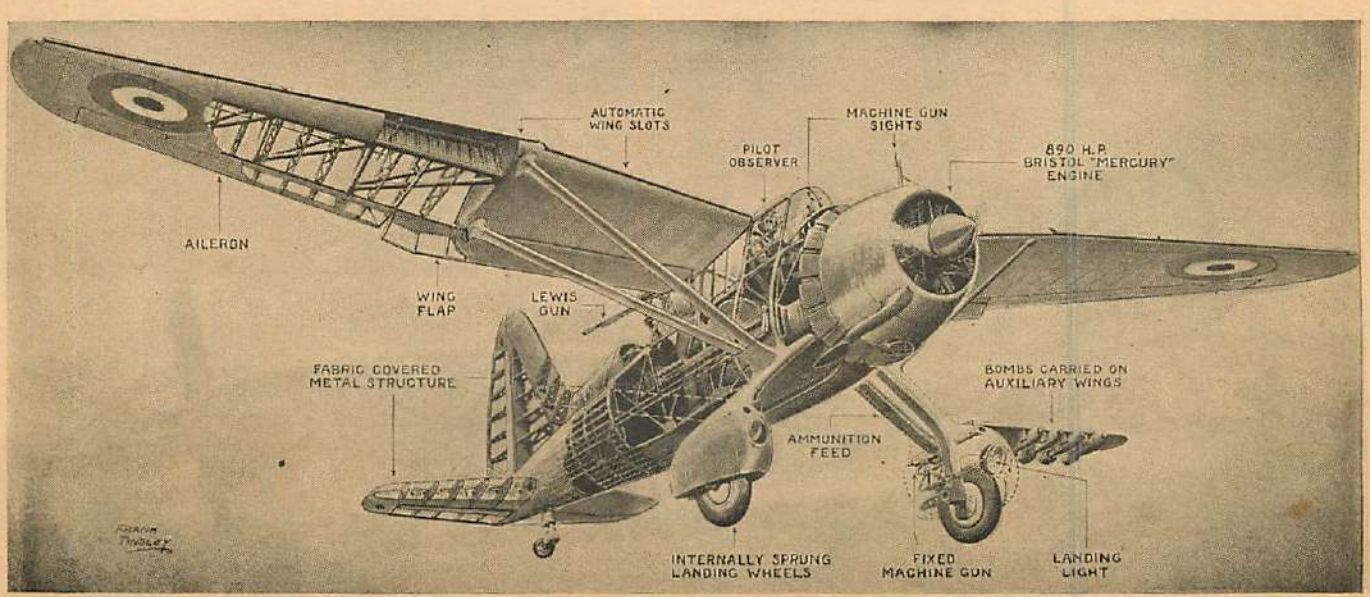
The advent of aircraft brought no basic change in the principles of military observation. The balloon and later the airplane merely lifted the observer to a higher perch than that provided by the old church steeple. He found himself equipped with an aërial camera instead of sketching materials, and a two-way wireless set to replace the old visual and oral signals.

By 1914, every military power of any pretension had an air force of one kind or another. All were organized exclusively for reconnaissance service. It was not until after the World War was well under way that airplanes began being used for combat purposes. The demands of the opposing armies for a variety of *(Turn to page 76)*

Thorell Photo

This American Douglas O-46A, powered with a 700 h.p. P. & W. Wasp, is designed mainly for military observation.

Below—In this cutaway by the author, the English Westland Lysander observation and army co-operation plane is shown.



## MORAL SABOTAGE

GREETINGS, Air Adventurers!

I am writing these lines to you who may be discouraged at the progress of things, to you who have been working hard to advance in the face of all present-day opposition.

These in a sense are discouraging days, and many of us have been wondering where it will all end. We have passed through several phases of war, near-war and the prospects of peace. We have heard great men appeal to the nations of the world to do their utmost to prevent war, and we have seen the efforts of great men derided when they have made sacrifices to gain peace. We have heard the threats of political madmen and heard the rumble of their armaments in the sound tracks of the newsreels. We have seen them grimace on the screen and heard them bellow their threats over the air waves.

What does it mean to us who are entering the educational and business world? What chance does it leave for you who have been working hard to gain a place in aviation? What hopes can we have when the warmongers threaten to blast the foundations from the pillars of civilization?

All this can be summed up as moral sabotage. It is a dastardly plan devised by those who do not have moral courage, to break down the moral resistance of men who would live in peace, but who on the other hand are willing to take up arms if necessary to maintain that peace.

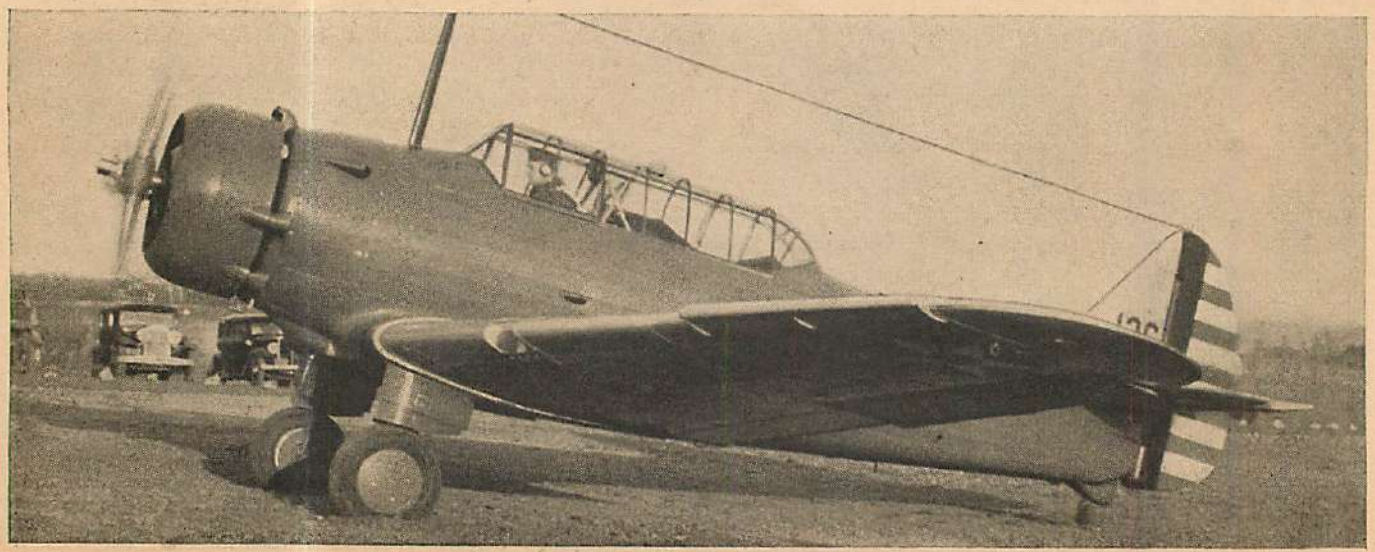
Whatever the future of the world, the warmongers are already firing the initial shots. These projectiles do not come from the flaming muzzles of guns, but from the whirling cylinders of printing presses, from the loudspeakers of our radios and through a far more treacherous medium, the whispering campaign. Do not be discouraged by any of it.

Now the drumfire is being directed at the air services of the United States. It is a noticeable fact that all these statements credited to So-and-so are never actual statements. They are always qualified with the words "it is reported that" or "it is believed that," but never an actual straightforward statement made by these men. The self-appointed experts are having a field day. Few of them have ever fired a shot in any war and practically none of them has ever been in a military plane. Their one basic standard on which they all judge the relative merits of military types is on the speed a plane makes. They have ignored the fact, or are ignorant of it, that the fastest plane used in the Spanish War was the one that suffered the most casualties.

The moral sabotage barrage does not stop there. Not only is the equipment belittled but the men who are working hard against all forms of opposition are bullied and derided. Nothing they attempt is right. Nothing they do has any worth-while effect. The designers are designing planes that are obsolete before they come off the drawing boards and do not in any way compare with the Jung-Blotz BJ-109 fighter or the Fiat-Romeo bomber.

We've got to stop this flood of moral sabotage, and we Air Adventurers are the ones who can do it. They have no ammunition for youthful enthusiasm, and if we can go out and tell the real story of the strength and

This splendid photograph of a North American BT9 was sent in by Air Adventurer R. R. Meyers, of 155 Chew St., Allentown, Pa.

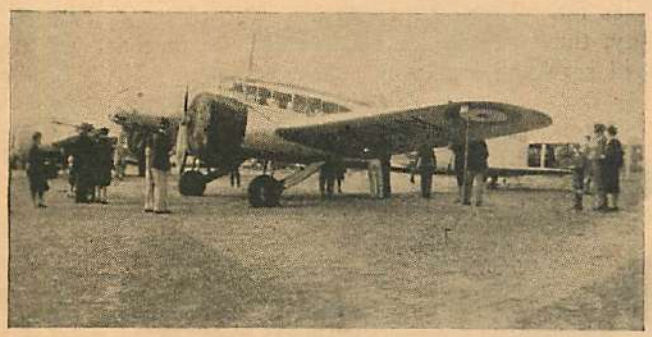


moral armament of our air services, we can destroy all the subversive drumfire in one week. We won't be told by self-appointed experts what is wrong and we won't listen to the astronomical figures of the strength of the dictator forces. If they can show us actual figures, details of the actual squadrons, their numbers and where they are located—then, and then only will we believe them. We can pick up authentic volumes and find out that there are so many squadrons in the United States air services. We can take the same volumes and learn the disposition of the various commands, wings and squadrons of the Royal Air Force and the same about the French and many others. Why, then, build up a lot of faked secrecy about the dictator forces?

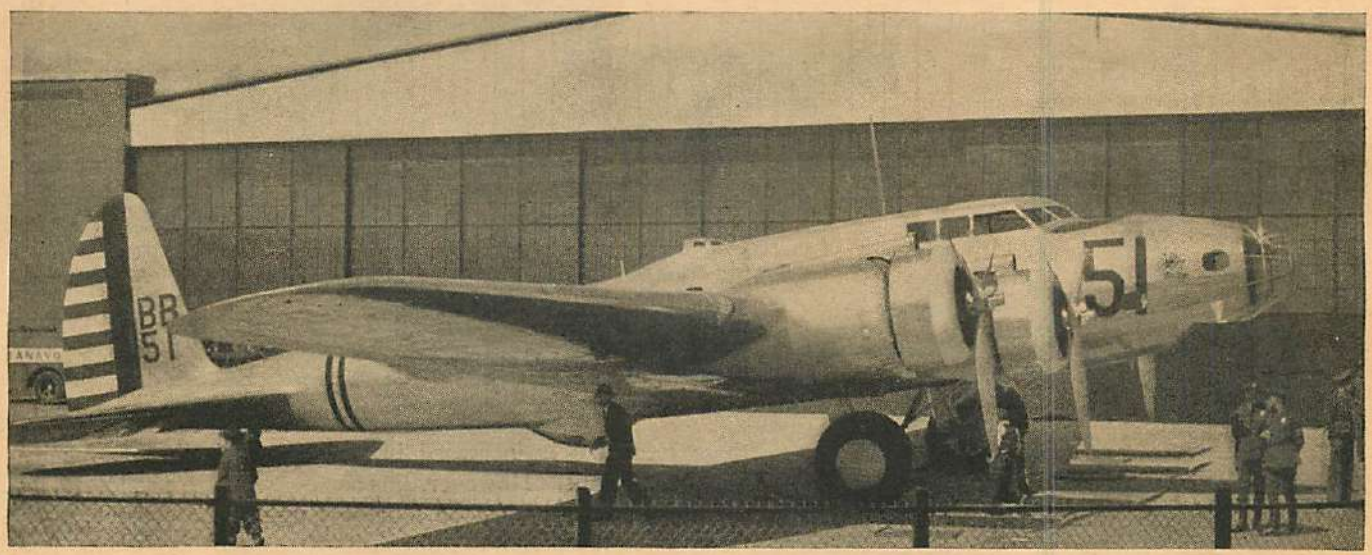
No, the moral sabotage goes on just the same, and we have been eating it up for months. Now we are going to lash out and tell the world that the United States has well over three thousand first-line war planes. That the army air corps has nearly one hundred first-line fully equipped squadrons. That the United States naval air service is the best in the world, and that our pilots and observers are all volunteers—not conscripts. We have the best aircraft carriers in the world and the finest long-range patrol boats and bombers. We have the most effective attack squadrons, the most effective air machine guns, and antiaircraft equipment which compares with the best.

And what is more we have thousands of Air Adventurers who are ready and willing to step in and take the places of the men who are working hard to make our air services the greatest the world has ever known.

Let's go, Air Adventurers! We'll tell 'em if they really want to know. We'll give 'em facts and figures, not merely drumfire propaganda that has no authentic background. *(Turn to page 73)*



All the way from Australia comes this photo of an Avro Anson, of the Royal Australian Air Force, sent in by Graham Strout.




An exceptionally clear photo of famous YB-17 bomber taken and sent in by Air Adventurer Earl Hafer, of Nashville, Tenn.

Showing beautiful craftsmanship, this Boeing F4B4 model was built by Air Adventurer J. Dalton Crandall, Jr., Peace Dale, R. I.

Actual size of your Air Adventurers pin.

## (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 enclose ten cents to cover postage.

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

Address .....

.....

☐ Check here if interested in model building.

*(This coupon not to be used after Sept. 15, 1939.)*

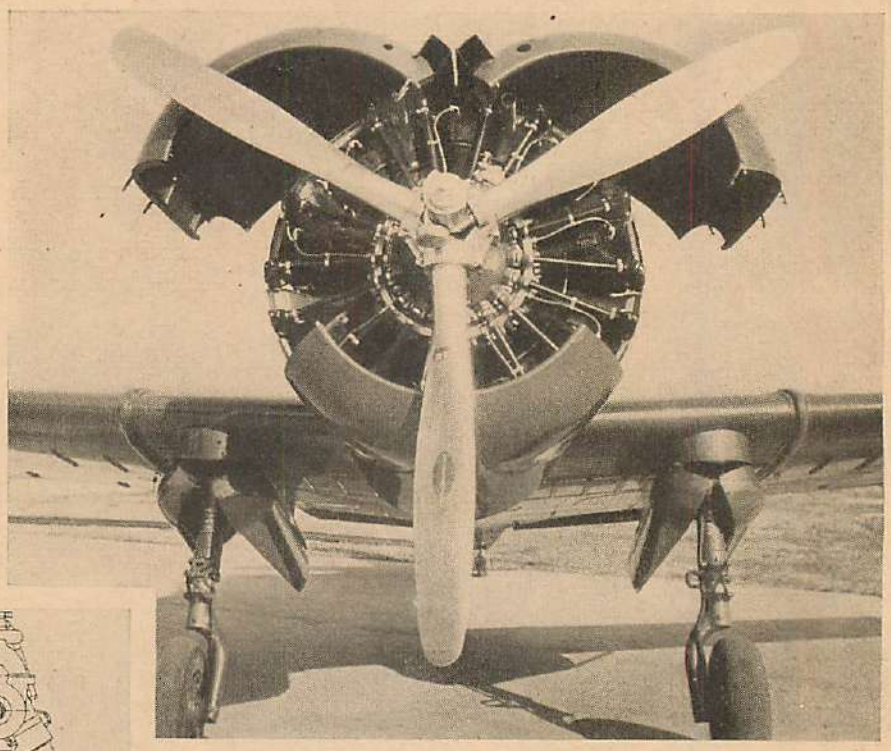
# INVENTORS FOR ENGINES NEEDED

by JAMES P. EAMES

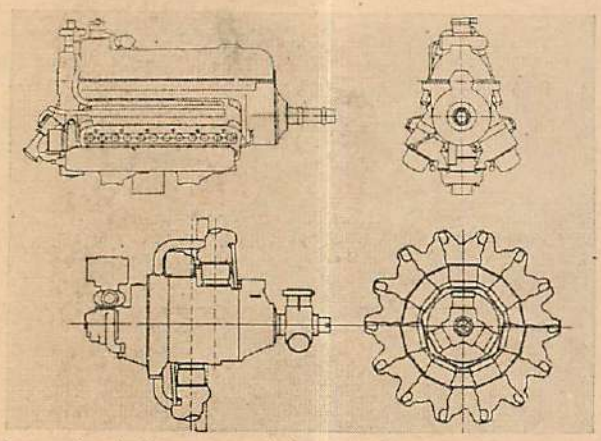
**An authority charts the trend in future engine development.**

THERE exists apparently at the present time a gradually increasing trend toward reversion to the in-line type of aircraft power plant, particularly in military circles. The respective advantages of the radial and in-line types of engines are, roughly, quite evenly equated. The lowered drag emanating from the decreased frontal area of the latter type represents an important factor, although antidrag rings and the various modifications of the N. A. C. A. cowlings have tended to assist the radial engine tremendously in this regard.

The radial aircraft power plant unquestionably possesses the all-important characteristic of better accessibility, thus making for ease of maintenance as well as rapid servicing and replacement of parts. Visibility is undoubtedly increased in the case of in-line engine installations. However, this factor is not so pronouncedly favorable as may be apparent upon first consideration, since the pilot's cockpit must necessarily be located farther back in the fuselage structure. Some of the latest military pursuit designs give ample evidence of this condition, the pilot being located just forward of the vertical stabilizer or fin in many instances.



Typical of the present development in aircraft engines is this 1,000 h.p. Wright Cyclone, mounted in the Curtiss CW-21.



Proportional dimensions of the radial and in-line engines.

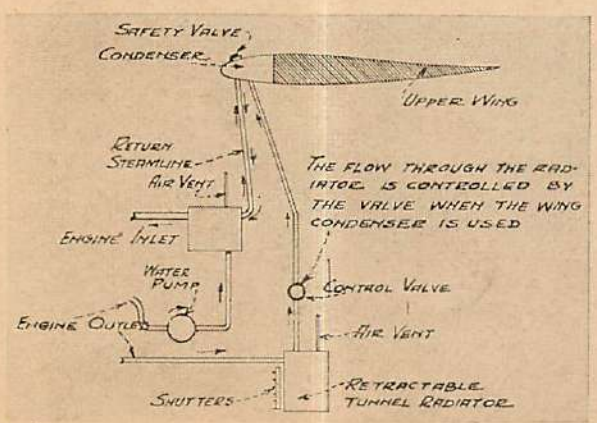


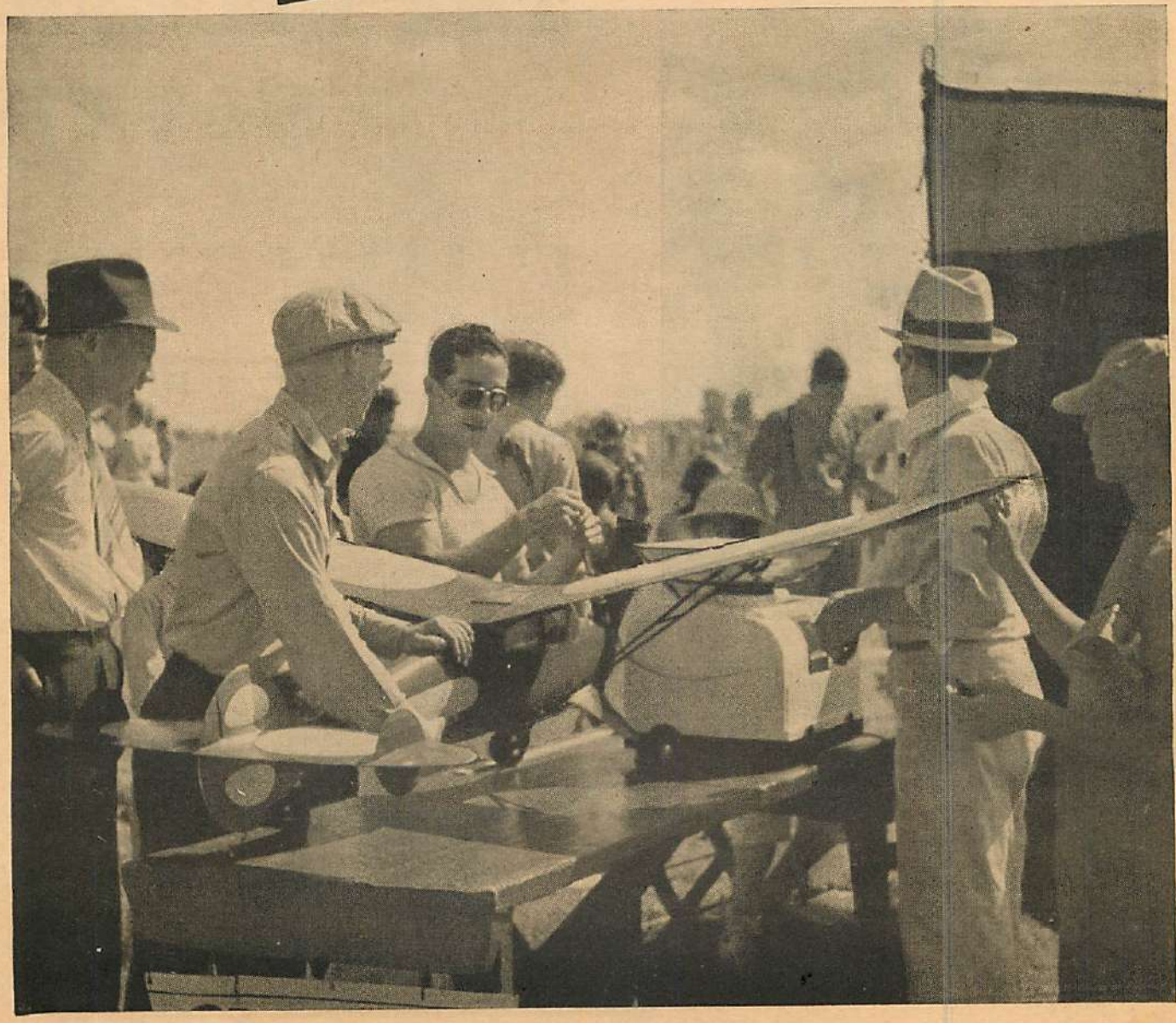

Diagram of a typical engine evaporation cooling system.

The double-row radial aircraft power plant with the rear bank of cylinders baffled for adequate cooling represents a compromise between the single-row radial and the in-line engine and possesses certain favorable characteristics superior to either of these types. Now we hear from authentic and reliable sources that several big military engine designs are projected for the near future incorporating multiple banks of cylinders, as many as four in some instances. Figure 1 illustrates the proportional frontal areas and longitudinal dimensions for two typical military engines of the in-line and double-row radial types.

When we pause to consider, as above, the enormous strides that have been accomplished within the past few years, we wonder what the future has in store for the field of aëronautical power plants. Engines have progressed step by step with advances in *(Turn to page 89)*

THE LATEST NEWS, PLANS AND TECHNICAL DEVELOPMENTS IN BUILDING AND FLYING MODEL AIRPLANES.

# AIR TRAILS Model building SECTION



# THE RECORD HOUND

BY HENRY STRUCK

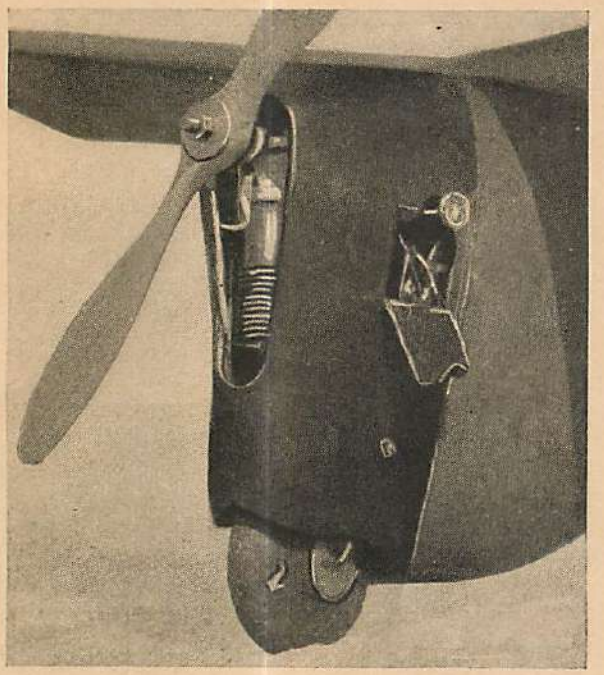
**The ship that set a 1939 N. A. A. record during the winter with a three-flight average of 5:41!**

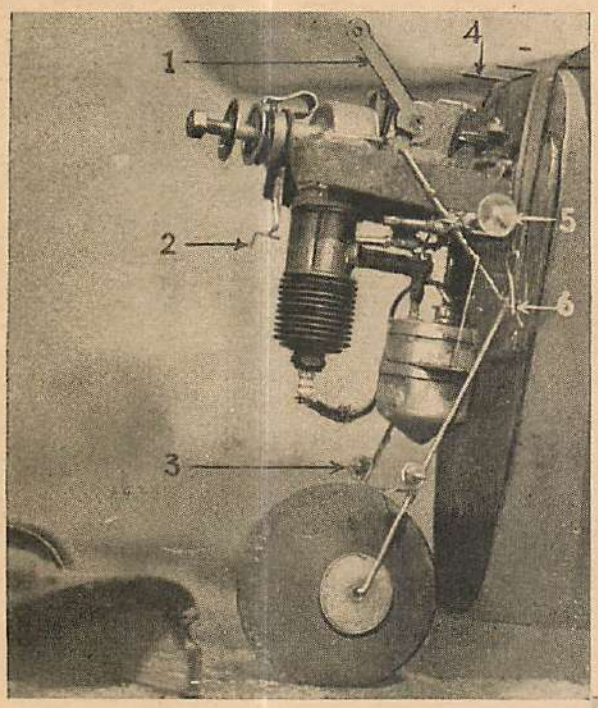
CAREFULLY designed for high performance, easy servicing, and thorough protection of vital parts, this ship is ideal for both contest and sport flying.

The single-wheel arrangement has many advantages, chief of which is a great reduction in drag, as the motor and landing gear can be completely housed within the fuselage itself, without exceeding the cross section required by the N. A. A. rule ($L^2/_{100}$). Though inverted, the engine cannot be damaged by striking an obstruction or nosing over. Last, but not least, a considerable amount of weight can be saved and incorporated in the rest of the structure for greater strength. (Could it be that two ships can be built from one pair of wheels?)

The motor unit is easily removable, permitting instant inspection at the field, or bench-testing at home clamped in a vise.

A comparatively high thrust line, long tail moment arm, and large stabilizer area aid the ship in assuming and maintaining its own most efficient attitude. Generous polyhedral in the wings and slight anhedral in the

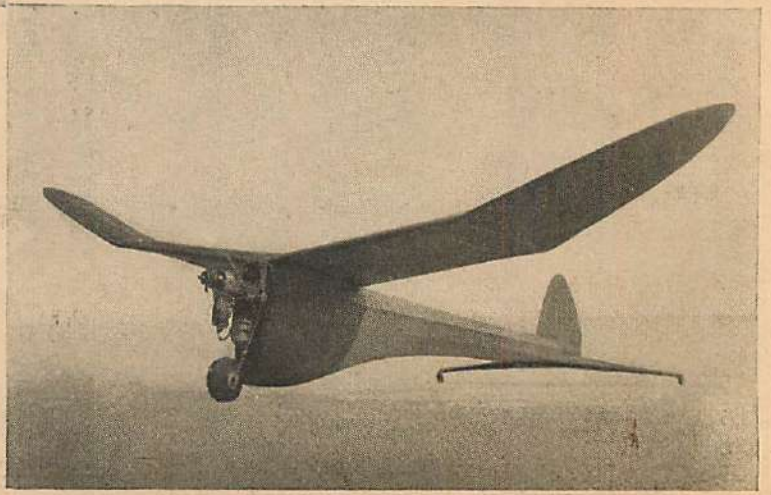





Top—Though inverted, engine is protected by wheel. Frontal area is small, engine accessible.

Above: 1—timer, 2—spark extension, 3—cowl retainers, 4—cowl pins, 5—throttle, 6—wing hooks. Nose cowling is quickly detachable.

Right—This ship was designed expressly for contests and every flight is a record threat.



tail work for spiral stability. After watching many a juicy spiral, it seems that the tail swings outward, increasing the angle of attack on that portion, helping to rotate the rear of the fuselage. Anhedral in such a situation creates just the opposite effect, producing a righting tendency.

The wing area has been kept as small as possible without skimping weight on the motor unit, or exceeding the minimum N. A. A. weight rule of 8 ounces per square foot, to attain the fastest climb and lowest sinking speed possible. These desirable qualities were exhibited by the original at its first contest by flights of 3 minutes, 19 seconds and five minutes, 40 seconds on a 19-second motor run. In calm air the altitude reached with this motor run has been determined to be actually 300 to 400 feet, resulting in a power to glide ratio of over 8 to 1.

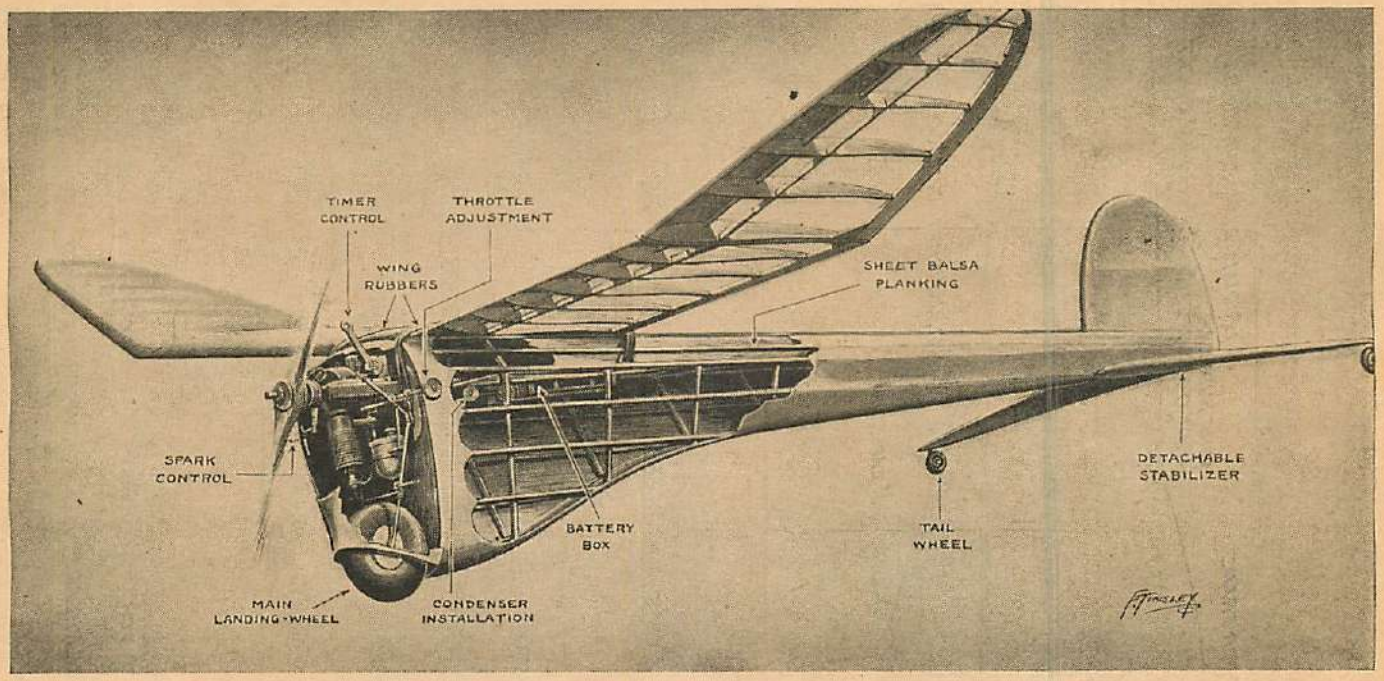
## FRAME CONSTRUCTION

The drawings should be enlarged to full size wherever necessary, using the dimension chart and the scale given on the plans.

