

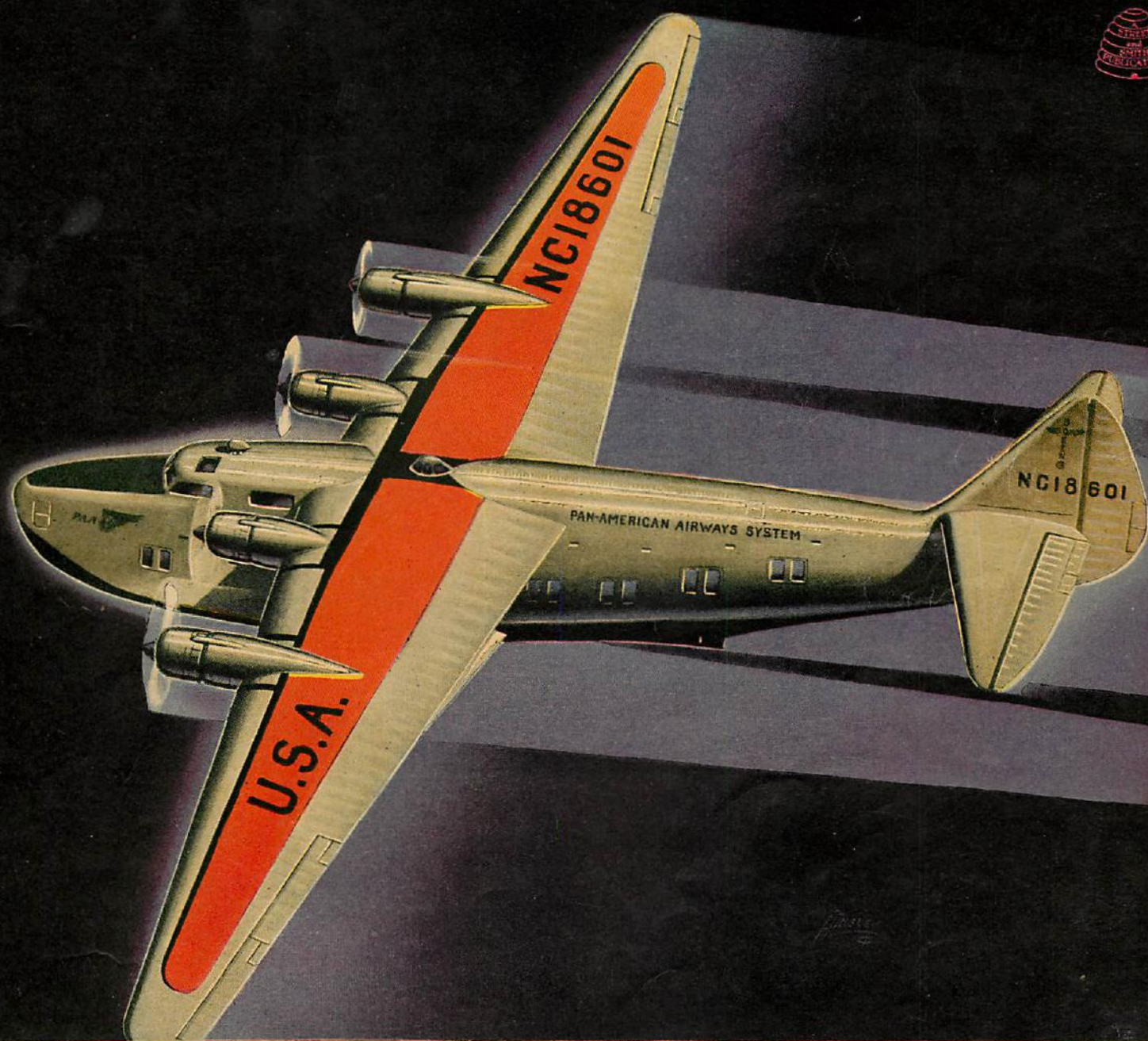
LARGEST CIRCULATION OF ANY AVIATION MAGAZINE

5¢

AIR TRAILS

9 G's AND PULL OUT - - Test Diving - - by LEE GEHLBACH, Page 8

JANUARY, 1938



DRAWING BOARD TO RUNWAY (Pictorial) Page 18

★ **Radio-Controlled Gas Model** ★ **Light Plane Clubs** ★

★ **30 Fact and Fiction Features** ★ **Gliding and Soaring**

COMPLETE BILL BARNES AIR NOVEL IN THIS ISSUE

A MEGOW MODEL

is "TOPS" for CHRISTMAS!

MISS STRATOSPHERE

Approved by
Clarence Chamberlain
Exact 1/2-in. scale model kit of Col. Chamberlain's high altitude ship, introducing a new type of construction using wood veneer.
60c plus 10c postage

"GULL WING" STINSON RELIANT
Exact in outline scale and external details. Designed chiefly for flying. 30-inch wingspan.
50c plus 10c postage

MONOCOUE 90A
Exact outline scale model of a much-liked two-place sport plane. Very stable flier. 30-inch wingspan.
50c plus 10c postage

\$3.25 plus 20c postage

STINSON RELIANT SR7A
3/4-in. Scale Model... The highest development in scale model building ever offered. Complete in detail even to seats and hinged cabin doors. 31-inch wingspan.

So easy to get... so exciting to build... so much fun to own! Every model enthusiast—and that means every red-blooded young man and boy—gets his greatest Christmas thrill from really top-notch model airplanes and boats. With many indoor days and long evenings ahead, start now on the big record-breaker you have dreamed about. Either for yourself or as a gift, MEGOW MODELS give you the greatest pleasure.

Many sensational models have been added... big fellows, beautiful fliers and detail scale models... many autographed by famous fliers like Clarence Chamberlain & Al Williams. Gas-powered models, too... at the lowest prices ever... and all shown in the new Megow's 52-page catalog!

You may order right from this page—or ask your dealer to show these models to you. Or—you can send for a copy of the new catalog, your picture-guide of all the latest planes and best-known ship models.

Send this Coupon and 5c postage for your copy!



Use this Coupon!

MEGOW'S

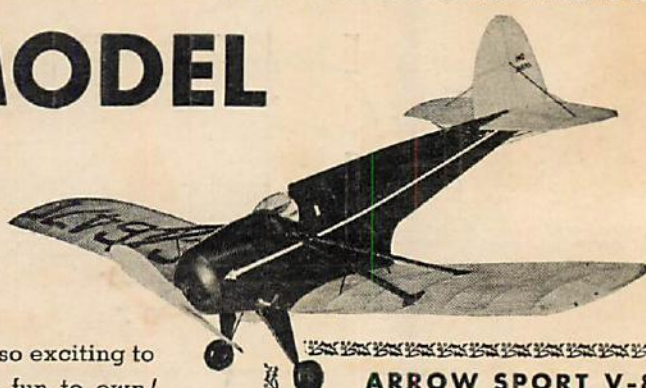
Dept. AT., Howard & Oxford Sts.
Philadelphia, Pa.

Please send me

- | | |
|--|---|
| <input type="checkbox"/> GULFHAWK | <input type="checkbox"/> ARROW SPORT V-8 |
| <input type="checkbox"/> MONOCOUE | <input type="checkbox"/> QUAKER FLASH |
| <input type="checkbox"/> AERONCA K | <input type="checkbox"/> MISS STRATOSPHERE |
| <input type="checkbox"/> "GULL WING" STINSON | <input type="checkbox"/> STINSON RELIANT SR7A |

Money Order for _____ is enclosed
☐ If you want a catalog, enclose 5c and check here.

Name _____
Address _____
City _____ State _____



ARROW SPORT V-8

Authentic detail model of an outstanding Ford V-8 powered sport plane. 30-inch wingspan.
50c plus 10c postage

QUAKER FLASH

\$4.95 plus 30c postage
Outstanding among all gas-powered models. Uses any model airplane motor. Large, but folds to carry in car. 3/4 in. rubber wheels. Wingspan 67 in. Length 47 in.

AERONCA K

50c plus 10c postage
A new development of the famous Aeronca C3. In place of old wire bracing, wing struts are now used. 30-inch wingspan.

GULFHAWK
50c plus 10c postage

An easy-to-build model kit of the famous Grumman, duplicating the latest navy fighting plane, plus new features by Major Williams.

SHIP MODELS
The historic "BOUNTY" shown here, **\$1.25 plus 15c postage**. The new Megow catalog contains dozens of fascinating ship models, comprising almost every type from ancient galleons to the modern QUEEN MARY.



Scripps - Howard

JUNIOR AVIATION NATIONAL CONTEST

Now Going On—Closes March 31, 1938

Any boy or girl may enter and compete for Cash Prizes. Write to your nearest Scripps-Howard newspaper or to us for details.

DEALERS: Write for information and ask about our Plans and Materials for building business!

MEGOW'S

Dept. AT.

Howard & Oxford Sts., Phila., Pa.
217 N. Desplaines St., Chicago, Ill.

Aer-O-Kits—Sheffield, England



RYAN

*Now Trains
You in*

AERONAUTICAL ENGINEERING

INDUSTRY DEMANDS more men properly trained for aeronautical engineering. Young men, alert to this opportunity, can now train under the personal supervision of T. Claude Ryan, one of the foremost manufacturers, whose airplanes make history.

Affiliated with the factory producing Ryan S-T and S-C airplanes and with 15 years success in training men for aviation, the Ryan School now offers one and two-year courses in aeronautical engineering, balancing theory with practice under actual factory conditions. The *most practical*, if not the **ONLY** courses of their kind in America!

Learn engineering where the U. S. Navy maintains its largest flying base, scene of the world's greatest flying activity; where the huge Consolidated Aircraft plant is right next door. Enrollment applications now accepted; high school education or equivalent necessary. For catalog describing courses in accordance with revised Air Commerce regulations effective Nov. 1, 1937, use the coupon.

WINTER TRAINING AT SUNNY SAN DIEGO:
Mid-Winter Term for Flight and Mechanics Courses
Starts January 3rd

RYAN SCHOOL OF AERONAUTICS

LINDBERGH FIELD, SAN DIEGO, CALIF. DEPT. AT-1

Please send additional information on courses checked:

- | | |
|--|---|
| <input type="checkbox"/> Commercial (formerly Transport) | <input type="checkbox"/> Master Mechanic |
| <input type="checkbox"/> Limited Commercial | <input type="checkbox"/> Advanced Navigation |
| <input type="checkbox"/> Private | <input type="checkbox"/> Advanced Radio |
| <input type="checkbox"/> Solo (formerly Amateur) | <input type="checkbox"/> Aircraft Welding |
| <input type="checkbox"/> Combination including Commercial Pilot's Course plus new Ryan S-T Plane | <input type="checkbox"/> Aeronautical Engineering |

NAME _____

AGE _____

ADDRESS _____

CITY _____

STATE _____

A
STREET & SMITH
PUBLICATION
Volume IX No. 4
January, 1938

AIR TRAILS

Reg. U. S. Pat. Off.

Editor

C. B. Colby

Consulting Editor

F. Orlin Tremaine

Associate Editors

Clyde Pangborn
William Winter

Light Plane Editor

Arch Whitehouse

Gliding and Soaring Editor

Alexis Dawydoff

Model Editor

Gordon S. Light

Art Editor

W. R. Lawler

Model Board

Gordon S. Light
Frank Tinsley
William Winter

New York:

Advertising Director
Harry Brown
Ass't. Adv. Director
Ralph R. Whittaker

Chicago:

Lewis & Noelle
612 N. Michigan Ave.

Detroit:

E. M. Lubeck
1415 Parker Ave.

St. Louis:

Fred Wright Company
Insurance Exchange Bldg.

San Francisco:

Don Harway & Company
155 Montgomery St.

Single Copy, 15 Cents

Yearly Subscription, \$1.50



The entire contents of this magazine are protected by copyright, and must not be reprinted without the publishers' permission.

Monthly publication issued by Street & Smith Publications, Inc., 79-89 Seventh Avenue, New York, N. Y. Artemas Holmes, President; Ormond V. Gould, Vice President and Treasurer; Henry W. Ralston, Vice President; Gerald H. Smith, Secretary; A. Lawrence Holmes, Assistant Secretary. Copyright, 1937, by Street & Smith Publications, Inc., New York. Copyright, 1937, 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 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.

We do not accept responsibility for the return of unsolicited manuscripts. To facilitate handling, the author should inclose a self-addressed envelope with the requisite postage attached.

STREET & SMITH
PUBLICATIONS, INC.

79 Seventh Avenue
New York, N. Y.

CONTENTS

3 Articles:

- 9 G's and Pull Out by Lee Gehlbach 8
One of the world's renowned test pilots recounts highlights in a dangerous career—making fighting planes safer for tactical maneuvers.
- What I've Learned About Gliding . . . by Pete Bonotaux 22
A top-flight article by a noted glider pilot benefiting those anxious to join the soaring ranks.
- Atlantic Clipper by Frank Tinsley 24
A review of the mighty Boeing Clipper and about the significance of international transatlantic developments—about the plane on the cover.

2 Stories:

- Never the Two Shall Mix by Harold Montanye 12
In which a fast-stepping pilot meets with unexpected difficulties—
- High Over Maxembourg (Bill Barnes Novel)
by George L. Eaton 30
Bill stuck the nose of the Lancer into the ominous black mass as rain came lashing in against the windshield—

10 Features:

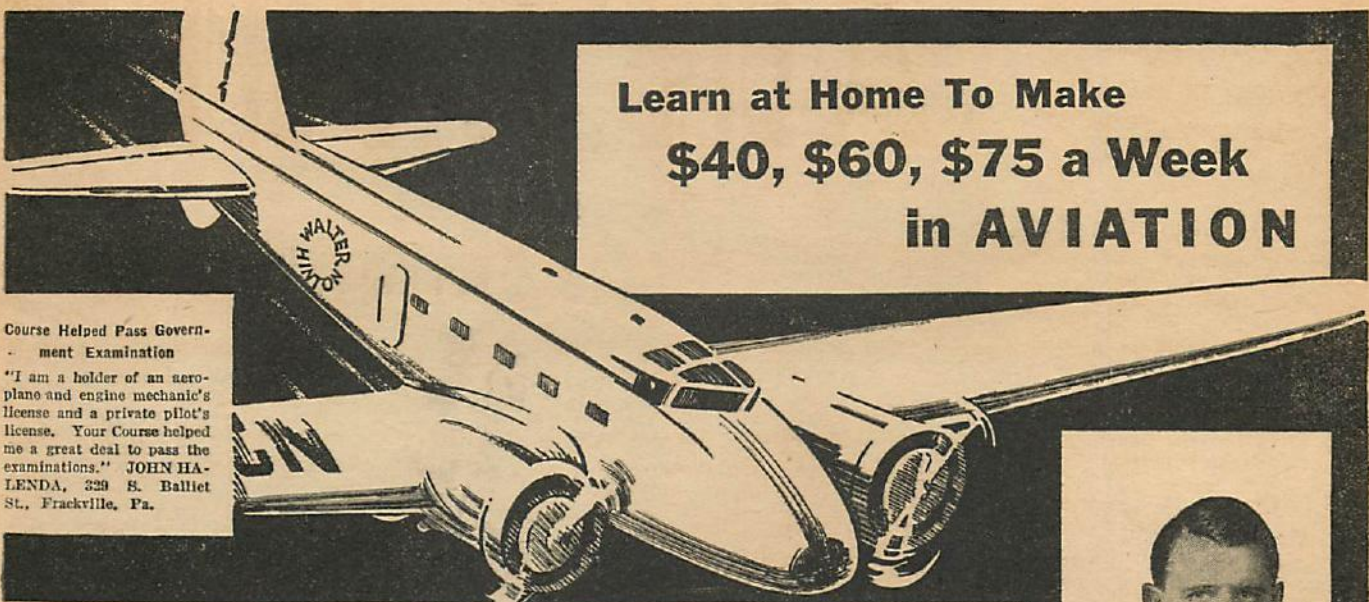
- Air Progress 4
The current news review of aviation.
- This Winged World 6
News photos of airplanes, air events—everything new in aviation.
- Pictorial History of Man in the Air 11
The early days of powered flight.
- Light Plane Development 15
A pictorial lesson in basic principles.
- From Drawing Board to Runway 18
An instructive pictorial feature presenting the story of the fabrication of the Seversky Convoy Fighter.
- What's Your Question? by Clyde Pangborn 26
A page of expert information on technical questions for Air Trails readers.
- The Air Trails Gallery 37
Photographic studies of new planes.
- Split-second Action by Jon L. Blummer 38
Aerial adventures that come only once in a lifetime.
- The Eaglet by Frank Tinsley 69
A three-view drawing in response to popular demand.
- Cross Winds 71
The Air Trails Aviation Crossword Puzzle Page.

3 Departments:

- Light Plane Flying Clubs . Conducted by Gerald H. Smith 16
A valuable department helping those who expect to fly; news notes and a timely article by Arch Whitehouse.
- Gliding And Soaring Conducted by Alexis Dawydoff 20
New developments in an active sport; what the clubs are doing; news from everywhere.
- Air Adventurers Club Conducted by Albert J. Carlson 28
An association for the advancement of aviation.

14 Model Building Items:

- Model contents are listed on a separate page 39



**Learn at Home To Make
\$40, \$60, \$75 a Week
in AVIATION**

**Course Helped Pass Govern-
ment Examination**

"I am a holder of an airplane and engine mechanic's license and a private pilot's license. Your Course helped me a great deal to pass the examinations." **JOHN HALENDA**, 329 S. Balliet St., Frackville, Pa.

Make Me PROVE I Can Train You at Home in Your Spare Time Send Coupon for FREE Lesson

Don't take my word for it. Make me PROVE that I can give you at home in your spare time, the vital ground training you need for success in the growing Aviation Industry. How can I prove it? Just mail the coupon, and I'll send you a sample lesson absolutely free, with no strings attached. Go over it for yourself. Note the clear, easily understood way in which everything is explained. See how easy it is to learn—right from the start. Then read my free book, "Wings of Opportunity." It will give you the facts on Aviation—tell you how you can train at home in spare time for a good job—show you what a big future there is in Aviation—give you all the latest information on the fascinating business of Aviation. You will see what my graduates are doing, what they make, how they got jobs, etc. Mail the coupon now for my FREE BOOK and FREE LESSON. It may start you toward a good pay job in Aviation.

My up-to-date home-study Course gives you the ground work you need to *get and keep a real job* in this fascinating, fast-growing industry. Many of my graduates, who didn't know a thing about Aviation when they started training, are holding down fine jobs right now—in the air and on the ground. *Over forty different types of jobs to choose from*, once you have the necessary training. Get the facts about my practical training and Money-Back Agreement NOW!

I Train You QUICKLY—at Home in Your Spare Time

You don't need to give up your present job—don't need to leave home, to get your training in Aviation. I've made it easy for you. I've put my own twenty years of experience—five years of instructing in the Navy—all into my thorough, quickly mastered home study Course.

No Previous Experience Needed

You don't need a high school education—don't have to know anything about planes or engines to learn the ground work of Aviation with my Course. Everything is clearly explained—illustrated by hundreds of pictures, drawings and charts—made as simple and easy as possible. You get all the information you need to pass the Government's written examinations for Mechanic's or Pilot's Licenses, in a few short months. If you want to learn to fly, I can probably save you more than the cost of my Course on your Flight instruction at a good airport near your home.

Get My FREE Book Now—Mail Coupon

Aviation is growing fast. Don't wait and let the other fellows get ahead of you. Think about your own future. Get the FACTS. Mail the handy coupon on the right today—right now—while you're thinking about it. I'll send you my SAMPLE LESSON and my big FREE Book—packed with interesting facts about your opportunities in Aviation. Mail coupon NOW.

WALTER HINTON, President, Dept. A3R
Aviation Institute of America, Inc.
1115 Connecticut Avenue, Washington, D. C.



Walter Hinton

First to fly the Atlantic; first to fly from North to South America; first to explore the upper regions of the Amazon by plane. Flying Instructor in Navy for five years. Now giving ambitious men practical ground work training in Aviation at home. Mail the coupon below for your copy of his big new FREE Book today.

AIRPLANE FLIGHT INCLUDED

Just as soon as you complete my training, I arrange a flight for you at an accredited Flying Field. There is no extra charge for this. My book tells all about it. Mail coupon.



Mail for my big FREE BOOK on AVIATION Now!

Walter Hinton, President
Aviation Institute of America, Inc., Dept. A3R
1115 Connecticut Avenue, Washington, D. C.

I am anxious to have you prove to me that you can train me at home in my spare time for Aviation. Send me, without obligation, your free sample lesson, and your free book, "Wings of Opportunity."

Name.....
(Print Clearly)

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

City..... State.....S



Not a projectile, but the English DeHavilland Albatross, intercontinental liner breaking through the clouds on a test hop. Four inverted 500 h.p. Gypsy Twelves will drive the long-distance freighter version over the Atlantic.

TRANSPORT

ALL American air lines continue to show substantial increases in passenger traffic and revenue. The month of August was particularly encouraging with most lines showing new record highs. American Airlines flew 12,754,327 passenger miles, showing an increase of 36 per cent over the figures of August, 1936.

Eastern Air Lines flew more than four million passenger miles. Up to July, air lines under American registry had flown more than fifty-two million passenger miles.

United Air Lines celebrated its tenth anniversary on September 1st, but the post-office department refused to allow the pooling of equipment on the Pullman plan with Western Air Express. The government decree was that the move would be "monopolistic."

Transport officials in this country are waiting with intense interest for the first trial flight of the British Mayo-Composite transatlantic mail plane. Both components, the upper and the lower, have been completed and test-flown. No doubt by the time this appears in print, the first test of flying the upper compo-

ment off will have been made. The lower component, a Short boat, appears similar to the Empire boats. The upper is a high-wing monoplane powered with four Gypsy-12s and has two long slim pontoons.

Eastern Air Lines now has a fleet of air-conditioning motor trucks which carry equipment to cool the cabins in summer and heat them prior to flight in the winter.

Details on the new Wright "Cyclone" engine which has been on the so-called secret list, have finally been given out. The motor will be known as the GR-2600A-2 and it will have a take-off output of 1,500 h.p. at 2,300 r.p.m. on 95-octane fuel. The bore is 6.125 and the stroke 6.312

inches. It has a total displacement of 2,603 cubic inches, a compression ratio of 6:85 to 1 and weighs 1,875 lbs.

Information has just been released by Pratt & Whitney that their series "H" Wasp engine will be manufactured under license in Australia by the Commonwealth Aircraft Corp. Proprietary, Ltd., of Melbourne. This move is the first in a new national defense plan, after an Australian commission had made an extended tour of (Turn to page 64)

30 Years Ago

Thirty years ago Alexander Graham Bell carried on his famous experiments with his giant "tetrahedral" kites flown by Lieut. Thomas E. Selfridge, December 6, 1907.

These huge kites were made up of hundreds of small cells united by a framework. First flown as a kite—with no one aboard—then piloted by Selfridge, still at the end of a long ground cable, these kites showed remarkable stability and airworthiness but were abandoned as impractical for further experimentation.

During these same days Henri Farman won the Deutsch-Archdeacon prize of 50,000 francs for flying 1,000 meters over a closed circuit. To win the prize he was required to fly a straightaway course of 500 meters and return without landing—which was considered a tremendous feat for the machines of that day.

Farman, an English painter, had been flying for some time after having become a champion bicycle and race driver and turning from these sports to the air for new thrills.

The machine he flew on this memorable January 13, 1908, was a Voisin biplane.

Competing for laurels, Ellehammer, of Denmark, introduced a triplane of radical design. This machine boasted of a tractor propeller—new in Europe and unheard of in America—bird wings, and a unique landing gear. Ellehammer flew this machine for a distance of 178 meters across the island of Sindholt, Denmark, during January of that year.

*What will you
be doing - ONE
YEAR FROM TODAY*



THREE hundred and sixty-five days from now — what?

Will you be struggling along in the same old job at the same old salary — worried about the future — never able to make both ends meet?

One year from today will you still be putting off your start toward success — thrilled with ambition one moment and then cold the next — delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man — don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could advance.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 4931-C, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," ★ and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- | | | | |
|--|--|--|--|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Mechanical Engineer |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Bridge and Building Foreman | <input type="checkbox"/> Mechanical Draftsman |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Machinist | <input type="checkbox"/> Highway Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Plumbing | <input type="checkbox"/> R. R. Locomotives | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Heating | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Pipefitter | <input type="checkbox"/> R. R. Signalmen | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Ventilation | <input type="checkbox"/> Air Brakes | <input type="checkbox"/> Agriculture |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Tinsmith | <input type="checkbox"/> Train Operation | <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Poultry Farming |
| <input type="checkbox"/> Electrician | <input type="checkbox"/> Automobile Mechanic | <input type="checkbox"/> Aviation Engines | |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Coal Mining | <input type="checkbox"/> Navigation | |

BUSINESS TRAINING COURSES

- | | | | |
|--|--|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Civil Service | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Railway Mail Clerk | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Complete Commercial | <input type="checkbox"/> Grade School Subjects | <input type="checkbox"/> Lettering Show Cards |
| | | | <input type="checkbox"/> Signs |

DOMESTIC SCIENCE COURSES

- | | |
|---|--|
| <input type="checkbox"/> Professional Dressmaking and Designing | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Millinery |
| <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Foods and Cookery |

Name..... Age..... Address.....

City..... State..... Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

This

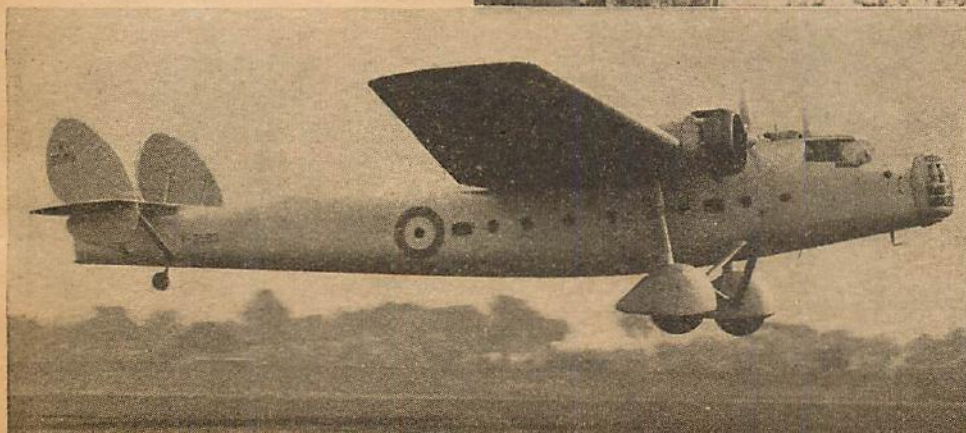


Left—A false picture of peace is presented by this trio of British submarine spotters on duty over the Mediterranean. These huge flying boats are equipped with light cannon so mounted as to fire vertically—extremely effective armament for counter submarine warfare from the air.

Below—The smooth take-off of the British Bristol Bombay troop carrier as it left Hendon for Germany. Aboard were Sir Cyril Deverell, Chief of the Imperial General Staff, and Air Marshal Sir Arthur Langmore with other officers on their way to German army maneuvers.



Above—Like robots these R. A. F. "hot papas" stride through blazing oil to successfully test their new asbestos suits.

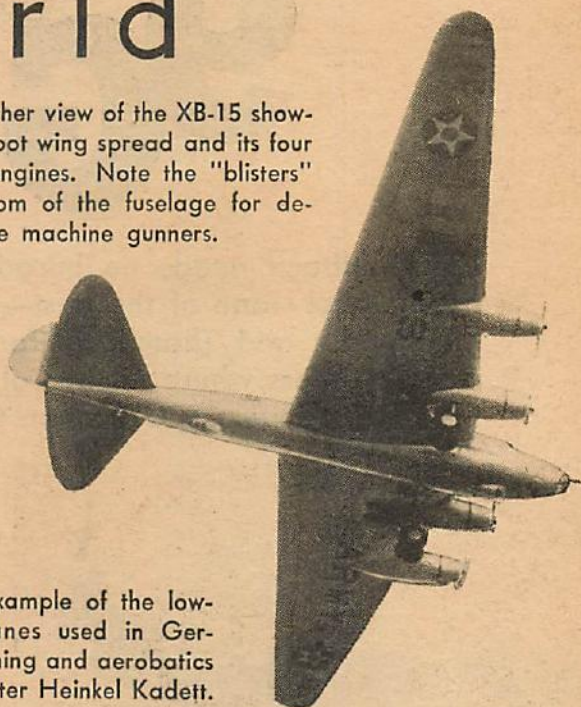


Winged World

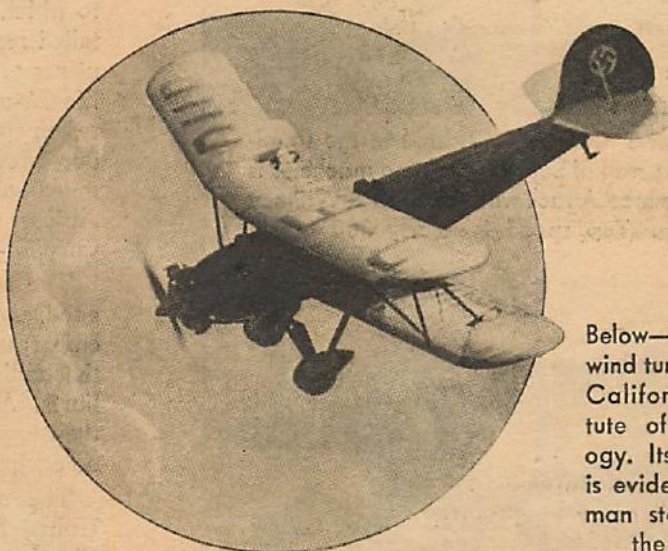


Above—Thirty tons of death-dealing power in the form of the new Boeing XB-15 army bomber.