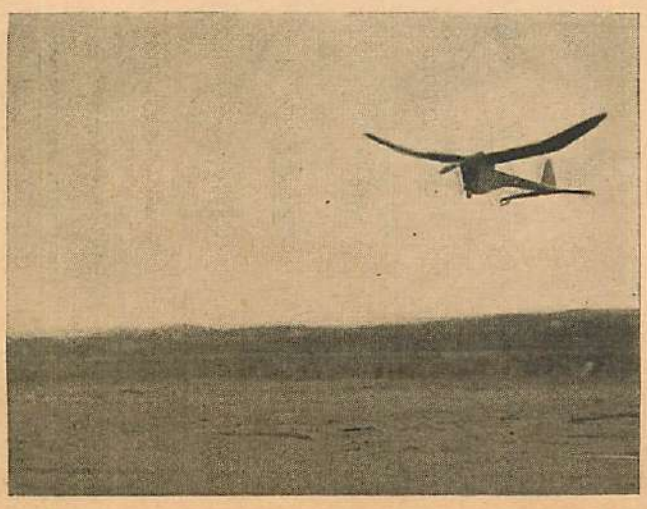
The fuselage is illustrated in four stages of construction on Plate I. Pin the longerons of $^3/_{16}$" square hard balsa on the fuselage frame layouts. Fit the crosspieces of $^3/_{16}$" square and the diagonals of $\frac{1}{8}$ x $\frac{1}{4}$" in place. See Step I.

Remove the upper frame from the plan and mount it above the lower frame, using temporary uprights to maintain the correct heights, as called for by the fuselage dimension chart. See Step II.

Transfer the outline of bulkhead No. I, given in full size on Plate III, to a sheet of $^3/_{32}$" plywood 4 x 10". Use a jig saw to cut it to shape and glue it to the frame, checking the alignment carefully. Prebend the bottom longeron of $^3/_{16}$" square hard balsa by soaking in water and running it over a soldering iron or other hot metal. When all the moisture has dried out the wood will retain its shape. Insert the longeron in the bulkhead and true it up with temporary uprights cut to the heights given on the chart. Cut the actual uprights to approximate length and cement them against the corners of the longeron, trimming the bottoms when dry. Cover the upper frame




The most interesting job in the East. Drawing shows features.



Below—Its flat glide is uncanny; just any thermal will do.

sides with $^1/_{16}$" soft sheet balsa to form a rigid backbone structure. See Step III.

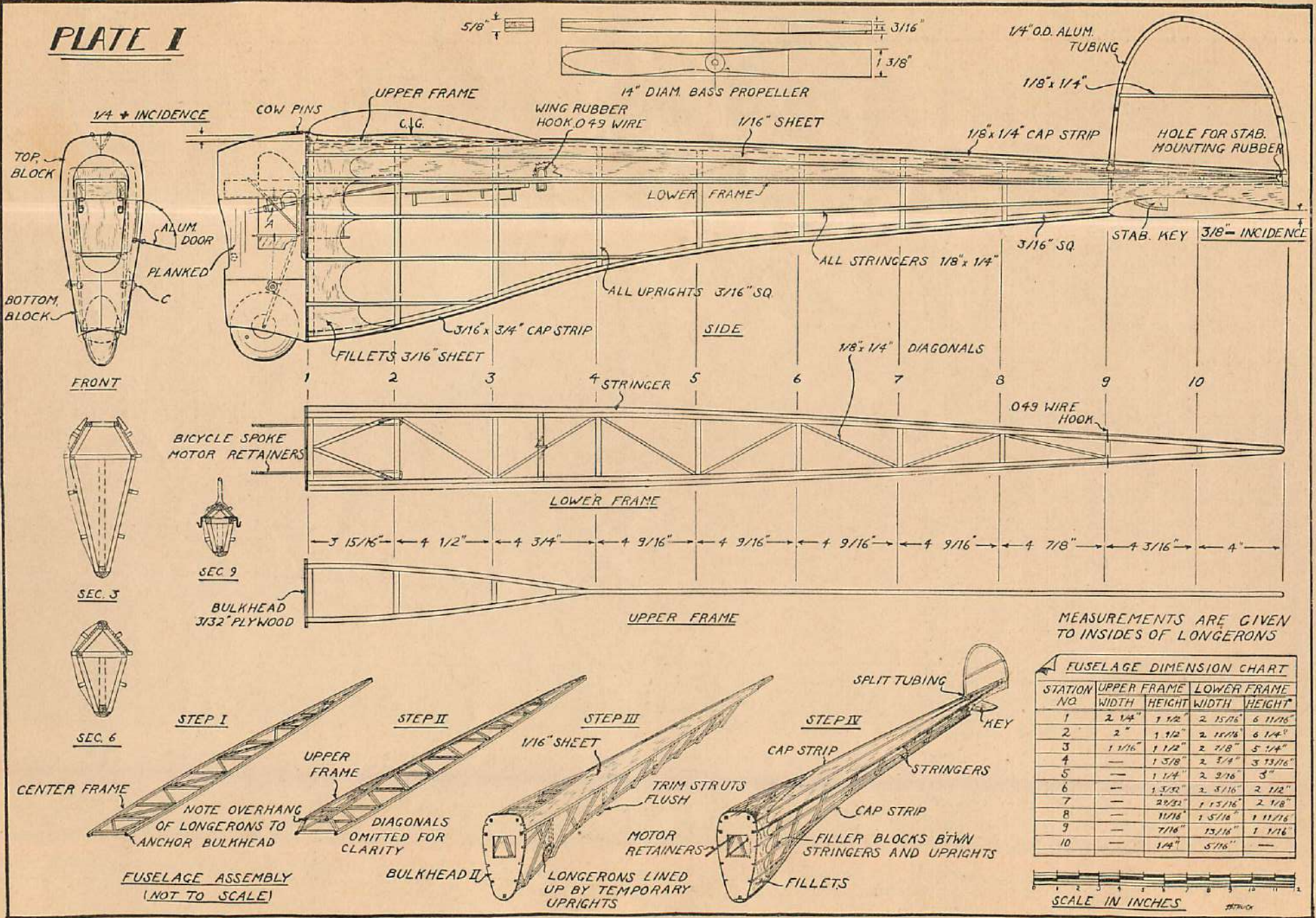
Cement a cap strip of $^3/_{16}$ x $\frac{3}{4}$" soft balsa to the bottom longeron. Stringers of $\frac{1}{8}$ x $\frac{1}{4}$" medium balsa, fillets of very soft $^3/_{16}$" sheet, and the tail rest of $\frac{1}{8}$" hard sheet are added to complete the fuselage.

Anchor the motor unit retainers formed of bicycle spokes to the lower frame with plenty of cement.

The rudder outline is made entirely of a 20" length of $\frac{1}{4}$" O. D. aluminum tubing. Bend the tubing to the desired outline and hammer it lightly to flatten the section. Split the ends and mount on the fuselage with several coats of cement. This type of rudder can be bent perfectly as the aluminum is "dead" and cannot spring, warp, or be knocked out of adjustment. See Step IV.

*(Turn to page 77)*

# PLATE I




MEASUREMENTS ARE GIVEN TO INSIDES OF LONGERONS

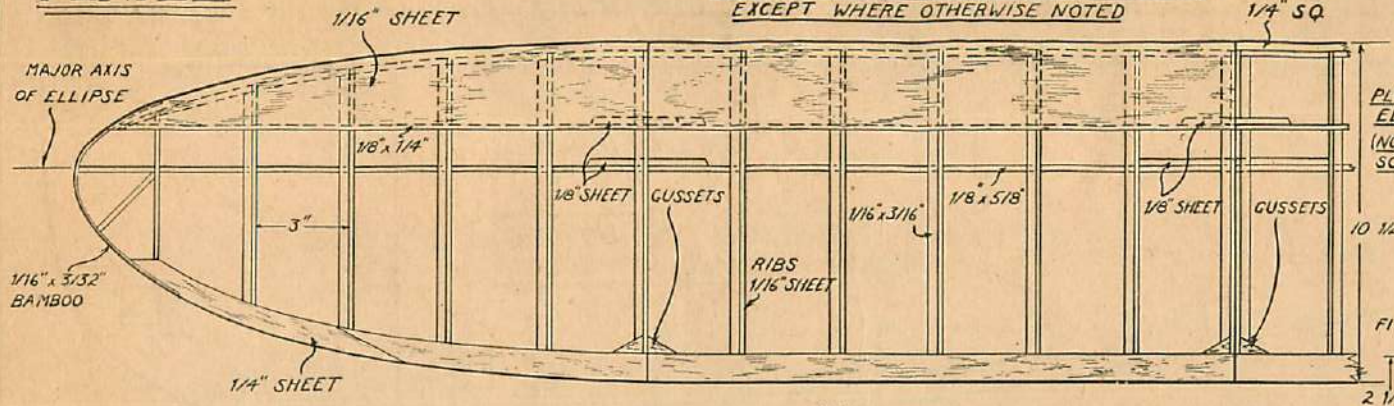
FUSELAGE DIMENSION CHART

| STATION NO | UPPER FRAME WIDTH | UPPER FRAME HEIGHT | LOWER FRAME WIDTH | LOWER FRAME HEIGHT |
|---|---|---|---|---|
| 1 | 2 1/4" | 1 1/2" | 2 15/16" | 6 11/16" |
| 2 | 2" | 1 1/2" | 2 15/16" | 6 1/4" |
| 3 | 1 1/16" | 1 1/2" | 2 7/8" | 5 1/4" |
| 4 | — | 1 5/8" | 2 3/4" | 3 13/16" |
| 5 | — | 1 1/4" | 2 3/16" | 3" |
| 6 | — | 1 3/32" | 2 5/16" | 2 1/2" |
| 7 | — | 29/32" | 1 13/16" | 2 1/8" |
| 8 | — | 11/16" | 1 5/16" | 1 11/16" |
| 9 | — | 7/16" | 13/16" | 1 1/16" |
| 10 | — | 1/4" | 5/16" | — |

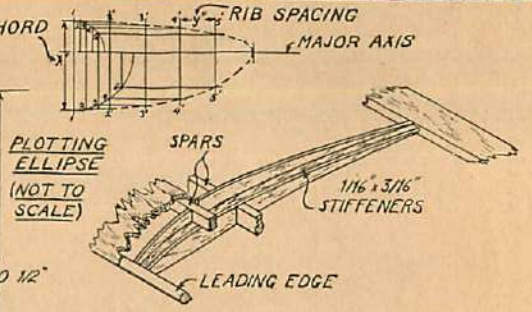
SCALE IN INCHES

# PLATE II

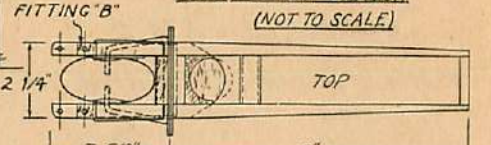
SAME SCALE AS PLATE I (1"=6")
EXCEPT WHERE OTHERWISE NOTED




WING



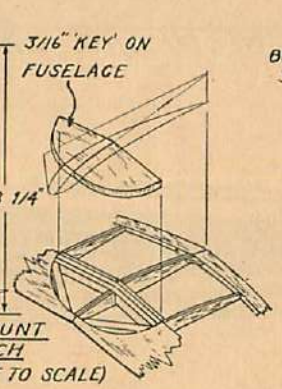

WING AND STABILIZER CONSTRUCTION SKETCH (NOT TO SCALE)



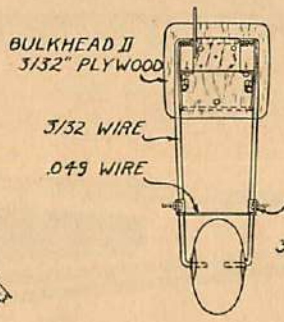

TAIL WHEEL SKETCH



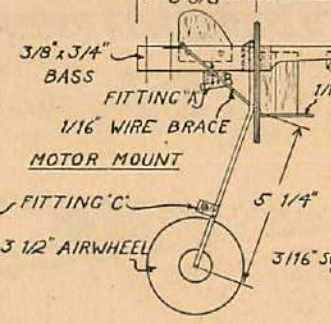

STABILIZER



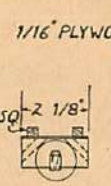

STAB MOUNT SKETCH (NOT TO SCALE)



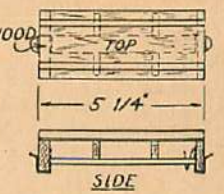

FRONT



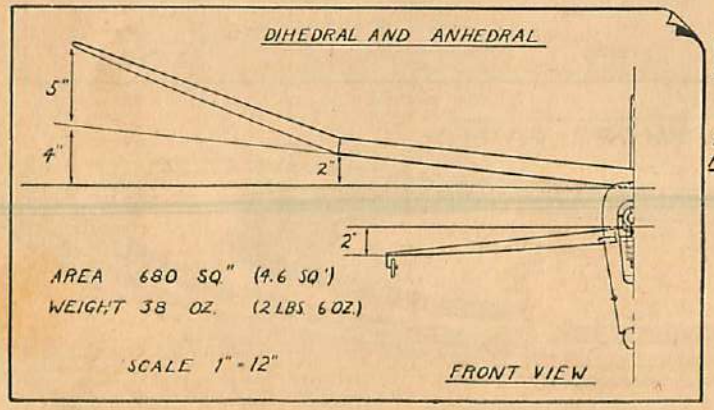

SIDE

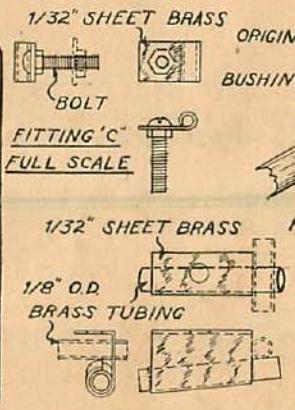



FRONT

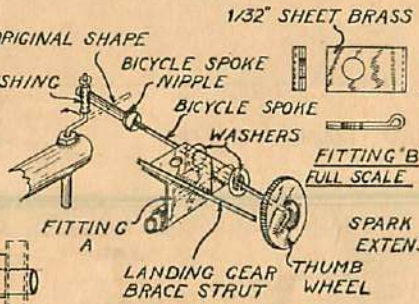



SIDE

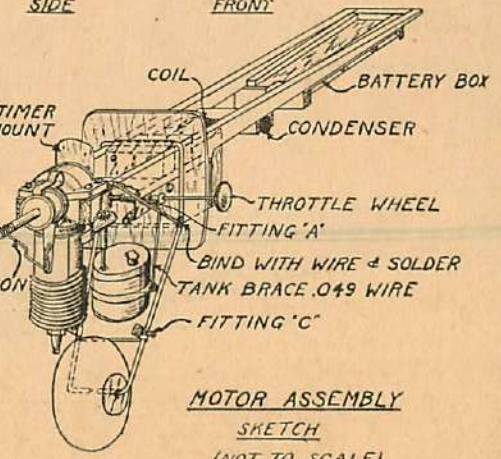



FITTING "A" FULL SCALE

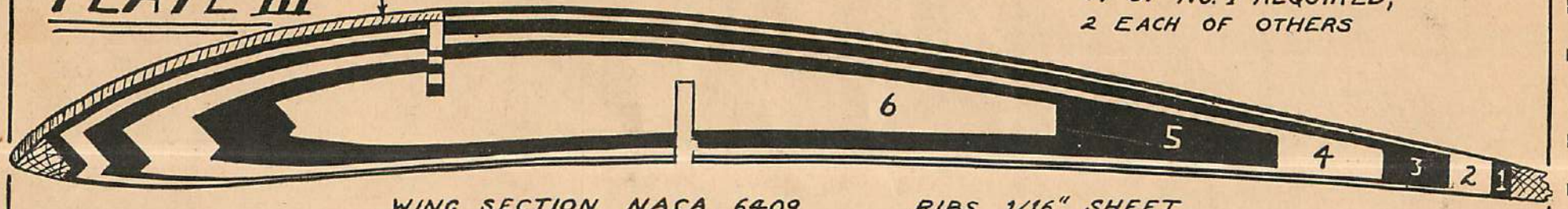



NEEDLE VALVE ADAPTION FOR BROWN "D" (NOT TO SCALE)

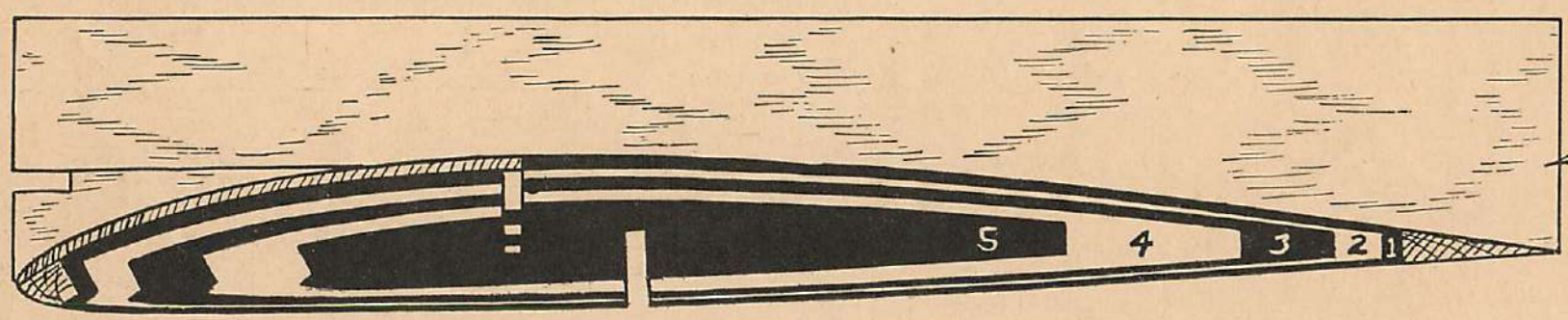



MOTOR ASSEMBLY SKETCH (NOT TO SCALE)

# PLATE III

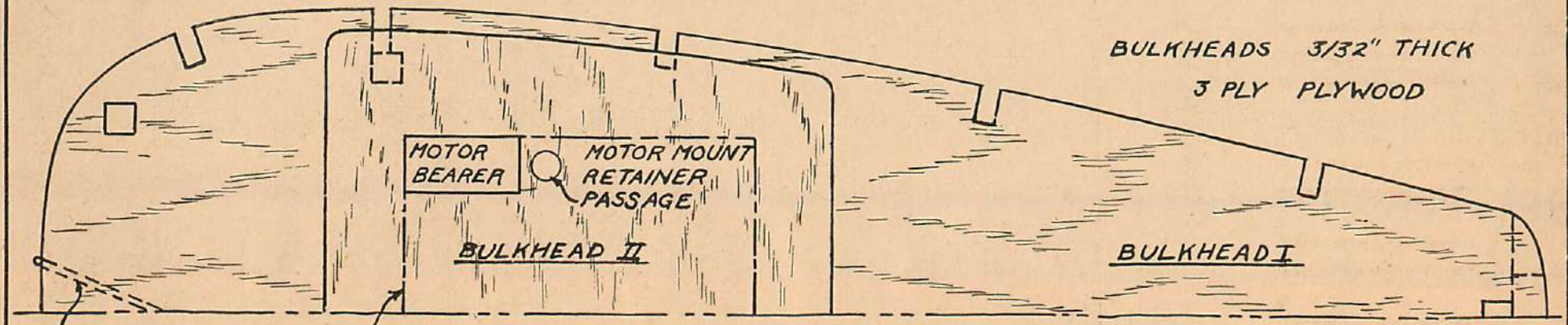



WING SECTION N.A.C.A. 6409 RIBS 1/16" SHEET




2 OF EACH REQUIRED RIBS 1/16" SHEET

ALTERNATE RIBS SHOWN IN BLACK AND WHITE FOR CLARITY




FULL SCALE

# junior N.A.A. NEWS

## Prepared by

## William R. Enyart, Sec. N. A. A.

### OFFICIAL MODEL FLIGHT TIME

N. A. A. has received a number of requests for an interpretation of the new ruling governing the method of determining official flight times.

In order to eliminate to a greater extent the element of luck, and in order to encourage finer workmanship and design in model aircraft, the Academy of Model Aëronautics changed the rules to read, "Scoring time shall be the average elapsed time of three official flights." This means that the three official flights turned in by a model shall be averaged; this average to be entered as the flier's official time.

In order to make sure that the flier takes advantage of all three official flights, rather than stopping with one or two, the Academy further ruled that the total elapsed time should be divided by three, representing the three official flights allowed.

### AIR FIELD FOR PITTSBURGH MODELERS

Model enthusiasts in the Pittsburgh area have long realized the need of a model airplane field where modelers could operate without hazard or inconvenience to anyone. The dream was realized recently when the county commissioners of Allegheny County set aside a tract of land to be used exclusively for model flying. Known as the Allegheny County Model Airfield, it will be open to all modelers in the Allegheny Mountain area. Already several contests have been held there, with more scheduled for later summer.

This model air field is the first of its type in the State. It shows a progressive attitude on the part of public officials in trying to meet the needs of the fastest-growing hobby in the country.

Contests are sponsored by the Aëro Club of Pittsburgh, the Boys' Club of Pittsburgh, and Post 531, American Legion. All contests call for a full schedule of events—rubber and gas-powered, glider, and original design.

Model work is moving forward rapidly in the Pittsburgh area. With such enthusiasts as Harry Vogler, Jr., R. K. Allen, George McKinley, and many others, there's little doubt that Pittsburgh will gain even greater national recognition within the next few years.

The following contest dates have been set for contests at the new Allegheny County Model Airfield: July 23rd, August 20th, and September 17th. Full information is available from Contest Director Harry G. Vogler, Jr., Boys Club of Pittsburgh, Pittsburgh, Pa.

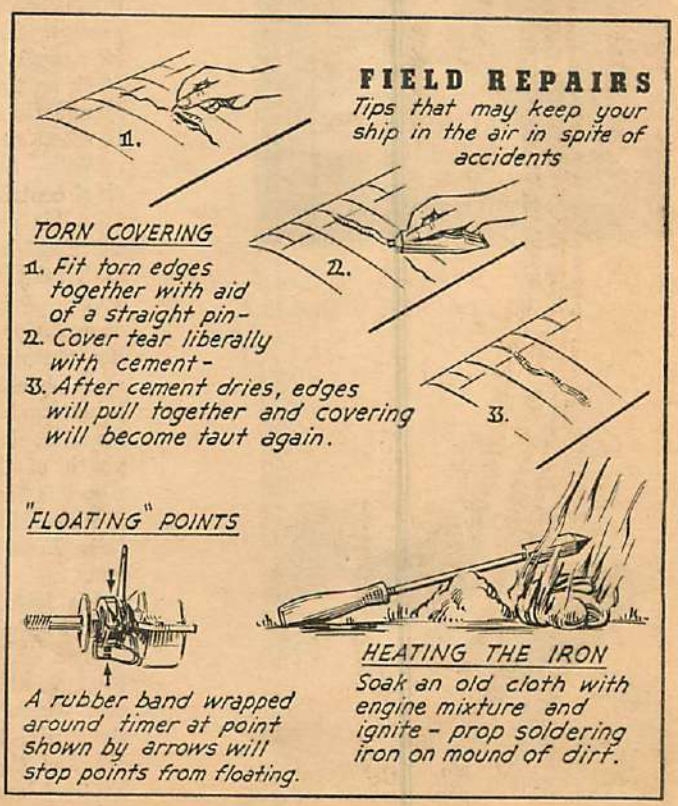
### LEWIS CHOSEN HEAD OF MODEL DIVISION

Good news for model builders interested in contest rules and organization throughout the country is the appointment of Albert L. Lewis to handle the model activities of the enlarged Model Division of the National Aëronautic Association. Lewis will operate through the Washington office of the N. A. A. Walton H. Grubbs, one of the N. A. A.'s first officials devoted to model work, will work with Al Lewis.

The Model Division acts as a clearing house for all sanctioned meets, contest results, issues licenses for gas-model fliers, and compiles the registration of all gas models.

As a past president of the Academy of Model Aëronautics, Lewis will be especially interested in its activities. Part of his duties will include advancement of A. M. A. activities.

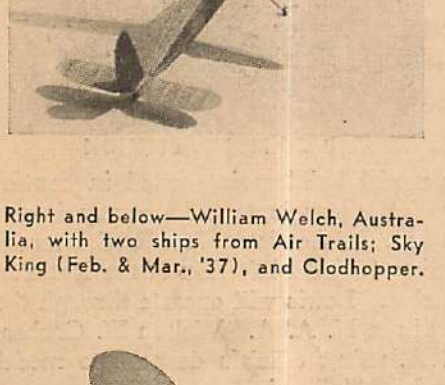
Lewis has been a model enthusiast for many years. His work with the Junior Aviation League of Boston brought him into close touch with the organization of clubs and promotion of modeling. However, his work with models gives him the modeler's viewpoint—a necessary item if the modeler is to benefit *(Turn to page 78)*



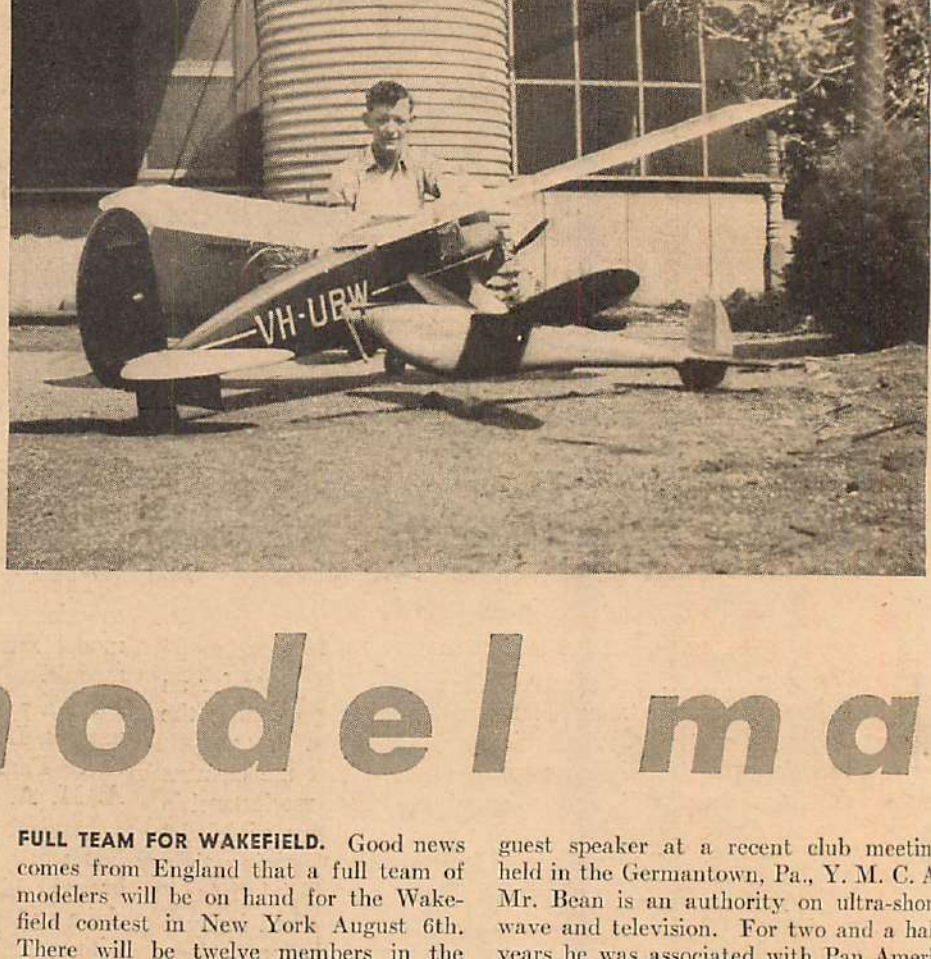

**BECOME A MEMBER OF THE N.A.A.**

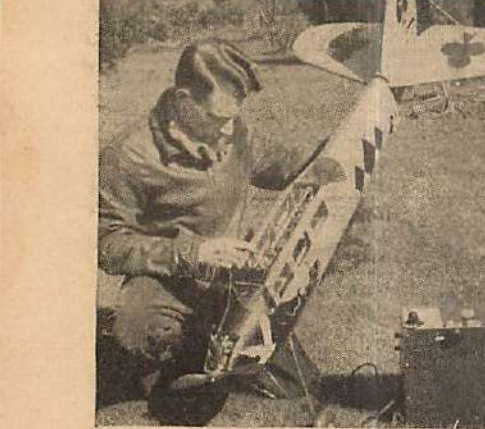
WRITE THE NATIONAL AERONAUTIC ASSOCIATION, DUPONT CIRCLE, WASHINGTON, D. C., FOR APPLICATION BLANK.

Below—An interesting gull-winged model made by Joe Walsh, New Bedford, Mass.



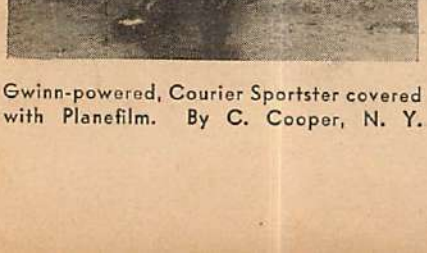
Right and below—William Welch, Australia, with two ships from Air Trails; Sky King (Feb. & Mar., '37), and Clodhopper.




# model ma

Radio-controlled, 7½-ft., 6¾-lb. Super Buccaneer, built by John Ault, Alliance, O.



Gwinn-powered, Courier Sportster covered with Planefilm. By C. Cooper, N. Y.

**FULL TEAM FOR WAKEFIELD.** Good news comes from England that a full team of modelers will be on hand for the Wakefield contest in New York August 6th. There will be twelve members in the party—six official team members, four alternate fliers, and two council delegates of the Society of Model Aëronautical Engineers. They plan to arrive aboard the *Aquitania* August 2nd and leave New York on the *Queen Mary* on August 9th. Elimination contest was held May 28th to select the team.

Again Lord Wakefield has been the chief contributor to the expense fund. In 1936 his generosity made it possible for the English to attend the Detroit contest and take the Wakefield Trophy back home. Ever since he put the trophy into competition back in 1927, he's been giving the model hobby his financial and moral backing. The idea behind this international trophy is to create better international understandmg through the youth of the various nations. Anyone who has been fortunate enough to attend a Wakefield contest realizes how successfully Lord Wakefield's idea has worked out.

We look forward to the contest this year as the high point in the year's activities. Modelers everywhere appreciate the splendid trophy and enthusiastic support which Lord Wakefield has given to the model hobby throughout past years. We feel the good sportsmanship shown by modelers has justified his support.

**QUAKER CITY GAS MODEL AIRPLANE ASSOCIATION.** Mr. Norman Bean was guest speaker at a recent club meetin held in the Germantown, Pa., Y. M. C. Mr. Bean is an authority on ultra-sho wave and television. For two and a ha years he was associated with Pan Amer can Airways, developing radio-direction finding equipment and short-wave radi telephone transmitting and receivin equipment. Two years were spent wit the Bell Telephone Laboratories Aircra Receiver Group developing radio-tele phone equipment for the United State army air corps.

During the past year he took time ou from his work in television to build radio-controlled model. Its span is si feet, area eight hundred square inches weight four and a half pounds complet with radio apparatus. This model is on of the smallest radio-control jobs buil to date.

Mr. Bean used his model and other ap paratus to demonstrate the difficulties t be overcome when building a radio-contro unit. More than a hundred and fort persons were present at the meeting— breaking all attendance records for th club. Members of the Philadelphia Wire less Association were present and offere their services in further development o radio control.

On May 14th the association held it regular monthly meet at the new Phila delphia Airport, attracting fifty gas mod els and five hundred spectators. Rober Jacobsen, of the Quaker City Association averaged 6:51, which is probably a ne N. A. A. record. His highest single fligh was 18:40. Robert Lichten had an inter esting chase after a wayward model. Hi

Capt. Dawson, United, with members of Franklin Simon Club he addressed in New York.
Norman Schaller

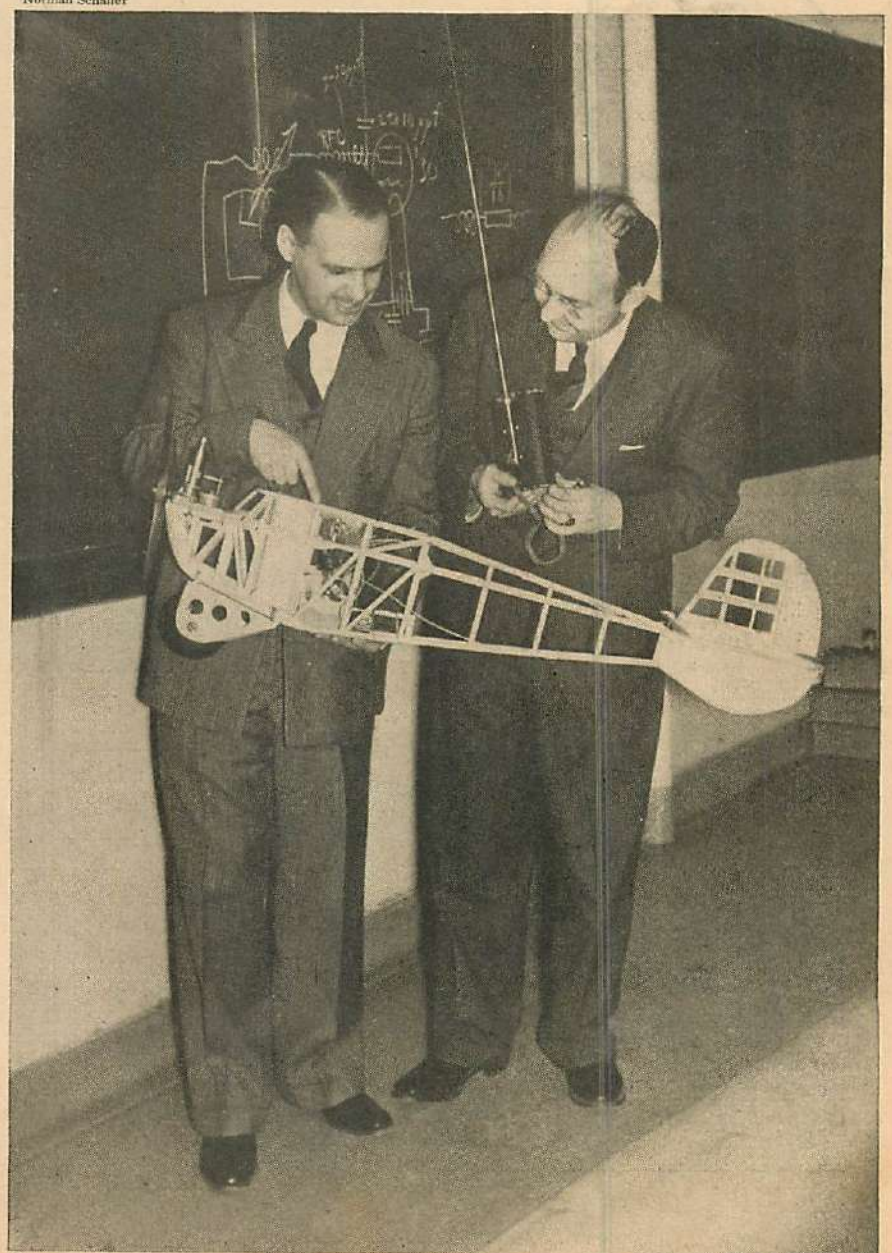
# tters

timer failed—allowing the motor a thirty-four-second run. This was enough time to snare a good thermal which carried the model more than thirty-seven miles to the Pennsylvania-Delaware State line. For the past two years the Q. C. G. M. A. A. has been holding N. A. A.-sanctioned meets once a month. Anyone is invited to attend. Contact William Beck, 209 Righter Street, Philadelphia, for information.

**CLODHOPPER IN NEW ZEALAND.** Clodhoppers are flying in all parts of the world. New Zealand comes to bat with the latest reports of the Clodhopper's success. Max Allen writes an interesting letter from Yore, New Zealand. He belongs to the Yore Model Aëroplane Club, which has unofficially beaten nearly every outdoor record in the Dominion. The following are some of the club's times: gas job (45-seconds engine run)—35 minutes out of sight; limited fuel ($^1/_{16}$ ounce per pound of weight)—18 minutes with a model of Goldberg's Valkyrie; hand-launched glider—12 minutes out of sight; and hand-launched stick—17 minutes.

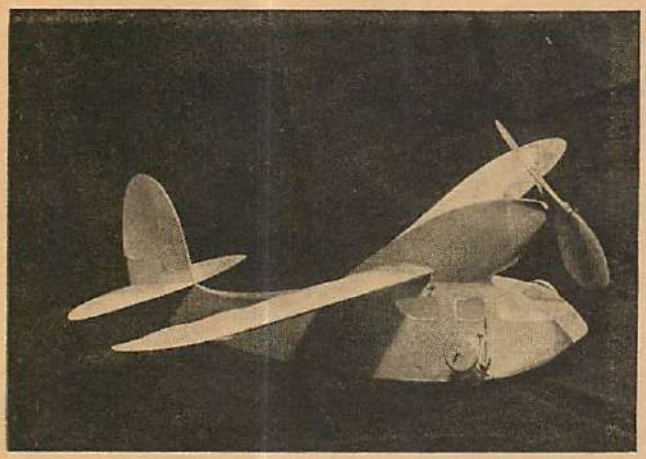
The Valkyrie model was built by the Pepperells and was awarded second place in the recent South Island competition. The 17-minute stick job was made with a model of Jerry Kolb's design. An official stick flight of 16 minutes and 19 seconds was turned in with a model of Alvie Dague's 1937 Mulvihill winner.

The Yore Model Club has a collection of about twenty different engines. They have kept these engines busy flying the wide variety of gas jobs *(Turn to page 59)*



Norman Bean points out 3-oz. receiver to William Berry at Quaker City "Y" meeting. Berry holds portable pack transmitter. Bean was radio specialist with Pan American.

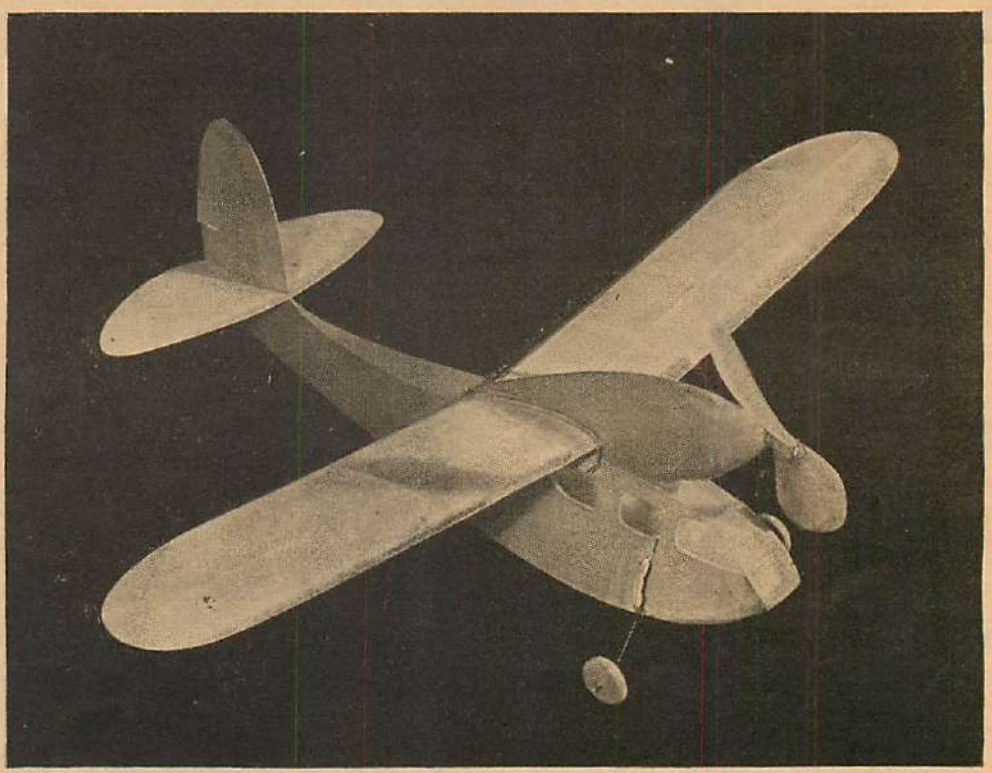
The Duck takes off easily from water. The landing gear folds upward for water flying, is locked in place by rubber band.



# THE DUCK

BY LOUIS GARAMI

**A rubber-powered amphibian.**

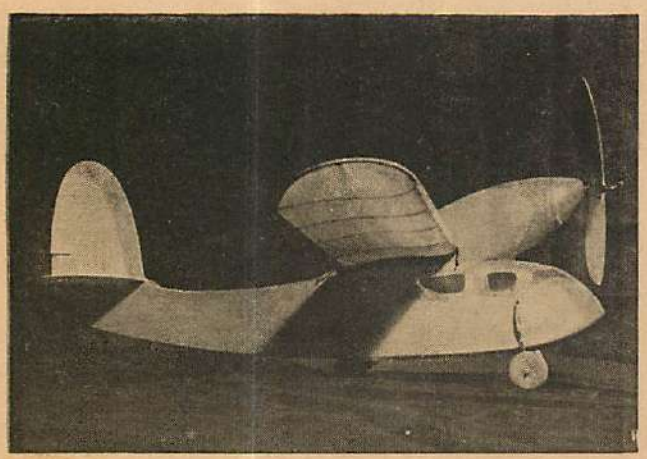


Right—The ship is light but strong. Assembly is easy.

WITH the exception of the multimotored ships, an amphibian is regarded as one of the toughest to adapt for rubber power. The numerous problems in designing which pop up here and there are all out of the ordinary and even the necessary flying adjustments seem to go against one's previous experiences.

The main problems are to secure a normal length of concealed rubber line, safe prop clearance with a normal-size prop, and an easily retractable landing gear for water take-offs.

In the past few years I have made several attempts to produce a good flying amphibian, but for some reason they all wound up far too complicated to attract the average builder. The first models had a regular crankshaft transmission with the propeller constantly shaving the imaginary pilot's head in the open cockpit. Later on a single universal joint would do, but at the same time it would scare away the interested builder.



The hull, tail, and engine nacelle are cut from sheet balsa. Consequently, performance is better than would be expected.

And then came the "Duck."

There are no mechanical gadgets to coax into action here, which, while taking most of the romance out of it, places this amphibian within the ability of the average sport modeler.

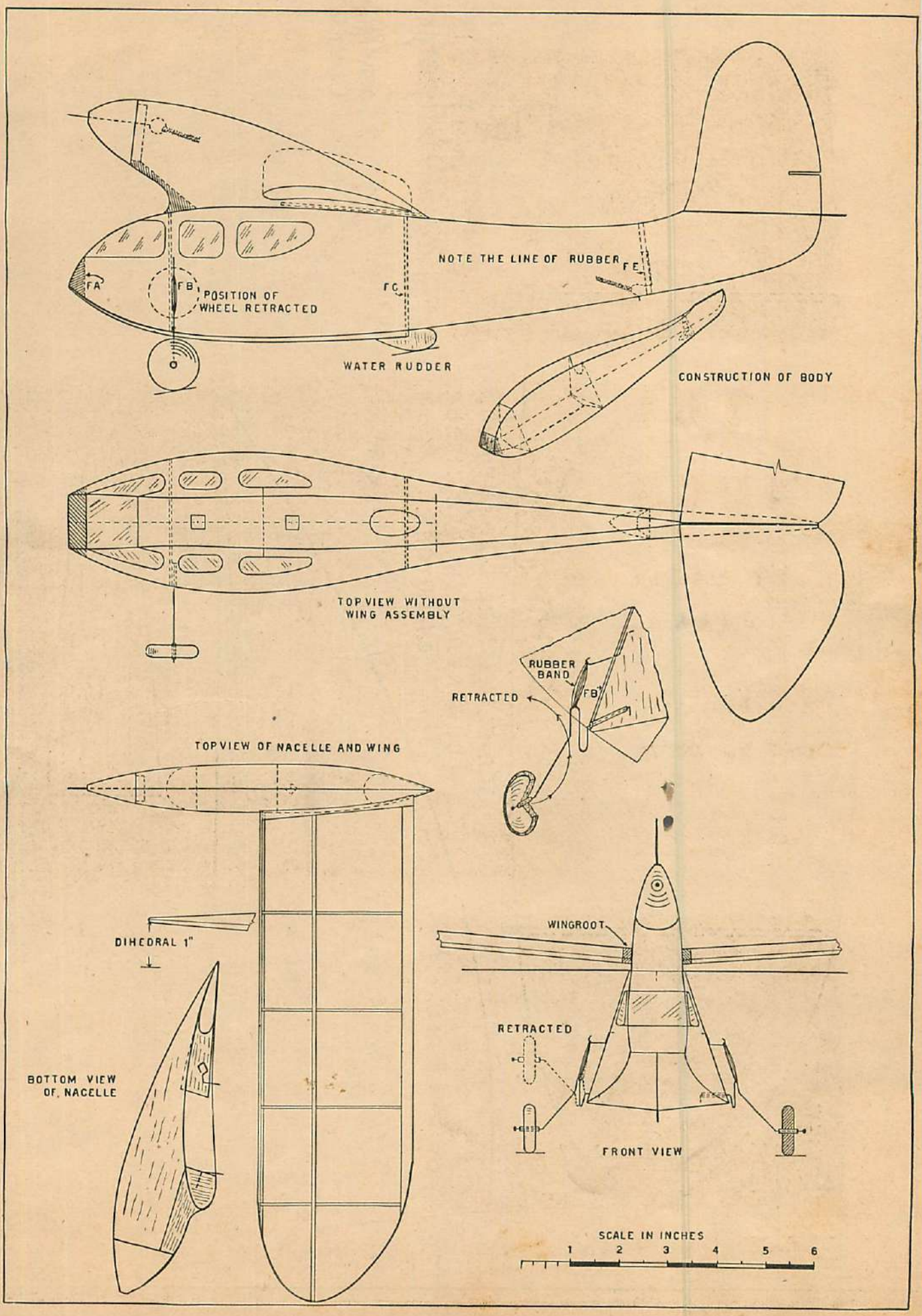
The unusual features are the tissue-covered sheet balsa body and tail for waterproofing, the built-in upthrust to overcome the tendency of diving, and a very simple retractable landing gear.

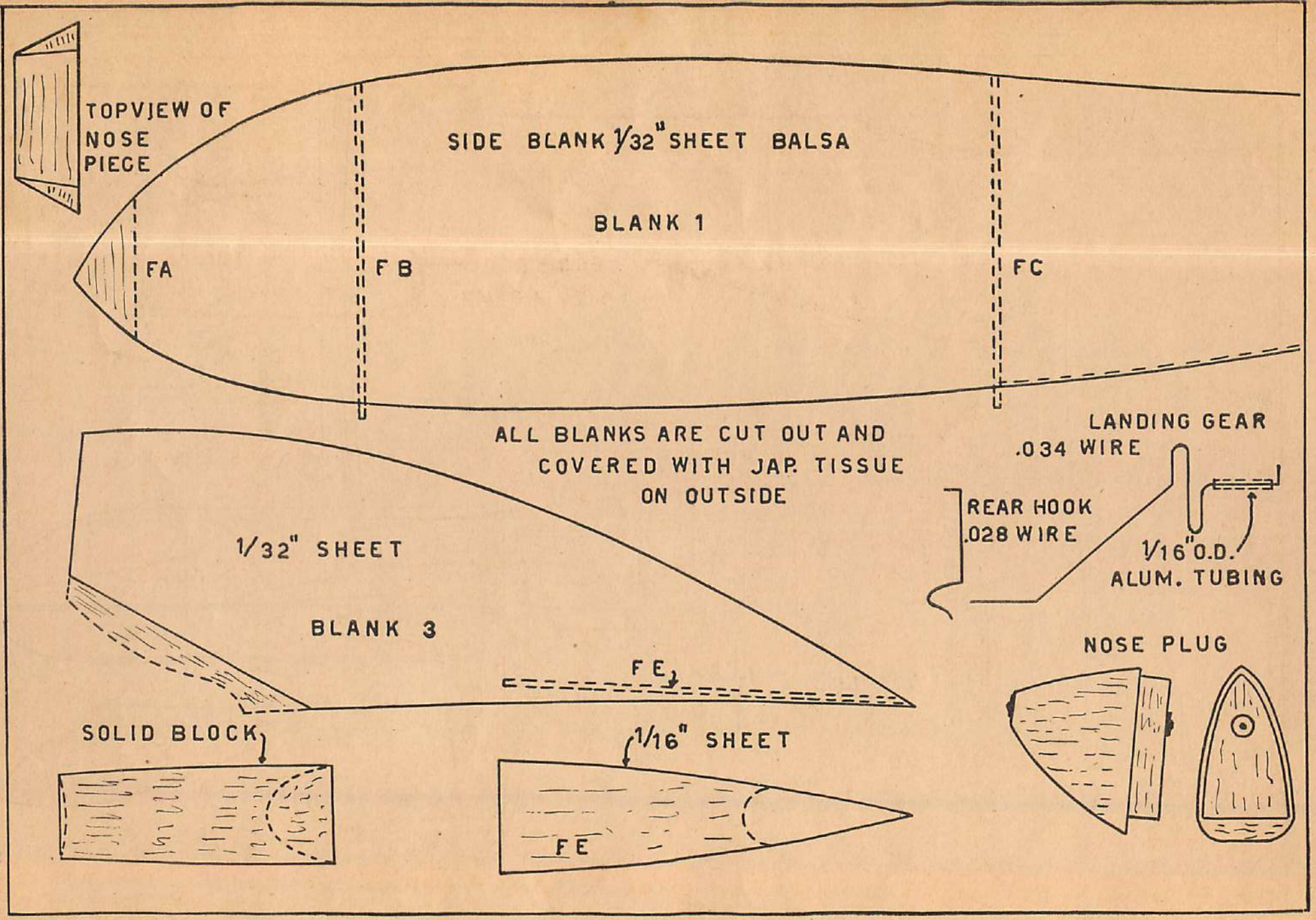
And now you may ask the often-heard question: But how does it fly, mister?

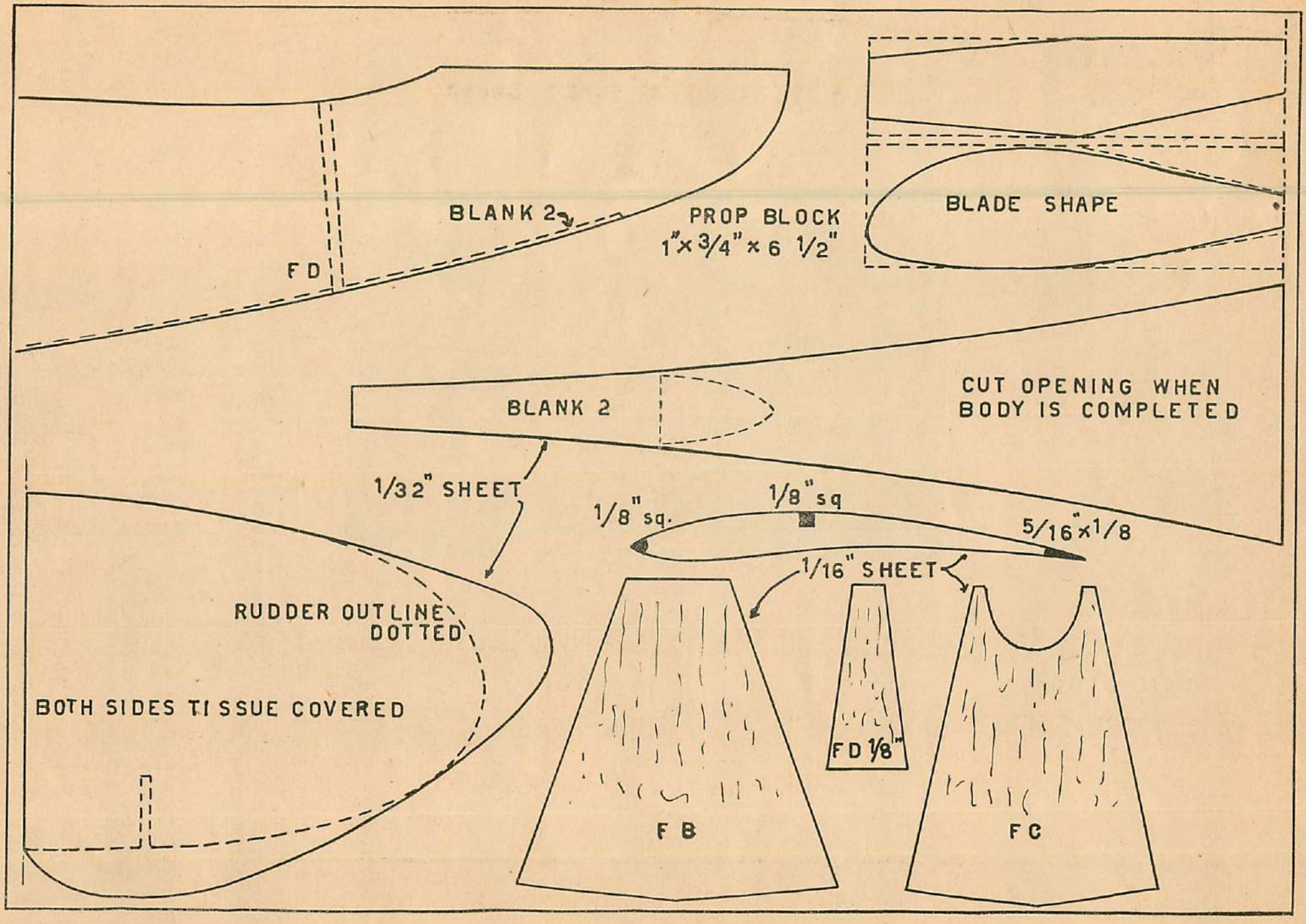
Excellent, my dear chappie. But definitely.

## BODY AND NACELLE

The body and nacelle are made of $^1/_{32}$" soft sheet balsa. First cut out two of No. 1 and No. 3 blanks and one of No. 2 blank. Now cover these with Jap tissue on one side. Make sure that a left and right blank is obtained of each twin. In addition to these cover *(Turn to page 58)*


NOTE THE LINE OF RUBBER
FA
FB
POSITION OF WHEEL RETRACTED
FC
FE
WATER RUDDER
CONSTRUCTION OF BODY
TOP VIEW WITHOUT WING ASSEMBLY
RUBBER BAND
FB
RETRACTED
TOP VIEW OF NACELLE AND WING
DIHEDRAL 1"
BOTTOM VIEW OF NACELLE
WINGROOT
RETRACTED
FRONT VIEW
SCALE IN INCHES
1 2 3 4 5 6


TOPVIEW OF NOSE PIECE
SIDE BLANK 1/32" SHEET BALSA
BLANK 1
FA
FB
FC
ALL BLANKS ARE CUT OUT AND COVERED WITH JAP. TISSUE ON OUTSIDE
LANDING GEAR
.034 WIRE
REAR HOOK .028 WIRE
1/16" O.D. ALUM. TUBING
1/32" SHEET
BLANK 3
FE
NOSE PLUG
SOLID BLOCK
1/16" SHEET
FE


BLANK 2
FD
PROP BLOCK
1"x3/4"x6 1/2"
BLADE SHAPE
BLANK 2
CUT OPENING WHEN
BODY IS COMPLETED
1/32" SHEET
1/8" sq.
1/8" sq
5/16"x1/8
1/16" SHEET
RUDDER OUTLINE
DOTTED
BOTH SIDES TISSUE COVERED
FB
FD 1/8"
FC

# THE LOW-DOWN ON LOW-WINGS

By J. L. SADLER and H. A. THOMAS

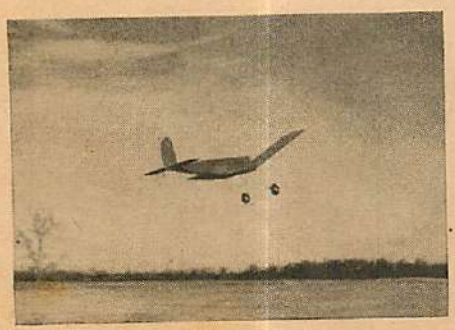
Low-wings offer many advantages. Above, a completely planked job getting off.

OCCASIONALLY references are made in various publications regarding low-wing gas models, and the remarks therein are nearly always based on theory alone. Statements to be made in this article, however, are based on sound practice involving thousands of flights on many types and sizes of low-wing gas models.

J. L. Sadler, an active experimenter, did not select this type of model for the novelty of it, but because he has always contended that there are certain definite advantages to low-wing models—particularly gas models.

In the first place, a low center of lateral area is generally considered to be a desirable feature in any model. The wing location of a low-wing model causes the center of lateral area nearly always to be low. Second, a low-wing model usually has the principal forces of drag, lift, and thrust more nearly centralized than other types. This is why downthrust is seldom required in a low-wing model. Third, the weight of the wing on low-wing models, being low, causes a "sledding" effect when landing, instead of a "toppling" effect, and as a result low-wing models make a much higher percentage of good landings than high-wing types.

From the practical standpoint, a one-piece wing, fitting a curved opening in the bottom of the fuselage, will "stay put" with only a few rubber bands holding it, and when the wing is removed, the entire wiring is exposed for inspection or battery renewal. Our advice to anyone con-



A 4½-ft. Elf-powered low-wing by Sadler. Low-wings are not dangerous as supposed.

John Worthen and his all-wood low-wing, shown in flight in the picture above.

In Little Rock high-wings are apologized for. Maybe the boys have something.

sidering the construction of a low-wing gas model is that the wing be made in one piece, held in place by rubber bands. With this arrangement, the model can absorb a surprising amount of shock without damage. The tail group, also, should be held in place with rubber bands.

It has been our opinion that a low-wing design has more wing-to-fuselage interference than either a flush high wing or a parasol. As a remedy, the use of large wing fillets was questionable. We looked to real aircraft for ideas in this line, and found an apparent disagreement there. The Douglas company evidently favors the use of wing fillets, for they are to be found on nearly all their aircraft. The Lockheed and Boeing companies, on the other hand, do not seem to find the use of wing fillets necessary. It seemed logical to us that most of this wing-to-fuselage interference was due to the fact that cantilever wing design almost necessitates the thickest and broadest part of the wing to be at the center. With this in mind, a wing plan was laid out having a rather narrow and thin center section. The wing broadened and thickened on each side to a point about halfway to the tip, from where it again tapered down in chord and thickness. Another reason for selecting a wing of this type is this: The greatest lift being on the outer panels, and consequently higher due to the dihedral angle, causes a higher center of lift. This contributes much to lateral stability.

Test flights on our newest low-wing, equipped with this type of wing, were very satisfactory. It has a fast rate of climb, yet it ascends at a safe angle. It has great stability even in gusty weather, and a slow, very flat glide. We are anxious now to see this model competing with other types in limited-motor-run events.

Some low-wing models are tricky and sensitive to adjustment, but if the average builder designs a low-wing model, incorporating the following points we have found by practice to be desirable, he should find that his model can hold its own in competition with any other type.

1. We have found that 1½" of dihedral per foot of span is ideal. Experiments with even greater dihedral angles have shown no undesirable results.

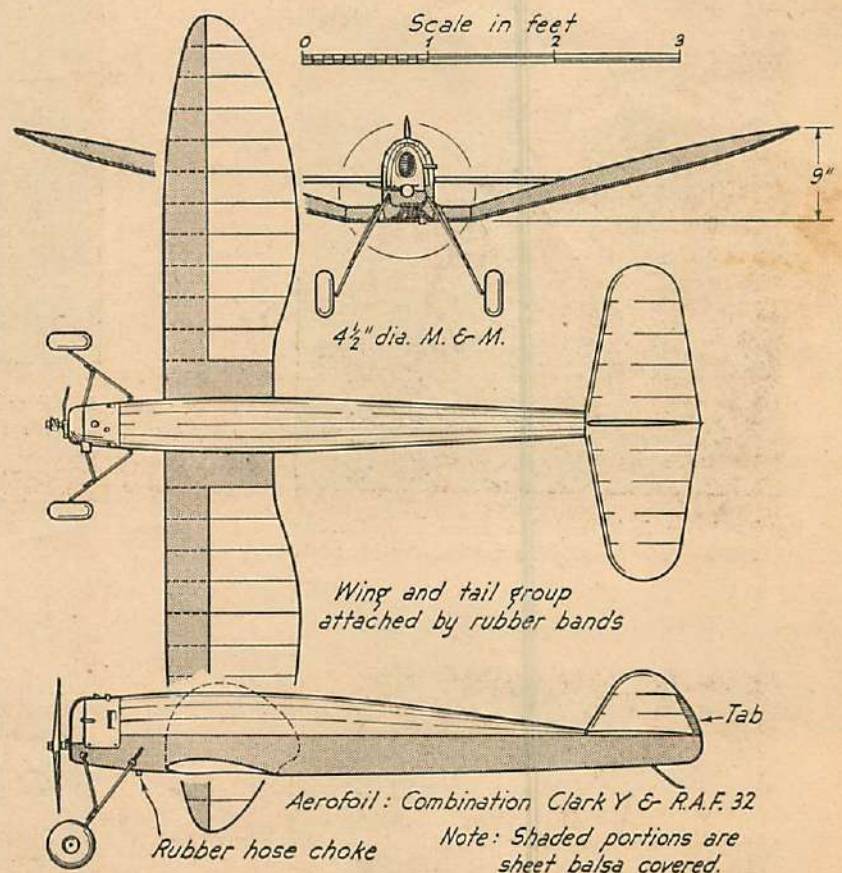
2. Use a small rudder, five to seven percent of the total wing area.

3. Keep the line of thrust at the lowest possible location. This is one of the most important differences in the design of low-wing models as compared to high-wing models.

4. The ratio of the stabilizer moment arm to the distance between the center of gravity and the propeller should be at least three to one. This means that the engine should not be mounted too near the center of gravity. We wish to stress this point as a means of preventing spiral instability, which is probably the one greatest hazard to low-wings.

So if you find yourself becoming a little bored with the same old conventional types of gas models, try a *low-wing*—one that will really fly.

**If you haven't tried a low-wing you've missed something. Properly designed, they're reliable.**



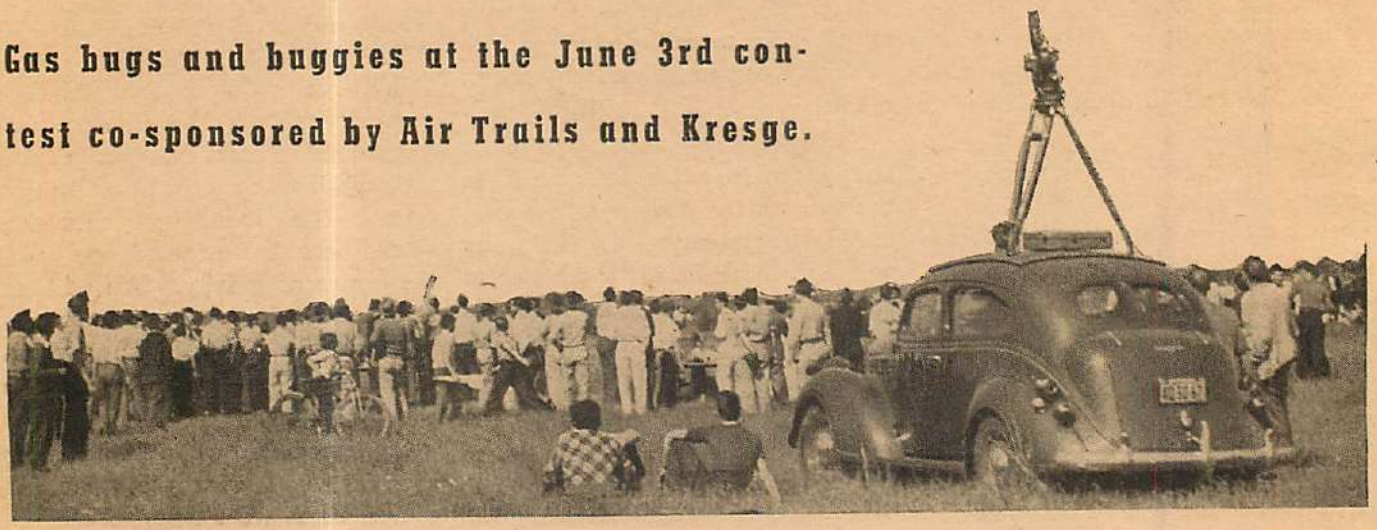

**SUCCESSFUL LOW-WING CONTEST MODEL**

Span—6½'. Weight—3¾ lbs.
Power—1/5 h.p. Dennymite.
Designed and built by J. L. Sadler. Drawn by H. A. Thomas.