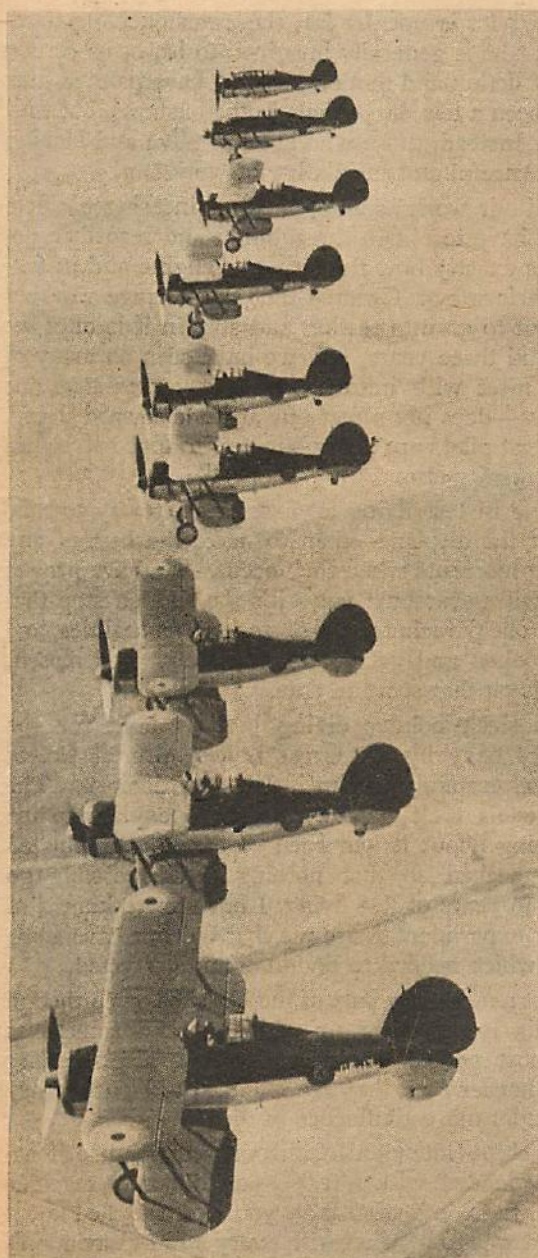
Right—Another view of the XB-15 showing its 150-foot wing spread and its four 1,000 h.p. engines. Note the "blisters" on the bottom of the fuselage for defense machine gunners.



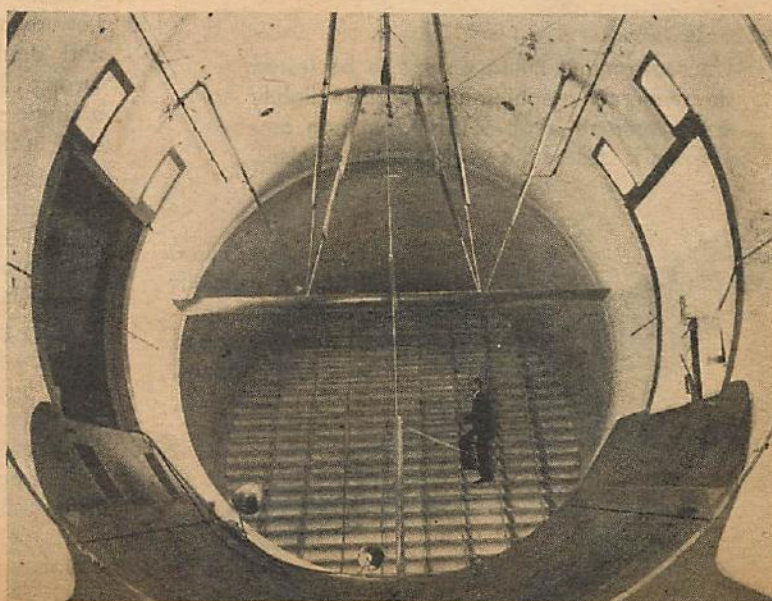
Below—An example of the low-powered planes used in Germany for training and aerobatics—the two-seater Heinkel Kadett.



Below—The giant wind tunnel at the California Institute of Technology. Its huge size is evident by the man standing in the rear.

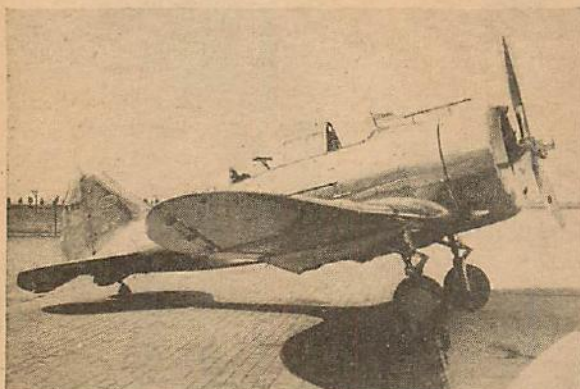


Above—Nine reasons why Belgium buys air strength from England—British Gloster Gladiators of the Belgian air force.

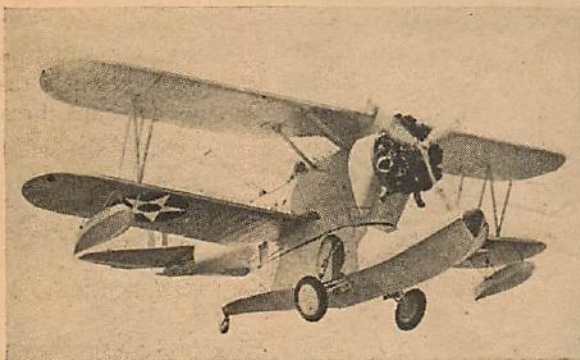


9 G's ... AND

Lee Gehlbach needs no introduction to aviation readers. For years he was a racing pilot—one of the best—having flown a GeeBee and a Wedell-Williams in the Bendix and Thompson Races. Lately he has turned to test work, carrying on, with others, where Jimmy Collins left off. To-day he is one of the nation's ranking test pilots. Seversky, Grumman, Great Lakes and Vought have all depended on him.



Designers never rest. Added to the formidable array of Seversky fighting machines is the 2-place Attack with the Pratt & Whitney engine. Top speed is nearly 300 m.p.h.



Unusual among military ships to be tested are numerous amphibians and other slightly unconventional craft. This Grumman amphibian is one of the world's most efficient.



Hawks for China. Modified versions of accepted fighters are in demand by foreign nations.

THE test pilot is not, by far, the swashbuckling daredevil that he is generally imagined to be, or as certain styles of fiction and motion pictures have painted him. There have been a few dare-devils in the business, but they did not last. Instead, those who are still alive and kicking are the most careful and calculating of workmen.

We regard our work as an applied engineering problem to which we have to obtain the solution and record in detailed reports exactly how the airplane, engine and instruments are performing. Granted that the average working life for a pilot to go into testing and stay in it is only between two and three years, still we have seen so many of our friends meet with unfortunate occurrences that one more—or less—does not affect our attitude toward flying. At least we test pilots are doing our best to make airplanes safer for everybody else.

The routine in test flying is, first of all, to try to take good care of the airplane—then to make the best of any embarrassing moments when they occur. We have proven that falling will never hurt you—it's the sudden stop that hurts. Also, our parachutes are there for eventualities, and they usually open and get you down safely. For myself, no complaints on that score to date.

The new, sleek-looking diving bomber built for the United States navy by the Great Lakes Aircraft Co. of Cleveland was certainly a trim little job to look at. The company officials took elaborate pains to explain to me how everything about it had been so carefully calculated and double-checked so that nothing could possibly go wrong. But in years of test flying, I have never known of a single new experimental aircraft that did not have some defects in it which needed to be found and corrected.

This is just a necessary part of the business, even though it often leads to breaking up airplanes and sometimes pilots. If most people would realize how airplanes are tested much harder than they are intended to be used, they would have a lot more confidence in them.

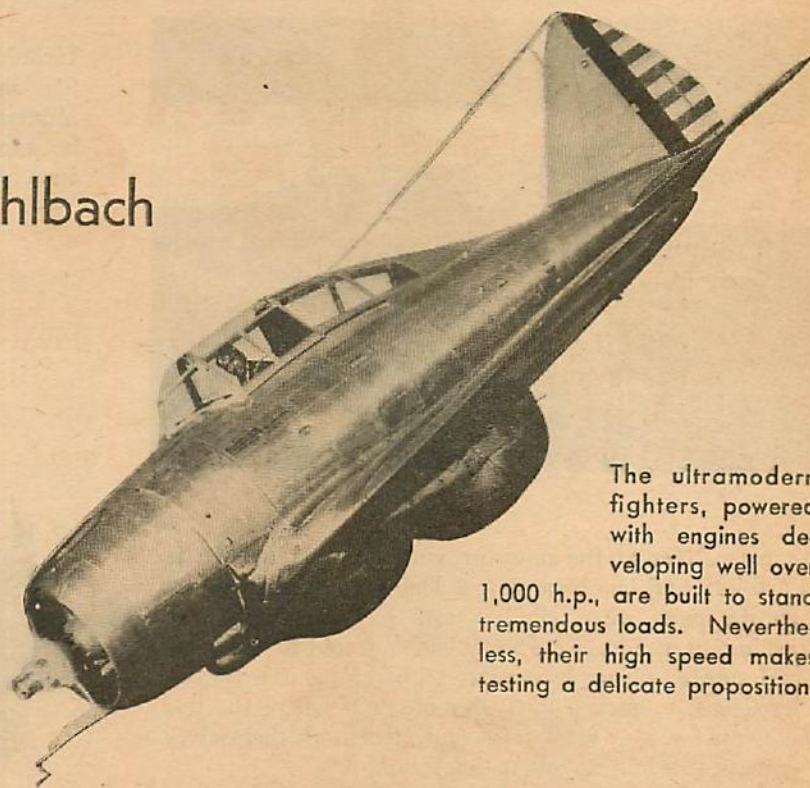
This new ship—intended for aircraft carrier use if accepted—fully loaded with a 1,000-pound bomb, machine guns, bullets, radio and what have you else, weighed about three tons. It was to be tried with every stunt in aviation's book of tricks, including several terminal velocity dives with a pull out of 9 G's. That meant diving it from two to three miles straight down, attaining a speed of about 500 miles per hour—at which the air resistance of the plane equals its own weight and it can go no faster. This speed is about that of most pistol and revolver bullets. 9 G's

PULL OUT

By Lee Gehlbach



Lee Gehlbach



The ultramodern fighters, powered with engines developing well over 1,000 h.p., are built to stand tremendous loads. Nevertheless, their high speed makes testing a delicate proposition.

mean just that many times gravity. In other words, everything about the airplane—including the pilot—is subjected to the extreme strain of nine times normal weight.

The first difficulty we found in the preliminary dives was the fact that all the small cuffs and fairings would blow away. Even the cover plates would leave the wheels for parts unknown. We finally developed what we called the "sledge-hammer" test. That is, if anything looked as though it could be knocked off with a sledge hammer, it would probably blow off during a good, long dive. At the very high speeds, air has the feeling of becoming solid. The airplane feels as though it were riding in a groove or positively held on tracks. Just an engineer's slight error, a bump in the air or a little overcontrol by the pilot can easily cause the plane to fly to pieces as if it were dynamited.

All in all, the preliminary flying at Cleveland went off fairly smoothly. When was trouble to begin? Our modern, up-to-date aircraft are more complicated, have more machinery and more gadgets about them than you usually would find around a machine shop.

This airplane had one of the first 14-cylinder Pratt & Whitney twin-row Wasp engines of 700 h.p. to help throw it around. At that time, these engines were considered highly experimental. This particular power plant wanted to run much too hot—particularly on the ground or when climbing the airplane. It was equipped with thirty-two different temperature gauges which, along with everything else, I was expected to check and record every five minutes. It occurred to me that if a broom could have been suitably at-

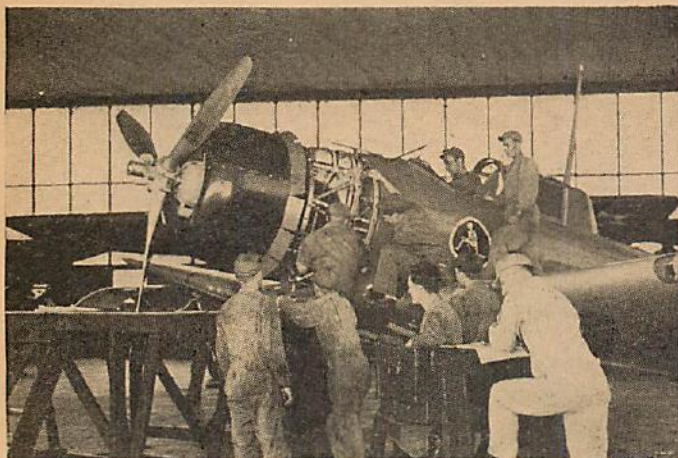
tached to my anatomy, I could just as well have been sweeping out the cockpit at the same time. Also, I've always claimed that a test pilot should be furnished with a good-looking blonde, brunette or red-headed stenographer to take the instrument readings and other miscellaneous notes.

The problem of cooling these engines which were then considered so complicated was finally solved by a suitable cooling system after much mental agony and head scratching by many people. But at the time it was a real challenge for the pilot to labor under the constant threat of an overheating engine and the likelihood of a forced landing with a dead propeller.

With all the preliminary flying at the factory at Cleveland finally completed, we took the new diving bomber to the Naval Air Station at Anacostia, D. C. The final dive tests are not run there, but about forty miles down the

A testimonial to the test pilot's work is to be found in the Great Lakes Dive-Bomber which has been supplied in large numbers for air corps service. Stressed to withstand power dives and pull-outs while loaded with a 1,000-pound bomb, this ship is flown in the most strenuous service assignments.





Technicians give meticulous care to the inspection and rigging of each ship to be tested. Maneuvers, far more violent than those to be expected in service, place the dependence of the pilot on a skilled ground crew.

Potomac River at the navy proving grounds (which is an artillery and bomb range) at Dahlgren, Virginia.

In the past, when similar tests had been run near Washington, the local citizenry had objected to the occasional shower of airplane parts. Therefore, it was considered best to pick a fairly remote spot where the test pilots could scatter airplanes—and sometimes themselves—without messing up our nation's capitol.

Before going up for the first dive I inspected the plane thoroughly, although it was in perfect order. I always like to make a final check-up by myself—to ease my mind if nothing else. I saw that the stabilizer was set properly and that the hatch cover was opened, so that I could get out in a hurry—if necessary.

It was a beautiful day, not a single cloud in the sky. I slapped on my leather jacket, helmet and goggles over ordinary attire, as I never did believe in the efficacy of taping myself up, etc. Such a precaution doesn't do a test pilot any good—as far as I am concerned. All it does is hold your skin together, which it does in any case. It's one's insides that count, and you can't shove the tape down your stomach and intestines to hold them together.

The only thing that really ever bothered me was high altitudes without oxygen equipment. But in any case, I never was up there long. This time I went up to a little over 22,000 feet and was rather glad when I reached there and was ready to go downstairs.

I rolled the plane over on its back, picked a likely spot to dive at—in this case the river lining up the wings at right angles to its banks—and pushed the nose down, “on the way.” I shoved the throttle all the way forward—



Foremost among the world's bombing planes are the American Boeings, Douglasses and Martins. Each is a tribute to some capable test pilot.

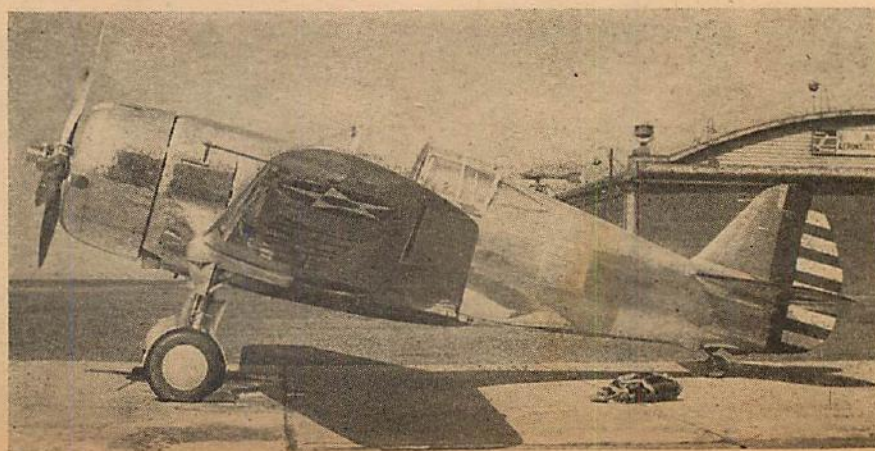
until the engine starts to “over-rev”—braced my left hand firmly against the instrument panel board and away we went.

The greatest hazard for a test pilot is when the plane “undresses” or sheds its wings—when the only thing left to do is jump. I watched for that with an uncomfortable eye. My ears began to get that uncomfortable, clogged-up feeling caused by the change in pressure through losing altitude rapidly. I've never suffered any other ill effects. I guess that's because I've gotten used to it. Ordinarily, a 5-G dive would put the average person in a hospital.

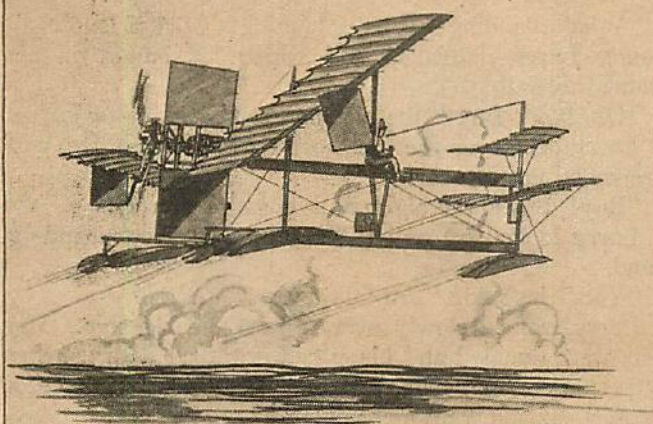
As the ship gathered more speed, I began to check the air speed, altitude and tachometer indicators. As I explained, the air speed goes up to a certain point and then stays stationary—about 500 miles per hour when terminal velocity is reached. The altimeter drops jerkily, probably due to the fact that there is an unsteady and turbulent flow of air as the plane plummets downward. I watch the tachometer so that I can detect if the engine begins to “over-rev.” If it does, I have to pull the plane out of the dive in a hurry—before the engine goes to pieces.

(Turn to page 88)

The personification of speed, today's streamlined bullets are the visible culmination of lengthy design periods. Terminal velocity—when the resistance of a diving plane is equal to its weight—is the most dangerous of flight-testing operations.

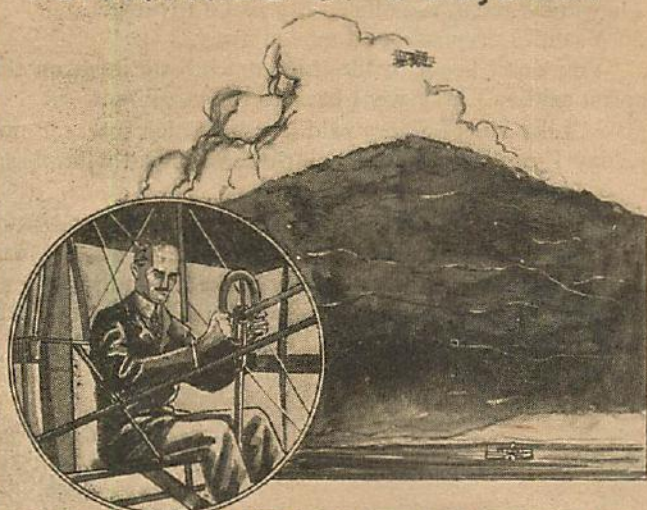


Pictorial History of Man in the Air



1910 ON MARCH 28TH OF THIS YEAR THE FIRST AMPHIBIAN PLANE TOOK OFF FROM THE GULF OF FOS AT MARTIGUES, FRANCE. HENRI FABRE, THE FRENCH AIRMAN FITTED RICOCHET FLOATS TO HIS LAND PLANE AND WAS ABLE TO RISE FROM THE WATER AND LAND UPON THE BEACH.

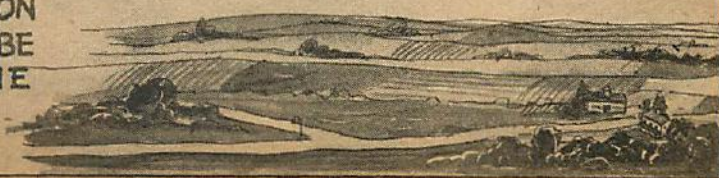
1910 LOUIS PAULHAN DEFEATS CLAUDE GRAHAME-WHITE IN THE FIRST INTERNATIONAL AIR RACE. THE RACE, FROM LONDON TO MANCHESTER, WAS A DISTANCE OF 183 MILES AND TOOK PLACE ON THE 23RD OF APRIL FOR A PRIZE OF \$50,000.



1910 THE FIRST CROSS COUNTRY FLIGHT IN AMERICA ALSO TOOK PLACE IN THIS YEAR. CHARLES K. HAMILTON, AMERICAN FLYER, FLEW FROM NEW YORK TO PHILADELPHIA, A DISTANCE OF 149 MILES, IN 3 HOURS AND 27 MINUTES. THIS FLIGHT TOOK PLACE ON JUNE THE 13TH, WHICH PROVED TO BE ANYTHING BUT UNLUCKY FOR THE FLYER.



THE GREAT GLEN CURTISS TAKES THE SPOTLIGHT ON MAY 31ST OF THIS YEAR BY MAKING THE FIRST LONG FLIGHT IN THE WESTERN HEMISPHERE. FLYING ALONG THE HUDSON RIVER AT AN AVERAGE SPEED OF 55 M.P.H. CURTISS COVERED THE DISTANCE OF 142 MILES FROM ALBANY TO NEW YORK IN 2 HOURS AND 50 MINUTES. DURING THIS TRIP HE SOARED OVER RUGGED BEAR MOUNTAIN NEAR PEEKSKILL.



Never The Two Shall Mix

Thoughts were racing through his mind— He was trying desperately to figure a way out—

By
Harold Montanye

THE big, four-place, black-and-red cabin job came throbbing out of the clouds at four thousand feet and began a wide, sweeping circle above the field.

Young Larry Bossert rubbed his chin—spreading the grease that was on his hands neatly across his face—and shaded his eyes to see the black-and-red plane nose down with its 1,000 h.p. Avalanche motor cut.

The pilot fishtailed to reduce his speed and set the ship down on the runway with a landing that would have done credit to a Turner or a Hawks.

"A very pretty landing," said the man standing beside young Larry.

"You don't have to tell him, he knows it," Larry growled.

The red-and-black ship rolled up to the apron and the pilot killed his motor, set his brakes and climbed out the port door. He was a big man with a florid face, what the British call a military mustache and a grin that showed a line of white, even teeth.

"What a landing! What a landing! What a landing!" he chanted—to any one who would listen—as his feet touched the concrete.

"Wha' a landing! Wha' a landing! Wha' a landing!" young Larry mimicked and wiped his hands on his stained overall.

"Oh, boy! Boy!" the big man said, looking at Larry.

Larry bent over the fuel hose that lay at his feet and pretended not to hear.

"Boy! Boy!" the big man said, more sharply.

Larry looked up and the man waved a commanding hand.

"You," he said. "I'm talking to you."

Larry walked slowly over toward the big ship. His fists were doubled and his eyes were filled with dancing little sparks. "My name isn't boy," he said. "My name's Bossert. If you want me, call me by my name."

"O. K., Bossert," the big man said after he had got over being surprised. "O. K., kid. Did you see that landing I just made? Wasn't that something?"

"What do you want?" Larry asked him.

"I want you to clean my ship, check her over a little and refuel her," the big man said. "I'll be back at four o'clock with the best-looking little dame you ever set your eyes on."

"O. K.," Larry said. "Is that all?"

"That's enough," the big man said. "Four o'clock. They know me in the office. My name's Riley."

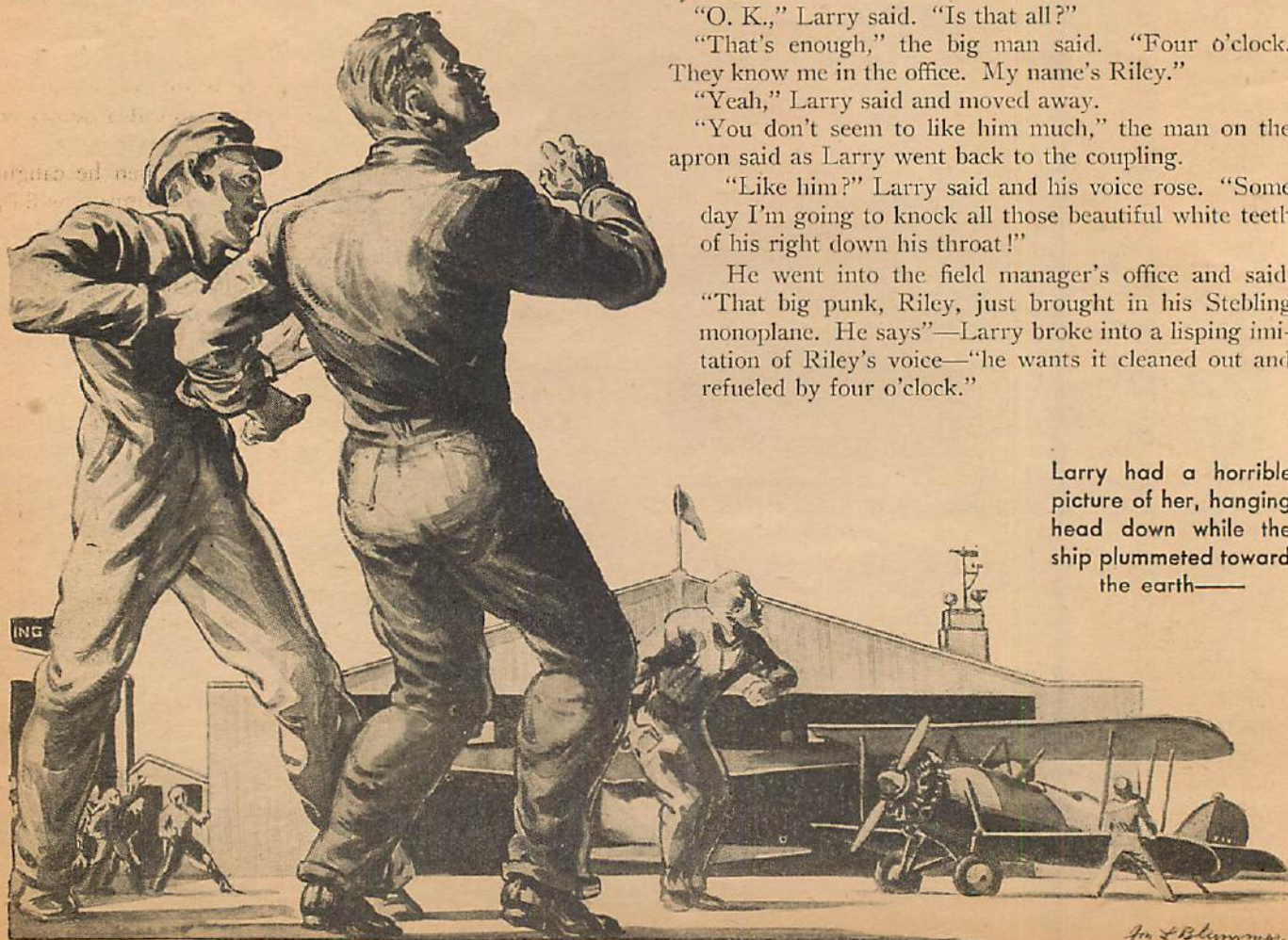
"Yeah," Larry said and moved away.

"You don't seem to like him much," the man on the apron said as Larry went back to the coupling.

"Like him?" Larry said and his voice rose. "Some day I'm going to knock all those beautiful white teeth of his right down his throat!"

He went into the field manager's office and said, "That big punk, Riley, just brought in his Stebbling monoplane. He says"—Larry broke into a lisping imitation of Riley's voice—"he wants it cleaned out and refueled by four o'clock."

Larry had a horrible picture of her, hanging head down while the ship plummeted toward the earth—



Jim L. Blumstein

The manager grinned at him. "Why tell me about it? Have the boys run it into the hangar and go to work on it." He repeated the words of the man on the apron, "You don't seem to like Riley very much."

"Do you?" Larry asked.

"Well, he's a member of the club and he pays his dues and monthly bills. I can't say I'd pick him as a boon companion, but as long as I have this job I've got to be civil to him."

"He gets in my hair," Larry said and went out without saying why.

He didn't explain to the manager that he had once known the girl Riley had brought to the Rosemont Aviation Club a half dozen times before and was probably going to bring again that day. He didn't explain that he had known her well enough to hold her in his arms while he danced with her.

Larry had met Phyllis Montgomery at a house party at the home of Jerry Squires on Long Island. The Squires estate was only a few miles from the grounds of the Rosemont Aviation Club. Jerry Squires' father had found the job for Larry when Larry's father died, during his last year in college.