Sadler and the ship in the article—a swell flier. See drawing on the right of page.

# THE ALL-EASTERN

**Gas bugs and buggies at the June 3rd contest co-sponsored by Air Trails and Kresge.**



Yes, even the newsreel was there. Despite limiting the number of entrants, a good day's flying fun was enjoyed by everyone.

L. to R.—Larry Smithline, Ben Shereshaw, Gordon Light, Bill Winter. No, Light's not holding his nose.

**1** Ever been to a contest? Photos 1–6 give an idea of what it's like. These are entrants waiting turn to weigh in.


The uninitiated thought the engines noisy. They ought to be after being picked up by address system.

**4** Funniest incident was collapse of a runway under Class A job. Spectator remarked, "What a heavy model."

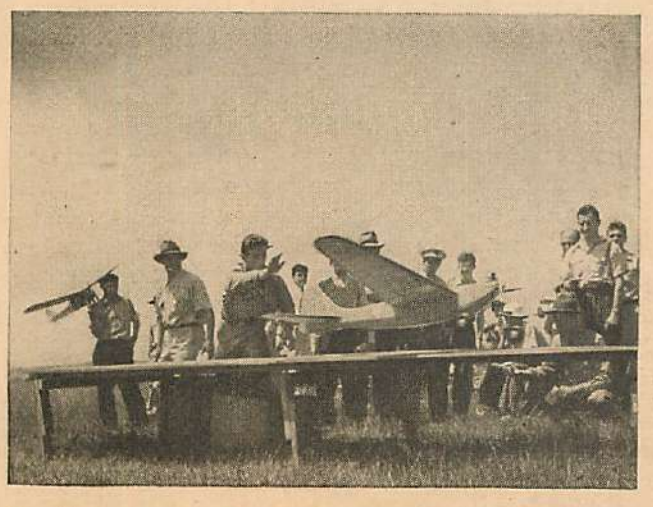
# CHAMPIONSHIP

Photos by Al Daraghy

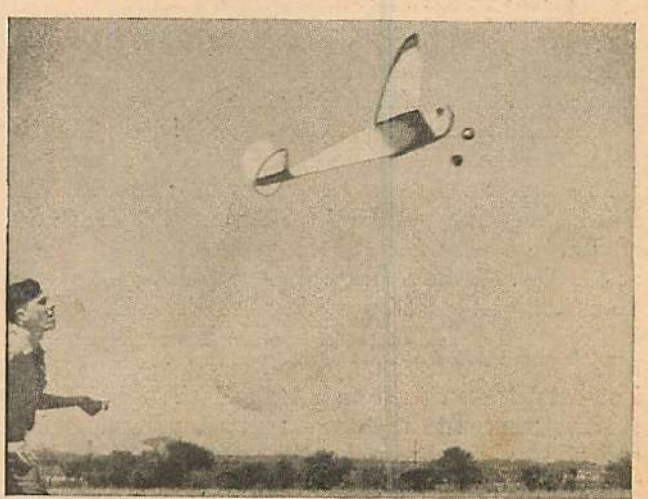
The winners, left to right—Donald Huff, 1st Class B; Frank Ehling, 1st Class A and high-point winner; John Findra, Sr., 1st Class C; Roy Oliva, 2nd Class C; Richard Boegehold, 2nd Class A; and Harvey Watts, 2nd Class B. Ehling is the All-Eastern Champion.

**2** Starting engines on the runway. The ship in front is a Clipper, prominent as always. Raised runways helped a lot.

**3** Looks like a Golden Eagle. Notice length of runway. Most contestants used boosters. Result, many less headaches.



**5** Has anyone ever seen an unassisted take-off? Runways did make it impossible to lift a ship off by the wingtips.



**6** Boy, oh, boy, these 1939 gas jobs climb faster than ever. Of course, there was the usual batch of folding wings, too.

# THE LITTLE JUNIOR

THIS model lays no claim to unusual performance or unique construction methods. But it does make a bid for the attention of the beginners as an easy-to-build-and-fly model of sound design. All parts are numbered and listed in the bill of materials and should be readily available at any model supply shop.

## CONSTRUCTION

The motor stick (#1) is the "backbone" of the model —serving as attachment for the motor, tail, landing gear, and wing. Select hard balsa to avoid excessive bending when the motor is fully wound. The thrust bearing (#2) can be made or bought in a variety of different shapes and materials. The most conventional is dural, but a drilled brad or bent wire bearing makes an effective substitute.

Rear hook (#3) is bent from $^1/_{32}$"-diameter wire and threaded and cemented to the rear end of the stick. The landing gear is made up of four pieces of bamboo (#6 and #7) with the ends pointed and inserted into the motor stick. Apply cement liberally to hold them in place. A wire axle (#8) is threaded and cemented to the ends of each V of the landing gear. Hardwood wheels (#9) of 1" diameter are slipped on the axles—the ends of the axles being bent to hold them on. A tail skid is bent from bamboo (#5). Bamboo is most conveniently formed by bending around a hot soldering iron or curling iron. Or an old screwdriver can be heated over the gas-stove flame.

Wing is made in two halves. Spread a piece of wax paper over the work table to prevent cement from sticking. The inside-center panel of each half of the wing is filled in with $^1/_{32}$" sheet (#15) set flush with the top edge of the spars. Cement the two halves together—blocking up each tip 2½" for the necessary dihedral.

Elevator is cut from a piece of $^1/_{16}$" soft sheet balsa. Only half the full-size pattern is given in the drawing. Cut the elevator in a single piece by turning over the pattern and tracing the other half. A slot is cut in the center for the tail skid. Cement the elevator firmly to the bottom of the motor stick. Balsa cross strips (#20) are cemented to each half for additional strength.

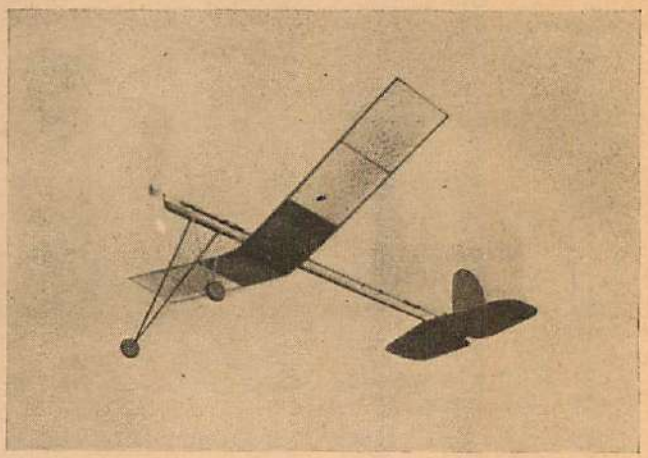
Rudder pattern is also shown full-size. It is cemented atop the elevator and to the rear end of the motor stick.

Clips bent from $^1/_{32}$"-diameter piano wire hold the wing to the stick. These clips are shown full-size and should fit the motor stick snugly. The rear clip (#18) should be $^3/_{32}$" higher than the front (#17), giving the wing this amount of incidence. Cement these clips firmly to the two spars at the center of the wing.

Propeller is cut from a soft balsa block. The blank should first be shaped as indicated in the drawing. Punch a hole through the *exact* center with a needle. Blades should be rounded at the tips after cutting. Blade thickness should vary from about ⅜" at the center to $^1/_{16}$" at the tips. Reinforce the hub of the propeller against wear from the shaft by coating liberally with cement.

The shaft (#11) should first be inserted through the thrust bearing and three small brass washers (#12) inserted between the propeller and the bearing. The shaft is secured to the propeller by bending a U in the end and pulling back into the front hub and securing with cement.

Rubber motor is made up of four strands of ⅛" flat. However, don't hesitate to add additional strands if your model seems to lack the necessary power for a fast, high climb.



What could be simpler to build? Even if you have never made a flying model before, this is a good one to start on.

Covering is conventional tissue. Cover the sheet balsa portions of the wing and tail as well as the remaining portions of the wing. Apply dope only to the edges—a full covering will more than likely cause the wing to warp out of shape.

## FLYING

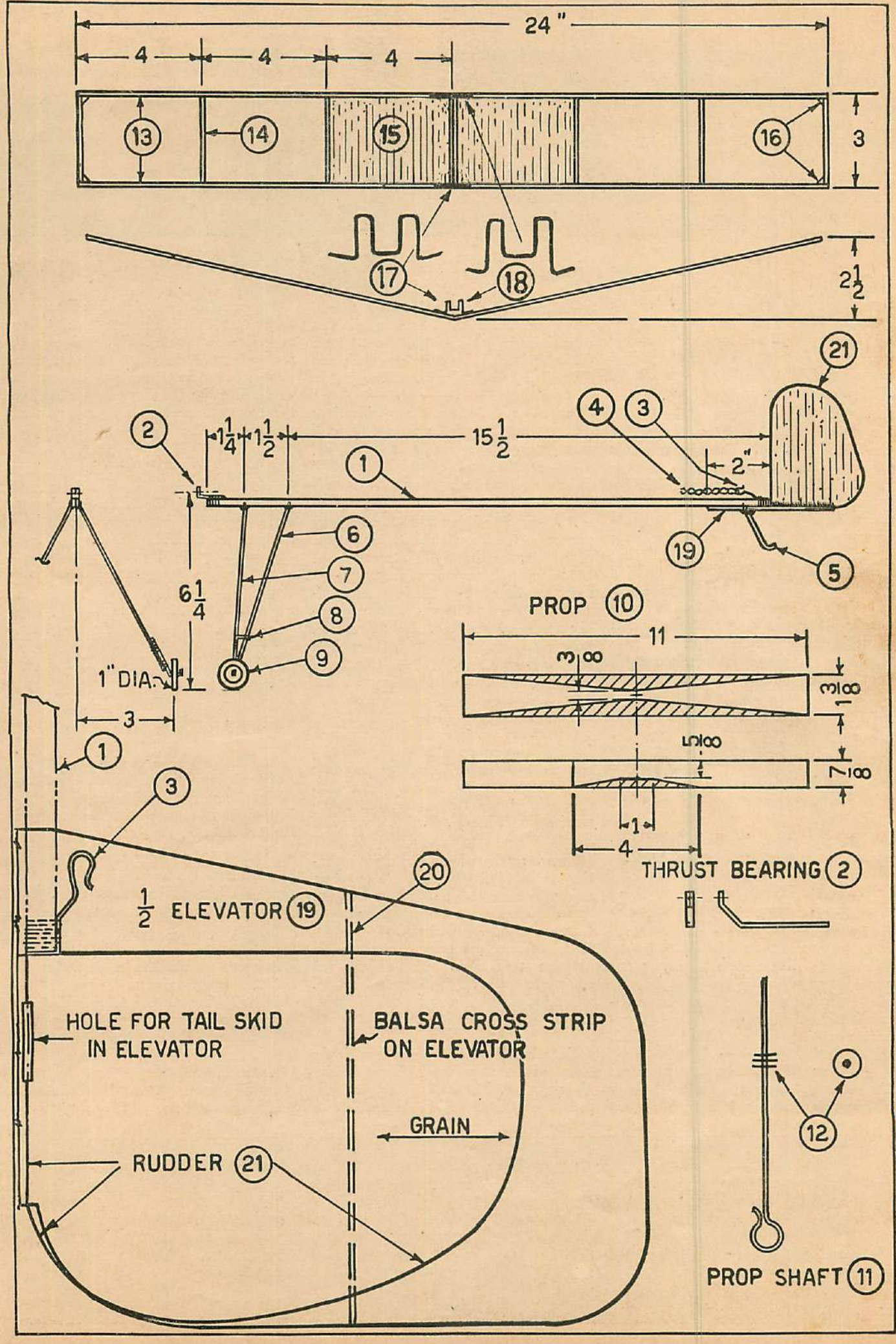
Flying should get under way with a few trial glides, having the wing in the approximate position of the model in the photographs. Always point the nose of the model toward the ground at a slight angle, and follow through with a firm, steady push. If the model falters and then dives toward the ground, make adjustment by moving the wing toward the propeller. Make adjustments slowly. Never move the wing more than ¼" forward or backward without making a test glide. If the model dives toward the ground without showing any tendency to climb, move the wing toward the tail.

Power flights should first be tried with about fifty turns in the rubber. This will be enough power to detect any serious misadjustment. The turns can be increased as the trial flights prove the setting to be satisfactory.

Never point the model upward when launching. Hold it level and push it at the speed at which it normally flies. If you're not too sure of your ability to launch it properly, let it take off from a smooth surface.

If the model shows a tendency to spiral sharply to the left and lose altitude quickly, warp up the front spar of the left wing (looking from the rear). At the same time turn the rudder slightly to the right. A model will show a tendency to spiral to the left more often than to the right since the reaction to the turning propeller depresses the left wing.

Despite its single-surface wing, Little *(Turn to page 67)*


24"
4
4
4
13
14
15
16
3
17
18
2½
21
2
1¼
1½
15½
4
3
2"
1
19
5
6
7
8
9
6¼
1" DIA.
3
PROP 10
11
3/8
3/8
5/16
7/8
1
4
THRUST BEARING 2
1
3
20
½ ELEVATOR 19
HOLE FOR TAIL SKID IN ELEVATOR
BALSA CROSS STRIP ON ELEVATOR
GRAIN
RUDDER 21
12
PROP SHAFT 11

# WHAT'S YOUR QUESTION?

*Question: Could you tell me whether the Dornier Do. X had a greater wingspan than the French Lieutenant de Vaisseau Paris? Also, is there a difference between gliders and sailplanes or are they the same? What is the fastest plane flown in the R. C. A. F.? H. F., New Westminster, B. C.*

Answer: The wingspan of the French transatlantic ship is greater than that of the Do. X by 4′ 8″. The *Lieutenant de Vaisseau Paris* has a span of 161′ 8″; the Do. X 157′. There is a difference between a glider and a sailplane. A sailplane is much more streamlined, has a long tapered wing whose aspect ratio is over 10, is much more strongly built, has a lower sinking speed, higher cruising speed and a greater gliding angle; a sailplane is also much more maneuverable than a glider. I think that the fastest plane in the R. C. A. F. at present is the McGregor pursuit ship which has a speed of 300 miles per hour, unless the Canadian air force has taken delivery of the Spitfires which they ordered.

---

*Question: Will you please let me have information regarding requirements for a position in the Civil Service as a Link trainer and operator? I. J. E., Wisner, Neb.*

Answer: Write to the Civil Aëronautics Authority, Washington, D. C.

---

*Question: Where could I get some plans for a pusher-type plane and also information on it? G. R., Upper Darby, Pa.*

Answer: There aren't any plans available on pusher planes that I know of. Technical data on them can be obtained from the National Advisory Committee on Aëronautics, Washington, D.C.

---

*Question: Would you please give me the address of a company where I could obtain plans for a sailplane of fifty feet or so wingspan? W. A., Quebec City, Can.*

Answer: No plans for such a sailplane are available in this country. You can, however, get a sailplane in kit form manufactured by the Bowlus Sailplane Mfg. Co., San Fernando, Cal.

---

*Question: What are the specifications and performance of the Ryan STM and what other planes are built by Ryan? What is the cost of the Ryan ST? Whom do I write for answers to model airplane questions? E. V. P. Stuart, Fla.*

Answer: The Ryan STM is a military version of the ST model. It has a span of 29′ 11″, length 21′ 5¾″, top speed of 169 miles per hour and cruising speed 135 miles per hour. The ST costs approximately between $4500 and $5300, depending on the engine used. Another model built by Ryan is the SC, a three-place low-wing cabin ship. Write to Gordon S. Light, care of this magazine, for all information on model matters.

---

*Question: On page 97 of the March issue you mentioned that several aircraft manufacturers were experimenting with the apprentice system of training. Can you give me more detailed information on this? A. R. T., Evansville, Ill.*

Answer: There is no further information available on the apprentice system as conducted by aircraft manufacturers. Some of them have taken on graduates from vocational aviation high schools, these having had some experience in aviation mechanics. You might get some information by writing to the Civil Aëronautics Authority, Washington, D. C.

---

*Question: Could you tell me if the naval air base at Floyd Bennett Field, Brooklyn, N. Y., has training for noncollege graduates? If not, what schools near Brooklyn give this training? F. D., Brooklyn, N. Y.*

Answer: I do not think that the naval reserve at Floyd Bennett Field trains noncollege graduates. I would suggest that you write them and find out. The only schools in Brooklyn or near it which give the training you are looking for are commercial aviation ones, and they charge for instruction.

---

*Question: Please let me know where information concerning sailplane and glider construction can be found, and also where can I get information on how to fly them. W. J. C., Jr., Ashley, Mich.*

Answer: Write to the Soaring Society of America, 1909 Massachusetts Ave., Washington, D. C.

---

*Question: I am an ex-navy flier and think that I have run into a new type of wing. However, I do not know how to figure lift coefficient and would like to have you explain this point. K. R. D., Encinatas, Cal.*

Answer: This would be rather hard to explain here because of lack of space. I suggest you write to the National Advisory Committee for Aëronautics, Washington, D. C., and ask them to send you their booklet on the subject.

---

*Question: I have a private pilot's license and forty hours in the air. Do you think that there is any chance of my joining the Brazilian or Argentine air force? L. E., Minneapolis, Minn.*

Answer: I am afraid that there is not the slightest chance for you to join these air forces. First, you haven't enough flying time. Secondly, you must be a citizen of these countries to join. Also, Brazil and Argentine have excellent facilities and equipment to train their own men, whom they doubtless prefer to outsiders. *(Turn to page 82)*

**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 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. (Pee-Wee)
9830 Wyoming, Detroit, Mich.

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

Forster Brothers
521 Lake St., Maywood, Ill.

G. H. Q. MOTORS
854T East 149th St., New York, N. Y.

Hi-Speed Division (Hi-Speed)
800 E. Gage 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.

Keener Aircraft Industries (Brat)
2429 N. Washington, Los Angeles, Calif.

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.

Synero Devices, Inc.
523 Boydell Bldg., Detroit, Mich.

Husky Miniature Motor Co.
1400 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)
251 West 55th St., New York City.

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

## 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
105 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.

Ideal Aeroplane & Supply Co., Inc. (boats)
20-24 West 19th St., New York, N. Y.

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

## WHEELS, PROPELLERS, COVERING MATERIALS

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

COMET MODEL AIRPLANE & SUPPLY CO. T-5 (Ritz props)
129 W. 29th St., Chicago, Ill.

Marpell Superior Products Co. (Wheels)
6406 Victoria Ave., Los Angeles, Calif.

Floyd Bros. Model Supplies (Mirro-film 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.

Planefilm 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 7102, 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)
251 W. 55th St., New York, N. Y.

Midwest Model Supply (props)
445 West 69th St., Chicago, Ill.

Model Parts Manufacturing Co. (racing-car wheels)
218 East 120th St., New York, N. Y.

Lawrence Propellers
2106 Llewelyn St., Baltimore, Md.

## 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.
9830 Wyoming, Detroit, Mich.

American Model Airplane Co. (Rubber only)
347 E. 143rd St., New York, N. Y.

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

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

Superior Model Company
Box 1954, Tulsa, Okla.

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

Polk's
429 7th Ave., New York, N. Y.

V. K. Model Airplanes & Supplies (Gas only)
7304 Main Street, Williamsville, N. Y.

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

The Korff Co. (Gas only)
607 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 Avenue, Brooklyn, N. Y.

Paramount Model Airplanes
59-61 Liberty St., Brooklyn, N. Y.

BAY RIDGE MODEL AIRPLANE & SUPPLY CO.
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.
83 Low Terrace, Staten Island, N. Y.

International Models
251 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
230 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.
854T E. 149th Street, New York, N. Y.

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

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

Sun Aero Company (Rubber only)
954 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.
3088 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.

Beshar Models
329 East 54th Street, New York City.

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)
896 Bellevue Ave., Trenton, N. J.

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

## 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., Philadelphia, Pa.

The Aero-Spark Company (coils)
37-30 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.

## SUPPLIES

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
51 Humboldt St., Brooklyn, N. Y.

Junior Aero Supply Co.
100 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-E Main St., Hackensack, N. J.

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

Triangle Model Supply
32-57 38th 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.
3329½ Troost, Kansas City, Mo.

Triboro Model Supply Co.
3521 32nd St., Long Island City, N. Y.

D D X R SALES CO. (fuel)
285 Madison Ave., New York, N. Y.

MODEL RESEARCH LABORATORY
3531-T North Western Ave., Chicago, Ill.

WATERBURY MODEL BUILDERS SUPPLY
131 Cherry Street, Waterbury, Conn.

Logan Model Aircraft
818 Windsor Avenue, Windsor, Ontario

MERCURY
1592 Lincoln Place, Brooklyn, N. Y.

# SEA LEVEL—MILES HIGH!

*(Continued from page 30)*

pressure by the piston, after which compressed air is introduced to make a proper firing mixture. This system, although working quite well in a number of trials, proved rather complicated, and much too heavy for ordinary aircraft, where weight must be kept to a minimum.

The second, and most successful, supercharger is the blower or compressor type, where all air entering the carburetor is compressed by a rotary blower, run either from engine-driven gears or an exhaust gas turbine. Turbine blowers have been used in the army air corps for some time, although the past few years have seen their first service use.

When we consider that a modern aircraft engine of 1,500 horsepower consumes about five tons of air per operating hour, we can vividly see that the means of forcing this all-important gas into the combustion chamber is very vital. The turbine type of supercharger was pioneered by Professor Rateau of France, who in the early years of the War built many successful aircraft superchargers. His first exhaust-gas-operated installation was on a Lorraine-Deitrich 100-horsepower engine. At an altitude of 9,000 feet the available horsepower was boosted from 111 to 165, and the engine revs were increased from 1,370 to 1,550, a very creditable increase for those days.

Much interest was evidenced in these superchargers by the Allied powers as time after time their slow, heavy bombers had been shot down because of their relatively low absolute ceiling, making them easy prey to ground guns and enemy aircraft. Could they but boost the engine horsepower sufficiently to allow their lumbering Handley-Pages, Caudrons and Capronis at least a fighting chance, their chances of success would be greatly enhanced. Professor Rateau continued his experiments and soon produced a turbine-driven "super" for the 300-horsepower Breguet, standard observation and light-bomber type of the French air service at the time. Time of climb to 15,400 feet was reduced from 48 minutes to 27 minutes, and speed at this altitude was raised from 91 to 120 miles per hour. Tests on this plane definitely showed that the turbine type of supercharger had great possibilities, a fact that is just now being borne out. Tests on the Breguet showed that sea-level manifold pressure could be maintained up to 20,000 feet with the equipment then on hand. All military authorities agreed that the possibilities of high-altitude flying for military aircraft were almost unlimited.

Superchargers were recognized in Germany as important adjuncts of military aviation, and although data on early models is rather sketchy at best, it is known that many types were tested during the War. Multistage compressor-type superchargers were built that could maintain sea-level pressure up to 12,000 feet, and in addition the pressure could in most cases be varied at will by the mechanic or pilot. More recently has come news from Germany of the popular Junkers Jumo Diesel with a successful exhaust-driven two-stage supercharger. Seven hundred and fifty horsepower can be developed up to 20,000 feet. For take-off and low-altitude speed runs the gear-driven supercharger is cut in, the exhaust-turbine unit evidently being used only for extreme altitudes. This trend in design seems to have much in its favor and is being used in a modified form in the new Boeing B-17B Flying Fortress being built for the U. S. air corps.

Our own army air corps, naval bureau of aëronautics, and N. A. C. A. laboratories have done more actual experimental work on engine superchargers than have the official organs of any other nation. The army, co-operating with the General Electric Company, has made a very successful turbo-exhaust supercharger that is proving more and more valuable as man explores the upper strata of the atmosphere to even greater heights. More about this interesting invention follows, but first let us examine some developments of other types.

One of our earliest "supers" was the Sturdevant, an engine-driven blower, of the one-stage type (only one-gear ratio) operating at a constant rate of ten times engine speed. It was connected through belt and gear drive, the belt allowing for slippage encountered in sudden acceleration or deceleration. When mounted on a Liberty "6" engine, the r. p. m.s actually increased from 2,100 to 2,500 at 20,000 feet, raising the blower speed from 21,000 to 25,000 r. p. m., a very desirable condition.

The Root supercharger, somewhat more complicated than others, was tested for some time by the N. A. C. A. and the navy department. It consists of two rotors, or blowers, turning in opposite directions. The blades of one compressor fit into the recesses of the other and are held in correct timing by a gear system. This installation was quite successful in most cases, although somewhat more complicated than other types. It developed up to eighty-nine percent of sea-level horsepower at 16,000 feet and raised the practical ceiling of the Liberty-powered DH-4B from 14,500 feet to 31,000 feet. This type of "super" was one of the first to be used on a radial engine, being tested on a Curtiss TS-1 fighter for some time. A Root supercharger was also used on a Wright J-4-powered Vought UO, and showed that above 28,000 feet pre-ignition and detonation were caused by overheating. This showed in no uncertain manner that high-altitude engines must have adequate fin area on cylinder heads. Although the air is considerably colder at high altitudes, it is also much thinner and consequently dissipates heat at a much slower rate than at sea level.

The Rateau type of turbo blower was patented in this country in 1917, and out of this unit came in turn the Moss supercharger and finally the successful General Electric exhaust-gas-driven "super." When the army air corps ordered fifty Consolidated PB-2A two-place pursuit planes a few years ago, they specified the installation of these General Electric superchargers to enable combat flights to be made in hitherto unused levels of the upper air. That this type of two-seater has succeeded was shown a year ago when a PB-2A belonging to the Thirty-third Pursuit Squadron reached 39,200 feet, a record for such a type.

Before going on it would be well to explain just how this turbine-driven "super" operates, and just what its advantages are. In most cases the turbo supercharger must be mounted on the outside of the cowling, due to the extremely high operating temperatures encountered, often running from 1,200 to 1,400 degrees F. at the exhaust outlet. Although the latest installations are well faired into the general fuselage or nacelle shape, all cowlings must be made of stainless steel or some other durable metal that will withstand terrific heat. The motive power used to operate these superchargers is the waste exhaust gas which is run into a collector pipe and then to the "super" turbine itself. These hot exhaust gases are sent through a nozzle box into the fluted turbine much like an ordinary steam turbine. The actual nozzles are arranged in a semi-circular plate, in front of the nozzle box, in order to keep the temperatures as low as possible.

Cooling bearings on early models was relatively simple, as water from the regular radiator system could be piped through the chamber, but with the advent of Prestone cooling, and air cooling, specially hardened steels were turned to for bearing surfaces. The turbo unit has a by-pass valve that enables the gases to be passed out of the manifold without going through the nozzle box. Turbine speeds run from 20,000 to 22,000 r. p. m.s, and the entire unit of the supercharger usually weighs

about one hundred pounds, depending, of course, on the type of engine it is used with. The inner section of the General Electric supercharger is much like that used on conventional radial engines, the turbine being connected to a small fanlike blower that forces air into the carburetor.

As the air is greatly heated by this increase in pressure it is necessary to pass it through an intercooler to bring its temperature down to approximately one hundred degrees F. If the air were allowed to enter the engine in its original heated state it would cause a great decrease in horsepower, and make the engine detonate violently. The intercooler is, in effect, an air radiator, operating much like a water radiator. Many of the inner details of this supercharger may not be revealed, due to the restricted military nature of all present installations. As far as is known, the materiel division of the air corps has, in co-operation with General Electric, made the only known serviceable turbo-driven supercharger in general use at present, and they evidently wish to keep it solely for the use of this country.

Many of the more recent air corps orders specify these efficient General Electric units to boost horsepower in the rarefied upper air. The recent service order for thirteen Bell FM-1 Airacudas will use these superchargers, as will the Curtiss P-37 single-seaters, which are thought to be, respectively, the fastest multiplace and single-place fighters in the world. The Allison V-1710 engine, used in both of these ships, has been expressly designed for use with the turbine supercharger, and owes much of its success to this efficient supercharging system. So efficient is this engine, in fact, that it can develop its full 1,000-rated horsepower up to 25,000 feet, making it one of the most powerful engines today.

In addition to these liquid-cooled turbo installations the army has ordered twenty-six Boeing B-17B heavy bombers, all of which will mount exhaust-turbine superchargers, in addition to their two-stage, gear-driven "supers." The addition of the turbo units should increase the effective ceiling of the B-17B some 10,000 feet over the earlier YIB-17 Flying Fortresses. Tests have already been run, and are now continuing, on the Boeing YIB-17A and Lockheed XC-35 airplanes, both of which use turbo "supers." Although the Boeing ships will not be pressure-cabin jobs, like the XC-35 and the Boeing 307-S Stratoliner, they will use full oxygen equipment to make such high-altitude flights possible.

Although superchargers do take a certain amount of horsepower to operate, they more than make up for their keep by the increase in available horsepower they effect. A 1,200-horsepower aircraft engine uses approximately 196 horsepower to run its supercharger, while a 1,500-horsepower type may use up to 330 horsepower. When we consider that the supercharger allows the engine to turn up perhaps fifty percent more horsepower at altitude, we can see that it is not only a convenient accessory, but one of utmost necessity if man is to effectively travel the air lanes of the future—the substratosphere.

## THE DUCK

*(Continued from page 44)*

a whole sheet of $^1/_{32}$ x 2" the same way to provide for the top and bottom of the body. The best way to cover with tissue is to brush dope on the whole surface, lay an oversize tissue on top and smooth out with the palm of the hand. To counteract the strong warping tendency a coat of dope should follow on the other side, and when both sides are dry the tissue is trimmed with a razor blade.

Now prepare the four formers (FA, FB, FC, FD). FA is a triangular block of wood forming the nose of the body. Cement the rear hook on FD before assembling the two sides. First pin and cement the two sides to FA. When the glue has set put the other formers in one by one and lastly pull the top of the tail together and cement. Bottom blank No. 3 is fitted in between the two sides, thereby shaping the bottom of the boat from the step on.

All the other pieces needed for the body are just oversize pieces of wood glued on to the sides and trimmed after. The whole top can be made easily out of one piece, but the front end of the bottom requires four pieces. Two pieces between formers FC and FB, and from FB to the very nose, two other pieces, with the grain running right-angle to them, are required.

Trim and sandpaper the edges smooth. Now dope a strip of tissue along each corner to cover up and strengthen the joints. Proceed to cut out all the openings. Cutting the window shapes out of a different color tissue and doping in their places on the body makes the razor-blade work easier and neater. Next the landing-gear struts are bent. Do not forget to slip the aluminum tubings on first. They are glued on FB (several coats) through the side windows.

Now you can cover the windows with celluloid, fasten small hooks for the landing-gear rubber bands, also the two straight wires through the top which hold the rubber bands for the nacelle.

The wheels and water rudder are made of light balsa and waterproofed by several coats of dope.

The slight bulge of the nacelle sides is the result of an extra coat of dope on the uncovered insides. First the top seam is pinned and cemented, then the bottom former FE and the solid balsa front piece are added. Two wire pins fix the nacelle to the body. Place the nacelle in position on top of the body and press lightly to mark the position of the pins. Now enlarge the two holes and glue a square piece of sheet aluminum, also punctured, to coincide with the holes.

The two-piece nose plug is fitted and carved to shape. The bearing is a copper washer and small bushing in the front and rear of the nose plug. Cut the propeller out of medium-hard balsa. Waterproof with a couple of coats of dope, colored or otherwise. Fit in the same bearings as on the nose plug, and make sure that it is equipped with your choicest freewheeling.

Use six strands of $^1/_8$" flat rubber for motive power. It is important to lubricate the rubber, because going through the body it sometimes rubs slightly on the wood. For this reason the rubber should be put in the body and the prop tried for smooth run. If too much vibration results the cause may lie in too small a hole on top of the body or bottom of the nacelle. Or a too-large hook on prop shaft striking the sides of the nacelle will cause uneven run.