Larry had been majoring in aeronautical engineering when the crash came. It had never occurred to him or to his mother or sister that his father wasn't a wealthy man. They knew it two days after his death. Larry had been forced to leave college immediately and had jumped at the chance to work at the swanky Rosemont Aviation Country Club.

He hadn't stopped to think that he would be in a pretty tough spot when he ran into his old friends at the club. He found out for the first time in his life what a lot of difference money makes. Some of his friends were just the same as they had always been. Others, because Larry had been more popular and better liked than they, saw an opportunity to humiliate him.

But the thing that hurt the most was when Phyllis Montgomery had pretended never to have known him. She nodded and smiled and thanked him the way she would have treated any garage mechanic. After that he didn't exist.

The first time she had come to the club with Riley he had started to say, "Hello, Phil!" But something in her expression kept him from saying it. He had waited for her to call him by name. But she had merely glanced at him, nodded and looked away.

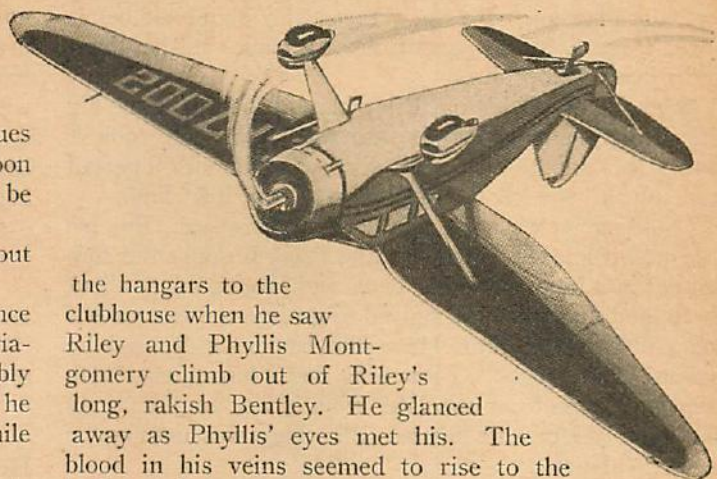
Even a Vassar girl who had studied only child psychology could have told Larry why he didn't like Leonard Riley—aside from the fact that Riley was a loud-mouthed playboy.

Larry went into the big hangar and glanced down the rows of gleaming Stinsons, Wacos, Fairchilds, Taylor Cubs and a half dozen other makes. A dozen grease monkeys swarmed over them, polishing them until they gleamed. He shouted some orders and then directed the taking of the big red-and-black Stebling monoplane into the hangar for servicing.

He wondered if he would ever make enough money out of the half dozen aviation devices he had invented and patented to buy a ship like it. If he did, he told himself, he would be a member of the Rosemont Aviation Country Club instead of its assistant manager.

"Boy!" he said to himself in disgust. "Imagine that big red-faced lout calling me 'boy'!"

Larry was crossing the tennis courts on his way from



the hangars to the clubhouse when he saw Riley and Phyllis Montgomery climb out of Riley's long, rakish Bentley. He glanced away as Phyllis' eyes met his. The blood in his veins seemed to rise to the boiling point.

"Is she ready to go, Bossert?" Riley shouted at him as they started into the clubhouse.

Larry gave his head a quick nod to indicate that she was and he wondered how much Riley had had to drink. His voice was more than a little thick and he stumbled over the sill as he went through the doorway.

A few minutes later Larry saw them standing at the bar. He saw that Riley had finished one whiskey sour and was calling loudly for another one. Phyllis was drinking vichy and milk and for a reason he couldn't explain to himself, he was glad.

He was standing on the apron when a crew of men brought the high-winged Stebling out on the concrete and the head mechanic got into the pilot's seat to warm up the 1,000 h.p. Avalanche motor. The coal-black fuselage of the big flying sedan shone brightly in the late-afternoon sun. The wings were a bright red. Two red stripes ran the length of the fuselage and also decorated the tear-drop wheel spats.

"She's a honey!" Larry said aloud. Then he caught sight of Riley and Phyllis. Her face was crimson as they came down the steps of the clubhouse and it wasn't hard to discover why. Riley was drunk. He didn't stagger and his speech was no thicker than it had been before, but it was louder. He had the appearance of a man who might become very definitely drunk at any moment and collapse.

Larry turned his back and pretended not to notice because he could see that Phyllis was more than a little embarrassed. Larry knew he had probably made a fool of himself in the bar and had so embarrassed Phyllis that she was glad to get out. He wondered how a girl like her could stand having him around. They were, he told himself, as different as any two people could possibly be. Or maybe they weren't—from the way she had treated him. Maybe she was just like him. But he couldn't make himself believe that.

He saw Riley almost fall on his face as he put his foot on the bottom step. A mechanic stepped to his side and helped him through the door. Then Larry's eyes popped as he saw Phyllis follow him. He had thought she had just come out to see him off. But she was going with him. He started to run toward the ship to yank her back to the ground. He had taken a half dozen steps before he caught himself.

"She's mad!" he said to himself. "But it's none of my damned business. If she wants to risk her neck with that drunk it's up to her."

He debated whether he ought to go in and tell Mathews, the manager. He knew that Riley shouldn't be allowed to get behind the controls of a plane, but he didn't know how to stop him.

While he was debating, Riley blasted the tail of the big ship around and kicked it into the wind. He took it across the smooth turf with scarcely a bump. The tail came up and she left the ground in a long, low climb.

"Nothing wrong with that," Larry breathed. But his face was pale. He watched while Riley brought the ship around in a long, sweeping bank and leveled off at about three thousand feet. He started to go into the hangar but something stopped him. He couldn't take his eyes off the red-and-black plane. Something held him there. He knew a couple of minutes later what it was and he nearly died from terror and horror. But there was nothing he could do about it.

He could tell by the increased roar of the motor that Riley was pouring soup into the 1,000 h.p. engine as he raced overhead.

Suddenly, the nose of the big ship rose and the tail came around as Riley took it upstairs in a fast climbing turn. When it was pointed almost straight up and was ready to stall, he kicked the tail all the way around and let the nose drop. He had reversed his direction of flight with a flashing chandelle.

"The damned fool!" Larry raved. "The fat, pig-headed drunk—trying to stunt a ship like that one. I'll see that he loses his license if he doesn't lose his life."

Larry was aware that some one was standing beside him as he heard the head mechanic's voice say, "That guy was boiled when he took off, Mr. Bossert. He's a—a——" He stopped.

"Yeah," Larry said. "He's a louse. Does he have a two-way radio?"

"Yes."

"See if the radio operator can make contact with him."

Larry stood with his finger nails digging into the palms of his hands while he followed the Stebling with his eyes. He watched Riley do a series of barrel rolls and wing-overs and prayed that Phyllis had her safety strap fastened.

His heart was pounding in his throat as he wondered how long it would take Riley to get sober enough to realize what he was doing. So far he had been lucky. But his luck couldn't last forever.

Then Riley took the big red-and-black monoplane up and up and up in a normal loop until it was flying on its back. At the top he half rolled it back to normal flight and Larry swallowed to keep his stomach from choking him to death. His whole body was cold and clammy. He felt that he was going to be violently sick at any moment.

People were standing on the lawn in front of the clubhouse watching the mad show overhead and the apron was dotted with grease monkeys and mechanics.

Larry heard a woman scream and collapse on the grass, heard a dozen men shouting curses at the madman overhead. He heard the roar of two airplane motors and knew that they were going up to try to wave Riley to earth. He thought of trying to stop them because he believed that they would only add to the danger if Riley became truculent and stubborn. He might even be so mad as to aim the nose of his Stebling at them and try to knock them out of the air. He knew that a drunk never thought he might be hurt himself. He was for the time being living within his own little world and was immune.

"Oh, Lord!" Larry said aloud as he saw Riley stick the nose of the big monoplane down in an almost vertical dive. Down and down and down it plunged until it seemed the wings could not stand the terrific strain they were asked to bear.

Perspiration cascaded off Larry's face and his whole body writhed in pain as the muscles in his cheeks bulged and twisted.

"Oh, Lord," he said again, "isn't there anything any one can do?"

"Some one has got to do something pretty quick, Larry," Mathews, the field manager, said beside him. "This is horrible. Think what that girl must be going through."

"I'm thinking," Larry said.

At a thousand feet Riley began to ease out of his dive. He brought the nose up slowly and Larry couldn't help admiring his craftsmanship. Then his engine blasted again and he came up and over. But he didn't complete the loop. Instead, he pushed the control column forward and dived toward the field upside down.

Larry had a horrible picture of Phyllis hanging in her seat with her head down while the ship plummeted toward the earth.

"Get fire extinguishers!" Larry shouted at the grease monkeys who were watching—faces strained and white.

Then Riley lifted the nose of the monoplane and raced the length of the field only a hundred feet above the ground. At the end he rolled it level and hung it on its prop to take it upstairs again.

No one could speak now. They could only watch with horrified eyes, waiting until the thing that had been a beautiful red-and-black monoplane became a twisted mass of burned fabric and hot metal. The thing could not go on forever.

The monoplane had climbed to three thousand feet again and had leveled off to fly in great widening circles when Larry heard the excited voice of the head mechanic in his ear. The man was babbling incoherently. Larry grabbed him by the arm with fingers that were like bands of steel and slapped him on the side of the face. "Take it easy!" he said. "Now talk!"

"It's Miss Montgomery," the mechanic said. "The radio operator made contact with her. She wants to talk to you."

Larry dipped his head, dug his toes in and sprinted toward the little radio room in Hangar No. 2. He made a motion with his hands at the radio operator as he went in the door and grabbed for the headphones the operator handed him.

"Bossert speaking," he said. "Go ahead, Phyllis—go ahead!"

"Larry!" she gasped in his ear. "You've got to do something. I'm—I'm afraid I'll faint any moment. I'm—I'm——"

"Hold it!" Larry screamed in her ear. "Where's your nerve, kid? How is Riley? Is he getting sober?"

"He's unconscious," she sobbed. "I—I hit him over the head with the fire extinguisher after he came out of that last inverted dive and began to climb again. I—I think I killed him."

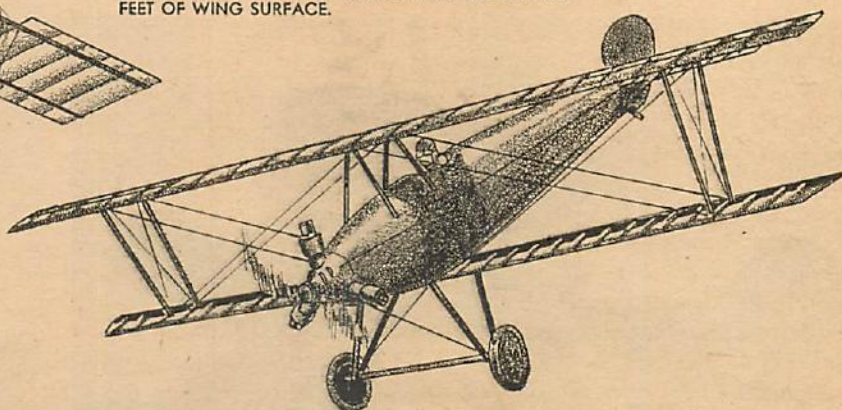
"It's too bad if you didn't," Larry growled. "Can you bring her in?"

"No! No! Larry," she screamed, "I'm afraid. I'm frightened to death. I can hardly talk. I've never piloted a plane before. I'm just doing what I've (Turn to page 86)

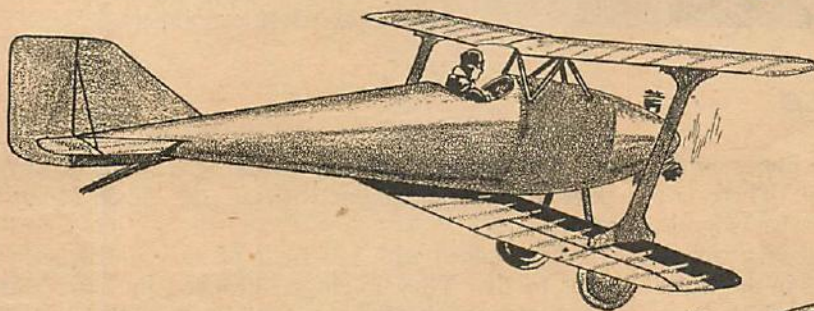
Light Plane Development



THE ORIGINAL LIGHT PLANE APPEARED IN 1909, THE PRODUCT OF SANTOS-DUMONT, THE FAMOUS PILOT AND BUILDER OF EARLY PLANES. IN SPITE OF THE FACT THAT IT ONLY WEIGHED 59 POUNDS, ITS TINY ENGINE DROVE IT AT A SPEED OF 55 MILES AN HOUR. THIS TINY SHIP COULD ONLY BOAST OF 102 SQUARE FEET OF WING SURFACE.

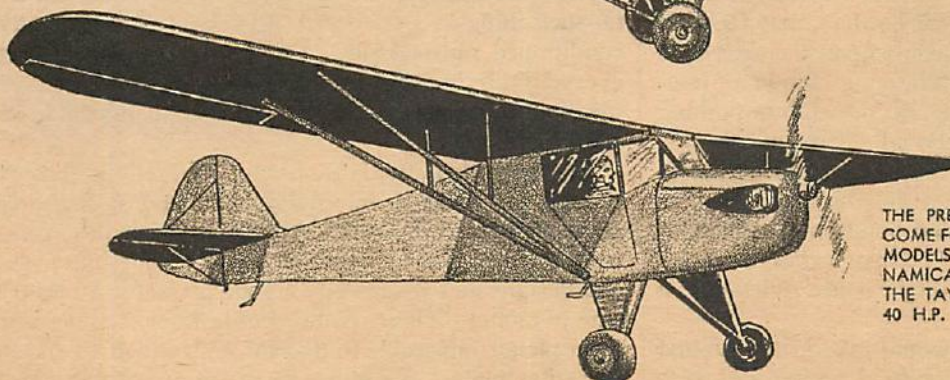
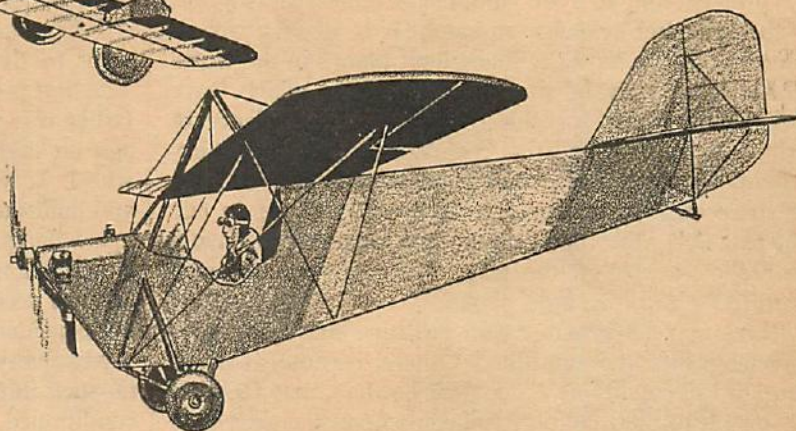


IN 1919 THE WORLD TURNED FROM WAR PLANES TO COMMERCIAL PLANES. AMONG THEM WE FIND AN INTERESTING LIGHT PLANE BUILT BY THE FAMOUS BELLANCA. THIS LITTLE SHIP POWERED WITH A SMALL "Y" TYPE ENGINE COULD CARRY A SINGLE OCCUPANT AT A SPEED OF OVER 80 M.P.H.



ABOUT THE FIRST REAL LIGHT PLANE TO BE PRODUCED IN QUANTITY WAS THE AERONCA. IN 1931 THE AERONCA C-3 APPEARED DRIVEN BY AN AERONCA E-113 ENGINE OF 36 H.P. THIS HIGHLY PRACTICAL LITTLE SHIP HAD A SPEED OF OVER 80 M.P.H. AND A RANGE OF 200 MILES.

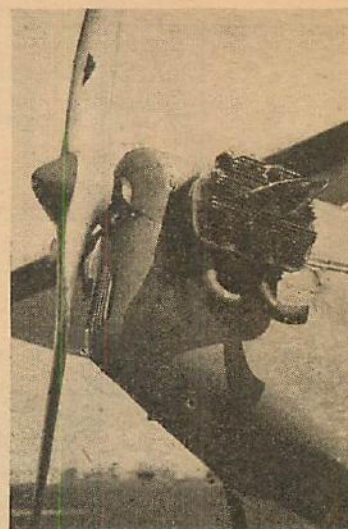
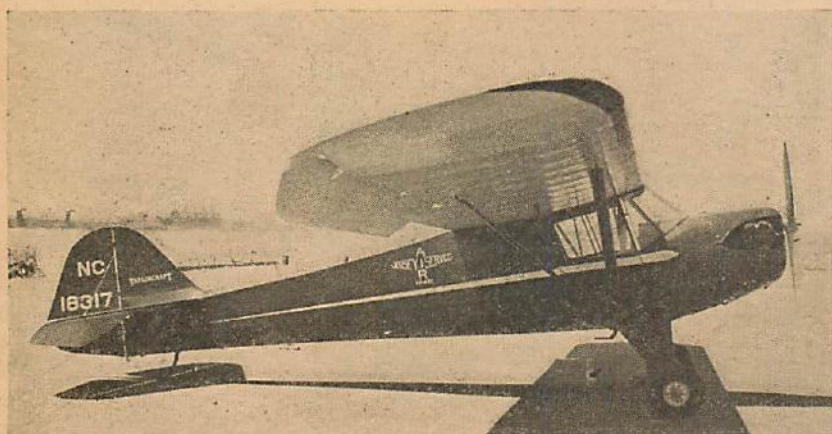
BY 1925 OTHER LIGHT PLANES BEGAN TO APPEAR OF A MORE MODERN APPEARANCE. ONE OF THE MORE ADVANCED WAS THE LINCOLN-STANDARD SPORT PLANE POWERED WITH A 35 H.P. ANZANI ENGINE. THIS SHIP WEIGHED BUT 370 POUNDS EMPTY BUT WAS CAPABLE OF DOING NEARLY 100 M.P.H.



THE PRESENT LIGHT PLANE INDUSTRY HAS COME FORWARD WITH MANY OUTSTANDING MODELS AND TYPES OF SPLENDID AERODYNAMICAL CHARACTERISTICS. AMONG THEM THE TAYLOR CRAFT "A" POWERED WITH A 40 H.P. CONTINENTAL ENGINE IS TYPICAL.

LIGHT PLANE FLYING CLUBS

Conducted by Gerald Smith



Close-up of the Continental installation in the Heath. A 2-cylinder, air-cooled unit developing 40 h.p., the Continental is an ideal power plant for light planes.

One of the fastest-selling light planes, the Continental-powered Taylorcraft is earning the praises of pilots everywhere.

By Arch Whitehouse

FOR years I have been trying to put my finger on the crux of the light plane flying problem. There is a problem and any one who insists otherwise is ignoring the facts and evidence on hand. It is all very well to point out that we have the finest light planes in the world and that they may be purchased at prices which leave foreign enthusiasts speechless. We do have plenty of territory to fly over and fuel costs are far from being exorbitant. There are plenty of good schools and we have our share of good instructors. The safety factor in our light planes is very high and we are fortunate to have a few million people in the wage brackets who can well afford to fly and own light planes.

Others may have better club facilities and enjoy government grants and subsidies. Others, because of pertinent political conditions about their borders, may feel that they owe it to their country to take it upon themselves to learn to fly. In some instances the flying club is an integral part of the national defense and the club is nothing more than a country club National Guard where the sporting gentry is taught to fly for a minimum fee—providing they are also willing to learn how to fire a machine gun, place detonators in demolition bombs and take valuable photographs from the air. The instruction is carried out by official military men and the laws are strict—but a good many like it.

I do not know how the idea would take in the United States. We are presumably a peaceful nation and anything that smacks of militarism is immediately frowned on. But the fact still remains that a lot of swell fellows want to fly and the flying club plan, as we know it, is not the success it should be. When we consider our standards of living, our inherited love for the great outdoors,

our standing as a sporting nation, one wonders why our skies are not swarming with aircraft flown by private owners.

I have talked with hundreds of men and women who want to fly. They might be grouped into two classes. The first is the dyed-in-the-wool sportsman whose grandfather was willing to take a chance thirty or forty years ago on giving up a pair of leather reins for a steering wheel. It was that man who made the present automobile and built our system of roads. The second group is made up of imaginative men who see aviation as a profession, either as a military pilot or the commander of an airliner. He has accepted the airplane without question and does not consider it something thrilling or unusual. He is like my twelve-year-old son who never knew when there was no such thing as a transport, a twelve-tube set or an air-conditioned railroad car. Aviation is an integral part of everyday life and he sees no reason why he should even mention the fact that he flew up from Washington to New York.

But why then, with thousands of men in these two groups, are there so few flying clubs and so few private or amateur pilots? Most certainly it is not the manufacturer's fault. He is sinking plenty of money into factories and designs and we can buy a good plane for a reasonable sum of money. These planes can be bought on an installment plan, comparable to that through which we purchase our automobiles. Insurance rates are reasonable and during the past few months the Bureau of Air Commerce has softened the licensing restrictions to the point where no one can argue that government laws make private flying a very limited form of sport or amusement.

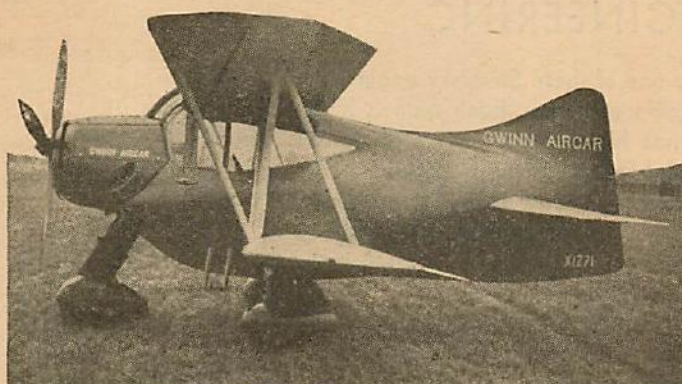
A point that few have really considered is the matter of



The well-known Taylor Cub continues to make advances in production. Light planes are responsible for the great percentage of civil aircraft sales.



Although an older Aeronca model, this Collegiate is interesting because of its floats. Edo floats are available for light planes.



Foolproof airplanes have always been the goal of designers. The Gwinn Aircar is the latest attempt and has autolike controls in addition to its many other, more evident features.

sufficient light-traffic airports where flying clubs may make their home. Most flying schools, for economic reasons, carry out their work on busy airports from where transports and other business ships come and go every hour of the day. This is no one's fault. It happens to be a situation that has come up with the times, but unfortunately it is one of the big things that scares off the prospective student.

We have all seen the air activity about a modern airport. Big airliners race away or glide in for landings. To protect them and the industry they represent, there must be stringent air laws and rules. The transports are controlled from dispatch towers by radio or visual signals and the light plane has to attempt to fit itself in somewhere between the close channels of control that make the transport business what it is.

A skilled pilot finds himself well occupied getting in or out of the modern airport, obeying the rules, watching the wind, his own instruments and going through the movements necessary to put his plane down safely. What, then, can the novice go through as he attempts to put his own plane down amid all this commercial uproar? We who learned to fly on the wide spreading fields of Texas, Canada or England can only stand off and gasp when we see students to-day attempting to put a 40 h.p. light plane down amid the bustle of 250-mile-an-hour transport, military models and the conglomerate tangle that makes up the modern commercial airport.

Unfortunately, most of our airports are busy, bustling centers. There are few of the easy-going spots well away from large cities and the reaching tangle of industry. We cannot but realize that the few accidents that do overtake light-plane enthusiasts occur near a busy airport or in the cities that surround them.

(Turn to page 82)

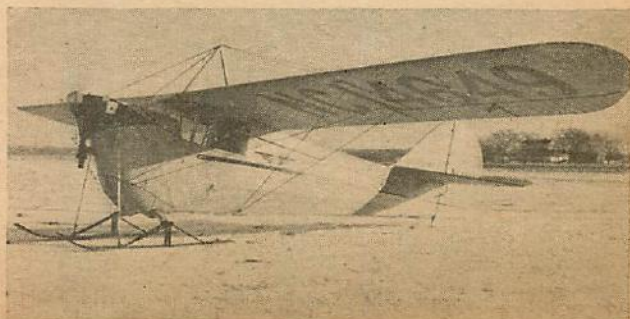


Although not exactly a light plane, the 100 h.p. Kinner-powered Fleet has earned mention because of its years of service as a trainer for schools and military services.

The DeHavilland Puss Moth, D. H. Gipsy of 85 h.p., is probably the most popular of British sport planes.



Below—The versatility of light planes is attested to by this ski-fitted Aeronca. Skis, floats or wheels, the light plane is incomparable for sport.



FROM DRAWING BOARD



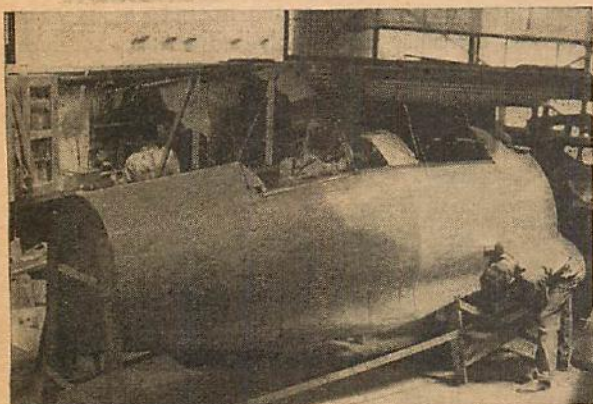
ENGINEERING

Every one of these Seversky engineers is working on the same airplane. Each man is highly specialized and has his own particular job to do. There are over a hundred of these engineers employed at the Seversky plant and each is a graduate of a college or engineering school.



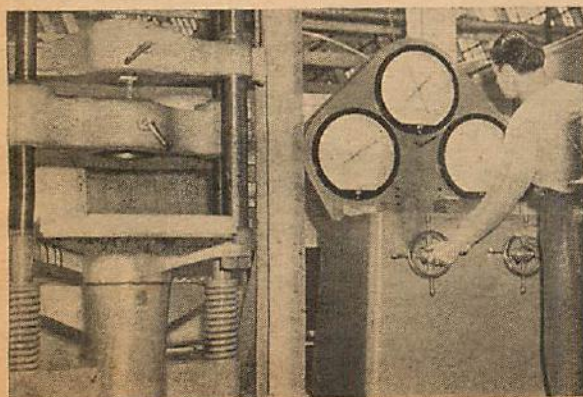
WIND-TUNNEL MODELS

A scale model is first made to the last detail. This model takes weeks of the most skillful labor. When completed, the model is suspended in the wind tunnel. Engineers observe the model under various wind velocities and check reactions so that changes can be made before actual construction. Pilots, too, know how the finished ship will fly.



MOCK-UP

A mock-up is actually nothing more than a working model of the plane to be built, complete with flight controls, instruments and armament. The mock-up enables engineers to eliminate "bugs" which otherwise would only present themselves in the finished product. For one example: It can be determined whether or not the pilot has ample space for required movements.



MATERIAL TESTER

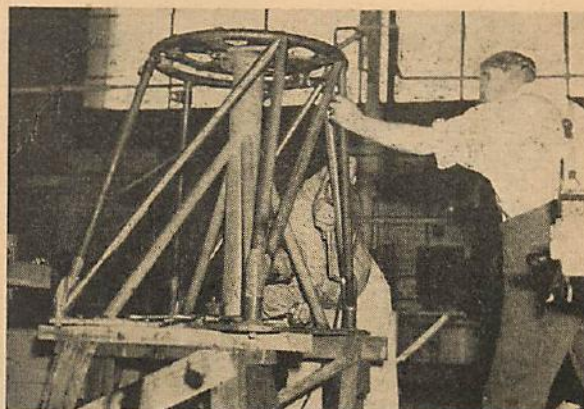
This machine, by exerting thousands of pounds of pull on the parts, enables the experimental engineer to discover how much weight and strength various fittings will stand under abnormal conditions. Photo shows a wing fitting being tested for strength. The dials tell the engineer the pounds and fractions of a pound of strain a fitting will take before breaking.

How the experimental airplane is designed and tested—Photos of the Seversky "Convoy Fighter," fastest 2-place military ship in the world.

TO RUNWAY

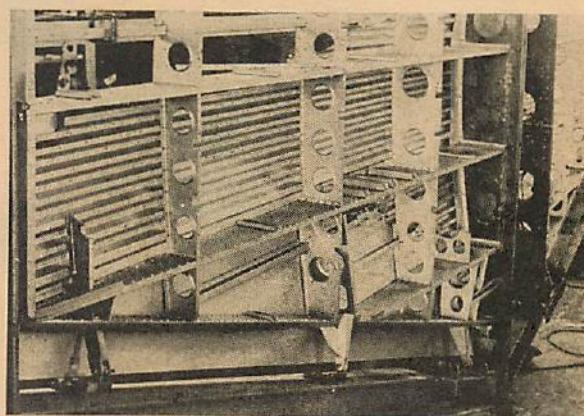
MOTOR MOUNT

Photo shows workmen welding fitting on the motor mount. This mount when placed in a horizontal position is the unit that attaches the motor to the actual plane. Great care must be exercised in the fitting and welding of these mounts because, if each joint was not secure, the motor would vibrate the mount and eventually shake loose.