### WING AND TAIL

Cut out ten ribs, two of which are $^1/_4$" thick. These are placed first as wing roots, and later on carved to fit the side of the nacelle. The wing is made in two halves. Fix the two end ribs of each wing to the leading and trailing edges and set the remainder and the spar in after. Bend a $^1/_4$"-wide bamboo into the shape of the tip above the gas range and slice two $^1/_{16}$"-thick pieces off with a knife. Upon finishing the wing frames, cover them with tissue, spray with water and dope once.

The tail surfaces are of $^1/_{32}$" sheet balsa. Cut out the exact shape and smooth the surface with fine sandpaper. Cover both sides with tissue the same way as the body has been.

With the tail surfaces fixed in place, the center of gravity should fall to a spot five inches from the nose. Set the wing so that this spot coincides with the wing spar, not forgetting the proper incidence and dihedral.

### FLYING

A rough adjustment can be accomplished indoors, in the cellar, or even a large-size room with pillows placed at the probable landing spot. Ten feet of gliding is ample distance to show a stalling or diving tendency. Warp the elevator flippers to correct anything but a flat glide. Do not rush outdoors regardless of the weather; wait for a calm hour and save yourself a lot of trouble. For outdoor adjustment I recommend $^1/_{16}$" right rudder and an equal amount of right thrust on the nose plug. Wound to capacity, which is four hundred turns, it will take off from water or land alike.

### BILL OF MATERIALS

*(Soft balsa throughout)*

2 sheets $^1/_{32}$ x 3 x 36"
1 sheet $^1/_{16}$ x 2 x 36"
1 prop block 6 x 1 x ¾"
1 length bamboo ¼ x 15"
Small blocks for nose plug, nose of hull, bottom of nacelle
Wire bushings, aluminum tubing and washers

# MODEL MATTERS

*(Continued from page 43)*

which they turn out. The Pepperells recently made some changes in the original Valkyrie model. Powered with a Baby Ohlsson, it shows a practically vertical climb of a thousand feet per minute. The average duration on forty-five-second engine run is five minutes. The Pepperells hold all gas-model records.

Max Allen says the best time of the year for thermals is from February to April. He's had the pleasure of watching three of his models in thermals. The longest flight was thirteen minutes with a modified version of Dague's Mulvihill Winner (1937).

Unfortunately gas motors in New Zealand cost twice as much as in this country. This is a stumblingblock for many modelers who would like to graduate from the rubber class.

Air Trails can't help but boast that all the models mentioned in Allen's letter were built from plans presented in the model department. Through the long list of championship models we have been able to present designs that have all the "bugs" ironed out. In this way the builder is assured of good flights. Letters and contest results have proved this to be true.

**FROM ENGLAND.** Peter G. F. Chinn of Hertfordshire, England, sent a photo of the Gordon Light Wakefield Winner (April, 1936, issue) and the Dick Korda Record Holder (February, 1938). The Wakefield has been patched no less than forty-six times because of the numerous treetop landings. The Korda has come in for its share of patching—the most recent being after a perfect flight of nearly two minutes on only three hundred turns, it landing in a top branch of a seventy-foot tree. And since it was wintertime, there were no leaves to ease the landing.

The circular insignia on the side of the fuselage is that of the National Guild of Aëromodelists which was founded early this year. The N. G. A. issues insurance to its members against third-party claims. The rates are six shillings per annum for rubber models and two pounds six shillings for gas-powered. All ships must bear the guild insignia which carries the motto, *Volas cum cura*—fly with care. At present the guild is unable to insure modelers living beyond the boundaries of the United Kingdom.

This is worth while news from England. We in this country will do well to follow the motto of the guild, even though we are not members. It will be interesting to learn further news of the N. G. A. activities.

**NEW SOUTH WALES, AUSTRALIA.** This month we have a letter from another modeler in Broken Hill, New South Wales, Australia. Last issue William Welsh told us about the success he's had with models built from plans presented in this magazine. This month W. A. Hall takes the lead with an officially recorded flight of ninety minutes with a Korda design (February, 1938, Air Trails). At a meet last March he launched his model, watched it circle into the sky. Leisurely he followed it cross-country for twelve miles, and after ninety minutes it passed from sight—still climbing. No news has been received from the model. And it seems unlikely it will be returned because of the uninhabited nature of the country.

Hall's performance is even more remarkable since he's only fifteen years old. He's been building models for about three years. It will be interesting to learn whether this flight constitutes a new Australian record.

They certainly raise good model builders in Broken Hill, Australia. By the time Welsh and Hall are a few years older they will be threatening our hold on the international trophies. Further news from Broken Hill will certainly be welcomed.

**FIFTH ALL-EASTERN CHAMPIONSHIP GAS MODEL CONTEST.** This meet, held at Hadley Field, New Jersey, June 3rd, was cosponsored by Kresge Aëro Club of Newark and Air Trails. Perfect weather for the spectators, but a trifle too much wind for the gas models were the conditions greeting the entrants. Nevertheless, between gusts, many fine flights were turned in. Fast-climbing jobs made the most of the allotted twenty-second motor run. Many of them drifted out of sight while still high in the air. H. K. Moon, of the Brooklyn Sky-Scrapers, described the flights and the activities of the contestants through the loud-speaker system. Being a modeler himself, his talk did much to clear up the hazy ideas on models held by the uninitiated spectators.

Benjamin Shereshaw, director of the Kresge Club, did a capable job in ironing out the usual contest difficulties and putting across a smooth-running contest. Soldiers from the Raritan Arsenal acted as timers and officials.

Flying was done in three events: Class A—up to 225 square inches wing area, with engine displacement up to .2 cubic inches; Class B—225 to 450 square inches wing area, maximum engine displacement of .3 cubic inches; and Class C—450 square inches wing area and up, maximum engine displacement of 1.25 cubic inches. Two flights were allowed

to each contestant. Take-off was from runways built about two feet above the ground.

The S. S. Kresge Trophy was awarded to Frank Ehling for scoring the greatest number of points in the combined events. This trophy is perpetual and is awarded each year. Scoring is based on 20 points for 1st; 15 for 2nd; 12 for 3rd; 9 for 4th, et cetera. Attractive trophies were awarded to the first two places in each events. Motors, kits, subscriptions, books, and other prizes were given to the next eight places in each event.

Tabulated results were as follows:

**Event I—Class A.** 1st—Frank Ehling, 1:27; 2nd—Richard Boegehold, 1:15; 3rd—Jerome Stoloff, 1:12.

**Event II—Class B.** 1st—Donald Huff, 5:28; 2nd—Harvey Watts, 4:14; 3rd—Gordon Murray, 4:06; 4th—George Moro, 3:14; 5th—J. Onofer, 2:46; 6th—Gus Jung, 2:29; 7th—Steven Curtis, 2:25; 8th—V. J. Bonnema, 1:56; 9th—Frank Ehling, 1:45; 10th—Joe Mastrovitch, 1:45; 11th—Henry Nelson, 1:33; 12th—Howard Beltchman, 1:15; 13th—Edward Soltis, 1:14.

**Event III—Class C.** 1st—John Findra, Sr., 11:40; 2nd—Roy Oliva, 8:10; 3rd—H. Spates, 6:45; 4th—Magnus Anderson, 6:53; 5th—John Findra, Jr., 4:36; 6th—Arthur Gray, 4:35; 7th—J. Moore, 4:03; 8th—Kenneth Hjelm, 3:30; 9th—Harold Sauer, 3:02; 10th—Bud Van Wyk, 3:02.

**NO FIRSTS ALLOWED!** April 30th was the date for a type of contest designed to attract modelers who had never won a place (1st, 2nd, or 3rd) in a model contest. It was sponsored by the Milwaukee Aëronauts, and open to all modelers in the city. Rubber stick and fuselage, together with a glider event, constituted the day's program.

Contests like this give the up-and-coming modeler a chance to show his stuff. Not only are the veteran modelers prevented from taking the prizes, but they are encouraged to attend the contest without their models and give freely of their advice and help to not-so-expert rivals. A program like this insures a steady flow of experts to carry out the club's representation in State and national meets from year to year.

**NATIONAL AERO RESERVE,** sponsored by Gannett newspapers, is holding a national meet late in August. Winners in the contests sponsored in the wing cities will be flown to Rochester for the national event. John L. Sherer is conducting the affairs of the N. A. R. All letters regarding membership and contest information should be addressed to him in care of Gannett Newspapers, Municipal Airport, Rochester, New York. Scherer is also copilot of the Gannett airplanes—a Lockheed 12 and four Stinsons. Outside of a list of attractive prizes including trophies, gas engines, and merchandise, the winners of the national meet will be flown to the National Air Races in Cleveland the beginning of September in the Gannett-owned Lockheed.

At present, wing cities are Hartford, Conn.; Albany, N. Y.; Utica, N. Y.; and Rochester, N. Y. Plans call for extending the N. A. R. activities to the nineteen other cities in which Gannett papers are published.

The Rochester city contest is scheduled for July 15th.

**SYRACUSE MODEL AIRPLANE CLUB.** The second N. A. A.-sanctioned annual Invitation Model Airplane contest sponsored by this club was held at Cicero Airport, near Syracuse, N. Y., on May 14th. Several new N. A. A. records were believed to have been made. All times were judged on an average of three official flights.

Winners were as follows:

**Hand-launched stick event.** 1st: Edward J. Swenton, Senior, 11:37.3; 2nd: William Hayes, Senior, 7:59.7; 3rd: Leighton M. Webb, Senior, 5:54.6.

**Fuselage R. O. G. event:** 1st: George Kessel, Senior, 10:38.7; 2nd: Robert Tonsend, 6:42.6; 3rd: John Etherington, Senior, 5:27.3.

**Gas event** (20-sec. motor run). 1st: Daniel J. Veronica, Senior, 17:32.9; 2nd: Clarence Quillin, Open, 8:20.8; 3rd: Robert Randolph, Senior, 2:1.4.

Conditions for the rubber-powered contests were ideal during the morning when those events were held. However, a high wind kicked up in the afternoon, which spelled the doom of many a gas job. The contest drew nearly a hundred and fifty entrants, three of whom were girls. Officials and timers were members of the Syracuse Model Railroad Society and the Syracuse Exchange Club.

**ALLEGHENY MOUNTAIN AREA** model program got under way with their first major contest in the 1939 season on May 21st with entries from western Pennsylvania, Ohio, and West Virginia. The meet was the largest of its type ever held in the Pittsburgh or western Pennsylvania area. Low clouds greeted the fliers early Sunday morning, but these disappeared in favor of sunlight and ideal flying conditions.

Winners were:

**Gas Powered.** Senior: 1. Robert Davis; 2. Frank Dunn. Open: 1. Chester Lanzo; 2. Edgar Fulmer.

**Fuselage.** Junior: 1. Jack Schneider; 2. Joseph Messner. Senior: 1. N. Von Tuil; 2. Sam Gerrard. Open: 1. Joseph Scuro; 2. Chester Lanzo.

**Stick.** Senior: 1. N. Von Tuil; 2. Joseph Boyle. Open, 1. Richard Korda; 2. Richard Everett.

**Gilder.** Junior: 1. Richard Querman; 2. William King. Senior: 1. Robert Cogar; 2. Jack Kinzler. Open: 1. John Tracz; 2. Edgar Fulmer.

**Original Design.** Rocket ship: Fred Loedding.

Harry Vogler, Jr., was contest director. N. A. A. rules were used. An impressive list of Pittsburgh citizens representing the Air Board of Allegheny County, the Aëro Club of Pittsburgh, and Post 531, American Legion, served as timers and judges. Honorary officials were John Kane, county commissioner, George Rankin, county commissioner, and Major Hornbostel, director of parks.

**EAST PATERSON GAS MEET.** Nearly three hundred of the leading Eastern gas modelers assembled at Cherry Hill Airport, near East Paterson, N. J., on May 21st, and competed in the East Paterson Gas Model Club's first annual gas model meet, before an audience of more than five thousand interested spectators.

At the close of the meet, both participants and witnesses were unanimous in their opinion that the meet was one of the best managed of the contest year to date. The committee in charge was under the supervision of Hans Schroeder, senior adviser of the club, and arrangements were made to provide one half of the field for official flights and the other half for test flights, a procedure which worked out very well.

Gus Jung, of the Sky-Scrapers Club, flying in one of the first official flights of the day, set a mark of 4:04, and subsequent flights gave him an average of 3:02 for final time. Although this mark was made within an hour after the contest opened, it was not beaten during the entire day of flying, although Jung had some tense moments when ships made outstanding flights. His closest competition came from John Findra, Sr., of the Queen City Gas Model Club, who averaged 2:19 for three flights. Mr. Findra's plane was an outstanding performer. It was a redesigned Standard Buccaneer, featuring a six-foot instead of a five-foot wing. Following his official flights, Mr. Findra entered it in the workmanship class, and after a 2:45 demonstration flight before officials, he took first in this event. In addition his ship flew 1:53 in its initial flight, the time being the "bogy" time of the day and winning him a prize. Jung's ship was a deep-bellied, single-wheel Brown-powered job of his own design.

Thirteen participants were the recipients of prizes in Class C. Other winners and their clubs were: Howard Simmons, Queen City Gas Model Club; Walter Kessler, Queens Aëro Model Association; Bill Frost, Jr.; John Gibson, Quaker City Model Club; Mathew Porta, Sky-Scrapers; Mickey de Angelis, Quaker City Model Club; John Taubl, South Connecticut Gas Model Club; Arthur Gray, Queen City Gas Model Club; Sal Taibi, Sky-Scrapers; Howard Beitchmann, Sky-Scrapers, and Roy Nordbloom, Silk City Gas Model Club.

Frank Ehling, veteran prize winner representing the Jersey City Airwheels, took first honors in Class B, flying his self-designed Ohlsson-powered ship to an average of 2:03 in three flights. Other prize winners, and club affiliations: S. I. Andes; V. Bonnema, Silk City Gas Model Club; Joe Mastrovitch, Hadley Model Airplane Club; H. Karlfers, Silk City Gas Model Club, and James Onofri, Trenton Gas Model Club.

Ehling also took second in Class A,

losing out to Sal Taibi, of the Sky-Scrapers, by a few seconds in this event. Once again the Class A ships proved a disappointment in the meet, the best flights hardly being over the forty-second limit. Taibi's ship, a new model designed by Bill Effinger, used a Husky on several flights, but changed to a Bantam on later flights. Ehling's tiny job also used a Bantam.

As is usual on such occasions, several contestants lost ships due to carelessness in setting timers. A standard Cavalier disappeared after a fourteen-minute motor run early in the morning, and was reported several miles away later in the day at an altitude of approximately three thousand feet, as checked by the pilot of a Taylor Cub who followed the ship for nearly an hour.

A standard Buccaneer, with an overlong motor run, hung in a thermal for several minutes directly below a hawk which was riding the same riser. After close scrutiny, the hawk dove on the plane, but making no impression, soon gave up and flapped dismally away.

Several of the new Megow designs were present and flew well. Robert Long of Philadelphia brought them up. They have high-aspect ratio, but have unusually fine characteristics in turn, surprising in such design.

One lad's ship, after making a spectacular test flight, was wrecked *three times* by the ships of other contestants. Once a wing was sheared off, once a prop split, and when a ship washed out and crushed the tail assembly, the sad-eyed flier gave it up.

**N. Y. METROPOLITAN MODEL AIR COUNCIL.** Rubber meets held the focus of attention of New York City modelers on May 20th, and more than a hundred and fifty entries participated in the two meets scheduled for that day. A larger group of entries participated in the first of the 1939 rubber meets to be sponsored by the Metropolitan Model Air Council, which was held at Holmes Airport in Queens, although a fine turnout was on hand at a meet sponsored by the City of New York, Department of Parks, which was held at Sheep's Meadow, Prospect Park, Brooklyn.

In the M. M. A. C. meet, the Queens Aëro Model Association took other clubs by a large margin. Christian Berger of Quama (as the club is called) took first in the hand-launched glider class with an average of 1:35 on three flights, being closely followed by Elton Ballas, of the same club, who averaged 1:06. Gil Schurman, of the New York Aëronuts, was third, while H. Halpern, of the Metropolitan Model League, and H. Schindelman, of the New York Airfoilers, also placed.

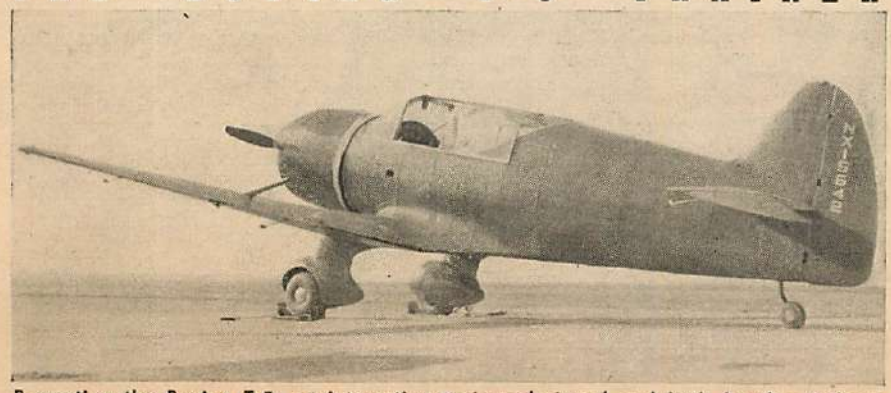
Paul Plecan, of Quama, took first in the Cabin Class with an average of 3:01 on three flights, and incidentally registered 6:10 on one flight for the best performance of the day. Gordon Murray, of the Sky-Scrapers, was second, with an average of 1:58, while C. Karacostantia, of M. M. L., was third, W. Dickinson of the Kresge Aëro Club was fourth and Buddy Leamy of Quama, fifth.

Henry Struck, of Quama, took first in the scale event with a Caudron, while Jack Minassian of the same club took second with a similar plane. Jerry Persch of New York Airfoilers was third, and Gordon Murray of the Sky-Scrapers took fourth.

Struck, Murray, Berger and Plecan tied for high-point score, but computation on the highest total time of placing flights took this award for Plecan.

At Prospect Park, Herbert Cohen took first in the hand-launched glider event, with Paul Manlove second and Jerry Stoloff third. Bob Phillips took first in the cabin class, with G. Gordon second and W. Silverman third. Samuel Eskenaisi took top honors in the scale event with a Polish fighter. George Dressing entered two planes in this event and took second and third prizes with a Floyd and a Nieuport. A junior scale event resulted in prizes for R. Mitchell, R. McKay and Bill McNeilly. Gas models were on exhibition, and Arnold Klonin and Anthony Tortuese won the awards for construction. Flights in this event were not on the program, due to the small space available.

## THE BOEING T-5 TRAINER



Presenting the Boeing T-5, an interesting trainer designed and built by the students of the Boeing School of Aeronautics, and test flown by the well-known Eddie Allen.

# BALLOON BARRAGE

*(Continued from page 27)*

let few raiders pass to test out the system.

Fully aware that in the next war its cities face certain attack, Germany has lately developed the balloon barrage extensively. In extra-heavy weather giant kites will replace the bulbous sausages. Vulnerable cities like Stuttgart, Munich, Essen, Cologne, Dusseldorf, some of which were bombed in 1918, will be curtained with steel networks. In Berlin the barrage system will penetrate far inward to protect such nerve centers as the new Chancellery. Great industrial plants will be similarly safeguarded. An extensive system will lattice the sky behind the Siegfried Line.

The general layout is about the same in all countries. Unlike the World War aprons, which resembled the overhead row of warning wires seen at railway-tunnel approaches, the modern air minefield consists of highly mobile kite balloons and the cables from which they are suspended. The cables are attached to winches on speedy trucks. The equipment can be rushed from one aërial approach of a city to another on short notice. At present, complete encirclement of cities by a barrage is not regarded practical or necessary.

Theoretically, the balloon barrage is designed to force enemy bombers up into the open sky for the intercepter combat planes. This conforms to the military tradition of getting the enemy to fight on your own terms. Moreover, the bomber will not only be deprived of easy targets in low murderous attacks, but brought within effective range of the antiaircraft batteries. For a few hundred feet a raider is the least vulnerable to gunfire owing to the angular velocity of the craft about the guns' position.

London's barrage set-up, a masterpiece in design, is based primarily on this strategy. Only an hour's flying time from the German border, the British capital is the most vulnerable air target on earth. No doubt some of the enemy bombers will get through the defensive system, but Londoners feel pretty confident today of keeping most of them away. Those that penetrate the barrier will have to resort largely to blind bombing, a not-so-forbidding possibility because nine-tenths of the metropolitan area is represented by open space—streets, parks, squares, and so on.

London discounts the formerly held fear that modern aërial warfare may wipe out large cities. To accomplish this in London, say with phosgene (carbonyl chlorid) gas, would require fourteen thousand bombers carrying twenty-eight million pounds of the stuff. Too, reports of a new German wholesale death-dealing bomb or liquid oxygen are considerably discredited.

Fears of large-scale disaster were expressed during the World War, but from 1914 to 1918 Britain suffered one hundred and eleven air attacks with a toll of only one thousand four hundred and thirteen dead, three thousand four hundred and seven injured and property damage of fifteen million dollars.

The first war-time barrage device was the short-lived curtain or bursting shell which was tried out on the first night attack on London, September 3 and 4, 1917. Ten planes got through and bombed the capital. Expensive, this measure was promptly dropped and replaced with the apron system—four or five balloons in line with a network of dangling wires between them.

In both England and France these barrages were crude and cumbersome. They could be raised only ten thousand feet. Their wind velocity resistance was only fifty miles. Their real value, however, was psychological; they created a fear hazard which forced the enemy out of bombing range, decreasing his accuracy. No German bombers are believed to have been destroyed in either country's network; one big Gotha flew through in London, breaking off one of the cables, but escaped to Germany.

Nevertheless, by May, 1918, the barrage, combined with other weapons of air defense, had saved London from further bombing. No doubt this was due largely to the fact that the Allies were advancing on the Western Front after the March defeat, and the Germans, armed with a new horrible thermite bomb, did not want to embark on a savage bombing campaign in the face of possible termination of the War.

If the Germans come again they'll find Britons vastly better prepared than in 1918. As currently planned, the defensive network at the empire's heart in London will comprise six protective zones. The two outer zones consist of coastal air reconnaissance and naval patrol on the Narrow Seas and observation by a volunteer corps on the distant cliffs. The third zone is armed with rapid-firing three or four-inch antiaircraft guns, sound locators and powerful searchlights. The fourth zone comprises the main fighter belt patrolled by royal air force squadrons. The fifth zone is the balloon barrage area. The sixth zone is manned by special antiaircraft guns and intercepter fighters, fast, single-seat multigunned craft which Britain claims as the world's speediest.

Because of its picturesque nature, the

balloon system is perhaps the most interesting of all these defensive forms. Manned by an enlisted auxiliary and officered by the Royal Air Force, the service is divided into squadrons of thirteen officers and six hundred and two men. A squadron has forty-five balloons and maintains intercommunication with field telephone and motorcycle dispatch riders.

A balloon is operated by a crew of ten men. Rolling equipment consists of a truck with winch and a trailer for the hydrogen cylinders. A winch is mounted on the rear of a six-wheel chassis which can be driven over rough ground with the balloons at practically any height. Working at high speed, the winch can haul down a balloon at between one thousand to one thousand four hundred feet a minute.

The winch is in use all the time the balloon is up, because if the bag were moored to an immovable object it could not be brought down in an emergency. The chief purpose of the barrage, in fact, is to keep the balloon mobile at all times so that the prospective raider may be constantly confounded and outfoxed.

Present plans call for from four thousand to five thousand balloons in the London network and a covering outer barrier along the entire eastern and southeastern coast of England, from Newcastle to the Isle of Wight. There will be protective systems also for the big midland industrial cities and such vital points as arsenals, training fields, barracks, munition dumps, power plants, factories, food storehouses, docks, et cetera.

The barrage equipment still is undergoing extensive experiment and much is yet to be learned. At present two distinct patterns have been worked out. One is the "perimeter siting" plan in which the balloons are sited singly in ring fashion on the perimeter of an area to be defended. The other is the "field siting" fillet, in which the bags are staggered equidistantly over a circular area.

A perimeter barrage envisages for London a stockade of balloons in a ten-mile radius of St. Paul's. The ring would consist of one thousand one hundred bags spaced at hundred-yard intervals.

The field-siting plan provides the same encompassing protection but calls for only six hundred bags. Although the bags are spaced wider apart, this design is said to offer twice as many chances of impact.

An enemy squadron attacking in line-ahead formation with a "sweeper" in front would only have to worry about the first cable in a perimeter job. But in the field scheme the formation would likely as not run plumb into a second or third wire inside the area.

Two cardinal advantages of the field set-up are that the cables are practically invisible, reputedly even in good weather, and they counter the dread low-altitude attacks to a certain extent, as well as dive bombing. There is one disadvantage to this design, however. The difficulty of servicing the balloons with hydrogen, gasoline and other supplies is greater. A compromise pattern is expected to be worked out eventually. It's merely a question of arranging the bags.

Much speculation on the potential protective value of these barrages has marked their development. But that goes for all air defensive forms. The speed and supermobile qualities of a modern airplane do not seemingly make for impregnability in any air defensive program. However, the British war office and the air ministry do not share the misgivings of Ex-premier Baldwin and others. Indeed, military technicians have pronounced the aërial cables as one of the most efficient modern weapons against air attack.

Naturally, they expect some bombers to get through. But the picture of those lethal cables twisting and turning in their paths is not going to be an inviting one to raiders in unknown skyways. There will be an added moral deterrent in decoy balloons carrying explosives, which will be set off electrically from the ground.

Unable to fly at will and with impunity, the enemy raiders will be forced to ascend far beyond normal bombing ranges into the arms of the intercepters. Thus the barrages, if they prove effective, may radically alter bombing tactics now in use. Pilots will have to equip themselves with oxygen apparatus and other stratosphere gear, special range-finding and sighting instruments.

What that means in bombing accuracy can only be imagined. At present, according to a paper recently read in London by Air Commodore I. M. Bonham-Carter and Colonel A. J. G. Bird, a fast bomber must begin to take aim at least five to eight miles from the target and begin to release his eggs two miles away. That's figuring on about a ten-thousand-foot altitude.

As for the actual destructive power of the cables, that is inevitably problematical at this juncture. Some technicians believe that any contact with the steel wires will be sufficient to wreck or disable a bomber bowling along at two hundred and eighty miles an hour. Others feel that neither by impact nor shock can a cable do real damage. However that may be, there's about one chance in four of a bomber colliding with a cable if we assume that the span of a big bomber is seventy feet and the balloons are tethered at hundred-yard intervals. In an "in and out" passage this is boosted to one chance in two of collision. Hence, the risk is formidable.

What has been done to circumvent the cables is only darkly whispered in military air circles. It is said that devices have been perfected but do not fit the existing types of planes, whatever that means. Certainly, the balloon crews are in for some brusque surprises when war comes.

For the nonce, they are not worrying about counterdevices. There are other problems to solve. One is the weather hazard. The ideal balloon is, of course, one that will stand the worst inclemency. At present the barrages must be lowered in a severe storm, and it is during storms that the other antiaircraft weapons become less effective.

Electrical storms, particularly, are vexing. "Brush" discharges on the fabric of the sausages have been caused during trials by static charges of electricity, a dangerous hazard because hydrogen when mixed with air becomes a very explosive mixture. Actual lightning discharges on the equipment also are fraught with peril; the cable becomes a lightning conductor and a lethal threat to the ground crew.

Wind is not the hazard imaginable. Present equipment is believed to be proof against all but violent winds. But usually these blows prevail at low levels, so that the balloons can rise easily above them.

The balloons are streamlined to reduce the effect of wind and possess stabilizers at the rear ends. The forward component of the kiting effect balances the effect of the wind drag on the cable and the balloon, and keeps the balloon on the same level whatever the wind velocity.

In recent experiments the sausages were flown in winds up to ninety miles velocity. True, there have been mishaps, and the tugging bags have broken loose on several occasions and trailed miles of cable across the countryside, pulling out roofs, trees and power wires.

In war time no doubt many balloons will be punctured by enemy machine guns and falling shrapnel from the defending archies. It is expected these punctures will only cause the bags to deflate slowly so they can be hastily hauled down, patched without complete deflation and put up again.

The balloons, of course, are nonrigid. As the pressure of the atmosphere becomes less with increase in altitude, gas aboard the sausage tends to expand, and this increase in volume must either be valved into the atmosphere or taken into an expanding container during the ascent. The most usual method is to divide the sausage's innards into two sections by a false bottom. Hydrogen is then forced into the section above the false bottom and air into the lower section. As the blimp ascends the increased volume of hydrogen presses down the false bottom, expelling air through the scoop.

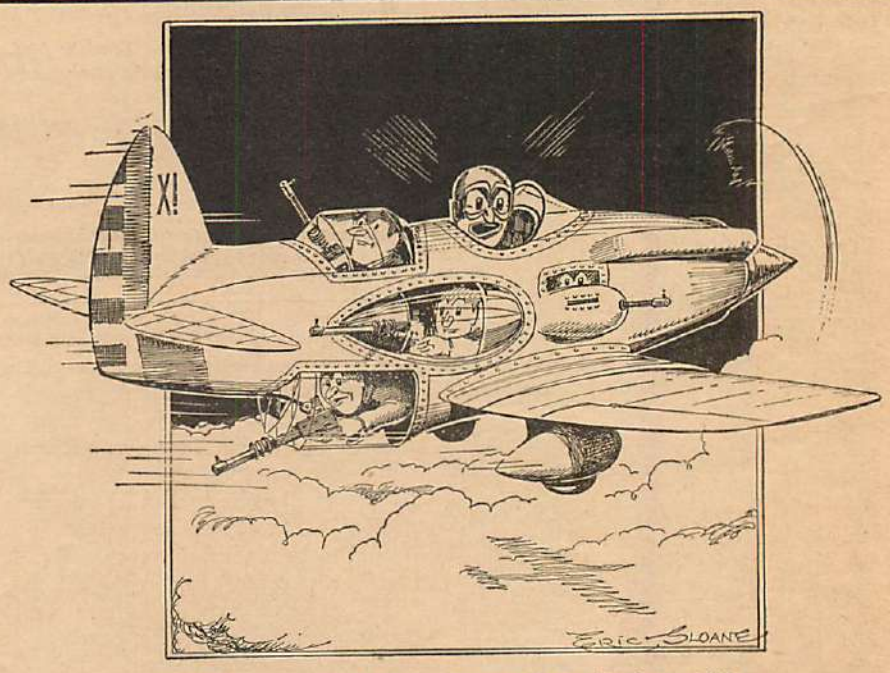
Another way of making a bag of variable capacity is to construct the envelope with longitudinal gores of fabric over which are laced elastic cords. As the gas expands the elastic cord lacing is stretched and the gores are pulled taut.

A third method is to make a balloon lobular in section, that is, a section consisting of a polygon on each side of which is described an arc of a circle. The sides of the polygon are elastic cords and the arcs the fabric envelope. When the bag rises the elastic cords are stretched and the bag takes a more circular section.

Because the ordinary proofed fabrics used for balloons are not completely air or gas-tight, hydrogen is constantly escaping in small quantities. The bag tends to become flabby and the purity of its hydrogen becomes lower. This reduces the lift and leads toward an explosive mixture. As a result, a continuous supply of hydrogen and a periodical hauling down are required.

The problem of developing a light cable was equally as arduous as work on the balloons. The cables must be of high strength-to-weight radio and be extremely flexible. For high-level operations, tapered cables are used, because the load at the lower end is less than at the upper end. The steel material also must be of very high tensile quality, of over two hundred tons per square inch. Such a cable of over a ton breaking-strength can be less than 3mm. diameter.

All of which makes the London balloon barrage look pretty sound and formidable. It may well be that the service will become the most thrilling and adventurous in the next war. The spectacle of flying these grimlike kites forty thousand feet in the stratosphere while zooming enemy aircraft are caught in the entwining tendrils of death is hard to beat.




Will the guy with the hobnail boots keep his feet still?

## MEET CASEY JONES

*(Continued from page 7)*

but he decided to enter a field which his experience had taught him was the most vital to aviation, the training of aviation mechanics. He organized the Casey Jones School of Aëronautics, Inc., in Newark, New Jersey. He built a school that specialized in the training of aviation mechanics and aëronautical engineers, and today this is the largest of its kind in the world, with an enrollment of over five hundred students.

Casey is also president of the J. V. W. Corporation, a sales and consulting organization that handles aviation equipment, including the Link Trainer, which he helped to develop.

Despite the pressure of business at his school, Casey still finds time to fly, both commercially and as a member of the army air corps reserve. He's an active member of the Institute of Aëronautical Science and the National Aëronautical Association, a Quiet Birdman and a member of Aviators' Post 743.

Casey Jones resides at Washington Crossing, Pennsylvania, with his wife and son, C. S. Jones, Jr., and his daughter Deborah Harrison. He plays the piano, but *well*, with or without request, and among his intimates he is now known affectionately as the "Flying Farmer."

## SENIOR N.A.A. NEWS

*(Continued from page 22)*

those pilots who are privileged to carry passengers are possessed of mature judgment and have the proper mental attitude toward the operation of aircraft. While there may be a few exceptional cases in which boys of sixteen years are sufficiently mature to be intrusted with the lives of passengers in an aircraft, many such boys are apt to be deficient in judgment, if experience with automobiles is any criterion."

### PRIVATE FLYING SURVEY TRIP

Covering practically all the major private flying centers in the East and Middle West, Bill Strohmeier, past president of the National Intercollegiate Flying Club, and the writer recently completed a seven-day two-thousand-mile trip by light plane. The tour was made to study interest in an expanded N. A. A. program for the promotion of private flying.

This survey marked an important step in N. A. A. activity toward a closer and firmer co-operation between the various phases of private flying to promote the general interests of nonscheduled aviation. Along the route of the tour, various operators and airport managers were contacted from the standpoint of what their own particular problems were and how the N. A. A. might help with some of the difficulties which now confront the private pilot and operator.

Feeling was one hundred percent agreed that much can be done and should be done to further the interests of private flying. Full co-operation and considerable enthusiasm for the N. A. A.'s newly developed Private Flying Division were expressed by plane manufacturers and representatives of allied industries.

An interesting sidelight was the demonstration of the practicability of using light airplanes for travel on long business trips, as shown in the performance figures of the Continental-powered Cub coupé used to make the tour. The actual airline distance flown was 2,005 miles, completed in exactly a week's time. Flight time logged was twenty-four hours and fifty minutes, at an average ground-to-ground speed of 83.54 miles per hour. Total fuel cost was $26.73, a little over one half cent per passenger mile.

### CLEVELAND CHAPTER OPENS SCHOOL

The Cleveland Women's Chapter of N. A. A. and the Cleveland *Press* joined hands in April to conduct a ground school at Cleveland College for all properly qualified young people of the city. Tuition was free and the sessions were held Tuesday evenings from eight to ten.

Major Clarence Barnhill, commanding officer of the 112th Observation Squadron, O. N. G., served as dean, and on the staff with him were William M. Robertson, division chief of the Civil Aëronautics Authority; C. George Andrus, head of the weather bureau station at the Municipal Airport; and Paul Bollman, chief instructor of the Aircraft Mechanics School. Mrs. William M. Robertson, who is president of the chapter, headed a committee of school sponsors, composed of Major Jack Berry, Mrs. J. Noble Richards, Dr. Caswell Ellis of Cleveland College, and Louis B. Seltzer, editor of the *Press*.

At the end of the course, all students who passed their examinations with a grade of seventy or better were awarded certificates. The three best students were awarded flying scholarships by the Aircraft Mechanics School and the leading student was also awarded sixty courtesy flights.

### LOUISIANA AIR TOUR

More than forty planes from five States participated in the Third Annual Louisiana Air Tour, sponsored jointly by the Louisiana Department of the N. A. A. and the Louisiana Aëronautics Commission, and directed by the Harry P. Williams Chapter, N. A. A., of New Orleans.

The Ark-La-Tex Chapter at Shreveport originated the air-tour program three years ago, sponsoring the first two tours. Starting from Alexandria, where the mayor was host at a banquet at Camp Beauregard, the fliers visited and were royally entertained at Natchitoches, Monroe, Shreveport, Many, Lake Charles, Lafayette, Opelousas, Baton Rouge, and New Orleans.

## CORRECTIONS FOR THE MYSTERY MAN GAS MODEL

A number of unavoidable minor errors existed in the drawings of the Mystery Man in the June and July issues. Anyone who was confused in building this ship from the plans should write to Elbert J. Weathers in care of this magazine.

# BORDER PATROL

*(Continued from page 16)*

of southern California; next, the dry, sandy and extreme-temperatured wastes of the Yuma Desert, where 100 degrees is considered "fair to cool." This in turn gives way to the rugged, mountainous mining regions of Arizona, and the rolling, sierra-rimmed valleys of southern New Mexico. At El Paso, Texas, the Rio Grande River relieves carefully placed granite monuments as the line of demarcation between the United States and Mexico, and pursues its tortuous course as a boundary through shifting scenes of mesquite-covered flatlands, rocky, multihued canyons, snakelike arroyos and wooded lowlands to the Gulf of Mexico.

All the coast guard operations over this vast slice of our country are directed from the central base at El Paso. Using the combined facilities of the army and the department of commerce radio and teletype systems, this base is able to keep in close communication with its planes, even though they may be on patrol duty a thousand miles away. Maintenance and repair work to the aircraft are also carried out here by a fine crew of highly trained coast-guard mechanics and radiomen. These men are kept going at top speed in order to meet the rigid requirements for mechanical perfection laid down by the service for its operating equipment.

In addition to being experienced in these two fields, every enlisted man of the unit is a capable pilot, or well able to take over the controls of a plane if necessary. In addition, the military status of the coast guard, as well as its law-enforcement activities, require that all personnel be well trained and expert marksmen in the use of service-type firearms. Regular range practice is conducted with pistol, rifle and machine gun, as well as in the cleaning and maintenance of weapons.

Although law enforcement is the coast guard service's, and thus the Border Patrol detachment's chief duty, "assistance to life and property" is and always has been a most important consideration. It is thus that the air patrol detachment finds itself constantly called upon to perform rescue and assistance missions inland, in much the same manner as the coastwise units perform them at sea.

It may be necessary to transport a badly injured person from a mining camp to a hospital hundreds of miles away; or a child taken dangerously ill of some serious ailment demanding immediate attention of a physician; or it may be that an epidemic is spreading throughout some mountain community, and serums are needed quickly to check its murderous progress. A call for help will bring a coast-guard plane to the scene as fast as its engine will carry it—often to make a risky landing upon rough and dangerous terrain, or in a clear spot the size of a handkerchief.

The flat wastelands of Texas are deceptively smooth when viewed from the air, but a forced landing on the part of a pilot may often spell disaster. A washed-out landing gear, or the plane up on its nose, propeller damaged, is a comparatively fortunate experience. Unable to land and pick up the pilot and passengers, the Border Patrol drops a cargo 'chute laden with food and water; then radios the location to the home base. In a few hours or so an automobile rescue party will be on the scene.

Tourists and inexperienced exploring parties are often the victims of the desert; they frequently attempt trips without bothering to take on a good supply of water or food, or sufficient tools to be used in case of a breakdown. Once, two women driving a brand-new car got a flat tire, only to find that they had no jack. Aside from keeping a watchful lookout for any such cases while out on regular patrol, Border Patrol planes often go out on a search at the request of anxious relatives or friends.

It is not always a simple matter, however. In one instance, a party of three motorists were reported almost two days overdue on a trip that ordinarily would take perhaps six hours. Residents of the East, they had traveled at night to avoid the scorching heat, turned off the main road to some little-used track, and finally had wound up in the desert with a broken fan belt, overheating the automobile's engine. Foolishly, although they had sufficient food and a quantity of water, they attempted to walk their way toward help, after spending a fairly comfortable night in the car, when the proper tactics would have been to wait at least half the day to see whether anyone would come along. Several hours of tramping under a boiling sun soon had its effect. Extreme dizziness and nausea caused by going bareheaded weakened their resistance. A fitful night spent in the open on hard ground somewhat recuperated their strength, but left the three wanderers with practically no water and not the faintest idea of where they were.

V-159 took off at 7:00 a. m. for the search, and some fifty minutes later began a methodical crisscross circuit of the area in which the lost party was thought to be. Like the whitecaps encountered over the ocean, the mesquite bushes of the flat wastelands make observation extremely difficult, although in clear spots it is possible to discern tracks and automobile tire marks, and trace them onward. Cruising at one hundred and ten miles per hour, at altitudes of between four and seven hundred feet above the ground, almost four hours elapsed, fuel supply meanwhile growing steadily lower, before the pilot was able to catch a glimpse of brightly colored cloth which led to the lost party.

After swooping down low in a deafening dive which scared the unhappy three out of their wits, an already prepared cargo 'chute containing emergency supplies was dropped. They were evidently as yet physically strong and able, as well as enthusiastic over the prospect of food, water and rescue, if the speed at which they raced to the life-saving 'chute was any evidence. A message dropped with the supplies informed them that help would soon be on the way—and that they should stay "put" instead of wandering away. Enthusiastic waving of arms acknowledged this word from the skies, and the plane waggled its wings in farewell as the radioman tapped out their location. That evening they were safe in El Paso, undaunted by their experience, even bragging about it. However, they were fortunate, for the saga of the desert has woven far grimmer tales of people who disappeared into the unknown and were lost forever. For this is a land that has never been conquered by man, and still wages constant battle with him.

Major disasters provide the hardest work. Whenever a serious flood is imminent, or a hurricane expected, the

planes are sent out to warn the inhabitants of farms and isolated communities of their approach. Preventive measures like these have been instrumental in the saving of countless lives.

During the summer and fall seasons, the air patrol detachment remains always on the alert for the dread hurricane calls. Should one of these terrible storms threaten the area around the Gulf of Mexico, it is up to the coast guard to give quick warning. They have prepared for this duty during the winter months, whenever they have time, by making up hundreds of small wooden containers to which are attached long white or yellow streamers bearing the terse message—"Hurricane Warning." A hollow space inside of the blocks provides room for a more detailed message as to the course of the storm and the possible time it is expected to strike—and reiterates the warning to move to higher ground, if near a river, and to safe and strong quarters, if away from immediate water.

After a storm or flood has struck, the planes are employed in surveying and charting inundated areas, searching out marooned persons and directing rescue parties to their aid. The result of one flight alone was instrumental in rescuing eight persons stranded in treetops barely sticking out of the water. After actual rescue work has been completed, the planes act as aërial ferries for transporting of serums and other medicinal supplies to those engaged in the inevitable struggle against disease that follows every major disaster of nature.

Between times, the air patrol detachment sandwiches in additional co-operative activities with Federal, State and local authorities, rendering efficient and impartial assistance whenever possible to the best of its ability. This, among other reasons, is why the Border Patrol has earned itself, without any fanfare of publicity and limelight, the enviable reputation of being one of the very finest of the government's military forces. The citizens of the far-flung area covered by its wings and Uncle Sam in Washington take equal pride in the manner in which this tiny unit of America's "peacetime army" carries out the best traditions of a service that has always been a credit to our country—the coast guard itself.

## LITTLE JUNIOR

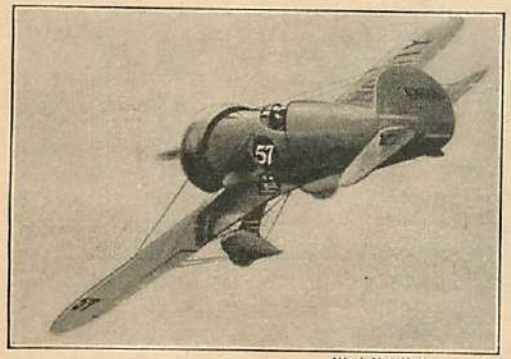
*(Continued from page 52)*

Junior is a nice performer. In fact, two were built before the plans were drawn and both were flown out-of-sight.

### BILL OF MATERIALS

*(Balsa unless otherwise noted)*

1 motor stick ¼ x ¼ x 18¼", hardwood (#1)
1 thrust bearing (dural) heavy duty (#2)
1 rear hook $^1/_{32}$" dia. x 1½" wire (#3)
6 ft. rubber ⅛ x $^1/_{30}$", flat (#4)
1 tail skid $^1/_{16}$ x $^1/_{16}$ x 2", bamboo (#5)
2 rear landing-gear struts $^1/_{16}$ x $^1/_{16}$ x 6¼", bamboo (#6)
2 front landing-gear struts $^1/_{16}$ x $^1/_{16}$ x 5⅞" (#7)
2 wheel axles $^1/_{32}$" dia. x 3½" wire (#8)
2 wheels 1" dia. x ¼" thick, hardwood (#9)
1 propeller ⅞ x 1⅜ x 11" (#10)
1 propeller shaft $^1/_{32}$" dia. x 3" wire (#11)
3 washers ¼" O. D., brass (#12)
4 spars $^3/_{32}$ x $^3/_{32}$ x 12" (#13)
8 ribs $^3/_{32}$ x $^3/_{32}$ x $2^{13}/_{16}$" (#14)
2 sheet inserts $^1/_{32}$ x $2^{13}/_{16}$ x $3^{27}/_{32}$" (#15)
4 corners $^3/_{32}$ x $^5/_{16}$ x $^5/_{16}$" (triangle) (#16)
1 clip (front) $^1/_{32}$" dia. x 2½" wire (#17)
1 clip (rear) $^1/_{32}$" dia. x 3" wire (#18)
1 elevator $^1/_{16}$ x 4 x 10", soft (#19)
2 elevator reinforcing strips $^1/_{32}$ x $^1/_{16}$ x 3½" (#20)
1 rudder $^1/_{16}$ x 3 x 4", soft (#21)
Additional items: 1 small sheet tissue, cement, dope, and thread



Wedell-Williams—1934

Folkerts Special—1937

Laird Pesco Special—1938

# BUILT-IN HORSESHOES

*(Continued from page 21)*

itself. This nosing-over, groundlooping problem is representative. Let's stick to it.

The tricycle gear has attracted favorable comment as a solution of this problem. The rear wheels are slightly behind the center of gravity, so groundlooping leverage is canceled. A swiveling nose wheel takes the weight there, so tipping is avoided. Because of these factors, cross-wind landing and take-off are easy. Taxiing control is good since power turns of small radius can be made without groundlooping, or brakes can be applied without nose-over danger.

Since the tricycle gear has so much to recommend it, the hopeful light-plane pilot would be dismayed at the price if it were added to his plane. It demands a complicated fuselage structure to bear the nose stress, and that means extra cost. It would add one hundred percent in landing-gear weight, with an extra wheel and leg plus the shock-absorbing system which must be larger to serve three wheels.

Another factor steering light-plane development at present away from this gear is that low price depends on mass appeal. The light-plane pilot wants to land in any cow pasture to visit Aunt Jane's farm, and he flies from meadows if his small town has no field; his faith is sometimes larger than his gas tank. For these pilots the tricycle has its drawbacks. There is, on some models, the tendency of the nose wheel to dig into soft ground when the thrust of the motor, as in a conventional plane, tends to lift the tail. There is little danger of nosing over but take-off requires a longer run, or is impossible. The three-wheeler at present seems to favor the airports, and while manufacturers do not advise landing *everywhere*, the use of planes by the average man increases in proportion to the increase in freedom.

Autogiros and helicopters are "tops" in freedom. Taking off and landing nearly vertically, flying sideways or backward as the helicopter can do, sound ideal until you investigate the building costs—and the more complicated business of learning to fly them.

But what of built-in horseshoes for the average man *now?*

In looking over the light planes, the pilot sees one outstanding characteristic —extremely large wings. The area of the wings divided into the gross weight of the plane gives the wing load—the pounds that each square foot must carry. In an airliner it may be twenty-five pounds, in the military plane still higher, in a racer extremely high. Speed adds extra lift and the cut-down wing reduces drag to produce that speed. In a light plane this wing loading ranges from seven pounds down.

Because of these glider characteristics, it can come in quite flat or take off steeply. If a stall does occur and the plane starts to fall, it can recover in fifty feet while an airliner would need ten times that. This wing, large in proportion to the weight, also cushions a drop so that if the motor fails on take-off or the inexperienced pilot "lands" twenty feet above the field, nothing more serious than a blown tire or a strained landing gear will result.

The large wing has the disadvantage of slowing the plane down by drag. However, cutting off curves in the highway, smoothing the hills, and avoiding traffic saves about thirty percent time, and the lower speed constitutes definite safety.

Any time the light-plane pilot is close enough to the ground to hit anything, his landing speed is down around thirty miles per hour. (We'll disregard the pilot who indulges in low acrobatics. Dynamite is always a dangerous plaything.) At thirty miles an hour with propeller, nose or wings to absorb the shock, collision will usually do nothing but mess up the plane. The force, though, will increase with the square of the speed, and a plane that hit at sixty miles per hour would hit with four times the force of the light plane. The amount of room needed to stop also increases with the square of the speed, and the thirty-mile-an-hour-landing-speed plane that boasts of getting down in a hundred-and-fifty-foot run would need six hundred feet if its landing speed were doubled.

Figuring some head wind which is to be subtracted from airspeed, he often lands at a ground speed of fifteen or twenty miles an hour. This same slow speed is a safety factor in taking off, since the head wind will push the plane steadily backward as it climbs so that its path is comparatively steep and obstructions are cleared with an ease impossible to the heavier ship less sensitive to wind effect. In maneuvering, low speed adds safety in that a turn can be made in small radius. A light plane can "hunt" its way down a valley with lowering ceilings to an emergency field, while the fast ship that needs "all outdoors" to make a turn cannot.

Manufacturers try to build added safety besides that inherent in low speed. One uses "all-metal" construction which adds to fireproofing and through less maintenance cost may actually add to safety through leaving a larger margin of operating cost to keep up the mechanical condition. (On the other hand, damage is more expensive to repair.) Visibility on most of the light planes is good, one having side windows that go far back of the pilot's shoulders so that he can actually see the tail surfaces. Two of them have large doors on both sides for quick exit if necessary.

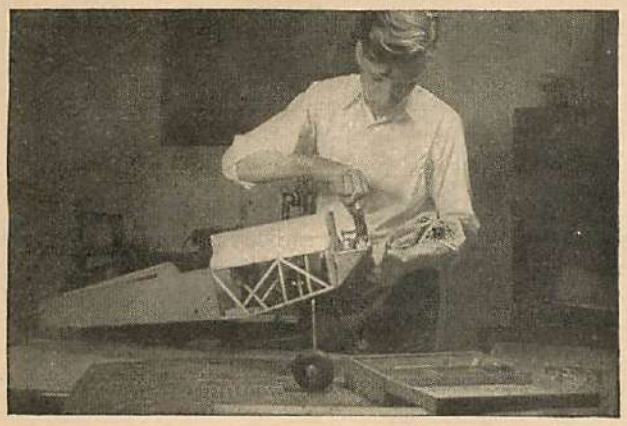
All have strong landing gears well shock-absorbed to prevent straining the fuselage in hard landings. One has both legs hinged at the fuselage and brought to the center in a sliding joint with a single shock-absorber that keeps the wheels always on the same level. This makes ground loops less likely since both wheels "give" the same amount in a one-wheel landing or on rough ground. No light plane has much tendency to groundloop anyhow because of wide-spread landing gear and soft air-cushioned wheels.

The wing sections vary. One is thin for slightly more speed. One is thicker for high-lift qualities, especially attractive to students, since it stalls only in extreme circumstances. All have wing sections with a flat or gentle lift curve. That is, the ship will steadily climb until the steepest possible angle is reached. Some of the fast ships and many of the old ships then go suddenly into a stall or spin. The light plane will mush with the wings at the extreme angle for some time in a squirmy fashion, the ailerons retaining some control even after the plane is wallowing and mushing. The pilot has all the warning in the world. Pressure released on the controls, the plane recovers. In an actual stall, the plane will resume level flight after a shallow dive. Large control surfaces add controllability, too.

Will the safety features of present "unconventional" plans be added to the light plane? Probably yes. Mass production cuts unit cost. Total overhead remains fairly constant in a factory no matter what its production, but as sales increase, as they are doing at an amazing rate, this unit cost drops. Gradually, light planes can absorb in their production system the added costs of more complicated features unconventional planes have proven desirable. Their extra weight may be absorbed through more efficient streamlining of the future, extra power, or new materials. Any bad features can be worked out of the safety devices, and as costs drop the light planes themselves will probably increase in size and power as well as safety.

In the meantime, safety can be added by more efficient training. There are too many pilots who fly today by "pulling this and pushing that," without understanding the aërodynamic causes. A competent instructor should be able to increase student safety in a few hours of careful explanation. That it pays is illustrated by the C. A. A. program in the colleges. These pilots had half an hour dual check for every hour of solo after their first solo. In thirty-five hours, they passed their tests more easily and efficiently than most who have trained a minimum of eight hours more by the uncontrolled system. Those boys are wearing their horseshoes in their heads.

# *Keep in touch with* AVIATION!



Get acquainted with this exciting sport. Know model building and model flying. Aviation is today's greatest international force. Keep in touch! You can make the latest models—have your own workshop like the one shown at left. Keep closer to live-wire aviation—

## READ MODEL AIRPLANE NEWS


*This offer expires August 8th. Act now!*

## KIT FREE

Complete outfit to build this 18" Endurance Model Flyer given with each yearly subscription during this special offer. Includes all materials, full size drawings, instructions for building and flying.

**FUN** Enjoy fascinating stories about the world's greatest aces—the fastest planes. Know about up-to-the-minute model flying. Watch your OWN miniature ships climb sky high and glide home for perfect three point landings.

**KNOWLEDGE** Build gliders, endurance flyers, cabin planes, pursuit ships, bombers. Know about lifting force, wing stress. Understand miniature gasoline motors—have your own gas powered job that will fly 25 minutes!

**MONEY MAKING** Win Model Building Prizes and Flying Awards. Make realistic, exact scale models and sell them for gifts—for home decorations, etc. Earn while you learn this exciting aviation business.

**POSSIBLE CAREER** It's wise to keep in close touch with AVIATION—the world's fastest growing business. Flyers, mechanics, technical experts and executives who *know* AVIATION get the best jobs and the biggest money.

## MODEL AIRPLANE NEWS

now in its TENTH YEAR, is published for men and boys interested in *practical* aviation. The editors are experienced technical experts. They furnish you the latest, exciting developments from leading builders all over the world. Many contributors are World's Record Holders. MODEL AIRPLANE NEWS gives you 64 big pages each month—packed with dozens of new models, hundreds of photos—news of the best flyers and builders. That's why model builders in 55 countries rely on this magazine for accurate, up-to-date information in the model airplane industry. It is the best way to *keep up with AVIATION.*

**12 MONTHS $1**

### ALTERNATE OFFER

In the event premium is not desired subscription will be entered for a period of 13 months. Check coupon accordingly.

*MAIL THIS COUPON* →

**20¢ PER COPY AT ALL NEWS STANDS**

***Special Summer Subscription Offer***

**MODEL AIRPLANE NEWS** AT8
**551 Fifth Avenue, New York, N. Y.**

For the enclosed $1 please send me
( ) Model Airplane News for one year and the FREE Endurance Model Flyer Kit.
( ) Model Airplane News for 13 months. (No kit)

*Name* .....

*Address* .....

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

This offer good in the U.S. and Canada. Canadians please add 10c to cover kit mailing costs. Offer, excluding kit also good in U.S. pos., Cuba, Mexico, Panama and South America.

# MAINTENANCE MEN MUST BE GAME

*(Continued from page 17)*

were his friends, laughing off their lost bets, pulling for him. He was almost as happy as if he had won.

That is, he felt that way until he met Brother Tiger in the dressing room. For quite plainly the Tiger was unhappy about the whole thing.

"So now"—Tiger swung his hands wide, palms upward—"so now a Stawski is a clown for a collitch-learned amachoor, and de grunters kin give me de ha-ha."

"Sure I clowned," Pete said. "But you often told me it's O. K. to give the fans a laugh when the other guy is sure to tire. That stooge is twenty-eight years old. He got a lucky—"

"So he's an ice-cream cone an' melts quick because he's twenty-eight!" Tiger's voice rose to a squeak. "And I'm thoity-six! What does dat make me?" He raised his arms and looked toward the ceiling for justice.

Pete got ready for the shower. Tiger tapped his chest with a thick, ungentle finger, but spoke quietly.

"Get me, kid. You ain't no wrestler. You just ain't got it. You grab a crotch hold, but your body ain't in line. You start a body slam, but you ain't in line again and you don't slam nuthin'. They's a diffrunce between clownin' an' bein' a clown. You're a factory dog—stay in de factory."

Tiger swept both arms downward as if throwing a rock off from a cliff. It was the longest speech Pete had ever heard him make.

"I'll throw him yet," Pete promised. "He keeps picking on me in the plant, and I'll show him up on the mat."

"So dat's it," said Tiger. "Well, you show him up by cuttin' in on de job de way he wants it cut. A guy what is yellow in his woik is yellow in all he does all his life."

"How you big brothers do go on!" Pete ducked for the shower, escaping a swiftly swung kick.

But Tiger's words had stung him. For this brother was all the father and mother he had ever known.

Pete thought it all over on Sunday. Tiger was silent, but watched him through squinted, speculative eyes—a thing he had never done before. Well, Pete told himself, he wasn't yellow. He thought he had earned that promotion, but now he would earn it so well there would be no doubt about it. He, too, was silent.

On Monday morning Pete's first task was to fasten an electric motor to its base. Picking up the huskiest wrench that would fit those nuts, he went at it with a will. He would show McShark something. He yanked hard.

But McShark rushed over. "What the hell are you using on that motor, a wrecking tool?" He grabbed the big wrench from Pete's hand, threw it back into the kit.

"I was only trying to speed things," said Pete mildly.

"Yeah!" McShark said. "But speed 'em so you don't spoil 'em. Here, let me show you what you were doing."

McShark took from his private kit a torque wrench which had at its head a dial scale that showed in pounds the exact pull it put on each bolt. With this, Pete knew, the assemblers of engines could get the parts fitted to microscopic tightness, without twisting the millionths-of-an-inch accuracies out of line. He had wanted to see one of those babies in action.

One by one, McShark tried those motor base bolts with it, watching the dial.

"See," he said, "you've got several hundred pounds more strain on the first bolt than on the third. You could pull bearings out of line that way or split a casting—"

"I know," Pete interrupted. "But I have no torque wrench to test with."

"Pick out a light, thin, sensitive wrench. Get your body in line to use your shoulder muscles for leverage, just like lining up a half Nelson on the mat. Then you can feel the tightness you are getting. Your fingers will tell you."

Pete tried a thin, graceful little wrench. He had never used it before, for somehow it had seemed like a toy beside the huskies in his kit. With his slightly bowed legs braced he could lean on it. When each nut was just right there was just a slight quiver, plain as day to his fingertips.

His brown eyes lit up with amazement. "Why," he said, "it's just like feeling a bite when you go fishing. Why didn't you tell me that wrenching is fun?"

McShark seemed about to let loose one of his rare, thin-lipped smiles. Then he was snapping again. "You quarter-witted ape! Look at that motor switch box."

"Why, it's shut off all right," said Pete.

"Yes, but it is not locked off. Someone could bump into that handle, turn the power on, and blow a fuse if he didn't electrocute anybody! Lock it, you jackass, and quick!"

A little sullenly, Pete threw the locking lever. He had taken an awfully dangerous chance, but—

McShark was not through with him. "And just this once more, I'm telling you. Rubber muscles can be useful here, but not when wired up to a rubber head. A maintenance man can never take a chance, for his work keeps all the other men at work. Think what you are doing first, then do it right. Just as in wrestling," he sneered over his shoulder as he walked away, "clowns are nothing but boobs."

Pete wanted to slug the boss. But he knew that Tiger would call that quitting—getting yellow—like an athlete fouling when he could not win fairly. He would stick and lick this job. In the meantime, he would learn more wrestling.

Next morning Pete had forgiven McShark. It was not in his sunny soul to hold a grudge. After all, did not Tiger himself take bawlings out from his trainers? He grinned at the boss as he punched his time card. Soon he was up on a safety ladder to adjust the exhaust fan over the lacquering ovens. McShark could not get anything on him this time. The power was off and the switch padlocked, and he had the right-sized tools.

Pete felt a little dizzy. It surprised him. He laughed it off and reached up to work. His head started to hurt. It was the first headache he had ever had. He got dizzier—grasped the ladder rail—carefully dropped his wrench onto the platform—swayed.

And there was McShark, wearing a gas mask, carrying him down the ladder. He was aware of everything, although a million devils were pounding his head with tiny hammers. Then other men were grasping him, dragging him out into the air.

"Thanks, boss," he managed to say. "I won't forget."

"Thanks my foot!" McShark avoided Pete's outstretched hand. "I can forgive an enemy, but never a sap. You knew that that fan was for getting poisonous fumes out of the ceiling peak, yet you ran your bare nose right up there. You keep your job for using your head enough to drop that wrench onto the platform instead of into the ovens."

Pete heard a man laugh. "Fish-blood McShark has bit a sucker." Angrily he got to his feet, staggered, drew a few deep breaths, staggered again, forced his legs to carry him straight. His head seemed to be on fire. But he put on a gas mask, climbed back up that ladder, used the right tools in just the right way, turned on the power, saw the fan blades move, speed up to a blur.

He was ashamed of his foolishness. The safety rules about gas masks were plain. The silence of the men accused him. No one even looked at him. He did not realize that this was the silence of deep respect for the way he could take it.

He tried harder. But every day McShark got something on him. The unshielded spray from a paint gun flying where it might get into someone's eyes, a Stillson wrench used so a slip might

send his naked arm against a hot steam pipe, a grinding wheel shooting sparks and his eyes unprotected by goggles—there seemed a million mistakes to make, and all of them dangerous.

Pete got so he swiftly catalogued every move to be made before he started any task. He did not realize that he was developing into an ace maintenance man, safe and speedy on any assignment. He only knew that McShark bawled him out constantly, always with some wisecrack about clowning and wrestling. The man was out to disgrace him.

Once Pete sounded out Tiger on the wrestling. He ought to be learning more about it, he thought. But Tiger sneered and waved his arms until Pete feared for the bric-a-brac on the sideboard. "Frum yer cradle you was tolt and learnt about wrestlin'. An' frum all I hear, you're nuthin' but a factory punk—an' a stooge an' choppin' block fer McShark, at dat! You fergit wrestlin'."

Pete became silent. He was silent a lot these days.

But if he kept getting bawled out, he also kept getting more important tasks to do. He scarcely noticed that.

Until one day McShark asked him to stay overtime and help replace the trip-pedal clutch inside the base of a huge press. He and McShark would team up for the job, work alone together. It was a proud moment when the boss told him that.

So tall was the machine that its base had to go into a pit to bring the working level to the right height for a man who stood on the floor. But that was no trouble. They would raise it in its pit, crawl under it, stand upright, use the wrenches for a few moments, and all would be well. It would be just like working inside of a big bell, Pete thought.

Together they ran the electric crane along its overhead rails, anchored it in position, and fastened its chains to the press.

Quickly McShark ran extension cables from the hoist motor-control box. He used two cables with push-button switches at their ends, one for raising the load and the other for lowering it. With them the men could stand in the pit and change the working height of the press so they could reach its parts without bending or tiring themselves. It was easy enough.

They raised the press a few feet and tested the slinging of it to make sure that nothing would slip. All was secure.

Soon both of them were under it, working. It would only take a few minutes. Good thing, thought Pete. It was hot in that pit; the bell-shaped base held all of the heat given off by their wire-guarded trouble lamps. And anyway, he was going to watch Tiger wrestle in a charity bout tonight. He did not want to be late. He worked fast. McShark worked faster. They got into an impromptu race. McShark's wrench slipped and he fell off balance, banging his head on the steel base. Pete laughed. This was good.

To his surprise, he saw McShark fall on the floor. The whack had not seemed hard enough for that.

And then he felt the machine base pushing down on his back. The boss was lying on the down switch button of the hoist. Three tons of cold steel were coming down—down. Pete could see the small space through which he might escape, closing and closing. He knew he should jump. He tried to yank the cable free. It jammed more tightly.