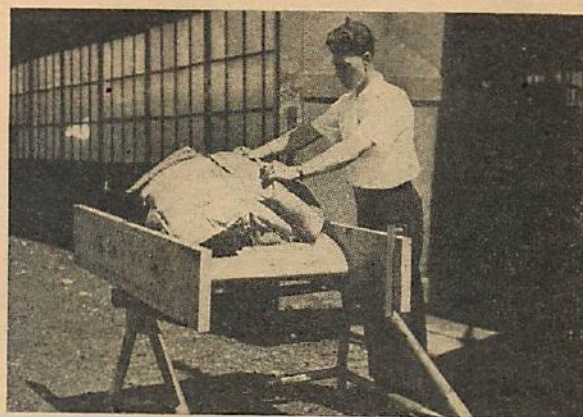
METAL CONSTRUCTION

The development of modern plane construction was facilitated by engineering advances made in the study and fabrication of metals. The photo shows a center section of an all-metal Seversky. No tanks are used, the structure being so designed that fuel is retained within the wing surfaces. Construction is simplified and production cost reduced.



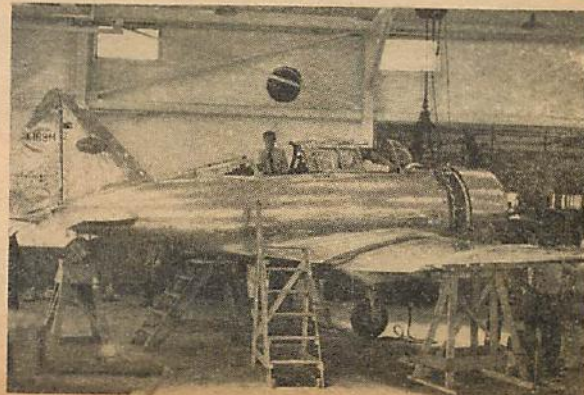
SAND BAG TESTS

These bags being placed on a section of a wing are filled with lead and sand and weigh 60 pounds apiece. Many such bags are piled high on a section, in order to discover how much weight it will actually hold. Bags are piled on until the breaking point is ascertained.



GROUND TEST

The completed plane is hung in flying position off the ground so that the landing gear may be retracted for testing purposes. Engineers and pilots are giving the ship a final ground inspection. All standard equipment is installed in the plane, so that the pilot may make his test with full military equipment and gasoline load.





GLIDING AND SOARING

Conducted by Alexis Dawydoff

LOOKING BACK ON 1937

AS the year draws to a close let us look back and see what progress gliding and soaring made in 1937.

Up to this year practically all gliders except a few imported ones belonged to an antiquated type, a

number of them being utilities that were rebuilt by their owners. The only American-made sailplanes were the Bowlus-duPont Albatross and the Haller Hawk, Sr., now practically out of existence. But this year at the contest, Elmira saw half a dozen new ships constructed right here

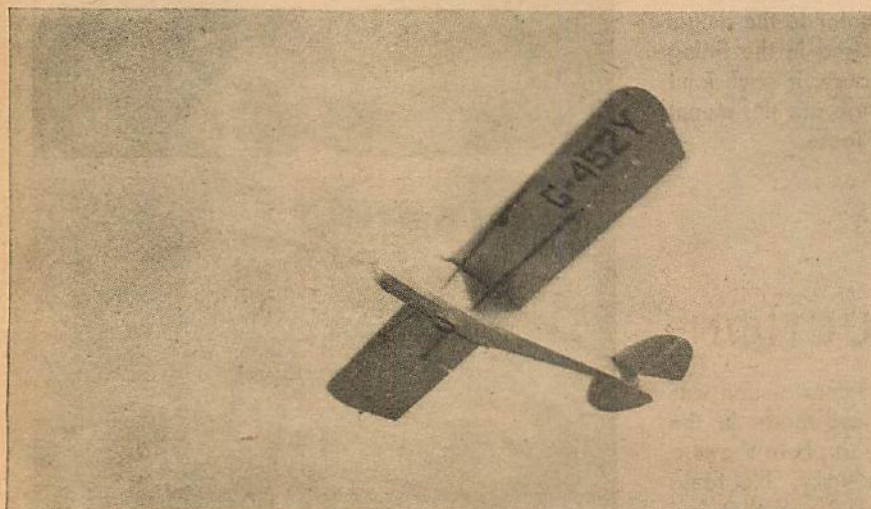
—these ranging from a utility to a high-performance sailplane and including three two-place jobs. All did exceptionally well and the sailplane was equal to any of the importations in its class. The successful showing made by these ships has spurred designers to such an extent that there are at least seven types of machines now being built in this country.

The past year also witnessed the purchase of some very good ships from abroad, these including two Minimoa sailplanes owned by Lewin Barringer and Richard C. duPont, one Hutter H-17, classed as a secondary sailplane and belonging to duPont, and the Rhönsperber bought by Emil Lehecka. Two sailplanes have been constructed from foreign-obtained plans. Leslie Barton, Tom Nilon and Stanley Hruslinsky put together an English Kestrel and a man in California built a Gnat, which is an English ship of the Scud type.

The launching method took a long stride ahead in 1937, the winch practically replacing auto-tow. Not only does use of the winch permit operation on small fields and fields too rough for a car to be driven over, but it spells greater altitude and a smoother climb for the glider. The credit for making this method popular goes to Gus Scheurer, the originator of the winch, and to Paul duPont and the M. I. T. Glider Club, who developed and improved the basic conception. This year at Elmira the auto-tow was completely

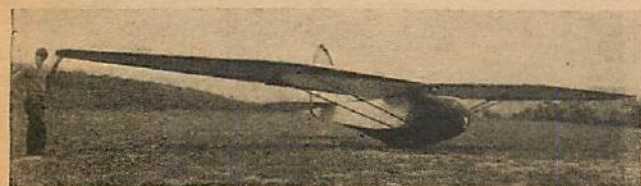
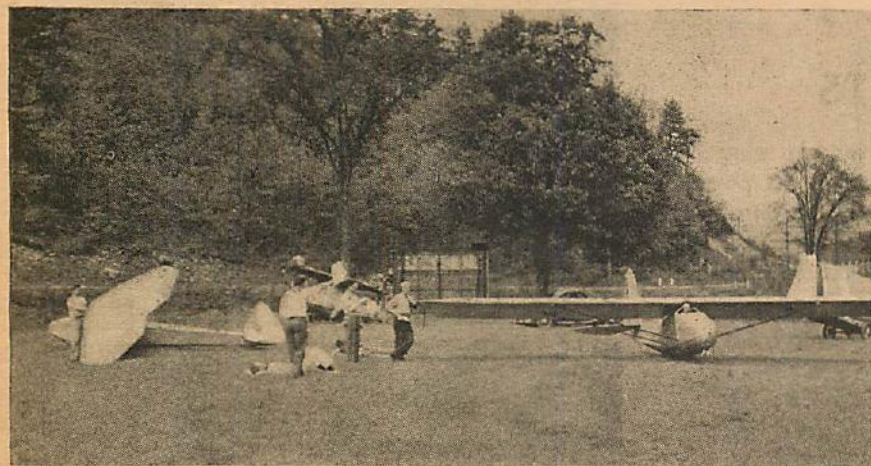
abandoned, winch launching and airplane-tow being used exclusively. All progressive glider clubs either own or are constructing winches to facilitate take-offs.

The marked improvement in soaring technique during the past twelve months has been due mainly to the fact that more ships were equipped with instruments than



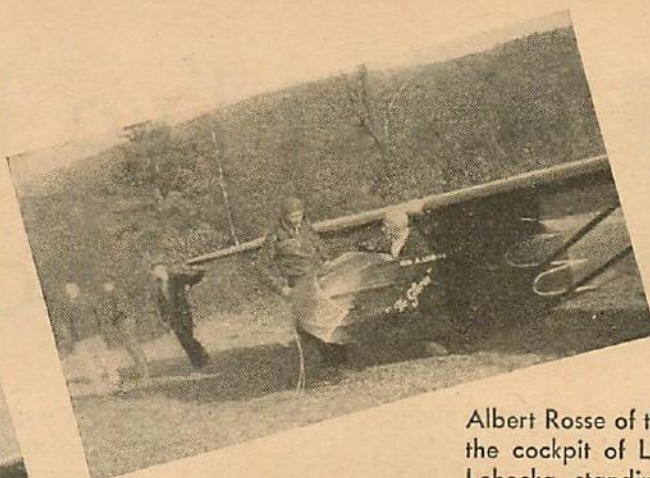
The Airhoppers' Franklin being towed aloft at the Wurtsboro, New York, Columbus Day Meet.

Below: Members of the Airhoppers Club with their Franklin utility, right.



Stevens Franklin of the Wings Soaring Club.

Below: Alexis Dawydoff and the Schweitzer all-metal utility at Wurtsboro, New York. This ship is soon to go into production.



Albert Rosse of the Airhoppers in the cockpit of Lehecka's Cadet; Lehecka standing at the nose.

formerly. The "variometer," for instance—this being the sensitive rate-of-climb indicator—has helped eliminate guessing on the part of the pilot as to the strength of the up-current and aided him in finding the center of it where the lift is at its maximum. Use of the variometer made it possible to turn in some good flights at the Elmira meet when soaring conditions were regarded as unfavorable. Too, more ships were equipped with blind-flying instruments, permitting pilots to enter clouds in attempts to reach greater altitudes.

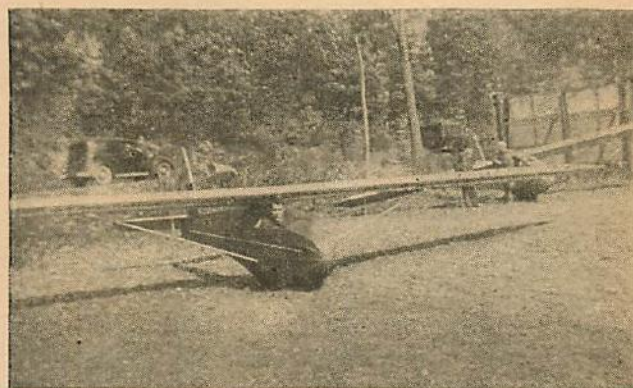
Storm-front soaring was experimented with by American pilots this year for the first time—Lehecka and duPont soaring that way to distances of forty-eight and twenty-three miles respectively. Another "first" was provided by the welcome inclusion of foreign competition at our annual contest—the visitors being Peter Riedel of Germany and Jonas Pyragius and Bronius Oskinis of Lithuania.

Two pilots obtained their Silver "C" certificates, raising the total number in the United States to ten. This gives us fourth place in world ranking. Germany is first with 240 Silver "C" pilots, Poland second with 56, England third with 26, U. S. A. fourth with 10, Switzerland fifth with 4, and France last with only 1.

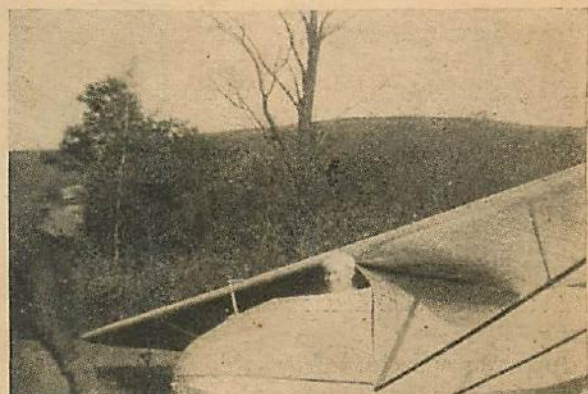
The fact there were twice the number of ships and pilots entered in this year's soaring contest compared with last year is an indication of how fast the movement is growing. With the Bureau of Air Commerce now actively cooperating with the Soaring Society of America, prospects for 1938 look brighter and more interesting than ever.

GLIDING INSTRUCTION BY RADIO

During the Metropolitan Soaring Association meet at Wurtsboro, New York, last Columbus Day, a new method of instruction for glider training was introduced—radio. This marks the first time radio has been used for such work. The general method, whereby (Turn to page 90)

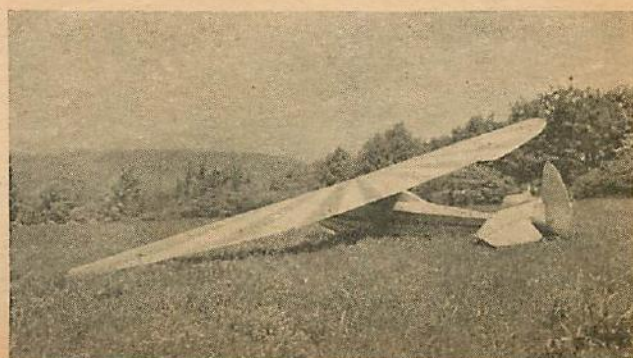


Ernest Schweitzer, at the controls of the Schweitzer all-metal utility, prepares for take-off.



Arthur Ramer, secretary of the Metropolitan Soaring Association, about to take off in the Airhoppers' Franklin.

Below: The Goeppingen Wolf owned by Wistar Brown of the Wings Soaring Club of Philadelphia.





Pete Bonotaux,
taken in flight.

What I've Learned About Gliding

I'VE been actively interested in gliding ever since I was fourteen years old.

At that time aviators used to say, "These glider pilots must be nuts. I want a motor ahead of me!" Nowadays they attend our meets and come away remarking, "It must be fun. I'd like to try it." A lot of them do. Hundreds of their younger brothers, fliers still in the making, are being taught gliding as part of their curriculum. Colleges with aeronautical courses have found it a great aid in flight training and construction work, and the U. S. navy reports excellent results from the use of gliders in the basic training of naval aviators.

In other words, gliding in this country has become a safe, practical sport if conducted properly—and one that is infinite fun. We have learned a great deal in the last ten years, profiting from our mistakes and discovering new tricks that have added to the general knowledge in our field. Clubs are springing up all over the land, and in a few years I predict that cities will vie with one another for the honor of having the National contests.

Many people want to know how much this sport costs. That depends on the type of ship—whether you plan to build or buy it—and the amount of safety and practicality which interest you. I'll explain the latter qualification as I go along.

Suppose you decide to buy a ship. From 1927 to 1932 there were a number of airplane manufacturers building gliders, but technical difficulties, the depression and other factors caused this branch of their business to disappear completely, so that from 1932 till recently no

proven ships with government A. T. C. rating were being turned out for the general market. As I write this, however, I know of at least three concerns—with very promising models—which are rushing final details to get ships into production. All these models gave excellent account of themselves at the Elmira contest last summer, and I have little doubt you will be able to buy them by the time these words reach print. (Just a little example of how fast glider interest is moving at the present time.)

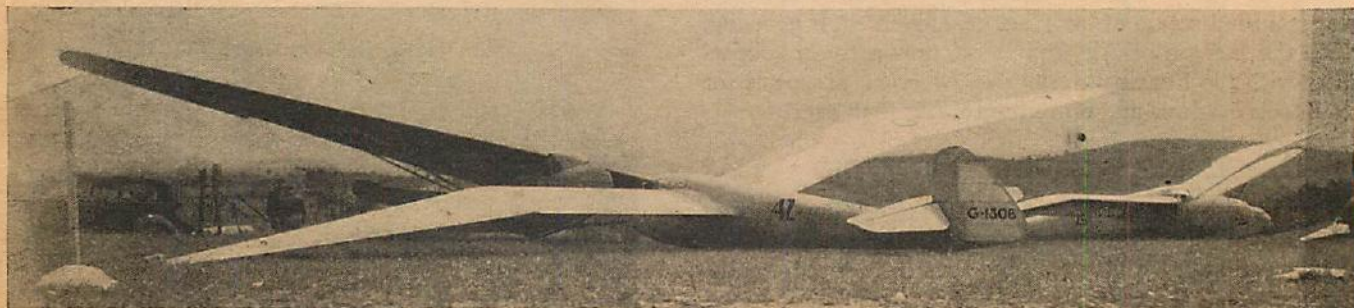
Disregarding such new ships for the moment, most ready-made gliders available are of a second-hand nature, belonging to the pre-'32 period. The majority of them are the utility type, of proven performance, and in good shape—if licensed. Some have even been completely rebuilt with improvements that make them better than in their original form. These ships now bring anywhere from \$250 to \$500 and are worth it when compared to imported craft in the same class, which cost at least \$500 to \$1,000.

Second-hand gliders of the primary type still left on the market from the old days have generally been allowed to deteriorate badly, so that their average performance after being conditioned for the air is not worth the cost of repairs.

But perhaps you would rather do your own building. In that case you must first buy a set of plans from abroad (except in the case of a primary, which can be purchased here) that have been approved by their respective governments. (Contact the Soaring Society of America, 1500 Locust Street, Philadelphia, Pennsylvania, for



The 2-place Buxton Transporter carrying 2 people climbed 6,000 feet; once remained aloft 9 hours.



Sailplanes at Elmira: 2 Minimoas, foreground; the Buxton, background.

Fliers once looked down on glider pilots. Now gliding has become a part of many college curriculums and hundreds of future pilots are being taught to glide.

By Pete Bonotaux



The 2-place utility is safer and capable of soaring and should be built in preference to a primary, if possible.

specific information.) If ships constructed according to such plans are O. K'd by airplane mechanics, they will be licensed by the department of commerce.

Incidentally, I would advise those building their own gliders to consider chiefly a two-place utility job. Primaries are less desirable in many ways. (A primary, of course, can only glide, whereas the other is capable of

quality. These two items are really necessary adjuncts, and I'll tell you why.

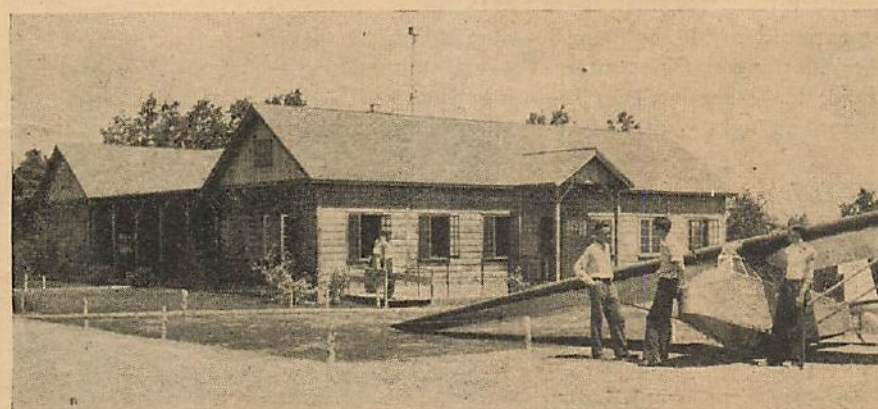
A glider needs a trailer just as a ship needs a dock. Few glider clubs have the benefit of a hangar and no fellow wants to leave his ship tied down in a field at the constant mercy of wind and weather. Remember that a glider weighs only 300 pounds or less, and even a mild storm can jerk it from its moorings and destroy it. Disassembled and placed on a trailer, however, it can be stored in any garage or barn. And if left in a regular hangar, storage costs are only one-third this way than they'd be for a set-up ship. Of course, the requisite of a trailer in conveniently getting your craft to meets and take-off sites is obvious.

A suitable winch, which is not expensive or hard to build, furnishes by far the fastest and easiest way to launch a glider off a field. Through its use training time can be saved not only because of quicker ground-handling operations, but because 500 to 1,000 feet of altitude is attainable before cutting loose. Such altitude

will allow a free flight of two to five minutes, depending on the weather and the pilot. Launching by auto-tow is also good, but a winch is considerably more efficient and actually cheaper.

So in building a glider you have to add on these accessories if you want to do the thing in a safe, up-to-date manner. Here are my figures for an average two-place utility job:

(Turn to page 84)



Gliding and soaring is flourishing. The administration building at Elmira, shown above, and the pilots' facilities there are a testimonial to the rapid advancement of the sport. Similarly equipped sites may soon be commonplace.

soaring.) A two-place utility ship, in addition to being safer and affording more versatile flight, also makes training much easier, and with little hazard. An instructor can be carried along at all times. Since the controls are exactly the same as in an airplane, any regular aviation pilot may assume the rôle of instructor. He need learn but a few new rules. With such a pilot—a competent one, naturally, who has gained his glider license—a whole club may learn as a result of his coaching a single member, for once that member has acquired his license he in turn can teach the others.

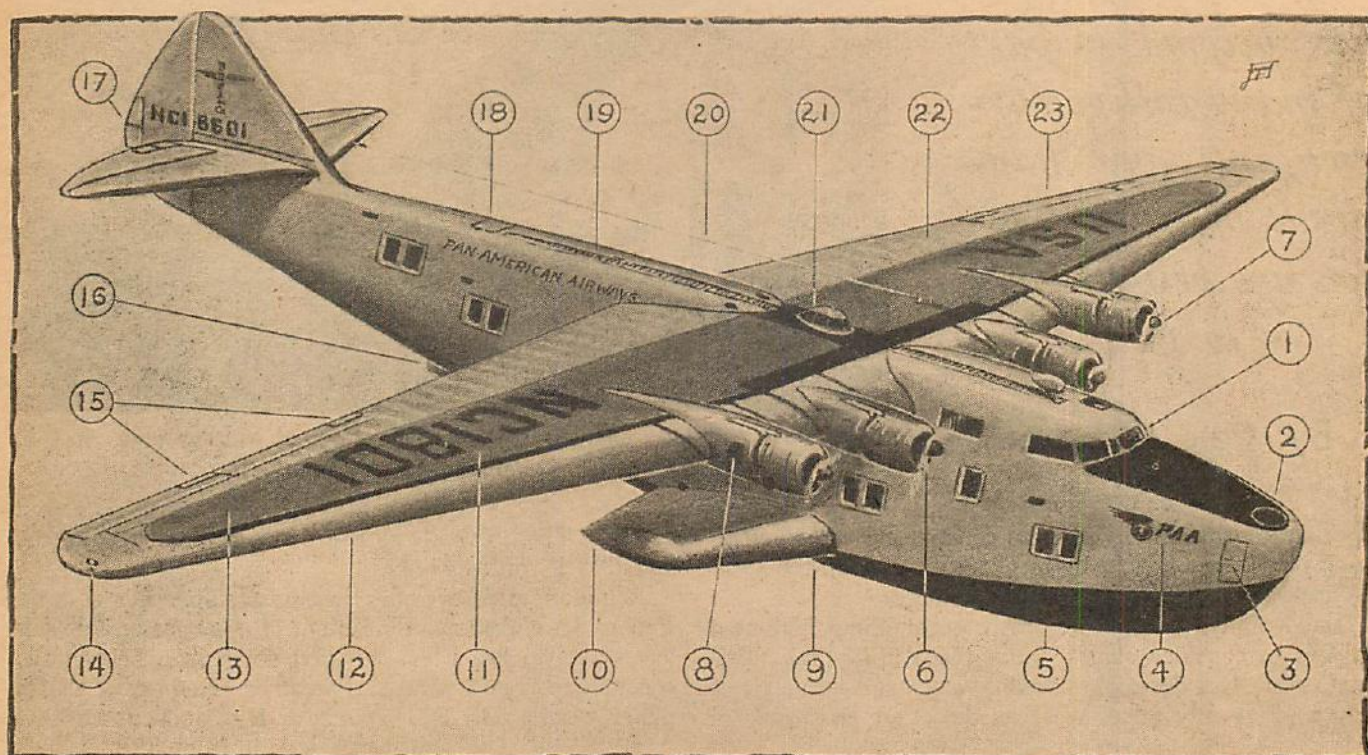
Thus the extra cost of materials to build a two-place utility is more than made up by the advantages gained. At least that's what I think.

How much does a two-place glider cost to build? Let's assume that besides plans and materials, a club also intends to purchase a trailer and a winch of dependable

A winch will convert an ordinary field into a soaring site when an airport is not available.



Atlantic Clipper



1—Control bridge; 2—mooring cockpit; 3—mooring door; 4—insignia; 5—all-metal hull; 6—1,500 h.p., Twin-row Wright Cyclone; 7—constant-speed propeller; 8—lighting port; 9—sponson; 10—air chamber; 11—license; 12—cantilever wing; 13—visibility panel; 14—navigation light; 15—trimming tab; 16—water rudder; 17—trimming tabs; 18—cargo hatch; 19—walk-way; 20—antenna; 21—navigation turret; 22—fabric trailing edge covering; 23—double ailerons.

The inside story of the development of the first commercial transatlantic flights.

By Frank Tinsley

THE race to span the stormy reaches of the North Atlantic with a truly commercial air service is rapidly nearing the finish line. Survey ships, both British and American, have been shuttling back and forth in a steady succession of experimental flights. Huge masses of data on weather and flying conditions have been accumulated, exchanged and evaluated by the operations departments of Imperial Airways and Pan American. Navigational methods and fuel consumption have been checked and rechecked under a great variety of flight conditions. Now at least one of the two greatest air transport companies in the world is ready to inaugurate regular Anglo-American mail and passenger service to Europe. Behind this achievement lies a fascinating story involving not only political and financial maneuvering over a period of several years, but also a triumph of technical brain power over almost insurmountable difficulties.

An interesting sidelight on man's civilization and progress is revealed by the fact that it took two years longer to agree on transatlantic landing rights than it

did to design a plane capable of making the actual flight! The maze of tangled political and economic ambitions involved in the future of international air transport had to be patiently and carefully unraveled by the diplomatic representatives of the two companies.

Imperial Airways, backed by the English government, has elaborate plans for an all-British chain of air lines with which they hope to eventually encircle the globe. The project calls for a transatlantic service from the British Isles to Newfoundland, a transcontinental line, already inaugurated, across southern Canada and a trans-pacific hookup with England's possessions in the Far East. These routes—established and projected—will connect with the existing Imperial Airways network at New Zealand in the east and Ireland in the west to complete a world-wide British transport system.

Probably the most important single link in the chain is the North Atlantic run. Imagine, therefore, the secret annoyance of the English Air Ministry several years ago, when Pan American placed the Sikorsky S-42 in service and requested landing rights in Ireland for their long-planned transatlantic route. The speed, range and weight-carrying efficiency of the American ship amazed the ministry heads and jolted them into a realization that British flying-boat design had been far outstripped. Their first reaction was to buy the English manufacturing rights to Sikorsky's boat and commence preliminary studies of joint operations. This brought a quiet howl from their home aircraft builders who pointed out that the British

export trade would hardly be benefited by such a public admission of Yankee superiority. The final decision, therefore, was to stall Pan American along until an English ship could be designed and built to meet the American competition.

Matters were further complicated at this time by the sudden appearance of a second Yankee threat. The Martin Clipper was launched and her tests showed still greater advances in efficiency. Spurred on by this development, the Air Ministry took a radical step forward. It was decided to send all first-class mail by air and to give the contract to Imperial Airways with the understanding that a suitable heavy flying boat would be designed for the job. In collaboration with Short Bros., Ltd., of Rochester, plans for a four-motored cantilever monoplane of the American type were produced. The type was designated the "Empire" class and, backed by a generous governmental subsidy, Imperial Airways placed an order for twenty-eight of the big boats.

Thwarted temporarily in their transatlantic plans, Pan American Airways turned westward and commenced preliminary operations in the Pacific. After a season of survey and mail flights, using both Sikorskys and Martins, regular passenger service was inaugurated on October 7, 1936 from Alameda, California to Manila. Shortly afterward, the service was extended to Macao on the Chinese coast, thus completing the transpacific run.

Meanwhile, another winter intervened and it was not until early in the summer of 1937 that the British Air Ministry was ready to revive the question of operations in the Atlantic. During the interim, an understanding had finally been reached by Imperial Airways and Pan American which called for joint operations on a 50-50 basis. Two of the "Empire" class boats, the *Caledonia* and the *Cambria*, were withheld from regular service and fitted with special long-range tanks for the necessary survey work.

To the same job, Pan American assigned the Sikorsky Clipper III, veteran pathfinder of the Pacific surveys. The first flights took place on July 6th when the *Caledonia*, under the command of Capt. A. S. Wilcockson, flew from Fownes on the River Shannon to the great new Canadian air terminal at Botwood, Newfoundland in 15 hours and 28 minutes. Capt. Harold E. Gray flew the clipper eastward over the same course in 12 hours, 29 minutes. Subsequent flights resulted in slightly better records. On August 24th, Gray surveyed the southern route by way of Horta, Lisbon, Marseilles to Southampton.

A number of highly interesting findings resulted from the survey cruises. Pan American pilot Gray discovered a very definite connection between altitude, speed and comfort in transatlantic flying. Following American practice, he flew at an altitude of around 10,000 feet most of the way. He found less storms and head winds were encountered at this height.

Wilcockson flew British style, hugging the surface and ran into continuous foul weather. He found it necessary to resort to instrument flying most of the time.

On a later trip, the American pilot experimented by

flying low and found that he ran into the same rough weather that had battered his English confrère. Subsequent trips at his usual cruising height proved to Gray that he could easily evade the worst of the storms.

Another point brought out by the practice hops was the unsuitability of the new Empire boats for transatlantic passenger traffic. The *Caledonia* has a normal gross weight of 40,500 lbs. She is intended to seat twenty-four and sleep sixteen under ordinary conditions. For her transoceanic flights, however, 17,000 lbs. of fuel were required. This necessitated an overload of nearly 5,000 lbs. Only 3,000 lbs. above her empty weight were left for oil, crew, food, water, stores, baggage and mail—1,000 lbs. had to be reserved for the latter. At an estimated weight of 170 lbs. per man, her crew of four totaled 680 lbs. It can be easily seen why no margin was left for passengers.

Carrying an equal amount of mail plus a crew of seven, the old Sikorsky showed up very well beside the newer Empire boat. Powered with 840 less horses, the Clipper III came within 10 m.p.h. of the maximum speed of the *Caledonia* and had a 5 m.p.h. edge in cruising speed. With special tanks, both ships have a cruising range of approximately 3,000 miles—the minimum with which the Atlantic can be flown safely.