He gave one more yank, then tried to lift McShark. The press had come too near to the floor now for him to be able to get both of them free. He was down on his knees, cursing the high speed of that hoist. The cold steel pushed on the back of his neck; he thought foolishly of that full Nelson. He flopped on his back to get more room, got his left hand under McShark, tried to lift with his fingers. The switch would not come loose.

Pete could hear the hoist gears whine. The steel edge pushed on his chest. He couldn't get a full breath. He turned his left hand palm down, cupped it, got it like a bridge between McShark and that switch. The motor stopped.

He was gasping in short, squeezed breaths. That left-hand bridge was an old wrestler's trick to lift an opponent clear of his leverage. It would give them a moment or so, until his hand tired.

Swiftly his mind catalogued the situation. He was all maintenance man now. The up switch! He groped for it, got hold of the wire, could not reach the switch. He was tiring fast.

McShark came to. "Pete," he groaned. "Pete."

"Raise your hip off from my hand," Pete gasped. "I'm holding you off from the down button." McShark could not move much. But he could help a little.

"What is that scraping?" he asked.

"I'm rubbing the cable to the up switch on the edge of the press base," Pete answered. "I'll wear through the insulation and short the wires, forming a switch."

Pete rubbed. His deep eyesockets were like cups to catch the blinding sweat. His wrist ached. There was a flash, and the smell of scorched insulation. The wires were shorted across the steel. He heard the hoist gears growling, and slowly, slowly, the press base rose. Pete wondered at the slowness, then remembered that a hoist rises far more slowly than it lowers.

Soon the machine reached clear working height. McShark stopped it. Both men were trembling. But neither would show quit. They picked up their wrenches again. In five minutes they were outside, lowering away to fasten the anchor nuts.

Pete knew that as he had had McShark's life in his hands, so now he had his reputation. The boss had made a bull. There should have been an extra man out on the floor, just in case of emergencies like that.

But McShark seemed unafraid that Pete might talk. And Pete was proud. He was trusted.

"Look, Pete," said McShark. "Let's go watch Tiger wrestle. The excitement will calm my nerves." It was the first time Pete had ever heard that old Fishblood had any nerves.

They went into the hall. There in the ring stood Tiger, alone. His opponent had run out.

The show manager rushed over to them. "Mr. McShark," he said, "will you wrestle Tiger? He'll go easy on you. It's for the crippled children's fund, you know."

"No!" McShark laughed. "But Pete, here, will. He is a much better wrestler than I am."

In the ring, Pete knew that Tiger meant to go home early. All of the champion's famous speed was turned on. He was using every trick.

But all the new habits that Pete had learned in licking his job came into play now. His body always in line, his brain cataloguing every situation as it developed, Pete kept out of trouble, and even threatened the Tiger at times.

Faster and faster they went. Rolling, spinning, diving, butting—even slugging a bit—they sweated and grunted. Grip was answered with break; only an expert could follow their action, but the crowd stood on the chairs and went roaring crazy at the fury of their fighting.

Pete felt Tiger reaching for a full Nelson. He waited until the exact split second when Tiger would be unable to step quickly. Then his body flashed down, and reaching backward between his feet, he got hold of Tiger's left ankle. Instantly he straightened, lifting Tiger's leg high between his hips. It was a perfect Cornish back heel hold.

Pete twisted, then heaved himself over straight backward. Tiger fell beneath him and tried to move out of it. But this was Pete's night. He would not be denied. The referee slapped his shoulder. He had thrown the world's champion.

At midnight Tiger, McShark and Pete were drinking coffee together.

"So I suppose," said Tiger, "you'll be a mat scrapper now."

"No," said Pete. "Your game is a good one, Tiger. But I like to do the work that keeps other men at work. I am going on in maintenance."

"You made de assembly-line gang, den?"

McShark answered that one. "He skipped it. He is assistant foreman under me now. And," he continued, "when he's had a few years of engineering night school—"

"I know," Tiger interrupted. "I been savin' up t'ree years to pay fer dat. I had to be sure de kid had what it takes. Because frum what I hear, maintenance men gotta be game."

# GLIDING AND SOARING

*(Continued from page 29)*

## SECOND ANNUAL WESTERN SOARING CONTEST

Sponsored by the Southern California Soaring Association and supported by the Arvin Boosters Club and Kern County Junior Chamber of Commerce, the contest had four days of official flying, April 8th and 9th, 15th and 16th. Five flight categories were open for competition: duration, altitude, distance, with return and goal flights. All pilots had to exceed the following minimum performances in order to earn credit points: duration, one half hour; altitude, eight hundred feet; distance, eight miles. Although only forty-five hours of soaring time were logged on a total of one hundred and eighty-four flights during the contest, official flights were made in each of the five categories. Twelve ships and thirty pilots entered the contest. All ships were inspected by the technical committee headed by Paul Sanderson. C. A. A. Inspectors Brewster and Steward issued "X" licenses to all ships which were not already licensed. Columbia Broadcasting broadcast the opening of the meet over a national hook-up of one hundred and twenty-six stations and twenty stations in Europe, a thirty-minute program, directly from the soaring site. Fifteen minutes of this broadcast were conducted by Paul Pierce, C. B. S. announcer, from a portable transmitter installed in Jay Buxton's two-place Transporter sailplane flown by Lucretia Buxton. This flight was a "first" in radio and won for the West Coast division of C. B. S. a prize for the best special sport broadcast event of the year. Newsreel companies shot a number of interesting pictures which are now showing throughout the country.

A special communication system was set up for the contest by two of Hollywood's well-known radio amateurs, Mr. Schuch and Mr. Archer. It consisted of radio telephones between the take-off site and the winch, eliminating the use of hand flags. The publicity committee was headed by Gus Briegleb, famous glider designer and constructor, and Speed Westphal. Their combined efforts attracted a crowd of over ten thousand spectators to the contest.

The prizes and prize money were donated by the Kern County Junior Chamber of Commerce, civic organizations and clubs, as well as by individuals and business concerns. The first prize and the Western Championship was won by Woodie Brown flying a Bowlus Baby Albatross Thunderbird. Second prize went to John Robinson flying his *Robin*, a ship designed and built by him. Dick Essery in the Buxton Transporter took third, and fourth was captured by our friend Hawley Bowlus piloting his Albatross. Best altitude attained was 4,000 feet, by J. Robinson; best duration, 3 hours, 48 minutes, by Woody Brown; best distance, 42 miles by J. Robinson; goal flight, 40.5 miles by Woody Brown; goal and return, 9 miles by Dick Essery.

Trophies and cash prizes were presented at the banquet held in Hollywood.

## FOREIGN NEWS

On April 21st two German sailplane pilots, Brauetigam and Meyer, broke the world's two-place goal record with a flight of two hundred and twenty-five miles. A Kranich ship was used.

---

Soaring is to be included in the Olympic Games which will be held in Finland in 1940. The competition will start on July 22nd at the Finnish soaring center and will continue until August 4th. The tests for sailplane types were conducted in Italy last February, and a German Meise was selected. All pilots must fly the same type of ship.

---

On April 24th Geoffrey H. Stephenson of the London Gliding Club, Dunstable, England, took off from the club's site by winch tow, expecting to fly to Reigate. Some three and a half hours later he landed near Boulogne, France, a distance of one hundred and twenty-five miles. This is the first time that a sailplane has been soared across the English Channel. The ship in this case was a Kirby Gull.

The British Air Defense Cadets are getting their first taste of flying in gliders, a number of them being trained at Dunstable.

# AIR ADVENTURERS

*(Continued from page 33)*

We won't be sabotaged out of our trust in what our forefathers built up for us. Let's go, Air Adventurers!

Your Flight Commander,
ALBERT J. CARLSON.

## AIR ADVENTURERS' NEWS

And now for the mail, which is getting heavy again.

George Micari, of Sag Harbor, Long Island, N. Y., comes through with a long letter this month about his new badge and membership card, over which he is quite enthused. He's going to do some flying this summer with Carl Hennicki, who used to be quite a stunt flier a few years ago.

Another flying member of Air Adventurers is Bob Taylor, who lives in Denver. Bob is taking lessons at the Roy Wilson Flying School out there, and he plans a tour through New Mexico and Colorado with his brother. Well, let's know how you make out, Bob. You may run into a swell story on that trip.

Graham Strout, of Adelaide, Australia, sends us a lot of fine photographs taken at the Parafield Aërodrome in Adelaide. Most of them are shots of the Vickers Wellesleys which broke the world's non-stop record a short time ago. Strout, whose address is 17 Ailsa Street, Fullarton Estate, Adelaide, S. A., Australia, would like to correspond with some American Air Adventurers who are interested in exchanging photos, stamps or newspaper clippings. He is about nineteen years of age. And speaking of those Wellesleys, which are supposed to have a range of fifteen hundred miles, they actually covered more than seven thousand miles on that record flight.

Walter Baumont of New Bedford wants Arch Whitehouse to tell him where he can get a copy of Talbot Booth's "Fighting Planes of the World." Arch tells us that it can be obtained from the Appleton-Century Co., of 29 West Thirty-second Street, New York City.

Earl C. Hafer, of Nashville, Tenn., sends in a long letter telling about an experience he had with a "50" Cub. "About a month ago," he writes, "I gave my grandfather in Hopkinsville a surprise by flying there for dinner. They live far out in the country, so I went down over the house, cut my motor and *yelled down* for them to come after me in a car. I landed in a cow pasture, and by the time I got out of the plane there were four cars there to see what the trouble was. Seeing that I was in no trouble, they left, and I got into my uncle's car and went to the house for dinner. After dinner I got into the car, went back to the plane and came back home. As soon as I save enough money I'm going to make the trip again."

J. R. Settle, of Edmonton, Canada, is still bringing in new members. This month he has rounded up Marvin L. Dower, of Edmonton, who has already passed ten examinations in the Hurricane Aëro Club of Edmonton, which seems to be run by Settle.

Cecil Thackery, of Norfolk, England, is a real aëro bug. He has a workshop and tells us he is building a light plane of his own design which will be powered with an American Continental. He is loud in his praise of Air Trails as a real aëronautical publication, and says he wishes some of the British publishers would turn out a book like it. Well, that's very kind of you, Thackery, and we hope you will continue to read our magazine. Thanks also for the picture of the old Avro which you say is still flying over there. What a bus that must be!

Harry Lavington, of "Eversham," 52 Victoria Street, Lidcombe, N. S. W., Australia, is an Air Adventurer who wants to get in touch with American Air Adventurers who are interested in model making and aviation in general. Harry is eighteen and seems to be a swell bird to know. He certainly is a great booster for Air Trails down there.

John Longworth, of Philadelphia, goes off the deep end with a model winner. His Comet Junior Clipper won the Philadelphia Model Building Contest award, and he has sent in two grand pictures of it.

G. F. Baly, of Nelson College, in Nelson, New Zealand, has won his Photographer's award with two good pictures of Lockheed Electras used by the Union Airways of New Zealand. One is a particularly interesting study of lights and shadows.

Other members who have gained Photographer's awards this month are: William Ritter, of York, Pa., who sends in a photo of a Curtiss Junior; Donald Thenhaus, who sends in two shots of light planes at the Cedar Rapids Aviation Country Club; Martin George, of Concord, N. H., for a shot of a Waco on floats; Allan Stover, Jr., of San Diego, Cal., for an air shot of the Consolidated Aircraft factory at San Diego; Hugh McGraw, of Kirkland Lake, Ontario, for a picture of a Waco on skis; Leonard Wasserman, of Los Angeles, for his photo of a Fairchild taken at the Santa Monica airport; Jack Mason, of Omaha, Neb., for a shot of a Grumman designed for Nicaragua; and Leland Ruffner, of South Bend, Ind., for his shot of a TWA airliner.

We have had a few good attempts for Topographer awards this month, showing careful attention to detail.

Which is all for this month, but we shall be waiting to hear from you. We want more good letters, more good photos and drawings.

Until next month!

# WHAT'S THE AIR CORPS MEDICAL EXAM?

*(Continued from page 19)*

individuals. For example, asthma, history of hay fever or other pronounced allergic reactions; history of kidney stone or renal colic; history of mastoidectomy, unless it can be shown that the operation was a simple drainage and there are no residuals. Also excessive underweight and overweight and dental defects, such as caries (decay and ulceration) or loss of masticating or incisor teeth beyond the required standard. Dental defects are very often the cause of either temporary or permanent disqualification.

Many young aspiring fliers ask: Are there any home tests which can show a fitness or aptitude for piloting a plane? The answer is honestly no. Army doctors frown upon any such crude efforts, and the reason is obvious. It is practically an impossible task. Those miniature whirling airplanes seen at carnivals and all other similar contraptions may provide a simulated aërial thrill, but they prove nothing. And the majority of general practitioners are not familiar with the A. C. standards, though they may be capable of conducting the exam.

Naturally, a youngster may see whether he measures up to the regulation five feet four inches and weighs in proportion to his height. He may, too, for his amusement, try out the self-balancing equilibrium test. It's done by flexing the knee backward, arms out, eyes shut, for fifteen seconds, each foot. The standard findings are: fairly steady, unsteady, or failed, the last when one out of three trials fails. Unless its results are observed by an expert and are related to other factors, this exercise cannot be of any importance to the aspiring youngster.

The organ of equilibrium, incidentally, is in the inner recess of the ears, and this sense plays its rôle in flying in acceleration and deceleration in landing, as well as in keeping the various parts of the body orientated. Swing sickness, train sickness and airsickness are results of defects in the organ of equilibrium. The old-time Ruggles orientator has been discarded, but checks are made today with the Barany chair. The applicant is spun around in it and then the ocular muscle spasm resulting therefrom is scientifically measured.

But, as I have said, the quickest and best way to ascertain physical fitness is to drop in on your family doctor, and, passing him, go immediately to the nearest flight surgeon. It will save time and anxiety.

Once you get inside his office it won't take the flight surgeon long to tell whether you are eligible for flight training. First off, he'll be looking you over, making minute observations of character and manner, gait and posture, mental responses and neuropsychic reflexes as you respond unawares to his seemingly mechanical questions. This done, along you go to a series of chambers with all sorts of machines and testing gadgets which will remind you of a Rube Goldberg cartoon.

What comes first? The eyes, of course. And here's where most of the Bill Smiths come an aërial cropper. "Eyes right!" the infantry sergeant sings out. Well, in the air corps it's "eyes *have* to be right." If you fail in the eye test you might as well go home; nothing else matters. No vocation as yet undertaken is so dependent upon vision as flying. Defects regarded as bagatelles in civilian pursuits may be serious indeed for the pilot.

The stringent eye-test requirements are about the same in the transport service; but their importance in flying competence is far greater in military aviation. A transport pilot flies month after month—often year after year—over the same route, at the same altitude, under more or less familiar conditions and circumstances. Not so your army flier. He may be ordered north, east, south or west on a few moments' notice. He may have to land on strange fields, and in weather which would ground the civilians. His plane is speedier, and his tactical work calls for power dives at five hundred miles an hour and formation maneuvers at dizzy altitudes. He's got to rocket through space at three hundred miles an hour, dropping bombs intended for his objective.

Just how important the eyes are is indicated by the fact that the ocular division in the form for physical examination for flying of the army air corps contains fourteen items alone. But don't rush off scared! There's nothing in them calling for optical miracles. You are not required to possess second sight or the ability to see through opaque glass. Each item merely covers a specific organic function and reaction of that sensitive little ball that gives us vision. I took part of the test, and I assure you it is no more than an exhaustive check-up by a first-rate oculist.

The items treat, for examples, such matters as visual acuity (acuteness), depth perception, prism divergence, unimpared ocular muscle balance, refraction, shape and equality of pupils, angle of divergence; tangent curtain movements, associated parallel movements, central color vision.

The first test is for visual acuity and depth perception. In the first the old-fashioned alphabet cards as well as slide machines are used; you take the test every time you go to your eye man. The depth-perception check-up is done with the Howard-Dolman apparatus—combination refractors and eye-muscle testers.

This test is important, for it shows the ability to judge distance in terms of the third dimension. A pilot needs it in taking off, landing or in leveling off his plane, and in correctly orientating himself in relation to surrounding objects; too, it is an aid to proficiency in gunnery and in maintaining position in flight formations.

The two tests are usually the worst hurdles for the cadet aspirant. Here the common disqualifying defects come to the surface. Errors in refraction, color blindness, muscular imbalance, and myopia (nearsightedness) are some of them. If you wear glasses for myopia, don't waste time and money in going to an air field for a test.

Glasses do not necessarily bar an applicant, although in each case he is examined without glasses. You may wear

them for mild cases of astigmatism which may be no deterrent to categorical rejection, all other things being equal. Anyway, the flight surgeon will tell you soon enough, even if you don't remind him of it.

Lids, cornea, pupils, retina are examined with minute care; and then come the ears, nose, throat, sinuses and oral cavity. The nose and throat must be free of all obstructions.

Hearing is important to a pilot so that he may not be distracted by extraneous noises. Good hearing enables him to co-ordinate sound and the work at hand. For this reason the whole naso-pharyngeal system must be checked with audimeter and other precision instruments. Many applicants try to conceal ailments or inherited defects, but the machines produce the subjective evidence which the doctor can study with his objective findings and conclusions. If the young man has ringing sounds in his ears, dizzy spells, a discharge, mastoiditis, or deviations due to a head injury, the instruments will tell.

The general examination of the trunk and limbs includes a study of the heart and blood-vessel system, the gastro-intestinal system, the genito-urinary system, respiratory system, and the bones, skin, joints, et cetera.

The blood pressure and heart tests indicate within themselves their importance to flying. The doctors measure the reclining blood pressure, the standing blood pressure, reclining pulse rate, standing pulse rate, and the pulse rate after each definite exercise and the time required to return to normal. Then a count is made of the red and white blood cells.

The heart comes in for a lot of personal attention. It is X-rayed when this is indicated necessary, and its rhythmical expansion and contraction are checked by an electrocardiograph machine, which has a slow-motion effect. To pass the test the heart must be entirely free of any valvular disease or muscular abnormality in rate or rhythm. A man with a faulty heart or a low or high blood pressure would be practically committing suicide in a four-hundred-mile-an-hour army plane. The test is only that which a cardiologist would give a man who went to see him for heart murmurs, tobacco heart or burnings or flutterings in the cardiac region.

Now comes the third and last important special test: the check-up on the nervous system. It includes such items as pupillary reactions, gait, tic (local and habitual convulsive movements such as face twitching); other motor disturbances, patellar (kneecap) reflexes, tremor, psychomotor tension, peripheral circulation (exterior), stammering, insomnia, amnesia, sensory disturbances, reality adjustment, apathy, depression, headaches, fainting, migraine (blues), *pavor nocturnus*, anxiety trends and phobias.

Again, this examination is similar to that given by a practicing neuro-psychiatrist. It is merely designed to ascertain whether mind and nervous system are in harmony. The doctor may strike your kneecap with a small mallet to study the rebound of the leg; he may check your gait as you cross the room, peer into eyes with a small light and ask you a million and one questions about your family and yourself.

His findings, arrived at after considerable study, will determine whether you are capable of undergoing the terrific strain of army flying; whether you "can take it" in wartime, and whether you are able to live a normal, composed life like the rest of us human beings when you are grounded. In a word, whether you can fly and still fulfill that old Latin slogan, *mens sana in corpore sano*—sound mind in a sound body.

Unlike people in many another calling, cadets don't forget their bodies once they get in. Special attention is paid to health throughout the training period; not only is exercise a part of the curriculum, but facilities are provided to enable the cadets to keep in sound condition. A physical exam is conducted twice a year.

The same goes for aërial bombers, gunners, photographers, radio men, observers, all of whom are not subjected to the rigid requirements of pilots but must keep constantly fit and undergo periodical examinations.

But of course, passing the physical test does not mean that the cadet is assured of his wings. He must undergo eight months' primary instruction, usually at Randolph Field. This embraces studies in navigation, meteorology, radio and other subjects of military aviation, such as engines, gunnery and the like. This training consists of a hundred and sixty-nine hours in the air.

If the cadet gets by this hurdle without physical disbarment, he is sent to Kelly Field, also in Texas, for four months' advancing training. This is special work in pursuit, bombardment, attack and observation; about eleven hours in the air plus the regular academic work.

The physical test is worth trying for any young man, because pilot training in the army, aviation leaders agree, is the best foundation for the majority of positions in commercial flying. If you can handle the wheel in a silver bullet that zooms through space at four hundred miles an hour you can almost pick your job.

But don't let any disgruntled Bill Smiths tell you that you've got to be a superman to get in.

# OBSERVATION PLANES

*(Continued from page 31)*

aërial services speeded up the development of specialized types. By the time the armistice was signed, single and two-seater fighters, light and heavy bombers, observation and even armored attack planes had been created. While kite balloons were still largely used for artillery spotting, radio-equipped planes were slowly but surely displacing them. The airplane had also taken over all photographic reconnaissance. The old process of trial and error had gradually evolved a standard observation type. It was a two-seater biplane carrying radio and camera, armed with two defensive machine guns and fitted with racks for light bombs.

The present-day type bears a variety of designations. To the French they are reconnaissance machines. We call them observation planes. The British designation of army co-operation plane is awkward, but I think it best describes the duties of this class of military aircraft.

The standard army co-operation plane of the British army is now the Westland Lysander. (See cutaway drawing accompanying this article.) This high-wing, strut-braced monoplane follows what is at present an almost universal formula for the type. The ship was designed to provide a maximum of visibility for the pilot, who, in accordance with R. A. F. practice, does the observing, spotting and photography. Together with his gunner, he is inclosed in a transparent cabin equipped with sliding hatches. The Lysander is fitted with wing slots and flaps which facilitate operations from small emergency fields. These aids also make it unusually easy and safe to fly. The ship is provided with all necessary equipment, including electrical, radio, navigational and photographic gear, parachute flares and oxygen. A long hinged hook is fitted beneath the fuselage for use in picking up messages from ground troops. The armament consists of two fixed machine guns mounted in the wheel fairings and a Lewis gun on a flexible mount aft. Bombs are carried on two small stub wings projecting from the landing gear. This arrangement eliminates synchronization gear and greatly facilitates rapid reloading. Powered with a Bristol Mercury engine of 890 horsepower, the Lysander has a top speed of 229 miles per hour. At a cruising speed of 150 miles per hour, its range is 600 miles. The rate of climb is 1,650 feet per minute, service ceiling 26,000 feet, and landing speed 52 miles per hour.

So successful has the Lysander proven that the Polish P. Z. L. designers have copied it almost line for line. The Mewa (Gull), as the Polish ship is called, differs only in its retention of the typical P. Z. L. wing. It is powered with the small-diameter 710-horsepower Gnome-Rhone M.14 engine and is fitted with a wooden propeller to reduce maintenance problems. Its maximum speed is 223 miles per hour, cruising speed 190 and service ceiling 29,000 feet.

The Italians still look with favor upon ruggedly built biplanes for observation work. Their Meridionali Ro.37 has achieved considerable success in Spain. This model, powered with a 1,020-horsepower Piaggio engine, is characterized by very simple and sturdy design. On both sides of the fuselage, below the gunner's cockpit, are placed large sliding observation windows, typical of Italian practice. The Ro.37 has a high speed of 233 miles per hour, cruises at 189 miles per hour, and has a normal range of 620 miles. It reaches an altitude of 28,500 feet and is armed with two machine guns.

Germany has adopted the Henschel Hs.126 as her standard army co-operation type. This ship is a "dead ringer" for our more or less obsolete Douglas O-46-A. It is a high-wing, externally braced monoplane, with fixed, single-strut landing gear. Its two-man crew is protected by a transparent, sliding cockpit-inclosure. Powered with a B. M. W. air-cooled radial engine developing 870 maximum horsepower, the Hs.126 hits a top of 220 miles per hour and has a cruising range of 680 miles. Two defensive machine guns are provided.

The German army is also experimenting with the Fieseler Storch for artillery spotting. It is a comparatively slow (130 miles per hour) lightweight monoplane fitted with an elaborate system of slots and flaps that give it remarkable take-off and landing characteristics. It is said to fly safely at speeds as low as thirty-two miles per hour.

Another example of the high-wing, strut-braced reconnaissance machine is France's Mureaux 200.A3. This is a three-seater powered with the 850-horsepower Hispano-Suiza liquid-cooled "Moteur-canon" engine. The ship is designed so that its principal component parts are interchangeable with those of the company's two-seater fighter. Carrying complete army co-operation equipment, the 200.A3 attains a maximum speed of 198.7 miles per hour, lands at 60.2 and has a normal range of 620 miles.

The present standard observation ship of the United States army is the North American O-47. This model differs radically from European practice, being an all-metal, midwing monoplane designed to the most modern formula. It carries a crew of three and the fuselage is featured by a deep, glass-paneled belly for the observer's use. The landing wheels retract into the underside of a cantilever wing, fitted with hydraulically operated, split-edge flaps. An 860-horsepower Wright Cyclone drives the O-47 at a maximum speed of 243 miles per hour. It cruises at 217 and lands at 67 miles per hour. Normal range is 853 miles.

The past two or three years have seen a growing tendency toward the development of two distinct sub-types of observation planes. One is the short-range army co-operation class already described. The second is a twin-engine, multiplace, long-distance, strategical reconnaissance ship. At present, this latter type is usually a converted high-performance light bomber, equipped for photographic scouting.

No article on army co-operation planes would be complete without mention of the recent interest in rotating-wing aircraft. The obvious advantages possessed by the autogiro for observation work have impressed the English authorities so much that a number of these ships have been purchased for service testing. Germany has progressed even further in developing the highly successful Focke-Wulf helicopter. For a year or more, the United States army has been operating an autogiro school equipped with Kellett YG-1a machines, and Congress has just appropriated funds for further giro research.

What will the observation plane of the near future be like? It is probable that the present trend toward specialization will continue. A general-purpose type, suitable for long-range reconnaissance, bombing and attack duties is already being developed. For short-range army co-operation work, it is the writer's opinion that the giro or helicopter will eventually displace fixed-wing types. It has many points of superiority over the balloon for artillery spotting, is capable of slow, detailed reconnaissance at low altitudes and possesses vertical take-off and landing characteristics that permit a maximum of co-operation with ground units. It has the ability to land scouts on any reasonable terrain, support them with machine guns while they effect a detailed ground reconnaissance of farms, villages, woods, and the like, pick them up again and communicate their findings to headquarters by radio. The rotating-wing ship is the only type of aircraft that can thus combine aërial and ground observation with any degree of practicability. Medium-sized, high-powered, four-place helicopters, carrying teams of well-trained ground scouts and working in collaboration with armored cars or light tanks, could cover a wide area during advance or rear-guard operations. Functioning in this way with ground troops, the army co-operation ship of the future will furnish field commanders with a reconnaissance service of a speed, completeness and quality undreamed of today.

# THE RECORD HOUND

*(Continued from page 37)*

Attach the wing-and-tail-rubber hooks of .049 wire, using plenty of cement.

The wing and stabilizer are of extremely light, yet strong construction. Trace the outline of the trailing edges of ¼" sheet balsa and shape to a wedge-shaped cross section with knife and sandpaper. Prebend the ¼"-square leading edges in the same manner as the bottom longeron. Pin the edges to the plans, insert the 1/16" sheet ribs and attach the bamboo tips. Remove the frame, adding the hard balsa spars and the 1/16 x 3/16" rib stiffeners. See wing and stabilizer sketch, Plate II. Cut the panels apart and install the required dihedrals given on Plate II, reinforcing the joints with gussets of ⅛" sheet. Cover the leading edge with 1/16 x 3" soft sheet balsa.

The stabilizer is built in identical fashion, using the smaller sizes of wood specified. Cut out the center to fit the 3/16" sheet balsa "key" cemented to the fuselage. Be sure this is a good fit and that the key rests on the 3/16"-square diagonals in the stabilizer. See stabilizer mount sketch, Plate II. Attach a pair of 1"-diameter hardwood tail wheels to the tips by .049 piano-wire fittings. See tail wheel sketch, Plate II.

## MOTOR UNIT CONSTRUCTION

The motor unit must be made as solidly and accurately as possible to obtain the most consistent performance and trouble-free motor operation. Use thin brads and plenty of cement in assembling. Bind all intersections of metal parts with fine copper wire and solder. Be sure the surfaces to be soldered are perfectly clean and free from oil. Get the metal hot enough to cause the solder to flow, and good joints are guaranteed. Solder of the acid-core variety is simplest to use.

The arrangement described was worked out for a Brown D, but may be easily converted to fit any other motor.

Cut Bulkhead No. II from 3/32" plywood and slide the motor bearers of ⅜ x ¾ x 12⅝" bass through it. Bend the landing gear of 3/32" piano wire and fasten it to the mount by a 1/32" sheet aluminum strap clamped between the bulkhead and the crosspiece of ⅜ x ¾" bass. A similar crosspiece is bradded to the rear of the bulkhead. The landing-gear brace, a single length of 1/16" piano wire, passes across the back of the bulkhead.

A block of 1¼ x 2¼ x 3" hard balsa, hollowed out in back to fit the coil, is cemented to the bulkhead and reinforced along the bottom edge by 1/16" plywood.

Fittings A, consisting of ⅛" O. D. brass tubing soldered to a 1/32" sheet-brass strap, are attached to the bearers by ¼" wood screws and soldered to the landing-gear brace. Bolt the engine in place, clamping Fittings B between the crankcase and the bearers, to anchor the upper ends of the landing-gear braces.

The needle-valve adaption for the Brown D illustrated on Plate II provides an extension control capable of fine adjustment and not affected by vibration. No dimensions are given, as the best way to assemble the control is by trial. The two washers on either side of the tube must fit snugly to prevent play.

The cowling should not be omitted, as it is of great value in keeping the engine free of dirt, also improving the streamlining and the appearance tremendously. The top and bottom of the cowling are made of pairs of 2 x 3 x 4" soft-balsa blocks. Carve them roughly to outside shape and hollow the inside to clear the motor parts. Cement them lightly to the front bulkhead and plank the middle portion with strips of 3/16 x ⅜" balsa. Finish the cowl with sandpaper. The cowl is held at the top by 1/16" wire pins and tubes, at the front by a hook and eye of .028 wire, and at the bottom by Fittings C. Reinforce the inside with large washers to prevent the bolts from crushing the wood. A small door of thin sheet aluminum is installed and fitted with a rubber band to keep it closed.

The battery box shown is for large-size flashlight cells. The box with batteries is held to the bearers with rubber binding. A flight timer is mounted on the 1/16" plywood bracket. Three holes are drilled through Bulkhead No. II for the wires, and the motor is wired up in the regular way.

It is advisable to varnish the inside of the cowl, the bulkheads, and the motor bearers before mounting the motor and fittings, to oilproof the structure.

## COVERING AND ASSEMBLY

The original ship was covered with red and blue double tissue, cross-grained. This proved much tougher, lighter, and neater than bamboo paper.

Apply the first covering with the grain running opposite to the usual way—chordwise on the wings and up and down on the fuselage. Spray with water but do not dope. Cover the ship again with the grain running as usual—spanwise on the wings and lengthwise on the fuselage. Spray with water again and apply two or three coats of dope when dry.

Slip a hank of four strands of ¼" rubber, about 12" long, through the wing rubber hook, and attach a alarge S hook to each end. The wing can be quickly attached by pulling the rubber over the leading edge and hooking the S hooks to the intersection of the landing gear and the landing-gear brace struts. The stabilizer is mounted by an 8" loop of ¼" rubber passed through a small hole in the rear of the fuselage and onto the stabilizer hooks.

## FLYING

Check the ship to be sure that the surfaces are not warped—especially unevenly, that the incidence is correct, and the thrust line is not tilted in any way. Check the balance by moving the batteries till the C. G. is located about 4½" from Bulkhead No. I.

Hand-glide the plane, pushing it fairly hard, as it glides at about fifteen miles per hour. Adjust, if necessary, to make a straight and flat glide by warping the rudder or changing the incidence of the wing. Make plenty of tests to make certain it always acts the same. Then bend the rudder slightly—about ¼" if measured at the rudder rib—to circle the model to the right against the torque.

Start the motor, get it going to about half speed, set the timer for ten seconds and let the ship R. O. G., pushing it slightly to get it under way. Continue adjustments till a large right circle is made under power and a slightly smaller one on the glide, gradually revving up the motor. Under full power the plane should be launched slightly off the wind to the right for maximum performance, which—take it from one who has chased the ship cross-country—is plenty.

## MATERIALS

*(Balsa unless otherwise noted)*

8 pcs. 3/16" sq. x 5' hard
10 pcs. 1/8 x 1/4" x 5' med.
8 pcs. 1/16 x 3/16" x 3' soft
2 pcs. 1/4" sq. x 3' med.
7 pcs. 1/16 x 2" x 3' soft
3 pcs. 1/16 x 3" x 3' soft
3 pcs. 1/8 x 2" x 3' hard
1 pc. 3/16 x 2" x 3' med.
1 pc. 3/16 x 2" x 3' very soft
3 pcs. 1/4 x 2" x 3' med.
1 pc. 1¼ x 2¼ x 3" hard
4 pcs. 2 x 3 x 4" soft
1 pc. 3/32 x 4 x 15" 3-ply plywood
2 pcs. 3/8 x 3/4 x 15" bass
1 pc. 1/16 x 2½ x 10" 3-ply plywood
1 pc. 5/8 x 1 3/8 x 14" bass
1 pc. 1/32 x 2" sq. brass
1 pc. 3 1/8" O. D. brass tubing
3 bicycle spokes with nipples
1 pc. 18 x 3/32" diam. piano wire
1 pc. 18 x 1/16" diam. piano wire
1 pc. 20 x 1/4" O. D. alum. tubing
1 pc. 1/32 x 2 x 4" alum.
1 pc. 18" .049 wire
16 sheets tissue
1 streamlined airwheel
8 oz. cement
16 oz. dope
Bolts, wood screws, solder, varnish, fine copper wire, brads, 10' ¼" rubber, various grades sandpaper.

**Weights**

| | |
|---|---|
| Fuselage and rudder | 5.5 oz. |
| Wing | 4.5 " |
| Stabilizer | 1.0 " |
| Motor mount and cowl | 5.5 " |
| Motor unit (without L. G. and mount) | 21.5 " |
| Total ready to fly | 38.0 " |

# JUNIOR N. A. A. NEWS

*(Continued from page 41)*

most from organization and promotion work. Best of luck to Al Lewis in his new job!

### CONTEST CALENDAR

**Kiwanis Model Airplane Contests.** Monroe County, Pa. Rubber-powered elimination contests open to students of grades 4-12 inclusive, in Monroe County. Local eliminations to close by September 30, 1939; final county meet October 16th-21st. Rules are same as those determined by the N. A. A. for the 1939 Wakefield Contest. Complete information from Elmer Kiefer, Chairman, Kiwanis Model Airplane Club, 108 N. Sixth, Stroudsburg, Pa.

**Regular Monthly Gas Model Contests.** Creedmore, Long Island, N. Y. Sponsored by the Metropolitan Model League. Information from Irwin Polk, 429 Seventh Avenue, New York, N. Y.

**Regular Monthly Contests.** Philadelphia Gas Model Association, sponsor. Open to all N. A. A. members. Information from Jack Schwartz, 1742 N. Peach Street, Philadelphia, Pa.

**Tri-State Area Contests.** (Eastern Ohio, Pennsylvania, West Virginia.) To be held throughout summer. Sponsored by the Aëro Club of Pittsburgh, Post 531, American Legion, and the Boys Club of Pittsburgh. Attractive awards have been pledged for all meets. Outdoor contests include gas-powered events in all three classes; rubber-powered, fuselage and stick; glider, hand-launched, tow-launched and catapult. Contest schedule is as follows: July 15th, Tri-State Competitions, Butler Airport; August 19th, Tri-State Competitions, Butler Airport; September 16th, Tri-State Championships (outdoor), Butler Airport; October, Tri-State Championships (indoor), Hunt Armory; November 18th, Scale Model Competition, Boys Club of Pittsburgh.

Information about these contests or about model work in the Pittsburgh area may be obtained from Harry Vogler, Jr., 4412 Butler Street, Pittsburgh, Pa.

**Midwest Gas Model Contest.** July 23rd. Sponsored by the World Publishing Co., Omaha. Three groups: junior, senior, open, and small bore. N. A. A. sanctioned. For information, address T. W. Summers, The World-Herald, Omaha, Neb.

**National Gas Model Contest.** July 23rd, Municipal Airport, Indianapolis, Ind. Sponsored by the Indiana Gas Model Association. Many prizes, both cash and mer-

chandise. Invitations are extended to gas-model clubs all over the country. For information, address W. F. Keough, 2627 E. North Street, Indianapolis.

**New Jersey State Gas-model Meet.** July 29th, Hadley Field, South Plainfield, N. J. Sponsored by Linden Model Aircraft Club, N. A. A. rules. Events for out-of-State visitors, who are welcome. Prizes. Write Linden Recreation Commission, Linden, N. J.

**Eastern States Championships.** This year's official Eastern States Power Model Airplane Championships, the largest power activity in the United States, outside of the National meet, will be held in or near New York City, on July 29th or August 5th. Two events. One for Class A models (models powered by engines of not more than .20-cubic-inch displacement and wing area not greater than 225 square inches), and the other for both Class B and Class C models (models powered with engines having a cubic-inch displacement over .20 and not greater than 1.25, and having wing areas over 226 square inches). Each contestant will be allowed two flights in each of the two events. No delayed flights will be permitted. This is necessary due to the large number of entries expected, and will also discourage the flying of untested models in competition. Models must conform to all N. A. A. rules, and all contestants, in order to compete, must hold N. A. A. power-model licenses. There will be an entry fee of 50 cents. Members of the Metropolitan Model League may enter upon payment of a fee of 25 cents. Applications may be obtained by sending a self-addressed, stamped envelope to the Metropolitan Model League at 429 Seventh Avenue, New York City.

**Third Annual Tri-State Gas Meet.** July 30th, Allentown-Bethlehem Airport, Allentown, Pa. Sponsored by Lehigh Aëronautical Society and Lehigh County WPA program; N. A. A. sanction. Prizes, gold cup to club winning highest number of points. Entry fee of twenty-five cents. Write Mr. Frederick F. Waverek, Lehigh County Recreation Program, 445 Hamilton Street, Allentown, Pa.

**Rocketeer Aero Club.** All-Iowa meet, July 30th, Ottumwa Airport on Highway 63. Gas and contest fuselage events. N. A. A. rules. Prizes include trophies, gas engines, gas-model kits, rubber-powered kits and supplies. All modelers invited. For rules, write Claude D. McCullough, Rural Route 5, Ottumwa, Iowa.

**Second Annual Model Airplane Contest.** July 30th, sponsored by Baltimore Model Airplane Association, Baltimore Municipal Airport. Both gas and rubber events. For information, address William W. Saunders, 4303 Kathland Ave., Baltimore, Md.

**Third Annual Midwestern States Gas Model Contest.** Sunday, August 6th, Ashburn Field, Chicago. Cash, engines, kits. Meet sanctioned by the N. A. A. and sponsored by the Chicago Gas Model Aëronauts. For information, write Joe Ott, 1443 Merchandise Mart, Chicago, Ill.

**Western State Gas Model Meet.** August 7th, Kent County Airport, Grand Rapids, Michigan. Merchandise. J. G. Vinkemulder, director, 3160 Reeds Lake Boulevard, Grand Rapids, Mich.

**Oshkosh Exchange Club** sponsoring gas and rubber meet at Oshkosh Airport Hangar, Oshkosh, Wis., August 12-15. Airplane rides. Dr. H. E. Bitter, director, 515 Ninth Street, Oshkosh, Wisconsin.

**Queen City Gas Model Club.** Second annual gas meet, August 12th, Hadley Field, South Plainfield, N. J. N. A. A. sanction. Open to all modelers. Two events: one for motors up to .30 cu. in. displacement; other for motors over .30 cu. in. to 1.25 cu. in. displacement.

**Third Annual Gas-model Meet.** August 13th, Miller Field, Staten Island, N. Y. C. Sponsored by Richmond Model Flying Club. For further information write to the secretary, Charles Guarnien, 26 Bond Street, Staten Island, N. Y. C.

**Pennsylvania State Championships.** Tentative date, August 19th. Sponsored by the Model Flying Club of Johnstown. Open to out-of-State contestants. Cash prizes. For information write Earl Stahl, 810 Suter Street, Johnstown, Pa.

**Tri-State Gas Model Contest.** August 24-25th, sponsored by the Torque Fliers Club, Greenville, S. C. Contest to be held at Greenville Municipal Airport, limited to contestants from North and South Carolina, and Georgia. N. A. A. sanction. For information write Jimmy Metchicas, 107 W. Washington Street, Greenville, S. C.

**Seventh Annual Outdoor Flying Meet.** August 26th, Lebanon, Pa. Sponsored by Exchange Club. Complete schedule of outdoor events, both gas and rubber. Information from Contest Director, Lebanon Exchange Club.

**Gulf States Model Meet.** Saturday and Sunday, August 26th-27th, at Milneburg, near New Pontchartrain Beach. Sanctioned by the N. A. A. and open to contestants from Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, Tennessee, and Texas. Many cash and merchandise prizes. For information, address Whalen J. Norman, Contest Director, 4506 Freret Street, New Orleans, La.

**Third Annual September Quaker City Meet.** September 9th, at Northeast Philadelphia Airport, Red Lion Road, half mile east of U. S. No. 1. Wm. S. Berry, Director, 951 E. Price Street, Philadelphia, Pa.

**Gas Model Contest.** September 24th, in or near New York City. For information, address August Ruggeri, 434 East Ninth Street, New York City.

## MADISON, WISCONSIN

Gas modeling in Madison, Wisconsin, has gotten a fairly late start as compared to other sections of the country. However, good work on the part of the Madison boys is fast closing the gap. Last November organization plans got under way for a club designed as an official N. A. A. chapter. They recently got sufficient membership to gain official recognition.

Club officers are William Bates, president; Earl Lunde, vice president; and Harvey Barch, secretary and treasurer. Bill Bates was former champion in the State of Wisconsin for endurance.

John Parker is publicity chairman for the Madison group. He will gladly send full information about the club's activities. Address 209 Ramsey Court, Madison, Wisconsin.

# INVENTORS FOR ENGINES NEEDED

*(Continued from page 34)*

airplane structural design. Double propellers, rotating in opposite directions, are designed to eliminate torque loads just as soon as all-metal cantilever construction emerges on the horizon and renders obsolete all of the rigging methods heretofore employed for this purpose. As an alternative method of obtaining a torque-resisting unit, the power plant is sometimes offset slightly from the center line of the airplane fuselage structure, thus tending to introduce a right-rudder effect. Clever designing has progressively decreased aircraft engine-weight-per-horsepower ratios down to their lowest values in recent years. The French Hispano-Suiza in-line aircraft power plant of a few years ago boasted a weight-per-horsepower ratio of 0.8 pound per horsepower unsupercharged. At the present writing, engines are becoming slightly heavier again, the uptrend in weight being occasioned by the addition of many accessory devices such as de-icer pumps, engine-driven vacuum pumps for instruments, and a host of other appendages.

Just as the above advances were visualized and later developed by far-seeing technicians, an inventive field that is tremendous in its scope underlies the ever-increasing demand for greater speeds and power outputs and the attendant higher performances.

It is quite likely that the present strides being made in the researches into the respective merits of evaporative or steam cooling will be reflected in the adaptation of this refinement extensively in the near future. The Rolls-Royce Kestrel engines that power the huge British flying boats operating out of the Singapore base encounter severe tropical conditions that have only been overcome through the medium of steam cooling.

For instance, for a temperature rise of one degree Fahrenheit, one pound of water will dissipate 20 British Thermal Units of heat. On the other hand, one pound of steam formed under the conditions of the same temperature rise will dissipate 990 British Thermal Units of heat due to the high latent heat of vaporization of the steam. In other words, under the same existing conditions an equivalent quantity of steam will carry off nearly fifty times the amount of heat dissipated by the cooling water. The comparison is not so marked in the case of ethylene glycol, or Prestone, as it is more commonly known by its trade name.

The favorable features of steam or evaporative cooling may be briefly summarized as follows: It possesses low overall weight, occupies comparatively small space, and the heat generated within the radiator can be readily employed for the purpose of heating the interior of the airplane at high altitudes. A typical evaporative cooling system is illustrated by Figure 2. The engine is cooled by water alone during flight conditions entailing low values of forward speed, as, for instance, in climbing. This condition also applies during the warming-up period. In the course of flight at high and cruising speeds, the radiator is retracted and its water consequently converted into steam upon circulation throughout the heated engine. Expanding into the condenser, the steam is subsequently cooled and condensed by the propeller slipstream, which is directed against the condenser unit. The heat transformation accompanying the process of condensation functions in cooling the power plant.

We are hearing much these days regarding proposed scheduled flight operations in the substratosphere regions, wherein the lowered atmospheric density and pressure permit increased values of forward speed to be attained due to the greatly reduced drag. From the military standpoint, additional security from antiaircraft batteries and hostile pursuit formations, as well as the attainment of the maximum penetration for aërial bombs, represent factors which make high-altitude operations attractive. As a consequence, supercharging of aircraft engines so as to effect the delivery of normal-rated horsepower at these altitudes is receiving a great deal of attention. It is not uncommon at the present time to find engines supercharged up to manifold pressures of forty-three inches of mercury. One late National Air Race entry even claimed to be "suped up" to sixty-eight inches of mercury!

In the field of supercharging as it exists at the present time, there is a remarkable opportunity for some inventive genius to come forward with a revolutionary contribution to the science of aëronautics. We all know that the atmosphere is composed, roughly, of eighty percent nitrogen and twenty percent oxygen. Only the oxygen content, which is by far the lower of the two, is favorable to combustion. The nitrogen is practically useless, except that a reduction of the nitrogen content of the atmosphere could go to too great a length. Should the engine be fed a mixture comprising one hundred percent oxygen, the resultant rapid and complete oxidation would give characteristics similar to a cutting torch, terminating ultimately in the destruction of the power-plant members.

Detonation, with its reduced power output and dense exhaust smoke, results from the chemical dissociation of carbon and nitrogen. Excessive moisture is also traceable to the presence of nitrogen; in fact, this condition underlies the water-recovery ballast system employed in our late naval dirigibles, since more water is produced through combustion of the fuel in the present forms of internal-combustion engines than the original weight of the gasoline employed as the fuel.

The problem resolves itself into the question: How to separate the oxygen content from the nitrogen content of the atmosphere? Their respective atomic weights are very closely related, that of oxygen being sixteen, while that of nitrogen is fourteen. Being gases, they cannot be separated by centrifuging, as can be done with liquids. Nitrogen, being a more or less inert substance, does not combine readily with other elements. Recent experiments in France to combine nitrogen with hydrogen, thus forming a resultant combustible ammonia compound, have not proved signally successful.

Another much-needed accessory is some form of device to measure the thrust force exerted by the engine and propeller assembly while the airplane in which they are installed is engaged in actual flight operations. At present, perhaps the best available indication of the performance of the power plant during flight is the engine rotational speed as measured by the tachometer. This condition is applicable to both the direct-drive and geared types of power plants. Of course, the torque, thrust and horsepower output of the power plant may be measured statically, so to speak, while on the ground the latter quantity being obtained by means of an electrical dynamometer or suitable brake mechanism. The Sprague electrical dynamometer, as a typical example, consists of an electrical generator coupled directly to the engine under test. When the generator is loaded up, the wattage developed is read on suitable meters and converted to horsepower units through the employment of the standard conversion factor: one horsepower is equivalent to 746 watts. The thrust may be measured by the "drawbar pull" method, in a manner similar to that of a locomotive, by means of a cable attached to the airplane at one end and a suitable scale at the other. In this manner the thrust force is "weighed."

A simple, though very roughly approximate, rule-of-thumb process for determining the thrust force consists in equating the thrust to three times the full-rated engine horsepower output at a hundred miles per hour. If this figure could be accurately obtained and be always available to the pilot, it would represent the only indication of engine and propeller performance and efficiency ac-

tually required. Some form of measuring or indicating device could be perfected wherein the longitudinal movement of the radial thrust ball bearings could be transmitted, probably through an adequate oil seal, to a suitable recording instrument. The device would, of course, have to be capable of providing accurate readings throughout the entire range of available propeller pitches. Such an instrument would be invaluable to flying personnel, since it would supplement, or possibly even eliminate, the two primary means of determining power-plant performance during flight employed at the present time, namely, the tachometer and the manifold pressure gauge.

It is not likely that aircraft power plants in their present form will attain larger dimensions of cylinder bore and stroke, but will, rather, possess an increasingly greater number of cylinders and higher compression ratios, the latter factor being limited, of course, by the octaine ratings of the available aviation fuels. Too, there always exists the possibility that the inherent deficiencies affecting the Diesel power plant will be overcome to the extent of permitting this highly desirable form of engine to enter the aircraft field as a strong competitor to existing practice. Germany has had much success with Diesels.

For several years engine designers have been effecting an increase in the cylinder bore and stroke of aircraft engines and justifying this form of design by pointing to the increased bearing areas which these larger dimensions tended to introduce. We now fully accept the physical limitations represented by this condition. An increase in stroke is reflected in a definite enlargement of engine frontal area with the consequent additional drag characteristics. It is conceded that an increase in the cylinder bore does tend to create larger bearing areas. However, it also effects a correspondingly large increase in the size and weight of the connecting-rod big ends. These, in turn, introduce added inertia forces which, again, cause even greater bearing pressures than existed before.

Now, another problem confronts us: How can compression ratios and engine rotative speeds be boosted beyond present limits? For many years the spherical combustion chamber has been universally recognized as the most efficient form from the standpoint of combustion efficiency. However, with the prevalent valve arrangement, any further increase in compression ratio is apparently impossible. It is quite likely that a reversion to some modification of the sleeve valve would permit compression ratios as high as twelve to one to be incorporated in future designs of the big military engines. We know, of course, that the attainable revolutions per minute of an aircraft power plant is limited by the propeller efficiency. Another rough rule of thumb equates the engine revolutions per minute to ten times the forward speed of the airplane in miles per hour. The propeller, although essential to the creation of the requisite thrust force, limits engine performance in many ways. For instance, should an engine of 3,000 horsepower output be projected for the future, the propeller assembly for such a unit, complete with controllable-pitch mechanism and all standard attachments, would weigh, roughly, 1,600 pounds.

Elimination of the conventional carburetor through the use of direct fuel injection, such as is being done in Germany with the engines that power their fast military pursuit airplanes, represents another field with untold possibilities. Direct fuel injection practically eliminates, or at least greatly minimizes, the icing hazard encountered with the operation of the conventional carburetor, and is said to afford better distribution to all the cylinders of the power plant on which the system is installed. On the other hand, some of the difficulties to be overcome prior to its wide adoption by the aircraft industry are as yet unsolved—notably, adequate mixture control to take care of high-altitude operations and sudden acceleration of the power plant as required for combat maneuvers.

Many new and mystifying attachments are constantly appearing on the modern aircraft power plant. Take, for instance, the case of a certain army pilot on the West coast. He was forced to land with an overheated engine at a small airport some little distance from his home air-corps field. After permitting ample time for the engine to cool, he attempted to turn the propeller over by hand. Hearing a pronounced *thump* in the crankcase of the Wright radial engine, he immediately telephoned the engineering officer at his base. Upon his arrival at the scene, the engineer disgustedly diagnosed the "trouble" as the noise of the dynamic dampeners attached to the engine crankshaft. These are actually counterweights comprising flexible masses attached to the rear crankcheeks by doweled pins. The weights are permitted a movement of about one quarter inch before the stop incorporated in the assembly is reached. This allowable movement of the counterweights caused the questionable "thump."

## THE TIPSY

*(Continued from page 23)*

placed in the leading edge of all the control surfaces and inset hinges are also used. For taking care of the ship on the ground a steel tube horseshoe houses each landing wheel, and rubber padding takes care of the load, together with low-pressure tires, while pants complete the unit. A novel tail skid uses tightly bound bamboo strips and is steerable.

Now that we know something of the make-up of the Tipsy we can see how the ship can give the performance that it does. Entrance to the cockpit is easy, and there is a centrally located control column which is quite handy for the pilot, who occupies the left-hand seat. A detachable "tiller arm" extends over to the right-hand seat for dual-control purposes, and the extra rudder pedals fold out of the way when not in use. Because of the small ground angle and the high seating of the occupants, fine visibility for taxiing and take-off is attained. Wing area is 129 square feet. The ship can easily be flown without goggles, as the windshield is very large and efficient. It is very simply constructed with a minimum of braces and a simple type coupé top also is planned shortly.

In the air the Tipsy has no bad characteristics at any speed and flies in a slightly nose-down position which gives as fine visibility as that on the ground. With the motor off, the ship can be stalled down to thirty-seven miles per hour and not have any tendency to fall off on either side; "wash-out" in both wing tips helps this condition greatly. Coming in for a landing, the flaps with a chord of about six inches are lowered, and they decrease the landing speed by about three miles per hour. Their operation is most simple, and they are held in the up position by springs. A slight pressure on their control tube and a twist of the knob lowers them in an instant. Setting down is simplified by limiting the movement of the one-piece elevator to keep the ship at the proper landing angle when at landing speed.

Approved by the British government, the Tipsy also passed special tests for an aerobatic approval. Following are accurate and complete figures on its sparkling performance:

| | |
|---|---|
| Span | 31′ 2″ |
| Length | 21′ 8″ |
| Height | 5′ 8″ |
| Weight, empty | 618 lbs. |
| Gross weight | 1,074 lbs. |
| Top speed | 110 m. p. h. |
| Cruising speed (2,600 r. p. m.) | 100 m. p. h. |
| Stalling speed | 37 m. p. h. |
| Take-off run | 125 yds. |
| Landing run | 150 yds. |
| Rate of climb | 650 ft./min. |
| Ceiling | 19,000 ft. |
| Fuel (in fuselage tank) | 12 gals. |
| Oil | 1¾ gals. |
| Range at cruising speed (3½ hrs.) | 350 mi. |
| Gas consumption | almost 30 mi. to gal. |
| Baggage | 22 lbs. |
| Price | £675, or about $3,280 |

## QUESTIONS

*(Continued from page 54)*

*Question: In a recent issue you had a picture of a small plane called the Flying Flea. Could you tell me where I could get blueprints of a similar plane? M. B., New York City.*

Answer: Write to the Universal Aircraft Co., Fort Worth, Texas.

*Question: What are the span, length and height of a primary glider? Does Lockheed have a school for aëronautical engineering? T. Z., Derry, Pa.*

Answer: A primary glider has an approximate span of 35′, length 18′, and an overall height of about 6′. The Lockheed Co. has no school for aëronautical engineering.

*Question: I am very much interested in airplane design. Could you tell me where I could get information about it? I am only in the first year of high school. Please send me a list of books on this subject. J. W., Pittsburgh, Pa.*

Answer: Most books on airplane design are very technical, and you may have difficulty in following the subject. I suggest that you write to McGraw-Hill Publishing Co., 330 West Forty-second Street, New York City, and ask them to send you their list of aviation books.

*Question: Please tell me where I could obtain blueprints for a two-place, low-wing light plane. F. T. H., Honolulu, T. H.*

Answer: There aren't any plans available for such a ship.

*Question: What are the speed and ceiling of the Bell Airacuda? What other data have you on this plane? Could you tell me in what issue the plans for Bill Barnes' Charger were published? F. M., Elizabeth, N. J.*

Answer: There is no information available on this ship, as it is still in the experimental stage. According to rumors, it has a ceiling of 30,000 feet and speed in excess of 300 miles per hour. The plans for the Charger appeared in the October, 1938, issue.

# HERE ARE THE AMAZING NEW FEATURES

*of the*

COMET

# ZIPPER

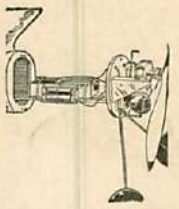

*What a climb!*
2,000 ft. per MIN!



CARL GOLDBERG, whose genius made these Comet models possible.

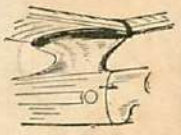
## NO WONDER IT WINS CONTEST AFTER CONTEST!

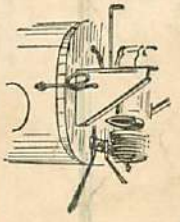
9 out of 11 Meets



**Detachable Motor Unit and Battery Track**—At the slightest suspicion of ignition trouble, you can instantly detach the motor unit and battery track, and inspect closely every inch of wiring, and every possible source of trouble.

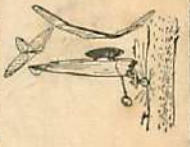
**"Automatic Pilot" Wing Mount**—Hundreds of flights have proved it makes models so stable, so much easier to fly, that it's like having an automatic pilot in your ship!

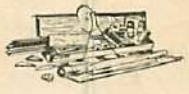




**Motor Locks Hold Motor**—Why didn't somebody think of this before? They hold with absolute firmness, detach instantly, safeguard motor in hard landings, and never need replacement.

**Shock-proof Wing and Tail**—One of the greatest developments in Gas Model History! The Goldberg method of mounting wing and tail allows them to fly off undamaged in event of a hard collision, and thus lightens the stress on the fuselage.





**Kit Completeness**—So many finished parts that building time is cut down tremendously. Absolutely the most complete kit in its class.

Examine it at your dealer's now

## *presented to a startled world* of COMET *and* CARL GOLDBERG


MORE FEATURES than you've ever seen packed into a gas model—FEATURES that create new standards of performance—FEATURES proved by hundreds of test flights! The ZIPPER'S breath-taking climb and floating glide will thrill and amaze you! And look at this partial list of contents: FINISHED RITZ PROPELLER—aerodynamically efficient. FINISHED ALUMINUM MOTOR MOUNTS—fit all motors. READY FINISHED PLYWOOD FIREWALL and front ring. WING AND ELEVATOR RIBS accurately cut. WING AND ELEVATOR SPARS tapered. STREAMLINED BALSA WHEELS. READY-FORMED LANDING GEAR. COMPLETELY FINISHED MOTOR LOCK FITTINGS. Plenty of COLORED BAMBOO PAPER, CEMENT and DOPE; dressy ZIPPER decal. All Necessary Hardware. Full Size Plans.

### *Specifications of the* COMET ZIPPER

Wingspan, 54"; Overall Length, 34½"; Wing Area, 3.44 sq. ft. (495 sq. in.); Total Weight (with motor), 30 oz.; Wing Loading, 8.7 oz. per sq. ft.; Wing Airfoil Goldberg G5; Power Plant, Any 1/5 or 1/6 h.p.; Climb, 2000 ft. per minute.

*A folder, "How to Adjust and Fly the Zipper and Mercury" by Carl Goldberg, free with each kit.*

**$3.95**

KIT No. T10
Postage 25c; none if ordered from dealer.

### *The* COMET MERCURY

ecially designed the small motor, Comet Mercury is mplified sister-ship he Comet Zipper. ally outstanding in class, and equally ressive in specifi-ons, kit contents value.

**$2.95**

KIT No. T11
Postage 25c; none if ordered from dealer.

### *NEW FEATURES NOW EMBODIED IN THE* 1939 COMET CLIPPER

Because of the undying popularity of the Comet Clipper, it has now been revised—a new 1939 Clipper—incorporating all the latest, approved ideas in gas model construction. For example:

ALUMINUM MOTOR MOUNTS—IMPROVED, DETACHABLE MOTOR UNIT—REDESIGNED IGNITION TRACK—IMPROVED, STURDY WING WITH POLY-HEDRAL—NEW, CLEAN-CUT FUSELAGE—FINISHED RITZ PROPELLER—COLORED BAMBOO PAPER.

With all these new improvements, the price remains at only $4.95. Kit No. T7. POSTAGE, 25c. None if ordered from dealer

## OMET MODEL AIRPLANE & SUPPLY COMPANY

*W ADDRESS:* 129 W. 29th St., CHICAGO. Dept. T8. Eastern Branch: 688 Broadway, NEW YORK

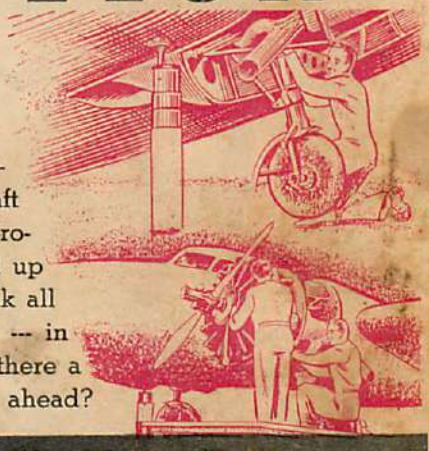
IET maintains distributors in many cities throughout the United States and other parts of the world. Foreign distributors ide: F. P. Sweeten, Blackpool, England; E. J. Hyams and Son, Wellington, C.I., New Zealand; PACIFIC COAST DISTRI-ORS: Edw. Kapitanoff, 4546 Hollywood Blvd., Los Angeles, Calif.; Smalley Paint and Paper Co., 5300 Ballard Ave., tle, Wash. Exclusive Di tributor Detroit Area: Airco Model Supply, 13329 Charlevoix Ave., Detroit, Mich.

# DON'T JUST *Read About* AVIATION!

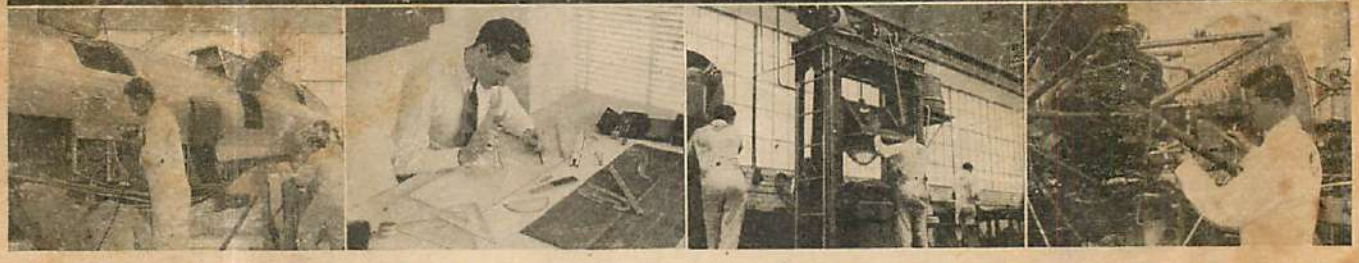
# DON'T JUST *Play* AT AVIATION!

# *Get into* AVIATION

Do you realize that Aviation's swift growth and tremendous activity may mean something REAL to *your own* future? You already know . . . that airlines are growing fast, in size, numbers, and miles flown . . . that public and private airports are bee-hives of activity . . . that aircraft plants face a huge military aircraft building program . . . while big backlogs already piled up represent years of production ahead. Think all this over. In some branch of Aviation — in the type of work you like best — isn't there a place for *you* to start, and a big future ahead?



## *Here is the* AERO I.T.I. WAY TO AN AVIATION CAREER . . .



To start your career in some branch of Aircraft Mechanics, or in Aeronautical Engineering, Aero I.T.I. training gives you actual practice in the very duties you must understand and perform. Actual aircraft industry production equipment, from small hand tools to huge hydraulic presses and power brakes, are found in the Aero I.T.I. shops. You use this equipment day in and day out . . . in scenes like those above. You gain a thoroughly practical background for engineering . . . or definite ability to do airplane or engine mechanics work. Get complete information on an Aero I.T.I. course to meet your needs (you may start at home or take a full-time course at the school). For free booklet on Aviation and Aero I.T.I. training — send the coupon.


# AERO INDUSTRIES TECHNICAL INSTITUTE

5257 W. San Fernando Rd., Los Angeles, Calif.

*Aircraft Mechanics :: Aeronautical Engineering*

Offering U.S. Civil Aeronautics Authority Approved 12 Months Aircraft Mechanics Training

**EXECUTIVE BOARD**

**C. A. VAN DUSEN** — Vice-Pres., Consolidated Aircraft Corporation

**JOHN K. NORTHROP** — formerly Pres., The Northrop Corp. and Vice-Pres., Douglas Aircraft Company, Inc.

**ROBERT E. GROSS** — President, Lockheed Aircraft Corporation

## *GET YOUR* FREE COPY

AERO INDUSTRIES TECHNICAL INSTITUTE
5257 West San Fernando Road, Los Angeles, California

Please send free booklet on Aviation 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-20-t