English authorities have calculated that a boat weighing at least 60,000 lbs. will be required to transport even a dozen passengers across the big pond. The estimated time is thirty hours. Starting from the new big Empire base at Portsmouth, the flying time to Fownes on the west coast of Ireland is three hours. Refueling takes an hour. Then comes the big hop to Botwood, Newfoundland in seventeen hours. Another hour for refueling, transferring of mails and possibly a quick tub for the passengers and then off they go to New York—1,200 miles distant. This is figured as an eight-hour run, including a stop at Halifax for Canadian mails.

The five-hour time difference between Greenwich and Eastern Standard cuts the clock time down to twenty-five hours. On the eastbound run, the prevailing winds can



An artist's conception of the new Boeing Clipper.

be counted on to speed up the schedule enough to balance the loss of the five hours—clock time. With these figures in mind, English designers are working overtime to produce the first of the thirty-ton ships as rapidly as possible. Inasmuch as the present order of twenty-eight Empire boats will not be completed until early in 1938, most observers doubt that the thirty tonners can possibly go into service before 1939.

(Turn to page 92)

What's Your Question?

By CLYDE PANGBORN

Wing Commander



As soon as possible after the questions are received, the Wing Commander of the Air Adventurers will answer on this page such questions as appear to be of general interest to our members.

Question: What is the required number of hours for a transport ticket. What does R. O. G. stand for?

Answer: An applicant for a transport license must have had 200 solo flying hours, of which at least 5 hours have been acquired within the last preceding 60 days prior to filing the application. R. O. G. means "Rise Off Ground," a model flying term.

Question: Will you please give me the addresses of the manufacturers of the Ryan ST-A and Menasco motors? F. C., East Radford, Pennsylvania.

Answer: The Ryan planes are made by the Ryan Aeronautical Co. of Lindbergh Field, San Diego, California. The Menasco Co. is at 6714 McKinley Avenue, Los Angeles, California.

Question: I cannot see out of one eye but have above the average sight in the other. Will I ever be able to fly and how many hours would I require, with this handicap, to get an amateur license? H. H., Los Angeles, California.

Answer: I would not care to make any statement on your case until you had seen a Bureau of Air Commerce physician. If he passes you for a student permit, you will only have to put in the same number of dual and solo hours as any other candidate for an amateur ticket.

Question: Does a graduate from a recognized flying school have a better chance of becoming an air-line pilot than a graduate from the army air corps? Would two years at M. I. T. be accepted as two years of college by the air corps? R. A., Newburyport, Massachusetts.

Answer: This is another answer that has to be qualified. Pilots from the air corps usually stand a good chance of getting jobs with air-line companies—particularly if they have flown large, multi-engined bombers, but if they have only flown pursuits they are not as well qualified as a graduate from a good school like Boeing or Parks. Two years at Massachusetts Institute of Tech-

nology would be accepted by the air corps—if you can still pass their examination.

Question: If a person wears glasses, but has a private license, would he be eligible for training as an army pilot during wartime? Would they be as strict during wartime? G. R., Grand Rapids, Michigan.

Answer: This is a hard question to answer. Conditions during a war emergency may create a big demand for pilots, so that any one who can fly, even though he uses corrective lenses in his goggles, may be accepted for certain flying duties. During the Great War a few noted pilots were handicapped in some way. Mickey Mamock had only one eye; Guynemer was consumptive; and there were one or two who flew with wooden legs. But their cases were exceptions, and you must remember they usually flew single-seaters, so that they were responsible only for their own safety. Pilots with certain physical defects will no doubt find flying jobs to do in case of another war, such as testing, ferrying or flying ambulances.

Question: Please explain what the Link trainer is and who makes it? W. E. B., Scotia, New York.

Answer: The Link trainer is a scientific device for training students in flight and flight maneuvers, by artificial means. It consists of a small fuselage-like body, a control wheel and rudder and a complete set of instruments. The movement of the controls operates the body in the same way that a joy stick would a plane in flight. In addition, there is an electrical device connecting the trainer with a desk and board on which are recorded the actual movements of the student. An instructor gives orders through a telephone set and the student attempts to carry them out. His moves are all charted on a white paper form to show him what mistakes he made. The Link trainer is also used for blind-flight instruction. Then the student is placed in the machine and

completely covered over so that he must take the instructor's orders and "fly" the trainer on the instruments. Many air lines make their pilots take Link trainer tests at regular intervals.

Question: I am fourteen years of age and am very interested in aviation. Is there any way one can get into aviation without having to pay a lot of money for training? J. P., Raleigh, North Carolina.

Answer: Frankly, no! You must realize that aviation is a skilled profession, just like that of a lawyer, doctor or engineer, and you must pay for your training. Aviation pays well and it's paying for highly skilled labor. You can only get that skill through skilled teachers. In the old days one might break into the game by starting in a barnstorming crew's hangar. But that's all over today. There is, of course, one way open if you care to give up a few years of your life. That is to enlist in the army or navy and aim for aviation training. In the meantime you can prepare yourself for it by a careful selection of suitable studies in high school.

Question: Which of the two twin-engine Curtiss attack planes were accepted by the army air corps, the A-14 or the A-18? Is the nose cannon a feature of both planes and what are their speeds and armament in comparison to the Fokker Le Faucheur?

Answer: The Curtiss Y1A-18 was the one accepted by the army air corps. I do not know the details of the armament nor the speed, but the Curtiss firm claims that it is the fastest twin-engined military airplane in the world. That's all I can tell you, as no details have been given out by the government.

Question: Is there such a thing as a three-banked radial motor? Can you tell me the name of this unusual seaplane I have drawn? I saw it some time ago in a magazine but cannot seem to get any information on it. V. A., Buffalo, New York.

Answer: As far as I know there are

no three-bank radial engines in production, but I believe the British Bristol firm is considering building one within a short time. There will be a special cooling problem to consider, of course. The plane you sent in is the Levasseur P. L200, a special French reconnaissance seaplane for shipboard work. Yes, it has two pontoons that form the outriggers for the tail assembly and the gunner sits in the rear turret of the nacelle, which is set fairly high above the pontoons. It has a top speed of 142 m.p.h. and uses a 750 h.p. Hispano-Suiza 9Vb's radial engine mounted as a tractor.

Question: What are tracer bullets? Are they any better than ordinary bullets? B. W., Traverse City, Michigan.

Answer: Tracer bullets are special bullets fitted with a hollow tail in which is packed a load of special phosphorus. When the bullet is fired, this phosphorus ignites and provides a fiery tail to the bullet. This is believed to aid a gunner in aiming. In some respects, too, they are incendiaries. They were popular during the War for aviation use, mainly because of the effect on the enemy airman. They are not as effective as ordinary bullets, because they burn out, lose their shape and do not maintain true flight.

Question: Will you please give me all complete performance figures on the Curtiss A-14 and the Northrop A-17A? J. F. R., Vallejo, California.

Answer: I cannot give you the performance figures on the Curtiss plane, as they have not as yet been given out by the company. The Northrop is said to have a top speed of 220 m.p.h., a range of 1,760 miles and a ceiling of 20,000 feet.

Question: Would a plane like the Bill Barnes Lancer be ruled out of the New York-to-Paris air race?

Answer: As there is to be no New York-to-Paris air race, your question hardly fits to-day. However, the Lancer would not have been eligible, as the rules stated that all planes entering must be multi-engined craft.

Question: Where is the Glenn L. Martin factory? T. A., Portland, Oregon.

Answer: The Glenn L. Martin Co. can be reached by addressing a letter to the factory in Baltimore, Maryland.

Question: What instruments are necessary on planes carrying passengers? If an unlicensed pilot builds a light plane like the Flying Flea, can he fly the plane? B. A. R., Peace River, Alberta, Canada.

Answer: The usual instruments required are a tachometer for each engine; oil-pressure gauge; water thermometer where water-cooled engines are used; altimeter; air-speed indicator. If flights

of 100 miles or more are made, a compass is necessary. I would suggest that you write to your Minister of Aviation, Department of Transport, Ottawa, for a ruling concerning the builder of the Flying Flea-type plane.

Question: Is there any reason for having two sets of ailerons on the Boeing XB-15 besides the possibility of damage to or failure of one set? L. C. B., Glen Ridge, New Jersey.

Answer: I do not believe there are two sets of ailerons on the new Boeing bomber. I believe you have mistaken the trailing edge flaps for ailerons. They are only used for take-offs and landings and have no part in lateral control.

Question: Do the Northwest Mounted Police have a flying division? Could any one from the United States get into it? H. W., Burdett, New York.

Answer: The Northwest Mounted Police of Canada are using airplanes for forestry patrol and certain communication details, but their planes and pilots are only attached to the force for the time being. There is no regular air division as yet. However, no doubt there will be in time. You must be a British subject to get into the R. C. M. P.

Question: I want to become an aviation mechanic. Can you tell me the price of the course and the education required? How can I become an American citizen? J. L., Charlottetown, Prince Edward Island, Canada.

Answer: We gave most of this information in our *Getting into Aviation* article, which appeared in the June issue. We explained that an airplane mechanic's course took about forty-two weeks and cost about one hundred and eighty dollars. An engine mechanic's course runs about a week longer and costs about one hundred and eighty-one dollars. These schools prefer men with a high-school education, but it is not absolutely necessary. To become an American citizen you must have lived in this country for five years. You may take out your first papers any time, but your final papers cannot be obtained until two years after the awarding of the first papers.

Question: What is your opinion of the bomber versus the pursuit ship, on a comparison of the respective abilities of modern types? R. H. S.

Answer: Any answer given to this question can only be theoretical, until we get an opportunity to see just what would happen in actual combat. So far, the Spanish Civil War and the Chinese-Japan affair have not provided any form of a suitable answer. Experts all over the world, however, are of the opinion that the pursuit, or single-seater, is too fast and too intricate a piece of war

mechanism for one man to handle. On the other hand, the modern bomber is as fast and in many cases faster than the average pursuit. It carries as many guns and the guns are manned by skilled men who have nothing else to do. They work in comparative comfort from a comparatively steady platform, and today are provided with high-caliber air cannons that far outrange the armament of the single-seater. I see no reason for any form of single-seater escort for modern high-speed bombers, and I question whether they will ever get it in the future.

Question: Could you recommend some inexpensive book which would teach me something about the parts of the modern airplane? J. E., New York.

Answer: By all means get Asa Jordanoff's book "Your Wings," which is on sale at all good bookstores at about three dollars a copy.

Question: Do you know of any school or correspondence course that teaches aircraft salesmanship? R. S., Detroit, Michigan.

Answer: Yours is the first question on this subject. I do not believe there's any such course listed in the aviation tuition books. You might write to the International Correspondence Schools, Box 4935-B, Scranton, Pennsylvania, and see if they list such a course. Most aircraft salesmen, you know, are licensed pilots and usually men who have had some factory experience as well as sales training.

Question: Do the gunners on our bombers require two years of university training? E. K., Flint, Michigan.

Answer: No. Gunners aboard our aircraft are usually selected from the ranks of enlisted men who volunteer for flight training. They are usually men who have served about two years in armament work.

Question: Can you tell me where I can get plans for a Stinson Reliant and the Stinson "A"? L. W., Nutley, New Jersey.

Answer: We published the plans of the Reliant in the September issue of AIR TRAILS. We'll see what we can do for you on the Stinson "A" model.

Question: Where are Randolph Field and Corry Field situated? What army field is near Chicago? R. R., Chicago, Illinois.

Answer: Randolph Field is near San Antonio, Texas. I have no Corry Field in my army list. Chanute Field, near Rantoul, and Scott Field, near Belleville, are in Illinois, and Selfridge Field, at Mt. Clemens, Michigan, is not far from Chicago.



The Honor Roll For January

FLIGHT CAPTAINS

Arlo Koontz, Onawa, Iowa
Charles Ed Duffy, Shady, N. Y.

FLIGHT LIEUTENANTS

Bobby Beall, Sherbrooke, Quebec, Can.
Billy Bliss, Temagami, Ont., Can.
Charley Bratres, Castle Rock, Wash.
E. H. Cocks, Kiama N. S. W., Australia
Angel D. Crespa, Coiba, Honduras
Jas. Fitzgerald, Jr., South Pittsburg, Tenn.
William J. Karges, Wheeling, W. Va.
Michael Markovich, Scalp Level, Pa.
Hadley Morrison, Portland, Ore.
M. H. Osborne, Ebenezer, S. C.
Arthur Patak, Carlstadt, N. J.
Stanley Peterfreund, City Island, N. Y.
William H. Robey, D. O., Sullivan, Mo.
B. Shapiro, Camden, N. J.
Nita Simpson, New York, N. Y.
J. G. Young, Toronto, Ont., Can.

ENGINE MECHANICS

B. E. Bewell, Victoria, B. C., Can.

Thomas Clohosey, E. Orange, N. J.
Murray Donovan, St. John, N. B., Can.
Roy Kaufman, Bridgeport, Conn.
Terence A. Taylor, Featherston, Wairaraha, N. Z.

PHOTOGRAPHERS

W. G. Williams, Vancouver, B. C., Can.
Francis Quattuch, Hannibal, Mo.
Franny Loomis, Merrill, Ore.
Raymond Fowler, Jr., Waterbury, Conn.
Kenneth Alden, Cambridge, Mass.
Peter Lebares, Portland, Me.
Eugene Otte, Chicago, Ill.
Bob Eggersman, Seymour, Ind.
David Thompson, Orlando, Florida
Norman Hopper, New Westminster, B. C., Can.
Arthur K. Hamp, Kokomo, Ind.
Fred Potter, W. Newton, Mass.
Sam Kaminsky, Brooklyn, N. Y.
Fred Van Pelt, Springfield, N. J.
Douglas Valteau, Toronto, Ont., Can.
Jerry Baer, Madison, Wis.

TOPOGRAPHERS

Jack C. Lowe, Willowbrook, Cal.
Emanuel De Taillefer Taylor, San Francisco, Cal.
Elizabeth Saur, San Francisco, Cal.
Harold Aaron, Richmond, Ind.
Clyde Wallace, Madison, Ind.
Charles J. Thiessen, Bronx, N. Y.
Bob Rose, St. Vital, Winnipeg, Man., Can.
Ed Allen, Lompoc, Cal.
John N. Rossi, Phippsburgh, Colo.
Carl Wiesinger, Altoona, Pa.
Jack R. Harvey, Winnipeg, Man., Can.
J. W. Foster, Miami, Fla.

AIRPLANE MECHANICS

Michael Serduck, Thomaston, Conn.
Alfred Ericksen, Brooklyn, N. Y.

OBSERVERS

Andrew J. Vangalis, Wausau, Wis.
James W. MacLaren, Toronto, Ont., Can.

New Freedom in the Skies

GREETINGS Air Adventurers! Have you noticed the new air laws? They affect you tremendously and you should look them up. It is not enough to simply buy a plane, get in a few hours solo and then haunt airports wearing your coveralls, helmets and goggles. You owe it to yourself, your ticket and the industry to get as much as you can out of it—for in taking out what you are entitled to, you are automatically building up the game. All Air Adventurers have a Creed, a pledge, and it is not simply a formula we go through by rote.

It demands action!

According to the new regulations, fewer restrictions will be imposed on private fliers during good weather. For years a certain group who have been more of the hangar-flying type than those who have built up the light-plane industry have been complaining about the restrictions that have been placed on amateur flying. They demand what practically amounted to a free hand to go out and build freakish craft, endanger the general public, break their own necks and generally demolish the solid foundations on which all successful commercial aviation has been founded.

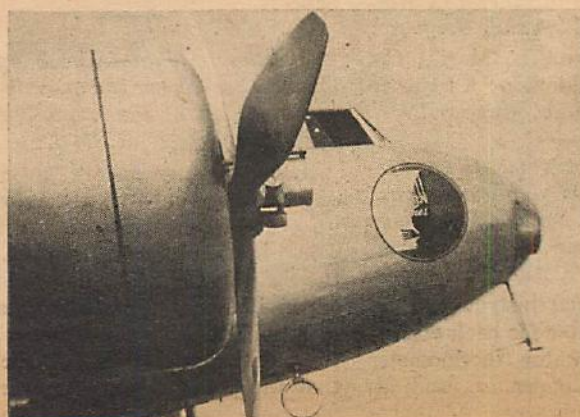
The Bureau of Air Commerce has carefully sifted their arguments and one by one the objectionable restrictions have been quietly re-

moved as the amateur fliers were, in turn, trained to recognize their own responsibilities.

The latest is that private pilots may now "fly along, or across civil airways without filing a flight plan or reporting to responsible airway traffic officers."

In other words, you light-plane men who have always used the flight plan and reporting business, as an excuse to get out of doing a reasonable amount of real cross-country flying, are left holding the bag. As long as the weather is "good," and the Bureau has been very liberal in its definition of "good weather," you can do that cross-country show you have been talking about for years.

We of Air Trails have long bemoaned the fact that few



A fine close-up of the DC-3 by H. R. Rutland, Jr. Note the antenna, shielded loop and other nose details.

private pilots get the best out of amateur aviation. Most of them take a ticket; a small number buy their own planes. But beyond a few week-end circuits about the airport, few ever get out of sight of their own hangars. They are in the same class as the motorcycle maniacs of a decade or so back who spent most of their time charging up and down the street, kicking up an unearthly racket, but never going anywhere. It was not until the motorcycle crowd turned to area rallies, economy runs and the actual value of an efficient muffler that the machine became a valuable item of outdoor sports.

The same goes for the light-plane sport. The Bureau is making it easier every year for you to fly. The manufacturers to-day are building planes, which if they are not absolutely foolproof, they must be considered in that category of safety which provides an outlet for normal expression of skillful recreation. The airways are there; the country is big enough to offer practically every type of flying trip. Until you have actually plotted a course, flown from one point to another and glowed with the satisfaction of having completed a successful cross-country flight, you have NOT flown.

So get in on this business, you flying Air Adventurers.

We want to know how well you are upholding the Creed of our club. Those of you who are contemplating taking your ticket next spring should brush up on these new air regulations. Write to the Bureau of Air Commerce and apply for the new booklet of regulations. See just what you can do, and how far you *can* go, once you have severed the shackles that have so long bound our light-plane pilots to their own areas.

And while you are in this writing mood, don't forget to fill in the Air Adventurers' coupon below, or get that air-minded pal of yours to throw in his weight with us. All we want is an expression of your desire to really do something for aviation. Ten cents, a signed coupon, and you can leave the rest to me.

Your Flight Commander,

Albert J. Carlson

AIR ADVENTURERS NEWS

Our Air Adventurers are sticking with us loyally. Each month brings another stack of mail, photographs, plans and examination papers. But we got the shock of our life this week when Bill Barnes dropped us a line. He was in Syracuse and he said: "Twice each week I ride my bike out to the Syracuse airport and take pictures of the planes there. I am sending you some prints of a Martin B-10 bomber and a Douglas O-46-A observation ship. When I go out to the airport, my friends and I clean off the planes and the pilots often take us up for short hops. I have been up four times lately, twice with

Harold Johnson who stunts a six-ton Ford transport and then lands it on one wheel!"

Yes, it left us sort of breathless, too, until we read on and discovered that this Bill Barnes was none other than Willard Barnes, whose friends all call him Bill. We wonder how many more Bill Barneses there are in the roll of Air Adventurers?

Arthur Hoscelo of, darn it, he didn't inclose his address, sends us in a drawing of his idea of a cooling system for a three- or four-bank radial motor. His idea is to have what he calls "a hollow spindle" set in the front of the engine, from which curved pipes would carry a flow of air to the spaces between the cylinders. His idea has merit and perhaps he'll go into it further and develop it to a more understandable stage.

You know, we were talking to a noted designer the other day and brought up the question of these trick ideas and "dream ships" the young readers of aviation magazines put down on paper. "Don't laugh at them," he told me. "Many of these ideas have real merit. I could show you twenty or thirty examples of ideas that were snatched from the so-called 'dream ship' idea, that

are now standard on many of our modern airliners and military types."

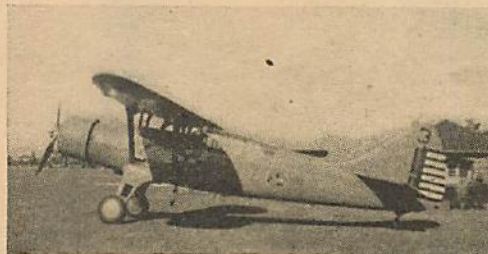
So go to it, Hoscelo! You may have just the thing that Pratt & Whitney are searching for.

Laird Blakney of Moncton, New Brunswick, Canada, sends us some very interesting stuff on the transatlantic Clippers and Empire boats that were doing the North-Atlantic runs last summer. They flew over Laird's house and he saw them very often. He explains that Moncton is having an area surveyed for a new airport and promises to send us the plans as soon as they are available. He also has a lot of dope on the Canadian Airways and the Eastern Canada Airlines. There's a D. H. Dragon operating out of Moncton and running to Charlottetown, Prince Edward Island, that carries more mail and express annually than any other ship in Canada. Glad to have you with us, Laird.

(Turn to page 89)



Above: H. Warren Willhoite of Portland, Oregon, snapped the Russian A. N. T. 25 at the end of its flight. Right: A Douglas O-46-A, taken by Bill Barnes at Syracuse.



(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.

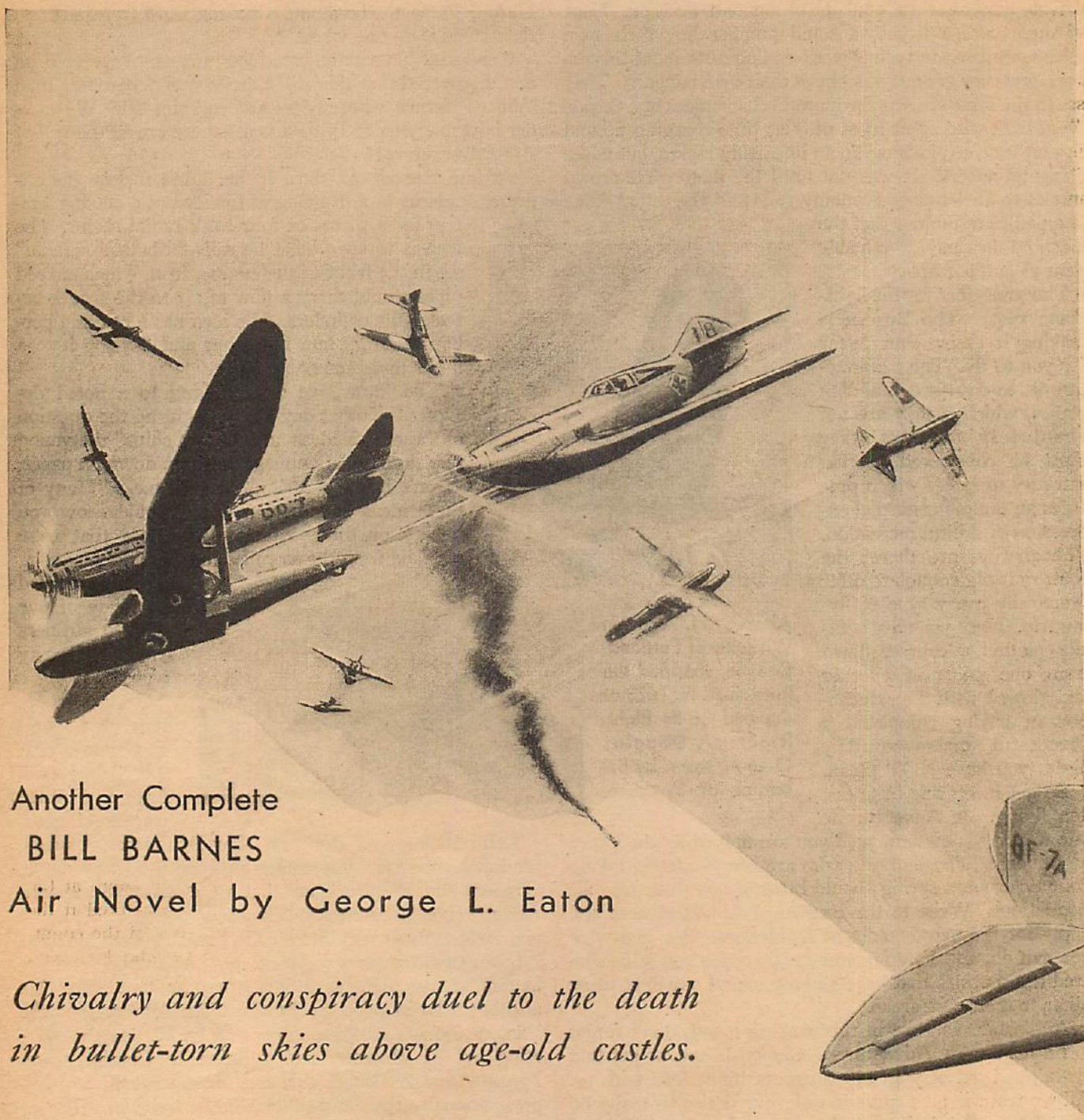
Please enroll me as a member of AIR ADVENTURERS and send me my certificate and badge. I enclose ten cents to cover postage.

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

Address

☐ Check here if interested in model building.

(This coupon may not be used after February 15, 1938.)



Another Complete
BILL BARNES

Air Novel by George L. Eaton

*Chivalry and conspiracy duel to the death
in bullet-torn skies above age-old castles.*

High Over Maxembourg

BILL BARNES' powerful frame was clearly silhouetted against the moonlight as he stood in pajamas and dressing robe, gazing out across Barnes Field, Long Island. He had turned off the lights in the sumptuously furnished living room of his bungalow and was pondering the weird and ghastly thing that had happened in his office that afternoon.

All of the runways on the field were dark now, except the one leading directly into the wind that was automatically connected with the illuminated wind indicator. The shops, hangars and mechanics' quarters were dark and silent. Lights gleamed only in the traffic control tower and in the four guard booths along the high, electrically charged wire fence surrounding the field.

The staccato chant of a guard reporting to the central guard room in the administration building floated faintly across the field. The low hum of motor traffic along Wauchuck Road to the north kept up its never ceasing symphony.

Bill Barnes shook his head irritably and began to go over the events of the day for the thousandth time. He began where that day began—for him. It was when young "Sandy" Sanders, his secretary and the youngest of his little squadron of fliers, had come into his private office with a grin on his freckled face.

"There's an old goat outside, Bill," young Sandy had said. "He talks as though he had a couple of hard-shelled crabs fastened to his lip."

"Well, what does he want?" Bill asked without looking up from the letter he was reading.

"I guess it's a secret," Sandy said. "I ducked when he started to whisper in my ear. I thought he was going to kiss me."

"What are you talking about?" Bill snapped. "Make sense or get out of here. What did he say?"

"I think he was trying to chant the Volga boat song," Sandy said. "He's all right when he lets his chin idle and talks slow. But when he opens the throttle his s's get tangled up with his front teeth and everything he says sounds like 'safety pins.' Maybe that's what he's selling. You want to buy some safety pins?"

"Listen, kid," Bill said as calmly as he could. "If you don't stop trying to be so funny you're going to find yourself out on the street selling safety pins. Find out what he wants and if it's anything of importance I'll see him."

"I can't," Sandy said. "They taught him to speak English with a crab apple in his mouth. But you better see him. He's a fierce old tamale with one of those grand-duke mustaches."

"Bring him in," Bill said. "I can learn more from him than I can from you, even though he doesn't speak English."

Bill was immediately impressed by the man Sandy ushered into his office a moment later. He was a large, powerfully built man with snow-white hair, mustache and goatee. His eyebrows were black and bushy and made his small, black eyes glitter like the eyes of a bird. His face was gaunt and heavily lined and his whole bearing was both military and dignified. He was dressed in an ordi-

nary double-breasted business suit and carried a gold-headed walking stick and gray fedora.

As Bill rose from his chair behind his desk the man came to a halt, clicked his heels together and bowed from the waist. Sandy watched him with something more than amusement in his blue eyes. The man stuck his fingers in his breast pocket and withdrew a card which he presented to Bill. Bill glanced at it and then at Sandy.

"What are you waiting for?" he said.

Sandy went out, closing the door behind him.

"Count von Howtz," Bill said and extended his hand.

"Mr. Barnes," the man said as he shook hands. "It is good of you to see me, sir." He spoke with a very decided accent but Bill was impressed by his old-world dignity. He judged him to be about sixty years old and wondered, casually, if dueling had been taboo in Europe when he was a young man.

"Won't you sit down, sir?" Bill said. "My—ah—secretary seemed to be a little puzzled about your reason for wishing to see me."

The old gentleman pointed to the two balconies outside the two open windows opening into the room. "There is no danger of our being overheard?" he asked.

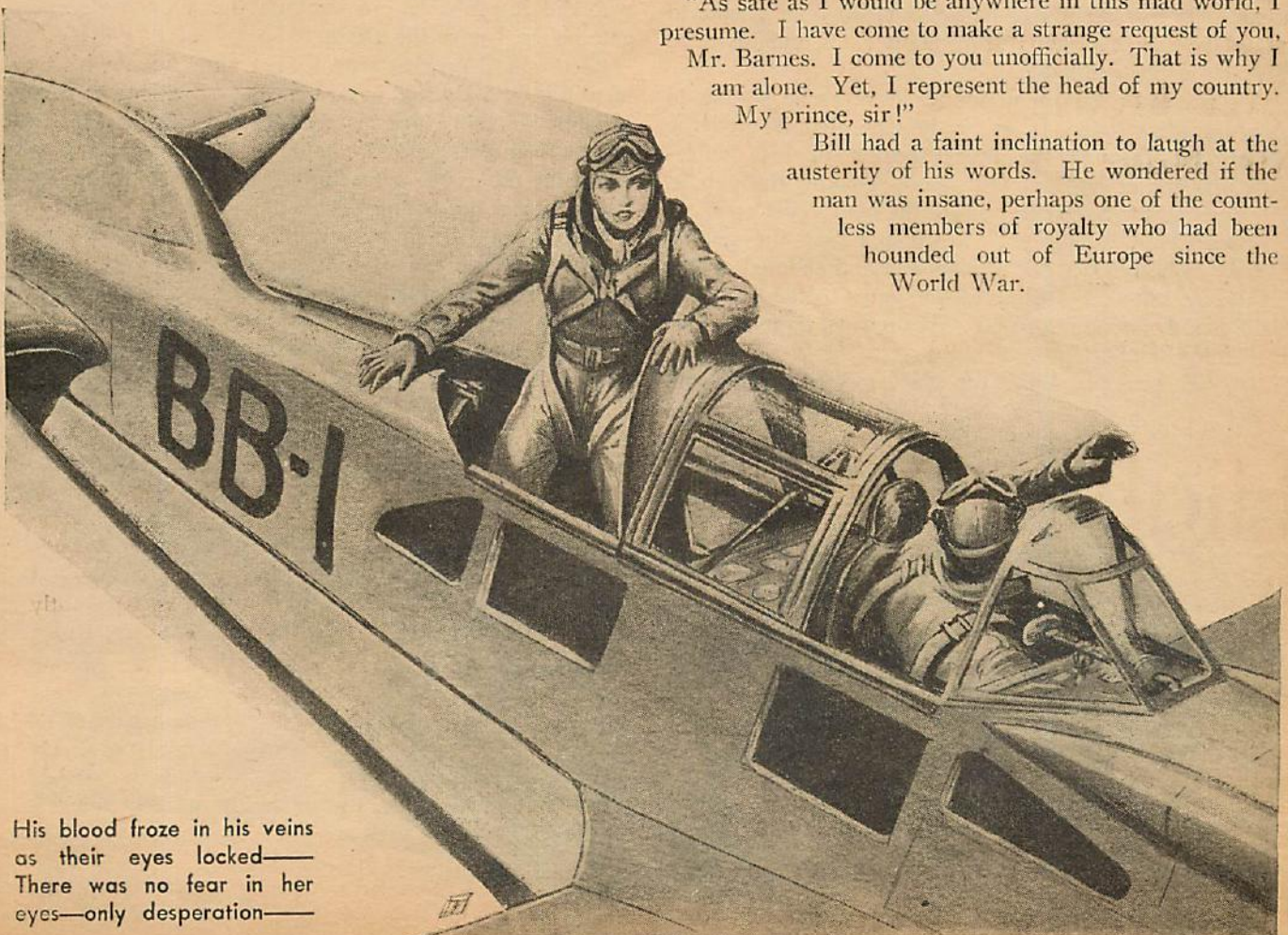
"None," Bill said. "My guards are quite alert. We have had trouble here. I've had to be careful."

"I know," Von Howtz said simply. "I know a great deal about you, sir. That is why I have come to you. I have been followed, constantly, since I came to your country. I must be very careful and discreet."

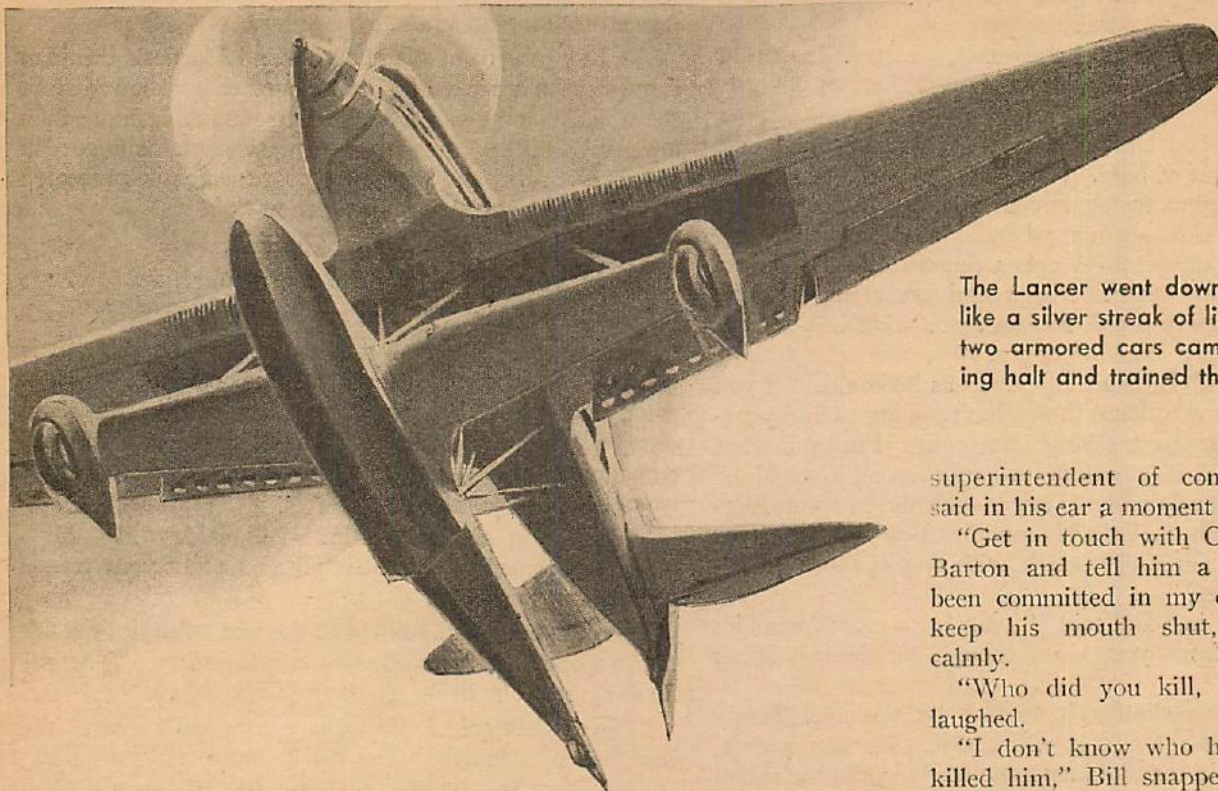
"You're safe enough here," Bill said.

"As safe as I would be anywhere in this mad world, I presume. I have come to make a strange request of you, Mr. Barnes. I come to you unofficially. That is why I am alone. Yet, I represent the head of my country. My prince, sir!"

Bill had a faint inclination to laugh at the austerity of his words. He wondered if the man was insane, perhaps one of the countless members of royalty who had been hounded out of Europe since the World War.



His blood froze in his veins as their eyes locked—
There was no fear in her eyes—only desperation—



The Lancer went down the runway like a silver streak of light— The two armored cars came to a swirling halt and trained their guns—

superintendent of communications said in his ear a moment later.

"Get in touch with Commissioner Barton and tell him a murder has been committed in my office and to keep his mouth shut," Bill said calmly.

"Who did you kill, Bill?" Tony laughed.

"I don't know who he is or who killed him," Bill snapped. "Get on it, Tony!"

"He's dead as a herring, Bill," Sandy said.

"I know that. Find out if they picked up the man who shot him at the gate before he got away. He used a silencer and got him through that window. The person who did it probably got through the Wauchuck Road gate before I gave the alarm."

"The guard on that patrol went after a car with two men in it," Sandy said in a moment. "But they were out of sight before he got his motorcycle started. He says one of them was parked outside with his motor running while the other one came in. They went like the devil when he ran out again."

"It's a good thing he saw him or old Barton would probably accuse me of killing him," Bill said. "You better leave him alone until after the medical examiner sees him," he said to Doc Humphries as he came in.

"There's nothing I can do," Humphries said a moment later. "Who is he?"

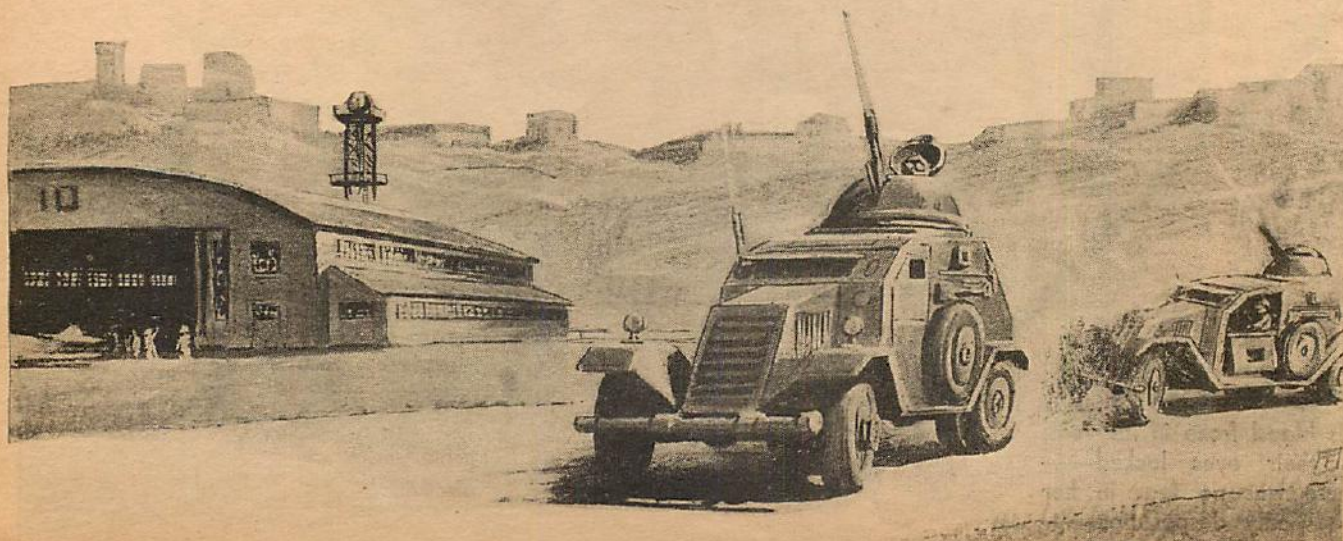
"I come sir," he went on, "as the emissary of his majesty——"

Bill's eyes widened as the old man, suddenly, stopped and grasped at his throat as he made a horrible, gasping noise. In that second while he watched him, unable to move, he saw his hands drop at his sides and his head loll at a grotesque angle.

He pressed a button under his desk as he sprang to Von Howtz's side. It was only then that he saw the clean hole through the breast pocket of his double-breasted jacket and saw the blood welling through it. He shouted for Sandy as he tore the man's coat open.

"Get Doc Humphries!" he snapped at the gaping Sandy as he reached for a telephone and shouted orders in the mouthpiece. "Close all the gates to the field," he said. "Let no one in or out. That means, *no one*. Give me Tony Lamport."

"Tony speaking, Bill," the chief radio operator and



"Count von Howtz," Bill said as he glanced at the card on his desk. "Just as he started to talk some one shot him."

A thousand things rushed through Bill's mind as he stood there in the moonlight gazing out across his deserted field.

Suddenly, his whole body stiffened as the electric detector in the traffic tower picked up the sound of an airplane motor overhead and automatically switched on the floodlights. A moment later Bill could see and hear one of his own Snorters circling overhead to come in for a landing.

The big red, black and orange amphibian raced down into the shadowless sodium vapor lights of the runway and rolled up to the apron. The pilot set his brakes and the twin Diesel power plants in the nose wheezed and died.

Bill watched with bulging eyes as young Sandy climbed out of the forward cockpit and then helped a woman out of the rear one!

II—A PROPOSITION

HE cursed softly to himself and picked a telephone out of its cradle on his desk. "Send a messenger out on the apron," he said into the mouthpiece, "and tell Mr. Sanders I want to see him here, at once." He snapped on a floor lamp and stood scowling at the door as he heard Sandy coming.

"What do you mean," he growled as Sandy opened the door, "by bringing a woman around here at this time of night? Especially after the trouble we've had here to-day."

"Sh—sh—Bill!" Sandy began. But it was too late. Another form appeared in the dim light behind Sandy.

"Don't blame him, Mr. Barnes," a soft, modulated voice said. "I duped him into bringing me."

In that brief instant while Bill stared at her he saw that she was a remarkably beautiful woman. She was, he judged, about twenty-five or six years of age. She was small, but not too small. There was something about her deep blue eyes that was mature instead of sophisticated. Her voice was low and sweet and her accent indicated that she might have been educated abroad.

"Miss Roebing, Mr. Barnes," Sandy stuttered. "I couldn't help it, Bill. She talked me into it. She's—gosh, Bill. She's—"

"—a siren," the girl finished for him and her eyes twinkled. "It's true, Mr. Barnes, I talked him into it."

"I'm afraid it wouldn't have taken much persuasion," Bill said and he was racking his brain to place the face of the girl who stood there so coolly.

"You see," the girl said, "I know a great deal about you, Mr. Barnes, and your men. I knew that Mr. Hassfurther, your right-hand man is always ragging—'kidding' is the word, I think—Mr. Sanders. I had heard about that. I telephoned Mr. Hassfurther to-day and asked him to tell me the name of one of Mr. Sanders' friends. I told him I wanted to play a joke on Sandy. He took me into his confidence and gave me the name of a girl. I then phoned Mr. Sanders and asked him to come over to the Skyport on 33rd Street and see me, using that name."

"And Sandy fell for it," Bill said. "You seem to be able to get what you want."

"I do," she said simply. "I wanted to talk to you and I didn't know any other way to get in touch with you

without connecting myself with the horrible thing that happened here to-day."

"What do you know about that?" Bill said, and the twinkle was gone from his eyes.

"A great deal," she said. "You'll understand why I couldn't risk having the police know I was communicating with you when I tell you."

"You know who the man was who was murdered here to-day?" Bill asked.

"He was Count Ludwig von Howtz, Minister of Finance of the principality of Maxembourg," she said unsteadily.

"That's right," Bill said dryly. "Perhaps you can tell me who killed him and why?"

"That's why I came," she said quietly. "I—"

"Bill!" Sandy blurted. "She's Rene Roebing! I knew I'd seen her picture or something. My gosh, Bill!"

She nodded her head as swift recognition leaped into Bill's eyes. "That's right," she said. "I'm Rene Roebing. The girl all the papers say is trying to buy herself a king and a country."

"Well, aren't you?" Bill asked.

"No!" she flared at him. "I love the Prince of Maxembourg, Mr. Barnes, and it is reciprocated. I would gladly do anything in my power for him."

"That's a gal!" Sandy said and turned a deep crimson.

Bill Barnes couldn't help joining Rene Roebing in her laughter. "Let's get back to Von Howtz," Bill said. "Who killed him and why?"

"Let me say what I have to say in my own way," she answered. "May I sit down?"

"I'm sorry," Bill said. "I'm being very rude."

"I can't blame you under the circumstances," she said. "But you're merely startled."

"I hope that is it," Bill said. "You're an exceptional girl, Miss Roebing."

"Thank you. But we're wasting time. It's a bit hard to begin. First, let me tell you Count von Howtz was Prince Michel's uncle. But let me go back to the beginning. You know where Maxembourg is located?"

"Generally," Bill said. "I know it's in a hot spot between two nations that have been warring for a couple of hundred years."

"You've put your finger right on the trouble," Miss Roebing said. "The London Treaty of 1867 guaranteed the integrity and neutrality of Maxembourg as a principality. It was helpless between two great powers when the World War came along. Maxembourg asked for a guarantee of rights after the War and wished to continue to be recognized as a separate principality with its own money and customs. Those rights were guaranteed then."

"Since Prince Michel succeeded to the throne fifteen years ago the country has prospered. Prince Michel is the ruler, of course. But a premier heads a cabinet, and a Diet of 17 are elected every four years under universal suffrage."

"Prince Michel's one thought is for the happiness and contentment of his people. He has eradicated slums and poverty and has placed Maxembourg in a unique position in a world that seems to be going mad."

"But some of his cabinet have been trying to wrest control of the country from him. They are trying to force Prince Michel to abdicate in favor of his twelve-year-old brother, because of Michel's devotion to me. They are using that as an excuse, although the people want him. The premier and a majority of the cabinet

want to force him out so they can sell the country out to the world power to the east of Maxembourg. They want to seize control because of the strategic position they will be in if they are attacked from the west. Do you understand the situation?"

"Yes," Bill said. "But I don't understand what I have to do with it or why Count von Howtz came to me to-day."

"I'm coming to that," she said. "I have known Prince Michel for a long time. He is older than I, but he is every inch a man. He could sell out his country himself if he wanted to do it but his love for his people comes first."

to have been able to plot and execute that thing to-day," Bill said bitterly.

"They have watched Prince Michel and me like hawks for months," she answered. "They have known everything we intended to do. They approached Michel to persuade him to sell his own country. When he refused they began using me as a reason to force him to abdicate. They have used every foul means they could command."

"Prince Michel must be a determined man to stand against them," Bill said thoughtfully.

"He is! That's why you must come and help us. It is why I am willing to use every cent of my fortune to help him. It's because I love him and because I believe in his honesty and his ideals! Don't you understand?"

"Yes," Bill said, slowly. "I think I do understand. And Miss Roebing, in spite of my better judgment, I think I'm going to try to help him. It's something to know that men still have such ideals."

"I will pay anything, anything for your help," she said. Her eyes were flaming now.

"I'm not so much interested in that," Bill said. "I'm going to get a kick out of helping a man who is trying to shoot straight. Expenses are all I'll want."

"Then you'll go?" she asked breathlessly.

"I'll go."

"Didn't I tell you he was quite a guy, Miss Roebing?" Sandy wanted to know.

"You did," she said and she was crying. She brushed the tears out of her eyes and said to Bill, "Can I stay here some place until we are ready to go?"

"We?" Bill said.

"Of course," she said. "I must go."

"Because of the unique location of Maxembourg, Prince Michel believes it could always defend itself from any invader with a proper air force. He wants you to come to Maxembourg to help him develop that air force."

"But that is no reason why Count von Howtz should have been murdered," Bill said. "If he was acting on behalf of Prince Michel why was he murdered?"

"Since we left Maxembourg to come here," the girl said, "things have become worse in Madura, the capital. Prince Michel was under constant surveillance before we left. Since then he has, we learned two days ago, been, virtually, a prisoner of the premier and his men. They must have known of our plan to come to you and suspected that Prince Michel wants you to do more than develop an air force. He wants you to help him fight his battle against them."

"Wouldn't his enemies keep me from entering the country?" Bill asked.

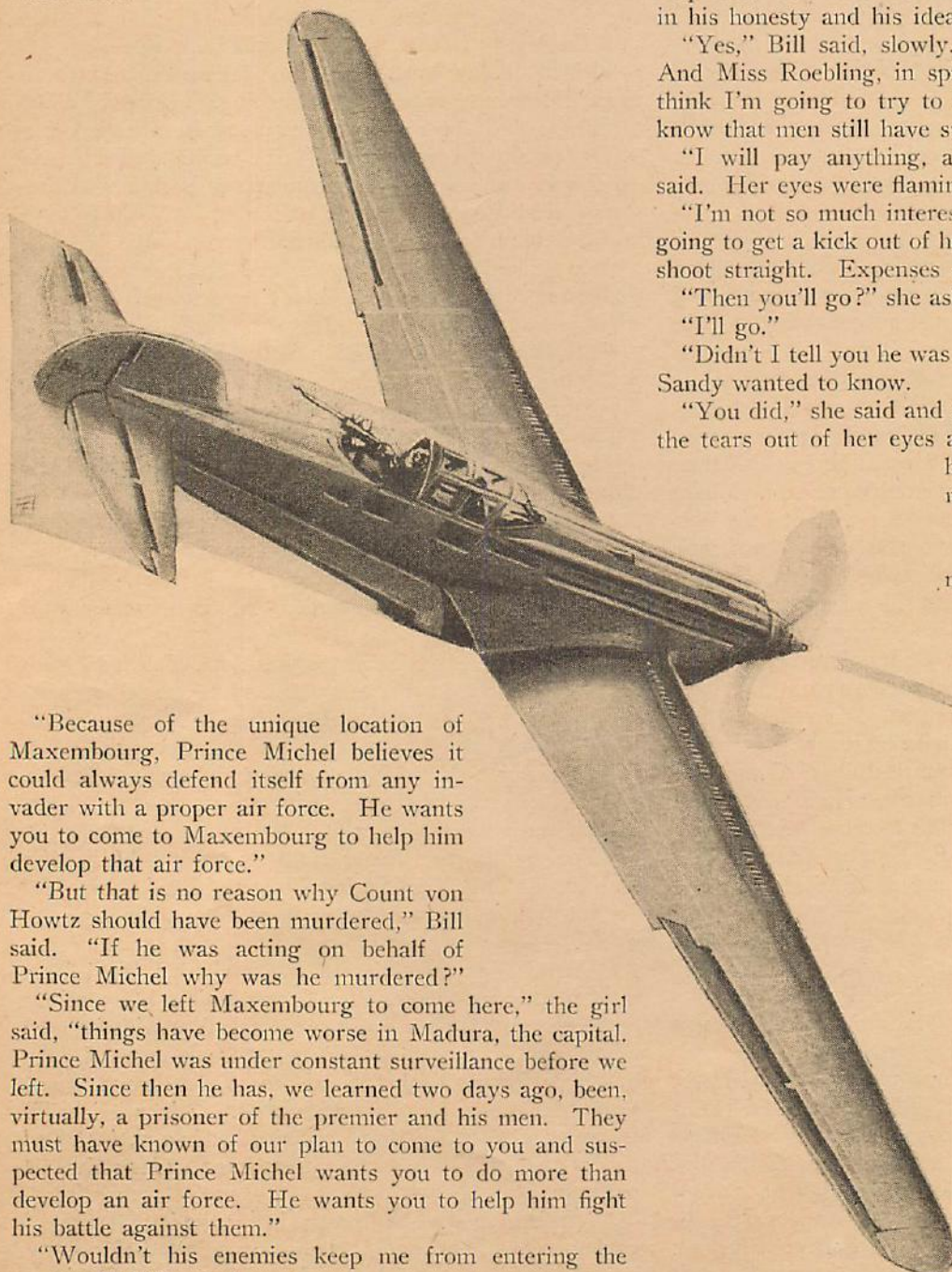
"I have all the necessary papers," she said. "They couldn't stop you because they bear Prince Michel's signature. They wouldn't dare."

"They sent a man to murder Von Howtz to prevent my going to Prince Michel's aid?" Bill asked.

"Exactly," she said.

"They must have known your plans very thoroughly

He switched from his machine guns to his 37mm. cannon and literally blew the next ship out of the air—



"Aren't you afraid to return to Maxembourg?"

"I'm more afraid in America," she said. "That's why I want to stay here. A single individual's life is of no importance when nations are preparing for war."

"You can stay here in my bungalow," Bill said. "There is lots of room for me over at my pilots' quarters."

"I'll have to send for some things," she said. "When will we start?"

"At dawn day after to-morrow," Bill said. "Sandy can do your shopping for you. He seems to know what women want."

Bill was grinning at Sandy's discomfiture. But he wasn't thinking about Sandy.

III—THE START

BILL didn't see Rene Roebling the next day. He was too busy working with "Scotty" MacCloskey, the head technician, in the small, but complete, airplane factory he maintained on Barnes Field.

Early the next morning Bill called a conference of his little squadron. They were a hand-picked collection of the country's best fliers starting with young Sandy whom Bill had trained from close to infancy. There was I. Kinter Hassfurth, better known as "Shorty," who was Bill's right arm and chief of staff. Beside him was Eric L. Gleason, called "Red" because of his flaming thatch of hair. Those two had started flying together in the same squadron of the Royal Flying Corps in 1916. "Cy" or Marvin K. Hawkins, a leathery-faced Texan who had first flown over the French lines in 1917 and Beverly Bates, a soft-spoken, brown-eyed Bostonian with a Harvard accent who came from the school of post-War fliers but was a flying demon in combat, were there. And Scotty MacCloskey who could no longer fly but who had been made a Scottish major at the age of twenty-two for his work over the British lines in 1915 and 1916.

One thought flashed through the minds of all of them as they assembled there. They each thought that this was the first time they had been called together by Bill since an enemy plane had rammed Mort Henderson—the seventh member of Bill's squadron—and sent him to his death. He was the first of Bill's combat pilots ever to have been killed in action.

Bill sensed what his men were thinking. Was it fair to them to ask them to risk their lives for a man they didn't know? But that, he told himself, wasn't the issue. Behind it was the desire of Prince Michel of Maxembourg to see his country free. It is the same spirit, he said to himself, that brought Lafayette to the help of the stricken colonists. They can decide for themselves whether it is worth it.

But he knew that now he must go because he had given his word. His eyes scanned the cluster of faces before him. He knew what they would decide.

First, he mentioned the

murder of Von Howtz. Then, he told them about the happenings of the night before just as they had occurred. He said, "I saw a Snorter coming in for a landing and saw Sandy there climb out of the front cockpit. Then I watched him help a girl out of the rear cockpit." He stopped as they all gasped.

"Old Casanova himself," Shorty said, his broad Pennsylvania-Dutch face beaming. "Who was she, kid?"

"Who do you think it was?" Sandy said, his face crimson.

"Just a stage-door Johnnie," Shorty said. "Did she ask you if the big fans on the front of your Snorter were to keep the engine cool?"

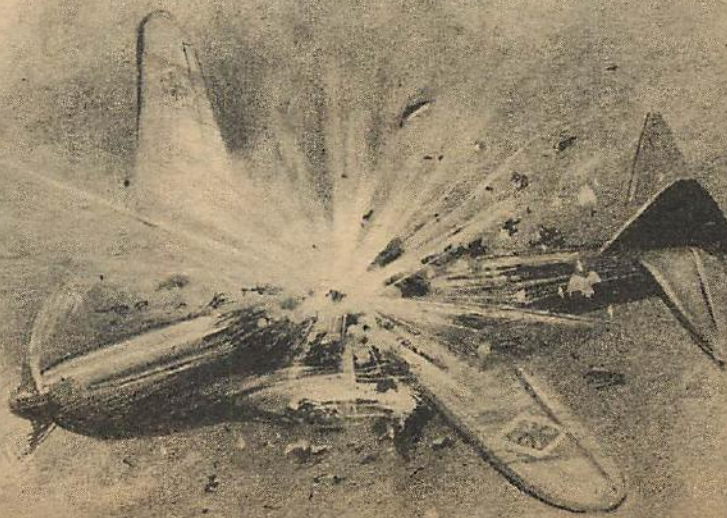
"Nuts, you big ape!" Sandy said. "Go on and tell 'em the rest of it, Bill, before I break his schnozzle."

When Bill had finished he said, "This isn't part of your job. But I think it's as worthy as any job we ever wrote on the books. You can go or you can stay home. You don't have to answer now. If you're going you'll have to check your ships and have them on the line at dawn. Have your men check them thoroughly. We'll make a nonstop flight from here to Madura, the capital of Maxembourg."

During the day Bill had Tony Lamport make arrangements with a dozen steamship lines plying the Great Circle course to have their ships listen in on their radio for him every hour of the next day. He knew that if they ran into trouble the ships could establish triangulation to locate them.

He had the Sperry gyropilots in five Snorters and the Silver Lancer, his own ship, carefully tested so that they would be able to turn the manual handling of their ships over to them and have time to give attention to navigation.

He, personally, inspected and saw to the loading of the two powerful .50-caliber Browning machine guns



mounted in each ship. Also the 37mm. automatic cannon built integral with the Lancer's motor.

At a quarter of four the next morning Bill Barnes knocked on the door of his bungalow. The door opened and Rene Roebing stood framed in the oblong of light. She was wearing the white overalls Sandy had loaned her.

"Good morning," she said. "Are we ready? Do I have to wear this helmet?"

"You won't be able to hear anything without it after we start," Bill laughed. "The interplane telephone and radiophone plug into the ear sockets. The Lancer isn't soundproofed like passenger transports. I'm afraid you're going to find it rather uncomfortable."

"Oh, I won't mind," she said.

"I'll take your bag," Bill said. "Are you nervous?"

"I'm too thrilled to be really frightened," she said. "I'll be like one of those women who went west in a covered wagon. Not so brave though, I'm afraid."

"You're brave enough," Bill said grimly.

Old Scotty MacCloskey was directing the operations of a couple of dozen grease monkeys on the apron. The props of five Snorters and the Silver Lancer were ticking over slowly. The goggled, white-helmeted heads of Bill's men stuck above the rim of the five amphibians. Their hands rose above their heads in salute as Bill and Rene Roebing came into view in the dim light. They had all met her the day before and were unanimous in going to her aid.

"It's a shame," Shorty said, "she's mixed up with this Prince Michel. He'll probably beat her."

"What do you mean?" Sandy said indignantly.

"It's a habit with European royalty," Shorty said. "All princes beat their wives, kid."

"If I ever hear of it I'll pin his ears back," Sandy said. "She's a swell gal."

"Sure, she's a swell gal," Shorty said. "But what's the

matter with her eyes? Did you notice the way one of them shoots off in a different direction from the other one?"

"Yeah," Red Gleason said, without a smile. "I noticed it. There's nothing mysterious about that. She's just cross-eyed. I had a girl like her once and she——"

"Hey, you lugs!" Sandy said. "She's no more cross-eyed than I am!"

"You're right there, kid," Shorty said. "Go take a careful look at yourself in a mirror."

Bill helped Rene Roebing into the rear cockpit of the big silver sesquiplane, then shook hands with Scotty MacCloskey. "We're all set?" he asked.

"Everything is shipshape, boy," Scotty said. "Tony will arrange for fuel."

Bill's hand came above his head. The dispatch tower acknowledged and a signal flashed. Shorty's Snorter rolled slowly forward as he released his brakes. He blasted the tail around into the wind. The flaps came down and the Snorter stuck its nose up with the grace and speed of a wild fowl.

As it began to spiral upward Red Gleason took his Snorter down the runway at terrific speed. He lifted the ship into the air to be followed by Sandy and Bev and Cy Hawkins.

Bill showed Rene Roebing how to plug in her earphones and fasten her safety belt. He flipped a hand above his head and opened the throttle of the Lancer. Its three thousand horses thundered their hoofs as the flaps came down and he whipped it into the air.

At five thousand feet he leveled off and adjusted his radiophone dials. "Are you listening in, Miss Roebing?" he said.

"Yes," she said. "I thought perhaps I couldn't hear you because of the roar of the motors."

"O. K.," Bill said. "Calling all planes—calling all planes."

They gave him the all clear signal.

"Here's your course," Bill said and gave it to them. "We'll form a 'V' at nine thousand. Speed three hundred."

"Is Miss Roebing listening in?" Sandy asked.

"Yes," she said.

"How yah doin', Toots?" Sandy wanted to know.

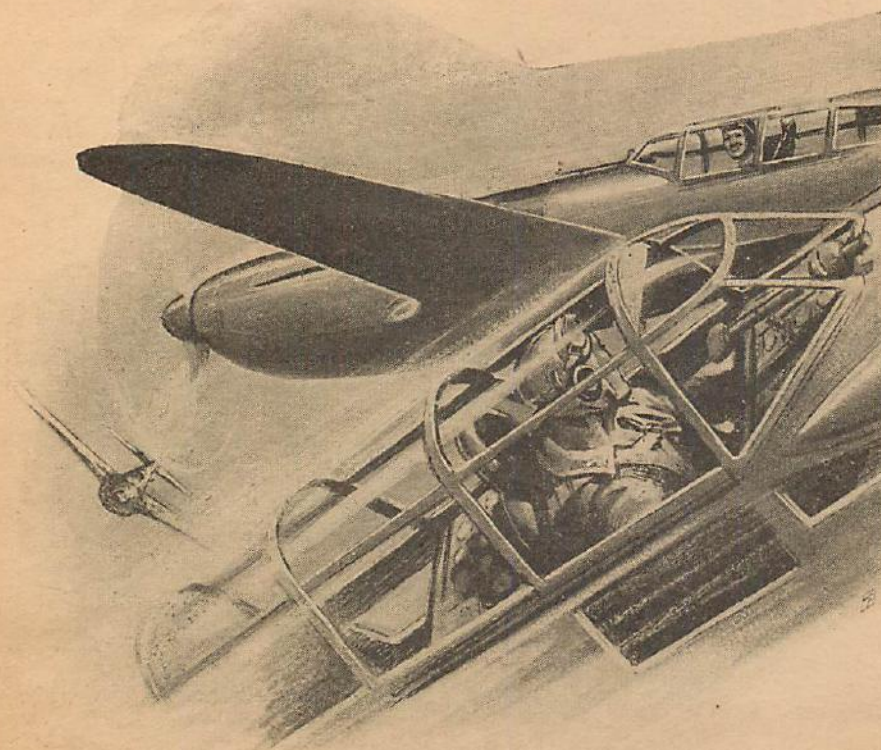
There was a silence for a moment. Then Bill said, "Will you please throw your switch a moment, Miss Roebing. I want to say something to Sandy that I don't wish you to hear."

"Don't," she said and she could hardly speak because of her laughter.

IV—TROUBLE AHEAD

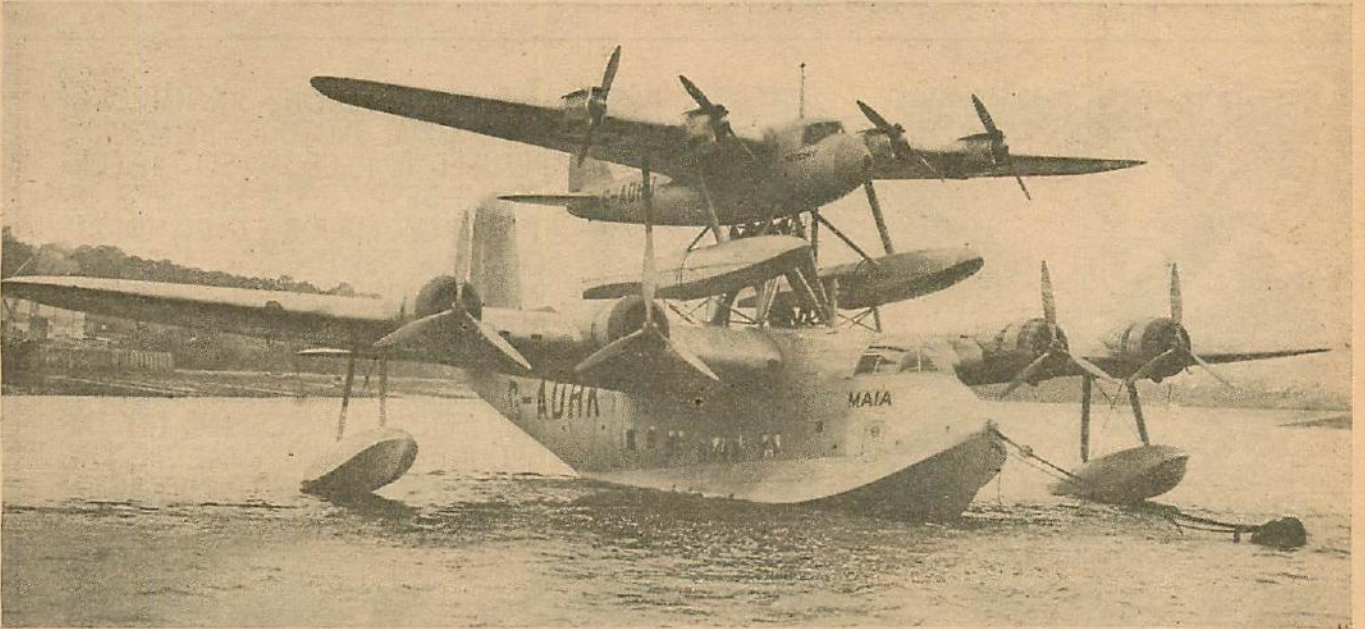
THE tip of Cape Cod showed dimly below them just before the sun came out of the east. Their engines were eased back to about sixty-five per cent throttle as a thirty-mile tail wind caught them. They turned off their running lights, compared compasses and Bill shot a "sun sight" to be sure that they were true.

Every half hour Bill talked to Tony Lampont on Barnes (Turn to page 66)



As the ship screamed past, Bill caught a flash of the pilot's white teeth——

AIR TRAILS GALLERY



The Mayo-Composite plane ready for tests on the River Medway near Rochester, England. The lower component, with its flared hull for increased buoyancy, is a modification of the "Empire Class" Short. The upper component, its wing loading being too great to permit take-offs when loaded, will soar from the back of the mother ship when in full flight. Fuel consumed in flight will lower the weight to permit a normal landing at the destination. Power plants—upper component: 320 h.p. Napier "Rapier"; lower: 910 h.p. Bristol "Pegasus." Span—upper: 73 feet; lower: 114 feet. Maximum speed of the Composite is 195 m.p.h.

Right: Latest American primary trainer is the clean-looking Federal XPT-1. Struts replace the usual interplane wires. The wide-tread landing gear insures the novice of safe landings. The power plant appears to be one of the "760 E" series of Whirlwinds, approximately 225-320 h.p.



Below: Powered by the inverted 240 h.p. Argus engine, the Arado Ar96 is of all-metal construction. Fine streamlining features the design. The fish-tail stabilizer is reminiscent of the Wartime Albatross. The use of inverted engine provides exceptional visibility for the pilot.

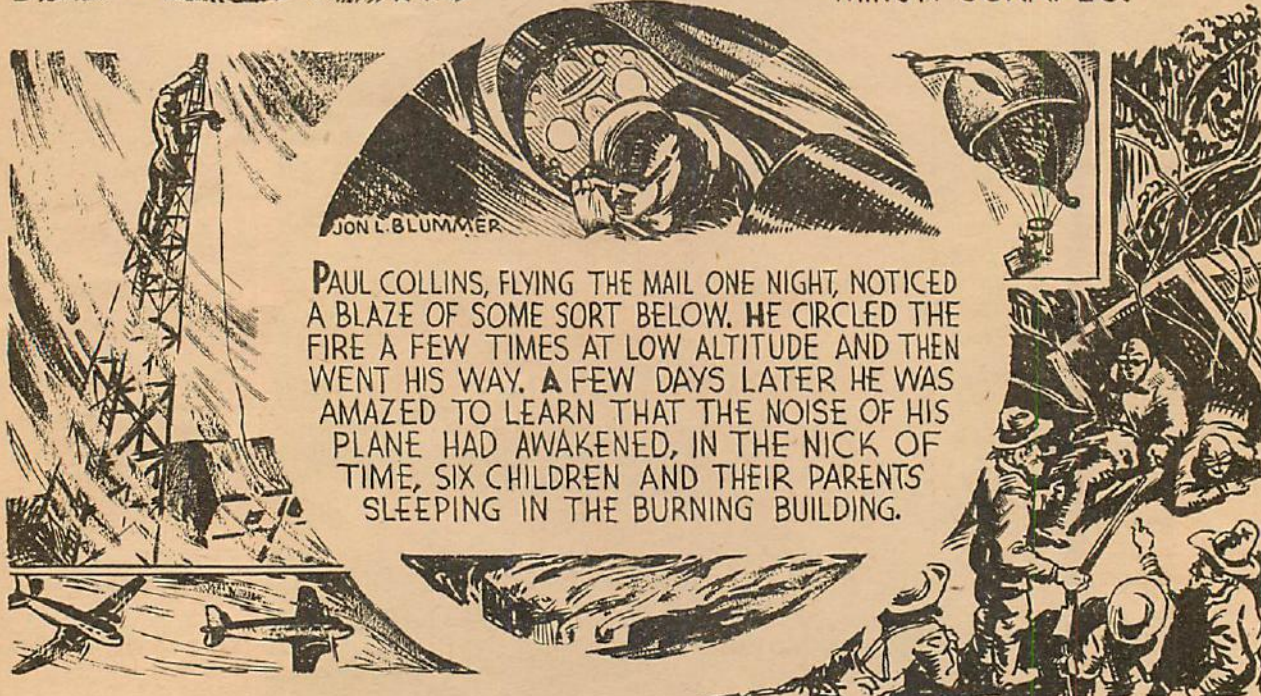


SPLIT-SECOND ACTION

Hair-breadth escapes, hair-trigger decisions, dangerous moments that come once in a lifetime.



THE OLD KEYSTONE BOMBER, ON AN ARMY AERIAL PHOTOGRAPHY MISSION, REFUSED TO RESPOND TO THE CONTROLS DESPITE THE EFFORTS OF THE CREW, MAJOR E. CARP, CAPT. N. CRAW AND SERGT. E. SELL. THE PLANE RAPIDLY LOST ALTITUDE, MISSED BUILDINGS BY MERE INCHES, AND THEN, WITH AN AWFUL CRASH AND A SHOWER OF SPARKS, BURST THROUGH HIGH TENSION WIRES AND HIT THE GROUND - A TOTAL WRECK. THE CREW ESCAPED WITH ONLY A FEW MINOR SCRAPES.



PAUL COLLINS, FLYING THE MAIL ONE NIGHT, NOTICED A BLAZE OF SOME SORT BELOW. HE CIRCLED THE FIRE A FEW TIMES AT LOW ALTITUDE AND THEN WENT HIS WAY. A FEW DAYS LATER HE WAS AMAZED TO LEARN THAT THE NOISE OF HIS PLANE HAD AWAKENED, IN THE NICK OF TIME, SIX CHILDREN AND THEIR PARENTS SLEEPING IN THE BURNING BUILDING.

IN A RAGING BLIZZARD A TRANSPORT PILOT WAS FOLLOWING HIS RADIO BEAM, LEADING TO SAFETY ANOTHER TRANSPORT WITH ITS BEACON RECEIVER GONE DEAD. CHAS. MERCHANT, ENGINEER OF THE BEACON TRANSMITTER ON A LONELY PEAK OF THE ROCKIES WAS LISTENING IN ON THE DRAMA. SUDDENLY, THE GUIDING SIGNALS STOPPED. MERCHANT FOUND THAT A WIRE HAD BROKEN AWAY FROM ATOP THE TOWER. THOUGH NO SAFETY BELT WAS AVAILABLE, HE CLIMBED THE SWAYING HEIGHT OF THE ICE-COATED TOWER AS THE HOWLING BLASTS TORE AT HIM. SOMEHOW HE MADE THE NECESSARY REPAIRS AND AGAIN THE GUIDING SIGNALS LED THE AIRMEN THROUGH TO SAFETY.

A.H. FORBES AND J. YATES, AFTER ATTAINING AN ALTITUDE RECORD IN A BALLOON, RELEASED GAS TO DESCEND. THE BASKET SHIFTED, PULLING THE RIP-CORD WHICH OPENED A PANEL OF THE ENVELOPE. THEY DROPPED LIKE A PLUMMET. WHEN THEY CAME TO, THEY FOUND THEMSELVES AMID A GROUP OF MOONSHINERS, WHO, WITH ONE EXCEPTION, DEMANDED THEIR DEATH AS "REVENOOERS". THE HAPLESS AIRMEN, DUE TO INJURIES, COULD UTTER NO WORD OF DEFENSE. THE ONE EXCEPTION, HOWEVER, PREVENTED THEIR IMMEDIATE EXECUTION. A FEW HOURS LATER THE AIRMEN DISCLOSED THEIR IDENTITY, AND STAYED UNTIL THEIR RECOVERY-HONORED GUESTS.

MODEL MAKING—

Air Trails Department of Practical Construction

It's Indoor Weather

By Gordon S. Light

"I could do 10 minutes in here or maybe 15 if the lights were raised," is a typical thought of an indoor modeler. Whenever he finds himself in a room or hall of sufficient proportions for flying an indoor model—whether it's a railroad station or theater—he immediately evaluates its possibilities for indoor flying. Indoor modelers are always on the alert for a suitable indoor place just as outdoor modelers are continually searching the country for suitable outdoor sites.

Indoor airports range in size from an ordinary living-room—where a small R.O.G. will turn in a few minutes' flight—to the dirigible hangars at Lakehurst and Akron where larger indoor models fly as long as 20 minutes. Fortunately, a suitable flying space is available to practically any modeler. School gymnasiums, auditoriums, and armories are just a few of the suitable places for carrying on an intensive indoor campaign.

Indoor modeling is a scientific battle to reduce weight with increased duration as the goal. An indoor contest represents a true test of skill with the luck element reduced to a minimum.

Many modelers go indoors when winter weather clamps down on their outdoor flying. The cold drafts that blow through most unheated armories and auditoriums do not dull their enthusiasm. They have a good time and get much valuable experience. Get the indoor habit—whether you're a microfilm expert or a beginner still in the early stages of tissue covering.

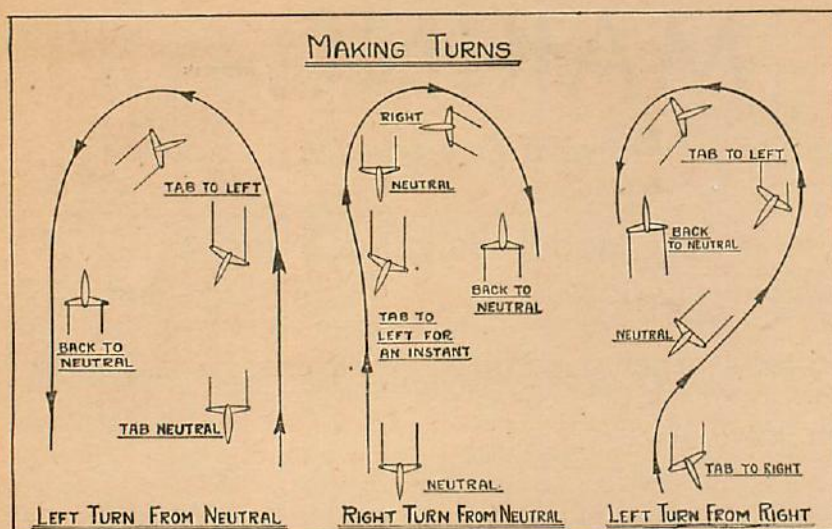
Watching your model overhead, battling the ceiling which keeps it from climbing higher, is an important part of a well-rounded model education.

14 Model Building Items

IT'S INDOOR WEATHER.....	BY GORDON S. LIGHT	39
<i>The indoor season is in full swing. Why not try your hand at the game?</i>		
RADIO-CONTROLLED GAS MODEL.....	BY CHESTER LANZO	40
<i>Concluding the most sensational model article in recent years.</i>		
MODEL MATTERS.....		44
<i>Club notes, model activities everywhere, news of recent contests, pictures. This is your page. Send in your notes, news, snaps.</i>		
THE CONTEST CALENDAR.....		44
<i>A schedule of competitive events which keeps Air Trails readers up to the minute.</i>		
DOUGLAS XTBD-1.....	BY MARTIN E. DICKINSON	45
<i>Continuing the succession of premier three-view drawings.</i>		
THE QUESTION MARK.....		46
<i>All model building questions answered by mail.</i>		
THE DISCUSSION CORNER.....		47
<i>This month readers discuss "Retractable landing gears."</i>		
THE WAKEFIELD ELIMINATION WINNER.....	BY HERBERT FISH	48
<i>Detailed plans and instructions for building one of 1937's foremost models.</i>		
NEW DEVELOPMENTS IN EUROPEAN MODELING.....	BY HERBERT FISH	52
<i>A first-hand account of new planes and ideas in Europe by the first-ranking American Wakefield representative.</i>		
SPEED WINGS.....	BY ALAN D. BOOTON	54
<i>A beautiful model of America's most efficient airplane—a flying scale model of proven performance.</i>		
BOEING CLIPPER.....	BY MARTIN E. DICKINSON	59
<i>Plans for the Boeing super airliner—an authentic drawing that was withheld by Air Trails for months pending Pan American's special release.</i>		
INDOOR FEVER.....	BY LAWRENCE N. SMITHLINE	62
<i>Do you wish to learn the art of building indoor models? Then read this expert's discussion—it's really easy.</i>		
CRASH-PROOF R.O.G.....		63
<i>In deference to beginners—a simple model worthy of every model builder's best efforts.</i>		
THE TURNER RACER.....	BY WILLIAM WINTER	67
<i>Another outline of a famous ship—one of 1937's leading racing ships.</i>		

AIR TRAILS ADVERTISERS—JANUARY, 1938

Ace Model Works	87	Gun Model Co.	91
Aero Industries Technical Institute, Inc.	Back Cover	Heathe Model Airplane Co.	83
Aeronautical Chamber of Commerce of America, Inc.	93	Imperial Model Aero Supply	81
Aircraft	65	International Correspondence Schools	5
Air-Foto	91	Johnson Smith & Co.	96
Air Progress Ad	89	Mechanix Universal Aviation Service	91
Aviation Institute of America, Inc.	3	Megow's	2nd Cover
P. Battles	85	Mercury Model Airplane Co.	85
Berkeley Model Supplies	85	Model Airplane News	3rd Cover
Cleveland Model & Supply Co.	91	Newell Pharmacal Co.	91
Clymer Co.	85	E. M. Paine	91
Curtiss Wright Technical Institute	73	Rapaport Bros.	87
Eastern Model Aircraft Bldg. Co.	91	Ryan School of Aeronautics	1
Federal	85	Scientific Crime Detection Institute	87
		Scientific Model Airplane Co.	76-77
		Skyway	87
		Universal Aircraft Co.	85



Complete description and diagrams of the radio apparatus, concluding the presentation of the National Contest winner—the 15th Air Trails trophy-winning model.

RADIO-CONTROLLED PART II. By Chester Lanzo In collaboration with Gordon S. Light. GAS MODEL

THE difficulties which Lanzo overcame to win the radio-control contest last July in Detroit were not caused by any complications in his radio equipment or in the model itself. He was all set for an official demonstration. He had located a 110-volt a.c. "plug-in" for his transmitter and had finished stringing up the antenna. The trouble began during the few minutes he was away from his model locating the officials who were to witness his flight.

During Lanzo's absence, one of the Cleveland entrants thoughtlessly launched his gas model in the restricted area set aside for the radio-control contest. The model proved to be badly adjusted and dived in at the spectators watching the radio-control contest. Lanzo's model suffered a badly crushed wing tip as the spectators scattered out of the model's path. A quick repair job was all that saved Lanzo from being eliminated before he even had a chance to fly his model.

Pat Sweeney of the Chicago Gas Model Plane Society generously supplied Lanzo with material for patching his wing. The model was finally restored to flyable condition through the joint efforts of Lanzo and several friends. Then he proceeded to demonstrate his radio-control to the judges—a demonstration so convincing that he was awarded first prize. But in winning 1st place, Lanzo beat out Pat Sweeney, who had to be content with 2nd prize. Sweeney's good sportsmanship cost him the victory. Such are the thanks one receives for favors granted during a model contest!

But on to the serious matter of finishing the presentation of the radio-controlled model.

THE RECEIVER

This part of the radio-control apparatus has been the source of much trouble to experimenters. Fundamentally, the problem is to design a lightweight, reliable receiver that will respond to signals sent out from a ground transmitter without using excessively high power. Lanzo had turned out a splendidly designed receiver. The range is effective for distances well over a mile or practically as long as the model can be seen. This is with the relatively low-powered transmitter described last month. However, the receiver functioned perfectly on signals sent by amateurs from New York—500 miles from Lanzo's home in Cleveland.

These transmitters were considerably more powerful than the one he uses. But it really does bring out the capabilities of a radio-controlled model. It's hard to imagine anything more exciting than watching the rudder tab on his model swing back and forth—under perfect control of the radio operator 500 miles away!

The receiver is extremely lightweight. Other radio-control experimenters have estimated as much as 8 pounds for the minimum weight of a receiver. Lanzo's receiver weighs only 1¾ pounds! The total weight of the model equipped for a controlled flight is only 5¾ pounds.

CONSTRUCTING THE RECEIVER

First remove all of the iron core from the center of the audio transformers. The individual pieces are then cut in half and reassembled. This not only cuts the weight in half, but also peaks the transformer at the proper frequency. The tube bases are also removed by placing the

All questions pertaining to the construction and operation of both plane and apparatus will be answered by Gordon S. Light advised by Chester Lanzo.

tubes upright in a pan of boiling water for about ten minutes. Then, while holding them with a cloth to prevent burning your hands, gently twist the base. This motion will loosen the material holding the base of the tube. Now heat the ends of the prongs in a gas flame and shake the base quickly. This will remove the solder and the base can then be readily removed.

Carefully note where the wires from the prongs lead to and mark them accordingly with small pieces of paper cemented onto the wires. Slip two small pieces of spaghetti insulation tubing over the filament leads so there will be no short circuits.

The components are then cemented firmly in their proper positions in the radio compartment of the fuselage. The location of the various parts can be seen in the photo. Wiring diagram #3 will give you the necessary information for wiring the receiver. Secure all connections against vibration of the engine, using a good grade of resin core solder.

The 45-volt battery used in the receiver is a specially built lightweight type manufactured especially for radio experiments and scientific research. They can be obtained from The National Carbon Co., Cleveland, Ohio, for \$1.00 each. Their span of usefulness is short—about 2 hours of use from each unit. For testing the circuit and experiments on the ground, substitute the large and more substantial 45-volt B batteries.

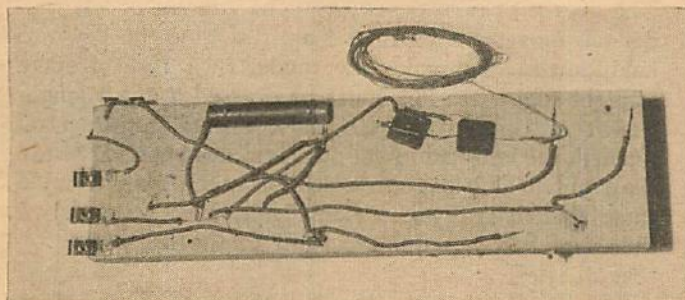
THE RUDDER-TAB CONTROL

A small electric motor is used to turn the rudder tab. It is wired to the relay as indicated. It operates on a small 1½-volt cell for a fairly long time. The motor itself was originally used to run a model electric train. It was obtained from the Cleveland Model Supply Co., Cleveland, Ohio, and cost \$1.25.

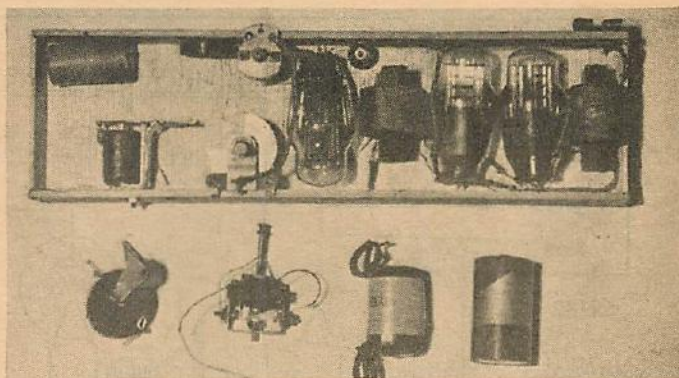
A series of gears is used to convert the revolutions of the motor into rudder-tab motion. These gears can be obtained from an old clock. They should be arranged so that the last gear revolves at approximately 1/25th the r.p.m. of the motor. The gears are mounted in an aluminum gear box—made



Chester Lanzo and some of the trophies won at major contests.



Bottom view of the radio compartment showing placement of parts and wiring. Extreme left are the Fahnestock clips, next the (C-) bias batteries, then the grid-leak condenser combination and then the antenna-coupling condenser with the antenna attached.



Receiver mounted in a section of the fuselage. Side pieces are bass longerons and cross pieces the formers. Receiver parts are mounted to the 1/8" flat balsa lining the bottom. Following are the parts: 1. (to right)—1 mfd. relay by-pass condenser; relay coil with tuning condenser, at top; below, the regeneration control condenser; detector tube with radio-frequency choke mounted above it; first audio-frequency transformer; 2 audio tubes; and the 2nd audio transformer with 2 Fahnestock clips mounted above for earphones. At bottom of photo are the gear mechanism and the electric motor which are mounted in the fuselage to the rear of the radio compartment; and the 45-volt B battery and the 1½-volt dry cell which are carried in the battery compartment, forward of the radio receiver.

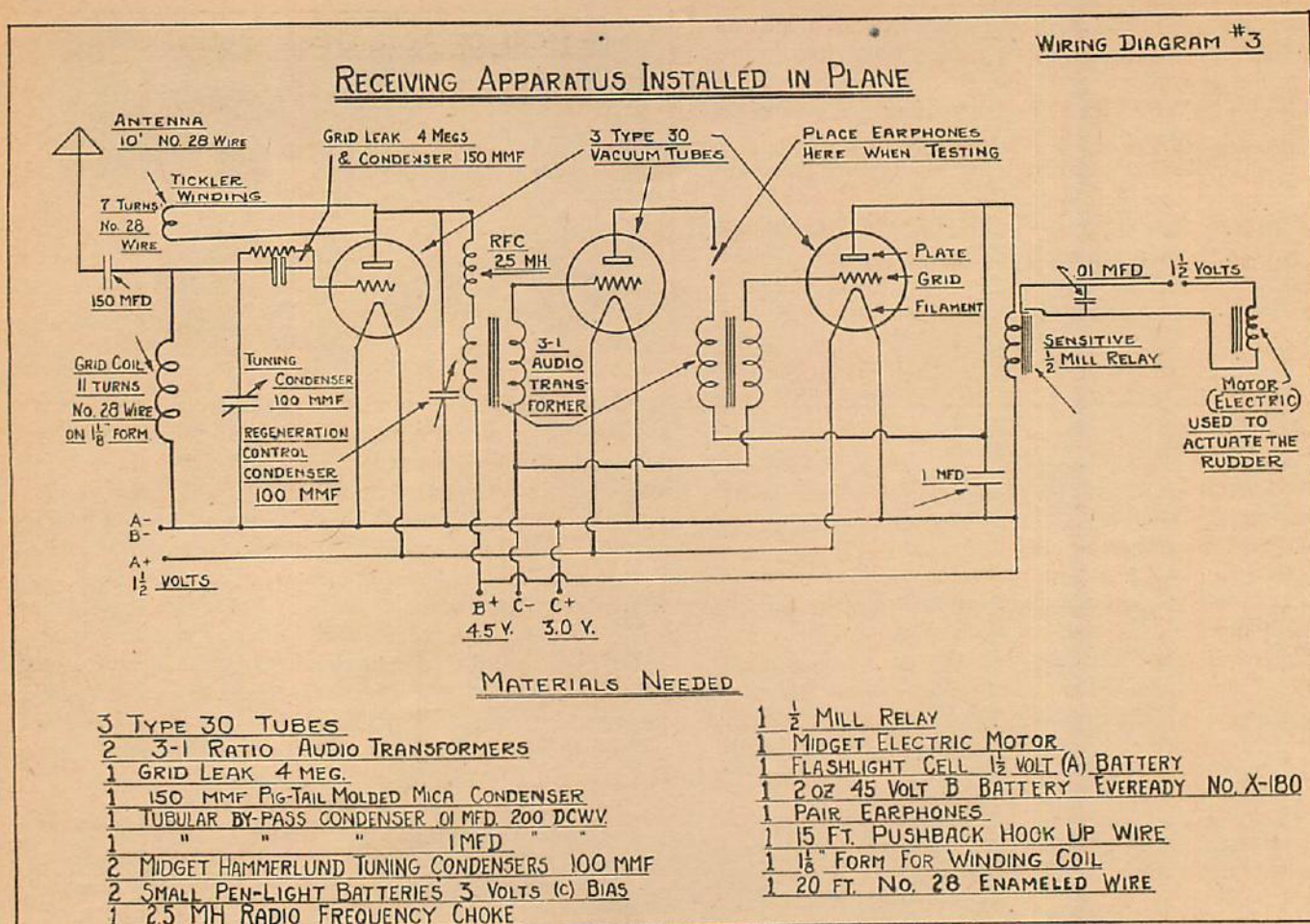
by bending up the sides of a flat piece of aluminum. Holes punched in the bent-up sides serve as bearings for the shafts of the gears. The unit should be as light and as compact as possible. The gear box must be mounted alongside the electric motor on top of the fuselage directly in back of the compartment containing the receiver.

The shaft of the electric motor always revolves the same direction regardless

of direction the rudder-tab is to turn. The change in rudder-tab direction is obtained by the motion of the two wire arms (3/4" long) extending outward from the shaft of the last gear wheel. The rudder tab is in neutral position when the wire arms are vertical. Then as the gears begin to revolve, (the wire arms rotating at 1/25th the speed of the electric motor) the tab is first swung to the left, reaching its maximum position when the arms are horizontal at the end of the 1/4th revolution. As the gear continues to revolve, the tab returns to neutral and then swings to the right, finally returning to neutral as the gear completes its full revolution. This cycle is repeated with each revolution of the gear. This type of mechanism provides good control, is easily built and practically foolproof. It is far superior to complicated mechanisms developed by other experimenters.

TESTING THE RECEIVER

Turn the tuning condenser so that all of its plates are "all the way out" and adjust the regeneration condenser carefully over its entire scale—proceeding slowly until



a rushing sound is heard in the headphones. This indicates that the tube is oscillating. While tuning with the small tuning condenser, move the regeneration-control condenser so as to maintain the tube at this sensitive point.

If the set will not oscillate, try a larger number of turns in the tickler coil. It is important to have the tickler coil wound in the same direction as the grid coil. Try reversing the terminals of the tickler coil to produce oscillation.

To test both the transmitter and the receiver, connect all the batteries in their proper places on the receiver. Then plug in the transmitter and tune the receiver to the frequency of the transmitter or vice versa. If everything is working properly, the sensitive relay will close every time the transmitter key is pressed. This, in turn,

will set the electric motor in motion, revolving the gears and actuating the rudder tab.

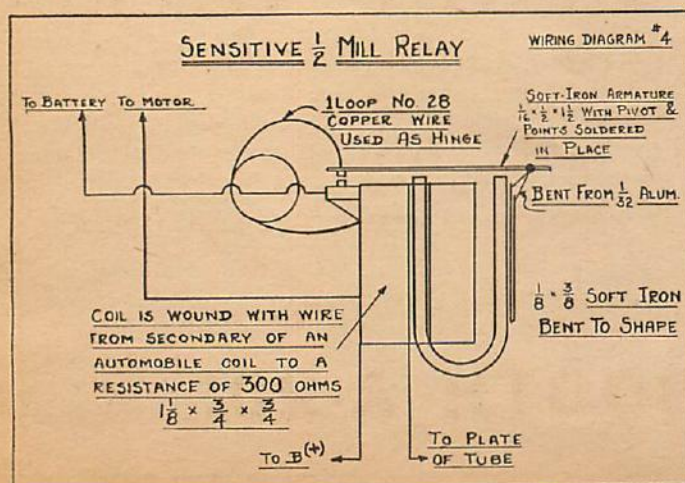
If a loud squealing noise is heard in the earphones when testing the receiver, try reversing the terminals of the first audio transformer. This should prevent the disturbance.

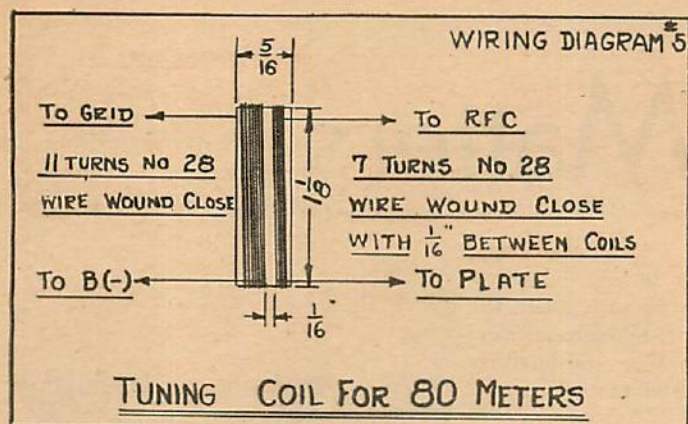
FLYING THE MODEL

When a signal is transmitted, the relay closes the motor circuit, setting the motor in motion and revolving the gears. This will continue until the signal is stopped. To make the gears revolve very slowly or just a fraction of a revolution, the key is intermittently tapped for just an instant.

Suppose the rudder tab is in neutral and the model is flying straight. To make it turn left, the key is pressed for an instant. This swings the rudder tab to the left. The degree of turn depends on the amount of left rudder-tab movement and the length of time the key was held down. To make the model turn right from a straight flight, the key must be pressed a much longer length of time. The tab must swing from neutral through the left position and back to neutral and then to the right. This operation sounds much more complicated than it really is. Actually it takes a very short time and becomes quite natural to the operator after several tries.

The drawings further explain the method of making turns. This description clears up the false impressions held by some observers who watched Lanzo's model in flight—that his apparatus operated erratically. Actually it worked perfectly. This slightly irregular way of making turns is natural with this type of control.

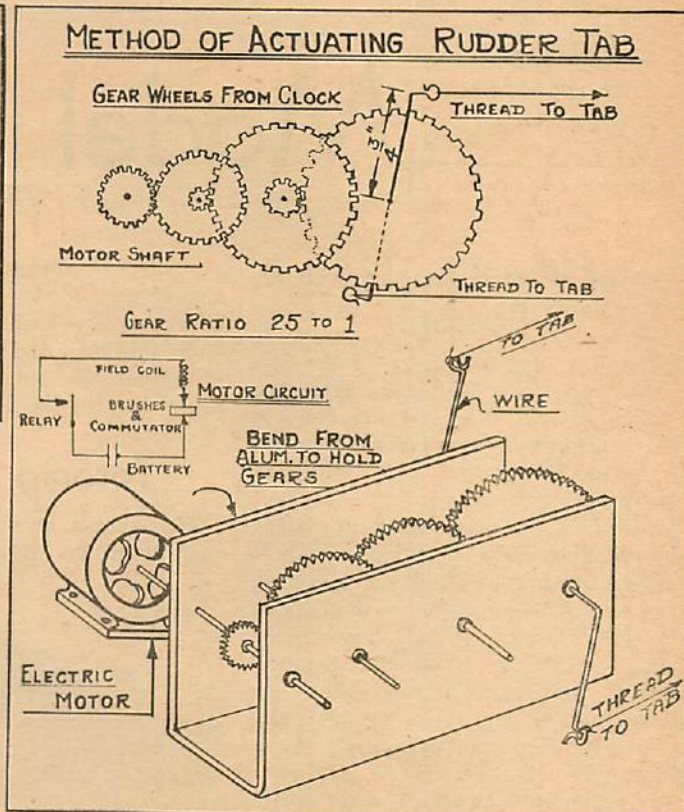




Any radio transmitter which is tuned to the frequency of the receiver is capable of sending signals to control the plane. This brings up the possibility of another radio transmitter being used to put a model out of control—assuming that some one would resort to such a trick to win a contest. However, every maneuver that the model performed on the signals from another transmitter could be corrected immediately by your transmitter, unless the other operator held down the transmitter key, thereby transmitting a continuous signal and rendering the receiver useless.

Building a radio-controlled model is a difficult task since it ties together two complicated sciences—aeronautics and radio. Unless you're expert in both these fields, numerous problems and difficulties are certain to turn up. Send your problems to the model department. Lanzo has offered his help in answering them. His answers will be particularly helpful since he knows both the model and the radio side of the problem.

New developments are taking place rapidly in radio-controlled models. Lanzo and many others are already



Address all questions relating to the radio-controlled model to Gordon S. Light.

working on advance designs. Air Trails will keep pace with the developments in this thrilling phase of model flying with authoritative information designed to clear up your problems and present the most recent developments. Your letters will be the guide in determining what points are troublesome and what information should be included in future articles.

AIR TRAILS WILL BE THERE!

BOOTH A-20

INTERNATIONAL AIR SHOW

INTERNATIONAL AMPHITHEATRE, CHICAGO, ILL.

JAN. 28th to FEB. 6th

SANCTIONED BY THE AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA

DISPLAYS—SHIPS—ACCESSORIES—MOVIES—AND THE

AIR TRAILS BOOTH A-20!

*Flight records
and contestants
in competitions.*

Model Matters

*Club notes and
news of model
organizations.*

(In contest tabulations, results are to be read as minutes (to left of colon), seconds, and fractions.)

Junior Aviation League, Boston

The first microfilm meet of the fall-winter season was held in the Irvington St. Armory, Saturday morning, October 2nd. Two new Boston records were set by Ralph Brown and Jack Golden in the R. O. W. events.

The J. A. L. has drawn up rating rules for their members. Through these ratings the beginner will be given an opportunity to improve his standing in the club. The Ace rating—which is the highest—calls for well-rounded model ability. And once this rating has been earned, the club member automatically assumes an important rôle in the club's program of activities.

Following are the tabulated contest winners:



Picture number 1

Stick H. L.

1. Cain (senior), class B	10:54.6
2. R. Brown (junior), class C	10:47.8
3. Wallerstein (senior), class B	10:45.5
4. Golden (senior), class B	10:30.2
5. H. Phillips (senior), class C	9:15.2

Stick R. O. G.

1. H. Phillips (senior), class B	10:21
2. Wallerstein (senior), class B	10:20.1
3. Cain (senior), class B	9:01.2
4. Golden (senior), class B	5:40
5. R. Brown (junior), class A	5:16.8

Stick R. O. W.

1. Golden (senior), class A	1:50.2
2. R. Brown (junior), class B	:57.7

About John Dilly

John T. Dilly of Galt, Ontario, is a crackerjack modeler. When he really gets down to work, he'll match flights with the best of us. He turned in a top performance at the Canadian Nationals last summer. And now he tells us that he has interested a sponsor for a trip to France next year for a try at the Wakefield Trophy. If John demonstrates that his Wakefield models are really capable fliers, the trip is his. It certainly

shouldn't be difficult to put in some mighty good model work with a trip to France as a reward. And unless we're badly mistaken, the next several months will reveal some outstanding model work being done in the Dilly workshop.

Toronto Contest

The annual outdoor model airplane contest of the Broadview Boys' Fall



Picture number 2

Fair was held in Toronto, October 2nd. Each year this contest shows increased interest in modeling. It's encouraging to see that model-airplane building is one of the outstanding hobbies encouraged by this annual hobby fair.

Following is the list of prize winners:

Gas Models

1. Jack Buck	5:00.6
2. Vernon Anthony	5:00.
3. Harry Johns	2:14.6

Gas Models

1. Ray Hunter	:21.4
---------------	-------

(Power Shut-off)

Wakefield Models

1. Bob Milligan	1:03.6
2. Jim Price	:54.8
3. John Meyers	:37.6

(Average of 3 flights)



Picture number 3

Stick Models

1. Fred Bower	8:15.2
2. Clyde Lockhart	2:49
3. Bob Milligan	1:32

Grand Champion

Bob Milligan

Connecticut Gas Laws

Connecticut has banned gas model flying throughout the state. Charles Morris, director of aviation for Connecticut, said that special permits would be issued for gas-model flying conducted on a strictly scientific basis. Previously, the state of Massachusetts had banned gas models. However, flying has been restored. Modelers must obtain licenses from the state department of aeronautics before they can legally fly their models.

A definite drive is being conducted throughout the country to coordinate gas-model flying activities under a fixed set of rules and regulations designed to assure the safety of the public on the ground and of aircraft in the air. Gas models may be flown from airports or landing fields only after the airport manager has given his consent and has designated the portion of the field to be

Contest Calendar

READERS AND CLUBS. Notices should be mailed to the Contest Calendar, Air Trails, 79 7th Ave., New York City, at least 2 months in advance; news of winners and results immediately after the events.

SCALE MODEL CONTEST sponsored by the Scripps-Howard Junior Aviators, and open to all Canadian and American model builders; subject: Maj. Al Williams' Grumman Gulfhawk; no entry fee or previous registration required; contestants to compete under 3 divisions: up to 14 years, 14 to 18, and over 18; \$250 cash prizes; contest closes March 31, 1938. Cities not having local Junior Aviator Chapters are invited to compete through local model building or N.A.A. groups. Local winners are eligible to enter the finals. Complete information can be obtained from National Junior Aviator Editor, Press Bldg., Cleveland, Ohio.

ANNUAL CONTEST of the Ace Model Club, Marshalltown, Iowa. Tentative date July 4th; announcements to be made later. For further information address Ace Model Club, 19 South Center Street, Marshalltown, Iowa.



Picture number 4

used. Flying must be confined within the area designated and the duration of the flight must be limited. Flying activity must be suspended upon signal from the airport manager to prevent any interference with airplanes that are taking off or landing.

This is a sensible set of rules that any serious-thinking modeler should find no trouble in obeying. Widespread adoption of these rules would do much to clear up the present problem of the safety of gas models.

Tulsa Activities

The fall opening of schools and colleges has slowed down modeling activities in Tulsa, Oklahoma. Vernon Sears, Bruce Luckett, and Alvie Dague, Jr. are getting their first taste of life as college freshmen. However, they plan to follow the example of Roy Wriston. He's

Pictures #1 to #5 inclusive are action shots taken at the Quaker City Gas Model Contest. Picture #4: The Kapral twins, Joe fueling and Tom looking on. Joe won the stunt event.

been attending the university for the past three years and has maintained his standing as one of Tulsa's most active modelers. So despite this sudden quest for learning, there's every indication that Tulsa builders will keep a firm hold on their top position among model clubs.

New York Police Contest

Over 200 entrants turned out for the model airplane contest sponsored by the Police Athletic League and the Model Builders' Exchange. Flying was done in Marine Park, Brooklyn, New York. Events were confined to rubber-powered models and gliders. Hand-launched glider event started at 10:30 Saturday, September 25th. With clouded skies and still air, the gliders turned in rather poor flights. Theodore Kaiser of Queens won the event with 1:08; Morton Kaufman, Brooklyn, second; and Henry Struck, Jackson Heights, third. Struck was the winner of last year's contest.

By noon the air conditions had improved to the extent that rubber-powered models were flying out of sight

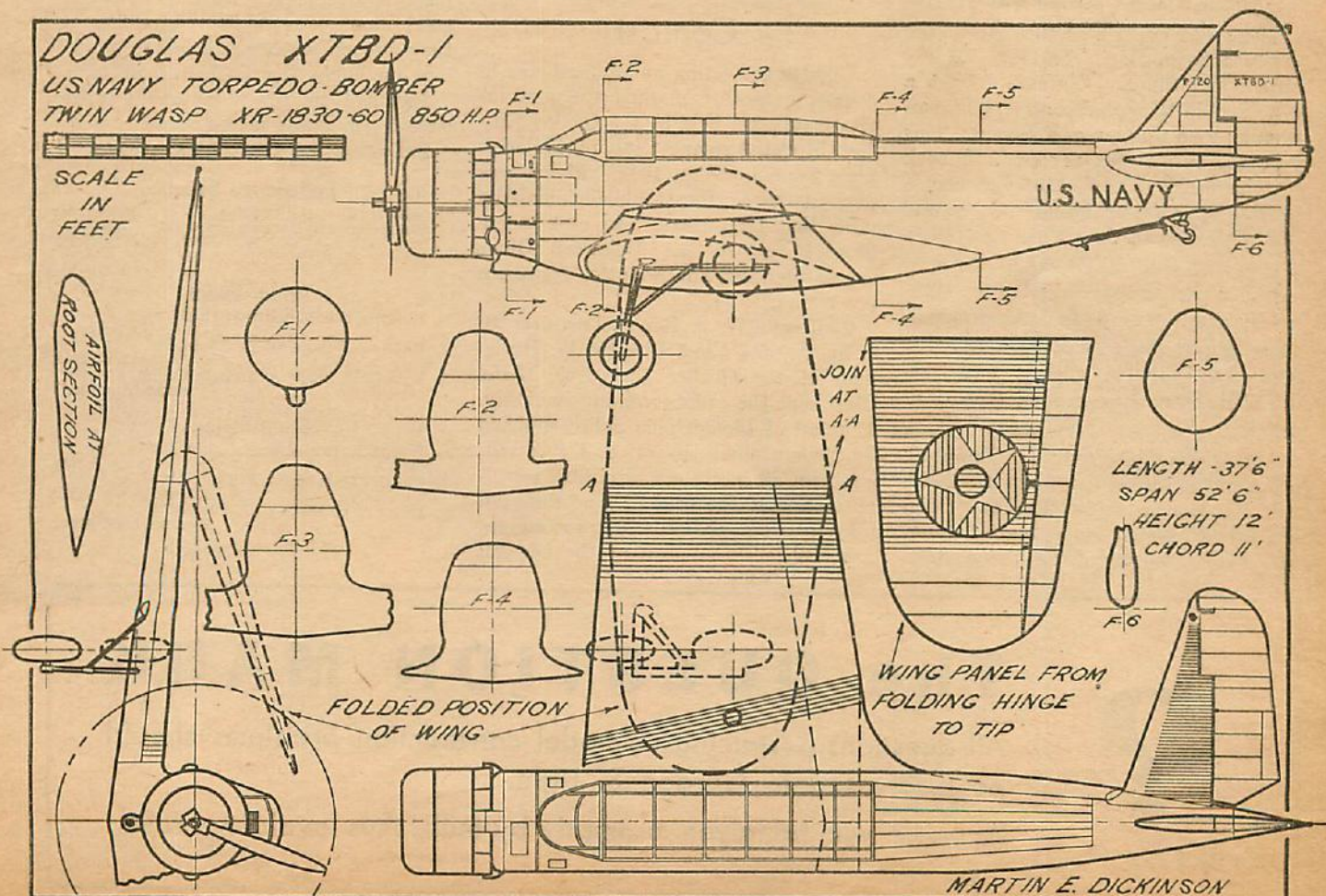


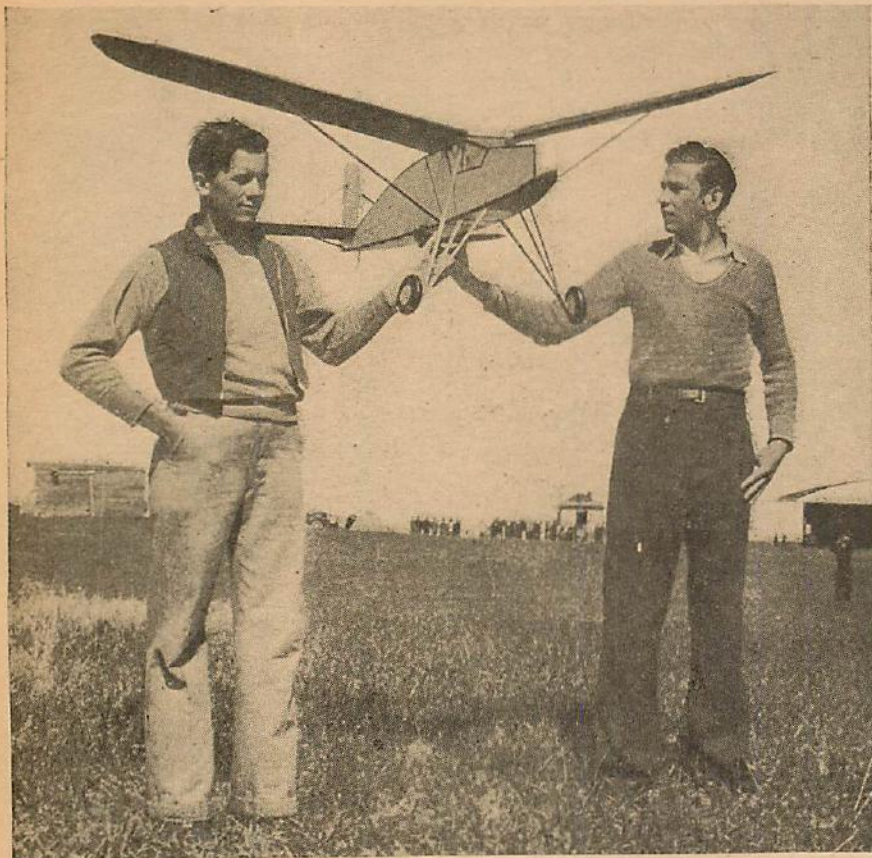
Picture number 5

directly overhead. Consequently, good flights were turned in during the stick model event. Theodore Kaiser again won first with a flight of 5:51; Frank Haynes, New York City, second; Robert Nixon, Brooklyn, third.

The cabin fuselage was the next event. A freshening breeze began to make flying a trifle difficult. Many models suffered disastrous crack-ups before they had a chance to gain altitude. William Hayden of Jackson Heights won the event with 4:14.

Henry Struck seemed a sure winner in the tow-line glider event when his model met favorable currents and soared over the field for nearly six minutes. Struck was eager to retrieve his model. He chased after it, taking the timer along with him. Since timers were forbidden to leave the field, Struck's entry was disqualified. Gordon Murray of





J. Lernowich, left, and Ed Sengowoda, right, holding a 6-foot rubber-powered model. Picture taken at the Brandon, Manitoba contest.

Brooklyn took first with 1:25; Rune Schylander, Queens, second with 1:21.

The speed event was the last in the afternoon's program. Last year Henry Struck and Stanley Clurman fought a close duel in the speed contest, Clurman winning by a fraction of a second. This year the result was reversed. Struck sent his entry over the 105-foot course in $1\frac{1}{5}$ seconds. Clurman was second with $1\frac{2}{5}$ seconds for the course. These speeds were close to 60 m.p.h.

Kaiser won the special prize for high-point scorer. Awards included trophies, subscriptions, medals, material. For the first time gasoline engines and gas-model material appeared on the list of prizes.

Acting Captain Frank H. Campbell; commanding officer of Unit 6, Police Athletic League and Patrolman John McMahon assisted model club director, Mr. Lynn, in running off the contest.

Quaker City Gas Contest

Good organization and smoothness in contest procedure marked the first invitational meet held by the Quaker City Gas Model Airplane Club of Philadelphia, September 11, 1937. Flying was done at the Northeast Philadelphia Airport, Red Lion Road. An east breeze blowing toward the Delaware River necessitated fuel limitation to $\frac{1}{28}$ ounce per pound.

Chairman W. S. Berry, Treasurer B. J. Spotts, and Chief Director W. Hurleman of the Quaker City Gas Model Club kept the events running smoothly. A detail of Philadelphia police supplied by Philadelphia's mayor, S. Davis Wilson, kept all spectators within the roped-off section of the field. At no time did they interfere with contest proceedings. A sound truck supplied by the General

Baking Co. of Philadelphia kept the spectators informed of contest proceedings. An eight-page program listing the events, prizes, and contestants was distributed free to spectators and contestants. A map of the country surrounding the airport was included in the program. This map was intended to help locate gas models that flew away from the airport. Special tree climbers and model retrievers were provided in an effort to reduce the annoyance which neighboring farmers are sure to suffer during any gas model contest.

Four hundred seventy-two flights were recorded in the two major events—endurance flights and timer flights. Six runways were provided with facilities for weighing, timing, and fueling of the models. Flying continued from 10 a. m. to 5 p. m. The Major Award event was run off from 5 to 6 p. m. and was limited to the place holders of all previous events.

The Nonwinners' Lucky Time event is original with the QCGMC. It is intended for the entrants who do not place among the winners. The night before the meet the "lucky times" were written and sealed in an envelope. After the close of the contest, the official flights that were closest to the lucky times were awarded prizes.

This contest must have been ideal for the spectator as well as the contestant. No trouble was spared to make the meet enjoyable for both. It seems a good idea to cater to the public. If they become enthusiastic about modeling, our hobby is certain to benefit.

Included in the selection of prizes were 5 Air Trails subscriptions.

Following are the contest results:

Endurance Event

1. William Flynn, Brooklyn, N. Y. Buccaneer
2. Charles Bossi, Germantown, Pa. Miss Philadelphia
3. Harold Phillips, Philadelphia, Pa. Flying Quaker

Timer Event

1. William Effinger, Brooklyn, N. Y. Standard Buccaneer
2. Welford Schaneley, Perkaskie, Pa. Quaker Flash
3. Mrs. C. H. Stagg, Philadelphia, Pa. Flying Quaker (modified)

Stunt Flying

1. Joseph Kapral, Philadelphia, Pa. Own Design
2. Charles Gutekunst, Philadelphia, Pa. Parasol Monoplane
3. Leonard Gutekunst, Philadelphia, Pa. Parasol Monoplane

(Turn to page 89)



The QUESTION MARK

All questions pertaining to model construction problems should be addressed to Gordon S. Light.

Answers will be given promptly by mail, thus avoiding delay.

The Discussion CORNER

The model art progresses through exchange of ideas. The Discussion Corner is a monthly sounding board for your opinions. For February the subject is fuselage cross sections. Other topics are listed below. Think about them, then write your opinion in 150 words or less and send it to The Discussion Corner. One dollar is paid for each answer printed.

RETRACTABLE landing gears are not desirable on fuselage models of the Wakefield or Stout type.

Here are the reasons: (1) retractable gear would shift the position of the center of gravity of the model; (2) retracting mechanism would be too heavy; (3) the necessarily long struts on a duration model would require too intricate a retracting mechanism. Instead of a retractable gear, I'd suggest a fixed gear with special attention to streamlining through use of cantilever bamboo struts or music wire. Fairings or wheel pants may be used. A carefully streamlined landing gear eliminates any necessity of retracting.—JAMES KAGAWA, Bayside, Long Island, New York.

Retractable landing gears should definitely be used on a fuselage model built under the new weight rules. To be sure it would be more trouble—but does not all good model building entail that bit of "extra trouble"? Thorough streamlining should be the keynote of a builder aiming for the maximum in performance. The landing gear should be the first step in this clean-up campaign. Therefore, up with the landing gear!—RALPH KUMMER, St. Louis, Missouri.

I believe that a retractable landing gear would be of little value in a contest model. The extra weight of the retracting mechanism would be more useful as a larger propeller and a longer motor. Naturally, careful attention should be given to streamlining the fixed landing gear.—BUD ALEXANDER, Miami Beach, Florida.

The value of a retractable landing gear depends upon the speed of the model. If the wing loading is high enough to raise the flying speed to 40 m.p.h. or higher we must turn to superstreamlining, including a retractable landing gear. But until such speeds are reached, the greater resistance of the fixed landing gear will not prove too much of a handicap.—DUKE FOX, Manteca, California.

Retractable landing gears on the new weight rule models would obviously increase the climb and efficiency. There would be few design problems in a retractable gear since they have all been solved by Alan Booton in his articles on the Folkerts' racer and Time Flies (January and February, 1937, Air Trails). This device is fool-proof and exceptionally lightweight. With a little in-

genuity it can be adapted to practically any model.—CLAUDE MCCULLOUGH, Ottumwa, Iowa.

A retractable gear on a new, weight-rule model would not improve performance enough to justify difficulties in design and construction. At a speed less than 40 m.p.h. a retractable gear would have no noticeable superiority over a clean, low-drag type such as the wire tripod equipped with wheels that are in line with the path of flight. Also, it would be difficult to adjust a model since a retractable gear would shift the center of gravity every time it was raised or lowered.—DAVID ALEXANDER, JR., Aiken, South Carolina.

This Month's Topic

Would the use of a retractable landing gear on the new, weight-rule models improve performance enough to justify difficulties in design and construction?

Retractable landing gears? Absolutely not! The only advantage of a retractable landing gear is streamlining and the reduction in air resistance. Because of the weight of the retracting mechanism the speed gained from streamlin-

ing would be lost in the transportation of the mechanism.—LYMAN ANDERSON, Walnut Park, California.

I don't believe in retractable landing gears. In the first place, it would add more weight to the model. Secondly, it would be more difficult to design and construct. And, too, a retractable gear would expose the model to considerable risk that might result in cracking up an otherwise good job. Some, no doubt, will attempt this gear, but for the everyday model builder it is much too risky.—ROBERT L. PFEIFER, West Allis, Wisconsin.

COMING UP are these topics:

For March—*Does the use of twin, vertical tails improve a model's performance from either the stability or efficiency standpoint?* Answers must reach us by December 15th.

For April—*Does the "Diamond" type fuselage model improve efficiency? What do you believe to be the best method of design for reducing the interference drag of wing and fuselage junction?* Answers must reach us by January 15th.

For May—*Is the one-bladed propeller likely to improve contest times to the extent that it should be incorporated in all contest designs? What do you consider to be the chief advantages and disadvantages of this newly developed device?* Answers must reach us by February 15th.